

**A STUDY OF UTILIZATION OF NUTRIENT MANAGEMENT
PRACTICES BY THE POMEGRANATE GROWERS**

By

Mr. Kolgane Bharat Taterao

(Reg. No. 013/42)

A Thesis submitted to the
**MAHATMA PHULE KRISHI VIDYAPEETH
RAHURI – 413 722, DIST. AHMEDNAGAR
MAHARASHTRA, INDIA**

in partial fulfillment of the requirements for the degree

of

DOCTOR OF PHILOSOPHY (AGRICULTURE)

in

AGRICULTURAL EXTENSION



DEPARTMENT OF EXTENSION EDUCATION

**POST GRADUATE INSTITUTE
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MAHARASHTRA, INDIA.**

2019

CANDIDATE'S DECLARATION

I hereby declare that this thesis or part
there of has not been submitted
by me or other person to any
other University or Institution
for a Degree or
Diploma

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Date : / /2019

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CERTIFICATE

This is to certify that the thesis entitled, “**A STUDY OF UTILIZATION OF NUTRIENT MANAGEMENT PRACTICES BY THE POMEGRANATE GROWERS**” submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri Dist. Ahmednagar (M.S.) in partial fulfillment of the requirements for the degree of **DOCTOR OF PHILOSOPHY (AGRICULTURE)** in **AGRICULTURAL EXTENSION**, embodies the results of a piece of *bona fide* research work carried out by **Mr. BHARAT TATERAO KOLGANE**, under my guidance and supervision and that no part of the thesis has been submitted for any other degree or diploma.

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Place : MPKV, Rahuri

Date : / /2019

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(Bharat T. Kolgane)

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LIST OF ABBREVIATIONS / SYMBOLS

%	:	Per cent
NRC	:	National Research Centre, Pomegranate
etc.	:	Et cetera (and so forth)
et al.	:	Et alia (and other)
EEI	:	Extension Education Institute
fig.	:	Figures
ha	:	Hectare
i.e.	:	That is
INM	:	Integrated nutrient management
IPM	:	Integrated pest management
KVK	:	Krishi Vigyan Kendra
MPKV	:	Mahatma Phule Krishi Vidyapeeth
MANAGE	:	National Institute of Agricultural Extension Management
NIRD	:	National Institute Rural Development
NIAM	:	National Institute of Agricultural Marketing
No.	:	Number
PGA	:	Pomegranate Growers Association
Rs.	:	Rupee (s)
viz.	:	Vicelike (namely)
J.		Journal
Sl. No.	:	Serial number
ICAR	:	Indian Council of Agriculture Research
DAC	:	Department of Agriculture & Cooperation
Agri.	:	Agriculture
Dr. BSKKV	:	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth
Dr. PDKV	:	Dr. Panjabrao Deshmukh Krishi Vidyapeeth
VNMKV	:	Vasantrao Naik Marathwada Krishi Vidyapeeth

ABSTRACT

A STUDY OF UTILIZATION OF NUTRIENT MANAGEMENT PRACTICES BY THE POMEGRANATE GROWERS

By

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(Reg. No. 2013 / 42)

A candidate for the degree

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Though area under pomegranate cultivation has increased tremendously, but the productivity has not increased the desired extent. The low level of nutrient input accounted as one of the reasons for relatively low yields, much below the reliable potential. Long term and continuous application of one favoured nutrient source may lead to its accumulation in soil resulting in the increased concentration and build-up of nutrient that may interact with other nutrients influencing either synergism or antagonism. Therefore, there is a need for rational application of nutrients for ensuring efficient use of external inputs for optimizing productivity besides, addressing the issue of pollution. This emphasizes the need for an integrated nutrient management approach for sustainability of pomegranate production across the state. Use of organic and inorganic fertilizer sources that are locally available, culturally suitable and economically viable is needed for ensuring balanced supply of nutrients impacting soil and human health. It is therefore felt necessary to find out the existing level of knowledge and extent of utilization of nutrient management practices in pomegranate.

Therefore, the study entitled “A study of Utilization of Nutrient Management Practices by the Pomegranate Growers” was planned and undertaken with objectives to study the personal, social, situational, communication and psychological characteristics of the pomegranate growers and their use of information sources, their extent of knowledge, utilization and constraints faced by them in utilization of the nutrient management practices and to obtain their suggestions for overcoming the constraints.

The present study was conducted in three tahsils viz., Sangola, Pandharpur, Atpadi, Jat , Malegaon and Satana (Baglan) which represent the respective three agricultural divisions in the state. The 270 pomegranate growers selected by following proportionate random sampling method from the eighteen villages constitutes sample of the study. The knowledge test and utilization scale about Nutrient Management Practices was designed for the study. The data were collected with the help of well constructed and pretested interview schedule.

The collected data were processed through primary and secondary tables and statistically analysed. The coefficient of correlation (r) was computed to find out the relationship between the selected independent and dependent variables. Multiple regression analysis was done to explain the extent of variability caused by the sets of independent variables in dependent variables.

The findings of the study showed that, the near half of the pomegranate growers (47.00 %) were of ‘old’ age., (34.07 %) were educated up to ‘Higher Secondary’ near three fifth of the respondents (58.89 %) belonged to medium size of family, most of the respondents (53.70 %) had experience up to 16 years in pomegranate cultivation, near one third of the pomegranate growers (27.03 %) belonged to ‘ very high’ socio-economic status, two third (63.33 %) respondents had low level of social participations, belonged to the category of ‘semi-medium ’ land holding ranging from 2.01 to 4.00 ha., majority of pomegranate growers (60.75 %) belonged to the category of ‘semi-medium’ area under pomegranate cultivation from 2.01 to 4.00 ha., The pomegranate growers (46.30 %) had annual income between Rs.5,13,001 to Rs.8,91,000/-, Majority (71.48 %)

of Pomegranate growers had medium level of risk preference, Majority of the respondents were having moderate favourable attitude, 78.89 per cent of the respondents were in 'medium' scientific orientation category, Majority of the respondents (55.55 %) were having 'medium' level of use of information sources, The large majority of the pomegranate growers (88.15 %) had 'medium' level of information sources used through local personnel, The near half of the pomegranate growers (47.04 %) had 'high' level of information sources used through personnel cosmopolite,

All the cent per cent Pomegranate growers had 'complete knowledge' about different types of organic manures that is bulky and concentrated, sources of bulky organic manures and advantages of manures (98.88 %), While near about fifty per cent of respondents had 'complete knowledge' about year wise application of recommended doses of manures per plant per year from 1st year to 5th year that is (50.74 %), (35.18 %), (63.70 %), (41.11 %), (42.59 %) respectively. Near one third of the pomegranate growers had 'partial knowledge' about types of green manures while, types of leguminous crops (39.64 %) had no knowledge, about recommended stage of burying green manuring crops (50.00 %) had no knowledge. Near about 90.00 per cent of the pomegranate growers had 'complete knowledge' regarding meaning of Bio-fertilizer (92.59 %), formulations of bio-fertilizers (96.29 %), types of Bio-fertilizers like Pseudomonas (100.00 %), Trichoderma(100.00 %), Pacelomysis (96.29 %), PSB (88.88 %), VAM (85.18 %), KSB (77.77 %) and cent per cent for time of application of bio fertilizers at pit filling stage respectively. As per time of chemical fertilizer application at bahar treatment (85.18 %), after bahar treatment (88.88 %) and as per recommended N, P₂O, and K₂O doses of fertilizers per plant for one and two year old orchard.(46.29 %), three and four years old orchard (36.29 %) and five years and above old orchard (51.11%) had "complete knowledge" respectively. While, cent per cent respondents had complete knowledge regarding micronutrient formulations viz. Ferrous Sulphate, Magnese Sulphate, Zink Sulphate, Copper Sulphate, Borax respectively.

Near about fifty (51.85 %) per cent of the respondents had 'high' knowledge about integrated nutrient management, green manure 42.23 per cent and Bio-

fertilizers, 62.59 per cent had medium knowledge level. About chemical fertilizers 64.82 per cent, respondents had 'high' knowledge level about fertigation and 57.05 per cent about micronutrients had 'high' knowledge level.

The relationship between age and cropping pattern with knowledge level of the respondents was found to be negative and significant. The relationship between other independent variables like education, family size, experience in pomegranate cultivation, socio-economic status, social participation, irrigation status, area under pomegranate, annual income, risk preference, attitude, scientific orientation, information sources use and Cosmopolitanism and knowledge was found to be positive and significant. The only total land holding was found positive non-significant with the knowledge level of the respondents.

However regarding organic fertilizer dose for first year of plant, respondents had 54.40 per cent not utilized as per recommendation followed by for second years plant 52.96 per cent followed by for third years plant 52.59 per cent followed by for fourth years plant 54.81 per cent respondents and for five and above years plant 55.55 per cent respondents respectively.

It was observed that about types of leguminous crops utilized by Pomegranate growers viz. *Sunhemp* 61.48 per cent had not utilized as per recommendation. About *Mung* crop 60.37 per cent had not utilized followed by Cowpea, 60.00 per cent, Berseem 60.00 per cent, Gavar 60.00 per cent and *Dhaincha* 58.88 per cent respondents had not utilizes as a green manures crop.

Bio-fertilizer dose used by Pomegranate growers viz. *Pseudomonas* 69.62 per cent followed by *Trichoderma* dose 67.77 per cent respondents had utilized as per recommendation followed by 16.29 per cent had not as per recommendation respectively. About *Pasilomycene* dose, 63.70 per cent respondents followed by PSB dose 69.62 per cent had utilized as per recommendation followed by VAM dose, 45.92 per cent followed by KSB dose, 41.48 per cent respondents had utilized as per as per recommendation respectively. Majority 83.70 per cent Pomegranate growers had not utilized chemical fertilizer dose as per soil testing report followed by large majority, 95.18 per cent

respondents had utilized ring method and 91.11 per cent respondents had utilized drip method of fertilizer application. Regarding stages in which NPK are given, at planting stage 59.25 per cent respondents had not utilized NPK as per recommendation followed by flowering and fruiting stage, 54.81 per cent respondents had not utilized NPK as per recommendation followed by fruits size like chikku stage 58.14 per cent respondents had not utilized followed by at one month before harvesting stage. About half respondents 50.00 per cent had not utilized NPK as per recommendation. However regarding doses of NPK g / plant for 1-2 years plant near to half 45.55 per cent respondents followed by 3-4 years plant 62.22 per cent respondents followed by for 5 years and above years plant 43.70 per cent respondents had not utilized as per recommendation and 39.25 per cent respondents had only utilized as per recommendation dose and 17.03 had not utilized any NPK fertilizers dose.

While, about dose of different micronutrients *viz.* Ferrous sulphate dose , 45.55 per cent respondents had utilized as per recommendation followed by Ferrous sulphate followed by Manganese sulphate 70.37 per cent followed by Zinc sulphate-79.25 per cent followed by Copper sulphate 75.92 per cent and by Borax 68.14 per cent respondents had utilized as per recommendation respectively.

Near 41.86 per cent of the pomegranate growers had high utilization about integrated nutrient management. About organic fertilizer, 44.07 per cent, green manuring, 43.33 per cent, biofertilizer, 57.03 per cent and chemical fertilizer respondents had medium utilization. More than sixty per cent (64.44 %) followed fertigation, (52.59 %) micronutrients, respondents had high utilization in pomegranate cultivation.

The relationship between age and cropping pattern with utilization level of the respondents was found to be negative and non significant. The relationship between other independent variables like education, family size, experience in pomegranate cultivation, socio-economic status, social participation, irrigation status, total land holding, area under pomegranate, annual income, risk preference, attitude, scientific orientation, information sources use and Cosmopolitaness and utilization level of the respondents was found to be positive and highly significant.

Among the constraints, regarding unavailability of pure breed graft material followed by lack of knowledge about chemical properties of water, high investment cost of drip installment, less knowledge about quantity of drippers and water per plant, lack of knowledge about pruning management, lack of knowledge about pests and diseases.

To overcome the constraints respondents suggested that, organization of workshop on soil health followed by organization of method and result demonstration on spacing and doses of organic manures, authentic seedlings should available in time, organization of method demonstration on water testing sampling, organization of workshop for farmers on drip irrigation management, regarding bahar management, *Shivar ferries* should organized by extension personnel, Government should organized training programme on market oriented bahar management, regarding nutrient management, awareness of nutrient managements among farmers through farmers rally and agricultural exhibitions by State Agriculture Department with Agricultural Universities.

1. INTRODUCTION

Pomegranate (*Punica granatum* L.) commonly known as Anar, Dadim and Dalimb in Marathi, belongs to family Lythraceae, regarded as 'fruit of paradise', an ancient favorite fruit of tropical and subtropical regions of the world. The centre of origin of this plant is thought to be Iran, where it was first cultivated in 2000 B.C. It is extensively cultivated in Spain, Morocco, Egypt, Iran, Afghanistan, China, Japan, USA, Russia, Pakistan, India and other Mediterranean countries. The wide adaptability, hardy nature, low maintenance cost, stable and high yields, fine table and therapeutic values, better keeping quality and possibilities to keep the plants into rest period when there is scarcity of irrigation water are some of the qualities which make this fruit crop ideally suitable for semi-arid and arid regions. Pomegranate fruits are mainly used for dessert purposes. This fruit also has wide consumer preference, for its attractive, juicy sweet, acidic and refreshing fruits. Fruits are used for both fresh consumption and processing. The fresh fruit is of exquisite quality, while its processed products such as bottled juice, syrups and jelly are highly appreciated and nourishing. The fruit is good source of carbohydrates, minerals and vitamins. Pomegranate plant and fruit are prized over centuries for their medicinal properties.

India with diverse soil and climate comprising several agro ecological regions provides ample opportunity to grow a variety of horticultural crops. These crops form a significant part of total agricultural produce in the country comprising of fruits, vegetables, root and tuber crops, flowers, ornamental, medicinal and aromatic plants, spices, condiments, plantation crops and mushrooms. It is estimated that all the horticulture crops put together cover nearly 11.6 million hectares area with an annual production of 91 million tones. Though these crops occupy hardly 7.00 per cent of the cropped area they contribute over 18.00 per cent to the gross agricultural output in the country. Horticultural crops play a unique role in India's economy by improving the income of the rural people. Cultivation of these crops is labour intensive and as such they generate lot of employment opportunities for the rural population. Fruits and vegetables are also rich source of vitamins, minerals, proteins and carbohydrates, which are essential inhuman nutrition. Hence, these are referred to as protective foods and assumed great importance as nutritional security of the people. Thus, cultivation of horticultural crops

plays a vital role in the prosperity of a nation and is directly linked with the health and happiness of the people.

Pomegranate growth excels in dry climate. Generally, pomegranate grows in variety of soils and even survives in alkalinity and salinity in soils. The pomegranate plant may begin to bear fruits in 1 year after planting out, but 2 1/2 to 3 years is more common. Cultivars like Alandi or Vedki, Dholka, Kandhari, Kabul, Muskati Red, Paper Shelled, Spanish Ruby, Ganesh (GBI), g 137, P 23, P 26, Mridula, Jyoti, Ruby, IIHR Selection, Yercaud 1, Co-1 etc. are most commonly grown in and around India. In India pomegranate was previously grown in kitchen gardens and commercial plantations have come up in recent years with the introduction of some improved cultivars like *Bhagwa*, *Ganesh*, *Araktha*, *Mridula* and *Super Bhgwa*. With the recent developments in dryland horticulture, the production of this fruit has increased with increased demand in internal trade and export market. In the past, India used to import pomegranate fruits from Afghanistan and West Pakistan, but the import scenario has completely changed since from the last decade of twentieth century and India started exporting pomegranate to different countries.

1.1 Pomegranate scenario in India and Maharashtra

Pomegranate is a high value crop. Entire tree of pomegranate is of great economic importance. Apart from its demand for fresh fruits and juice, the processed products like pomegranate wine, pomegranate tea and candy are also gaining importance in world trade. All parts of pomegranate tree have great therapeutic value and have high potentiality for their use in leather and dying industry. Demand in the international market has widened the scope for earning higher dividends from this crop. Profits up to 1.5 lakhs/ha/annum have been demonstrated by some growers. It is an ideal crop for the sustainability of small holdings, as pomegranate is well suited to the topography and agro-climate of arid and semi-arid regions. In addition, it provides ample opportunity for livelihood security, as it has high potentials to utilize wastelands widely available in the region and an ideal crop for diversification. Moreover, it can make sizeable contribution to GDP with a small area. Pomegranate is gaining a lot of attention world over because of its high economic and nutraceutical values (Pareek *et al.*, 2002). India is the largest pomegranate producer in the world (24 lakhs tons) covering about 2 lakh ha of land

standing fourth at global level. Maharashtra state (cultivated area 136 thousand ha) is considered as pomegranate basket in India contributing almost 80 per cent of production (1578 thousand tones) followed by Karnataka, Andhra Pradesh, Gujarat, Rajasthan and Tamilnadu (Horticulture at a Glance 2017). Other states like Bihar and Punjab are also venturing to take pomegranate crop in their farming system. It is an ideal crop for the sustainability of small holdings as it comes up well under the agro climatic and topographic situation existing in arid and semi-arid regions. Innovations in pomegranate cultivation had a dramatic impact on the livelihood of poor people in the semiarid regions of India, where farmers adopted production technology of this crop. Pomegranate growers have adopted new improved varieties and hi-tech horticulture to produce more and more quality fruit in order to keep pace with export market.

Table 1. State-wise area, production and productivity of pomegranate in India (Area in 000 Hectare, Production in 000 MT, Productivity in MT/Hectare)

States Year	Maharashtra	Karnataka	Gujarat	Andhra Pradesh	Tamilnadu	India
2012-13						
Area	78	15.10	7.40	6.20	0.38	113
Production	408	150.30	79.02	62.01	11.90	745
Productivity	5.23	9.95	10.68	10.00	31.32	6.58
2013-14						
Area	90	16.62	9.38	6.00	0.40	131
Production	945	134.18	99.33	90.01	13.09	1346
Productivity	10.50	8.07	10.59	15.00	32.73	10.29
2014-15						
Area	128.65	23.23	14.77	5.38	0.35	181
Production	1197.71	261.82	171.66	76.69	12.19	1789
Productivity	9.31	11.27	11.62	14.24	35.24	
2015-16						
Area	128.40	27.26	18.54	08.39	0.48	197
Production	1486.11	319.34	278.10	113.28	15.92	2306
Productivity	11.57	11.72	15.00	13.51	33.10	
2016-17						
Area	136.75	28.09	18.54	07.17	0.51	209
Production	1578.04	328.92	278.10	105.20	13.96	2442
Productivity	11.54	11.71	15.00	13.64	27.43	

(Source: National Horticulture Board (NHB) -2015 and 2017)

Table 2. Area and Production for Major Producing Districts in Maharashtra

Sr. No.	Districts	2014-15		2015-16	
		Area	Production	Area	Production
1	Nashik	42.36	724.71	42.95	729.06
2	Ahmednagar	16.11	162.10	16.41	165.06
3	Solapur	19.03	169.80	17.13	118.86
4	Sangli	7.66	114.84	5.12	76.55

(Source : District wise area and production of fruit crops for Maharashtra -2014-15, final advance estimates)

1.2 Importance of pomegranate in human life

The pomegranate is very much liked for its cool refreshing juice and for its medicinal properties. The juice having sweet acidic taste is mainly used for patients suffering from leprosy. Its barks and rinds are commonly used in dysentery and diarrhea. The rind is also used as dyeing material for cloth. The low quality fruit after removal of skin/ shell is dried and used as 'Anar Dana'. Several processed products are also prepared like juice, concentrate, syrups and jelly. It contains 12 to 16 per cent digestible glucose and fructose. Acidity ranges between 1.5 to 3 per cent as per variety.

Table 3. Exports of Pomegranate from India (2010-11 to 2014-15)

Year	Production (tons)	Export (tons)	Export as % of Production
2010-2011	743090	18181.30	2.4
2011-2012	772450	30023.29	3.8
2012-2013	744950	35970.60	4.8
2013-2014	1345710	31328.29	2.3
2014-2015	1789310	20997.02	1.2

(Horticultural Statistics at a Glance-2015)

An overview of the above table regarding production and exports of pomegranate from India from 2010-11 to 2014-15 depicts that share of exports to the total pomegranate production in the country ranges from 1 to 5 per cent only, wherein maximum of pomegranate exported (4.8 per cent of production) was reported in 2012-13 which reduced tremendously to 1.2 per cent of total production in 2014-15.

Looking at the global level, total trade of pomegranate is 1 to 1.2 million tons per year. Spain is the biggest exporter contributing 70 to 75 per cent of World's trade of pomegranate while Iran is the 2nd largest exporter shares 15 to 20 per cent. In spite of the largest producer in the World, India lies at 3rd position and exports 5 -10 per cent only (Nichit, 2007). The greatest month of commercial pomegranate production in Spain is from September to December and the demand for Indian pomegranates decreases once the pomegranates from Spain and Iran starts flooding the markets. But in India pomegranate fruits are produced throughout the year, therefore it has a comparative advantage to supply pomegranate fruits even during off-season to European countries.

No doubt, the higher prices derived from export had encouraged few growers to learn new techniques for export but they are not very successful yet. They are few in number. In fact, they have gained quality expertise in agronomical practices like water and nutrient management, pruning, thinning, growth hormones etc. Despite of taking all such efforts and intensive care, it was possible to produce only 40 per cent of export quality fruits and rest of the produce was sold within the country. The private companies or export traders are playing dominant role in pomegranate export. But due to difficulties in documentation and procedures, and stringent Phyto-sanitary standards the growers are unable to export the pomegranates by own efforts. So export of this fruit has not been substantially increased yet, because the international standards are difficult to follow for growers. No doubt knowledge and adoption of Phyto-sanitary standards play vital role in global pomegranate market and INM is integral part of it.

Table 4. Nutrient Consumption in Pomegranate crop (Area In Ha, Qty in MT)

Sr. No.	Particulars	India Other than MS	Maharashtra
		Year-2011-12	Year 2011-12
1	Gross Area	67799	65474
2	Area Treated with Fertilizers	66475	64876
3	DAP	15317.488	15167
4	UREA	14724.907	14405
5	SSP	8265.724	8266
6	Ammonium Sulphate	134.807	135
7	Total N	11885.897	11689
8	Total P	12768.398	12676
9	Total K	4514.652	4492
10	FYM	291363.812	272720

(Source : Input Survey of India 2011-12)

Data pertaining to the major nutrient consumption by Pomegranate crop in India and Maharashtra is depicted in above table. The table clearly indicated that quantities utilized by the farmers from state are almost equal to the quantities utilized by farmers growing pomegranate in rest of India except FYM application where quantities utilized in state are less to national scenario.

India's dependence on imports to fulfill needs of the domestic farmers make the country dependent on other countries and also creates burden on Indian foreign exchange pool. In such conditions searching other avenues for soil fertility management and improving upon production quantities largely depends on integrated nutrient management practices.

1.3 Needs of Nutrient Management in Pomegranate

Present global pomegranate consumption ranks 18th place annually and expected to move onto 10th place within the decade in view of its innumerable nutraceutical importance. The fruit contains nearly about 153 Phyto-chemicals like ellagic acid, catechin and procyanidins, fatty acids and triglycerides, sterols and terpenoids, flavanols etc. The fruit juice contains tannins, anthocyanin, polyphenols and antioxidants A, E and C which plays major role in maintenance of heart blood vessels, and proper blood circulation. Among the various factors which contribute towards the growth, yield and quality of pomegranate, nutrition is the most important and it has direct effect on production and quality. Integrated nutrient management includes, use of inorganic and organic sources of nutrients to ensure balanced nutrient proportions by enhancing nutrient response efficiency and maximizing crop productivity of desired quality.

Though area under pomegranate cultivation has increased tremendously, but the productivity has not increased the desired extent. The low level of nutrient input accounted as one of the reasons for relatively low yields, much below the reliable potential. Long term and continuous application of one favoured nutrient source may lead to its accumulation in soil resulting in the increased concentration and build-up of nutrient that may interact with other nutrients influencing either synergism or antagonism. Therefore, there is a need for rational application of nutrients for ensuring efficient use of external inputs for optimizing productivity besides, addressing the issue

of pollution. This emphasizes the need for an integrated nutrient management approach for sustainability of pomegranate production across the state. Use of organic and inorganic fertilizer sources that are locally available, culturally suitable and economically viable is needed for ensuring balanced supply of nutrients impacting soil and human health.

1.4 Integrated Nutrient Management (INM) - the concept

The basic concept underlying the integrated nutrient management system (INMS), nevertheless, remains the maintenance and possible improvement of soil fertility for sustained crop productivity on long term-basis and also to reduce inorganic (fertilizer) input cost. The three main components of INMS as defined by FAO, 1998 are:

1. Maintain or enhance soil productivity through a balanced use of fertilizers combined with organic and biological sources of plant nutrients.
2. Improve the stock of plant nutrients in the soils.
3. Improve the efficiency of plant nutrients, thus, limiting losses to the environment.

Thus, integrated nutrient supply/management (INS) aims at maintenance or adjustment of soil fertility and of plant nutrient supply to an optimum level for sustaining the desired crop productivity through optimization of benefit from all possible sources of plant nutrients in an integrated manner (Roy and Ange, 1991).

Approach/components in INM

Besides inorganic fertilizers (chemical fertilizers) as the major component, others include farmyard manure (FYM), composts, green manure, bio-fertilizers, micro-nutrients, crop residues and crop rotation. (CICR, Coimbatore).

1.5 Scope and importance of the study

Pomegranate is an important dry land fruit crop which is being cultivated on large scale, but due to improper integrated nutrient management, production and productivity is declined. For understanding the reason for lower production and productivity, developing strategies for healthy orchard management is necessary. This study is a pioneering one of its kind and aims to identify the functional knowledge and extent of utilization level about nutrient management practices in pomegranate. It will provide clear picture about various nutrient management practices utilized by pomegranate growers. It brings to limelight the variety of information sources used for

obtaining information regarding production technology with special reference to nutrient management practices in pomegranate. The identified components would greatly help the administrators and policy makers to strengthen the relevant research, extension and client system for pomegranate production.

The analysis of research would reveal valuable research priorities to be focused and identified by the researchers in the area where the pomegranate growers need research information on varietal improvement, nutrient management, improvement in cultivation practices, bahar management, water management and soil related problems. It will help the extension workers to concentrate on a particular category of orchard holders who need the information on specific aspects of pomegranate production for increasing productivity and quality.

The study also delineates the characteristics of different categories of farmers which would influence the utilization of pomegranate production technology and their linkage system. This would help the extension workers to concentrate on such farmers who have the set of characteristics to pursue the technologies and to strengthen the linkage system. Similarly, the findings of this study will serve as background information for further detailed studies on orchard nutrient management. The knowledge test and utilization scale which will be developed for the study will be useful to other researchers to plan similar studies. The findings will also help to ascertain constraints faced by the pomegranate growers in practicing various nutrient management practices in pomegranate cultivation.

The study will help research workers and extension functionaries involved in solving the problems being arised during pomegranate cultivation. The extension and other action agencies will be equipped with guidelines of the present study, which in turn will be helpful for them to evolve a new strategy for introducing necessary changes in their action plan. Therefore, the present study will be carried out with the following objectives.

1.6 Objectives of the Study

1.6.1 General Objective of the study

The general objective of the study is to study the Extent of Utilization of Nutrient Management Practices by the Pomegranate Growers.

1.6..2 Specific Objectives of the Study

1. To study the personal, socio-economic and psychological characteristics of the pomegranate growers.
2. To develop a scale for utilization of nutrient management practices by the pomegranate growers.
3. To study the knowledge of the pomegranate growers about Nutrient Management Practices.
4. To study the Information Sources Use by the Pomegranate growers about Nutrient Management Practices.
5. To study the extent of Utilization of Nutrient Management Practices by the pomegranate growers.
6. To study the relationship between personal, socio-economic and psychological characteristics of pomegranate growers with their Knowledge and Extent of Utilization of Nutrient Management Practices by them.
7. To study the constraints faced by the pomegranate growers in utilization of Nutrient Management Practices and to obtain their suggestions for overcoming the constraints.

1.6.3 Hypotheses

1. There exists the relationship between personal, socio-economic and psychological characteristics of the pomegranate growers with their knowledge.
2. There exists the relationship between personal, socio-economic and psychological characteristics of the pomegranate growers with their extent of utilization of nutrient management practices by them.
3. Pomegranate growers do face constraints in utilization of nutrient management practices

1.7 Limitations of the study

The findings of the study would be restricted to the specific objectives under the investigation and would be based on the farm level data from selected respondents. The data will be collected from the respondent farmers through personal interview method. Due to limitation of time and resources available with the researcher, the investigation will be limited to 270 farmers from selected districts.

The findings of the study were based on the opinions expressed by the farmers. Hence, the objectivity of the data might be influenced by the extent of readiness and honesty of the respondents to furnish their real responses and opinion while collecting the responses.

1.8 Layout of the thesis

The report of the present research study entitled “**A study of utilization of nutrient management practices by the pomegranate growers**” has been presented in five chapters.

The first chapter “Introduction” comprises the information about scenario of pomegranate, its importance in human life, varieties grown, objectives of the study, hypotheses, scope, importance and limitations have also been presented in this chapter.

The second chapter ‘Review of Literature’ deals with relevant literature and findings of various past research studies conducted in different locations on the same or similar topics have been summarized.

The research methods, techniques, tools used and procedures followed in the present investigation have been presented in the third chapter on ‘Research Methodology’. The findings of the study have been presented, interpreted and discussed in the fourth chapter ‘Results and Discussion’.

A brief summary of the investigation, conclusions, implications and suggestions for further research have been given in the fifth chapter on ‘Summary, Conclusions and Implications’. The literature cited, test, scale, interview schedule and other schedules, formats and vitas are appended at the end of this dissertation.

2. REVIEW OF LITERATURE

A comprehensive review of literature is an integral part of any investigation, as it not only gives an idea on the work done in the past and assists in delineation of problem area and also provides basis for integration and discussion of findings. Fleishman (1969) said better ways are needed to generate research findings from laboratory studies to operational settings, from one experimental study to another and from one operational setting to another”.

Review of literature, both published and unpublished related to the subject under study, is always useful to the investigator to select the problem for research, formulate the objectives, hypotheses, choose a suitable methodology and avoid unnecessary duplication of efforts. It also provides a general orientation to the topic of investigation by creating an insight and a sense of integration about the subject as a whole. With these considerations in mind, an attempt is made in this chapter to review the published material like articles in scientific journals, technical journals, books, souvenirs, volumes of abstracts of seminar papers. The unpublished information in the form of theses, reports of surveys and committees, relating to the problem under investigation were referred.

As the literature on nutrient management practices in pomegranate crop is limited, reviews that are available on fruit crops regarding knowledge and utilization of recommended production technology, information sources use, constraints and suggestions, also reviews on other crops are included in this chapter. However, an earnest effort was made to review the available literature having direct or indirect bearing on the present study.

The reviews are presented under following heads

- 2.1 Personal and social characteristics of the farmers
- 2.2 Situational characteristics of the farmers
- 2.3 Economic characteristics of the farmers
- 2.4 Psychological characteristics of the farmers
- 2.5 Communicational characteristics / sources of information of the farmers
- 2.6 Knowledge of farmers about various nutrient management practices
- 2.7 Extent of Utilization of nutrient management practices by the farmers

- 2.8 Constraints faced by the farmers in utilization of nutrient management practices
- 2.9 Suggestions given by the farmers for overcoming the constraints
- 2.10 Conceptual model of the study

The concepts and variables for the present study have been selected for the empirical studies which are relevant and have been considered as the background of the respondents. The review of related research concerned to the concepts and variables has been presented in respect of personal, social, situational, economic, psychological and communication characteristics of the pomegranate growers. These are viewed as important variables concerned with the knowledge and utilization of the respondents. Therefore, these variables were studied in the objectives of the study. Availability of the literature having direct bearing on the aspects of the pomegranate growers is the limiting factor. However some studies, though not directly related, but applicable to similar situation are viewed and presented as under.

2.1 Personal and social characteristics of the farmers

2.1.1 Age

Yogananda (1992) in his study on coconut growers of Tumkur district in Karnataka revealed that the 41.66 per cent of small coconut land holders belonged to younger age group. Whereas, in case of big coconut land holders the percentage of young age was only 28.34. A reverse trend was seen in case of old age of coconut growers group. As much as 30 per cent of small land holders belonged to old age group among coconut growers.

Balasubramani (1997) in his study on knowledge and adoption behaviour of rubber growers in Belthangadi taluk of Dakshina Kannada district revealed that the 50 per cent of the farmers belonged to middle age group, 35.00 per cent of the farmers belonged to young age group and only 15.00 per cent of the farmers belonged to old age group.

Raghavendra (1997) in his study on knowledge and adoption behaviour of arecanut farmers of South Canara district, Karnataka state reported that 20.00 per cent of the growers are old aged, 39.00 per cent of them were middle aged and 41.00 per cent of growers were young.

Deshmukh *et al.* (1998) concluded that the majority (62.50 %) of the respondents were from middle age group (33 to 54 years), followed by 21.67 per cent from young age group (up to 32 years) and 15.83 per cent from old age category (above 55 years).

Geete (1999) observed that young mango growers (20.00 %) in the sample were less in number than their number in middle and old category.

Lakshmisha (2000) in his study on impact of cashew demonstrations on knowledge, adoption and yield levels of farmers in Dakshina Kannada district revealed that half of the farmers (50.00 %) belonged to middle age group, 27.00 per cent of farmers belonged to young age group and 23.00 per cent of the farmers belonged to old age group.

Mahajan (2000) found that, majority of banana growers (65.00 %) were in middle age group ranging from 36 to 50 years.

Ramshetwad (2001) revealed that, maximum number of the banana cultivars (50.83 %) belonged to young age group ranging up to 35 years, followed by 35.83 per cent appeared in middle age group ranging from 36 to 50 years.

Babanna (2002) in his study on areca nut growers in Shimoga district stated that 38.4 per cent belonged to old age category of areca nut growers, 35 per cent of them are middle aged and 26.6 per cent of the areca nut growers were belonged to young age group.

Borate (2002) conducted a study on entrepreneurial behaviour of the mango growers in Ratnagiri district of Maharashtra State. He observed that the majority (62.00 %) of the respondents belonged to 'middle' age category, while less than one-fifth (18.00 %) of the respondents belonged to 'young' age category. One-fifth (20.00 %) of the respondents belonged to 'old' age category. The average age of the respondents was 49.90 years.

Vedamurthy (2002) in his study on management of areca gardens and marketing pattern preferred by the areca nut farmers of Shimoga district in Karnataka stated that about 25.33 per cent of the areca nut growers are old aged, 40 per cent of them are middle aged and 34.66 per cent of the growers are young.

More (2002) found that, relatively higher proportion of the banana growers (40.00 %) were in middle age group, followed by 37.00 per cent and 23.00 per cent in young and old age group respectively.

Gangurde (2003) reported that, maximum number of the respondents (53.33 %) growing banana belonged to middle age group i.e. 36 to 50 years and 28.33 per cent belonged to young age category ranging up to 35 years.

Thorat (2003), in a study on technological gap and constraints in adoption of recommended cultivation practices of mango growers, revealed that a majority (70.00 %) of the respondents were in the 'middle age group', while 16.00 per cent of the respondents were in the 'old' age group and 13.00 per cent of them were in 'young' age group. The average age of the respondents was 46 years.

Chavan (2005), in his study observed that 56.00 per cent of the respondent grape growers were from middle age group of 36-50 years.

Dhakane (2005) reported that 44.66 per cent of the grape growers were from young age group of up to 35 years.

Ghadge (2005) revealed that 47.65 per cent of pomegranate growers were belonged to middle age group followed by young (30.25 %) and old age group (22.10 %).

Khaire (2005) observed that the 58.50 per cent of the fig growers were in middle age group. About 23.00 per cent of them were from young age group and 18.50 per cent were from old age group.

Kadam (2006), in his study on adoption behaviour of the commercial mango growers with reference to commercial mango production, revealed that majority (67.36 %) of the respondents were in the 'middle' age group, while 16.58 per cent of the respondents were in the 'old' age group and 16.06 per cent of them were in 'young' age group. The average age of the respondents was 47 years.

Howal (2008) observed that the 47.65 per cent of the respondent pomegranate growers belonged to the middle age group (35 to 50 yrs.) followed by 33.59 per cent of them were in young age group (up to 35 yrs.). Only 18.75 per cent respondent pomegranate growers were belonged old age group (51 yrs. and above).

Sharnagat (2008) indicated that 58.67 per cent of the respondents belonged to middle age group i.e. 36 to 50 years. Followed by young age (27.33 %) and old (14.00 %) age group.

Sorate (2011), in his study on technological gap in grape cultivation revealed that more than half of grape growers (53.00 %) were included in the middle age group of 36 to 50 years. Whereas, 41.00 per cent respondents were in the young age group of up to 35 years. Only, 06.00 per cent of respondents appeared in old age category i.e. above 50 years.

Deshmukh (2013), in his study on knowledge and adoption of plant protection measures by pomegranate growers in Western Maharashtra revealed that more than half of the pomegranate growers were of 'middle' age. Fifty five per cent of the total respondents were 'middle' age followed by 32.89 per cent 'young' age respondents and 11.56 per cent 'old' respondents.

Rajula Shanthi and Subramaniam (2015), in his study on farmers' perspective on integrated nutrient management in Sugarcane found that 50.00 per cent of the respondents belonged to middle age and old age (43.30 %) group respectively.

2.1.2 Education

Yogananda (1992), in his study on knowledge level and adoption behaviour and training needs of coconut growers reported that nearly 80.00 per cent of small growers, 85.00 per cent of big growers had education ranging from primary school to graduation. Majority of these literate growers in both the groups (36.66 %) had education up to high school. Some others 18.34 per cent of small farmers, 26.66 per cent of big growers) had college education. Among people who did not have formal education i.e., 06.68 per cent of respondents in both the groups were capable either read or write. Only 13.33 per cent small growers and 08.33 per cent of big farmers were illiterate.

Balasubramani (1997), in his study on knowledge and adoption behaviour of rubber growers in Belthangadi taluka of Dakshina Kannada district reported that the 44.00 per cent of rubber growers belonged to medium education group. Thirty per cent of them belonged to high education group and only 26.00 per cent of rubber growers belonged to low education group.

Raghavendra (1997), in his study on knowledge and adoption behaviour of areca nut farmers of South Canara district Karnataka state observed that 50.00 per cent of the growers have high education level, about 22.00 per cent of the areca nut growers have medium education level and remaining 28.00 per cent of them have low education level.

Angadi (1999), in his study on knowledge, adoption and marketing pattern of pomegranate growers in Bagalkot district in Karnataka State, reported that 30.00 per cent of the pomegranate growers had studied 'up to middle school' level, followed by 20.62 per cent, who had studied up to high school.

Anonymous (2000) observed in research review committee report on extension education that the majority (52.72 %) of the pomegranate growers were educated up to primary level while (16.37 %) each had secondary and level and eleventh standard education and 11.50 per cent of them were illiterate.

Chaugule (2000) observed that about two-fifth (39.50 %) of the respondents were in the 'high school' category of education, whereas 23.50 per cent and 19.00 per cent were from the 'primary' and 'preprimary' category, while 09.50 per cent respondents were from the 'college' category and only 08.50 per cent respondents were from the 'illiterate' category. Average education completed by the respondents was 7th standard.

Lakshmisha (2000), in his study on impact of cashew demonstrations in knowledge, adoption and yield levels of farmers in Dakshina Kannada district reported that majority of the cashew growers belonged to high education category (47.00 %), whereas half of the other farmers had medium education level.

Mahajan (2000) revealed that, maximum percentage (29.30 %) of the banana growers had education up to high school level, followed by 28.00 per cent of them were up to college level.

Katkar (2001), in a study on adoption of mango production technology in Akola tahsil of Ahmednagar district, found that the 45.33 per cent of the respondents received 'primary' education, followed by (28.00 %) received 'secondary' education and very few (7.34 %) of them had received 'higher' education, while 19.33 per cent of them were 'illiterate'.

Ramshetwad (2001) found that, relatively higher proportion of the banana growers (58.33 %) were educated up to college level, followed by 23.33 per cent educated up to high school level.

Babanna (2002), in his study on areca nut growers in Shimoga district revealed that as high as 44.2 per cent of areca nut growers had education up to 4th standard followed by 39.2 per cent of the areca nut farmers having education level above 4th standard as against to that only 16.6 per cent of the respondents had up to 2nd standard.

Vedamurthy (2002), in his study on the management of areca nut growers and marketing pattern preferred by the areca nut farmers of Shimoga district in Karnataka stated that 38.66 per cent of the areca nut farmers studied up to high school. Almost equal per cent of the areca nut growers were educated up to primary school (13.33 %) and college (14.66 %). Only 8.00 per cent of the respondents were illiterate and 6.66 percent of the areca nut farmers were graduates.

Gangurde (2003) found that, little more than half of the respondents (50.83 %) banana growers were educated up to college level and 25.83 per cent were educated up to high school level.

Thorat (2003) observed that a maximum number (46.00 %) of respondents had 'secondary' education, followed by 'graduation' (23.00 %), 'higher secondary' (15.00 %), 'primary' (10.00 %) and 'pre-primary' (6.00 %) education. Only 10.00 per cent of the respondents were 'illiterate'. The average educational level of the respondents was 10th standard.

Kulhal (2004) revealed that a maximum number (41.67 %) of the Guava growers were educated up to 'secondary' level, while 22.50 per cent of the respondents were educated up to 'higher secondary' and 'diploma level', only 7.50 per cent completed their 'graduation' and 19.16 per cent respondents were educated 'up to primary level', while 9.17 per cent were 'illiterate'.

Chavan (2005) reported that 56.00 per cent of the grape growers were having primary level of education.

Khair (2005), observed that little more than one third (34.00 %) of fig growers were educated in between 8th to 10th standards only. About 18.00 per cent of the

respondents were educated up to 4th standard and (17.00 %) were illiterate whereas (9.00 %) respondents were educated up to 5th to 7th standard.

Satale (2005), in his study on training needs of mango growers with respect to post harvest management practices, observed that a maximum number (36.00 %) of the respondents had 'college' level education, followed by 'secondary' (21.00 %), 'higher secondary' (20.00 %), 'primary' (10.00 %) and 'pre-primary' (8.00 %) education. Only 5.00 per cent of the respondents were 'illiterate'. The average educational level of the respondents was 10th standard.

Kadam (2006) reported that the maximum number (37.31 %) of the respondents had 'secondary' education, followed by 'graduation' (22.28 %). An equal number (19.17 %) of the respondents had 'primary' and 'higher secondary' education. Only 2.07 per cent of the respondents had 'pre-primary' education. The average education level of the respondents was 11th standard.

Karale (2006) found that, 33.34 per cent of the respondents were educated up to graduate level. It was followed by those (23.33 %) who were educated up to high school. Relatively less proportion of the respondents (14.16 %) had attended primary and secondary school. None of the respondents were illiterate.

Sorate (2011), in his study on technological gap in grape cultivation, revealed that 35.00 per cent of the respondents were educated up to high school, followed by 23.00 per cent respondents were educated above higher secondary school level; whereas 19.00 per cent of them were educated up to higher secondary school.

Deshmukh (2013), in his study on knowledge and adoption of plant protection measures by pomegranate growers in Western Maharashtra revealed that maximum number of respondents (36.00 %) were educated up to 'degree' and higher education level, followed by respondents educated up to the 'secondary' and 'higher secondary' level (21.78 and 20.00 per cent respectively). Respondents having 'primary' level of education were only 1.78 per cent; however, there were 20.00 per cent respondents educated up to 'pre-'primary' level of education.

Rajula Shanthi and Subramaniam (2015), in his study on farmers' perspective on integrated nutrient management in sugarcane found that 30.00 per cent of the respondents educated up to literate with secondary education and to (16.60 %) graduate level.

2.3.3 Size of family

Biradar (2008), in his study on, impact of income generating activities on sustainable rural livelihoods of KAWAD project beneficiaries reported that majority (60.83 %) of the beneficiaries belonged to small family having 5 and below members and remaining (39.17 %) belonged to large family.

Naveen (2012) observed that 43.33 per cent of farmers were in medium family size followed by 33.33 and 23.33 per cent of farmers were small and big farmers, respectively.

Rajula Shanthi and Subramaniam (2015), in his study on farmers' perspective on integrated nutrient management in sugarcane found that 69.66 per cent of the respondents belonged to small family having 6 and below members and remaining (30.33 %) belonged to large family.

2.3.4 Experience in pomegranate cultivation

Bhapkar (1994), in his study on cashew growers to assess the technological gap and causes of non-adoption of recommended practices in Sindhudurg district, reported that the two-third (66.66 per cent of the respondents were in the category of 'medium' experience in cashew cultivation. There were 16.67 per cent each of the respondents in the category of 'low' and 'high' experience in cashew cultivation. The average experience in cashew cultivation was 15.53 years.

More (1996) observed that 62.00 per cent of the respondents had 'medium' experience, while the remaining 25.50 per cent and 12.50 per cent were in 'low' and 'high' experience categories, respectively. On an average, the respondents had 10 years of experience.

Kale (2000) found that 43.00 per cent of the respondents were having the 4 to 5 years experience in grape farming followed by 37.00 and 20.00 per cent respondents had experience more than 5 years and upto 5 years, respectively.

Mahajan (2000) found that majority of the banana growers (60.00 %) were having 11 to 20 years of experience in banana cultivation, followed by 25.30 per cent had an experience up to 10 years in banana cultivation.

Natkar (2001), in his study found that majority of the respondents had medium farming experience (48.00 %) followed by high (45.00 %) and low (7.00 %) farming experience, respectively.

Rameshetwad (2001) reported that, majority of the banana growers (39.16 %) had experience of 6-10 years.

Gangurde (2003) found that, maximum number of the farmers (41.56 %) growing banana had an experience of 5 to 8 years in banana cultivation.

Thorat (2003) revealed that nearly half (49.00 %) of the respondents had 'medium' experience in mango cultivation, while remaining 26.00 and 25.00 per cent of the respondents had 'low' and 'high' experience in mango cultivation, respectively. On an average, the respondents had 19.28 years of experience in mango cultivation.

Dhakane (2005) observed that 60.68 per cent of the grape growers had experience of 7 to 13 years, while 20.66 per cent of them had experience below 6 years.

Kadam (2006) stated that less than three-fourth (74.24 %) of the respondents had 'medium' experience in mango cultivation, while remaining 14.51 per cent and 7.25 per cent of the respondents had 'low' and 'high' experience in mango cultivation, respectively. On an average, the respondents had 21 years experience in mango cultivation.

Karale (2006) observed that the majority of the grape growers (80.33 %) were having 3.01 to 10.00 years of experience in grape cultivation. As much as 5.84 per cent of grape growers were found to be engaged in grape cultivation from 3.00 years. About one seventh (13.33 %) of grape growers had experience in grape cultivation for more than 10.00 years.

Leonardo and Quintos (2006), in their study on 'adoption of mango production technologies in Pangasinan', concluded that the mango growers had '14-19 years' experience in mango cultivation.

Sorate (2011), in his study reported that, most of the respondents (79.00 %) had an experience of 4 to 8 years in grape cultivation. It was followed by (09.00 %) of respondents who had experience of above 8 years and (12.00 %) of the respondents had experience up to 4 years in grape cultivation.

Deshmukh (2013), in his study on, knowledge and adoption of plant protection measures by pomegranate growers in Western Maharashtra, revealed that, most of the respondents (52.89 %) had experience up to 7 years in pomegranate cultivation, followed by (32.44 %) respondents who had experience from 8 to 12 years and only (14.67 %) of the respondents had experience above 13 years in pomegranate cultivation.

Rajula Shanthi and Subramaniam (2015) in his study on farmers' perspective on integrated nutrient management in sugarcane found that half 50.00 per cent of the respondents who had had experience more than 25 years and 23.20 per cent of the respondents had experience more than 20 years in pomegranate cultivation.

2.1.5 Socio economic status

Reddy (1992) indicated that, 67.5 per cent of the mango growers in Khammam district had medium socio-economic status category followed by low (21.67 %) and high (10.83 %) socio-economic status.

Yogananda (1992), in his study on coconut growers of Tumkur district in Karnataka revealed that 41.66 per cent of small coconut land holders belonged to low socio-economic status. Whereas, in case of big coconut land holders the percentage of high socio-economic status was 58.34 per cent.

Lakshmisha (2000), in his study on impact of cashew demonstrators on knowledge, adoption and yield levels of farmers in Dakshina Kannada district reported that majority of the farmers (59.00 %) belonged to higher socio-economic status group and 17.00 per cent of them belonged to low socio-economic status.

Kadam (2006), in his study on adoption behaviour of the commercial mango growers with reference to commercial mango production, revealed that majority (67.36 %) of the respondents were in the 'medium socio-economic status', while 16.58 per cent of the respondents were in the 'low socio-economic status' and 26.06 per cent of them were in 'high socio-economic status'.

Deshmukh (2013), in his study on, knowledge and adoption of plant protection measures by pomegranate growers in Western Maharashtra, revealed that, majority of the pomegranate growers (51.55 %) belonged to 'high' to very higher socio-

economic status, followed by the respondents (21.78 %) belonging to 'medium' socio-economic status. While, 18.22 per cent of them had 'low' socio-economic status.

2.1.6 Social participation

Nagaraja (2002) reported that (32.91 %) of respondents were members of co-operative society, 27.08 per cent were members of Raitha Sangh, 6.66 per cent were member of youth clubs and in local level government institutions, such as gram panchayat, taluk panchayat and zilla panchayat it was 2.50, 1.25 and 0.40 per cent respectively.

Sandesh (2004) found that 39.17 per cent of the farmers were members of Taluka Panchyat and 0.83 per cent was members of Zilla Panchyat. Among those, 57.50 per cent of the farmers were regularly participating in cooperative societies.

Aitwade (2012) found that about two third (65.84 %) of the sugarcane growers had medium level of social participation, followed by one fourth (24.16 %) having low level of social participation. Furthermore, it was observed that very few i.e. 7.50 per cent and 2.50 per cent sugarcane growers had moderate and high level of social participation, respectively.

Singh *et al.* (2014) reported that majority (63.67 %) of the wheat growers were not a member of any organization.

Rajula Shanthi and Subramaniam (2015), in his study on farmers' perspective on integrated nutrient management in sugarcane found that majority (52.00 %) of the medium farmers had higher social participation followed by large farmes (34.00 %) had medium social participation.

2.2 Situational characteristics of the farmers

2.2.1 Irrigation Status

Bite (2009) reported that majority of the farmers were having irrigation source as well as (62.50 %), followed by tube well (40.83 %) while one fourth (25.00 %) of them had no irrigation source.

Aitwade (2012) found that about 30.00 per cent of the sugarcane growers irrigated their field by using tube well irrigation, followed by co-operative irrigation society (23.33 %), 13.33 per cent of the sugarcane growers irrigated their farm by using bore well, while 10.00 per cent by lift irrigation.

Dhere (2012) found that more than one half (55.00 %) of the farmers had well as the irrigation source, followed by tube well (17.00 %), river (15.00 %) and canal (10.00 %). Only 3.00 per cent of them had no source of irrigation.

Deshmukh (2013) in his study on, knowledge and adoption of plant protection measures by pomegranate growers in Western Maharashtra, revealed that

Singh *et al.* (2014) reported that 32.67 per cent of the small farmers had average irrigation facilities, followed by satisfactory irrigation facilities (30.00 %) and unsatisfactory irrigation facilities (30.67 %), while only 6.66 per cent of them had high irrigation facilities.

2.2.2 Cropping pattern

Waghmare (2001) in his study on, indigenous technological knowledge about fruit crops, observed that majority (80.00 %) of the farmers were from medium category, while 11.67 per cent and 8.33 per cent of them were from high and low category of cropping pattern.

Balsubramani and Subramaniam (2004) revealed that a majority of the paddy growers (86.67 %) practiced single season cropping pattern, while 13.33 per cent of the paddy growers practiced more than one season cropping pattern.

Bite (2009) reported that majority of the farmers (71.67 %) belonged to medium cropping pattern, 15.00 per cent had high cropping pattern and 13.33 per cent had low cropping pattern.

Dhere (2012) found that majority (70.00 per cent of the farmers having medium cropping pattern followed by 17.00 per cent with high cropping pattern and 13.00 per cent with low cropping pattern. Further he revealed that a large majority (90.00 %) of the farmers had cultivated *kharif* crop, followed by *rabi* (65.00 %), perennial (20.00 %), annual (15.00 %) and summer (9.00 %).

2.3 Economic characteristics of the farmers

2.3.1 Land holding

Sinha *et al.* (1991) in their study on changing scenario of dry land horticulture in tribal areas, reported that dry land fruit cultivation was mainly confined to farmers with more than 2 ha of land holding.

More (1996) reported that 45.50 per cent of the watermelon growers had 'small' land holding, while 40.00 per cent respondents possessed 'semi-medium' holdings. Only 7.50 and 7.00 per cent respondents had 'medium' and 'marginal' land holdings, respectively. The average size of land holding was 2.20 ha.

Balasubramani (1997), in his study on knowledge and adoption behaviour of rubber growers in Belthangadi taluk of Dakshina Kannada district revealed that 35 per cent of the arecanut growers were belong to marginal land holding category, 48 per cent of the arecanut growers were belonged to small land holding categories and only 17 per cent of them were belong to big land holding category.

Raghavendra (1997), in his study on knowledge and adoption behavior of areca nut farmers of South Canara district Karnataka state revealed that 30.00 per cent of the areca nut growers belong to the category of big farmers, 35.00 per cent of them belong to the category of small farmers and remaining 35.00 per cent of them belong to the category of marginal farmers.

Kumar (1998), in his study on knowledge, adoption and economic performance of banana growers in Bangalore rural district revealed that 46.00 per cent of banana growers possessed less than 12.63 acres of land, 27.00 per cent of them possessed from 12.63 to 15.08 acres and 27.00 per cent possessed more than 15 acres of land.

Lakshmisha (2000), in his study on impact of cashew demonstrations on knowledge, adoption and yield levels of farmers in Dakshina Kannada district revealed that 30.00 per cent of them owned medium land size. Whereas, 27.00 per cent of the farmers belong to small holding group and 43.00 per cent of the farmers had belong to high land holding category.

Vasanthakumar (2000), in his study on knowledge, adoption and economic performance of coffee growers in Virajpet taluka of Coorg district revealed that majority of big farmers (53 %) had medium level of land holding. Whereas, a considerable 48 per cent of the small growers possessed low level of land holding of less than 3.2 acres.

Ramshetwad (2001) reported that, majority of the banana growers (86.60 %) possessed medium land holding between 2.01 to 10.00 hectares.

Vedamurthy (2002), in his study on the management of areca gardens and marketing pattern preferred by the areca nut farmers of Shimoga district in Karnataka reported that equal per cent (28.66 %) of the areca nut growers were large and small areca nut farmers. Twenty four per cent of the respondents were medium land holding farmers and 18.66 per cent of the farmers were marginal land holders.

Gangurde (2003) revealed that, maximum number of the respondents growing banana (57.50 %) were in medium category of land holding possessing land between 2.01 to 10 hectares.

Thorat (2003) observed that 37.00 per cent and 36.00 per cent respondents had 'semi-medium' and 'medium' land holding, respectively, while 13.00 per cent respondents had 'large' land holding. 'small' and 'marginal' land holdings were owned by 11.00 per cent and 3.00 per cent respondents, respectively. The average size of land holding of the respondents was 6.91 ha.

Satale (2005) revealed that 42.00 per cent of the respondents had 'semi-medium' land holding, 39.00 per cent of the respondents had 'medium' land holding. 'Large' and 'marginal' land holding were owned by 5.00 and 2.00 per cent respondents, respectively. The average size of land holding of the respondents was 4.09 ha.

Karale (2006) observed that a relatively higher proportion of grape growers (49.17 %) possessed medium land holding, followed by 37.67 per cent having semi medium land holding. The respondents found in large, small and marginal category of land holding were 12.50 and 3.33 per cent, respectively. Thus, it can be concluded that majority of the respondents possessed medium land holding.

Singh and Mankar (2007) noticed that the 45.45 per cent of the respondents had semi medium (2.01 to 4.00 ha) land holding followed by 21.81 per cent of the respondents having medium (4.01 to 10.00 ha) land holding.

Sorate (2011), in his study observed that, nearly one - third of the respondents (31.00 %) belonged to the category of medium land holding ranging from 4.01 to 10.00 ha. It was followed by (28.00 %) semi-medium land holding possessing land from 2.01 to 4.00 ha. and (24.00 %) respondents belongs to small holding category i.e. 1.02 to 2.00 ha The percentage of the respondents (11.00 %) belonged to large

holding above 10.00 ha and 06.00 per cent of the respondents who possessed land up to 1.00 ha and belonging to marginal land holding category.

Deshmukh (2013), in his study on, knowledge and adoption of plant protection measures by pomegranate growers in Western Maharashtra, revealed that nearly two-fifth of the respondents (38.67 %) belonged to the category of 'small' land holding ranging from 2.01 to 4.00 ha. It was followed by (32.00 %) 'medium' land holding possessing land from 4.01 to 10.00 ha and (19.11 %) respondents belongs to 'large' holding category i.e. above 10.00 ha.

Sabi *et al.* (2014) inferred that 35.83 per cent of farmers belonged medium land holding category (10 - 25.00 acres), while 23.33 per cent of them belonged to small land holding category (2.51 - 5.00 acres). Whereas 22.50 per cent of them were semi medium farmers (5.01 - 0.00 acres), 12.50 per cent were marginal farmers (less than 25 acres) and 05.84 per cent belonged to big land holding category (less than 2.5 acres).

Rajula Shanthi and Subramaniam (2015), in his study on farmers' perspective on integrated nutrient management in sugarcane found that large majority (83.30 %) respondents belonged to the category of 'small' land holding ranging from 2.01 to 4.00 ha. followed by (16.70 %) 'medium' land holding possessing land from 4.01 to 10.00 ha.

2.3.2 Area under pomegranate cultivation

Sable (1991), in his study entitled, 'constraints in cashew nut cultivation in Sindhudurg district', revealed that the majority (77.34 %) of the respondents were having 'up to 1.32 ha' and 18.00 per cent of the respondents were having '1.33 to 2.24 ha' area under cashew nut cultivation.

Mane (1998), in his study entitled, 'A study of adoption of improved varieties of fruit crops by the fruit growers in Sindhudurg district', observed that 66.50 per cent of the respondents had 'medium' area under mango crop, while 16.00 per cent respondents had small area under mango crop and 17.50 per cent of the respondents had 'big' area under mango crop.

Mundekar (1993) reported that out of total mango growers in Ratnagiri district of Maharashtra, 93.00 per cent of the mango growers had 'small' mango orchards. Only 1.50, 0.50 and 0.50 per cent had 'medium', 'large' and 'larger' mango orchards, respectively.

Anonymous (2001), from AGRESCO report indicated that the large majority (65.00 %) of pomegranate growers had planted orchard up to 0.80 ha area, while remaining of them had plantation more than 0.81 ha.

Kadam (2006), it was observed that 46.11 per cent of the respondents were having 'medium' area under Alphonso mango plantation, whereas, 28.50 and 15.03 per cent of the respondents, respectively were having 'semi-medium' and 'marginal' area under Alphonso mango plantation. Only 6.21 and 4.15 per cent of the respondents were having 'large' and 'small' area under Alphonso mango cultivation, respectively. On an average, the mango growers were having 5.15 ha land under Alphonso mango.

Singh and Mankar (2007), in their study conducted on mango growers of Ratnagiri district found that maximum (70.90 %) respondents were having medium (1.01 to 4.00 ha) area under Alphonso mango followed by equal (14.55 %) percentage of respondents having small and big area under Alphonso mango, respectively.

Patil (2008) revealed that more than one third (36.00 %) of the grape exporting farmers belonged to small land holding category and equal (25.00 %) percentage of respondents belonged to semi-medium and medium category. Very few respondents belonged to large (11.00 %) and marginal (3.00 %) land holding categories, respectively.

Deshmukh (2013), in his study on, knowledge and adoption of plant protection measures by pomegranate growers in Western Maharashtra, revealed that majority of pomegranate growers (52.00 %) belonged to the category of 'small' area under pomegranate cultivation from 2.01 to 5.00 ha. followed by (25.33 %) 'marginal' category holding area up to 2.00 ha. and (14.22 %) respondents belongs to 'medium' category i.e. from 5.01 to 7.50 ha. The large proportion of the respondents were having '2.01 to 5.00 hectare' area under pomegranate.

Rajula Shanthi and Subramaniam (2015) in his study on farmers' perspective on integrated nutrient management in sugarcane found that large majority (72.33 %) respondents belonged to the category of 'small' area under sugarcane crop, ranging from 2.01 to 4.00 ha. followed by (16.70 %) 'medium' land holding possessing land from 4.01 to 10.00 ha.

2.3.3 Annual income

Chaugule (2000) observed that a maximum number (37.00 %) of the respondents were having 'lower' annual income, while 35.00 per cent and 15.50 per cent of the respondents were having 'low' and 'medium' annual income, respectively. The average annual income of the respondents was Rs. 96,173/-.

Lakshmisha (2000), in his study on impact of cashew demonstrators on knowledge, adoption and yield levels of farmers in Dakshina Kannada district reported that majority of the farmers (53.00 %) were found in high income group and nearly half of them other farmers in low income category (47.00 %).

Katkar (2001) recorded that majority (69.33 %) of the mango growers had 'medium' level of annual income, followed by 16.00 per cent and 14.67 per cent having 'high' and 'low' level of annual income, respectively.

Ramshetwad (2001) revealed that, majority of the banana growers (55.83 %) were in medium category of annual income ranging from Rs. 1 lakh to 2 lakhs.

Babanna (2002), in his study on areca nut growers in Shimoga district reported that the majority (61.6 %) of arecanut growing respondents were in medium level of annual income group. A little lesser than the one-fourth (23.4 %) of the respondents were in high level of annual income group followed by low level of annual income group (15.00 per cent).

Vedamurthy (2002), in his study on management of areca gardens and marketing pattern preferred by the areca nut farmers of Shimoga district in Karnataka stated that the 48.66 per cent of the areca nut growers had high annual income, 34.00 per cent of the farmers belonged to middle annual income category and 17.33 per cent of the areca nut growing farmers belonged to below poverty line category.

Gangurde (2003) revealed that, majority of the banana growers (45.00 %) had annual income in medium category i.e. 1 to 2 lakhs and 25.83 per cent had income up to 2 to 3 lakhs.

Thorat (2003) revealed that more than half (57.00 %) of the respondents had 'low' annual income, while 24.00 per cent respondents had 'high' annual income and 19.00 per cent respondents had 'medium' annual income. The average annual income of the respondents was Rs.1,26,010/-.

Mandavkar *et al.* (2004), in their study on adoption of improved varieties, observed that 60.00 per cent of the fruit growers were having 'medium' annual income and identical number of the respondents (20.00 %) were having 'low' and 'high' annual income. The average annual income of the fruit growers was Rs. 80,525/-.

Gaikwad (2005) revealed that more than two-fifth (44.67 %) of the respondents were having 'medium' annual income, while 30.67 per cent and 24.66 per cent of the respondents had 'low' and 'high' annual income, respectively. The average annual income of the respondents was found to be Rs. 1,68,980/-.

Garje (2010) found that a majority of the respondents (69.17 %) had medium level of income through the grape cultivation while, 16.67 per cent and 14.16 per cent had small and large level of income through grape cultivation.

Sorate (2011) in his study observed that, great majority of the respondents (89.00 %) had annual income up to Rs. 845666, followed by 09.00 per cent respondents who were found to have annual income of in between Rs. 845667 to 1691332. The percentages of the respondents having annual income Rs. 1691333 were found to be 02.00 per cent.

Deshmukh (2013), in his study on, knowledge and adoption of plant protection measures by pomegranate growers in Western Maharashtra, revealed that, majority of the pomegranate growers (41.33 %) had annual income between Rs. 4,00,001/- to 7,00,000/-, an equal proportion of respondents had income up to Rs. 4,00,000/- and Rs. 7, 00,001/- to 10,00,000/- respectively. While, 17.78 per cent had income above Rs. 10,00,000/-.

Patel *et al.* (2015) reported that half of the respondents 48.3 per cent have their annual income up to Rs. 80,000 and 42.50 per cent of the respondents above 80,000 remaining 09.20 per cent of the respondents up to 50,000 annual income.

2.4 Psychological characteristics of the farmers

2.4.1 Risk preference

Raghavendra (1997) observed that 62.66 per cent of the farmers had medium risk orientation followed by 24.66 per cent had high risk orientation and only 12.68 per cent respondents had low risk orientation.

Venkataramulu (2003) noticed that majority of the farmers had medium level of risk bearing capacity (73.33 %).

Thorat (2003) conducted a study on technological gap and constraints in adoption of recommended cultivation practices of mango growers and reported that medium risk orientation was observed in 84.00 per cent of the respondents, while 10.00 per cent of the respondents had 'high' risk orientation and only 8.00 per cent of the respondents had 'low' risk orientation. The average risk orientation score of the respondents was 14.68.

Shashidhar (2004) observed that majority of the farmers (70.83 %) had medium level of risk bearing ability and low (15.0 %) level of risk orientation.

Nagesh (2006) conducted a study on entrepreneurial behaviour of pomegranate growers in Bagalkot district of Karnataka and observed that most (85.84 %) of the farmers had medium risk orientation while only 10.00 and 4.16 per cent of farmers had low and high risk orientation, respectively.

Patil (2008), in his study on constraints analysis of grape exporting farmers of Maharashtra state, he reported that majority (77.00 %) of the respondents belonged to medium risk orientation category. followed by high (12.00 %) and low risk orientation categories (11.00 %) respectively.

Sawale (2011) delineates that, majority (43.75 %) of the pomegranate growers were in the medium risk orientation category while, (30.00 %) and (26.25 %) were low and high risk orientation categories, respectively.

2.4.2 Attitude

Sriram (1997) conducted a study in Tamil Nadu had reported that majority (65.50 %) of cotton growers had a favourable attitude towards eco-friendly agricultural practices, whereas 17.50 and 17.00 per cent had most favourable and less favourable attitude, respectively towards eco-friendly agricultural practices.

Meti (1998) had conducted a study in Tungabhadra command area of Karnataka and reported that majority (56.67 %) of farmers had favourable attitude towards improved agricultural technologies, whereas 23.75 per cent of farmers were observed to possess less favourable attitude. However, 19.58 per cent had most favourable attitude towards improved agricultural practices.

Sriram and Palaniswamy (2000) reported that the farmers had favourable attitude towards eco friendly agricultural practices in cotton.

Yadav *et al* (2006) reported that the farmers had unfavourable attitude towards soil testing practices.

Eunice (2011) had conducted study on attitude and utilization level of Maize growers about chemical fertilizers in Mozambique and reported that majority had favourable attitude towards chemical fertilizers.

Dhere (2012) reported that majority (68.00) per cent of the farmers were in the medium attitude scale score, 18.00 per cent of farmers were found to be in high category of attitude scale score, followed by low category(14.00 %).

2.4.3 Scientific Orientation

Chawkekar (1984) revealed that the majority (90.50 %) of the respondents were in the category of '18 and above' score, whereas, only 9.50 per cent were in the category of 'up to 17 score', of scientific orientation.

Rao (1985) mentioned that the majority of the demonstrated farmers (67.5 %) had medium scientific orientation followed by high scientific orientation (25.00 %) and low scientific orientation (9.5 %).

Reddy (1992) indicated that, 67.5 per cent of the mango growers in Khammam district had medium scientific orientation category followed by low (21.67 %) and high (10.83 %) scientific orientations.

Bhapkar (1994) observed that one-half (54.67 %) of the respondents had 'medium' scientific orientation, while 28.67 per cent and 16.66 per cent of them had 'low' and 'high' scientific orientation, respectively. The average scientific orientation score of the respondents was 13.45.

Wagh (1999) concluded that, maximum number of respondents (60.00 Bhapkar (1994) observed that one-half (54.67 %) of the respondents had 'medium' scientific orientation, while 28.67 per cent and 16.66 per cent of them had 'low' and 'high' scientific orientation, respectively. The average scientific orientation score of the respondents was 13.45.) orange growers had medium level of scientific orientation, while 20.00 per cent and 20.00 per cent of respondents possessing low and high level of scientific orientation respectively.

Kinkhedkar (2001) concluded that more than two third (68.39 %) of the orange growers were found to be moderate whereas, about one fifth (22.58 %) of the respondents had low scientific orientation in contrast to this, few (09.03 %) of them were highly orientated to ward scientific way of farming.

Dhole (2006) concluded that maximum percentage (58.00 %) of the orange grower respondents had semi medium level of scientific orientation. It was also found that (28.67 %) respondents had high level of scientific orientation and low (10.00 %) and medium (03.33 %) level of scientific orientation.

Moulasab *et al.* (2006) while studying the knowledge level of improved cultivation practices by mango growers of North Karnataka reported that majority of the respondents belonged to 'medium' level of scientific orientation.

Deshmukh (2013), in his study on, knowledge and adoption of plant protection measures by pomegranate growers in Western Maharashtra, revealed that 58.22 per cent of the respondents were in 'high' scientific orientation category. However, 29.78 and 12.00 per cent had 'medium' and 'low' scientific orientation category, respectively.

2.5 Communication characteristics of the farmers

The communication sources area is important stimuli to the individual in the knowledge and adoption process. It provides a link between the diffusion of an innovation and its final adoption. Thus, adoption of an innovation is result of use of sources of information. There are various sources of information from which the farmers can get information of new technology in agriculture. The findings of the different investigators are presented as under.

2.5.1 Personal localite information source

Chikhale *et al.* (1996) observed that, majority (77.33 %) of the respondents obtained information from personal localite sources, while 53.33 and 72.00 per cent respondents obtained information from the personal cosmopolite sources and mass media sources, respectively.

Radhakrishnan *et al.* (1997), in their study on information sources in the adoption of grape technology found that, among the personal localite sources, office bearers

of the grape growers association (63.33 %) and neighbors and friends (60 .00 %) had acted as the major source of information for the respondents.

Shirke *et al.* (2002) observed that the 33.00 per cent of the strawberry growers had low use of sources of information, whereas (46.00 %) of them had medium use of information sources and (21.00 %) of them had high use of information.

Malarkodi and Bharathi (2010), in a study on strategies for promoting bio-fertilizers among the farmers for sustainable agriculture revealed that farmers got information by neighbor farmer, friends (5.00 %) and relatives (3.00 %) for biofertilizers.

Sorate (2011) reported that majority of the respondents were sometimes contacting the neighbours (83.00 %), friend (84.00 %), progressive farmers (66.00 %) and local leader (49.00 %) for acquiring information about grape cultivation technologies.

Sharma (2012) found that 36.00 per cent of the respondents got information from personal localite sources of information and had neighbor as the source of information.

Rajula Shanthy and Subramaniam (2015), in his study on farmers' perspective on integrated nutrient management in sugarcane revealed that the near (17.33 %) sought other sources like neighbours, relatives, family members and friends as a personal localite information sources.

2.5.2 Personal cosmopolite information source

Chikhale *et al.* (1996) stated that the 63.50 per cent of the respondents belonged to medium source of information category followed by low source of information category (20.00 %), while 16.50 per cent of the respondents were in the category of high source of information.

Shirke *et al.* (2002) observed that the 39.43 per cent of the strawberry growers had low use of group contacts as sources of information, whereas (41.54 %) of them had medium use of information sources and (19.03 %) of them had high use of information source.

Malarkodi *et al.* (2010), in a study on strategies for promoting bio-fertilizers among the farmers for sustainable agriculture revealed that the main source of information about biofertilizers was the shop owners (45.00 %), Agriculture Officers (29.00 %), advertisements (17.00 %) .

Sorate (2011) reported that majority of respondents were contacting Agriculture Supervisor (65.00 %), Agriculture Officer (64.00 %), use of telephone (60.00 %). Krishi Sevak (57.00 %) and Horticultural Officers (56.00 %) and Agriculture Universities (50.00 %) were not at all contacted by majority of the grape growers for getting the information.

Dhere (2012) found that among the personal cosmopolite sources, Gramsevaka and Agriculture Extension Officer were contacted always by 36.00 per cent and 35.00 per cent farmers, respectively.

2.5.3 Mass media information source

Yogananda (1992), in his study on coconut growers of Tumkur district in Karnataka revealed that only 20.00 per cent of big growers did not listened to the radio broadcast on the other hand 46.66 per cent of small coconut growers stated that they were not listening to the radio broadcast. In case of reading newspaper, only 10 per cent of big farmers stated that they never read newspaper, whereas the percentage of growers who were not in the habit of reading newspaper in small coconut growers category is as high as 46.66 per cent. Same trend is seen even in case of viewing television or reading farm magazines.

Balasubramani (1997), in his study on knowledge and adoption behaviour of rubber growers in Belthangadi taluk of Dakshina Kannada district reported that 35.00 per cent of the rubber growers were in the category of medium mass media use, followed by 33.00 per cent of growers under low mass media use remaining 32.00 per cent of the rubber growers were in the high category.

Raghavendra (1997), in his study on knowledge and adoption behaviour of areca nut farmers of South Canara district, Karnataka state reported that 48.00 per cent of the growers were in the category of high mass media use, followed by 39.00 per cent of growers under low mass media use, remaining 13.00 per cent of the growers were in medium category.

Lakshmisha (2000), in his study on impact of demonstrations on knowledge, adoption and yield levels of farmers in Dakshina Kannada district stated that 44.00 per cent of the farmers were in the category of medium mass media use, 33.00 per

cent of the farmers were under high category and remaining 33.00 per cent of farmers were under low mass media use category.

Vedamurthy (2002), in his study on the management of areca gardens and marketing pattern preferred by the areca nut farmers of Shimoga district in Karnataka revealed that 37.00 per cent of the areca nut growers were in the category of high mass media use, 48.00 per cent of the areca nut growers were under medium mass media use category and remaining 27.33 per cent of the areca nut growers were under low mass media use category.

Sorate (2011) reported regarding mass contacts of the majority of the respondents used television (89.56 %), radio (79.40 %), and news papers (79.00 %) for getting the information about technologies of grape cultivation.

Sawale (2011) revealed that, nearly two third 63.75 per cent of the pomegranate growers used medium sources of information while, 18.75 per cent and 17.50 per cent of them were in low and high use of sources of information category, respectively.

Sabi *et al.* (2014) revealed that 40.83 per cent of the farmers belonged to medium level of mass media utilization category, followed by low (30.83 %) and high (28.34 %).

Rajula Shanthi and Subramaniam (2015) in his study on farmers' perspective on integrated nutrient management in sugarcane revealed that the mass media channels utilized by the farmers include television (farm programmes), radio, newspaper (news related to agriculture, development programs, farmers fair etc) and farm magazines. Only 21.33 per cent of the respondents had access to all the mass media channels, while remaining 78.67 per cent of the respondents had access to only selected mass media channels.

2.5.4 Extension education information source

Thimmaraju (1989) found that the big coconut farmers had received more extension guidance (55.70 %), when compared to small farmers and marginal farmers. The small farmers had received the more extension guidance (34.50 %) than the marginal farmers (13.9 %).

Nityashree (1992) point out that the 50 per cent of small growers and 42.00 per cent of the big growers received very little extension guidance as their extension guidance scores lie between 0 to 4 from this. It is inferred that the coffee growers received very little extension guidance irrespective of their size of holding.

Balasubramani (1997), in his study on knowledge and adoption behaviour of rubber growers in Belthangadi taluk of Dakshina Kannada district reported that 46.00 per cent of the growers had low extension participation and equal percentage of rubber growers had medium (27 %), high (27.00 %) extension participation, respectively.

Sadanandan (1998) reported that a great majority of women coffee growers (83 %) had low extension participation and only 17.00 per cent of women coffee growers had some extension participation.

Saikrishna (1998) observed that about 53.44 percent and 24.67 percent of farmers were regularly reading newspapers and farm magazines respectively. And about 51.00 per cent of farmers were in the habit of listening to radio programmes in television regularly.

Chandrashekar (1999) found that the majority of the coffee growers i.e., 58.5 per cent had low extension participation, 22.50 per cent of them had medium extension participation and only 19.00 per cent of coffee growers had high extension participation.

Lakshmisha (2000) in his study on impact of cashew demonstrations on knowledge, adoption and yield levels of farmers in Dakshina Kannada district revealed that the majority of the cashew growing farmers had medium extension participation more than one third (35 %) of cashew growers belonged to high extension participation group. Whereas, one-fourth of the other farmers belonged to low (22.00 %) extension participation.

Hinge (2009), in his study on, diffusion and adoption of wine grape production technology in Maharashtra, inferred that majority (38.75 %) of wine grape growers had medium mass media participation and nearly one third (32.50 %) of them belonged to low mass media participation category. Whereas, 28.75 per cent of them belonged to high mass media participation category.

Sorate (2011) reported that personal contact of the majority of the respondents were found to be contacting the neighbors (83.00 %), friends (84.00 %), relatives (79.00 %), progressive farmers (66.00 %) and local leaders (49.00 %), sometimes for acquiring information about grape cultivation technologies. While, agriculture supervisor

(65.00 %), agriculture officer (64.00 %), use of telephone (60.00 %), krishi sevak (57.00 %) and horticultural officers (56.00 %) and agriculture universities (50.00 %) were not at all contacted by majority of the respondents for getting the information about technologies of grape cultivation.

Patil (2015), in his study on utilization of farm implements by the farmers observed that in rainfed area, more than three fifth of the respondents (60.42 per cent %) had used extension education methods as a source of information to low extent, followed by medium extent (33.33 %) and high extent (6.25 %).

Rajula Shanthi and Subramaniam (2015) in his study on farmers' perspective on integrated nutrient management in sugarcane revealed that 82.67 per cent of the respondents contacted extension personnel of sugar factory for getting the information about nutrient management in sugarcane.

2.5.5 Cosmopolitaness

Kesarkar (1985), in his study on a study of extent of use of fertilizers and constraints experienced by rice growers in Sindhudurg district of Konkan region observed that majority (51.73 Patil (2015), in his study on utilization of farm implements by the farmers observed that in rainfed area, more than three fifth of the respondents (60.42 per cent) had used extension education methods as a source of information to low extent, followed by medium extent (33.33 %) and high extent (6.25 %) of the respondents had medium cosmopolitaness. There were 35.17 per cent respondents having high cosmopolitaness. Only 13.10 per cent respondents had low cosmopolitaness.

Balasubramani (1997), in his study on knowledge and adoption behaviour of rubber growers in Belthangadi taluk of Dakshina Kannada district revealed that 45.00 per cent of the arecanut growers were belong to medium level of cosmopolitaness, 48.00 per cent of the arecanut growers were belonged to low level of cosmopolitaness and only 07.00 per cent of them were belong to high level of cosmopolitaness.

Raghavendra (1997), in his study on knowledge and adoption behaviour of arecanut farmers of South Canara district Karnataka state revealed that 27.00 per cent of the arecant growers belong to the category of big cosmopolitans, 45.00 per cent of them belong to the category of medium cosmopolitans and remaining 38.00 per cent of them belong to the category of low cosmopolitans.

Katkar (2001) recorded that majority (59.33 %) of the mango growers had 'medium' level of cosmopolitanism, followed by 26.00 per cent and 14.67 per cent having 'high' and 'low' level of cosmopolitanism, respectively.

Gangurde (2003) revealed that, majority of the banana growers (57.00 %) had medium cosmopolitanism.

Govinda Gowda and Narayana Gowda (2006) conducted a study in Bijapur and Bangalore Rural districts and observed that more number of Thompson Seedless grape growers had medium (41.00 %) and low (43.00 %) cosmopolitanism. In case of Bangalore Blue grape growers, majority (62.00 %) of them had high cosmopolitanism

Naveen (2012) observed that 43.33 per cent of pomegranate farmers had medium level of cosmopolitanism, followed by 40.00 and 16.67 per cent of farmers had high and low level of cosmopolitanism, respectively.

Deshmukh (2013), in his study on, knowledge and adoption of plant protection measures by pomegranate growers in Western Maharashtra, revealed that majority of the pomegranate growers (46.67 %) had 'higher' level of cosmopolitanism, followed by 28.89 per cent and 24.44 per cent had 'medium' and 'low' level of cosmopolitanism respectively. The data thus indicated that large proportions of respondents were had higher cosmopolitanism.

2.6 Knowledge of farmers about various Nutrient Management Practices

2.6.1 Knowledge : Concept and Meaning

The knowledge may be defined as the change in person's cognitive learning behaviour resulting from a specific learning experience. English and English (1961) defined knowledge as a body of understood information possessed by an individual or by a culture. They further claimed that the knowledge was that part of person's information which was in accordance with established fact.

Bloom *et al.* (1969) stated that the knowledge involved the recall of specific facts and insoluble bits of information about the message.

Rogers and Shoemaker (1971) recognized knowledge function as one is four functions in the innovation decision process.

Ray (1991) stated that the knowledge occurred when an individual or decision making unit was exposed to the innovation's existence and gained an understanding of how it functioned. Knowledge function was mainly cognitive learning. Knowledge is one of the important components of behaviour and hence, it plays a vital role in the adoption behaviour of pomegranate growers. An attempt is made to review the researches related to knowledge aspect of cotton growers.

Nagaraj (2002) stated that majority (68.32 %) of the respondents were found in medium level of knowledge with respect to improved sugarcane cultivation practices, while (19.66 per cent and 12.49 %) of the respondents were found in low and high knowledge categories, respectively.

Rathod (2005) reported that, majority (60.83 %) of the respondents were found to belong to medium level of knowledge category. One-fourth of the respondents had fallen in high knowledge category followed by 13.33 per cent of the respondents low knowledge category.

Elakkia (2007) opined that majority of the farmers had high level of knowledge about organic farming followed by medium level of knowledge about organic farming.

Jaganathan *et al.* (2012) reported that, majority of respondents were organic (67.50 %) and inorganic farmers (74.16 %) had medium level of knowledge followed by high (11.67 per cent organic and 10.83 per cent inorganic) and low (18.33 per cent organic and 9.17 per cent inorganic) levels of knowledge.

2.6.2 Overall knowledge level about Nutrient Management Practices by the farmers.

Mehta *et al.* (1989), in their study on knowledge level of farmers in respect of selected horticultural practices of rice and mango crop stated that more than half (52.00 %) of the respondents were from 'medium' knowledge level group. Only 23.50 per cent respondents had 'low' level of knowledge about recommended practices, while 24.50 per cent possessed high level of knowledge.

Juliana *et al.* (1991) revealed that most of the marginal and small cotton growers (50.00 %) possessed medium level of knowledge while, more than half of big cotton growers possessed high level of knowledge about IPM practices.

Shivamurthy (1991) revealed that the arecanut growers of Shimoga district in Karnataka had knowledge about simple practices like selection of seed material, selection of seedlings, time and method of fertilizer and farmyard manure application, inter cultivation, intercropping, time of planting and pit size of the planting. This was due to simplicity of the practices. The arecanut growers knowledge was low with reference to practices like application of fertilizers during the first year and subsequent years.

Singh *et al.* (1991) stated that, 63.13 per cent of respondent citrus growers had high level of knowledge gap, thus indicating poor knowledge about improved production technology.

Sutha *et al.* (1991) revealed that the majority (57.50 %) of the rubber growers had high knowledge level. Studying category-wise nearly half (43.33 %) of the small growers had low level of knowledge as against only 3.33 per cent of the big farmers.

Rajashekaran and Haridasan (1992) observed that the 89.00 per cent of the sample rubber growers were aware of the stand per hectare, 67.00 per cent of growers had the knowledge of advantages of discriminatory fertilizer application and 86.00 per cent of the growers were lack of knowledge regarding importance of growing cover crops.

Yogananda (1992) reported that more than 80.00 per cent of the coconut growers in both groups (marginal, small, medium and big farmers) were aware of termite control. In case of small farmers only 31.66 per cent had awareness about Rhinoceros beetle, whereas in case of big farmers 73.33 per cent were aware of it.

Reddy and Ratnakar (1993), in their study on 'Adoption of mango technology' reported that the 83.33 per cent of the farmers were selecting suitable soil for mango cultivation, majority (77.33 %) of the farmers were found planting grafts in recommended months and recommended size of pit (1m x 1m x 1m) was found to be used by majority 71.67 per cent of the farmers. Less than one-fifth (19.17 %) of the farmers were using the plants as per recommendations. Application of organic manures was fully adopted by 37.50 per cent farmers whereas, others were either partially adopted or not at all adopted the manuring. More than one- third (37.50 %) of the farmers were using the fertilizers as per recommendation.

Bhapkar (1994) revealed that the maximum (54.50 %) technological gap was found in plant protection measures. The least (19.33 %) technological gap was observed in use of recommended variety. It was noticed that three-fifth (60.00 %) of the respondents were in the category of medium technological gap, while 23.33 per cent and 16.67 per cent respondents were observed in 'low' and 'high' technological gap categories, respectively. The average technological gap was found to be 49.14 per cent which indicated medium gap.

Bhople *et al.* (1996) noticed that the majority of the respondents in Akola district of Maharashtra had low level of knowledge (73.33 %) about the biocontrol pest management in cotton, followed by medium (22.00 %) and high level (04.67 %), respectively.

Balasubramani (1997) reported that a good deal of rubber growers (44.00 %) had medium level of knowledge about recommended practices of rubber cultivation, while 33 and 24.00 per cent of growers had low and high level of knowledge, respectively in South Canara district of Karnataka.

Raghavendra (1997), in his study on knowledge and adoption behaviour of areca nut farmers of South Canara district, Karnataka state revealed that the knowledge level of the areca nut growers regarding the recommended cultivation practices. A majority (45.00 %) of the areca nut farmers fell under medium knowledge category regarding manuring (12.00 %), pit size (12.00 %), plant protection measures (21.00 %), 33.00 per cent of the areca nut growers came under low knowledge category, while only 22.00 per cent of them were under high knowledge category.

Deshmukh *et al.* (1998), in their study on knowledge and adoption of custard apple technology, observed that only 13.33 per cent respondents had 'knowledge about plant protection' followed by 'knowledge about major insect and pests' (10.83 %) and about 44.16 per cent respondents had 'adoption of plant protection measures'.

Borkar *et al.* (2000) conducted a study in Maharashtra state on bio fertilizers and reveals that more than fifty per cent of farmers (58.67) had medium knowledge on bio fertilizers, followed by 34.67 and 18.66 per cent of them with high and low knowledge of bio fertilizers.

Chapake (2000) highlighted that the majority of the respondents in Akola district of Maharashtra had medium level of knowledge (75.91 %) about bio-control measures, followed by high (16.05 %) and low level (8.04 %), respectively.

Sriram and Palaniswami (2000) reported that the 59.16 per cent of cotton growers in Salem district of Tamil Nadu had medium level awareness, followed by high (25.84 %) and low (15.00 %) level of awareness of eco-friendly practices in cotton cultivation, respectively.

Thamban *et al.* (2000), in a study on perception of coconut farmers about plant protection measures against eriopyid mite, observed that maximum number (36.00 %) of respondents had knowledge about dose, method of preparation, quantity of components and frequency of application. It is also observed that the coconut farmers have observed the coconut pest infestation as high as 60.00 per cent.

Anitha Kumari and Kalavathy (2001) revealed that there was lack of skill in identification of pest attack symptoms due to lack of knowledge. They also revealed that farmer have more knowledge in mother palm selection, hybrid varieties, recommended spacing, irrigation, farmyard manure, all these practices were known to more than 50.00 per cent of the sample farmers. But, the proper adoption is less due to many constraints.

Kalashkar *et al.* (2001) conducted a study in Amaravathi district of Maharashtra and revealed that the 67.77 per cent of the farmers had medium level of knowledge about integrated pest management practices in cotton. Whereas, an equal percentage of respondents had low (15.76 %) and high (16.97 %) knowledge level.

Ranganath (2001), in a study in Cauvery command area of Karnataka state indicated that majority of the respondents (60.00 %) had medium level of knowledge about bio- fertilizers, whereas 25.00 and 15.00 per cent of them had low and high level of knowledge, respectively.

Babanna (2002), in his study on arecanut growers of Shimoga district, Karnataka revealed that the 44.2 per cent of the respondents were having medium level of knowledge regarding mother palm selection, manuring, plant protection practices, 35.00 and 20.8 per cent were having high and low level of knowledge on mother palm selection, manuring and plant protection measures.

Parthasarathi and Santha Govind (2002), in their study conducted in Thiruvannamalai district of Kerala reported that the majority of respondent farmers possessed the knowledge of IPM practices (78.6 %). Among the IPM components comparatively more number of farmers have knowledge of cultural methods (42.37 %), followed by chemical methods (31.24 %), biological methods and physical methods (11.67 %) in the cultivation of rice crop.

Sudhakar and Kanagasabapathi (2002) conducted study in Viruthunagar district of Tamil Nadu and indicated that cent per cent of respondents were aware of avoiding ratoon cropping, following crop rotation, inter cropping, light traps and maintaining the fields free from weeds. Further, it is observed that more than 90.00 per cent of the respondents were aware of summer ploughing (96.67) and correct spacing (90.84).

Vedamurthy (2002), in his study on management of areca gardens and marketing pattern preferred by the arecanut farmers of Shimoga district in Karnataka revealed that the knowledge level of areca nut growers regarding the recommended cultivation practices. A majority of the areca nut growers categorized under medium knowledge category, 46 per cent of the areca nut growers grouped under low knowledge category, while only 20 per cent of the areca nut growers grouped under high knowledge category.

Venkatesh (2002) reported that in Kolar district of Karnataka state equal percentage of farmers were belonged to low (30.00 %), medium (28.67 %) and high (41.33 %) knowledge of integrated pest management in tomato crop.

Darling and Vasanthkumar (2004), in a study carried out in Kanyakumari district of Tamil Nadu had indicated that 59.16 per cent of the respondents possessed medium level of knowledge and 28.33 per cent of the respondents had low level of knowledge on various dimensions of botanical pesticides.

Singh and Kaur (2004) observed that the majority of the trained cotton growers (73.7 %) had 'medium' knowledge level about integrated pest management, whereas, 21.3 per cent of them fell in the category of 'high' and remaining in the category of 'low' knowledge level. Among the non-trained respondents, 73.3 per cent

had 'low' knowledge level and rest of them (23.7 %) possessed 'medium' knowledge level. None of the non-trained cotton growers possess high knowledge level.

Anonymous (2005) study carried out by the Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli on socio-economic and psychological characteristics of mango growers revealed that, 53.64 per cent mango growers had 'medium' knowledge level, whereas, 30.00 per cent were having 'high' and 16.36 per cent had 'low' knowledge level. Regarding knowledge about effective control of mango hoppers, only 63.64 per cent respondents had knowledge and 36.36 per cent respondents had no knowledge about control of mango hoppers.

Kaid *et al.* (2005) found that there was higher technological gap in plant protection measures (76.03 %) of nursery raising (68.65 %). The medium (34.00-66.00 %) technological gap observed in recommended variety (60.83 %) irrigation schedule (59.06 %) chemical fertilizer (49.58 %) and harvesting (33.89 %) the low (up to 33.00 %) technological gap found in transplanting (24.31 %), hand weeding (14.17 %), farm yard manure (9.17 %), inter culturing, earthing up (6.67 %).

Moulasab *et al.* (2006), in a study on knowledge level of mango growers about improved cultivation practices, revealed that majority (72.50 %) of the respondents had 'medium' knowledge score regarding improved cultivation practices, whereas 14.17 per cent belonged to 'low' knowledge score and only 13.33 per cent respondents were reported to 'high' knowledge score.

Maraddi *et al.* (2007), in a study on knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) with respect to integrated nutrient management highlighted that more than half of the respondents had partial knowledge about practices such as quantity of FYM/compost to be used, green manure crops, pressmud, quantity of inorganic manures (fertilizers –NPK) to be used and method of application of fertilizers. Cent per cent of of NPK as a basal dose, first top dressing and application of fertilizers in equal quantity to all plots. Further the data revealed that majority of respondents had partial knowledge of vermicompost and biofertilizers.

Malarkodi *et al.* (2010), in a study on strategies for promoting bio-fertilizers among the farmers for sustainable agriculture revealed that the level of awareness was 98.00 per cent and only two per cent of them were unaware about the

biofertilizers. Awareness on crop specific usage of biofertilizers was only 19.00 per cent and 81.00 per cent of them were unaware about the crop specific usage level of biofertilizers. The farmers really used bio fertilizers in their field was 60.00 per cent and the 40 per cent not used bio fertilizers in their fields.

Jangid *et al* (2011), in a study on adoption of organic farming practices in Govindgarh Panchyat Samiti of Jaipur District (Rajasthan) regarding organic farmers had highest knowledge regarding general information about compost, whereas the conventional farmers had highest knowledge regarding organic weed management.

Bhingardeve *et al.* (2013), in his study on the knowledge and adoption of integrated nutrient management practices of Sugarcane crop by the farmers from Kolhapur district of western Maharashtra reported that considering the importance of integrated nutrient management, 69 per cent farmers had complete knowledge about practices like planting season, system of planting, seed treatment, soil testing, fertilizer management, organic fertilizer (FYM), time of application, green manuring, chemical fertilizer, use of micronutrients except quantity required for biological seed treatment, time of fertilizer application.

2.6.3 Relationship between knowledge level of farmers about nutrient management practices and their personal, social, economical, situational, communication and psychological characteristics.

2.6.3.1 Personal and social characteristics of the farmers and Knowledge

i. Age and knowledge

Mehta *et al.* (1989) stated that the age had non significant relationship with knowledge level of respondents.

Shantha Sheela and Seetharaman (2002a) showed that the relationship between age of the respondents and their knowledge level of potato growers was non-significant.

Anonymous (2005) showed that the age and knowledge level were found to have non-significant relationship.

Bodake *et al.* (2007) showed that the age and knowledge level of farmers about bio-fertilizers were found to have non-significant relationship.

Maraddi *et al.* (2007) observed that the age and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) with respect to integrated nutrient management were found to have non-significant relationship.

Hinge (2009) studied the diffusion and adoption of wine grape production technology in Maharashtra state and revealed that age of the wine growers had positive and non significant relationship with knowledge.

Doddamani *et al.* (2011) reported that age were found to be non-significantly associated with knowledge of land reclamation practices.

Chavai *et al.* (2013) reported that age does not have significant correlation with knowledge of turmeric growers.

Jaganathan *et al* (2012) revealed that the age and knowledge level of farmers about organic farming were found to have non- significant relationship.

ii. Education and knowledge

Pande *et al.* (1994) reported that the education level was positively and significantly associated with their knowledge level of IPM practicing cotton growers.

Kalaskar (1998) observed that education was positively and significantly correlated with knowledge of cotton growers about IPM technology.

Chapke (2000a) reported that education had significant relationship with knowledge of cotton growers about bio-control measures.

Shantha Sheela and Seetharaman (2002a) stated that the relationship between education and knowledge level of potato growers about plant protection practices was non-significant.

Chavai (2004) found that the relationship of education of the farmers with their knowledge level was positive and significant.

Anonymous (2005) stated that the education and knowledge level about recommended mango cultivation technology exhibited a negative and non-significant relationship.

Moulasab *et al.* (2006) found that the relationship of education of the farmers with their knowledge level was positive and significant.

Bodake *et al.* (2007) showed that the education and knowledge level of farmers about bio-fertilizers were found to have significant relationship.

Maraddi *et al.* (2007) observed that the education and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was positive and significant relationship.

Sawale (2011) observed that, there was positive and highly significant relationship between the education and their level of knowledge of the pomegranate growers about post harvest technology.

Atar (2012) showed that, there was a positive and highly significant relationship between the education and there level of knowledge of recommended grape cultivation practices.

Jaganathan *et al.* (2012) revealed that the education and knowledge level of farmers about organic farming were found to have positive and significant relationship.

Chavai *et al.* (2013) reported that education had positive and significant relationship with knowledge level of turmeric growers.

iii. Size of family and knowledge

Maraddi *et al.*(2007)observed that the size of family and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was positive and non-significant relationship.

Bite (2009) found that size of family had a positive and non significant relationship with knowledge.

Dhere (2012) reported that the variable size of family had no significant corelation with knowledge of farmers.

Jaganathan *et al* (2012) revealed that the size of family and knowledge level of farmers about organic farming were found to have positive and non-significant relationship.

Sai Arbind Kumar *et al.* (2016) observed that, size of family did not influence knowledge extent on scientific tomato cultivation practices.

iv. Farming Experience in pomegranate and knowledge

Shantha Sheela and Seetharaman (2002 a) found that the farming experience was 'non significant' with the knowledge level about plant protection practices of potato growers.

Maraddi *et al.* (2007) observed that the farming experience and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was positive and significant relationship.

Jaganathan *et al.* (2012) revealed that the farming experience and knowledge level of farmers about organic farming were found to have positive and significant relationship.

Chavai *et al.* (2013) reported that, farming experience was positive relationship with knowledge of the turmeric growers.

Pal *et al.* (2014) found that knowledge of flower cultivation was significantly related with farming experience.

v. Socio-economic status and knowledge

Mahajan (2000) stated that the socio-economic status and knowledge level about recommended banana cultivation technology exhibited a positive and significant relationship.

Reddy (1992) reported that there was a significant relationship between the socio-economic status of mango growers and their knowledge level.

Yogananda (1992) found that the relationship of socio-economic status of the farmers with their knowledge level was positive and significant.

Kadam (2006) observed that the relationship between knowledge level of mango growers and socio-economic status was positively significant.

Bodake *et al.* (2007) found that the socio-economic status and knowledge level of farmers about bio-fertilizers were found to have significant relationship.

Jaganathan *et al.* (2012) revealed that the socio-economic status and knowledge level of farmers about organic farming were found to have positive and significant relationship.

vi. Social participation and knowledge

Maraddi *et al.* (2007) observed that the social participation and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was positive and significant relationship.

Angait (2009) observed that the nature of relationship between social participation of banana growers and knowledge was found to be positive and significant.

Jaganathan *et al.* (2012) revealed that the social participation and knowledge level of farmers about organic farming were found to have positive and significant relationship.

Sabi *et al.* (2014) the social participation of the farmers showed a positive and highly significant relationship with their knowledge level.

2.6.3.2 Situational characteristics of the farmers and knowledge

Irrigation status and knowledge

Barse *et al.* (2010) observed that the irrigation status the knowledge level of Sweet orange growers in Amravati taluka had positive and significant relationship.

Cropping pattern and knowledge

Maraddi *et al.* (2007) observed that the cropping pattern and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was non-significant relationship.

Doddamani *et al.* (2011) reported that the cropping pattern were found to be non- significantly associated with knowledge of reclamation practices of saline and water logged soils.

Jaganathan *et al.* (2012) revealed that the cropping pattern and knowledge level of farmers about organic farming were found to have non- significant relationship.

Mangal (2012) revealed that the correlation between cropping pattern and adoption was negative and highly significant.

2.6.3.3 Economic characteristics of the farmers and knowledge

i. Land holding and knowledge

Kubade and Kalantri (1986) found that the land holding was significantly correlated with adoption of insecticides in cotton crop.

Mehta *et al.* (1989) observed that the size of land holding was not associated with knowledge level of respondents.

Bhopale *et al.* (1996) revealed that the land holding had possible and significant relationship with knowledge level of farmers.

Katole *et al.* (1998) while investigating the awareness about plant protection measures in hybrid cotton, observed that land holding was positive and significantly correlated with knowledge level.

Kalaskar *et al.* (2001) found that land holding of crop had a positive and significant relationship with knowledge of the farmers about IPM practices.

Chavai (2004) found that the land holding had positive and highly significant relationship with knowledge level of cotton growers.

Anonymous (2005) found that the land holding had positive and highly significant relationship with knowledge level of mango growers.

Bodake *et al.* (2007) found that the land holding and knowledge level of farmers about bio-fertilizers were found to have significant relationship.

Maraddi *et al.* (2007) observed that the land holding and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was non-significant relationship.

Doddmanni *et al.* (2011) reported that land holding were found to be non-significantly associated with knowledge of land reclamation practices.

Sawale (2011) observed that, the land holding of pomegranate growers were positively and significantly related with the level of knowledge of post harvest technology.

Jaganathan *et al.* (2012) revealed that the land holding and knowledge level of farmers about organic farming were found to have positive and significant relationship.

ii. Area under pomegranate cultivation and knowledge

Bhopale *et al.* (1996) revealed that the area under crop had positive and significant relationship with knowledge level of farmers.

Katole *et al.* (1998) while investigating the awareness about plant protection measures in hybrid cotton, observed that area under crop was positive and significantly correlated with knowledge level.

Kalaskar *et al.* (2001) found that area under cotton crop had a positive and significant relationship with knowledge of the farmers about IPM practices.

Chavai (2004) reported that the area of cotton had positive and highly significant relationship with knowledge level of cotton growers.

Maghade (2007) reported that there was negative and non-significant relationship between areas under onion cultivation with knowledge level of the respondents.

Maraddi *et al.* (2007) observed that the area of sugarcane and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was positive and significant relationship.

Jaganathan *et al.* (2012) revealed that the area under organic farming and knowledge level of farmers about organic farming were found to have positive and significant relationship.

iii. Annual income and knowledge

Mehta *et al.* (1989) reported that there was a significant relationship between the annual income of farmers and their knowledge level.

Katole *et al.* (1998), while investigating the awareness about plant protection measures in hybrid cotton, observed that the annual income was positive and significantly correlated with knowledge level.

Shantha Sheela and Seetharaman (2002a) observed that the relationship between knowledge level of potato growers about plant protection measures and annual income was non-significant.

Chavai (2004) reported that the relationship of annual income of the farmers with their knowledge level was positive and significant.

Anonymous (2005) found that the annual income had positive and highly significant relationship with knowledge level of mango growers.

Bodake *et al.* (2007) found that the annual income and knowledge level of farmers about bio-fertilizers were found to have significant relationship.

Maraddi *et al.* (2007) observed that the annual income and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was non-significant relationship.

Sawale (2011) observed that, the relationship between annual income and knowledge level of the pomegranate growers was positive and highly significant.

Jaganathan *et al.* (2012) revealed that the annual income and knowledge level of farmers about organic farming were found to have positive and significant relationship.

Chavai *et al.* (2013) reported that, annual income had positive and significant relationship with knowledge level of turmeric growers.

2.6.3.4 Psychological characteristics of the farmers and knowledge

i. Risk preference and knowledge

Maraddi *et al.* (2007) observed that the risk preference and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was positive and significant relationship.

Sawale (2011) observed that, risk orientation of pomegranate grower was positively and significantly related with the level of knowledge of post harvest technology.

Jaganathan *et al.* (2012) revealed that the risk preference and knowledge level of farmers about organic farming were found to have positive and significant relationship.

ii. Attitude and knowledge

Maraddi *et al.* (2007) observed that the attitude and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was positive and significant relationship.

Bite (2009) reported that attitude and knowledge level of farmers were positively significantly with each other.

Eunice (2011) reported that attitude and knowledge level of Maize growers about chemical fertilizers in Mozambique were found to have positive and significant relationship.

Dhere (2012) observed a positive and significant relationship between attitude and the knowledge level of farmers.

iii. Scientific orientation and knowledge

Chawkekar (1984) reported that the economic motivation was significantly related to the knowledge level of improved farm technology.

Kadam *et al.* (2006) reported that the scientific orientation was significantly related to the knowledge level of improved mango production technology.

Moulasab *et al.* (2006) found that the relationship of scientific orientation of the farmers with their knowledge level was positive and significant.

Bodake *et al.* (2007) found that the scientific orientation and knowledge level of farmers about bio-fertilizers were found to have significant relationship.

Maraddi *et al.* (2007) observed that the scientific orientation and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was positive and significant relationship.

Jaganathan *et al.* (2012) revealed that the scientific orientation and knowledge level of farmers about organic farming were found to have positive and significant relationship.

2.6.3.5 Communicational characteristics of the farmers and knowledge

i. Personal localite information source and knowledge

Juliana *et al.* (1991) reported that the personal contact source had a positive and significant relationship with the knowledge level of small, marginal and big cotton growers.

Chavai (2004) reported personal contact source of information had positive and highly significant relationship with knowledge level of cotton growers.

ii. Personal cosmopolite information source and knowledge

Juliana *et al.* (1991) reported that the group contact source had a positive and significant relationship with the knowledge level of small, marginal and big cotton growers.

Chavai (2004) observed that the group contact information source was positively associated with knowledge level of respondents.

Sawale (2011) observed that, the relationship between the source of information and knowledge level of the pomegranate growers was positive and highly significant.

Chavai *et al.* (2013) reported that, source of information had positive and significant relationship with knowledge level of turmeric growers.

iii. Mass media information source and knowledge

Chavai (2004) observed that the mass contact information source was positively associated with knowledge level of respondents.

Bodake *et al.* (2007) found that the mass media and knowledge level of farmers about bio-fertilizers were found to have significant relationship.

Maraddi *et al.* (2007) observed that the mass media and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was positive and significant relationship.

Jaganathan *et al.* (2012) revealed that the mass media and knowledge level of farmers about organic farming were found to have positive and significant relationship.

Sabi *et al.* (2014) revealed that mass media of the farmers showed a positive and highly significant relationship with their knowledge level.

iv. Extension education methods information source and knowledge

Maraddi *et al.* (2007) observed that the extension contact methods and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was positive and significant relationship

Bodake *et al.* (2007) found that the extension contact and knowledge level of farmers about bio-fertilizers were found to have significant relationship.

Jaganathan *et al.* (2012) revealed that the extension contact methods and knowledge level of farmers about organic farming were found to have positive and significant relationship.

Kumar Sarvesh (2014) observed that there was a positive and significant relationship between extension contact and knowledge level of farmers.

v. Cosmopolitanism and knowledge

Katkar (2001) stated that the cosmopolitanism and knowledge level about recommended mango cultivation technology exhibited a positive and significant relationship.

Gangurde (2003) reported that the relationship of cosmopolitanism of the banana growers with their knowledge level was positive and significant.

Bodake *et al.* (2007) found that the cosmopolitanism and knowledge level of farmers about bio-fertilizers were found to have significant relationship.

Maraddi *et al.* (2007) observed that the cosmopolitanism and the knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) was positive and significant relationship.

Jaganathan *et al.* (2012) revealed that the cosmopolitanism and knowledge level of farmers about organic farming were found to have positive and significant relationship.

2.7 Extent of utilization of nutrient management practices by the farmers

2.7.1 Utilization : Concept and meaning

Utilization as viewed by the rural sociologists is not a snap decision but a process.

Beal *et al.* (1957) stated that the process by which a farmer becomes aware of information and decided to use farm practices was called the adoption process.

Rogers (1962) expressed that the adoption was the mental process through which an individual passed from first hearing about an innovation to final adoption.

Rochin (1980) noticed that the adoption of new technology was a very uneven process, varying from farmer to farmer, region to region and country to country as well as various crop to crop system.

Rogers (1983) gave in his conceptualization identified five stages model of innovation - decision process as 1) Knowledge 2) Persuasion 3) Decision 4) Implementation and 5) Confirmation. According to Ray (1998) adoption was a decision to make full use of an innovation as the best course of action available.

Quadri *et al.* (2014) observed that 45.33 per cent of the potato growers had medium level of adoption level towards fertilizers and manure which was followed by 32 per cent growers who had high adoption level. Only 22.67 per cent of farmers had low adoption level about fertilizers and manures in potato crop.

2.7.2 Overall utilization level about nutrient management practices by Pomegranate growers

Shivalingegowda *et al.* (1990), in their study in the hill region of Karnataka reported that the most crucial nursery practices in cardamom cultivation like

seed treatments and application of fertilizer was not adopted by 85.5 and 84.66 per cent of farmers, respectively.

Sathiyarayanan (1991) indicated that less than two third of the respondents (63.33 %) were medium adopters of Azosprillum application, followed by low (20.00 %) and high (16.67 %) adopters, respectively.

Shivamurthy (1991) reported that arecanut farmers of Shimoga district in Karnataka had adopted simple practices like time of planting, pit size, intercultivation, intercropping, application of fertilizers from second year onwards, time and method of FYM and fertilizers application. Less percentage of farmers had adopted the practices namely variety, application of chemicals and time of irrigation due to lack of proper guidance and non-availability of materials, majority of the farmers were in medium and high adoption categories.

Sutha *et al.* (1991) reported that a majority (57.50 %) of the rubber growers had high level of adoption of various recommended practices like fertilizer application, cover crops, insect and disease control measures studying category-wise 43.33 per cent of the small growers had low level of adoption whereas, none was found on the low level of category among big growers.

Nityashree (1992) in her study on yield gap and adoption level of coffee growers in Chickmagalur district reported that more than 60 per cent both big and small growers had adopted practices like spacing, fertilizer application and liming. However, higher percentage of farmers had not adopted sprinkler irrigation and applied below the recommended dosage of FYM and plant protection chemicals.

Yogananda (1992) reported that in respect to control of pests and diseases, 70 per cent of small growers have taken up measures to control termite, rhinocerus beetle. Whereas, in case of big farmers more than 70.00 per cent adopted measures to control only termite and rhinocerus beetle but also avoided spread of diseases like stem bleeding and maheli.

Nagabhushanam and Guruprasad (1994) found that 51.67 per cent of coconut growers of South Canara district in Karnataka were belonged to low adopters regarding inputs like fertilizers and plant protection measures, whereas 35 per cent were

belonged to medium adopters group and only 13.33 per cent were belonged to high adopters group.

Singh (1996) found that more than half (53.33 %) of the coconut growers of Kamrup district in Assam had low level of adoption of recommended coconut cultivation practices like application of micronutrients and plant protection, fertilizers, while the remaining 25 and 21.67 per cent respondents were found in high and medium categories of adoption, respectively.

Balasubramani (1997) revealed that a considerable number of rubber growers (40.00 %) had medium level of adoption of improved practices like herbicides, smoking of rubber sheet, cover crops and insect and disease control practices. However, it was noted that equal percentage of growers (30 %) were in low and high categories of adoption in South Canara district of Karnataka.

Raghavendra (1997) found that all the arecanut farmers of South Canara district in Karnataka adopted practices namely weeding, harvesting and processing. Majority of the farmers adopted the practices namely application of green leaf and compost, plant protection measures, irrigation, drainage and right spacing.

Venkatakumar *et al.* (1998) reported that more than 97 per cent of the respondents of Coimbatore district in Tamil Nadu had adopted recommended variety, correct spacing and method of planting while 45.13 per cent of the farmers adopted water management practices and 28.32, 16.81, 41.6 and 45.1 per cent of the farmers adopted fertilizer application as per schedule, application of micronutrients, application of chemicals for pests and diseases and application of chemical in correct dose, respectively, 22.13 per cent of the farmers taken control measure of button shedding.

Chapake (2000) conducted a study in Akola district of Maharashtra state and reported that the 85.40 per cent of farmers were medium adopters of bio-control measures. Whereas, a mere 8.00 per cent of them were high adopters and remaining 6.56 per cent of them were low adopters of bio-control measures.

Saxena and Singh (2000) noticed that 40.00 per cent of farmers in Malwa region of Maharashtra state were medium adopters of organic farming. Whereas, 33.45 and 25.45 per cent of them were high and low adopters of organic farming.

Sriram and Paliniswamy (2000) conducted a survey in Salem district of Tamil Nadu and reported that the 39.16 per cent of cotton growers belonged to medium level of adoption, followed by high (35.84 %) and low (25 %) level of adoption of eco-friendly practices in cotton cultivation.

Sumati and Alageshan (2000) highlighted that large number of cotton growers of the Salem district in Tamil Nadu adopted the IPM practices. It was observed that the big farmers had high level of adoption (38 %), followed by marginal farmers (18 %) and small farmers (15 %).

Vasantha Kumar (2000) in his study on knowledge, adoption and economic performance of coffee growers revealed that majority of the small farmers had not adopted the recommended variety (58.00 %), control measures against pests (50.00 per cent), irrigation (60.00 %), drying yard specification (58.00 %) and recommended moisture content (55.00 %), whereas higher percentage of both big (72.00 %) and small (82.00 %) growers had not adopted control measures against diseases. He also revealed that nearly half of the big growers (47.00 %) had high overall adoption level followed by less per cent of respondents under medium (40 %) and low (13.00 per cent) overall adoption level category. On the other hand, a greater proportion of small growers were under medium (42.00 %) to low (30.00 %), overall adoption level category followed by mere (28.00 %) of respondents under high overall adoption category.

Anitha Kumari and Kalavathy (2001) revealed that a coconut farmer cannot adopt the plant protection measures recommended without the help of skilled climbers.

Bhopale *et al.* (2001) revealed that the 81.33 per cent of cotton growers in Maharashtra state belonged to low adoption category of with respect to bio-control pest management practices in cotton, followed by 16.67 and 2.00 per cent of them belonged to medium and high adoption categories, respectively.

Ranganatha (2001) conducted a study in Cauvery command area of Karnataka state and noticed that 51.00 per cent of respondents belonged to medium level of adoption of bio- fertilizer, whereas 34.00 and 15.00 per cent of them belonged to low and high adoption categories respectively.

Sudhakar and Kanagasabapathi (2002) noticed that most of the respondents in Viruthunagar district of Tamil Nadu adopted practices like cotton rattoning (95.00 %), summer ploughing (90.95 %), crop rotation (90.34 %) and use of light traps (85.00 %) and they further reported that nearly three-fourth of respondents adopted correct spacing and intercropping (72.50 %).

Christain *et al.* (2004) reported that the less percentage (37.50 %) cotton growing farmers in Vadodara district of Gujarat had adopted IPM practices followed by 36.67 per cent and 25.83 per cent in medium and high category, respectively.

Darling and Vasanthakumar (2004) in a study on botanical pesticides in Kanyakumari district of Tamil Nadu indicated that more than half of the respondents (51.66 %) were found with low level of adoption, followed by medium (43.44 %) level regarding adoption of botanical pesticides.

Govinda and Narayana Gowda (2007) observed that cent per cent of the Thompson seedless growers had partially applied micronutrients, compost and vermicompost to their soil. While, nearly 50.00 per cent and little more than one-third of the respondents applied green leaf manure and cent per cent of inorganic fertilizers for cultivation of Thompson seedless and Bangalore Blue grapes.

Maraddi *et al.* (2007), in a study on knowledge level of Sugarcane growers about selected sustainable cultivation practices (SCP) with respect to integrated nutrient management, it was highlighted that 42.00 per cent of the sustainable sugarcane growers had adopted the recommended quantity of FYM/ compost. The study further revealed that cent per cent of the sugarcane growers had followed the correct time and method of application of FYM/ compost to sugarcane crop. Majority (76.66 %) of sugarcane growers had not applied vermicompost to sugarcane crop, while 2.22 per cent growers had applied recommended dose followed by 21.10 per cent farmers who belonged to partial adoption category. Majority of the sugarcane growers (65.00 %) had not applied green leaf manure followed by majority (77.7%) of sugarcane growers did not adopt use of biofertilizers, while only 15.55 per cent of them had partially adopted the recommended quantity of biofertilizers (*Azotobacter/Azospirillum*) to sugarcane crop. The 67.22 per cent of the sugarcane growers belonged to complete adoption category regarding use of recommended N fertilizer quantity while 48.88 and 41.66 per cent of the

respondents belonged to partial adoption category of recommended P and K fertilizer quantity.

Naveen (2012) revealed that 37.50 per cent of the farmers belonged to high adoption practices of Pomegranate Cultivation. While, 32.50 per cent of the respondents had low adoption practices followed by medium adoption practices of Pomegranate Cultivation 30.00 per cent.

Bhingardeve *et al.* (2013) in his study on the knowledge and adoption of integrated nutrient management practices of Sugarcane crop by the farmers from Kolhapur district of western Maharashtra reported that considering the importance in integrated nutrient management, soil testing was not adopted by 80.00 per cent of farmers. Manganese sulphate and Borax as a micronutrient was completely adopted by 60.00 per cent of farmers. Regarding use of chemical fertilizers, 60.00 per cent of farmers had not adopted the proper time and quantity of fertilizer in Adsali and Suru planting of sugarcane.

Pandey *et al.* (2013) in a study on impact of integrated nutrient management on tomato yield under farmers field conditions reported that in tomato cultivation overall technological gap of 43.83 per cent and 64.90 per cent gap in overall fertilizer application. It was noticed that 73.82 per cent respondents applied more than the recommended dose of nitrogen and phosphatic fertilizers .Only 32.28 per cent apply FYM in their field.

Quadri *et al.* (2014) in a study on Adoption dynamics of fertilizers and manure in Potato crop revealed that overall 57.33 per cent of respondents had used recommended dose of urea followed by 26.22 per cent of respondents who had used lesser than the recommended dose whereas 16.45 per cent of overall respondents had used more than the recommendation. With regard to the extent of adoption of DAP, 40.89% of total respondents had used recommended dose whereas 7.11 and 52.00 per cent of respondents had used lesser and more than the recommended doses, respectively. Further it was revealed that 08.89 per cent of the total respondents had used recommended dose of MOP, whereas 91.11 per cent of overall respondents had used less than recommended dose and none of the respondents had applied more than recommended dose. About 32.00 per cent of respondents had used recommended dose of

FYM followed by 68.00 per cent of respondents who had used lesser than recommended dose of FYM.

Jebapreetha and Selvin (2015) in a study on adoption of recommended Grape cultivation practices observed that regarding the application of organic manure, almost all (98.00%) the respondents had not applied the recommended dose of manures. But organic manure was applied less than the recommended dose by the grape growers due to its less availability and exorbitant price. With respect to fertilizer application, about 97.00 per cent of the respondents had not applied the recommended dose of fertilizers. The actual adoption of manures and fertilizers by grape growers was in less quantity against the recommended dose whereas, had applied nitrogenous fertilizers and phosphatic fertilizers more than the recommended doses. Potash was applied in lesser quantity than the recommended dose.

Rajula Shanthi and Subramaniam (2015) in his study on farmers' perspective on integrated nutrient management in sugarcane found that more than 60 (66.00 %) of respondents applied urea followed by 76.00 per cent DAP followed by Potash (100.00 %) followed by Complex fertilizers (20: 20: 0: 13), 73 .00 per cent. About application of *FYM/ Compost* among the respondents, 50.00 per cent were applying FYM followed by nearly 30.00 per cent of the respondents were applying green manures like sun hemp / daincha as *insitu* application. About 63.00 per cent of the respondents were applying bio fertilizer in the liquid form like Azospirillum, and phospo bacteria were mostly used along with FYM. Regarding Micronutrient application, almost 83.00 per cent of the respondents were applying micronutrients (Sakthi special) as basal along with FYM.

2.7.3 Relationship between extent of utilization of the farmers about nutrient management practices and their personal, social, economical, situational, communication and psychological characteristics

2.7.3.1 Personal and social characteristics of the farmers and utilization

i. Age and utilization

Mehta *et al.* (1989) stated that the age had non significant relationship with extent of adoption level of respondents.

Shantha Sheela and Seetharaman (2002c) observed nonsignificant association between extent of adoption and age of brinjal growers on plant protection measures.

Anonymous (2005) showed that the age and adoption level were found to have non-significant relationship.

Bodake *et al.* (2007) found that the age and utilization level of farmers about bio-fertilizers were found to have non-significant relationship.

Maraddi *et al.* (2007) observed that the age and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have non-significant relationship.

Naveen (2012) in his study found that age had non-significant relationship with adoption pattern of pomegranate growers.

Chavai *et al.* (2013) reported that age does not have significant correlation with adoption behaviour of turmeric growers.

Sabi *et al.* (2014) revealed that age of the farmers showed a positive and significant relationship with their technological gap and adoption.

ii. Education and utilization

Pande *et al.* (1994) reported that the education level was positively and significantly associated with their extent of adoption of IPM technology by cotton growers.

Chapke (2000 a) reported that the education had significant relationship with adoption of cotton growers about bio-control measures.

Bodake *et al.* (2007) found that the education and utilization level of farmers about bio-fertilizers were found to have significant relationship.

Maraddi *et al.* (2007) observed that the education and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have positive and significant relationship.

Naveen (2012) reported that there was positive and significant relationship between education and adoption level of pomegranate growers.

Chavai *et al.* (2013) reported that education had positive and significant relationship with adoption behaviour of turmeric growers.

iii. Size of family and utilization

Deshmukh (1991) concluded that size of family of the respondents had a non-significant association with the adoption of tractor.

Maraddi *et al.* (2007) observed that the size of family and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have non-significant relationship.

Mule (2012) found that the family size of sweet orange grower and their adoption level were non significantly correlated with each other.

Naveen (2012) reported that there was non-significant relationship between family size and adoption level of pomegranate growers.

Patel *et al.* (2012) found that, family size showed positive and non-significant correlation with adoption of recommended production technology of potato.

iv. Farming experience in pomegranate and utilization

Shantha Sheela and Seetharaman (2002a) found that the farming experience was 'non significant' with the knowledge level about plant protection practices of potato growers.

Rubari (2006) stated that experience in tomato cultivation of the tomato growers had positive and non-significant relationship with their level of adoption of recommended technology of tomato crop.

Maraddi *et al.* (2007) observed that experience in sugarcane cultivation and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have positive and significant relationship.

Patel *et al.* (2012) observed that, farming experience had positive and significant correlation with adoption of the potato growers.

Borse (2015) reported that there was a significant association between farming experience of the respondents and adoption of groundnut production technology.

v. Socio-economic status and utilization

Yogananda (1992) found that the relationship of socio-economic status of the farmers with their adoption level was positive and significant.

Mahajan (2000) stated that the socio-economic status and extent of adoption of recommended mango cultivation technology exhibited a positive and significant relationship.

Kadam (2006) observed that the relationship between extent of adoption of banana production technology and socio-economic status was positively significant.

Bodake *et al.* (2007) found that the socio-economic status and utilization level of farmers about bio-fertilizers were found to have significant relationship.

Bangarva *et al.* (2010) found that socio-economic status and extent of utilization level of small, medium and large farmers about chemical fertilizers were found to have significant relationship.

vi. Social participation and utilization

Jalak (2002) revealed that social participation of the farmers and utilization were positively and significantly related with each other.

Maraddi *et al.* (2007) observed that social participation and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have positive and significant relationship.

Angait (2009) observed that the nature of relationship between social participation of banana growers and adoption was found to be positive and significant

Bangarva *et al.* (2010) found that social participation and extent of chemical fertilizers utilization level of small, medium and large farmers were found to have non- significant relationship.

2.7.3.2 Situational characteristics of the farmers and utilization

i. Irrigation status and utilization

Barse *et al.* (2010) observed that the irrigation status the utilization level of Sweet orange growers in Amravati taluka had positive and significant relationship.

Singh *et al.* (2014) revealed that irrigation facilities available with the farmers showed a significant and positive relationship with their extent of adoption of seed technology.

ii. Cropping pattern and utilization

Reddy (2000) reported that mechanization had a significant positive impact on cropping intensity, production, productivity and income of the selected farms.

Maraddi *et al.* (2007) observed that cropping pattern and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have non- significant relationship.

Doddamani *et al.* (2011) reported that cropping pattern were found to be non- significantly associated with adoption of reclamation Practices of saline and water logged soils.

Mangal (2012) revealed that the correlation between cropping pattern and adoption was negative and highly significant.

2.7.3.3 Economic characteristics of the Pomegranate growers and utilization

i. Land holding and utilization

Kubade and Kalantri (1986) found that the land holding was significantly correlated with adoption of insecticides in cotton crop.

Bhopale *et al.* (1996) revealed that the land holding had possible and significant relationship with knowledge level of farmers.

Chavai (2004) found that the land holding had positive and highly significant relationship with extent of adoption level of cotton growers.

Bodake *et al.* (2007) found that the land holding and utilization level of farmers about bio-fertilizers were found to have significant relationship.

Maraddi *et al.* (2007) observed that land holding and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have non- significant relationship.

Naveen (2012) reported that there was non-significant relationship between land holding and adoption level of pomegranate growers.

Patel *et al.* (2012) revealed that, land holding had positive and highly significant correlation with adoption of potato growers.

ii. Area under pomegranate cultivation and utilization

Kalaskar (1998) found that the area under cotton crop had a positive and significant relationship with extent of adoption of the farmers about IPM practices.

Katole *et al.* (1998) while investigating the awareness about plant protection measures in hybrid cotton observed that the area under crop was positive and significantly correlated with adoption level.

Chavai (2004) reported that the area of cotton had positive and highly significant relationship with adoption of IPM technology by cotton growers.

Maghade (2007) observed that there exist a positive correlation between area under given crop and level of adoption.

Maraddi *et al.*(2007) observed that area under sugarcane cultivation and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have positive and significant relationship.

iii. Annual income and utilization

Mehta *et al.* (1989) reported that there was a significant relationship between the annual income of farmers and their extent of adoption.

Chavai (2004) reported that the relationship of annual income of the farmers with their adoption of IMP technology was positive and significant.

Anonymous (2005) found that the annual income had positive and highly significant relationship with adoption level of mango growers.

Bodake *et al.* (2007) found that the annual income and utilization level of farmers about bio-fertilizers were found to have significant relationship.

Maraddi *et al.* (2007) observed that annual income and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have non- significant relationship.

Angait (2009) observed that the relationship between annual income and adoption level of recommended banana production technology practices was positively significant.

Patel *et al.* (2012) found that, annual income had positive and highly significant correlation with adoption of potato growers.

2.7.3.4 Psychological characteristics of the farmers and utilization

i. Risk preference and utilization

Rathod (2005) reported that the risk preference was positively significant to the utilization of sugarcane growers.

Maraddi *et al.* (2007) observed that risk preference and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have positive and significant relationship.

Angait (2009) found that risk orientation had highly significant relationship with adoption behavior of banana growers.

Sawale (2011) found that, there was positive and significant relationship with the adoption of post harvest technology of the pomegranate growers with risk preference.

ii. Attitude and utilization

Rao and Mishra (1997) found that the attitude was positively significant to the utilization of sugarcane and paddy growers.

Maraddi *et al.* (2007) observed that attitude and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have significant relationship.

Eunice (2011) reported that attitude and utilization level of Maize growers about chemical fertilizers in Mozambique were found to have positive significant relationship.

iii. Scientific orientation and utilization

Kadam (2006) reported that the scientific orientation was significantly related to the extent of adoption improved mango production technology.

Moulasab *et al.* (2006) found that the relationship of scientific orientation of the farmers with their adoption level was positive and significant.

Bodake *et al.* (2007) found that the scientific orientation and utilization level of farmers about bio-fertilizers were found to have significant relationship.

Maraddi *et al.* (2007) observed that scientific orientation and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have positive and significant relationship.

2.7.3.5 Communication characteristics/sources of information and utilization of nutrient management practices by the Pomegranate growers

i. Personal localite information source and utilization

Juliana *et al.* (1991) observed that the local personnel source of information had a positive and significant relationship with the utilization level of small, marginal and big cotton growers.

Chavai (2004) reported that the local personnel source of information had positive and highly significant relationship with adoption level of cotton growers.

Sawale (2011) observed that, relationship between sources of information and adoption level of pomegranate growers as positive and highly significant.

Atar (2012) found that, relationship between uses of sources of information was positively and significantly related with adoption of grape cultivation practices of grape growers.

Mangal (2012) reported that there exist a positive and significant correlation between sources of information and adoption.

ii. Personal cosmopolite information source and utilization

Juliana *et al.* (1991) reported that the economic motivation had a positive and significant relationship with the utilization level of small, marginal and big cotton growers.

Chavai (2004) observed that the group contact information source was positively associated with adoption level of respondents.

Bodake *et al.* (2007) found that the extension contact and utilization level of farmers about bio-fertilizers were found to have significant relationship.

iii. Mass media- (print/electronic media) information source and utilization

Juliana *et al.* (1991) reported that the use of mass media had a positive and significant relationship with the utilization level of small, marginal and big cotton growers.

Bodake *et al.* (2007) found that the extension contact and utilization level of farmers about bio-fertilizers were found to have significant relationship.

Maraddi *et al.* (2007) observed that mass media uses and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have positive and significant relationship.

iv. Extension education methods information source and utilization

Juliana *et al.* (1991) reported that the extension personnel source of information had a positive and significant relationship with the adoption level of small, marginal and big cotton growers.

Maraddi *et al.* (2007) observed that extension personnel source of information and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have positive and significant relationship.

Singh (2010) observed that extension contact had positive and significant relationship with adoption of improved practices in Mango.

Naveen (2012) found that extension participation had positive and significant relationship between adoption level of pomegranate growers.

Patel *et al.* (2012) reported that extension contact had positive and highly significant correlation with adoption of potato growers.

2.7.3.6 Cosmopolitanism and utilization

Yogananda (1992) observed that cosmopolitanism was significantly associated with adoption level of coconut growers in Tumkur district.

Katkar (2001) stated that the cosmopolitanism and extent of adoption level about recommended mango cultivation technology exhibited a positive and significant relationship.

Gangurde (2003) reported that the relationship of cosmopolitanism of the banana growers with their adoption level was positive and significant.

Bodake *et al.* (2007) found that the cosmopolitanism and utilization level of farmers about bio-fertilizers were found to have significant relationship.

Maraddi *et al.* (2007) observed that cosmopolitanism and utilization level of sugarcane growers about sustainable sugarcane cultivation practices with respect to INM were found to have significant relationship.

Naveen (2012) found that there is positive and significant relationship between cosmopolitanism and adoption level of pomegranate farmers in Chitradurga districts.

2.8 Constraints faced by the farmers in utilization of nutrient management practices

2.8.1 Constraints : Concepts and meaning

One of the important specific objectives of the study was to analyze the constraints faced by the pomegranate growers with respect to utilization of various nutrient management practices. According to American Heritage dictionary constraints is the stage, quality or sense of being restricted to a given course of action or inaction.

2.8.2 Overall constraints of farmers

Lokhande and Wangikar (1991) conducted a study in Omerga taluk of Osmanabad district in Maharashtra and reported that, majority of the grape growers (79.16 %) were not able to get improved varietal cuttings, 70.83 per cent of them expressed the problem of less resistance to pest and diseases and 75.00 per cent expressed non-availability of loans from bank in time.

Urade *et al.* (1991) conducted a study on adoption of dry land horticulture technology in Washim tahsil of Akola district in Maharashtra state reported that, more than 80.00 per cent of the respondents were facing the difficulty in successful plantation of their crops for want of technical guidance, 93.2 per cent were facing difficulty in timely supply of information, 97.80 per cent in getting protective irrigation, 94.60 per cent in early procurement of bank loan and 89.8 per cent were facing difficulty of trampling by stray cattle.

Jayale (1992), in his study on horticulture crop growers observed that, majority of the respondents (79.16 %) opined that the filling of pit with manure and fertilizers is costly and laborious, while, 66.66 per cent of respondents expressed that, the problem of digging the standard size pit is expensive and forty five per cent of the respondents expressed that, getting seedling is difficult.

Nityashree (1992) pointed out that the main constraints in the adoption of improved practices of coffee as revealed by the coffee growers of Chickmangalore district in the order of its importance were non-availability of inputs and high cost of

labour, non-availability of desired fertilizers, non-availability of water for sprinkler irrigation and processing, high processing cost, inadequate drying yard facilities, high rate of fertilizers, insecticides and pesticides, no facility for soil testing, no proper extension guidance and high cost of transportation.

Yogananda (1992) reported that the lack of knowledge and guidance were the major constraints in the adoption of recommended practices of coconut cultivation. Other factors like high cost of inputs, no water, lack of rainfall, no transportation and lack of equipment were the constraints which come in the way of adoption of the recommended practices.

Shaikh *et al.* (1993) revealed that, farmers were facing many problems in the adoption of custard apple production technology, such as; non-availability of the grafts of improved varieties, fluctuations of market price and exploitation by middlemen. As regard to the extension service, 76.00 per cent of growers felt that the training classes, discussion and mela were not organized by government agency though there was a great need for organizing training classes, holding discussion and mela.

Bhogal (1994) conducted a study in Nainital district of Uttar Pradesh and reported that, 66.66 per cent of the apple growers were facing problems of non availability of cold storage facilities, 61.00 per cent of the apple growers were facing problem of higher incidence of pest and diseases and 51.39 per cent were facing the problem of lack of transport facilities.

Srinivas Reddy (1995) conducted a study in Kolar district of Karnataka on mango growers and reported that, problem faced by mango growers were more pest and disease incidence, high cost of fertilizer, high cost of plant protection chemicals, non-availability of labour, lack of technical guidance, rain during harvest and problem of weed.

Bonny (1996) surveyed the constraints in commercial production of vegetables in Pondichery and Puthur in Kerala and reported that, increased cost of plant protection chemicals was perceived as the most important factor by respondents, followed by; in adequate market facilities poor storage and other post harvest facilities, insufficient capital and high labour costs.

Iqbal *et al.* (1996) observed that the lack of adequate knowledge on the natural predators and parasites, lack of adequate knowledge on the economic threshold level of different pests, inability to apply pesticides in time, excessive use of synthetic pyrethroids, non availability of NPV were the major constraints in adopting integrated pest management practices in cotton.

Shivaraj (1996) reported that the non availability of pheromone traps, green lace wing predator and NPV, lack of knowledge in selecting IPM practices, lack of technical guidance and lack of printed materials were the major constrains which come in the way of adoption of IPM practices.

Balasubramani (1997) reported that the majority of rubber growers faced the problems like poor quality of planting materials, attack of insects and diseases, non-availability of skilled tappers, loss of top soil due to soil erosion, non-availability of seeds for cover crop, non-availability of planting materials, lack of technical guidance and non-receipt of timely rainfall.

Muneem (1997) indicated that, majority (78.57 %) of the respondents perceived high cost of chemicals as major constraints followed by lack of knowledge (64.28 %), lack of credit facilities (58.16 %), non availability of specific chemicals in time in local markets (52.04 %), lack of technical guidance (48.98 %), application of pesticides, fungicides and fertilizer were dangerous (29.59 %), no faith on recommendations (24.49 %), adulteration of chemicals (23.47 %), damage is not up to the threshold level (17.35 %), high cost of labour (15.31 %), non-availability of suitable equipment (12.24 %) and not aware of practice (11.22 %).

Raghavendra (1997) reported that the non-availability of labour (88 %), damage due to high wind speed during rainy season (67.00 %), scarcity of water during summer (49.00 %), irregularity in the supply of electrical and heavy power cuts during summer (38.00 %), problems of Koleroga diseases (22.00 %), problem of tender nut drop (16.00 %), price fluctuation (17.00 %), non-availability of green leaves for manuring (12.00 %), problem of excess rain (12 %), problem of pests (7.00 %), loss due to thunder shocks, marketing problem, theft and animal grazing (2 per cent each) were important problems perceived by arecanut growers of South Canara district in Karnataka state.

Sangram (1997) observed that the red gram growers were facing problems of non-availability of IPM materials in the market (28.24 %), labour shortage (28.84 %) and high wages (11.54 %) per cent, respectively in the adoption of IPM practices.

Sharma (1997) conducted a study on mango growers and reported that, one fourth of the respondents (25.00 %) each were facing problem of high cost of fertilizer and weedicide, high cost of nursery plants (24.00 %) and lack of technical knowledge in application of fertilizer (22.50 %).

Shereif and Vasantkumar (1997) reported that the farm magazine, Kerala Karshakan had higher coverage in the topic "Low cost farming technologies (14.80 %) while in Kalpadhenu higher coverage was for environmental issues (16.90 %). He also reported that Kerala Karshakan also covered use of biofertilizers (13.40 %) use of biopesticides (11.70 %), soil management practices (10.30 %), environmental issues (8.90 %), optimum use of organic materials (7.40 %), IPM (5.80 %), Agro-forestry (4.40 %), natural resource management (2.90 %) and organic farming (2.90 %).

Katole *et al.* (1998) revealed that majority of respondents (80.67 %) expressed the lack of the knowledge about biological control as constraint. Around eighty per cent (78.67 %) stated that cost of insecticide was exorbitant, followed by 69.33 per cent of the respondents faced the difficulties of lack of knowledge about plant protection measures.

Kumar (1998), in his study on banana growers in Bangalore district reported that, the farmers faced the problems like technical guidance, pests and disease, high investment, low price for the fruits, fluctuation in the prices and exploitation by the middleman.

Chitnis *et al.* (2000) reported the constraints of non-availability of inputs (19.00 %), phenomena trap (14.00 %) abiotic agents (12.00 %) and non availability of IPM lab at taluka level.

Kolhe (2000) reported that, the information was theory oriented but not practical (43.00 %), information was verbose (33.00 %), problems were not solved in argil. exhibitions (21.00 %) were the most information input constraints faced by the farmers.

Lakshmisha (2000) noticed that the commonly observed constraints by demonstrator farmers in the adoption of the improved production practices were severity of pest incidence, non-availability of quality grafts, high cost of labour and poor nutrient status of soil. The other farmers expressed in addition to above lack of technical guidance as the major constraints in adoption of improved cashew production practices.

Govinda Gowda (2002) in his study on sustainable grape cultivation practices adopted by Bangalore blue and Thomson seedless growers in Bijapur and Bangalore rural districts, reported constraints in such as no fixed price, low price, lack of regular market, exploitation by middle men, lack of cold storage facility, no guidance on marketing aspects and lack of transportation facilities.

Venkatesh (2002) in study on constraints analysis of tomato growers in the Kolar district reported that the eighty six per cent of the respondents cited the problem of susceptibility of crop to pest and disease. Labour shortage and higher wages (62.00 %), high transportation cost (58.00 %), non-availability of IPM material/input in the market (48.00 %), lack of technical knowledge and guidance about IPM (44.67 per cent %) and non-availability of sufficient credit (40.67 %) were the other problems faced by respondents in the adoption of IPM practices.

Kavaskar and Santha (2003) revealed that, lack of technical guidance was the constraints faced by (78.33 %) of the banana growers, lack of enthusiasm in extension personnel to provide latest information on cultivation practices were another constraints experienced by the banana growers in utilizing information sources.

Thorat (2003) conducted a study on technological gap and constraints in adoption of recommended cultivation practices of mango growers and reported that with respect to use of recommended varieties non availability of required grafts in time (38.00 %), lack of knowledge about improved variety (22.00 %) and grafts were costly (7.00 %) were the constraints faced by the respondents. High wage rate (19.00 %), lack of knowledge about scientific planting method (13.00 %) and lack of laborers (12.00 %) were the constraints faced by the respondents in planting of mango. fertilizer were not available in time (14.00 %) and lack of laborers (6.00 %) were the constraints reported by the respondents.

Christain *et al.* (2004) reported that the cotton growing farmers in Vadodara district of Gujarat had faced the major problems of timely availability of training on IPM (100 %) and lack of skilled labours (70.00 %). Similarly the non availability of plant production appliances, bioagents in time (47.50 %) and high cost of plant protection inputs (38.33 %) were the other constraints in the adoption of IPM practices.

Kaid *et al.* (2005) found that the major constraints faced by the fennel growers were lack of technical guidance (49.17 %) more problem of disease and insect (48.33 %), non getting remunerative price of the produce (47.50 %), long duration crop (43.33 %), higher charge and irregular supply of electricity (39.17 %).

Nagesh (2006) reported that high incidence of pests and diseases 90.83 per cent non availability of skilled labour for pruning operation 90.00 per cent, followed by labour problems for inter-cultivation 85.00 per cent, expensiveness of pruning operations 79.16 per cent, costliness of the chemical fertilizers 56.66 per cent and lack of processing units 52.50 per cent.

Bodake *et al.* (2007) revealed that, the major constraints of information faced by the farmers were non availability of Agricultural literature (66.66 %) followed by 56.66 and 45.33 per cent faced absence of timely guidance by Agril. Department and no guidance by Agricultural Supervisor respectively. Among financial constraints 63.33, 48.66 and 50.00 per cent of the respondents faced lack of finance, non-availability of subsidy and non-availability of credit respectively. In technological constraints 42.00 and 38.00 per cent faced lack of practical training and lack of knowledge about use of bio-fertilizers respectively.

Howal *et al.* (2010) observed that 56.25 per cent of the respondents were expressed lack of availability of guaranteed seedling or planting material from disease free nursery .It was observe that about 76.56 per cent of the respondents expressed lack of availability of drought resistant and disease resistant varieties As regards to spacing, about 36.71 per cent of the respondents expressed lack of knowledge about the plant population and spacing. It was observe that 44.53 per cent of the respondents expressed the lack of technical knowledge and skill about pruning practices. High cost of fertilizer was the major reason faced by 86.71 per cent of the respondents. Lack of knowledge

about the recommended fertilizer dose (82.81 %) and lack of knowledge about time of application of fertilizer (61.71 %). The major constraints faced by the respondents was shortage of labour at the time of harvesting and lack of knowledge of proper stage of harvesting (21.88 %).

Kadam *et al.* (2010) indicated that the important constraints faced by the majority of the sweet orange growers were high cost of transportation charges (87.50 %), high cost of plant protection chemicals (79.37 %), higher costs were incurred for pruning (72.62 %) and non availability of skilled labours during pruning (74.37 %).

Naveen (2012) revealed that constraints like technical problems obtained with an average score of 112.25 received first rank followed by labour problem with 109.33 average score, marketing problems with 108.25 average score, input problems with 84.4 average score, lastly the financial problems with 26.5 average score received last rank.

Bhingardeve *et al.* (2013), in his study on the knowledge and adoption of integrated nutrient management practices of Sugarcane crop by the farmers from Kolhapur district of western Maharashtra reported the constraints from data that all the farmers faced the constraints like Lack of technical knowledge regarding fertilizer dose conversion on the basis of Soil testing results, high prices and timely unavailability of straight fertilizers and unavailability of soil testing labs in nearby area in adoption of integrated nutrient management practices of sugarcane.

Quadri *et al.* (2014), in a study on Adoption dynamics of fertilizers and manure in Potato crop revealed that overall, majority of the respondents (76.00 %) reported non-availability of fertilizers at proper time followed by 61.77 per cent with high cost of fertilizers as the main constraints of non-adoption of recommended fertilization application. The other constraints was lack of labour (35.55 %) and lack of knowledge about dose and time of application (37.33 %).

Rajula Shanthi and Subramaniam (2015) in his study on farmers' perspective on integrated nutrient management in sugarcane found the constraints like high fertilizer cost (96.00 %), timely application of fertilizer (93.00 %), lack of availability of fertilizer (87.00 %). Majority of the respondents had less awareness about micronutrients and the contents there in of the micronutrients mixture and its function (80

.00 %), not having much knowledge about biofertilizer usage and its function (76.00 %), 73 per cent of the respondents faced non availability of FYM, good quality biofertilizer was not available in time (70.00 per cent). Nearly three fourth (73.00 %) of the respondents got only 25.00 per cent more yield due to adoption of INM as compared to average yield of normal practice.

2.9 Suggestions given by the farmers for overcoming the Constraints

Yogananada (1992) in study on coconut growers of Tumkur district in Karnataka suggested that it is a fact that most of small coconut growers have low knowledge level and low adoption level of recommended practices of coconut cultivation. But, it is quite opposite in case of big coconut growers. However, even among the big coconut growers, a sizeable proportion of them possess low knowledge and adoption level in case of amount of fertilizer, application of the fertilizers and therefore, it calls for intensification of educational efforts by the field extension wings of Department of Horticulture, Coconut Department Board and Central Plantation Crop Research Institute.

Balasubramani (1997), in his study on knowledge and adoption behaviour of rubber growers in Belthangadi taluk of Dakshina Kannada district suggested that the fact that most of the growers have adequate knowledge on rubber cultivation practices is a clear index of the progressiveness of the growers, still a sizeable proportion possess low knowledge on fertilizers, cover crops, insect and diseases, micronutrients, herbicides and smoking of sheet rubber therefore, it calls for intensification of educational efforts by the field extension workers of rubber board in these areas.

Lakshmisha (2000), in his study on impact of cashew demonstrations on knowledge adoption and yield level of farmers in Dakshina Kannada district suggested that tea mosquito bug is a major problem in the successful cultivation of cashew although chemical control methods are advocated. There is need for integrated pest management (IPM) approach to manage this pest effectively in the long range.

Bhargava (2001) suggested in Annual Report of Maharashtra State Grape Growers Association, about grapes growers that for efficient fertilizer management, there is a need to promote secondary and micronutrients to increase efficiency of primary fertilizer nutrients. Production, marketing and promotion of foliar spray grade in various

packing sizes for spray purpose. Recommendations for various agro-ecological situations, taking into account soil nutrient status, efficient fertilizer use and orchard management. In grapes apart from soil analysis, plant analysis is an important tool. This has to be taken up in all horticultural crops and specially on fruits. Location of active root zone and placement of fertilizers for various crops has to be worked out in the changing horticultural scenario, where irrigation pre being switched over to drip, sprinkler and efficient water use systems. Future work has to be concentrated on the production of high quality fruits by efficient fertilizer management. Balanced and judicious use of fertilizers will result in good quality fruits. Considering the present situation of global warming, it is necessary to go for integrated nutrient management, where use of organic manures, biofertilizers and chemical fertilizers will be used simultaneously.

Babanna (2002), in his study on areca nut growers in Shimoga district suggested that the major problems faced by respondents are such as identification and control of pests and diseases, getting proper remunerative price and availability, in time labour these problems should be have in mind to including in the development activities for improving the situation to encourage the farmers to adopt the production technologies in areca nut cultivation.

Vedamurthy (2002), in his study on the management of areca gardens and marketing pattern preferred by the arecanut farmers of Shimoga district in Karnataka suggested that a majority of the arecanut growers had low or partial knowledge regarding improved variety, scientific ways of selecting palms for seed purpose, scientific ways of choosing the seedlings for transplanting, pest and diseases, recommended fertilizers dose and irrigation interval. The farmers were expressed that the trainings on the aspects like identification and control of pests and diseases, processing areca nut varieties and application of recommended FYM and chemical fertilizers are very much essential. The series of institutional training programmes or peripatetic training programmes are helpful to realize the latest improved technologies relating to improved varieties higher production from areca nut cultivation.

Bhosale (2003) concluded that 63.13 per cent of the pomegranate grower suggested that government should provide minimum support price and also 43.75 per

cent farmers suggested information and guidance about export potential be made available.

Christain *et al.* (2004) suggested that the timely availability of training on IPM (100 %) and training for labours (80.00 %). Similarly the availability of plant production appliances, bioagents in time and subsidized plant protection inputs were the other suggestions.

Modak and Sawant (2004) conducted a study on constraint faced by the farmer in production and marketing of minor fruits growers and offered major suggestions for improving production technique like developing new varieties 78.67 per cent, purchase of fruits on co-operative basis 66.67 per cent, information of these crops and availability of planting material 61.33 per cent.

Malarkodi *et al.* (2010), in a study on strategies for promoting bio-fertilizers among the farmers for sustainable agriculture suggested that first was to educate the farmers through awareness campaign, second to the frequent demonstration of usage methods of bio-fertilizers, third the advertisements through TV, radio, free leaflets etc., conducting frequent field demonstration specifically about the usage methods of bio fertilizers, conducting awareness campaign to educate the farmers about the benefits of bio-fertilizers and giving more advertisement programmes to make aware of the bio fertilizer products through TV, radio, free leaflets etc., so that farmers can buy the products and use it in their fields.

Mule (2012) pointed out that proper guideline for use of chemical fertilizer be given was the major suggestions made by 96.66 per cent of farmer.

Bhingardeve *et al.* (2013), in his study on the knowledge and adoption of integrated nutrient management practices of Sugarcane crop by the farmers from Kolhapur district of western Maharashtra suggestion from data that all the farmers need of technical knowledge regarding fertilizer dose conversion on the basis of soil testing results, timely supply of straight fertilizers at reasonable prices and need for soil testing labs in nearby area for adoption of integrated nutrient management practices of sugarcane.

2.10 Conceptual model of the study

Any systematic is based on the sound theoretical model. A researcher develops a model for the purpose of testing it through study, since it helps in rational thinking about the research problem and represents the conceptualization of concepts used in the research study. The model is shown in Fig. 1. The postulated relationship between variables is portrayed in conceptual model (Fig. 1) based on assumptions made earlier. This model explains that knowledge level and extent of utilization of pomegranate growers about various nutrient management practices depends upon personal, social, economical, situational, communication and psychological and communicational variables.

3. RESEARCH METHODOLOGY

Research methodology is the description, explanation and justification of various methods of conducting research. The researcher has to develop and use appropriate research methods and tools so that desirable data is collected in line with the objectives set forth. Methodology describes where and how study will be carried out and methods of statistical analysis will be used to accomplish the objectives. The study was conducted during the year 2015-16 in Nashik, Solapur and Sangli districts of Maharashtra state. The research methodology and the procedures followed in the study are presented under the following headings.

- 3.1 Locale of the research study
- 3.2 Information about the selected research area
- 3.3 Research design
- 3.4 Sample and sampling technique
- 3.5 Operationalization and measurement of variables
- 3.6 Scoring techniques and categorization of the variables
- 3.7 Constraints
- 3.8 Suggestions
- 3.9 Development of interview schedule
- 3.10 Pretesting of interview schedule
- 3.11 Tools and techniques of data collection
- 3.12 Statistical tools used for analysis of data
- 3.13 Terms and concepts used for the study

3.1 Locale of the study

In Maharashtra the pomegranate is being grown on larger scales in Nashik, Solapur, Sangli, Ahmednagar, Satara and Jalgaon districts. Considering larger area under pomegranate cultivation in Sangli, Solapur and Nashik districts which represents the Kolhapur, Pune and Nashik divisions, respectively were selected for the present investigation. Moreover, the pomegranate growers from these districts are using excess chemical fertilizers than recommended doses.

3.2 Information about the selected research area.

3.2.1 Geographical location

The district Solapur lies in the Bhima-Sina-Man basins, just before the Bhima river leaves Maharashtra State to enter into Karnataka State. Bounded by 17° 10' north and 18°32' north latitudes and 74°42' east and 76°15' east longitudes, the district is fairly well defined to its west as well as to its east by the inward-looking scarps of Phaltan Range and the Osmanabad Plateau, respectively. While, Nashik district is located between 18.33 degree and 20.53 degree North latitude and between 73.16 degree and 75.16 degree East Longitude at Northwest part of the Maharashtra state, at 565 meters above mean sea level. The Sangli District is located in the southern part of the Maharashtra State. It lies between 73°42' and 75°41' East longitude and 16°43' and 17°38' North latitude.

3.2.2 Climate and rainfall

The climate of Solapur district is on the whole agreeable and is characterized by general dryness in the major part of the year. The cold season from December to about the middle of February is followed by the hot season which lasts up to the end of May. June to September is the South-West monsoon season. October and November constitute the post-monsoon or retreating monsoon season. The average annual rainfall in the Solapur district is 584.3 mm. (23.00"). The rainfall in the district varies from 448.8 mm. (17.67") at Akluj near the western border to 689.2 mm (27.14") at Akkalkot near the South-Eastern border of the district. Some rainfall in the form of thunder-showers occurs during the months of April and May. The rainfall during the South-West monsoon in the months of June to September amounts to about 74.00 per cent of the annual rainfall. September is the rainiest month. About 17.00 per cent of the normal annual rainfall in the district is received in the post-monsoon months of October and November. The variation in the annual rainfall from year to year is large. The average rainfall of the Nashik district is between 2600 and 3000 mm, there is wide variation in the rainfall received at various blocks. Most of the rainfall is received at various blocks. Most of the rainfall is received from June to September. The maximum temperature in summer is 42.5⁰C and minimum temperature in winter is less than 5⁰C. Relative humidity ranges from 43 to 62 per cent. While, in Sangli district average rainfall

ranges between 60 to 80 cm in a year is confined to southwest monsoon. The temperature is above 18°C through the year. Normal average rainfall in the district is about 692 mm extending to about 49 rainy days in a year. The average humidity is above 50 per cent. The climate gets hot and dry towards the East and humidity goes on increasing towards the western part of the district.

3.2.3 Rivers

The major rivers of the Solapur district are the Bhima, its right bank feeders the Nira and Man and its left-bank feeder the Sina. Besides, a good number of lesser streams form the tributaries of the Bhima and serve as its local feeders. The Bhima and the Sina flow with a roughly South-Easterly trend while the Nira runs East and the Man North-Easterly. During the dry season, all these rivers are fordable. The major rivers of the Nashik district are the Godavari and Girna. Godavari which is popularly known as Ganga of South India originates at holy place Trimbakeshwar. Other rivers are Darna, Mosam, Aram, Vaitarna, Manyad and Kadwa. The main rivers of Sangli district are Warna and Krishna. The Krishna is one of the three largest sacred rivers of southern India. Approx. 105 km of the river course falls inside the district. The rivers Venna, Koyna, Vasna, Panchganga, Dudhganga, Ghataprabha, Malaprabha and Tungabhadra join Krishna from the right bank; while the Yerla River, Musi River, Munneru and Bhima rivers join the Krishna from the left bank.

3.2.4 Socio-economic features of study area

The information regarding socioeconomic features of study area is depicted in Table 3. The population of the Solapur district according to 2001 census is 38,50,000, persons composed of rural (68.00 %) and urban (32.00 %). While, Nashik and Sangli consists rural (61.20 and 57.73 %) and urban (38.8 and 42.27 %), respectively.

Table 5. Socioeconomic features of selected districts

Sl. No.	Particulars	Solapur	Nashik	Sangli
1.	Total area (sq. km)	14895	15530	8572
2.	No. of villages	1150	1931	724
3.	Population (000)	3850	4994	2584
i.	Rural (%)	68.00	61.2	57.73
ii.	Urban (%)	32.00	38.8	42.27

(Source : District Socio-Economic Review- 2013-14)

3.2.5 Land utilization pattern

The information in respect of land utilization pattern in Solapur, Nashik and Sangli districts is presented in Table 5. It can be seen from the Table 5. that, In Solapur district out of the total geographical area 67.64 per cent area is under cultivation while, in Nashik and Sangli districts 56.16 per cent and 74.06 per cent area is under cultivation, respectively. There is need to improve cultivable waste land for bringing it under cultivation for better agricultural development.

Table 6. Land utilization pattern of selected districts

Sl. No.	Particular	Solapur	Nashik	Sangli
1.	Total geographical area (ha)	1487843	1425591	861065
2.	Area under forest (ha)	31947	240423	47593
3.	Barren land (ha)	63391	1286608	38202
4.	Non-agricultural land (ha)	15823	14635	39585
5.	Cultivable waste land (ha)	33595	42145	61205
6.	Current fallow (ha)	142453	69876	9043
7.	Other fallow (ha)	152002	47673	27730
8.	Net sown area (ha)	1006475	800700	637707
9.	Gross cropped area (ha)	1048596	880258	802913

(Source: District Socio-Economic Review- 2013-14)

3.2.6 Cropping pattern of study area

The study of cropping pattern focuses on the economic condition of the farmers. The nature of cropping pattern shows predominance of food or commercial crops which in turn indicates economic level and economic condition of cultivators in tract. The information regarding area under different crops is given Table 7.

It can be seen from Table 7 that, cereals and pulses are important crops in these districts. The total area under food grains and nonfood grains are 39.07 and 29.66 per cent, respectively.

Table 7. Cropping pattern of selected districts

Sr. No.	Crop	Area in ha		
		Solapur	Nashik	Sangli
1.	Wheat	48400	65897	17686
2.	Jowar (kharif+Rabi)	673222	14193	271849
3.	Other millet	393	3640	17054
	Total cereals	774723	463537	383737
4.	Gram	31908	21031	30836
5.	Tur	13309	5656	9696
6.	Other pulses	5606	3667	4483
7.	Total pulses	70174	78101	91907
	Total food grain	844897	541638	475644
8.	Sugarcane	65704	25255	55270
9.	Chilli	2967	4754	2770
10.	Other spices	1183	1515	1174
	Total spices	4336	6893	3944
11.	Fruits and Vegetables	130762	489610	25752
12.	Cotton	4392	3058	-

(Source : District Socio-Economic Review- 2013-14)

3.2.7 Irrigation

For the agriculture development, in general economic development, it is necessary to increase irrigation facilities. Wells, minor projects and rivers are the main sources of irrigation in district.

The Table 8 shows source wise irrigation in districts.

Table 8 : Sources of irrigation

Sr. No.	Source	Area (ha)		
		Solapur (000)	Nashik (000)	Sangli (000)
1.	Surface irrigated area	68	63	75
2.	Drip irrigation	25	29	20
3.	Sprinkler irrigation	7	8	5

(Source: District Socio-Economic Review- 2013-14)

3.2.8 Infrastructure facilities

Agriculture was moreover of important factor for development in these districts. Grapes, pomegranate, sugarcane etc. were the main commercial crops and responsible for economic development in these districts. Cereals and pulses are taken on commercial basis than subsistence. These districts were well connected with adjoining districts by roads. Railway facilities were also available for transport.

The factors like well developed transport facilities, regulated markets, establishment of co-operatives are distinct features of the selected districts. These together have helped in changing the face of district. All these development, in turn have increased the income of agriculturists. The increased income in the agriculture sector has brought about many changes in socioeconomic aspect of the people in general and agriculturists in particular.

3.3 Research Design

The emphasis in the study was on knowledge and utilization of nutrient management practices by the pomegranate growers. Hence, for conducting the present study an ex-post-facto design of social research was used.

3.4 Sample and sampling technique

3.4.1 Selection of tahsils

The districts selected for present investigation *viz.*, Solapur, Sangli and Nashik. Solapur district comprise eleven tahsils, while, Nashik and Sangli comprises fifteen and ten tahsils, respectively. Out of these two tahsil having maximum area under pomegranate cultivation from each selected district was considered for the study. Hence, six tahsils were purposively selected for the study. The data pertaining to the taluka wise area under pomegranate cultivation were presented in Table 9.

Table 9. Tahsilwise area under pomegranate cultivation

Sr. No.	Name of tahsil	Area under pomegranate cultivation (ha)
1.	Sangola	12627
2.	Pandharpur	5275
3.	Satana	20429
4.	Malegaon	8424
5.	Atpadi	2496
6.	Jat	3548

(Source: Taluka Agriculture Offices -2014-15)

3.4.2 Selection of villages

Three villages from each tahsil were purposively selected on the basis of maximum area under pomegranate cultivation. In all total eighteen villages were selected for the present investigation. The data pertaining to the village wise area under pomegranate cultivation is presented in Table 10.

Table 10. Village wise area under pomegranate cultivation

Sl. No	Name of tahsil	Name of villages	Area under pomegranate cultivation (ha)
I.	Nashik District		
1.	Satana	Nampur	349
2.		Phuphir	195
3.		Chaugaon	250
1.	Malegaon	Dabli	275
2.		Satmani	413
3.		Khaphurdi	185
II.	Solapur District		
1.	Sangola	Ajnale	859
2.		Chinke	589
3.		Anakdhal	434
1.	Pandharpur	Kasegaon	1800
2.		Umbargaon	845
3.		Bohaki	915
III.	Sangli District		
1.	Atpadi	Atpadi	745
2.		Gawalewadi	148
3.		Bobewadi	190
1.	Jat	Sonyal	310
2.		Jatbamb	178
3.		Daribadchi	250

(Source: Taluka Agriculture Offices -2014-15)

3.4.3 Selection of respondents

The list of the pomegranate growers were obtained from each of the selected villages with the help of village record, membership registered with Pomegranate Growers Association, Zilla Parishad Nashik, Solapur, Sangli and Department of Agriculture. While preparing the list, due care was taken that the pomegranate growers had at least more than five years of experience in pomegranate cultivation. Lastly, by following proportionate random sampling method 45 pomegranate growers from three selected villages were considered from one tahsil. Hence, 270

pomegranate growers were formed the sample for the present investigation from selected six tahsils from three agricultural divisions. The data on the total number of pomegranate growers and selected number of pomegranate growers has been given in Table 11

Table 11. Information on number of pomegranate growers and village wise selection of the respondents

Sl. No.	Name of villages	Total Pomegranate growers	Pomegranate growers selected for study
	Satana		
1.	Nampur	1648	32
2.	Phuphir	340	05
3.	Chaugaon	420	08
	Malegaon		
1.	Dabli	1325	25
2.	Satmani	714	14
3.	Khaphurdi	315	06
	Sangola		
1.	Ajnale	870	17
2.	Chinke	548	10
3.	Anakdhal	939	18
	Pandharpur		
1.	Kasegaon	1325	25
2.	Umbargaon	580	10
3.	Bohaki	635	10
	Atpadi		
1.	Atpadi	1580	31
2.	Gawalewadi	310	06
3.	Bobewadi	436	08
	Jat		
1.	Sonyal	734	14
2.	Jatbamb	765	15
3.	Daribadchi	863	17
	Total	14747	270

Thus, a sample of 270 interviewees was ultimately drawn from 14,747 pomegranate growers. Thus, the proportion of selected pomegranate growers to the total was 2.00 per cent.

3.5 Operationalization and measurement of variables

The variables are the characteristics or conditions that can be observed, manipulated or controlled by the researcher. With this understanding the variables included in the present study were selected as per the objectives of the study. The

variables included in the study were selected on the basis of an extensive review of literature, discussion with experts and preliminary study conducted in the area of investigation. Only those variables which were considered to be having some relevance to the investigation were selected.

3.5.1 Independent variables

The phenomenon or characteristics hypothesized to be the input or antecedent variable is called independent variable. It is presumed to cause the dependent variable and is selected, manipulated or measured prior to measuring outcome of dependent variable.

3.5.2 Dependent variables

Dependent variable may be defined as the phenomenon of characteristics hypothesized to be the outcome affect, consequences or output of some input variables. Its occurrence depends on some other variables which had preceded in time. The list of variables studied along with the instruments used for measuring them are given below.

The independent and dependent variables considered for the study are as follows.

Sl. No.	A. Independent variables	Empirical measurement
I	Personal and Social Variables	
1.	Age	Chronological age of the respondents completed in years at the time of data collection.
2.	Education	Number of years of formal education successfully completed by the respondents.
3.	Size of family	Number of individuals in the farm family.
4.	Farming experience in Pomegranate Cultivation	It refers to the number of years actually spent in Pomegranate Cultivation by the respondents.
5.	Socio-economic status	SES scale developed by Thakare (2004) was used with little modifications.
6.	Social participation	Scale developed by Nirban (2004).
II	Situational variables	
7.	Irrigation status	It refers to the situation of the respondents with regards to availability of water lifting devices, irrigation methods followed and percentage of irrigation potential used.
8.	Cropping pattern	Scale developed by Nirban (2004).
III	Economic variables	
9.	Land holding.	Number of hectares land owned by the respondents
10.	Area under pomegranate cultivation	Total area under pomegranate in ha.

Contd.....

Sl. No.	A. Independent variables	Empirical measurement
11.	Annual Income	Total annual income earned through all sources by the respondents family during the operational year.
IV	Psychological variables	
12.	Risk preference	Scale developed by Supe (2007)
13.	Attitude	Scale developed by Ajore (1989)
14.	Scientific orientation	Scale developed by Supe (2007)
V	Communication variables	
15.	Information source Use	Scale developed by Bhairamkar (2009) with some modification.
A.	Personal localite	
B.	Personal cosmopolite	
C.	Extension education method	
D.	Electronic media	
E.	Print media	
16.	Cosmopoliteness	
B.	Dependent variables	
1.	Knowledge	Knowledge test was specially developed for the study.
2.	Utilization	Utilization scale was specially developed for the study.

3.6 Scoring techniques and categorization of the variables

It was necessary to describe the pomegranate growers in terms of the personal, social, economical, communication and psychological characteristics, to put each pomegranate grower in one or other category. The techniques used for this purpose are described here under.

3.6.1 Independent variables

I. Personal and social Variables

1. Age

It is referred to the chronological age of the respondents at the time of investigation. The respondents were grouped into three categories based on the census report of GOI (2011).

Sl. No.	Category	Age (years)
1.	Young	Below 35 years
2.	Middle	36 to 55 years
3.	Old	56 years and above

2. Education

Education is defined as the number of years of formal education successfully completed by the pomegranate cultivator. According to the educational standard, the pomegranate growers were classified into six categories.

Sl. No.	Category	Formal educational (Standards)
1.	Illiterate	Having no formal education
2.	Primary	1 st to 4 th standard
3.	Secondary	5 th to 7 th
4.	Higher Secondary	8 th to 12 th standard
5.	Graduate	13 to 15 th standard (Bachelor Degree)
6.	Post graduate	16 th standard and above (Post Graduate)

3. Size of Family

It was defined as the number of member living together in a family under common roof with blood relations and sharing common food. The respondents were grouped into three categories of family size on the basis of range as follows,

Sl. No.	Category	Family size (members)
1.	Small	Up to 4
2.	Medium	5 to 9
3.	Large	10 and above

4. Farming Experience in Pomegranate cultivation

It refers to the number of years actually spent in Pomegranate cultivation by the respondents. All the respondents were classified into four categories on the basis of range.

Sl. No.	Category	Farming experience (years)
1.	Low	Up to 10 years
2.	Medium	11 to 15 years
3.	Moderate	1 to 20 years
4.	High	21 years and above

Minimum experience (yrs) =05, Maximum experience (yrs) = 24, Class interval = 5

5. Socio economic status

Socio-economic status is defined as the pomegranate growers position in village with reference to socio-economic status (SES) obtained by them on the basis of prevailing average standards of education, income, material possession, occupation, land holding, farm power implements and equipments and social participation. The scale developed by Thakare (2004) was used to measure socio-economic status of pomegranate growers. The maximum obtainable weighted SES score is 15.78 and the minimum weighted SES score is 3.05. The categorization according to SES score on the basis of minimum and maximum obtainable score has been done in five categories, keeping an equal interval.

Sl. No.	Category	Score
1.	Very low	Up to 05.59
2.	Low	05.60 to 08.14
3.	Medium	08.15 to 10.69
4.	High	10.70 to 13.24
5.	Very high	13.25 and above

6. Social Participation

It refers to the degree of involvement of pomegranate growers in formal and informal organizations, simply as a member or an office bearer.

This variable was quantified by using the scale developed by Nirban (2004) with slight modifications. A score of one was assigned to a respondent when he/she were a member of an organization and two score is assigned to a respondent who was office bearer of an organization. Further an additional score of two, one and zero was assigned for regular, occasional and no attendance to meetings, respectively.

Thus, the cumulative score was obtained for each respondent. Finally, they were categorized into three groups on the basis of range.

Sl. No.	Category	Score
1.	Low	Up to 6
2.	Medium	7 to 12
3.	High	13 and above

Minimum score = 0, Maximum score =17, Class interval =5.67

II. Situational Variables

1. Irrigation Status

It refers to the situation of the respondents with regards to availability of water lifting devices, irrigation methods followed and percentage of irrigation potential used. This variable was measured with the help of procedure followed by Nirban (2004). Accordingly, one score was given for each horse power of the electric motor/diesel pump etc. For irrigation methods, one score was assigned for surface irrigation, two score for sprinkler irrigation and three score was allotted for drip irrigation.

The sum total of all the three components indicated the irrigation status of the respondents. The irrigation status of the respondents grouped into five categories on the basis of range.

Sl. No.	Category	Irrigation status
1.	Very low	Up to 15
2.	Low	16 to 30
3.	Medium	31 to 45
4.	High	46 to 60
5.	Very high	61 and above

Minimum Score= 15 Maximum Score = 75 Class interval= 12

2. Cropping pattern

It refers to the yearly sequence and spatial arrangements of crops and fallow on a given area by the pomegranate growers. In other words, it denotes the crops grown by the respondent in *kharif*, *rabi* and summer season, as well as, annual and perennial crops on his/her land. This variable was measured with the help of procedure followed by Nirban (2004). One score was given for growing the crops in each of the three seasons, while four score was given for annual crops grown and five score was assigned for perennial crops grown by the respondent. The respondents were grouped into following three categories on the basis of range.

Sl. No.	Category	Cropping pattern (score)
1.	Poor	Up to 4
2.	Fair	5 to 9
3.	Good	10 and above

Minimum Score= 01 Maximum Score = 12 Class interval = 4

III. Economic Variables

1. Land holding

It refers to the number of hectares of land owned by pomegranate growers. The number of acres of land owned and cultivated by each respondent family was considered in hectares in determination of their size of land holding. Depending upon the farm size, the respondents were grouped into five categories using the criteria adopted by Ministry of Rural Development, GOI Circular No. 280-12/16/19-RD-III (Vol.II) dtd. 15th November, 1991.

Sl. No.	Category	Land (ha)
1.	Marginal farmers	Up to 1.00
2.	Small farmers	1.01 to 2.00
3.	Semi- Medium farmers	2.01 to 4.00
4.	Medium farmers	4.01 to 10
5.	Big farmers	10.01 and above

2. Area under pomegranate cultivation

The area under pomegranate was studied with view to understand the position of pomegranate growers in respect of intensity of the crop he had grown. It refers to the actual area in hectares of land holding, put under pomegranate crop by the pomegranate cultivator. The pomegranate growers were classified into five categories according to area under pomegranate cultivation. This was indicative of the status of the pomegranate grower in respect of his capacity to manage the pomegranate garden.

Sl. No.	Category	Area (ha)
1.	Marginal farmers	Up to 1.00
2.	Small farmers	1.01 to 2.00
3.	Semi- Medium farmers	2.01 to 4.00
4.	Medium farmers	4.01 to 10
5.	Big farmers	10.01 and above

3. Annual income

It refers to the total gross income of the pomegranate growers and his family in rupees received from all sources in a year. It was measured in rupees. The pomegranate growers were classified into four categories of annual income.

Sl. No.	Categories
1.	Below 5,13,000/-
2.	5,13,001/- to 8,91,000/-
3.	8,91,001/- to 12,69,000/-
4.	12,69,001/- to 16,47,000/-
5.	16,47,000 /-and above

IV. Psychological Variables

1. Risk preference

It is the degree to which a pomegranate grower is oriented towards risk and uncertainty and has courage to face the problems in farming. This variable was measured with the help of procedure followed by Supe (2007). The scale consist of six items. Of these six statements first four statements are positive and two (5 and 6 no.) statements are negative. The responses are to be recorded on five point continuum ranging from strongly agree to strongly disagree.

The five score was given for strongly agree, four for agree, three for undecided, two for disagree and one for strongly disagree for first four positive statements. The one score was given for strongly agree, two for agree, three for undecided, four for disagree and five for strongly disagree for last two negative statements for taking risk in pomegranate cultivation crops by respondent. By considering risk preference score the respondents were grouped into following three categories on the basis of range.

Sl. No.	Category	Risk preference (score)
1.	Low	Up to 20
2.	Medium	21 to 23
3.	High	24 and above

Minimum Score= 16 Maximum Score = 24 Class interval= 3

2. Attitude

Attitude is a psychological characteristic on the part of the individual that indicate mental inclination towards the subject at hand. In the present study, it was operationalized as the degree of positive or negative reaction of pomegranate growers mind towards the nutrient management practices. This variable was quantified by using the procedure followed by Ajore (1989) with slight modifications.

The content of attitude scale was composed of 12 statements, called items and the respondents were asked to react spontaneously to each item in the scale. Their responses, in the form of reactions were rated on five quantum *viz.*, strongly agree, agree, undecided, disagree and strongly disagree with the score of 5, 4, 3, 2 and 1, respectively for the positive statements and the score of 1, 2, 3, 4 and 5, respectively for the negative statements. The attitude score on this scale ranged between 12 to 60. Further, the respondents were groped in to three categories on the basis of range.

Sl. No.	Category	Attitude (score)
1.	Less favourable	Up to 28
2.	Moderately Favourable	29 to 44
3.	Highly favourable	45 and above

Minimum Score = 12

Maximum Score = 60

Class interval = 16

3. Scientific orientation

It refers to the degree to which pomegranate growers is oriented towards scientific processes. The scale developed by Supe (2007) was used to measure scientific orientation of pomegranate growers. The scale consisted of six statements, of which first five statements were positive and number six was negative. The responses were recorded on five point continuum ranging from strongly agree to strongly disagree. The positive statements were assigned the score 5, 4, 3, 2 and 1 for response categories *viz.*, strongly agree, agree, undecided, disagree and strongly disagree, respectively. Reverse scoring was given for negative statements. Scores of all the six statements of the scale were summed up and this sum total indicated the scientific orientation score for that respondent pomegranate grower. Maximum and minimum scores obtained by respondents on the scale were 30 and 06, respectively. Based on the total score, the respondents were categorized into three groups by using range as measure of check.

Sl. No.	Category	Scientific orientation (score)
1.	Low	Up to 14
2.	Medium	15 to 22
3.	High	23 and above

Minimum Score = 6 Maximum Score = 30 Class interval = 8

V. Communicational (Information source use) Variables

1. Information source use

It referred to the frequency of exposure of the respondents to different information sources for obtaining the agricultural information. The extent of use of information sources was measured by taking into consideration all the possible sources available to the respondent like personnel localite, personnel cosmopolite, extension education methods, electronic and print media. Each respondent was asked to indicate as to how frequency he/she got information about pomegranate nutrient management practices from each of the listed sources. The scoring procedure used was 3 for regular, 2 for occasional and 1 for never consulting the source. The sum total of score on all the components *viz.* personnel localite, personnel cosmopolite, extension education methods, electronic and print media indicated the information sources use score of the respondents. The respondents were categorized into three categories by considering the minimum and maximum scores. This variable was measured using the procedure followed by Bhairamkar (2009) with slight modifications.

Sl. No.	Category	Information sources use (score)
1.	Low	Up to 57
2.	Medium	58 to 103
3.	High	103 and above

Minimum Score=34, Maximum Score = 162, Class interval= 42.66

A. Personal localite

It referred to the frequency of contact or exposure of the respondents to local personnel such as friends, neighbors, relatives, progressive farmers and local leaders for obtaining the informations of nutrient management practices of pomegranate. The

information on the frequency of seeking information from these sources was collected. The scoring procedure used was 3 for regular, 2 for occasional and 1 for never consulting the source. Respondents were categorized into three categories on the basis of range.

Sl. No.	Category	Personal localite sources use (Score)
1.	Low	Up to 12
2.	Medium	13 to 24
3.	High	24 and above

Minimum Score = 12, Maximum Score = 16, Class interval = 3

B. Personal cosmopolite

It referred to the frequency of contact or exposure of the respondents to extension personnel from Agriculture Department, Panchayat Samiti, State Agriculture Universities, Agriculture Research Stations and Krishi Vigyan Kendras for obtaining the informations of nutrient management practices of pomegranate orchard. The information on the frequency of seeking information from these sources was collected. The scoring procedure used was 3 for regular, 2 for occasional and 1 for never consulting the source. Respondents were categorized into three categories on the basis of range.

Sl. No.	Category	Personal cosmopolite sources use (Score)
1.	Low	Up to 22
2.	Medium	23 to 44
3.	High	44 and above

Minimum Score = 0, Maximum Score = 66, Class interval = 22

C. Extension education methods

It referred to the frequency of contact or exposure of the respondents to extension education methods such as, meetings, group discussion, demonstration, trial, field day, field visit, farmers rally, farmers tour, workshop, etc., for obtaining the information of nutrient management practices of pomegranate orchard. The information on the frequency of seeking information from these sources was collected. The scoring procedure used was 3 for regular, 2 for occasional and 1 for never consulting the source. Respondents were categorized into three categories on the basis of range.

Sl. No.	Category	Extension education methods use (Score)
1.	Low	Up to 06
2.	Medium	07 to 12
3.	High	12 and above

Minimum Score = 0, Maximum Score = 18, Class interval = 6

Mass Media

D. Electronic media

It referred to the frequency of contact or exposure of the respondents to electronic media such as radio, television, internet, agricultural films etc. for obtaining the information of nutrient management practices of pomegranate orchard. The information on the frequency of seeking information from these sources was collected. The scoring procedure used was 3 for regular, 2 for occasional and 1 for never consulting the source. Respondents were categorized into three categories on the basis of range.

Sl. No.	Category	Electronic media use (Score)
1.	Low	Up to 06
2.	Medium	07 to 12
3.	High	12 and above

Minimum Score = 0, Maximum Score = 18, Class interval = 6

E. Print media

It referred to the frequency of contact or exposure of the respondents to print media such as newspapers, extension literature, publications, farm magazines, etc. for obtaining the information of nutrient management practices of pomegranate orchard. The information on the frequency of seeking information from these sources was collected. The scoring procedure used was 3 for regular, 2 for occasional and 1 for never consulting the source. Respondents were categorized into three categories on the basis of range.

Sl. No.	Category	Print media use (Score)
1.	Low	Up to 8
2.	Medium	09 to 16
3.	High	16 and above

Minimum Score = 0, Maximum Score = 24, Class interval = 8

2. Cosmopolitaness

It refers to the contacts established by the pomegranate growers with the outside world. The scale developed by Nandapurkar (1981) was used to measure cosmopolitaness of pomegranate growers. The scale consisted of five items. The responses were to be recorded on two point continuum namely yes to no and the score of 1 and 0 is given, respectively.

Scores of all the five items of the scale were summed up and this sum total indicated the cosmopolitaness score for that respondent pomegranate grower. Maximum and minimum obtained score by respondents on the scale were 5 and 2, respectively. Based on the total score, the respondents were categorized into three groups by using range as measure of check.

Sl. No.	Category	Cosmopolitaness (Score)
1.	Low	Up to 02
2.	Medium	03 to 04
3.	High	05 and above

Minimum Score = 0, Maximum Score = 5, Class interval = 2

3.6.2 Dependent variables

3.6.2.1 Knowledge of pomegranate growers about nutrient management practices

English and English (1961) defined knowledge as a body of information possessed by an individual. Rogers (1983) has classified knowledge into three types that is 'awareness knowledge', 'how to do knowledge' and 'principle knowledge'. In the present study, knowledge refers to awareness knowledge. The concept of knowledge was operationalized for the present investigation, as it refers to the technical know how possessed by an individual pomegranate grower about various nutrient management practices for integrated nutrient management. Knowledge of pomegranate growers was likely to affect the nature and extent of adoption. It was, therefore thought crucial to identify the knowledge level of pomegranate growers towards various nutrient management practices for integrated nutrient management. There was no any test available to measure the knowledge level of pomegranate growers about various nutrient

management practices. It is certain that the numbers of social scientists are interested in investigation of this aspect of knowledge of pomegranate growers towards various nutrient management practices for integrated nutrient management. Keeping this in view, it was felt that a standardized and objective test is developed to measure the knowledge level of pomegranate growers which may be useful to the researchers, scientists and extension personnel's working in this field.

3.6.2.1.1 Procedure for development of knowledge test

The standard procedures followed by Jha and Singh (1970), Trivedi and Patel (1995), Reddy and Rao (2002) and Khan *et al.* (2006) were referred for developing and standardizing the knowledge test for the study.

The following steps were followed for construction of knowledge test.

1. Item collection
2. Framing of items
3. Item analysis
4. Reliability of the test
5. Validity of the test
6. Administration of the knowledge test

1. Item collection

The content of the test consisted of questions called items. The important factor considered in collecting items for knowledge test was to determine and classify the object to be measured by it. Items about nutrient management practices of pomegranate were collected from the pertinent literature, personal experience; discussions held with the university experts, National Research Center for Pomegranate experts, progressive farmers and pilot study conducted in the area of investigation. In all there were 168 items covering all the knowledge aspects of practice wise and nutrient management practices in pomegranate. The items were edited and drafted in such a way that each item highlighted only one idea and did not have any ambiguity. All the items were having logical sequence. As a consequence, 161 items were retained.

2. Framing of items

These 161 items were sent to the 108 experts. The experts were requested to check each item carefully whether the items were really measuring the knowledge of

the respondents about nutrient management practices in pomegranate or not. They had, of course, liberty to add /delete or modify any of the items. After considering the opinion of the experts, items were retained in the knowledge test. The frequencies of the judges' rating were listed for each statement under most important, important and least important with weightage of 2, 1 and 0, respectively. In all items having mean score value equal to or higher than the overall mean score were selected for item analysis

Mean Score = $\frac{\text{Total score of that item}}{\text{Total number of judges}}$

Overall mean score = $\frac{\text{Total score of all statements for all the judges}}{\text{Total number of statement} \times \text{Total number of judges}}$

3. Item analysis

The item analysis was done on the lines of technique used by Jha and Singh (1970) which yielded three kinds of information *viz.*, index of item difficulty, index of item discrimination and index of item validity. The index of item difficulty indicated the extent to which an item was difficult to understand while the index of item discrimination was to find out whether an item really discriminated a well informed farmer from a poorly informed one. The index of item validity provided the information on how well an item measured or discriminated in agreement with rest of the test.

The items were administered to forty eight identical respondents who were not included in sample but they were included in pre-testing. Each statement was having two response categories either correct or wrong. Each correct answer was given '1' score while wrong answer was awarded '0' mark. Thus total score secured by all individual respondents on items for correct answers was the knowledge score. After computing the total score obtained by each of the respondents on 87 items, they were arranged separately from highest to the lowest in magnitude. The scores obtained by forty eight identical respondents were arranged in descending order and divided into six groups i.e. eight respondents in each group. The groups were named as G1, G2, G3, G4, G5 and G6. For the purpose of item analysis, the middle two groups G3 and G4 were eliminated keeping four extreme groups with high and low scores. The data pertaining to the correct

response for all the items in respect of these four groups were tabulated for calculating the difficulty discrimination indices and biserial correlation.

i. Item difficulty index

The index of item difficulty indicates the extent to which an item is difficult to answer. The item should not be so easy that all the respondents can pass it, nor should be so difficult that none can pass it. The item with difficulty values ranging from 30 to 89 per cent only were considered for final selection in the knowledge test.

$$P = \frac{\text{Number of respondents answering correctly}}{\text{Total number of respondents}} \times 100$$

ii. Item discrimination index (E 1/3)

The function of item discrimination index is to find out whether really an item discriminates a well informed respondent from the poorly informed respondent. In the present study, the items with E1/3 values ranging from **0.20 to 0.90** were considered for the final selection in the knowledge test.

$$E1/3 = \frac{(S1 + S2) - (S5 + S6)}{N/3}$$

Where, S1, S2, S5 and S6 were the frequencies of correct answers in group G1, G2, G5 and G6 respectively.

N = Here the total number of respondents in the sample of item analysis was 48.

ii. Biserial correlation

It is used for the test item validation when the criterion of validity is regarded as internal consistency that is the relationship of total score to a correct / incorrect response to any given item. Keeping this view, with the help of formula used by Guliford (1965), the significance of the biserial correlation for each of the items was calculated and tested by using the formula given by Guliford (1965).

$$\text{Biserial correlation (rbis)} = \frac{M_p - M_q}{S_d} \times \frac{pq}{y}$$

Where,

M_p = Mean of x values for higher group in dichotomized variable

M_q = Mean of x values for lower group in dichotomized variable

p = Proportion of cases in higher group

q = Proportion of cases in lower group

y = Ordinate of the unit normal distribution curve with surface equal to 1.0 at the point of division between segments containing p and q proportion of the cases.

iv. Test of significance of r_{bis}

The coefficient of biserial correlation was tested for their significance by using the following formula as given by Guliford (1965).

$$t = \frac{r_{bis}}{pq} \sqrt{\frac{y - r_{bis}^2}{N}}$$

Where,

r_{bis} = Biserial correlation

pq

$y - r_{bis}^2$ = Standard error of Biserial correlation

N = Total number of respondents

The item difficulty index, discrimination indices and biserial correlation of all the eighty three items were calculated by the procedure mentioned earlier.

Finally, one hundred and seven items which satisfied the above criteria were selected for knowledge test from one hundred and thirty eight.

4. Reliability of the test

The scale is reliable when it consistently produces the similar results when applied to the sample. In the present study, the commonly used method is test-retest method of measuring reliability was employed to answer the question what is the self correlation of this test

4.1 Test retests method:

The knowledge test with items as developed was administered to the 30 pomegranate growers who were neither previously interviewed nor had chance to come

in the final sample. After period of 15 days the same 30 pomegranate growers were given the test. Two sets of knowledge score were thus obtained. A very highly significant $r = 0.80$ correlation was found between the two sets of scores which indicated quite commendable degree of reliability in relation to stability of the knowledge test.

5. Validity of the test

Validity of a test is the property which ensures that the obtained test score measures the variable what it is supposed to measure.

- a. **Content validity** : It means the extent to which the items included in the test represent the total universe of the content. It was ensured while framing the items, which, were collected from the available books, journals, relevant literature and through interviews with scientists, experts and progressive farmers. This process acted as a measure of check. Thus, the validity of the knowledge test was built-in the every process of scale construction.
- b. **Construct validity** : The biserial correlation (rbis) was considered as a measure of test items validity. A highly significant biserial correlation coefficient (rbis) value proves the construct validity of the items included in knowledge test battery.

Table 12. Nutrient management practices considered under each major head for measuring the knowledge level of Pomegranate growers

Sl. No.	Major heads	Number of practices
1.	Soil Selection	04
2.	Water management	07
3.	Land preparation	06
4.	Selection of planting material	04
5.	Bahar management	13
6.	Integrated Management (INM)	05
7.	Organic manure	13
8.	Green manuring	05
9.	Biofertilizer	05
10.	Chemical fertilizer	11
11.	Fertigation	09
12.	Micronutrients	25
	Total	107

6. Administration of the knowledge test

The knowledge test was administered to pomegranate grower and their responses were elicited on 3 point continuum as complete knowledge, partial knowledge and no knowledge with regards to each of the 107 items/questions included in knowledge test. A numerical score of 3, 2, 1 was assigned to complete knowledge, partial knowledge and no knowledge responses given by the respondents, respectively. The sum of score to all the items of knowledge test was computed indicating the total knowledge score of the respondent.

Thus, the knowledge score was computed for individual respondent. Further, they were grouped into three categories by using range as measure of check.

Sl. No.	Category	Knowledge level (Score)
1.	Low	(Up to 178)
2.	Medium	(179 to 250)
3.	High	(251 and above)
	Maximum Score	321
	Minimum Sore	107
	Class interval	71

The knowledge test was developed for ascertaining the knowledge level of respondents. The number of practices identified and considered for assessing the knowledge level of respondents under twelve heads are shown in Table 12

3.6.2.2 Measurement of Utilization of nutrient management practices

In this study, the term utilization of nutrient management practices was operationalized as the behavior of the pomegranate growers with regards to continuous use of nutrient management practices with respect to type of different fertilizers, users category, per plant per year use, timeliness in application and methods of application by the pomegranate growers as per recommended by the MPKV, Rahuri about integrated nutrient management practices of pomegranate.

Based on the review of literature and in consultation with pomegranate experts from MPKV, Rahuri, National Research Centre for Pomegranate, Solapur, progressive farmers and some professional consultants on pomegranate, totally twelve

factors had been considered for the study. For ascertaining the extent of utilization of respondents, a list of 98 nutrient management practices was prepared as in case of knowledge level. The theoretical aspects related to integrated nutrient management practices was excluded. The number of practices identified and considered for measuring the extent of utilization is furnished in the Table 13(a) and 13 (b).

3.6.2.2.1 Construction of scale for measuring the extent of utilization of nutrient management practices by the Pomegranate growers

A scale was specially developed to measure the extent of utilization of nutrient management practices by the Pomegranate growers. The following steps were followed for construction of the scale.

1. Identification of parameters

After reviewing the literature and discussion with the experts in the field of Horticulture, Soil Science and Extension Education, parameters and sub-components were identified for developing the scale.

2. Framing and scoring of the parameters

The major parameters and their sub-components were arranged on a three point continuum *viz.*, most relevant, relevant and not relevant to test their relevance through judges. Besides this, weightages were proposed to these parameters and sub-components. The weightages were given for overall uses of different organic manures/ fertilizers was thirty, for green manures five, for bio-fertilizers ten, chemical fertilizers forty and micro-nutrients five. As per users categories is concerned, mainly for users of organic manure four score was assigned, for users of green manures three, for users of bio-fertilizers two, for users of chemical fertilizers five, for users of micro-nutrients one score was assigned. In this way, according to overall uses of combination of fertilizers, scoring was given. For per plant per year application, timeliness in application and methods of application of respondents according to less or more than recommendation one score was assigned, as per recommendation two score, as per report of soil testing/ plant, leaf, tissue test or as per recommendation but with modifications according to weather/ soil/ plant conditions three score was assigned and for no utilization zero score was assigned.

3. Relevancy analysis

It was quite possible that all the 5 parameters and 60 sub-components identified for the purpose may not be equally relevant to measure the extent of utilization of nutrient management practices. Therefore, they were tested for relevancy. A schedule, including these 5 parameters and 60 sub-components were mailed to a panel of 110 experts in the field of agricultural extension of National Agricultural Research System (NARS) such as ICAR Research Institutes, State Agricultural Universities, Agricultural Colleges, Krishi Vigyan Kendras and experts in Horticulture, Soil Science and Extension Education. They were requested to critically evaluate the relevancy of each parameters / sub-components against three point continuum *viz.*, most relevant, relevant and not relevant by marking (○) in the appropriate column.

The experts were also requested to indicate their degree of agreement to the proposed scores for parameters and sub-components by marking (√) in the appropriate column. The experts were also asked to add/modify/delete the 5 parameters and 60 sub-components, assign the new scores as per the importance and relevance (Appendix I).

Out of 110 experts, 86 experts (77.27 %) responded in time. The relevancy score for each statement was worked out by adding the score on the rating scale for all experts. From the data gathered, relevancy weightage, relevancy percentage and mean relevancy score were worked out for the entire 5 major parameters and 60 sub-components by using following formulae.

a. Relevancy weightage

Relevancy weightage was obtained by summing up the score of most relevant, relevant and not relevant response for each parameter and sub-component which was divided by maximum possible score for it.

$$\text{Relevancy Weightage} = \frac{\text{Most Relevant Responses} \times 2 + \text{Relevant Responses} \times 1 + \text{Not Relevant Responses} \times 0}{120 \text{ (Maximum Possible Score : } 2 \times 60 = 120)}$$

a. Relevancy percentage

Relevancy percentage was worked out by using the following formula.

$$\text{Relevancy percentage} = \frac{\text{Most Relevant Responses X 2} + \text{Relevant responses X 1} + \text{Not Relevant Responses X 0}}{120 \text{ (Maximum Possible Score :2 x 60 =120)}}$$

b. Mean relevancy score

Mean relevancy score was obtained by summing up the score of most relevant, relevant and not relevant responses and dividing it by number of judges.

$$\text{Most Relevancy Score} = \frac{\text{Most Relevant Responses X 2} + \text{Relevant responses X 1} + \text{Not Relevant Responses X 0}}{\text{Number of judges (86)}}$$

Accordingly, 5 parameters and 60 sub-components having relevancy percentage more than 66, relevancy weightage more than 0.66 and mean score of 1.31 and more were considered for final scale. By this process, 5 parameters and 56 sub-components were identified, suitably modified and recorded as per the comments of experts, wherever applicable (Appendix II).

4. Reliability of the scale

Reliability is the ability of a scale or instrument to give consistently similar score on repeated measurement. In short, reliability refers to the precision or accuracy of the measurement or score (Kerlinger, 1964). A well defined scientific instrument should yield accurate results, both at present, as well as, over time. The consistency of scores obtained upon testing and retesting after a lapse of time is referred to as the temporal stability of a scale, whereas, consistency of scores obtained from two equivalent sets of items of scale after a single administration is referred as internal consistency of the scale. The most appropriate techniques for estimating the reliability coefficient of a scale are test-retest and split-half methods. Therefore, to test the reliability test –retest method was used for the present scale.

Test-retest method

The scale was administrated on 30 farmers in the non-sample area and their responses were obtained. The second administration took place 30 days after first

administration. This yielded two sets of score was computed. The r value of 0.7811 was found to be significant, thereby indicating the evidence of reliability.

5. Validity of the scale

According to Lindquist (1951) validity of scale is the accuracy with which it measures that what is intended to measure. Kerlinger (1964) defined content validity as the representativeness or sampling adequacy of the content validity as the of the measuring instrument. In this study, content validity of the scale was established in two stages. Firstly, parameter and sub-component selected for inclusion in the scale were based on extensive review of literatures and discussion with the experts in the field of Horticulture, Soil Science and Extension Education. Secondly, the rating and weightage were ascertained from these experts. It was noticed that the selected items represented the universe of the contents. Thus, the scale developed for measuring the extent of utilization of nutrient management practices was found to possess adequate content validity. The scale is given in Appendix-III.

Table 13a. Aspect wise the extent of utilization of Nutrient management practices by the Pomegranate growers.

Sl. No.	Major aspects	Number of Items
1.	Types of fertilizers	20
2.	Users categories	25
3.	Per hectare Per plant use	04
4.	Timeliness in application	03
5.	Method of application	03
Total		56

Table 13b. Components wise nutrient management practices considered under each major head for measuring the extent of utilization by Pomegranate growers

Sl. No.	Major heads	No. of practices
1.	Organic manure	11
2.	Green manuring	04
3.	Biofertilizer	02
4	a. Chemical fertilizer	08
	b. Fertigation	05
5.	Micronutrients	06
Total		36

6. Administration of the scale

The final scale having 5 parameters and 56 sub-components and 36 recommended practices was administered on the respondent farmers under investigation. The responses of the respondents about utilization of nutrient management practices were collected. The scoring pattern followed for utilization of each practices was as follows.

Sl. No.	Utilization Level	Assigned Score
1.	Non- Utilization (No)	0
2.	Not as per recommendation (More than recommended / Less than recommended)	1
3.	As per recommendation	2
4.	As per recommendation with modification as per soil and plant leaf, tissue test report or weather conditions.	3

The utilization of practice as per recommendation was assigned with two score, less or more than recommendation was assigned with one score, as per recommendation with modification as per soil and plant test report was assigned three score and no utilization was assigned with zero score. Thus, the total utilization score for each respondent was worked out. On the basis of this score, the overall respondents were grouped in to three categories, considering range as the measures of check.

Sl. No.	Category	Extent of utilization (Score)
1.	Low	Up to 118
2.	Medium	119 to 211
3.	High	212 and above
	Maximum Score	304
	Minimum Sore	25
	Class interval	93

3.7 Constraints faced by the pomegranate growers

The term constraints was referred to as the barriers or problems faced by the pomegranate growers in utilization of nutrient management practices. Open end question technique was used to ascertain the constraints faced by the pomegranate growers in utilization of nutrient management practices. The data in this regard was analyzed in terms of frequency and percentage.

3.8 Suggestions made by the pomegranate growers

Suggestions were the probable solutions or opinion of the pomegranate growers suggested over the constraints faced while using the nutrient management practices. By using open end question technique suggestions were asked from the pomegranate growers to overcome the constraints in utilization of nutrient management practices. The suggestions were grouped and frequency and percentage.

3.9 Development of an interview schedule

The interview schedule was drafted so as to collect the information in line with the objectives of the study. The schedule was developed in three parts. In the first part, questions related to selected personal, economical, situational, economical and psychological characteristics of the respondents *viz.*, age, education, size of family, farming experience in pomegranate cultivation (years), socio-economic status, social participation, irrigation status, cropping pattern, land holding, area under pomegranate cultivation, annual income, risk preference, attitude, scientific orientation, information sources use and cosmopolitaness were included. The second part of the schedule consisted of the question related to the general information pertaining to the pomegranate crop. In the third part, questions related to knowledge of pomegranate growers about various nutrient management practices and their utilization along with the information on constraints faced by the pomegranate growers while using various nutrient management practices and various suggestions for overcoming these constraints.

3.10 Pre-testing of interview schedule

The interview schedule so developed was pre-tested for its accuracy, simplicity and practicability with group of thirty pomegranate growers in village Somewadi, Tal. Sangola, Dist. Solapur. Considering the experience of pre-testing, related questions were put together to have consistency in response. Number of copies of interview schedule was then got photocopied and used for data collection.

3.11 Tools and techniques of data collection

The methods followed for developing and administering the data collection tool are explained below.

i) Data Collection

The final data were collected with the help of a pre-tested interview schedule incorporating all the items on which information was required. The respondents were contacted in person mostly on their farms or in fields. The importance and objectives of the study were clearly explained to them and they were assured that the information furnished by them would be kept confidential and would be used for the research study only.

ii) Tabulation and analysis of data

The data were analyzed on the basis of specific objectives and hypotheses formulated for the study. In the beginning, the qualitative data were converted in to quantitative form and both qualitative and quantitative data were tabulated in primary tables. These tables were then used for recording responses according to categorized aspects in the study. The data in primary tables were used for categorization of secondary tables and the application of statistical tools. The statistical tools used in the present research study were frequency distribution, percentage distribution, mean, range, correlation coefficient and multiple regressions.

3.12 Statistical methods used

1. Percentage

Percentage was used in descriptive analysis for making simple comparison.

2. Arithmetic Mean

Mean will be calculated by using formula

$$\text{Mean} = \frac{\sum X_i}{N}$$

Where X_i = Score of respondents

N = Number of observations

3. Standard deviation

$$S.D. = \frac{\sqrt{\sum (X_i - \bar{x})^2}}{N}$$

Where X = Score of each respondent

X_i = Score of i^{th} respondent

\bar{x} = Mean

N = Number of respondents

4. Range method (Arbitrary method of categorization)

Generally arbitrary method is used on ad hoc basis and designed largely through researchers own subjective selection for formulation of groups of different variables.

Range is calculated by using formula

$$\text{Range (Category interval)} = \frac{\text{Maximum obtained score} - \text{Minimum obtained score}}{\text{Number of categories}}$$

5. Correlation coefficient

$$r = \frac{\frac{(\sum X)(\sum Y)}{n}}{\sqrt{\left[\frac{\sum X^2}{n} - \frac{(\sum X)^2}{n} \right] \left[\frac{\sum Y^2}{n} - \frac{(\sum Y)^2}{n} \right]}}$$

Where

r = Karl Pearson's coefficient of correlation

X = Score of each respondent

X_i = Score of i^{th} respondent

\bar{x} = Mean

n = Number of respondents

6. Multiple linear regression analysis

Multiple linear regression analysis will be employed to find out the relative contribution of the independent variables towards each of the dependent variable.

$$Y = a + b_1X_1 + b_2X_2 + \dots + b_nX_n$$

Where

Y = Dependent variable

X_1 = Independent variables 1, 2, -----n

b_1 = Partial regression coefficient 1, 2, -----n

a = Constant

n = Total number of independent variables

3.13 Definition of terms and concepts used for the study

Age

Age is the number of completed years at the time of enquiry by pomegranate growers.

Education

Education is defined as the number of years of formal education successfully completed by the pomegranate growers or education is defined as the level of formal education attained by the pomegranate growers.

Size of Family

It was defined as the number of member living together in a family under common roof with blood relations and sharing common food.

Farming experience in Pomegranate cultivation

It refers to the number of years pomegranate growers were actually engaged in pomegranate cultivation.

Socio-economic Status

Socio-economic status is defined as the pomegranate growers position in village with reference to socio-economic status obtained by them on the basis of prevailing average standards of education, income, material possession, occupation, land holding, farm power implements and equipments and social participation.

Social participation

It refers to the degree of involvement of pomegranate growers in formal and informal organizations, simply as a member or an office bearer. It shows the degree to which the respondents were involved in formal organization and member or office bearer and regularity in their attendance to meetings.

Irrigation status

It refers to the situation of the pomegranate growers with regards to availability of water lifting devices, irrigation methods followed and percentage of irrigation potential used.

Cropping pattern

It refers to the yearly sequence and spatial arrangements of crops and fallow on a given area by the pomegranate growers.

Land holding

It refers to the number of hectares of land owned by pomegranate growers.

Area under pomegranate cultivation

It refers to the actual area in hectares of land holding, put under pomegranate crop by the pomegranate growers.

Attitude

In the present study it has been operationalized as the degree of positive or negative relation of pomegranate growers mind towards the nutrient management.

Scientific orientation

It refers to the degree to which pomegranate growers is oriented towards scientific processes.

Information source use

It refers to how pomegranate growers received information from the different sources like local personnel, local cosmopolitaness, electronic media, print media and extension education methods regarding nutrient management practices at a given stage in pomegranate crop.

Cosmo politeness

It refers to the contacts established by the pomegranate growers to the outside world.

Knowledge

It refers to the awareness of the pomegranate growers about recommended cultivation and various integrated nutrient management practices of pomegranate.

Utilization

It refers to continuous use of recommended integrated nutrient management practices with regards to type of fertilizers, users categories, per plant per year use, timeliness in application and methods of application by the pomegranate grower.

Constraints

The term constraints was referred to as the barriers or problems faced by the pomegranate growers in utilization of nutrient management practices in pomegranate crop.

Suggestions

Suggestions are the probable solutions mentioned by the pomegranate growers to overcome the constraints faced during the utilization of integrated nutrient management practice.

4. RESULTS AND DISCUSSION

The information pertaining to this study was collected from the pomegranate growers by means of interview with the help of structured schedules. The data, thus collected were classified, tabulated and then treated with scientific methods to get the results. After tabulation, the results were interpreted to bring out emphatically the most striking relationship between the variables. The facts and findings derived after analyzing the information have been presented under the following heads and discussed in succeeding pages.

- 4.1 Personal and social variables
- 4.2 Situational variables
- 4.3 Economic variables
- 4.4 Psychological variables
- 4.5 Communicational variables
- 4.6 Knowledge of pomegranate growers about various nutrient management practices.
- 4.7 Utilization of pomegranate growers about various nutrient management practices.
- 4.8 Distribution of the pomegranate growers according to use of different combinations of nutrient management practices i.e. users categories.
- 4.9 Relationship of selected independent variables with their knowledge level about various nutrient management practices of pomegranate growers.
- 4.10 Multiple regression analysis of selected independent variables with their knowledge level about various nutrient management practices of pomegranate growers.
- 4.11 Relationship of selected independent variables with their extent of utilization level about various nutrient management practices of pomegranate growers
- 4.12 Multiple regression analysis of selected independent variables with their extent of utilization level about various nutrient management practices of pomegranate growers.
- 4.13 Constraints faced by the pomegranate growers.
- 4.14 Suggestions of pomegranate growers to overcoming the constraints.

4.1 Personal and social variables

The data regarding the personal and social characteristics of the respondent's *viz.*, age, education, size of family, farming experience in Pomegranate, socio-economic status and social participation of pomegranate growers are depicted as follows.

4.1.1 Age

Age is the number of completed years by the respondents at the time of data collection. Age of a person is an important social parameter to assess the knowledge level of that person. Previous researchers found that higher the age of the person lesser is the knowledge level. In the present study, the respondents were grouped into three categories *viz.*, young, middle and old age as shown in the Table 14.

Table 14. Distribution of pomegranate growers according to their age

Sl. No.	Age (years)	Respondents (N= 270)	
		Number	Percentage
1.	Young (Up to 35 years)	47	17.11
2.	Middle (36 to 55 years)	96	35.56
3.	Old (56 and above years)	127	47.43
	Total	270	100.00

Maximum Age = 62

Minimum Age = 25

The results revealed that approximately half of the pomegranate growers (47.00 %) were of 'old' age. 35.56 per cent of the total respondents were 'middle' age followed by 17.11 per cent 'young' age respondents. It is inferred from the table that more number of middle and old aged farmers are engaged in the pomegranate cultivation.

The results of the present study are similar to the trends obtained by Mahajan (2000), Deshmukh *et al.* (1998), Gangurde (2003), Dhakane (2005), Gaikwad (2005), Ghadge (2005) and Sorate (2011).

4.1.2 Education

Education is generally considered and the process of producing desired changes is human behavior such as knowledge, skill and attitude.

An educated individual is more prone to analyze ideas and cause and effect relationship of different phenomena. This also leads to increasing problems solving ability of the individual. Better formal education assists the farmers in improving their ability to know science and technology and utilize this modern technology for his betterment. Education also influences knowledge level and extent of adoption. Keeping this point in view the respondent were grouped in six categories *viz.* Illiterate, primary, secondary, higher secondary and graduation and post graduation as shown in Table 15.

Table 15. Distribution of pomegranate growers according to their education

Sl. No.	Educational Level	Respondents (N= 270)	
		Number	Percentage
1.	Illiterate	08	02.96
2.	Primary	71	26.30
3.	Secondary	54	20.00
4.	Higher Secondary	92	34.07
5.	Graduate	30	11.11
6.	Post graduate	15	5.56
	Total	270	100.00

Highest Education= Post Graduation

Lowest Education = No formal education

The results presented in Table 15 shows that maximum number of respondents (34.07 %) were educated up to 'Higher Secondary ' and Primary level (26.30 %) followed by respondents educated up to the 'secondary' and ' graduate ' level (20.00 and 11.11 %) respectively. There were 05.56 per cent respondents educated up to 'post graduate' level. Respondents having 'Illiterate' level of education were only 02.96 per cent. There were relatively higher educated respondents.

Since the level of education was quite high, use of literature, like leaflet, folder and farm magazines must be beneficial for these respondents. They also develop contact with the government and non-government organization to acquire the latest and

useful technologies suited for their farming business. This understanding of educational level of the respondents is also useful for the extension workers in selection of proper teaching tools and aids in their programmes.

The findings of the study are similar to those of Yogananda (1992), Chaugule (2000), Lakshmisha (2000), Thorat (2003) and Satale (2005).

4.1.3 Size of family

The family size may helpful in utilization of nutrient management in pomegranate. The size of family is defined as the number of member living together in a family under common roof with blood relations and sharing common food at time of data collection.

The distribution of the pomegranate growers according to their size of family were classified into three categories and is presented in Table 16

Table 16. Distribution of pomegranate growers according to their size of family

Sl. No.	Size of Family	Respondents (N= 270)	
		Number	Percentage
1.	Small (Up to 7 members)	74	27.41
2.	Medium (8 to 12 members)	159	58.89
3.	Large (13 and above members)	37	13.70
	Total	270	100.00
	Maximum Score	16	
	Minimum Score	3	
	Class interval	4	

The family size wise distribution of respondents presented in the Table 16 revealed that near three fifth of the respondents (58.89 %) belonged to medium size of family, followed by 27.41 per cent to small size and 13.70 per cent belonged to large family size category.

The findings are in line with the findings of Patil *et al.* (1998) and Dhare (2012).

4.1.4 Farming experience in pomegranate cultivation

The data pertaining to the actual experience of respondents about pomegranate cultivation in round years at the time of data collection was collected.

According to the experience the respondent were grouped in four categories as shown in Table 17.

Table 17. Distribution of pomegranate growers according to the experience in pomegranate cultivation

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1.	Low farming experience (Up to 11 years)	52	19.26
2.	Medium farming experience (12 to 16 years)	145	53.70
3.	Moderate farming experience (17 to 21 years)	52	19.26
4.	High farming experience (22 years and above)	21	7.78
	Total	270	100.00
	Maximum Score	24	
	Minimum Score	06	
	Class interval	5	

From Table 17, it was apparent that most of the respondents (53.70 %) had experience up to 16 years in pomegranate cultivation. It was equally followed by (19.26 %) respondents who had experience up to 11 years and from 17 to 21 years. Only (07.78 %) of the respondents had experience above 22 years in pomegranate cultivation.

The findings are consistent with the observations made by Fulzele *et al.* (2003), Thorat (2003), Dhakane (2005) and Sorate (2011).

4.1.5 Socio-economic status

The socio-economic status refers to the position of and individual occupies with reference to the prevailing average standard of cultural possession participation in the group activities of the community. Several studies in India have revealed the fact that higher social and economic status is linked with knowledge and utilization of various fruit production technology.

In the present investigation an attempt has been made to study the socio economic characteristics of pomegranate growers to determine their socio economic status. As discussed earlier, the socio- economic status scale developed by (Thakare, 2004) was used. After calculating the total score obtained by each respondent they were classified in five category *viz.*, very low, low, medium, high and very high socio economic status as shown in Table 18.

Table 18. Distribution of the respondents according to their socio- economic status

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1.	Very low (Up to 05.59)	22	08.14
2.	Low (05.60 to 08.14)	53	19.65
3.	Medium (08.15 to 10.69)	55	20.37
4.	High (10.70 to 13.24)	67	24.81
5.	Very high (13.25 and above)	73	27.03
	Total	270	100.00
	Maximum Score	15.78	
	Minimum Score	3.05	
	Class interval	2.54	

It is seen from Table 18, that near one third of the pomegranate growers (27.03 %) belonged to ‘very high’ socio-economic status, followed by the respondents (24.81 %) belonging to ‘high’ socio-economic status followed by 20.37 per cent respondents belonged to ‘medium’ socio-economic status followed by near one fifth (19.65 %) belonged to ‘low’ socio-economic status. While, 08.14 per cent of them had ‘very low’ socio-economic status.

It is inferred that majority of the pomegranate grower were having medium and high to very high socio economic status.

The findings of the study are in line with the findings of Raghavendra (1997), Kadam (2006) and Mahajan (2000).

4.1.6 Social participation

It shows the degree to which farmers were involved in formal organization as member or office bearer and regularity in there attendance to meeting. It brings farmers in close contact with other members of social organization which facilitate opportunity of sharing the ideas, information and experiences with others. The distribution of the respondents were categorized in to three category according to their level of social participations is presented in Table 19.

Table 19. Distribution of the respondents according to their levels of social participation

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1.	Low (Up to 6)	171	63.33
2.	Medium (7 to 12)	82	30.37
3.	High (13 and above)	17	06.30
	Total	270	100.00
	Maximum Score	17	
	Minimum Score	0	
	Class interval	5.67	

From Table 19 it is revealed that near two third (63.33 %) respondents had low level of social participation followed by 30.37 per cent had medium level of social participation and few had a high level of social participation (06.30 %).

The findings of the study are similar with the findings of Aitwade (2012) and Singh *et al.*(2014).

4.2 Situational variables

The data about the situational factors of the respondents *viz.*, irrigation status and cropping pattern of the pomegranate respondents are depicted as follows.

4.2.1 Irrigation status

Here, it refers to the situation of the respondents with regards to availability of water lifting devices, irrigation methods followed and percentage of irrigation potential used. The distribution of pomegranate growers were categorized in to five category according to their levels of irrigation status is presented in Table 20.

Table 20. Distribution of pomegranate growers according to their irrigation status

Sl. No.	Irrigation Status	Respondents (N= 270)	
		Number	Percentage
1.	Very low (Up to 27)	75	27.79
2.	Low (28 to 39)	113	41.85
3.	Medium (40 to 51)	68	25.18
4.	High (52 to 63)	12	04.44
5.	Very high (64 and above)	02	00.74
	Total	270	100.00
	Maximum Score	75	
	Minimum Score	15	
	Class interval	12	

From Table 20 it is revealed that 41.85 per cent respondents had low level of irrigation status followed by 27.77 per cent respondents had very low level of irrigation status followed by 25.18 per cent respondents had medium level of irrigation status. The very less per cent 04.44 per cent and 0.74 per cent respondents had high level and very high level irrigation status respectively.

The findings of the study are in line with the findings of Nirban (2004) and Singh *et al.* (2014).

4.2.1.1 Methods of irrigation followed

Here, it refers the situation of the respondents with regards to irrigation methods followed. The distribution of the respondents according to their irrigation methods followed is presented in Table 21.

Table 21. Distribution of pomegranate growers according to a irrigation methods followed

Sl. No.	Irrigation Status	Respondents (N= 270)	
		Number	Percentage
1.	Surface Irrigation	02	00.74
2.	Drip Irrigation	110	40.74
3.	Sprinkler irrigation	33	12.22
4.	Ring method + Drip irrigation	125	46.30
	Total	270	100.00

From Table 21 it was revealed that near to half (46.30 %) respondents had followed ring plus drip irrigation method for irrigating the crops. More than one third 40.74 per cent respondents had followed drip irrigation method for irrigating the crops. Nearly 12.22 per cent respondents had followed sprinkler irrigation method followed by 0.74 per cent respondents had surface irrigation method for irrigating the crops. So there is great need to divert the farmers from sprinkler and surface irrigation to complete drip irrigation method.

4.2.1.2 Percentage of area under irrigation utilization

Here, it refers the per cent of irrigation was used by the pomegranate growers by any methods to save or cultivate their orchard for fruit production. The distribution of the respondents according to their per cent area under irrigation utilization is presented in Table 22.

Table 22. Distribution of pomegranate growers according to per cent of area under irrigation utilization

Sl. No.	Per cent of Irrigation Area	Respondents (N= 270)	
		Number	Percentage
1.	Irrigated area (Up to 20%)	01	00.37
2.	Irrigated area (21 to 40 %)	11	04.07
3.	Irrigated area (41 to 60 %)	58	21.48
4.	Irrigated area (61 to 80 %)	69	25.56
5.	Irrigated area (81 to 100 %)	131	48.52
	Total	270	100.00

From Table 22 it was observed that half (48.52 %) of respondents had utilized 81 to 100 per cent area under irrigation .About one forth respondents (25.56 %) had utilized 61 to 80 per cent area under irrigation. Near one fifth (21.48 %) had utilized 41 to 60 per cent area under irrigation. A very less 04.07 per cent followed by 0.37 per cent utilized 11 and 01 per cent area under irrigation. That means pomegranate growers are maximum tried to save the orchard by giving irrigation to pomegranate plants by any circumstances.

4.2.2 Cropping pattern

It refers to the yearly sequence and spatial arrangements of crops and fallow on a given area by the pomegranate growers. In other words, it denotes the crops grown by the respondent in *kharif*, *rabi* and *summer* season, as well as, annual and perennial crops on his land. The respondents were grouped into following three categories namely 'poor' 'fair' and 'good' on the basis of arbitrary method and distribution of the respondents according to their cropping pattern is presented in Table 23.

From Table 23 it is revealed that about 37.78 per cent respondents had fair cropping pattern followed by 34.07 per cent respondents had good cropping pattern and 28.15 per cent had poor cropping pattern.

Table 23. Distribution of the respondents according to the cropping pattern

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1.	Poor (Up to 5)	76	28.15
2.	Fair (6 to 09)	102	37.78
3.	Good (10 and above)	92	34.07
	Total	270	100.00
	Maximum Score	12	
	Minimum Score	01	
	Class interval	04	

(Figures in parentheses indicate percentages)

The finding of the study are in line with the finding of Nirban (2004), Bite (2009) and Dhere (2012).

4.3 Economic variables

The data regarding the economic characters of the respondents *viz.*, land holding, area under pomegranate cultivation and annual income of pomegranate growers are presented as follows.

4.3.1 Land holding

Land holding is an important factor in relation to adoption new technology. The amount of land owned by a person is an important economic parameter to assess the economic standing of that person in the society. Previous researcher had pointed out that size of land holding as a major factor which influenced the adoption of improved plant protection techniques in the present study land holding refers to the total hectares of land owned by the respondents. The data thus, indicated that a large proportion of respondents were semi medium and medium farmer. The size of land holding determines the economic condition of the respondents. Therefore, while recommending new nutrient management techniques, we have to consider this aspect of the farming community.

According to the size of holding, the pomegranate growers were classified in five categories *viz.*, marginal, small, semi- medium, medium and big farmers as shown in Table 24.

Table 24. Distribution of pomegranate growers according to their land holding

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1.	Marginal (Up to 1.00 ha)	07	02.59
2.	Small (1.01 to 2.00 ha)	19	07.03
3.	Semi-medium (2.01 to 4.00 ha)	128	47.41
4.	Medium (4.01 to 10.00 ha)	83	30.75
5.	Big (10.01 and above)	33	12.22
	Total	270	100.00

Highest land holding = 15.00 ha Lowest land holding = below 1.00 ha.

It was apparent from Table 24, that nearly fifty per cent of the respondents (47.41 %) belonged to the category of ‘semi-medium ’ land holding ranging from 2.01 to 4.00 ha. It was followed by (30.74 %) ‘medium’ land holding possessing land from 4.01 to 10.00 ha and 12.22 per cent respondents belongs to ‘big’ holding category i.e. above 10.00 ha. The very negligible per cent of respondents (07.03 %) had small land holding followed by 02.59 per cent had marginal land holding.

Similar findings have also been reported by Sinha *et al.* (1991), Raghavendra (1997), Gangurde (2003), Thorat (2003) and Karale (2006).

4.3.2 Area under pomegranate cultivation

The previous researchers had pointed out that area under pomegranate was the major factor which influenced the knowledge and utilization level of improved fruit production techniques. In the present study, area under pomegranate refers to the actual area in hectare of the land holding, put under pomegranate fruit crop by the respondents. According to the area under pomegranate the respondent were grouped in five categories *viz.*, marginal, small, semi-medium, medium and big farmers as shown in Table 25.

It was observed from Table 25, that majority of pomegranate growers (60.75 %) belonged to the category of ‘semi-medium’ area under pomegranate cultivation from 2.01 to 4.00 ha. followed by (17.77 %) ‘medium’ category pomegranate cultivation from 4.01 ha. to 10.00 ha. and (15.18 %) respondents belongs to ‘big’ category i.e. 10.01 above ha. The data thus indicated that a large proportion of the respondents were having ‘2.01 to 4.00 hectare’ area under pomegranate. The very negligible (05.18 %)

respondents had 'small' category followed by 01.12 per cent had marginal category. Therefore one should consider this aspect of pomegranate growers before giving information about various nutrient management practices.

Table 25. Distribution of pomegranate growers according to their area under pomegranate cultivation

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1.	Marginal (Up to 1.00 ha)	03	01.12
2.	Small (1.01 to 2.00 ha)	14	05.18
3.	Semi-medium (2.01 to 4.00 ha)	164	60.75
4.	Medium (4.01 to 10.00 ha)	48	17.77
5.	Big (10.01 and above)	41	15.18
	Total	270	100.00

Highest area = 12 ha Lowest area under pomegranate cultivation = 1.00 ha.

The findings of the study are in conformity with the findings of Mane (1998), Mundekar (1993), Kadam (2006) and Singh and Mankar (2007).

4.3.3 Annual income

Income is a major determinant of the economic status of an individual. Every individual style of living is decided to a great extent by this income. His expenditure on farming, allied occupations and how hold matter is decided by the income he earned. Thus, income level of the respondents influences the degree of their prestige in the society and his contact with the outside word.

A low level of annual income hinder acquisition of news skilles and knowledge needed for modern farming. A better financial position enables a farmer to be more enterprising in taking risk in trying out improved fruit production technology. Thus, annual income motivate and influences farmers to utilizes various nutrient management practices in pomegranate. Keeping this point in view the respondent was grouped in to five categories as shown in Table 26.

Table 26. Distribution of pomegranate growers according to their annual income

Sl. No.	Annual income	Respondents (N= 270)	
		Number	Percentage
1.	Up to Rs. 5,13,000/-	17	6.30
2.	5,13,001 to Rs. 8,91,000/-	125	46.30
3.	8,91,001 to Rs. 12,69,000/-	108	40.00
4.	Rs. 12,69,001 to Rs. 16,47,000	11	04.07
5.	Rs.16,47,000 and above	09	03.33
	Total	270	100.00
	Maximum Score	Rs. 20,25,000/-	
	Minimum Score	Rs. 1,35,000/-	
	Class interval	Rs. 3,78,000/-	

Table 26 depicts that near half of of the pomegranate growers (46.30 %) had annual income between Rs. 5,13,001 to Rs. 8,91,000/-. However, 40.00 per cent respondents had income from Rs. 8,91,001 to Rs. 12,69,000/- While, near about equal per cent respondents 06.30 per cent had income above up to Rs. 5,13,000/- followed by 04.07 per cent had annual income Rs. 12,69,001 to Rs. 16,47,000/- and only 03.33 per cent respondents had Rs. 16,47,000 and above.

The findings of the present study are in line with the findings of Chaugule (2000), Katkar (2001), Ramshetwad (2001), Fulzele *et al.* (2003), Mandavkar *et al.* (2004), Thakare (2008) and Sorate (2011).

4.4 Psychological variables

The data regarding psychological characteristics of the respondents *viz.*, risk preference, attitude and scientific orientation of pomegranate farmers are presented as below.

4.4.1 Risk Preference

Risk Preference is the degree to which a pomegranate grower is oriented towards risk and uncertainty and has courage to face the problems in farming. By considering risk preference score the respondents were grouped into following three categories namely low, medium and high on the basis of maximum and minimum score with range as shown in Table 27.

Table 27. Distribution of pomegranate growers according to their risk preference

Sl. No.	Attributes level	Respondents (N= 270)	
		Number	Percentage
1.	Low (Up to 19)	04	01.48
2.	Medium (20 to 22)	193	71.48
3.	High (23 and above)	73	27.04
	Total	270	100.00
	Maximum Score	24	
	Minimum Score	16	
	Class interval	3	

From Table 27 it was observed that majority (71.48 %) of Pomegranate growers had medium level of risk preference followed by nearly one third respondents (27.04 %) had high level of risk preference and very less 01.48 per cent had low level of risk preference. The data thus indicated that large proportions of respondents were having medium risk preference. Therefore, while giving information about nutrient management practices, one has to consider this aspect of the farming community.

The findings of the study are in conformity with the findings of Raghavendra (1997) and Gangurde (2003).

4.4.2 Attitude

In the present study, attitude has been operationalised as the degree of positive or negative relation of respondent mind towards the nutrient management in pomegranate. Attitude in terms of reaction of an individual towards a particular technology is a key determinant for technology utilization. Although the respondents selected under study having pomegranate with utilization of various nutrient management practices, it was thought appropriate to respondents attitude towards nutrient management practices as a whole. The procedure for attitude measurement has been explained in the research methodology chapter. Distribution of the respondents were grouped into following three categories by their attitude towards various nutrient management practices is presented in Table 28.

Table 28. Distribution of pomegranate growers according to their attitude level

Sl. No.	Attitude level	Respondents (N= 270)	
		Number	Percentage
1.	Less favourable (Up to 26)	24	08.89
2.	Moderately favourable (27 to 29)	169	62.59
3.	Highly favourable (30 and above)	77	28.52
	Total	270	100.00
	Maximum Score	30	
	Minimum Score	23	
	Class interval	03	

From Table 28 it is revealed that majority of the respondents (62.59 %) were having moderate favourable attitude towards nutrient management practices followed by one third (28.52 %) were having highly favourable attitude while, very few respondents (08.89 %) were having less favourable attitude towards nutrient management practices.

The respondents favourable attitudes towards new technology is very important which determines the further steps or stages in utilization. This is a good sign that farmers exhibited a favourable attitudes towards use of nutrient management practices and can be taken in to consideration by the decision makers and policy making and extension agencies for effective dissemination and utilization of nutrient management practices.

The findings of the study are in conformity with the findings of Salunkhe (1994) and Dhere (2012).

4.4.3 Scientific orientation

Scientific orientation means readiness to change as changing conditions require, is fostered by these basic notions of process differences. Thus, there is a tendency of pomegranate growers to use the different nutrient management practices on larger area with view to increase production and productivity. On the basis of the scientific orientation score the respondents were grouped into three categories *viz.*, low, medium and high scientific orientation as shown in Table 29.

Table 29. Distribution of pomegranate growers according to their Scientific orientation

Sl. No.	Attributes level	Respondents (N= 270)	
		Number	Percentage
1.	Low (Up to 24)	24	08.89
2.	Medium (26 to 28)	213	78.89
3.	High (29 and above)	33	12.22
	Total	270	100.00
	Maximum Score	30	
	Minimum Score	22	
	Class interval	3	

It is seen from Table 29 that large majority 78.89 per cent of the respondents were in 'medium' scientific orientation category. However, 12.22 per cent and 08.89 per cent had 'high' and 'low' scientific orientation category, respectively.

The findings are in conformity with the findings of Chawkekar (1984) and Reddy (1992).

4.5 Communicational variables

Different sources of information have their own contribution and role in the transfer of information related to various nutrient management practices. In this study, sources of information refers to the frequency of contact or exposure of the respondents to different information sources for obtaining agricultural information. The extent of use of information sources is measured by taking into consideration all the possible sources available to the respondents like personnel localalite, personnel cosmopolite, mass media methods that is electronic and print media and extension education methods used by the pomegranate farmers to get latest information related to agriculture and allied are depicted in Table 30 is as follows.

Table 30. Distribution of the respondents according to their overall use of information sources

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1	Low Level (Up to 76)	43	15.93
2	Medium Level (77 to 118)	150	55.55
3	High Level (119 and above)	77	28.52
	Total	270	100.00
	Maximum Score	162	
	Minimum Score	34	
	Class interval	42.66	

4.5.1 Overall information source use

The utilization of an innovation is viewed as a process and requires some sorts of information at different stages. The farmers who are keeping frequent visit with extent agencies can obtain more knowledge about latest nutrient management practices. The preference and selection of a particular source may vary from person to person. In order to study various extension personnel as source of information used by the pomegranate growers for getting technical advice about various nutrient management practices. In this way, thirty two major information sources were indicated to the respondents and their frequency of contact was worked out. The respondents were grouped in three categories *viz.*, low, medium and high extension personnel contact as shown in Table 30.

It is observed from Table 30, that the majority of the respondents (55.55 %) were having 'medium' level of use of information sources, while 28.52 per cent of the respondents were having 'high' level of use of information sources. Only 15.93 per cent of the respondents were having 'low' level sources of information about pomegranate cultivation with respect to nutrient management practices.

Similar findings have also been reported by Thimmaraju (1989), Chikhale *et al.* (1996), Radhakrishnan *et al.* (1997) and Raghavendra (1997).

4.5.1.1 Personal localite source of information

Here it referred to the frequency of contact or exposure of the respondent to local personnel such as friends, neighbours, relatives, progressive farmers and local leaders for obtaining the information regarding different nutrient management practices for pomegranate. The distribution of the respondents according to their extent of use of personnel localite source of information is given in Table 31. In this way, the respondents were grouped in to three *viz.*, low, medium, high personnel localite source of information.

The data presented in Table 31, shows that the large majority of the pomegranate growers (88.15 %) had 'medium' level of information sources through local personnel, followed by 09.26 per cent with 'higher' level of local personnel contact. The extent of local personnel contact was to be 'low' in case of 02.59 per cent respondents.

Table 31. Distribution of pomegranate growers according to their use of personal localite source of information

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1.	Low (Up to 12)	07	02.59
2.	Medium (13 to 24)	238	88.15
3.	High (24 and above)	25	09.26
	Total	270	100.00
	Maximum Score	16	
	Minimum Score	12	
	Class interval	03	

From this it can be concluded that majority of the respondents had medium to high level of use of personal localite sources of information.

The findings are in conformity with the findings of Chikhale *et al.* (1996), Radhakrishnan *et al.* (1997) and Shirke *et al.* (2002).

Along with these categories of extent of use of personal localite source of information, an attempt has been made to place the respondents to different personal localite source of information e.g. friends, relatives etc. The frequency -wise distribution of respondents according to different personal localite source of information is given in Table 32.

From Table 32 it was observed that neighbours are the major source of information to respondents. Overall it was observed that 52.22 per cent respondents seek information once in a week from neighbours, followed by friends (47.03 %), progressive farmers (31.48 %) and relatives (21.85 %). While, local leaders (09.62 %) followed by agro service centre (10.74 %).

The findings are in line with the findings of Khajuria *et al.* (2003), Kumar (2006), Dhere (2012) and Sharma (2012).

Table 32. Distribution of Pomegranate growers according to their extent of use of Personal localite sources of information (N=270)

Sl. No.	Name of personnel (local) localite	Once in week	Once in fortnight	Once in a month	Once in a season	Once in a year	Never	Overall (N=270)
1	Progressive farmers	85 (31.48)	44 (16.29)	74 (27.40)	05 (1.85)	0 (0.00)	62 (22.96)	270 (100.00)
2	Friends	127 (47.03)	110 (40.74)	5 (1.85)	1 (0.37)	0 (0.00)	27 (10.00)	270 (100.00)
3	Relatives	59 (21.85)	08 (2.96)	135 (50.00)	25 (9.25)	0 (0.00)	43 (15.92)	270 (100.00)
4	Neighbours	141 (52.22)	44 (16.29)	18 (6.66)	0 (0.00)	0 (0.00)	67 (24.81)	270 (100.00)
5	Local leader	26 (9.62)	3 (1.11)	1 (0.37)	1 (0.37)	1 (0.37)	238 (88.14)	270 (100.00)
6	Agro service centre	29 (10.74)	2 (0.74)	84 (31.11)	0 (0.00)	1 (0.37)	154 (57.03)	270 (100.00)

4.5.1.2 Personal cosmopolite source of information

Here it referred to the frequency of contact or exposure of the respondent to extension personnel from Agricultural Department, Panchyat Samiti, Agricultural Universities, Agricultural Research Stations and Krishi Vigyan Kendras for obtaining the information regarding different nutrient management practices for pomegranate. The distribution of the respondents according to their extent of use of personnel cosmopolite source of information is given in Table 33

In this way, the respondents were grouped in to three categories *viz.*, low, medium and high personnel cosmopolite sources as shown in Table 33.

Table 33. Distribution of pomegranate growers according to their use of personal cosmopolite source of information

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1.	Low (Up to 22)	25	09.26
2.	Medium (23 to 44)	118	43.70
3.	High (44 and above)	127	47.04
	Total	270	100.00
	Maximum Score	66	
	Minimum Score	00	
	Class interval	22	

The data presented in Table 33, shows that the nearly half of the pomegranate growers (47.04 %) had 'high' level of information sources used through personnel cosmopolite, followed by 43.70 per cent with 'medium' level of personnel cosmopolite contact. The extent of personnel cosmopolite contact was to be 'low' in case of 09.26 per cent respondents.

From this it can be concluded that majority of the respondents had medium to high level of use of personal cosmopolite sources of information.

The findings are in conformity with the findings of Chikhale *et al.* (1996). The distribution of respondents as per their use of personal cosmopolite source of information respondents e.g. Agricultural Department, Panchyat Samiti, Agricultural Universities, Agricultural Research Stations and Krishi Vigyan Kendras for obtaining the information regarding different nutrient management practices for pomegranate is given in Table 34.

Table 34. Distribution of Pomegranate growers according to their extent of use of personnel cosmopolite sources of information (N=270)

Sl. No.	Name of personnel cosmopolite	Once in week	Once in fortnight	Once in a month	Once in a season	Once in a year	Never	Overall (N=270)
a. Department of Agriculture								
1	Agril. Assistant	51 (18.88)	135 (50.00)	47 (17.40)	4 (1.48)	0 (0.00)	33 (12.22)	270 (100.00)
2	Agril. Supervisor	23 (8.51)	9 (3.33)	41 (15.18)	5 (1.85)	0 (0.00)	192 (71.11)	270 (100.00)
3	Circle Agril. Officer	22 (8.14)	2 (0.74)	59 (21.85)	19 (7.03)	1 (0.37)	167 (61.85)	270 (100.00)
4	Taluka Agril. Officer	4 (1.48)	23 (8.51)	4 (1.48)	22 (8.14)	7 (2.59)	210 (77.77)	270 (100.00)
5	Sub. Div. Agril. Officer	1 (0.37)	1 (0.37)	16 (5.92)	2 (0.74)	8 (2.96)	242 (89.62)	270 (100.00)
6	Dist. Agril. Officer	0 (0.00)	2 (0.74)	16 (5.92)	2 (0.74)	7 (2.59)	245 (90.74)	270 (100.00)
b. Panchayat samiti								
1	Gramsevak	152 (56.29)	81 (30.00)	8 (2.96)	2 (0.74)	0 (0.00)	27 (10.00)	270 (100.00)
2	Agril. extension Officer	1 (0.37)	21 (7.77)	22 (8.14)	5 (1.85)	1 (0.74)	216 (80.00)	270 (100.00)
3	Agril Officer	1 (0.37)	14 (5.18)	7 (2.59)	10 (3.70)	1 (0.37)	227 (84.07)	270 (100.00)
4	Block Dev. Officer	1 (0.37)	0 (0.00)	16 (5.92)	7 (2.59)	0 (0.00)	246 (91.11)	270 (100.00)

Table 34 contd.....

Sl. No.	Name of personnel cosmopolite	Once in week	Once in fortnight	Once in a month	Once in a season	Once in a year	Never	Overall (N=270)
c. Agricultural University/ Research Station								
1	Agril. Assistant	12 (4.44)	2 (4.44)	11 (4.07)	31 (11.48)	6 (2.22)	208 (77.03)	270 (100.00)
2	SMS	0 (0.00)	0 (0.00)	9 (3.33)	25 (9.25)	7 (2.59)	229 (84.81)	270 (100.00)
3	Agril. Scientist	0 (0.00)	0 (0.00)	1 (0.37)	30 (11.11)	10 (3.70)	229 (84.81)	270 (100.00)
d. KVK								
1	Agril. Assistant	17 (6.29)	0 (0.00)	1 (0.37)	5 (1.85)	4 (1.48)	243 (90.00)	270 (100.00)
2	SMS	13 (4.81)	5 (1.85)	1 (0.37)	8 (2.96)	6 (2.22)	237 (87.77)	270 (100.00)
3	Project co-ordinator	26 (9.62)	0 (0.00)	4 (1.48)	6 (2.22)	7 (2.59)	227 (84.07)	270 (100.00)

Overall it was evident from Table 34 that 50.00 per cent respondents obtained information from Agriculture Assistant 'once in a fortnight' followed by Circle Agriculture Officer (21.85 %), Agriculture Supervisor (15.18 %) of Department of Agriculture, contacted by respondents 'once in a month' for getting information. Regarding contact to Panchayat Samittee officer, 56.29 per cent respondents contacted to Gramsevak 'once in a week' for obtaining information. From Agriculture University/ Research Station, Agriculture Assistant (11.48 %), Agril. Scientist (11.11 %) and SMS (09.25 %) respondents obtained information 'once in a season'.

Where about Agriculture Supervisor (71.11 %) followed by Circle Agriculture Officer (61.85 %) followed by Taluka Agriculture Officer (77.77 %) followed by Sub- Divisional Agriculture Officer (89.62 %) followed by District Agriculture Officer (90.74 %) and by KVK scientists (90.00 %) respondents never contacted for getting information.

The findings are in line with the findings of Khajuria *et al.* (2003), Kumar (2006), Dhere (2012) and Sharma (2012).

4.5.1.3 Mass media source of information

Here, it referred to the frequency of contact or exposure of the respondent to mass media such as electronic and print media for obtaining the information regarding different nutrient management practices for pomegranate.

4.5.1.3.1 Electronic media as a source of information

Here, it referred to the frequency of contact or exposure of the respondent to electronic media such as radio, television, internet, agricultural films etc. for obtaining the information regarding different nutrient management practices for pomegranate. The distribution of the respondents according to their extent of use of electronic media is given in Table 35.

In this way, the respondents were grouped in to three categories *viz.*, low, medium and high electronic media sources as shown in Table 35.

Table 35. Distribution of pomegranate growers according to their extent of use of Electronic media source of information

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1.	Low (Up to 6)	00	0.00
2.	Medium (7 to 12)	203	75.19
3.	High (12 and above)	67	24.81
	Total	270	100.00
	Maximum Score	18	
	Minimum Score	00	
	Class interval	06	

The data from Table 35 revealed that about three fourth (75.19 %) respondents has used electronic media as a sources of information to ‘medium’ extent followed by (24.81 %) ‘high’ extent and none of the respondent was in low use category.

The findings are in line with the findings of Dhere (2012).

The distribution of respondents as per their frequencies use of electronic media e.g. radio, television, internet, agricultural films etc. for obtaining the agriculture

information is given in Table 36. Overall, it was observed from Table 36 that a large majority of the respondents (93.70 %) were viewing the television daily for acquiring information. However, 26.66 per cent respondents were listening radio daily for getting information. Large majority of the respondents were not using computer with internet (95.92 %) and Agril. Film CD's or VCD's were not used by 93.33 per cent.

The findings are in line with the findings of Dhere (2012) and Sabi *et al.* (2014).

Table 36. Distribution of Pomegranate growers according to their extent of use of electronic media as sources of information (N=270)

Sl. No.	Name of mass (electronic) media	Always	Once in week	Once in fortnight	Once in a month	Once in a season	Once in a year	Never	Overall (N=270)
1	Television	253 (93.70)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	17 (6.29)	270 (100.00)
2	Radio	72 (26.66)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	198 (73.33)	270 (100.00)
3	Computer + internet	8 (2.59)	1 (0.37)	1 (0.37)	0 (0.00)	1 (0.37)	1 (0.37)	258 (95.55)	270 (100.00)
4	Agril. film (CDs)/ VCD,s	14 (5.18)	1 (0.37)	1 (0.37)	1 (0.37)	0 (0.00)	2 (0.74)	251 (92.96)	270 (100.00)

4.5.1.3.2 Print media as a source of information

Here, it referred to the frequency of contact or exposure of the respondent to print media such as newspapers, extension literature, publications, farm magazines, etc. for obtaining the information regarding different nutrient management practices for pomegranate. The distribution of the respondents according to their extent of use of print media sources is given in Table 37

In this way, the respondents were grouped in to three categories *viz.*, low, medium and high print media sources as shown in Table 37.

Table 37. Distribution of pomegranate growers according to their use of Print media source of information

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1.	Low (Up to 8)	00	0.00
2.	Medium (9 to 16)	112	41.48
3.	High (16 and above)	158	58.52
	Total	270	100.00
	Maximum Score	24	
	Minimum Score	00	
	Class interval	08	

The data from Table 37 revealed that majority (58.52 %) respondents had used print media as a source of information to high extent, followed by medium extent (41.48 %) and none of respondent were in low use category.

The findings are in line with the findings of Samrit *et al.* (1991), Rehman (2011) and Dhere (2012).

The distribution of respondents as per their use of different print media e.g. newspapers, magazines, etc. for obtaining the agriculture information is given in Table 38.

The data revealed that near to half of (42.22 %) respondents were reading *Agrowon* news paper daily followed by 18.51 per cent used extension publication 'sometimes' and 10.37 per cent used Agricultural magazine 'sometimes' as a source of information. Majority respondents (94.44 %) were not reading the university publication '*Shri Sugi*' and '*Krishidarshani*' (73.70 %).

The findings are in line with the findings of Deshmukh *et al.* (1997).

Table 38. Distribution of Pomegranate growers according to their extent of use of print media as sources of information (N=270)

Sl. No.	Name of personnel cosmopolite	Daily	Frequently	Sometimes	Rarely	Never	Overall (N=270)
1	Newspaper (Agrowon)	114 (42.22)	59 (21.85)	48 (17.77)	10 (3.70)	39 (14.14)	270 (100.00)
2	Folders/Leaflets	0 (0.00)	4 (1.48)	50 (18.51)	3 (1.11)	213 (78.88)	270 (100.00)
3	Agril. Magazines	18 (6.66)	27 (10.00)	28 (10.37)	5 (1.85)	192 (71.11)	270 (100.00)
4	Shrisugi	1 (0.37)	0 (0.00)	7 (2.59)	7 (2.59)	255 (94.44)	270 (100.00)
5.	Krishi Darshani	35 (12.96)	25 (9.25)	2 (0.74)	9 (3.33)	199 (73.70)	270 (100.00)

4.5.1.4 Extension Education method as a source of information

There were six major extension education methods were indicated to the respondents and their frequency of contact was worked out. The respondents were grouped in three categories viz., low, medium and high extension personnel contact as shown in Table 39.

Table 39. The distribution of the pomegranate growers according to their use of extension education methods sources of information

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1.	Low (Up to 06)	43	15.93
2.	Medium (07 to 12)	218	80.74
3.	High (12 and above)	09	03.33
	Total	270	100.00
	Maximum Score	18	
	Minimum Score	00	
	Class interval	06	

The data from Table 39 revealed that large majority of the respondents (80.74 %) had used extension education methods as a source of information to medium extent, followed by low extent (15.93 %) and high extent (03.33 %). The findings of the study are in line with the findings of Thimmaraju (1989), Sadanandan (1998) and Lakshmisha (2000).

The distribution of respondents as per their use of different extension education methods e.g. meetings, group discussion, demonstration etc. for obtaining the agricultural information is given in Table 39.

The data revealed in Table 40 that 27.77 per cent respondents attended group discussion 'once in a month' while, 24.44 per cent of respondents participated in demonstrations 'once in a season' followed by 36.29 per cent respondents who participated in 'shivar ferries' once in a season'. Majority (52.22 %) of the respondents participated and attended farmers rallies 'in a every season', 70.74 per cent respondents visited agricultural exhibitions 'every year' and 25.18 per cent took benefit of study tours and visited different locations every year.

The findings are in line with the findings of Deshmukh *et al.* (1997) and Dhere (2012).

Table 40. Distribution of Pomegranate growers according to their extent of use of extension education methods as sources of information (N=270)

Sl. No.	Name of extension education methods	Once in week	Once in fortnight	Once in a month	Once in a season	Once in a year	Never	Overall (N=270)
1	Group discussion	13 (4.81)	5 (1.85)	75 (27.77)	6 (2.22)	0 (0.00)	171 (63.33)	270 (100.00)
2	Crop demonstration	2 (0.74)	0 (0.00)	17 (6.29)	65 (24.44)	2 (0.74)	183 (67.77)	270 (100.00)
3	Field visit	0 (0.00)	1 (0.37)	19 (7.03)	98 (36.29)	0 (0.00)	152 (56.29)	270 (100.00)
4	Farmers rally	0 (0.00)	0 (0.00)	2 (0.74)	141 (92.22)	6 (2.22)	101 (37.40)	270 (100.00)
5	Agril. exhibition	0 (0.00)	0 (0.00)	0 (0.00)	11 (4.07)	191 (70.74)	68 (25.18)	270 (100.00)
6	Farmers Study tour	0 (0.00)	0 (0.00)	0 (0.00)	12 (4.44)	68 (25.18)	190 (70.37)	270 (100.00)

4.5.2 Cosmopolitaness

Cossmopliteness refers to the contacts established by the pomegranate growers with the outside world. Previous research suggests that cosmopolites are earlier adopters of innovations and that they use more diverse media sources. Also, cosmopolitaness is an important factor in relation to the knowledge level and utilization of various nutrient management techniques. In the present study, the pomegranate growers were classified in three categories *viz.*, low, medium and high level cosmopolitaness as shown in Table 41.

Table 41. Distribution of pomegranate growers according to their cosmopolitaness

Sl. No.	Cosmopolitaness	Respondents (N= 270)	
		Number	Percentage
1.	Low (up to 2)	45	16.67
2.	Medium (3 to 4)	218	80.74
3.	High (5 and above)	07	02.59
	Total	270	100.00
	Maximum Score	6	
	Minimum Score	2	
	Class interval	1	

It is observed from Table 41 that, large majority of the pomegranate growers (80.74 per cent) had ‘medium ’ level of cosmopolitaness, followed by 16.67 per cent and 02.59 per cent having ‘low’ and ‘high’ level of cosmopolitaness respectively. The data thus indicated that large proportions of respondents were having higher cosmopolitaness. Therefore, while giving information about nutrient management practices, one has to consider this aspect of the farming community.

The findings of the study are in conformity with the findings of Raghavendra (1997) and Gangurde (2003).

4.6 Overall knowledge level of pomegranate growers

The overall knowledge of the respondents in relation to nutrient management practices of pomegranate was assessed. For this purpose, a knowledge test was specially developed was used. As per the test the knowledge score of each respondents was calculated and the knowledge index was calculated. On the basis of knowledge index range respondents were grouped in to three categories with the help of range *viz.*, low, medium, high knowledge level as shown in Table 42.

Table 42. Distribution of the pomegranate growers according to their overall knowledge about nutrient management practices

Sl. No.	Category	Respondents (N= 270)	
		Number	Percentage
1.	Low Level (Up to 178)	40	14.81
2.	Medium Level (179 to 250)	180	66.67
3.	High Level (251 and above)	50	18.52
	Total	270	100.00
	Maximum Score	321	
	Minimum Score	107	
	Class interval	71	

It is evident from the Table 42 that majority (66.67 %) of the respondents were in the ‘medium’ knowledge level, while 18.52 per cent and 14.81 per cent of them were having ‘high’ and ‘low’ knowledge level respectively. Thus, it could be stated that the knowledge level of majority of the respondent is satisfactory. This might be due to the fact that the most of the pomegranate growers might have been exposed to the various nutrient management practices. These might also be due to the better educational level and better socio economic status of the respondent had evidenced in the study.

Similar findings were observed by Garje (2010), Mule (2012) and Nanaware (2017).

4.6.1 Practice wise knowledge level of pomegranate growers

The information pertaining to the knowledge of respondents about the different nutrient management practices under twelve major heads *viz.*, soil selection,

water management, land preparation, selection of planting material, bahar management, Integrated nutrient management, organic manure, green manure, bio-fertilizer, chemical fertilizer, fertigation and micro nutrient management are depicted hereunder.

4.6.1.2 Soil selection and water management

Soil selection and water management considered as a key factor for healthy pomegranate cultivation which in turn reduces disease and pest attack. The data pertaining to soil selection and water management was collected and presented in Table 43 and 44.

Table 43. Distribution of respondents according to practice wise knowledge about soil selection

Sr. No.	Particulars	Knowledge (N= 270)			Overall (N=270)
		Complete	Partial	No	
1.	Soil suitable for Pomegranate cultivation-				
	Deep loamy alluvial soil / medium to light black, well drained soil	235 (87.03)	35 (12.96)	00 (0.00)	270 (100.00)
2.	PH of soil-6.5 to 8.5	221 (81.85)	49 (18.14)	00 (0.00)	270 (100.00)
3.	EC of soil - < 0.5desimen/ mt (dsm ⁻¹)	92 (34.07)	68 (25.18)	110 (40.74)	270 (100.00)
4.	Carbon content of soil < 08 %	13 (04.81)	21 (07.77)	236 (87.41)	270 (100.00)

(Figures in the parentheses indicate percentage)

The data presented in the Table 43 revealed that, large majority (87.03 %) of the pomegranate growers had ‘complete knowledge’ followed by (12.96 %) had ‘partial knowledge regarding soil requirement for pomegranate crop. While, adequate respondents was known (81.85 %) followed by 18.14 per cent parial knowledge about pH limit of soil required. However, near about 40.74 per cent of respondents had no knowledge followed by (34.07 %) complete knowledge followed by (25.18 %) proportion of the respondents partial knowledge about EC of soil. As large majority (87.41 %) respondents followed by very negligible proportion (07.77 %) had ‘partial knowledge’ and (04.81 %) had no knowledge regarding carbonate content of soil required for pomegranate cultivation respectively.

Table 44. Distribution of respondents according to Practice wise knowledge about water management

Sr. No.	Particulars	Knowledge (N= 270)			Overall (N=270)
		Complete	Partial	No	
1.	pH of water – 6.5-7.5	62 (22.96)	73 (27.03)	135 (50.00)	270 (100.00)
2.	EC of water - < 1.0 dsm-1 (0..30-1.0)	43 (15.92)	75 (27.77)	152 (56.29)	270 (100.00)
3.	Suitable irrigation methods				
a.	Drip	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
b.	Sprinkler	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
d.	Ring	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	In case of Drip System-				
4.	Dripper per plant- 2 or 4	258 (95.55)	09 (03.33)	03 (01.11)	270 (100.00)
5.	Discharge of dripper per plant- 26-35 lit/ plant/day	168 (62.22)	79 (29.25)	23 (8.51)	270 (100.00)
6.	Pressure of Drip system 1to 2 kg/cm ²	160 (59.25)	40 (14.81)	170 (62.96)	270 (100.00)
7.	Dripper spacing from plant stem - 1.5 feet	250 (92.59)	20 (07.40)	00 (0.00)	270 (100.00)

(Figures in the parentheses indicate percentage)

The data presented in the Table 44 revealed that, near about fifty per cent respondents had ‘no knowledge’ about pH of water followed by (27.03 %) ‘partial knowledge and (22.96 %) had complete know about suitable pH of water. However, about EC of water more than half (56.29 %) had ‘no knowledge’ followed by (27.77 %) had partial knowledge and (15.92 %) had complete knowledge. About cent per cent of the respondents had complete knowledge about suitable irrigation methods *viz.* drip, sprinkler and ring. The data further reveal that, more than 90.00 per cent of respondents were having complete knowledge’ about number of dripper per plant (95.55 %) followed by very negligible (03.33 %) and (01.11 %) had partial and no knowledge respectively. About (62.22 %) had complete knowledge followed by (29.25 %) had partial and (8.51 %) had no knowledge about discharge of dripper per plant per day. However, about

pressure of drip system,((62.96 %) had no knowledge followed by (59.25 %) had complete knowledge and (14.81 %) had partial knowledge respectively. While about dripper spacing from plant to stem (92.59 %) had complete knowledge followed by (07.40 %) had ‘partial knowledge’ to respondents respectively.

4.6.1.3 Land preparation

Land preparation contributes towards the clean cultivation in pomegranate. It might act as booster for whole process of disease and pest management. The data regarding this aspect was collected and presented in Table 45.

Table 45. Distribution of respondents according to practicewise knowledge about land preparation

Sr. No.	Particulars	Knowledge (N= 270)			Overall (N=270)
		Complete	Partial	No	
1.	Ploughings required				
	2-3	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
2.	Size of pit- 3x3x3 ft.	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
3.	Spacing between two plants -3.0 mt (10 feet)	240 (88.88)	149 (55.18)	24 (08.88)	270 (100.00)
4.	Spacing between two rows-4.5 mt (15feet)	220 (81.48)	147 (54.40)	45 (16.66)	270 (100.00)
5.	Pit Filling - (1.5 kg SSP + 2 kg Neem cake + 25 g Trichoderma or Pseudomonas + 25 g Copper Oxychloride	155 (57.40)	101 (37.40)	14 (05.18)	270 (100.00)
6.	20 kg(2-3 baskets)	167 (61.85)	103 (38.15)	00 (0.00)	270 (100.00)

(Figures in the parentheses indicate percentage)

The results presented in Table 45 shows that, cent per cent of the respondents know about ploughing and size of pit pomegranate cultivation. While, more than eighty per cent of them had completely knowledge (88.88 %) followed by (55.18 %) had partial knowledge about plant spacing and about row spacing (81.48 %) had complete know followed by (54.40 %) had partial knowledge. While about contents required for filling of pit (57.40 %) had completely knowledge and by (37.40 %) had partial knowledge, respectively. However regarding application of FYM per pit (61.85

%) had complete knowledge and 38.15 per cent of the respondents had partial knowledge respectively.

4.6.1.4 Selection of planting material and bahar management

Selection of planting material and bahar management both factors are crucial for healthy orchard management. Disease free planting material is the soul of pomegranate cultivation. While, selection of bahar decides the disease and pest intensity in pomegranate. Selection of healthy planting material and proper bahar is the key for successful pomegranate cultivation. The data on these factors were collected and presented in Table 46 and 47.

Table 46. Distribution of respondents according to practicewise knowledge about selection of planting material

Sr. No.	Particulars	Knowledge (N= 270)			Overall (N=270)
		Complete	Partial	No	
1.	Sources–Agril. University / Govt. Nurseries/ Private nurseries/Progressive farmers	137 (50.54)	54 (20.00)	79 (29.26)	270 (100.00)
2.	Best planting material use-Air Layering/ Tissue culture	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
3.	Indices of quality Planting material-Healthy,disease free, well developed rooted plant	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
4.	Recommended Varieties				
i.	Ganesh	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
ii.	G-137	70 (25.92)	00 (0.00)	200 (74.07)	270 (100.00)
iii.	Mridula	260 (96.29)	10 (03.70)	00 (0.00)	270 (100.00)
iv.	Arakta	250 (92.59)	20 (07.40)	00 (0.00)	270 (100.00)
v.	Bhagva	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
vi.	Super Bhagava	200 (74.07)	70 (25.92)	00 (0.00)	00 (0.00)

(Figures in the parentheses indicate percentage)

It is seen from Table 46 that, 50.54 per cent of the pomegranate growers had complete knowledge followed by 29.26 per cent had no knowledge and 20.00 per cent had partial knowledge about different sources of planting material respectively. While cent per cent (100.00 %) of them having complete knowledge pertaining to best planting material use and the good quality indices of pomegranate saplings. However cent per cent respondents had complete knowledge about recommended varieties viz., *Bhagva* and *Ganesh*. Other varieties like *Mrudula* 96.29 per cent, *Arakta* 92.59 per cent, *Super Bhagva* 74.07 per cent and *G-137*, 25.92 per cent had complete knowledge respectively. As about varieties viz. *Mrudula* (3.70 %), *Arakta* (7.40 %), *Super Bhagva* (25.92 %) respondents had partial knowledge respectively.

It is seen from Table 47 that, with regard to bahar management cent per cent of the respondents had complete knowledge about recommended bahars viz., Ambe, Mrig and Hasta in pomegranate. However, more than eighty per cent (81.48 %) of the respondents had no knowledge about susceptible bahar for pest and diseases with respect to susceptibility for oily spot disease. With regards to chemical used for defoliation of leaves, purpose of defoliation, purpose of training and pruning, hundred per cent respondents had complete knowledge. While cent per cent respondents had complete knowledge about providing of resting period to plant, bahar initiation, improving fruit size and time of pruning. From table it is also observed that all the respondents had knowledge about spraying of bio-agent after pruning, location of Bordeaux mixture application- i.e. on pruned branch, stem and more than half (62.96 %) respondents had complete knowledge followed by (26.37 %) having no knowledge about spraying of 1 % Bordeaux mixture. While cent per cent respondents were having complete knowledge about resting period for heavy and light to medium soil respectively.

Table 47. Distribution of respondents according to practicewise knowledge about bahar management

Sr. No.	Particulars	Knowledge (N= 270)			Overall (N=270)
		Complete	Partial	No	
1.	Time of bahars - Ambe-(Jan.-Feb.)	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	Mrig-(June-July)	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	Hasta- (October)	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
2.	Bahar is susceptible for attack of oily spot disease- Ambe	32 (11.82)	18 (06.66)	220 (81.48)	270 (100.00)
3.	Chemical used for defoliation of leaves – Ethrel 1-2 ml/lit	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
4.	Purpose of Defoliation- better flowering	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
5.	Purpose of Training – proper shape	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
6.	Purpose Pruning –Remove unwanted shoots/stem	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
7.	Provide Resting Period to Plant	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
8.	Bahar Initiation	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
9.	Improve fruit size	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
10.	Time of pruning-Before bahar	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
11.	Spraying of bio-agent after pruning- 1 % Bordeaux mixture/ paste	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
12	Location of Bordeaux mixture application				
	Pruned branch	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	Stem	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	Spraying 1% Bordeaux mixture	170 (62.96)	45 (16.66)	55 (26.37)	270 (100.00)
13.	Resting period –Average 3-3.5 Months for heavy soil	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	2 months –Light-medium soil)	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)

(Figures in the parentheses indicate percentage)

Table 48. Distribution of respondents according to their practice wise knowledge level about pomegranate management practices

Sl. No.	Knowledge level	Respondents (N = 270)	
		Frequency	Percentage
1.	Soil selection (04 practices)		
1.	Low (Up to 07 score)	85	31.48
2.	Medium (08 to 10 score)	109	40.38
3.	High (11 and above score)	76	28.14
	Total	270	100.00
	Maximum score = 12	Minimum score = 04	
2.	Water management (07 practices)		
1.	Low (Up to 12 score)	68	25.18
2.	Medium (13 to 17 score)	112	41.49
3.	High (18 and above score)	90	33.33
	Total	270	100.00
	Maximum score = 21	Minimum score = 07	
3.	Land preparation (06 practices)		
1.	Low (Up to 10 score)	54	20.00
2.	Medium (11 to 14 score)	148	54.82
3.	High (15 and above score)	68	25.18
	Total	270	100.00
	Maximum score = 18	Minimum score = 06	
4.	Planting material (04 practices)		
1.	Low (Up to 6 score)	34	12.59
2.	Medium (7 to 09 score)	181	67.04
3.	High (10 and above score)	55	20.37
	Total	270	100.00
	Maximum score = 12	Minimum score = 04	
5.	Bahar management (13 practices)		
1.	Low (Up to 21 score)	57	21.12
2.	Medium (22 to 35 score)	118	43.70
3.	High (36 and above score)	95	35.18
	Total	270	100.00
	Maximum score = 39	Minimum score =13	

The data in Table 48 shows that the 40.38 per cent of the respondents had 'medium' knowledge followed by 31.48 per cent had low knowledge about soil selection. While, 54.81 per cent had 'medium' knowledge followed by (25.18 %) having high knowledge pertaining to land preparation. With regards to water management (41.49 %) had 'medium' and (33.33 %) had high knowledge. Nearly one third per cent respondents (67.04 %) had 'medium' knowledge level followed by (20.37 %) having high knowledge regarding planting material. However, 43.70 per cent and 35.18 per cent respondents had 'medium' and high level of knowledge about bahar management respectively. It is observed from the table 48 that most of the respondents are in medium to high knowledge category.

4.6.1.5 Integrated Nutrient Management

It is very necessary for farmers to know the integrated nutrient management practices used in pomegranate. The information about knowledge of pomegranate growers about integrated nutrient management practices were collected and presented as shown in Table 49.

Table 49. Distribution of respondents according to practicewise knowledge of integrated nutrient management

Sl. No.	Particulars	Knowledge (N=270)			Overall (N=270)
		Complete	Partial	No	
1.	Purpose of soil testing- Check deficiency /sufficiency and use of proper nutrient management	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
2.	Meaning of INM- Balanced use of organic, inorganic, green manures, biofertilizer and micro nutrients.	260 (96.29)	10 (03.71)	00 (0.00)	270 (100.00)
3.	Advantages of INM- a) Maintains soil productivity, fertility and fruit production optimizes.	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
4.	Advantages of INM in Pomegranate : Increased Production, Fruit Size and Quality	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
5.	Necessity of Nutrient management after harvest and before resting period	225 (83.33)	35 (12.96)	10 (03.71)	270 (100.00)

(Figures in the parentheses indicate percentage)

The results presented in Table 49 indicate that, cent per cent of Pomegranate growers had complete knowledge about purpose of soil testing, advantages of INM in general in Pomegranate. While, more than eighty per cent of respondents (83.33 %) had complete knowing and (12.96 %) had partial knowledge about necessity of nutrient management after harvest and before resting period .

4.6.1.6 Organic Manures

It is very necessary for farmers to know the organic manures management practices used in pomegranate. The information about knowledge of pomegranate growers about types, stages and doses of organic manures management practices were collected and presented as shown in Table 50.

The data presented in Table 50 shows that the cent per cent Pomegranate growers (100.00 %) had ‘complete knowledge’ about different types of organic manures that is bulky, concentrated, sources of bulky organic manures and advantages of manures (98.88 %). However, cent per cent of respondents had complete knowledge about functions of concentrated organic manures,time of application of organic manures at different growth stages.While near about fifty per cent of respondents had ‘complete knowledge’ about year wise application of recommended doses of manures per plant per year from 1st year to 5th year that is (50.74 %), (35.18 %), (63.70 %), (41.11 %), (42.59 %) respectively and near about one third respondents had ‘partial knowledge’ that is (40.74 %), (35.18 %), (36.29 %), (31.85 %), (35.55 %) from 1st year to 5th year respectively.As about types of plant origin -edible oil cakes (57.04 %), had no knowledge followed by (25.92 %) complete and (17.030 %) had partial knowledge respectively.About non edible cake (38.14 %) had complete knowledge followed by(35.92 %) had no knowledge (25.92 %) had partial knowledge respectively.However about animal origin-meals (40.72 %) had partial knowledge followed by (32.22 %) had ‘complete knowledge’ and (27.04 %) had no knowledge.

Table 50. Distribution of respondents according to their knowledge level about Organic manures in pomegranate management

Sl. No.	Particulars	Knowledge (N=270)			Overall (N=270)
		Complete	Partial	No	
A.	Organic Manures				
1.	Different types of organic manures- A. Bulky organic manure.- FYM,	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	B. Concen. organic manures- Oil Cakes	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
2.	Different sources of Bulky Organic manures- Cattle/Sheep/Poultry manures	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
3.	Advantages of manures-Facilitate aeration, increase soil microbial activity.	267 (98.88)	03 (01.11)	00 (0.00)	270 (100.00)
4.	Time of application of manures at different growth stages				
i.	At planting	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
ii.	At Bahar treatment	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
ii.	At flowering / fruit setting	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
5.	Application of doses of manures per plant per year from 1 st year-10kg /plant	137 (50.74)	110 (40.74)	23 (08.51)	270 (100.00)
6.	Doses of manures per plant per year for 2 nd year-20kg /plant	95 (35.18)	95 (35.18)	100 (37.03)	270 (100.00)
7.	Doses of manures per plant per year for 3 rd year-30kg /plant	172 (63.70)	98 (36.29)	00 (0.00)	270 (100.00)
8.	Doses of manures per plant per year for 4 th year-40kg /plant	111 (41.11)	86 (31.85)	73 (27.04)	270 (100.00)
9.	Doses of manures per plant per year for 5 th and above years-50kg /plant	115 (42.59)	96 (35.55)	59 (21.86)	270 (100.00)
	Concentrated organic manures				
10.	Types of plant origin conc. organic manures –a. Edible oil cakes- Mustard/g.nut/Linseed/Sesamum cakes.	70 (25.92)	46 (17.03)	154 (57.04)	270 (100.00)
	b. Non edible cake- Castor/Neem/Sunflower/Karanj cakes	103 (38.14)	70 (25.92)	97 (35.92)	270 (100.00)
11	Types of animal origin conc. organic manures- Blood meal/Bone meal/Fish meal.	87 (32.22)	110 (40.74)	73 (27.04)	270 (100.00)
12.	Functions of concentrated organic manures- a. Nitrogen and Sulpher availability is more.	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)

(Figures in the parentheses indicate percentage)

4.6.1.7 Green Manures

It is very necessary for farmers to know the Green manures management practices used in pomegranate. The information about knowledge of pomegranate growers about green manures management practices were collected and presented as shown in Table 51.

Table 51. Distribution of respondents according to their knowledge level about Green manures in pomegranate management

Sl. No.	Particulars	Knowledge (N=270)			Overall (N=270)
		Complete	Partial	No	
	Green Manures				
1.	Types of green manures-	86	124	60	270
	a. Leguminous Crop-	(31.85)	(45.92)	(22.23)	(100.00)
	b..Green Leaf Manures	95	140	35	270
		(35.18)	(51.85)	(12.96)	(100.00)
2.	Leguminous Crop-Sunhemp/ Mungbean/Cowpea/Berseem/Guar/ Dhaincha	67	96	107	270
		(24.81)	(35.55)	(39.64)	(100.00)
3.	Green leaf manure crops – Lucerne/ Subabhul/Glyricidea/Karanj / Shevari	47	63	160	270
		(17.40)	(23.33)	(59.25)	(100.00)
4.	Functions of green manures- -Increase nutrient availability -Increase quantity and growth of beneficial Microbial activity	103	228	29	270
		(30.14)	(84.44)	(10.74)	(100.00)
5.	Recommended stage of burying green manuring crops- 8-10 weeks (at early flowering stage)	52	83	135	270
		(19.25)	(30.74)	(50.00)	(100.00)

(Figures in the parentheses indicate percentage)

The data presented in Table 51 shows that near about one third of the pomegranate growers had ‘partial knowledge’ about types of green manures (45.92 %) followed by (31.85 %) had complete and (22.23 %) had ‘no knowledge’ respectively. As about types of green leaf manures (51.85 %) had ‘partial knowledge’ and (35.18 %) had complete and (12.96 %) had ‘no knowledge’ respectively. While, types of leguminous crops 39.64 per cent had no knowledge followed by (35.55 %) had partial knowledge and (24.81 %) had complete knowledge respectively. About functions of green manures (84.44 %) had ‘partial knowledge’ followed (30.14 %) had complete knowledge and

(10.74 %) had no knowledge respectively. While about recommended stage of burying green manuring crops (50.00 %) had no knowledge followed by (30.74 %) had partial knowledge and (19.25 %) had complete knowledge respectively.

4.6.1.8 Bio-fertilizers

It is very necessary for farmers to know the Bio-fertilizers management practices used in pomegranate. The information about knowledge of pomegranate growers about Bio-fertilizers management practices were collected and presented as shown in Table 52.

Table 52. Distribution of respondents according to their knowledge level about Bio-fertilizers in pomegranate management

Sl. No.	Particulars	Knowledge (N=270)			Overall (N=270)
		Complete	Partial	No	
	Bio-fertilizers				
1.	Bio Fertilizer meaning – Live latent cells of nitrogen solubilising, P fixing and organic matter decomposing micro organisms	250 (92.59)	20 (07.40)	00 (0.00)	270 (100.00)
2.	Formulations of bio-fertilizers-Powder and Liquid form-	260 (96.29)	10 (03.70)	00 (0.00)	270 (100.00)
	Pseudomonas	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	Trichoderma	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	Pacelomysis	260 (96.29)	10 (03.70)	00 (0.00)	270 (100.00)
	PSB	240 (88.88)	30 (11.11)	00 (0.00)	270 (100.00)
	VAM	230 (85.18)	40 (14.81)	00 (0.00)	270 (100.00)
	KSB	210 (77.77)	60 (22.22)	00 (0.00)	270 (100.00)
3.	Functions of bio-fertilizers application : Fixing atmospheric Nitrogen / Bio control of pest and diseases	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
4.	Recommended dose of Bio-fertilizers				
	Pseudomonas	220 (81.48)	50 (18.52)	00 (0.00)	270 (100.00)
	Trichoderma 25 gm /10 lit	225 (83.33)	45 (16.66)	00 (0.00)	270 (100.00)

Table 52 contd.....

Sl. No.	Particulars	Knowledge (N=270)			Overall (N=270)
		Complete	Partial	No	
	Pacelomysis	190 (70.37)	80 (29.62)	00 (0.00)	270 (100.00)
	PSB – 25 ml / lit drenching/ 20 gm/ plant	210 (77.77)	60 (21.48)	00 (0.00)	270 (100.00)
	VAM -20 gm /Plant	135 (50.00)	135 (50.00)	00 (0.00)	270 (100.00)
	KSB – 25 gm/ Plant	170 (62.96)	100 (37.03)	00 (0.00)	270 (100.00)
5.	Time of Application of Bio Fertilizers at pit filling	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)

(Figures in the parentheses indicate percentage)

The results presented in Table 52 indicate that more than 90.00 per cent of the pomegranate growers had ‘complete knowledge’ regarding meaning of bio- fertilizer (92.59 %), formulations of bio-fertilizers (96.29 %), cent per cent about types of Bio-fertilizers like Pseudomonas, Trichoderma and for Pacelomysis (96.29 %), PSB (88.88 %), VAM (85.18 %), KSB (77.77 %) and time of application of bio fertilizers at pit filling stage (100.00 %), respectively. While, more than two third had ‘complete knowledge’ about recommended doses of Biofertilizers like Pseudomonas (81.48 %), Trichoderma (83.33 %), Pacelomysis(70.37 %), PSB(77.77 %), VAM (50.00 %), KSB (62.96 %) respectively. As regarding meaning of Bio-fertilizer (7.40 %), formulations of biofertilizers (3.70 %), regarding Pacelomysis (03.70 %), PSB(11.11 %), VAM (14.81 %), KSB (22.22 %) and about recommended dose of Biofertilizers viz. Pseudomonas (18.52 %), Trichoderma (16.66 %), Pacelomysis (29.62 %), PSB(21.48 %), VAM (50.00 %) and KSB (37.03 %) respondents had partial knowledge, respectively.

4.6.1.9 Chemical Fertilizers

It is very necessary for farmers to know the chemical fertilizers management practices used in pomegranate. The information about knowledge of pomegranate growers about chemical fertilizers management practices were collected and presented as shown in Table 53.

Table 53. Distribution of respondents according to their knowledge level about Chemical fertilizers in pomegranate management

Sl. No.	Particulars	Knowledge (N=270)			Overall (N=270)
		Complete	Partial	No	
	Chemical fertilizers				
1.	Formulation of chemical fertilizers – Granule / Liquid	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
2.	Types of fertilizers –Straight, Compound, Complex and Mixed	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	Straight – Urea, SSP, MOP, SOP	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	Compound/ Complex-19:19:19, 20:20:0,14:35:14, M OP, DOP	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	Mixed -10:26:26 (Local made),NPK	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
3.	Functions of chemical fertilizers-Supply of major nutrients / Increase fruit and overall total production	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
4.	Application as per recommendation of soil test report	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
5.	Methods of fertilizer application of - Ring or Band Placement / Fertigation	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
6.	Stages /Time of application of major nutrients-At the time of planting (New Orchard)	191 (70.74)	39 (14.14)	40 (14.82)	270 (100.00)
i.	at bahar treatment	78 (28.88)	94 (34.81)	98 (23.29)	270 (100.00)
ii.	at flowering/fruit setting	83 (30.74)	104 (38.51)	83 (30.74)	270 (100.00)
iii.	at Chiku size fruit stage	127 (47.03)	69 (25.55)	74 (27.40)	270 (100.00)
iv.	before harvest (1 month)	84 (31.11)	106 (39.25)	80 (29.62)	270 (100.00)
7.	Time of N split doses at fruit setting stage-Equal two split doses	93 (34.44)	125 (46.29)	52 (19.25)	270 (100.00)
8.	Time of fertilizer application for bahartreatment- at bahar treatment	230 (85.18)	40 (14.81)	00 (0.00)	270 (100.00)
	after bahar treatment	240 (88.88)	30 (11.11)	00 (0.00)	270 (100.00)
9.	Recommended N,P ₂ O, and K ₂ O dose fertilizers per plant for 1to 2 year old orchard.-250:125:125 g /plant	125 (46.29)	135 (50.00)	00 (0.00)	270 (100.00)
10.	For 3 and 4 years old orchard.- 500:125:125 g/plant	98 (36.29)	140 (51.85)	32 (11.85)	270 (100.00)
11.	For 5 years and above old orchard- 625:250:250 g/plant	138 (51.11)	78 (29.25)	54 (20.00)	270 (100.00)

(Figures in the parentheses indicate percentage)

Table 53 reveals that, cent per cent of the pomegranate growers had ‘complete knowledge’ pertaining to formulation of chemical fertilizers, types of fertilizers, types of Straight fertilizers, Compound/ Complex fertilizers and Mixed fertilizers, functions of chemical fertilizers, application of fertilizers as per recommendation of soil test report and methods of fertilizer application respectively. However, regarding split dose application of chemical fertilizers majority (70.74 %) of the respondents had ‘complete knowledge’ of application at the time of planting followed by 47.03 per cent having knowledge of application at Chiku size fruit stage and 30.74 and 31.11 per cent respondents were having knowledge regarding fertilizer application at fruit setting and one month before harvest respectively.

About as per time of N split doses at fruit setting stage (34.44 %), at bahar treatment (85.18 %), after bahar treatment (88.88 %) respondents had ‘complete knowledge’ and as per recommended N, P₂O, and K₂O doses of fertilizers per plant for one and two year old orchard (46.29 %), three and four years old orchard (36.29 %) and five years and above old orchard (51.11%) respondents had “complete knowledge” respectively. For different stages / time of application of major nutrients like at the time of planting (14.14 %), at bahar treatment (34.81 percent), at flowering/fruit setting(38.51 %), at Chiku size fruit stage (25.55%), before harvest (1 month) (39.25 %) respondents had ‘partial knowledge’ respectively. About as per time of N split doses at fruit setting stage (46.29 %), time of fertilizer application at bahar treatment (14.81 %), after bahar treatment (11.11 %) and as per recommended N, P₂O, and K₂O doses of fertilizers per plant for 1to 2 year old orchard (50.00 %), for 3 and 4 years old orchard (51.85 %) and 5 years and above old orchard (29.25 %) respondents had “partial knowledge” respectively. As about stages /time of application of major nutrients-at the time of planting (14.82 %), at bahar treatment (23.29 %), at flowering/fruit setting (30.74 %), at Chiku size fruit stage (27.40 %), before harvest (1 month) (29.62 %) respondents had no knowledge of chemical fertilizers respectively. Regarding time of N split doses at fruit setting stage (19.25 %), for three and four years old orchard (11.85 %), for five years and above old orchard (20.00 %) respondents had no knowledge of chemical fertilizers.

4.6.1.10 Fertigation

It is very necessary for farmers to know the fertigation management techniques used in pomegranate. The information about knowledge of pomegranate growers about fertigation management techniques were collected and presented as shown in Table 54.

Table 54. Distribution of respondents according to their knowledge level about fertigation in pomegranate management

Sl. No.	Particulars	Knowledge (N=270)			Overall (N=270)
		Complete	Partial	No	
	Fertigation				
1.	Methods of Fertigation Through Ventury	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	Fertilizer tank	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	HTP Pump	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
2.	Grades of liquid fertilizers- 19:19:19	98 (36.29)	145 (53.70)	27 (10.00)	270 (100.00)
3.	0:52:34	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
4.	12:52:34	77 (28.51)	114 (42.22)	79 (29.26)	270 (100.00)
5.	13:00:45	93 (34.44)	140 (51.85)	37 (13.70)	270 (100.00)
6.	0:00:50	98 (36.29)	113 (41.85)	59 (21.85)	270 (100.00)
7.	Recommended dose of major nutrients through fertigation per plant/ year				
8.	500:200:200 gm/plant	130 (48.14)	140 (51.85)	00 (0.00)	270 (100.00)
9.	Dose of Fertigation 20 splits at 7 days interval	46 (17.03)	62 (22.96)	162 (60.00)	270 (100.00)

(Figures in the parentheses indicate percentage)

The data presented in Table 54 shows that cent per cent pomegranate growers had complete knowledge about fertigation methods, fertilizer tank, HTP pump and grades of liquid fertilizers viz. 0:52:34 respectively. While, regard in recommended dose of major nutrients per plant/ year that is 500:200:200 has (48.14 %) and doses of fertigation (17.03 %) respondents had complete knowledge. However regarding different

grades of liquid fertilizers viz., 19:19:19 (53.70 %), 12:52:34 (45.22 %), 13:00:45 (51.85 %) and 0:00:50 (41.85 %) respondents had partial knowledge .About recommended dose of major nutrients per plant/ year that is 500:200:200 (51.85 %) respondents and about doses of fertigation (22.96 %) respondents had partial knowledge .While, regarding grades of liquid fertilizers viz. 19:19:19(10.00 %),12:52:34 (29.26 %), 13:00:45(13.70 %) and 0:00:50 (21.85 %) respondents had no knowledge respectively and about doses of fertigation more than fifty per cent (60.00 %) respondents had no knowledge, respectively.

4.6.1.11 Micronutrients

It is very necessary for farmers to know the various micronutrients management practices used in pomegranate. The information about knowledge of pomegranate growers about various micronutrients management practices were collected and presented as shown in Table 55.

Table 55. Distribution of respondents according to their knowledge level about Micronutrients in pomegranate management

Sl. No.	Particulars	Knowledge (N=270)			Overall (N=270)
		Complete	Partial	No	
	Micronutrients				
1.	Chelating of micronutrients with Manures/Compost	67 (24.81)	85 (31.48)	118 (43.70)	270 (100.00)
2.	Role of Different Micronutrients - Ferrous Sulphate – Chlorophyll Content	84 (31.11)	128 (47.40)	58 (21.48)	270 (100.00)
3.	Magnese Sulphate- Carrier of Ferrous	79 (29.25)	118 (43.70)	73 (27.03)	270 (100.00)
4.	Zink Sulphate- Carbohydrate production	57 (21.11)	111 (41.11)	102 (37.77)	270 (100.00)
5.	Copper Sulphate- Metabolism catalyst	97 (35.92)	146 (54.07)	37 (13.70)	270 (100.00)
6.	Borax-Sugar translocation, Fruit setting, Reduces Fruit cracking,	111 (41.11)	148 (54.81)	11 (04.07)	270 (100.00)
7.	Micronutrient Formulations - Ferrous Sulphate	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
8.	Magnese Sulphate	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
9.	Zink Sulphate	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
10.	Copper Sulphate	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
11.	Borax	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)

Table 55 contd.....

Sl. No.	Particulars	Knowledge (N=270)			Overall (N=270)
		Complete	Partial	No	
12.	Doses of Micronutrients Ferrous sulphate 30gm/ plant	143 (52.96)	117 (43.33)	10 (03.70)	270 (100.00)
13.	Magnese Sulphate-40gm/ Plant	210 (77.77)	40 (14.81)	20 (07.40)	270 (100.00)
14.	Zink Sulphate-40gm/Plant	250 (92.59)	20 (07.40)	00 (0.00)	270 (100.00)
15.	Copper Sulphate-25gm/ Plant	230 (85.18)	40 (14.81)	00 (0.00)	270 (100.00)
16.	Borax-20gm / Plant	200 (74.07)	50 (18.51)	20 (07.40)	270 (100.00)
17.	Name of micronutrient used before flowering and fruit setting- Boric acid	110 (40.74)	130 (48.14)	30 (11.11)	270 (100.00)
18.	Methods of application of micronutrients- Trough Soil in Chelated form	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
	Spray	270 (100.00)	00 (0.00)	00 (0.00)	270 (100.00)
19.	Useful inorganic micronutrients- EDTA(0.2 % @ 2 g /Lt)	19 (07.03)	37 (13.70)	214 (79.25)	270 (100.00)
20.	EDDHA	22 (08.14)	38 (14.07)	210 (77.77)	270 (100.00)
21.	HEDTA	27 (10.00)	56 (20.74)	187 (69.25)	270 (100.00)
22.	DTPA	39 (14.14)	48 (17.77)	183 (67.77)	270 (100.00)
	Citric acid	64 (23.70)	99 (36.66)	107 (39.63)	270 (100.00)
23.	Useful organic micronutrients- Humic acid (0.1 % @ 1g /Lt)	118 (43.70)	127 (47.03)	25 (09.26)	270 (100.00)
24.	Amino acid	97 (35.92)	152 (56.29)	21 (7.78)	270 (100.00)
25.	Gluconet	68 (25.18)	102 (37.77)	100 (37.04)	270 (100.00)

(Figures in the parentheses indicate percentage)

The observations in Table 55 indicate that, pomegranate growers had near about thirty per cent complete knowledge regarding chelating of micronutrients with manures /compost (24.81 %) followed by 31.48 per cent had partial knowledge and 43.70 per cent had no knowledge respectively. As about role of different micronutrients viz. Ferrous Sulphate (47.40 %) had partial knowledge followed by (31.11 %) had complete knowledge and (21.48 %) respondents had no knowledge respectively. Regarding

Magnese Sulphate (43.70 %) respondents had partial knowledge followed by (29.25 %) had complete knowledge and (27.03 %) had no knowledge respectively. About Zink Sulphate (41.11 %) respondents had partial knowledge followed by (37.77 %) had no knowledge and (21.11 %) had complete knowledge respectively. For Copper Sulphate (54.07 %) respondents had partial knowledge followed by (35.92 %) had complete knowledge and (13.70 %) had no knowledge respectively. For Borax (54.81 %) respondents had partial knowledge followed by (41.11 %) had complete knowledge and (4.07 %) had no knowledge respectively. While, cent per cent respondents had complete knowledge regarding different micro-nutrient formulations. Regarding doses of Micronutrients *viz.* Ferrous sulphate (52.96 %) respondents had complete knowledge followed by (43.33 %) had partial knowledge and 03.70 per cent had no knowledge respectively. Regarding dose of Magnese Sulphate (77.77 %) respondents had complete knowledge followed by (14.81 %) had partial knowledge and 7.40 per cent had no knowledge respectively. About Zink Sulphate (92.59 %) respondents had complete knowledge followed by (7.40 %) had partial knowledge respectively. For Copper Sulphate (85.18 %) respondents had complete knowledge followed by (14.81 %) had partial knowledge respectively. For Borax (74.07 %) respondents had complete knowledge followed by (18.51 %) had partial knowledge and 7.40 per cent had no knowledge respectively. However regarding micronutrient used before flowering and fruit setting (48.14 %) respondents had partial knowledge followed by 40.74 per cent had complete knowledge and 11.11 percent had no knowledge respectively. While cent per cent respondents had complete knowledge about methods of application of micronutrients- trough Soil in Chelated form and in spray form respectively. However about useful inorganic micronutrients *viz.*, EDTA (79.25 %) had no knowledge followed by (13.70 %) had partial knowledge and 7.03 per cent had complete knowledge respectively. About EDDHA (77.77 %) respondents had no knowledge followed by (14.07 %) had partial knowledge and 8.14 per cent had complete knowledge respectively. About HEDTA (69.25 %) respondents had no knowledge followed by (20.74 %) had partial knowledge and 10.00 per cent had complete knowledge respectively. Regarding DTPA(67.77 %) respondents had no knowledge followed by (17.77 %) had partial

knowledge and 14.14 per cent had complete knowledge respectively. About Citric acid(39.63 %) respondents had no knowledge followed by (36.66 %) respondents had partial knowledge and 23.70 per cent had complete knowledge respectively. However about Humic acid (47.03 %) respondents had partial knowledge followed by 43.70 per cent had complete knowledge and 9.26 percent had no knowledge respectively. While about Amino acid (56.29 %) respondents had partial knowledge followed by 35.92 per cent had complete knowledge and 7.78 percent had no knowledge respectively. Lastly about Gluconet (37.77 %) respondents had partial knowledge followed by 37.04 per cent had no knowledge followed by (25.18 %) had complete knowledge, respectively.

Table 56. Distribution of respondents according to their component wise knowledge level about Integrated Nutrient Management Practices

Sl. No.	Knowledge level	Respondents (N = 270)	
		Frequency	Percentage
1.	Integrated Nutrient Management (05 practices)		
1.	Low (Up to 08 score)	49	18.15
2.	Medium (09 to 11 score)	81	30.00
3.	High (12 and above score)	140	51.85
	Total	270	100.00
	Maximum score = 15	Minimum score = 05	
2.	Organic Fertilizer (13 practices)		
1.	Low (Up to 21 score)	52	19.25
2.	Medium (22 to 30 score)	90	33.33
3.	High (31 and above score)	128	47.42
	Total	270	100.00
	Maximum score = 39	Minimum score = 13	
3.	Green Manure (05 practices)		
1.	Low (Up to 08 score)	48	17.17
2.	Medium (09 to 12 score)	108	40.00
3.	High (13 and above score)	114	42.23
	Total	270	100.00
	Maximum score = 15	Minimum score =05	

Table 56 contd.....

Sl. No.	Knowledge level	Respondents (N = 270)	
		Frequency	Percentage
4.	Biofertilizer (05 practices)		
1.	Low (Up to 08 score)	69	25.55
2.	Medium (09 to 12 score)	169	62.59
3.	High (13 and above score)	32	11.86
	Total	270	100.00
	Maximum score = 15	Minimum score = 05	
5.	Chemical Fertilizer (11 practices)		
1.	Low (Up to 18 score)	36	13.33
2.	Medium (19 to 26 score)	59	21.85
3.	High (27 and above score)	175	64.82
	Total	270	100.00
	Maximum score = 33	Minimum score =11	
6.	Fertigation (09 practices)		
1.	Low (Up to 15 score)	29	10.74
2.	Medium (16 to 22 score)	61	22.59
3.	High (23 and above score)	180	66.67
	Total	270	100.00
	Maximum score = 27	Minimum score =09	
7.	Micronutrients (25 practices)		
1.	Low (Up to 41 score)	38	14.07
2.	Medium (42 to 58 score)	78	28.88
3.	High (59 and above score)	154	57.05
	Total	270	100.00
	Maximum score = 75	Minimum score = 25	

The observations in Table 56 indicate that, near about fifty (51.85 %) per cent of the respondents had 'high' knowledge about integrated nutrient management

followed by (30.00 %) had medium and 18.15 per cent low knowledge, respectively. While, regarding organic fertilizers 47.42 per cent respondents had ‘high’ knowledge followed by 33.33 had medium and 19.25 per cent had low knowledge respectively. With regard to green manure 42.23 per cent respondents had ‘high’ knowledge level followed by 40.00 per cent had medium and 17.17 per cent had low knowledge level respectively. Regarding Bio-fertilizers, 62.59 per cent had medium knowledge level followed by 25.55 per cent had low and 11.86 per cent had high knowledge level respectively. About Chemical fertilizers 64.82 per cent respondents had ‘high’ knowledge level followed by 21.85 per cent had medium and 13.33 per cent had low knowledge level respectively. While about fertigation in pomegranate nearly two-third of the respondents had ‘high’ knowledge level followed by 22.59 per cent had medium and 10.74 per cent had low knowledge level respectively. About micronutrients 57.05 per cent respondents had ‘high’ knowledge level followed by 28.88 per cent had medium and 14.07 per cent had low knowledge level respectively.

4.7 Utilization of various nutrient management practices by the pomegranate growers

The information pertaining to extent of adoption about various plant protection measures by the pomegranate growers is presented hereunder.

4.7.1 Overall utilization level of pomegranate growers

The overall extent of adoption of the respondents in relation to nutrient management practices of pomegranate was assessed. For this purpose, an adoption index was developed and used. The adoption score of each respondent was calculated and the adoption index was calculated. On the basis of adoption index range respondents were grouped in to three categories with the help of range *viz.*, low, medium and high adoption level as shown in Table 57.

The data pertaining to overall utilization of nutrient management practices followed by respondents is presented in Table 57 and it can be observed from Table 57 that ,64.82 per cent respondents had ‘medium’ utilization, while, 26.29 and 8.89 per cent had ‘high’ and ‘low’ utilization pertaining to the various nutrient management practices.

This may be due to the reason that, majority of the Pomegranate growers were from the group who had medium level of knowledge about nutrient management practices. It can be concluded from the above results that , most of the Pomegranate growers had medium level of utilization category. Similar findings were reported by Mahajan (2000), More (2002)and Nanaware (2017).

Table 57. Distribution of the respondents according to their overall utilization of nutrient management practices

Sl. No.	Extent of utilization of fertilizers	Respondents (N= 270)	
		Number	Percentage
1.	Low (Up to 118)	24	08.89
2.	Medium (119 to 211)	175	64.82
3.	High (212 and above)	71	26.29
	Total	270	100.00
	Maximum Score	294	
	Minimum Score	25	
	Class interval	93	

4.7.2 Practice wise utilization level of pomegranate growers

The information pertaining to the extent of utilization of different practice wise and nutrient management wise by the respondents under eleven major heads *viz.*, soil selection, water management, land preparation, selection of planting material, bahar management, organic manures, green manures, bio-fertilizers, chemical fertilizers, fertigation and micro-nutrients are depicted hereunder.

4.7.2.1 Soil selection and water management

The data pertaining to soil selection and water management practices adopted was collected and presented in Table 58 and 59.

The data presented in the Table 58 revealed that the majority (73.33 %) of the pomegranate growers had utilized deep loamy, medium to light black, well drained soil for pomegranate cultivation which is ‘as per recommendation’ where as, land cultivated utilized by 26.66 per cent of respondents has ‘ not as per recommendation‘ for its cultivation. While, adequate pH limit of soil required was partial utilized ‘not as per recommendation by 44.07 per cent followed by complete utilization ‘as per recommendation’ and 27.03 percent has no utilization by respondents. However, 44.07

per cent respondents was partial utilized 'not as per recommendation followed by complete utilization' as per recommendation '28.88 per cent and 27.03 percent has no utilization about EC of soil by respondents. While, 85.55 per cent of the respondents had 'no utilization' followed by 8.52 per cent had partial utilization 'not as per recommendation' and 5.93 per cent had complete utilization 'as per recommendation' about appropriate carbonate content of soil required for pomegranate cultivation, respectively.

Table 58. Distribution of respondents according to practices of soil selection followed.

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
1	Soil type				
	Deep loamy alluvial soil/Medium to light black, well drained	198 (73.33)	72 (26.66)	0 (0.00)	270 (100.00)
2	Soil pH - 6.5-8.5	78 (28.89)	119 (44.07)	73 (27.03)	270 (100.00)
3	Soil EC < 0.05	78 (28.88)	119 (44.07)	73 (27.03)	270 (100.00)
4	Organic carbon	16 (5.93)	23 (8.52)	231 (85.55)	270 (100.00)

(Figures in the parentheses indicate percentage)

The data further reveal in table 59 that, more than eighty per cent of the respondents 66.29 per cent had 'no utilization' followed by 18.51 per cent had partial utilization 'not as per recommendation' and 15.19 per cent had complete utilization 'as per recommendation' about pH of water. However, about EC of water 84.81 per cent had 'no utilization' followed by 15.19 per cent had complete utilization 'as per recommendation' respectively. While, 90.74 per cent respondents had complete utilization 'as per recommendation' of drip irrigation method and for 9.26 per cent had complete utilization 'as per recommendation' of ring irrigation method for cultivation. As per number of dripper per plant is concern, 93.70 per cent had complete utilization 'as per recommendation' followed by 6.30 per cent had partial utilization 'not as per recommendation'. It was also observed that 85.18 per cent had complete utilization 'as per recommendation' followed by 14.81 per cent had partial utilization 'not as per recommendation' about drip placement from stem. While about accurate discharge of water per plant 53.70 per cent had complete utilization 'as per recommendation' followed by 41.48 per cent had partial utilization 'not as per recommendation' and 4.81 per cent

had 'no utilization respectively. About actual pressure of drip 48.14 per cent had complete utilization 'as per recommendation' followed by 24.07 per cent had partial utilization 'not as per recommendation' and 11.11 per cent had 'no utilization respectively. Lastly, about spacing of dripper 90.74 per cent had complete utilization 'as per recommendation' followed by 9.26 per cent had partial utilization 'not as per recommendation' in pomegranate cultivation.

Table 59. Distribution of respondents according to practices of Water Management followed

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
1	pH of water				
	6.51- 7.5	41 (15.19)	50 (18.51)	179 (66.29)	270 (100.00)
2	EC of water				
	>1.0	41 (15.19)	0 (0.00)	229 (84.81)	270 (100.00)
3	Irrigation method				
	Drip	245 (90.74)	0 (0.00)	25 (9.26)	270 (100.00)
	Ring	25 (9.26)	0 (0.00)	245 (90.74)	270 (100.00)
4	Dripper per plant				
	2-4	253 (93.70)	17 (6.30)	0.00 (0.00)	270 (100.00)
5	Drip placement from stem of pomegranate				
	1.5 feet	230 (85.18)	40 (14.81)	0 (0.00)	270 (100.00)
6	Discharge of water per plant				
	26-35 lit./plant/day	145 (53.70)	112 (41.48)	13 (04.81)	270 (100.00)
7	Pressure of drip				
	>2.00 kg/cm ²	130 (48.14)	65 (24.07)	30 (11.11)	270 (100.00)
8	Dripper spacing				
	1.5 ft	245 (90.74)	25 (09.26)	0 0.00	270 (100.00)

(Figures in the parentheses indicate percentage)

4.7.2.2 Land preparation

Land preparation contributes towards the clean cultivation in pomegranate. It might act as booster for whole process of nutrient management. The data regarding this aspect was collected and presented in Table 60.

Table 60. Distribution of respondents according to practices of land preparation followed.

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
1	Ploughing frequency				
	2- 3	158 (58.51)	112 (41.48)	00 (0.00)	270 (100.00)
2	Pit dimension				
	3x3x3	178 (65.92)	92 (34.07)	0 (0.00)	270 (100.00)
3	Spacing between plant				
	10 ft	231 (85.55)	49 (18.14)	0 (0.00)	270 (100.00)
4	Spacing between rows				
	15 ft	216 (80.00)	54 (20.00)	0 (0.00)	270 (100.00)
5	Organic and inorganic fertilizers in pit				
	Sand + SSP (1 kg) + Neem cake (2 kg) + Copper oxychloride (25 g) + Trichoderma or Pseudomonas (25 g) in pit	145 (53.70)	125 (46.29)	0 (0.00)	270 (100.00)
6	Quantity of compost				
	2 – 3Ghamela	155 (57.40)	115 (42.59)	0 (0.00)	270 (100.00)

(Figures in the parentheses indicate percentage)

From Table 60 it can be observed that, recommended ploughing frequency is 2-3 in pomegranate, while doing land preparation 58.51 per cent respondents followed

as per recommendation followed by 41.48 per cent respondents had not utilized the practice as per recommendation. While about dimension of pit 65.92 per cent respondents had utilized 'as per recommendation' and 34.07 per cent had utilized 'not as per recommendation'. Regarding spacing between plant 85.55 per cent had keeps 'as per recommendation' followed by 18.14 per cent had utilized 'not as per recommendation', while about spacing between row 80.00 per cent had utilized 'as per recommendation' and by 20.00 per cent respondents had not utilized as per recommendation. How ever, about material utilized for filling of pit 53.70 per cent had utilized 'as per recommendation' followed by 46.29 per cent had not utilized as per recommendation. About actual quantity of compost required for filling pit 57.40 per cent had utilized 'as per recommendation' followed by 42.59 per cent had not utilized as per recommendation in pomegranate cultivation.

4.7.2.3 Selection of planting material and bahar management

Planting material and bahar management both factors are crucial for healthy orchard management. Selection of disease free planting material and utilization of proper bahar decides the disease and pest intensity in pomegranate. The data on these factors were collected and presented in Table 61 and 62.

It can be observed from Table 61 that large majority (66.30 %) respondents had sourced seedlings from private nursery followed by 10.74 per cent respondents who sourced their seedlings from Govt. nursery, 14.07 per cent of the respondents had KVK as their source of seedling for plantation and only 08.88 per cent respondents purchased seedlings from Agril. University. While, air layering had complete utilizes by 56.30 per cent respondents and tissue culture 43.70 per cent respondents as a type of seedling. However, regarding varieties used *viz.*, Ganesh (29.25 %) followed by Mridula (02.96 %) followed by Phule arakta (23.70 %) followed by Super bhagva (41.85 %) and cent percent respondents used Bhagva variety for plantation.

Table 61. Distribution of respondents according to selection of planting material

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
1	Source of seedling				
	Agril. University	24 (08.88)	0 (0.00)	246 (91.12)	270 (100.00)
	Govt. Nursery	38 (14.07)	0 (0.00)	232 (85.93)	270 (100.00)
	Private nursery	179 (66.30)	0 (0.00)	91 (33.70)	270 (100.00)
	KVK	29 (10.74)	0 (0.00)	241 (89.25)	270 (100.00)
2	Types of seedling				
	Air Layering	152 (56.30)	0 (0.00)	0 (0.00)	270 (100.00)
	Tissue culture	118 (43.70)	0 (0.00)	0 (0.00)	
3	Varieties				
	Ganesh	79 (29.25)	0 (0.00)	191 (70.74)	270 (100.00)
	G-137	0 (0.00)	0 (0.00)	270 (100.00)	270 (100.00)
	Mridula	08 (2.96)	0 (0.00)	262 (97.03)	270 (100.00)
	Phule arakta	64 (23.70)	0 (0.00)	206 (76.29)	270 (100.00)
	Bhagva	270 (100.00)	0 (0.00)	0.00	270 (100.00)
	Super bhagva	113 (41.85)	0 (0.00)	157 (58.14)	270 (100.00)

(Figures in the parentheses indicate percentage)

Table 62. Distribution of farmers according to practices of bahar management followed

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
1	Bahars				
	Ambe (Jan.- Feb.)	71 (26.29)	0 (0.00)	199 (73.70)	270 (100.00)
	Mrig (June- July)	42 (15.55)	0 (0.00)	67 (24.81)	270 (100.00)
	Hasta (October)	203 (75.18)	0 (0.00)	228 (84.44)	270 (100.00)
2	Chemical used for defoliation				
	Ethrel (2 ml/lit)	270 (100.00)	0 (0.00)	0 (0.00)	270 (100.00)
3	Defoliation for better flowering	270 (100.00)	0 (0.00)	0 (0.00)	270 (100.00)
4	Time of Bordeaux mixture application				
	After pruning	198 (73.33)	72 (26.66)	0 (0.00)	270 (100.00)
5	Location of Bordeaux mixture application				
	Pruned branch	218 (80.74)	52 (19.25)	0 0.00	270 (100.00)
	Stem	270 (100.00)	0 0.00	0 0.00	270 (100.00)
	Spraying 1% BM	156 (57.77)	114 (42.23)	0 (0.00)	270 (100.00)
6	Resting Period –3 - 3.5 Months	228 (84.44)	42 (15.55)	0 (0.00)	270 (100.00)

(Figures in the parentheses indicate percentage)

With regard to bahar management in Table 62, large majority 75.18 per cent of the respondents had complete utilization of Hasta bahar followed by 26.29 per cent Ambe bahar and 15.55 per cent Mrig bahar respectively. While cent per cent respondents utilizes ethrel for defoliation and followed defoliation for better flowering as per recommendation. However, 73.33 per cent of respondents completely followed time

of Bordeaux mixture application after pruning as per recommendation, and 26.66 per cent did not followed as per recommendation. While, cent per cent respondents completely utilizes Bordeaux mixture application on stem followed by 80.74 per cent on pruned branch and by 57.14 per cent respondents has spraying 1% BM as per recommendation respectively. About resting period, 84.44 per cent respondents completely follow the practice as per recommendation and 15.55 per cent did not followed practice as per recommendation.

4.7.2.4 Organic fertilizers

Integrated nutrient management are crucial for maximum production of Pomegranate orchard. Selection, types, methods and time of application of organic and concentrated organic fertilizers and its utilization decides the productivity in pomegranate. The data on these factors were collected and presented in Table 63a and 63b.

From Table 63 (a) it can be observed that 84.07 per cent pomegranate growers had cattle as their major source of manure followed by (82.22 %) following Sheep penning for manuring crop and (80.74 %) utilizing Poultry manure as per recommendation. While, about timely application of organic manure at planting, majority (59.62 %) of the respondents had not utilized the practice as per recommendation followed by 20.74 per cent not utilizing it and only 19.62 per cent utilized it as per recommendation. About timing of application of manures at bahar treatment, 58.51 per cent had not utilized as per recommendation followed by 21.48 per cent not utilized and 20.00 per cent only utilized as per recommendation. And about application of manures at flowering / fruiting stage, 60.00 per cent had not utilized as per recommendation followed by 20.37 per cent utilized as per recommendation and no utilization for 19.62 per cent respondents only. However regarding organic fertilizer dose for first year of plant, 54.40 per cent respondents had not utilized as per recommendation followed by 25.92 per cent had not utilized and 19.62 per cent only utilized as per recommendation respectively. For second years plant 52.96 per cent respondents had not utilized as per recommendation followed by 27.77 per cent not utilized and 19.25 per cent only utilized as per recommendation respectively. For third years plant 52.59 per cent respondents had

not utilized as per recommendation followed by 28.51 per cent not utilizes and 18.88 per cent only utilized as per recommendation respectively. For fourth years plant 54.81 per cent respondents had not utilized as per recommendation followed by 26.66 per cent not utilized and 18.51 per cent only utilized as per recommendation respectively. And five and above years plant 55.55 per cent respondents had not utilized as per recommendation followed by 24.44 per cent not utilized and 20.00 per cent only utilized as per recommendation respectively.

Table 63a. Distribution of Pomegranate growers according to their utilization level about organic fertilizers

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
1	Source of manures				
	Cattle	227 (84.07)	43 (15.92)	00 (0.00)	270 (100.00)
	Sheep penning	222 (82.22)	48 (17.77)	00 (0.00)	270 (100.00)
	Poultry	218 (80.74)	52 (19.25)	00 (0.00)	270 (100.00)
2	Time of manure application				
	At planting	53 (19.62)	161 (59.62)	56 (20.74)	270 (100.00)
	At bahar treatment	54 (20.00)	158 (58.51)	58 (21.48)	270 (100.00)
	Flowering/ Fruiting stage	55 (20.37)	162 (60.00)	53 (19.62)	270 (100.00)
3	Organic fertilizer dose for 1-5 years and above age of plant				
4	First year- 10 kg manures / plant	53 (19.62)	147 (54.40)	70 (25.92)	270 (100.00)
5	Second year- 20 kg manures / plant	52 (19.25)	143 (52.96)	75 (27.77)	270 (100.00)
6	Third year- 30 kg manures / plant	51 (18.88)	142 (52.59)	77 (28.51)	270 (100.00)
7	Fourth year- 40 kg manures / plant	50 (18.51)	148 (54.81)	72 (26.66)	270 (100.00)
8	Fifth and above year- 50 kg manures / plant	54 (20.00)	150 (55.55)	66 (24.44)	270 (100.00)

(Figures in the parentheses indicate percentage)

Table 63b. Distribution of Pomegranate growers according to their utilization level about concentrated organic fertilizers

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
A.	Plant origin Edible cake				
1.	Edible oil cake- G.nut Cake, Lentil, Sesamum, Mustard	13 (04.81)	27 (10.00)	230 (85.18)	270 (100.00)
B.	Non edible cake				
1.	Castor cake	12 (04.44)	42 (15.55)	216 (80.00)	270 (100.00)
2.	Neem cake	10 (03.70)	46 (17.03)	214 (79.23)	270 (100.00)
3.	Sunflower cake	09 (03.33)	44 (16.29)	217 (80.37)	270 (100.00)
4.	Karanj cake	07 (02.59)	40 (14.81)	223 (82.59)	270 (100.00)
C.	Animal origin				
1.	Blood meal	01 (0.37)	04 (01.48)	265 (98.14)	270 (100.00)
2.	Bone meal	02 (0.74)	03 (01.11)	265 (98.14)	270 (100.00)
3.	Fish meal	03 (01.11)	06 (02.22)	261 (96.66)	270 (100.00)

(Figures in the parentheses indicate percentage)

It can be observed from Table 63b that majority 85.18 per cent respondents had not utilized edible oil cakes as organic fertilizer, only 4.81 per cent of the respondents had utilized it as per recommendation and 10.00 per cent had utilized edible oil cakes but not as per recommendation. Regarding non edible oil cakes majority (82.59 %) had not utilized Karanj cake, similar is with Sunflower cake (80.37 %) and Neem cake (79.23 %) respondents had not utilized them. Regarding animal origin concentrated organic fertilizers it can be observed from Table 63(b) that more than 95.00 per cent i.e. 98.17 per cent in case of blood meal 96.66 per cent in case of fish meal, respondents had not utilized it. A meager per cent of the respondents 01.11 per cent, 0.74 per cent and 0.37 per cent had utilized fish meal, bone meal and blood meal as per recommendation. It can also be stated from Table 63(b) that nearly 02.22 per cent had utilized fish meal for manuring but it was not as per recommendation. 01.11 per cent and

01.48 per cent of the respondents used bone meal and blood meal for manuring but not as per recommendation.

4.7.2.5 Green manures

Green manures management are crucial for maximum production of Pomegranate orchard. Selection of types, time and doses of green manures utilization decides the fertility and water holding capacity in pomegranate. The data on these factors were collected and presented in Table 64.

It was observed from Table 64 about types of Leguminous crops utilized by Pomegranate growers *viz.* *Sunhemp* 61.48 per cent had not utilized followed by 37.77 per cent has not as per recommendation and 0.74 per cent as per recommendation. About *Mung* crop 60.37 per cent had not utilized followed by 38.51 per cent has not as per recommendation and very negligible 01.11 per cent as per recommendation. While, *Cowpea*, 60.00 per cent had not utilized followed by 38.88 per cent had not as per recommendation and 01.11 per cent as per recommendation. About *Berseem* 60.00 per cent had not utilized followed by 39.25 per cent has not as per recommendation and 0.74 per cent as per recommendation. Also about *Gavar* 60.00 per cent had not utilized followed by 39.62 per cent has not as per recommendation and 0.37 per cent as per recommendation. While, *Dhaincha* 58.88 per cent had not utilizes followed by 40.00 per cent has not as per recommendation and 01.11 per cent as per recommendation. And cent per cent respondents had not utilized *Black gram* as a green manures crop. Also about use of perennial plants as a green manures *viz.* *Subabhul* 59.62 per cent respondents had not utilized followed by 38.14 per cent has not as per recommendation and 02.22 per cent as per recommendation. For *Glyricidea* 57.77 per cent respondents had not utilized followed by 39.25 per cent has not as per recommendation and 02.96 per cent as per recommendation. Regarding *Karanj* 58.88 per cent respondents had not utilized followed by 38.51 per cent had not utilized as per recommendation and only 02.59 per cent utilized as per recommendation. Also about *Shevari* 59.25 per cent respondents had not utilizes followed by 38.88 per cent has not as per recommendation and 01.85 per cent as per recommendation only. However about application stages of green manuring crop at 50 % flowering stage 50.37 per cent respondents had not utilizes followed by 39.25 per cent

has not as per recommendation and 10.37 per cent respondents had as per recommendation only. And about 8-10 weeks after planting stage 49.25 per cent respondents had not utilized followed by 40.00 per cent has not as per recommendation and 10.74 per cent respondents had as per recommendation only.

Table 64. Distribution of Pomegranate growers according to their utilization level about green manures

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
A. Leguminous					
1.	Sunhemp	02 (0.74)	102 (37.77)	166 (61.48)	270 (100.00)
2.	Mung	03 (01.11)	104 (38.51)	163 (60.37)	270 (100.00)
3.	Cowpea	03 (01.11)	105 (38.88)	162 (60.00)	270 (100.00)
4.	Berseem	02 (0.74)	106 (39.25)	162 (60.00)	270 (100.00)
5.	Gavar	01 (0.37)	107 (39.62)	162 (60.00)	270 (100.00)
6.	Dhaincha	03 (01.11)	108 (40.00)	159 (58.88)	270 (100.00)
7.	Black gram	00 (0.00)	00 (0.00)	270 (100.00)	270 (100.00)
B. Perennial Plants					
1.	Subabhul	06 (02.22)	103 (38.14)	161 (59.62)	270 (100.00)
2.	Glyricidea	08 (02.96)	106 (39.25)	156 (57.77)	270 (100.00)
3.	Karanj	07 (02.59)	104 (38.51)	159 (58.88)	270 (100.00)
4.	Shevari	05 (01.85)	105 (38.88)	160 (59.25)	270 (100.00)
C. Application stage of green manuring crop					
1.	At 50 % flowering	28 (10.37)	106 (39.25)	136 (50.37)	270 (100.00)
2.	8-10 weeks after planting	29 (10.74)	108 (40.00)	133 (49.25)	270 (100.00)
D. Dose of green manures (t/ha)					
1.	15-20	04 (01.48)	108 (40.00)	158 (58.51)	270 (100.00)

(Figures in the parentheses indicate percentage)

While, dose of green manures (t/ha) 58.51 per cent respondents had not utilized followed by 40.00 per cent has not as per recommendation and 01.48 per cent respondents had utilized as per recommendation only.

4.7.2.6 Bio-fertilizers

Bio-fertilizer management are crucial for maximum production of Pomegranate orchard. Selection, time and doses of Bio-fertilizer utilization decides the fertility and increase microbial activity in soil in pomegranate. The data on these factors were collected and presented in Table 65.

Table 65. Distribution of Pomegranate growers according to their utilization level about biofertilizers

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
A.	Biofertilizers				
1.	Pseudomonas 40 gm/plant	188 (69.62)	45 (16.66)	37 (13.70)	270 (100.00)
2.	Trichoderma 25 gm/plant	183 (67.77)	44 (16.29)	43 (15.92)	270 (100.00)
3.	Pasilomycene 20 gm/plant	172 (63.70)	41 (15.18)	57 (21.11)	270 (100.00)
4.	PSB 20 gm / plant	188 (69.62)	48 (17.77)	34 (12.59)	270 (100.00)
5.	VAM 20 gm/plant	124 (45.92)	75 (27.77)	71 (26.29)	270 (100.00)
6.	KSB 25 gm/plant	112 (41.48)	65 (24.07)	93 (34.44)	270 (100.00)
B.	Application time				
1.	At planting	161 (59.62)	27 (10.00)	82 (30.37)	270 (100.00)
2.	After planting	153 (57.03)	30 (11.11)	87 (32.22)	270 (100.00)

(Figures in the parentheses indicate percentage)

Data pertaining use of bio-fertilizers by the respondents it depicted in Table 65. It can be observed from Table B that equal no. of respondents (69.62 %) had utilized PSB and Pseudomonas as per recommendation followed by 67.77 per cent of respondents using Trichoderma and 63.70 per cent utilizing Pasilomycene as per as per recommendation. Less than fifty per cent i.e. 45.92 and 41.48 per cent of respondents had utilized VAM and KSB as per as per recommendation. How ever about application at

planting time 59.62 per cent respondents had utilized as per as per recommendation followed by 30.37 per cent had not utilized and 10.00 per cent had not as per recommendation respectively. Lastly about after planting time 57.03 per cent respondents had utilized as per as per recommendation followed by 32.22 per cent had not utilized and very less 11.11 per cent had not utilized as per recommendation respectively.

4.7.2.7 Chemical fertilizers and fertigation

Chemical fertilizer management are crucial for maximum production of Pomegranate orchard. Selection, methods, time, doses of Chemical fertilizer and through fertigation utilization decides the fertility and increase nutrient availability in soil in pomegranate. The data on these factors were collected and presented in Table 66.

Table 66. Distribution of Pomegranate growers according to their utilization level about chemical fertilizers and fertigation

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
1	Fertilizer dose by soil testing	34 (12.59)	10 (03.70)	226 (83.70)	270 (100.00)
2	Method of fertilizer application			37 (13.70)	270 (100.00)
	Ring	257 (95.18)	13 (04.81)	00 (0.00)	270 (100.00)
	Drip	246 (91.11)	24 (08.88)	00 (0.00)	270 (100.00)
3	Fertigation form				
	Liquid	246 (91.11)	24 (08.88)	00 (0.00)	270 (100.00)
4	Stages in which NPK are given				
	At planting	57 (21.11)	160 (59.25)	53 (19.62)	270 (100.00)
	Bahar treatment	48 (17.77)	142 (52.59)	80 (29.62)	270 (100.00)
	Flowering and fruiting	40 (16.66)	148 (54.81)	82 (30.37)	270 (100.00)
	When fruits size like chikku	57 (21.11)	157 (58.14)	56 (20.74)	270 (100.00)
	One month before harvesting	55 (20.37)	135 (50.00)	80 (29.62)	270 (100.00)

Table 66 contd.....

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
5	Time of split dose of N				
	½ N at Bahar	60 (22.22)	162 (60.00)	48 (17.77)	270 (100.00)
	½ N after one month	58 (21.48)	149 (55.18)	63 (23.33)	270 (100.00)
6	Dose of NPK g /plant for 1-2 years plant				
	250:125:125	98 (36.29)	123 (45.55)	49 (18.14)	270 (100.00)
7	Dose of NPK g /plant for 3-4 years plant				
	500:125:125	58 (21.48)	168 (62.22)	44 (16.29)	270 (100.00)
8	Dose of NPK g /plant for 5 and above years plant				
	625: 250:250	106 (39.25)	118 (43.70)	46 (17.03)	270 (100.00)
	Fertigation				
9	Fertigation method				
	Drip	246 (91.11)	00 (0.00)	24 (08.88)	270 (100.00)
	Sprinkler	15 (05.55)	00 (0.00)	255 (94.44)	270 (100.00)
10	Fertigation by means				
	Ventury	246 (91.11)	00 (0.00)	00 (0.00)	270 (100.00)
	Fertilizer tank	238 (88.14)	00 (0.00)	00 (0.00)	270 (100.00)
	HTP pump	222 (82.22)	00 (0.00)	00 (0.00)	270 (100.00)
11	Grades used of water soluble				
	19:19:19	51 (18.88)	135 (50.00)	84 (31.11)	270 (100.00)
	0:52:34	48 (17.77)	157 (58.14)	65 (24.07)	270 (100.00)
	12:52:34	61 (22.59)	163 (60.37)	101 (37.40)	270 (100.00)
	13:00:45	37 (13.70)	184 (68.14)	49 (18.14)	270 (100.00)
	00:00:50	22 (08.14)	12 (04.44)	235 (87.03)	270 (100.00)

Table 66 contd.....

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
12	NPK through fertigation g / plant/ year				
	500:200:200	108 (40.00)	125 (46.29)	37 (13.70)	270 (100.00)
13	NPK dose at interval (days)				
	20 splits at 7 days	19 (07.03)	34 (12.59)	217 (80.37)	270 (100.00)

(Figures in the parentheses indicate percentage)

Table 66 revealed that majority 83.70 per cent Pomegranate growers had not utilized chemical fertilizer dose as per soil testing report followed by 12.59 per cent only utilized as per recommendation and very negligible 03.70 per cent respondents had not utilized as per recommendation. While, large majority, 95.18 per cent respondents had utilized ring method and 91.11 per cent respondents had utilized drip method of fertilizer application and fertilizer in liquid form as per recommendation. However, regarding stages in which NPK are given, at planting stage 59.25 per cent respondents had not utilized NPK as per recommendation followed by 21.11 had only utilized as per recommendation and 19.62 had not utilized NPK fertilizers. While, about bahar treatment stage 52.59 per cent respondents had not utilized NPK as per recommendation followed by 29.62 had not utilizes NPK fertilizers and 17.77 had only utilized as per recommendation only. About flowering and fruiting stage 54.81 per cent respondents had not utilized NPK as per recommendation followed by 30.37 had not utilizes NPK fertilizers and 16.66 had only utilized as per recommendation only. Regarding fruits size like chikku stage 58.14 per cent respondents had not utilized NPK as per recommendation followed by 21.11 had only utilized as per recommendation and near about one fifth respondents 20.74 had not utilized any NPK fertilizers. Also at one month before harvesting stage half respondents 50.00 per cent had not utilized NPK as per recommendation followed by 29.62 had not utilizes NPK fertilizers and 20.37 had only utilized as per recommendation only. It is also observed that regarding time of split dose of N fertilizer at $\frac{1}{2}$ N at bahar 60.00 per cent respondents had not utilized as per recommendation followed by 22.22 per cent had only utilized as per recommendation

dose and 17.77 had not utilized $\frac{1}{2}$ N fertilizers at bahar stage. About $\frac{1}{2}$ N application after one month stage of orchard 55.18 per cent had not utilized $\frac{1}{2}$ N dose as per recommendation followed by 23.33 had not utilized $\frac{1}{2}$ N dose fertilizers and 21.48 had only utilized $\frac{1}{2}$ N dose as per recommendation only. However regarding doses of NPK g / plant for 1-2 years plant near to half 45.55 per cent respondents had not utilized NPK dose as per recommendation followed by 36.29 had only utilized as per recommendation dose and near about one fifth respondents 18.14 had not utilized any NPK dose fertilizers. While, NPK g / plant for 3-4 years plant 62.22 per cent respondents had not utilized as per recommendation followed by 21.48 per cent respondents had only utilized as per recommendation dose and 16.29 had not utilized any NPK fertilizers dose. About NPK g / plant for 5 years and above years plant 43.70 per cent respondents had not utilized as per recommendation followed by 39.25 per cent respondents had only utilized as per recommendation dose and 17.03 had not utilized any NPK fertilizers dose. And about fertigation method, 91.11 per cent respondents had used drip method for fertigation and only 05.55 per cent respondents used sprinkler method. While, 91.11 per cent respondents had utilized Ventury for fertigation followed by 88.14 per cent respondents used Fertilizer tank method and 82.22 per cent respondents used HTP pump for fertigation respectively. Near about fifty to sixty per cent respondents had not utilized different grades of water soluble as per recommendation viz. 19:19:19 grade (50.00 %), 0:52:34 grade (58.14 %), 12:52:34 grade (60.37 %), 13:00:45 grades (68.14 %) respectively. While, recommended dose of NPK through fertigation g / plant/ year (500:200:200) -46.29 respondents had not utilized as per recommendation followed by 40.00 per cent respondents had only utilized as per recommendation dose and 13.70 had not utilized any fertilization dose. Lastly, about NPK 20 splits dose at 7 days interval of fertigation, 80.37 per cent respondents had not utilized at all.

4.7.2.8 Micronutrients

Micronutrient management are crucial for maximum production of Pomegranate orchard. Selection, methods, time, doses of Micro nutrient utilization decides the fertility and increase nutrient availability in soil in pomegranate. The data on these factors were collected and presented in Table 67.

Table 67. Distribution of pomegranate growers according to their utilization level about Micronutrients

Sl. No.	Particulars	As per recommendation	Not as per recommendation	No	Overall (N=270)
1	Chelating of micronutrients				
	Manures/ Compost	52 (19.25)	156 (56.77)	62 (22.96)	270 (100.00)
	Neem cake	10 (03.70)	46 (17.03)	214 (79.25)	270 (100.00)
2	Dose of Micronutrients				
	Ferrous sulphate 30gm/plant	123 (45.55)	100 (37.03)	47 (17.40)	270 (100.00)
	Manganese sulphate 40gm /plant	190 (70.37)	61 (22.59)	19 (07.03)	270 (100.00)
	Zinc sulphate- 40gm/plant	214 (79.25)	31 (11.48)	25 (09.25)	270 (100.00)
	Copper sulphate25gm/plant	205 (75.92)	46 (17.03)	19 (07.03)	270 (100.00)
	Borax-20gm/plant	184 (68.14)	55 (20.37)	31 (11.48)	270 (100.00)
3	Micronutrients used at flowering and before maturity of fruit				
	Boric acid	83 (30.74)	106 (61.48)	81 (30.00)	270 (100.00)
4	Methods of application of micronutrients				
	Through Soil	225 (83.33)	00 (0.00)	00 (0.00)	270 (100.00)
	Spraying	251 (99.60)	00 (0.00)	00 (0.00)	270 (100.00)
	Chelated	235 (87.03)	00 (0.00)	00 (0.00)	270 (100.00)
5	Inorganic micronutrients				
	EDTA	15 (05.55)	41 (15.18)	214 (79.25)	270 (100.00)
	EDDHA	05 (01.85)	55 (20.37)	210 (77.77)	270 (100.00)
	HEDTA	22 (08.14)	61 (22.59)	189 (70.00)	270 (100.00)
	DTPA	34 (12.59)	53 (19.62)	183 (67.77)	270 (100.00)
	Citric acid	58 (21.48)	105 (38.88)	107 (39.62)	270 (100.00)
6	Organic micronutrients				
	Humic acid	76 (28.14)	169 (62.59)	25 (09.25)	270 (100.00)
	Amino acid	58 (21.48)	191 (70.74)	21 (07.77)	270 (100.00)
	Gluconet	41 (15.18)	129 (47.77)	100 (37.03)	270 (100.00)

(Figures in the parentheses indicate percentage)

The data presented in Table 67 also revealed that chelating of micronutrients with manures /compost by Pomegranate growers had 56.77 per cent not utilized as per recommendation and about Neem cake 79.25 per cent respondents had not utilized. While, about dose of different micronutrients *viz.* Ferrous sulphate dose, 45.55 per cent respondents had utilized as per recommendation followed by 37.03 per cent respondents had not utilized dose as per recommendation and 17.40 per cent not utilized Ferrous sulphate. Also for Manganese sulphate 70.37 per cent respondents had utilized as per recommendation followed by 22.59 per cent respondents had not utilized dose as per recommendation and 07.03 per cent not utilizes Manganese sulphate. About Zinc sulphate- 79.25 per cent respondents had utilized as per recommendation followed by 11.48 per cent respondents had not utilized dose as per recommendation and 09.25 per cent not utilized Zinc sulphate. For Copper sulphate 75.92 per cent respondents had utilized as per recommendation followed by 17.03 per cent respondents had not utilized dose as per recommendation and 07.03 per cent not utilizes Copper sulphate. While, about Borax 68.14 per cent respondents had utilized as per recommendation followed by 20.37 per cent respondents had not utilized dose as per recommendation and 11.48 per cent respondents not utilizes Borax. However about micronutrients used at flowering and before maturity of fruit by Pomegranate growers *viz.* Boric acid 61.48 per cent had not utilized as per recommendation followed by equal percentage 30.00 per cent as per recommendation and no utilization. About methods of application of micronutrients - through soil (83.33 %) followed by spraying (99.60 %) and chelated (87.03 %) respectively. While about inorganic micronutrients utilization *viz.* EDTA- (79.25 %) had not utilized followed by EDDHA- (77.77 %) followed by HEDTA- (70.00 %) followed by DTPA- (67.77 %) and Citric acid- (39.62 %) had not utilized any inorganic micronutrients. Lastly, about organic micronutrients utilization *viz.*, Humic acid (62.59 %) followed by - Amino acid (70.74 %) and Gluconet - (47.77 %) had not utilized any above organic micronutrients as per recommendation respectively.

4.7.3 Overall utilization level about pomegranate management practices

The data pertaining to the overall utilization regarding management practices in pomegranate is presented as shown in Table 68.

Table 68. Distribution of respondents according to their practice wise overall utilization level about pomegranate management practices

Sl. No.	Utilization level	Respondents (270)	
		Frequency	Percentage
1.	Soil selection (04 practices)		
1.	Low (Up to 07 score)	84	31.11
2.	Medium (08 to 10 score)	117	43.34
3.	High (11 and above score)	69	25.55
	Total	270	100.00
	Maximum score = 12	Minimum score =04	
2.	Water management (07 practices)		
1.	Low (Up to 12 score)	70	25.93
2.	Medium (13 to 17 score)	129	47.78
3.	High (18 and above score)	71	26.29
	Total	270	100.00
	Maximum score = 21	Minimum score =07	
3.	Land preparation (06 practices)		
1.	Low (Up to 10 score)	48	17.78
2.	Medium (11 to 14 score)	158	58.51
3.	High (15 and above score)	64	23.71
	Total	270	100.00
	Maximum score = 18	Minimum score =06	
4.	Planting material (03 practices)		
1.	Low (Up to 03 score)	51	18.88
2.	Medium (04 to 06 score)	85	31.49
3.	High (07 and above score)	134	49.63
	Total	270	100.00
	Maximum score = 09	Minimum score =03	
5.	Bahar management (06 practices)		
1.	Low (Up to 10 score)	31	11.48
2.	Medium (11 to 14 score)	148	54.81
3.	High (15 and above score)	91	33.71
	Total	270	100.00
	Maximum score = 18	Minimum score =06	

The findings presented in Table 68 indicated that, 43.34 per cent of the respondents had 'medium' utilization pertaining to soil selection. While, 31.11 per cent

and 25.55 per cent respondents had ‘high’ and ‘low’ utilization about soil selection in pomegranate. The observation about water management shows that the 47.78 per cent of the respondents had ‘medium’ utilization. Also nearly equal proportion of the respondents (26.29 %) and 25.93 per cent had ‘high’ and ‘low’ utilization about water management in pomegranate. However, 58.51 per cent of them had ‘medium’ followed by 23.71 per cent had high and 17.78 percent had low utilization with regard to land preparation practices in pomegranate respectively. About 49.63 per cent respondents were in ‘high’ utilization category followed by 31.49 per cent and 18.88 per cent respondents in medium and low utilization category of planting material selection. While, 54.81 per cent had ‘medium’ utilization followed by 33.71 per cent had high and 11.48 per cent had low utilization with respect to bahar management in pomegranate.

Table 69. Distribution of respondents according to their components wise overall utilization level about Nutrient Management Practices

Sl. No.	Knowledge level	Respondents (270)	
		Frequency	Percentage
1.	Organic Manures		
1.	Low (Up to 45 score)	188	69.64
2.	Medium (46 to 79 score)	52	19.26
3.	High (80 and above score)	21	07.77
4.	No utilization	09	03.33
	Total	270	100.00
	Maximum score = 111	Minimum score =12	
2.	Green Manure		
1.	Low (Up to 08 score)	114	42.23
2.	Medium (09 to 12 score)	18	06.66
3.	High (13 and above score)	36	13.33
4	No utilization	102	37.78
	Total	270	100.00
	Maximum score = 14	Minimum score =02	
3.	Biofertilizer		
1.	Low (Up to 09 score)	97	35.93
2.	Medium (10 to 13 score)	01	0.37
3.	High (14 and above score)	166	61.48
4	No utilization	06	02.22
	Total	270	100.00
	Maximum score = 19	Minimum score =04	

Table 69 contd.....

Sl. No.	Knowledge level	Respondents (270)	
		Frequency	Percentage
4.	Chemical Fertilizer		
1.	Low (Up to 23 score)	44	16.29
2.	Medium (24 to 37 score)	189	70.00
3.	High (38 and above score)	13	04.83
4	No utilization	24	08.88
	Total	270	100.00
	Maximum score = 49	Minimum score =10	
5.	Fertigation		
1.	Low (Up to 08 score)	21	07.78
2.	Medium (9 to 11 score)	97	35.92
3.	High (12 and above score)	142	52.59
4	No utilization	10	03.71
	Total	270	100.00
	Maximum score = 15	Minimum score =05	
6.	Micronutrients		
1.	Low (Up to 05 score)	02	0.74
2.	Medium (06 to 10 score)	14	05.18
3.	High (11 and above score)	236	87.40
4	No utilization	18	06.68
	Total	270	100.00
	Maximum score = 14	Minimum score =01	

The distribution of the respondents according to component wise utilization of nutrient management practices is given in Table 69.

It was observed from Table 69 that 69.64 per cent of pomegranate growers had low extent of utilization about organic manures followed by 19.26 percent respondents had medium utilization .Only 07.77 per cent respondents had high utilization and only 03.33per cent respondents had not utilized of organic manures.

It was revealed from Table 69 that 42.23 per cent of pomegranate growers had low extent of utilization about green manures followed by 13.33 per cent respondents had high utilization. Only 06.66 per cent respondents had medium utilization and also nearly 37.78 per cent respondents had no utilization of green manures.

It was found from Table 69 that 61.48 per cent of pomegranate growers had high extent of utilization about bio-fertilizers followed by 35.92 per cent respondents

had low utilization. Only 0.37 per cent respondents had medium utilization and 02.22 per cent respondents had not utilized bio-fertilizers.

It was concluded from Table 69 that 70.00 per cent of pomegranate growers had medium extent of utilization about chemical fertilizers followed by 16.29 per cent respondents had medium utilization followed by only 04.81 per cent respondents had high utilization and only 08.88 per cent respondents had no utilization of chemical fertilizers.

It was observed from Table 69 that 87.40 per cent of pomegranate growers had high extent of utilization about micro nutrients followed by 05.18 per cent respondents had medium utilization followed by only 0.74 per cent respondents had low utilization and only 06.68 per cent respondents had no utilization of micro nutrients.

4.7.4 Different types of fertilizers (integrated nutrient management) used in pomegranate cultivation

It is observed from Table 70, that, in organic manuring, majority of the (84.07 per cent) pomegranate growers had utilized FYM, followed by 20.74 per cent utilizing non-edible oil cakes followed by 19.62 per cent utilized compost followed by edible oil cakes 14.81 per cent and by 07.77 per cent utilizing vermi -compost and very negligible 03.33 per cent had utilized animal origin cakes by the respondents respectively. However, uses of about green manuring crops, an equal per cent age, 40.00 per cent had utilized leguminous crops and 39.25 per cent had utilized green leaf manure crops in Pomegranate. While, about bio-fertilizers uses, majority 86.29 per cent respondents had utilized bio-fertilizers in powder form and in liquid form 73.33 per cent respectively. It was also observed about chemical fertilizers that large majority, 81.11 per cent respondents had utilized mixed fertilizers followed by 68.88 per cent had utilized compound / complex fertilizers and one fifth per cent, (20.37 %) has utilized straight fertilizers respectively. About different micronutrients utilization, large majority respondents had utilized Manganese Sulphate (96.96 %) followed by Copper Sulphate (96.96 %) followed by Zinc Sulphate (90.74 %) followed by Borax (88.51 %) and Ferrous Sulphate (82.59 %), respectively.

Table 70. Distribution of respondents according to their different types of fertilizers used in pomegranate cultivation

Sl. No.	Type of Fertilizer	Number	Percentage
I.	Organic Manure		
1.	FYM	227	84.07
2.	Compost	53	19.62
3.	Vermi compost	21	07.77
4.	Edible oil Cakes	40	14.81
5.	Non-Edible oil cakes	56	20.74
6.	Animal Origin Cakes	09	03.33
II.	Green Manure		
1.	Leguminous crops	108	40.00
2.	Green Leaf Manure	106	39.25
III.	Bio-fertilizers		
1.	Powder form	233	86.29
2.	Liquid form	198	73.33
IV.	Chemical fertilizers		
1.	Straight	55	20.37
2.	Compound / Complex	186	68.88
3.	Mixed	219	81.11
V.	Micronutrients		
1.	Ferrous Sulphate	223	82.59
2.	Manganese Sulphate	251	96.96
3.	Zink Sulphate	245	90.74
4.	Copper Sulphate	251	96.96
5.	Borax	239	88.51

4.7.5 Per Year Per Plant Use of Different Organic Fertilizers in Pomegranate Cultivation

It is observed from Table 71 that 15.92 per cent of Pomegranate growers had not used FYM while near to half of the respondents (48.14 %) were using less than recommended quantity of FYM per plant per year of five years old orchard with an average rate of 44.04 kg per plant per five years orchard. Near about 08.14 per cent respondents were using more than recommended quantity of FYM per plant per year with an average rate of 53.68 kg per plant. Only one fifth (20.00 %) respondents were using quantity of FYM as per recommended with an average rate of 50.00 kg per plant. Only

07.77 per cent respondents were found using the FYM in accordance with the report of soil testing / plant / leaf / tissue testing with an average rate of 46.80 kg per plant.

Table 71. Distribution of the respondents according to per year per plant use of FYM in pomegranate cultivation

Sl. No.	Per plant Per year use of FYM	Number (N= 270)	Average rate of application FYM kg / plant / year
1.	Non- users of FYM fertilizers	43 (15.92)	-
2.	Less than recommended	130 (48.14)	44.04
3.	More than recommended	22 (08.14)	53.68
4.	As per recommendation	54 (20.00)	50.00
5.	As per the report of soil testing/ plant, leaf, tissue test	21 (07.77)	46.80
6.	Average rate of application	-	46.64
	Total	270	

(Figures in the parentheses indicate percentage)

The average rate of application of FYM was 46.64 kg per plant per five years orchard.

Table 72. Distribution of the respondents according to per year per plant use of Compost in pomegranate cultivation

Sl. No.	Per plant per year use of compost	Number (N= 270)	Average rate of application Compost kg/plant/year
1.	Non- users of Compost fertilizers	217 (80.37)	-
2.	Less than recommended	35 (12.96)	35.88
3.	More than recommended	08 (02.96)	44.87
4.	As per recommendation	10 (03.70)	40.00
5.	As per the report of soil testing /plant,leaf, tissue test	00 (0.00)	00
6.	Average rate of application	-	38.01
	Total	270	

(Figures in the parentheses indicate percentage)

It was revealed from Table 72 that majority (80.37 %) of Pomegranate growers had not used compost while very less of the of respondents (12.96 %) were using less than recommended quantity of compost per plant with an average rate of 35.88 kg/plant per. Near very negligible 02.96 per cent respondents were using more than recommended quantity of compost per plant with an average rate of 44.87 kg per plant. About only 03.70 per cent respondents were using quantity of compost as per recommended dose with an average rate of 40.00 kg per plant. Not a single respondents was found using the compost in accordance with the report of soil testing / plant / leaf / tissue testing.

The average rate of application of compost was 38.01 kg per plant per five years orchard.

Table 73. Distribution of the respondents according to per year per plant use of Vermicompost in pomegranate cultivation

Sl. No.	Per plant per year use of Vermicompost	Number (N= 270)	Average rate of application of Vermi compost kg/plant/year
1	Non- users of Vermi compost fertilizers	249 (92.22)	----
2	Less than recommended	10 (03.77)	0.80
3	More than recommended	08 (02.96)	1.81
4	As per recommendation	03 (01.11)	1.00
5	As per the report of soil testing / plant, leaf, tissue test	00 (0.00)	----
6	Average rate of application	---	1.16
	Total	270	

(Figures in the parentheses indicate percentage)

It was found from Table 73 that large majority (92.22 %) of Pomegranate growers had not used vermi-compost while very less of the of respondents (03.77 %) were using less than recommended quantity of vermi-compost per plant with an average rate of 0.80 kg per plant. Very negligible 02.96 per cent respondents were using more than recommended quantity of vermi-compost per plant with an average rate of 01.81 kg per plant. Only 01.11 per cent respondents were using quantity of vermicompost as per

recommendation per plant with an average rate of 01.00 kg per plant. Not a single respondents was found using the vermi-compost in accordance with the report of soil testing / plant / leaf / tissue testing.

The average per plant rate of application of vermi-compost was 01.16 kg per plant per five years orchard.

Table 74. Distribution of the respondents according to per year per plant use of Conc. Organic Fertilizer-Plant origin- Edible oil cake in pomegranate cultivation

Sl. No.	Per plant per year use of edible oil cake	Number (N= 270)	Average rate of application of Edible oil cake Kg/plant/year
1	Non- users of Edible oil cake fertilizers	230 (85.18)	-
2	Less than recommended	22 (08.14)	0.75
3	More than recommended	05 (01.85)	01.30
4	As per recommendation	13 (04.81)	01.00
5	As per the report of soil testing/plant, leaf, tissue test	00 (0.00)	-
6	Average rate of application	-	0.90
	Total	270	

(Figures in the parentheses indicate percentage)

It was concluded from Table 74 that majority (85.18 %) of Pomegranate growers had not used plant origin-edible oil cake while less of the of respondents (08.14 %) were using less than recommended quantity of edible oil cake per plant with an average rate of 0.75 kg per plant. Near very negligible 01.85 per cent respondents were using more than recommended quantity of edible oil cake per plant with an average rate of 01.30 kg per plant per five years orchard. About 04.81 per cent respondents were using quantity of edible oil cake as per recommendation per plant with an average rate of 01.00 kg per plant. Not a single respondents was found using the edible oil cake in accordance with the report of soil testing/plant/leaf/tissue testing.

The average per plant per year of five years old orchard rate of application of edible oil cake was with an average rate of 0.90 kg per plant per five years orchard.

Table 75. Distribution of the respondents according to per year per plant use of Conc. Organic Fertilizer -Plant Origin- Non-Edible oil cake in pomegranate cultivation

Sl. No.	Per plant per year use of Fertilizer	Number (N= 270)	Average rate of application of Non-Edible oil cake Kg/plant/year
1	Non- users of Non-Edible oil cake	214 (79.25)	-
2	Less than recommended	13 (04.81)	0.70
3	More than recommended	33 (12.22)	1.65
4	As per recommendation	10 (03.70)	1.00
5	As per the report of soil testing /plant, leaf, tissue test	00 (0.00)	-
6	Average rate of application	-	1.16
	Total	270	

(Figures in the parentheses indicate percentage)

It was observed from Table 75 that majority (79.25 %) of Pomegranate growers had not used plant origin – non edible oil cake while very less of the of respondents (04.81 %) were using less than recommended quantity of non edible oil cake per plant with an average rate of 0.70 kg per plant. Near about 12.22 per cent respondents were using more than recommended quantity of non edible oil cake per plant with an average rate of 01.65 kg per plant. About 03.70 per cent respondents were using quantity of non edible oil cake as per recommendation per plant with an average rate of 01.00 kg per plant. Not a single respondent was found using the non edible oil cake in accordance with the report of soil testing / plant / leaf / tissue testing.

The average rate of application of non edible oil cake was with an average rate of 01.16 kg per plant per five years orchard.

Table 76. Distribution of the respondents according to per year per plant use of Con. Organic fertilizers – Animal origin in pomegranate cultivation

Sl. No.	Per plant per year use of Animal origin cake	Number (N= 270)	Average rate of application of Animal origin cake kg/plant/year
1	Non- users of Animal origin fertilizers	261 (96.66)	----
2	Less than recommended	00 (0.00)	----
3	More than recommended	06 (02.22)	1.22
4	As per recommendation	03 (01.11)	1.00
5	As per the report of soil testing /plant,leaf, tissue test	00 (0.00)	----
6	Average rate of application	---	1.16
	Total	270	

(Figures in the parentheses indicate percentage)

It was found from Table 76 that large majority (96.66 %) of Pomegranate growers had not used animal origin organic fertilizer while not a single respondent was using less than recommended quantity of animal origin fertilizer per plant per year. About 02.22 per cent respondents were using more than recommended quantity of animal origin fertilizer per plant per year of five years old orchard with an average rate of 01.22 kg per plant. Very negligible (01.11) per cent respondents were using quantity of animal origin fertilizer as per recommendation per plant with an average rate of 01.00 kg per plant. Not a single respondent was found using the animal origin fertilizer in accordance with the report of soil testing / plant / leaf / tissue testing.

The average per plant rate of application of animal origin fertilizer was with an average rate of 01.16 kg per plant per five years orchard.

4.7.5.1 Per Year Per Plant Use of Different Green Manures in Pomegranate Cultivation

It was revealed from Table 77 that more than half (60.00 %) of Pomegranate growers had not used - leguminous green manures while one third of the of respondents (31.48 %) were using less than recommended quantity of leguminous crop per hectare with an average rate of 11.81 tone per ha. Near about 08.51 per cent

respondents were using more than recommended quantity of leguminous crop per hectare per year with an average rate of 16.82 tone per hectare. Not a single respondents were using quantity of leguminous crop as per recommendation per ha. with an average rate of 20.00 tone per hectare . Also not a single respondent was found using the leguminous crop in accordance with the report of soil testing / plant / leaf / tissue testing.

Table 77. Distribution of the respondents according to per year per hectare use of Green Manures- Leguminous crop in pomegranate cultivation

Sl. No.	Per hectare per year use of Green Manures-Leguminous crop	Number (N= 270)	Average rate of application of Leguminous crop tone / ha./ year
1.	Non- users of Leguminous crop	162 (60.00)	----
2.	Less than recommended	85 (31.48)	11.81
3.	More than recommended	23 (08.51)	16.82
4.	As per recommendation	00 (0.00)	20.00
5.	As per the report of soil testing/ plant, leaf, tissue test	00 (0.00)	----
6.	Average rate of application	---	12.87
	Total	270	

(Figures in the parentheses indicate percentage)

The average per hectare rate of application of leguminous green manures crop was with an average rate of 12.87 tons per hectare per five years orchard.

Table 78. Distribution of the respondents according to per year per plant use of Green manure –Green leaf manure in pomegranate cultivation

Sl. No.	Per plant per year use of Green leaf manure	Number (N= 270)	Average rate of application of Green leaf manure tone/ha./ year
1	Non- users of Green leaf manure	164 (60.74)	-
2	Less than recommended	75 (27.77)	13.74
3	More than recommended	31 (11.48)	21.35
4	As per recommendation	00 (0.00)	20.00
5	As per the report of soil testing /plant, leaf, tissue test	00 (0.00)	-
6	Average rate of application	---	15.96
	Total	270	

(Figures in the parentheses indicate percentage)

It was observed from Table 78 that more than half (60.00 %) of Pomegranate growers had not used green leaf manure while near one third of the of respondents (27.77%) were using less than recommended quantity of green leaf manure per hectare with an average rate of 13.74 tons per ha. Near about 11.48 per cent respondents were using more than recommended quantity of green leaf manure per hectare with an average rate of 21.35 tons per hectare. Not a single respondents was using quantity of green leaf manure as per recommendation per ha. with an average rate of 20.00 tone. Also not a single respondent was found using the green leaf manure in accordance with the report of soil testing / plant / leaf / tissue testing.

The average per hectare rate of application of green leaf manure was with an average rate of 15.96 tone per hectare per five years orchard.

4.7.5.2 Per Year Per Plant Use of Different Bio-fertilizers in Pomegranate Cultivation

It was found from Table 79 that about 13.70 per cent of pomegranate growers had not used Bio-fertilizers in powder form while near about 15.55 per cent respondent was using less than recommended quantity of powder form bio-fertilizers per plant per year of five years old orchard. A very negligible (01.11 %) respondents were using more than recommended quantity of powder form -bio-fertilizers per plant with an average rate of 27.00 gram per plant. About majority 69.62 per cent respondents were using quantity of powder form bio-fertilizers as per recommendation per plant with an average rate of 25.00 gram per plant. Not a single respondent was found using the powder form bio-fertilizers in accordance with the report of soil testing / plant / leaf / tissue testing.

The average per plant rate of application of powder form bio-fertilizers was with an average rate of 24.93 gram per plant per five years orchard.

Table 79. Distribution of the respondents according to per year per plant use of Bio-fertilizers –Powder form in Pomegranate cultivation

Sl. No.	Per plant per year use of Powder form Bio-fertilizers	Number (N= 270)	Average rate of application of Powder form g/plant/year
1	Non- users of Powder form Bio-fertilizers	37 (13.70)	-
2	Less than recommended	42 (15.55)	24.47
3	More than recommended	03 (01.11)	27.00
4	As per recommendation	188 (69.62)	25.00
5	As per the report of soil testing /plant, leaf, tissue test	00 (0.00)	-
6	Average rate of application	-	24.93
	Total	270	

(Figures in the parentheses indicate percentage)

It can be concluded from Table 80 that near one fourth (26.66 %) of Pomegranate growers had not used Bio-fertilizers in liquid form while near about 25.55 per cent respondent was using less than recommended quantity of liquid bio-fertilizers with an average rate of 24.63 ml per liter per plant. A very negligible 01.85 per cent respondents were using more than recommended quantity of liquid bio-fertilizers per plant with an average rate of 28.00 ml. per liter per plant. About near half of (45.92 %) respondents were using quantity of liquid form bio-fertilizers as per recommendation per plant per year of five years old orchard with an average rate of 25.00 ml per liter per plant. Not a single respondent was found using the liquid form bio-fertilizers in accordance with the report of soil testing / plant / leaf / tissue testing.

The average per plant rate of application liquid form bio-fertilizers was with an average rate of 24.94 ml. per plant per five years orchard.

Table 80. Distribution of the respondents according to per year per plant use of Liquid Bio fertilizer in Pomegranate cultivation

Sl. No.	Per plant per year use of Liquid form Bio-fertilizers	Number (N= 270)	Average rate of application of Liquid ml /lit/ plant/year
1.	Non- users of Liquid Bio-fertilizers	72 (26.66)	----
2.	Less than recommended	69 (25.55)	24.63
3.	More than recommended	05 (01.85)	28.00
4.	As per recommendation	124 (45.92)	25.00
5.	As per the report of soil testing/ plant, leaf, tissue test	00 (0.00)	----
6.	Average rate of application	---	24.94
	Total	270	

(Figures in the parentheses indicate percentage)

4.7.5.3 Per Year Per Plant Use of Different Chemical Fertilizers in Pomegranate Cultivation

It was observed from Table 81 that majority (79.62 %) of Pomegranate growers had not used straight fertilizers while very less of the of respondents (04.44 %) were using less than recommended quantity of straight fertilizers per plant with an average rate of 1252.00 g N : 1509.16 g P₂O₅ : 341.66 K₂O g/plant. Near about 08.14 per cent respondents were using more than recommended quantity of straight fertilizers per plant with an average rate of 1418.18 g N : 1602.27 g P₂O₅ : 461.36 g K₂O per plant. About 07.77 per cent respondents were using quantity of straight fertilizers as per recommendation per plant with an average rate of 1375.00 g N : 1550.00 g P₂O₅ : 400.00 K₂O per plant. Not a single respondent was found using the straight fertilizers in accordance with the report of soil testing / plant / leaf / tissue testing.

Table 81. Distribution of the respondents according to use per year per plant of Straight fertilizers in pomegranate cultivation

Sl. No.	Per plant per year use of Straight Fertilizer	Number (N= 270)	Average rate of application g /plant / year		
			N (Urea)	P ₂ O ₅ (SSP)	K ₂ O (MOP)
1.	Non- users of Straight Chemical fertilizers	215 (79.62)	---	---	---
2.	Less than recommended	12 (04.44)	1252.00	1509.16	341.66
3.	More than recommended	22 (08.14)	1418.18	1602.27	461.36
4.	As per recommendation	21 (07.77)	1375	1550	400
5.	As per the report of soil testing/ plant, leaf, tissue test	00 (0.00)	---	----	----
6.	Average rate of application	---	1363.45	1561.99	411.81
	Total	270			

(Figures in the parentheses indicate percentage)

The average per plant rate of application of straight fertilizers was with an average rate of 1363.45 g N : 1561.99 g P₂O₅ : 411.81 K₂O per plant per five years orchard.

It was seen from Table 82 that one third (31.11 %) of Pomegranate growers had not used compound/complex fertilizers while about 15.18 per cent respondents were using less than recommended quantity of compound/complex fertilizers per plant per year of five years old orchard with an average rate of 670.73 g N : 1268.58 g P₂ O₅ : 1268.58gs : K₂O g per plant per five years orchard. Near about 34.81 per cent respondents were using more than recommended quantity of compound / complex fertilizers per plant with an average rate of 705.31 g N : 1434.57 g P₂ O₅ : 1434.57 g K₂O per plant. About 18.88 per cent respondents were using quantity of compound / complex fertilizers as per recommendation per plant with an average rate of 625.00 g N : 1315.00 g P₂ O₅ : 1315.00 K₂O per plant. Not a single respondent was found using the compound / complex fertilizers in accordance with the report of soil testing / plant / leaf / tissue testing.

Table 82. Distribution of the respondents according to per year per plant use of Compound / Complex fertilizers in pomegranate cultivation

Sl. No.	Per plant per year use of Compound / Complex Fertilizer	Number (N= 270)	Average rate of application g /plant / year		
			N (Urea)	P ₂ O ₅ (19:19:19)	K ₂ O (19:19:19)
1.	Non- users of Compound Chemical fertilizers	84 (31.11)	---	---	---
2.	Less than recommended	41 (15.18)	670.73	1268.58	1268.58
3.	More than recommended	94 (34.81)	705.31	1434.57	1434.57
4.	As per recommendation	51 (18.88)	625.00	1315.00	1315.00
5.	As per the report of soil testing /plant, leaf, tissue test	0(0.00)	--	--	--
6.	Average rate of application	---	1365.19	653.62	1365.19
	Total	207			

(Figures in the parentheses indicate percentage)

The average per plant per year rate of application of compound / complex fertilizers was with an average rate of 1365.19 g N : 653.62 g P₂ O₅ : 1365.19 K₂O per five years orchard.

Table 83. Distribution of the respondents according to per year per plant use of Mix fertilizers in pomegranate cultivation

Sl. No.	Per plant per year use of Mix Fertilizer	Number (N= 270)	Average rate of application g/plant/year		
			N (Urea)	P ₂ O ₅ (10:26:26)	K ₂ O (10:26:26)
1	Non- users of mix Chemical fertilizers	51 (18.88)	-	-	-
2	Less than recommended	37 (13.70)	1004.05	902.70	902.70
3	More than recommended	148 (54.81)	1223.64	1024.66	1024.66
4	As per recommendation	34 (12.59)	1150	961	961
5	As per the report of soil testing /plant, leaf, tissue test	00 (0.00)	--	--	--
6	Average rate of application	-	994.17	1175.10	994.17
	Total	270			

(Figures in the parentheses indicate percentage)

It was observed from Table 83 that near about 18.88 per cent of Pomegranate growers had not used mix fertilizers while about 13.70 per cent respondents were using less than recommended quantity of mix fertilizers per plant with an average rate of 1004.05 g N : 902.70 g P₂ O₅ : 902.70g : K₂O g per plant. Near about half 54.81 per cent respondents were using more than recommended quantity of mix fertilizers per plant with an average rate of 1223.64 g N : 1024.66 g P₂ O₅ : 1024.66 g K₂O per plant. About 12.59 per cent respondents were using quantity of mix fertilizers as per recommendation per plant with an average rate of 1150.00 g N : 0961.00 g P₂ O₅ : 0961.00 K₂O per plant. Not a single respondent was found using the mix fertilizers in accordance with the report of soil testing/plant/leaf /tissue testing.

The average per plant per year rate of application of mix fertilizers was with an average rate of 994.17 g N : 1175.10 g P₂O₅ : 994.17 K₂O per plant per five years orchard.

4.7.5.4 Per Year Per Plant Use of Different Micro-nutrients in Pomegranate Cultivation

It was found from Table 84 that about 17.40 per cent of Pomegranate growers had not used micro-nutrients- Ferrous sulphate while near about one third 30.37 per cent respondent was using less than recommended quantity of Ferrous sulphate with an average rate of 28.78 g per plant. A very negligible 06.66 per cent respondents were using more than recommended quantity of Ferrous sulphate per plant with an average rate of 34.55 g per plant. About near to half 45.55 per cent respondents were using quantity of Ferrous sulphate as per recommendation with an average rate of 30.00 g per plant. Not a single respondent was found using the Ferrous sulphate in accordance with the report of soil testing / plant / leaf / tissue testing.

The average rate of application of Ferrous sulphate was 29.91 g per plant per five years orchard.

Table 84. Distribution of the respondents according to per year per plant use of Micro- nutrients- Ferrous sulphate in pomegranate cultivation

Sl. No.	Per plant per year use of Ferrous sulphate	Number (N= 270)	Average rate of application of Ferrous sulphate g/plant/year
1	Non- users of Ferrous sulphate fertilizers	47 (17.40)	----
2	Less than recommended	82 (30.37)	28.78
3	More than recommended	18 (06.66)	34.55
4	As per recommendation	123 (45.55)	30.00
5	As per the report of soil testing /plant,leaf, tissue test	00 (0.00)	----
6	Average rate of application	---	29.91
Total		270	

(Figures in the parentheses indicate percentage)

It was revealed from Table 85 that about (07.03 %) of Pomegranate growers had not used Manganese sulphate micro-nutrients while near about one third 14.81 per cent respondent was using less than recommended quantity of Manganese sulphate with an average rate of 39.50 g per plant. A very negligible 07.77 per cent respondents were using more than recommended quantity of Manganese sulphate per plant with an average rate of 42.50 g per plant. About near two third 70.74 per cent respondents were using quantity of Manganese sulphate as per recommendation with an average rate of 40.00 g per plant. Not a single respondent was found using the Manganese sulphate in accordance with the report of soil testing / plant / leaf / tissue testing.

The average rate of application of Manganese sulphate was 40.05 g per plant per five years orchard.

Table 85. Distribution of the respondents according to per year per plant use of Micro-nutrients- Manganese sulphate in pomegranate cultivation

Sl. No.	Per plant per year use of Manganese sulphate	Number (N= 270)	Average rate of application of Manganese sulphate g/plant/year
1	Non- users of Micro-nutrients- Manganese sulphate	19 (07.03)	----
2	Less than recommended	40 (14.81)	39.50
3	More than recommended	21 (07.77)	42.50
4	As per recommendation	191 (70.74)	40.00
5	As per the report of soil testing /plant,leaf, tissue test	00 (0.00)	----
6	Average rate of application	---	40.05
Total		270	

(Figures in the parentheses indicate percentage)

It was observed from Table 86 that about (09.25 %) of Pomegranate growers had not used micro-nutrients- Zink sulphate while near about 08.51 per cent respondent was using less than recommended quantity of Zink sulphate with an average rate of 39.56 g per plant per year of five years old orchard. A very negligible 02.96 per cent respondents were using more than recommended quantity of Zink sulphate per plant per year of five years old orchard with an average rate of 42.50 g per plant per five years orchard. About large majority 79.25 per cent respondents were using quantity of Zink sulphate as per recommendation with an average rate of 40.00 g per plant . Not a single respondent was found using the Zink sulphate in accordance with the report of soil testing / plant / leaf / tissue testing.

The average rate of application of Zink sulphate was 40.04 g per plant per five years orchard.

Table 86. Distribution of the respondents according to per year per plant use of Micro-nutrients- Zink sulphate in pomegranate cultivation.

Sl. No.	Per plant per year use of Zink sulphate	Number (N= 270)	Average rate of application of Zink sulphate g/plant/year
1	Non- users of Micro-nutrients- Zink sulphate	25 (09.25)	----
2	Less than recommended	23 (08.51)	39.56
3	More than recommended	08 (02.96)	42.50
4	As per recommendation	214 (79.25)	40.00
5	As per the report of soil testing /plant, leaf, tissue test	00 (0.00)	----
6	Average rate of application	---	40.04
Total		270	

(Figures in the parentheses indicate percentage)

It was concluded from Table 87 that about (07.03 %) of Pomegranate growers had not used micro-nutrients- Copper sulphate while near about 09.62 per cent respondent was using less than recommended quantity of Copper sulphate with an average rate of 29.19 g per plant per year of five years old orchard. A negligible 07.40 per cent respondents were using more than recommended quantity of Copper sulphate per plant with an average rate of 33.00 g per plant per five years orchard. About near three fourth 75.92 per cent respondents were using quantity of Copper sulphate as per recommendation with an average rate of 30.00 g per plant. Not a single respondent was found using the Copper sulphate in accordance with the report of soil testing / plant / leaf / tissue testing.

The average rate of application of Copper sulphate was 30.15 g per plant per five years orchard.

Table 87. Distribution of the respondents according to per year per plant use of Micro-nutrients-copper sulphate in pomegranate cultivation

Sl. No.	Per plant per year use of Copper sulphate	Number (N= 270)	Average rate of application of Copper sulphate g/plant/year
1.]Non- users of Micro-nutrients- Copper sulphate	19 (07.03)	----
2.	Less than recommended	26 (09.62)	29.19
3.	More than recommended	20 (07.40)	33.00
4.	As per recommendation	205 (75.92)	30.00
5.	As per the report of soil testing /plant, leaf, tissue test	00 (0.00)	----
6.	Average rate of application	---	30.15
	Total	270	

(Figures in the parentheses indicate percentage)

It was found from Table 88 that about (11.48 %) of Pomegranate growers had not used micro-nutrients- Borax while near about 14.07 per cent respondent was using less than recommended quantity of Borax with an average rate of 19.73 g per plant. A very negligible 06.29 per cent respondents were using more than recommended quantity of Borax per plant with an average rate of 23.52 g per plant. About near to seventy 68.14 per cent respondents were using quantity of Borax as per recommendation with an average rate of 20.00 g per plant. Not a single respondent was found using the Borax in accordance with the report of soil testing / plant / leaf / tissue testing.

The average rate of application of Borax was 20.20 g per plant per five years orchard.

Table 88. Distribution of the respondents according to per year per plant use of Micro-nutrients-Borax in pomegranate cultivation.

Sl. No.	Per plant per year use of Borax	Number (N= 270)	Average rate of application of Borax g/plant/year
1	Non- users of Micro-nutrients- Borax	31 (11.48)	-----
2	Less than recommended	38 (14.07)	19.73
3	More than recommended	17 (06.29)	23.52
4	As per recommendation	184 (68.14)	20.00
5	As per the report of soil testing /plant,leaf, tissue test	00 (0.00)	-----
6	Average rate of application	---	20.20
	Total	270	

(Figures in the parentheses indicate percentage)

4.7.6 Timeliness in Application of Different Organic Fertilizers in Pomegranate Cultivation

Application of the different organic fertilizers at the critical stages of Pomegranate growth has significant bearing on the nutrient uptake by the Pomegranate and ultimately on the yield. An attempt was made in this study to know as to whether the different organic fertilizers were being timely applied by the respondents or otherwise. The observation in this regard are presented in Table 89.

It was observed from Table 89 that majority of the Pomegranate growers (60.00 %) were not applying the FYM as per recommendation of Pomegranate growth, while 20.38 per cent respondents were applying the FYM as per recommendation of growth stages and only 03.33 per cent respondents were applying the FYM as per recommendation of growth stages but with slight modification according to weather /soil and plant conditions and 16.29 per cent respondents were non users of FYM.

Table 89. Distribution of the respondents according to timeliness in application of Organic fertilizer in pomegranate cultivation

Sl. No.	Timeliness in application	Respondents	
		Number (N= 270)	Percentage
I	Organic Fertilizers		
a)	FYM		
1	Not as per recommendation	162	60.00
2	As per recommendation	55	20.38
3	As per recommendation but with modification according to weather /soil / plant condition	09	03.33
4	Non users	44	16.29
	Total	270	100.00
b)	Compost		
1	Not as per recommendation	31	11.48
2	As per recommendation	22	08.15
3	As per recommendation but with modification according to weather /soil / plant condition	00	00.00
4	Non users	217	80.37
	Total	270	100.00
c)	Vermi-compost		
1	Not as per recommendation	07	02.59
2	As per recommendation	14	05.18
3	As per recommendation but with modification according to weather /soil / plant condition	00	00.00
4	Non users	249	92.23
	Total	270	100.00
d)	Plant Origin -Edible oil cake		
1	Not as per recommendation	27	10.00
2	As per recommendation	11	04.07
3	As per recommendation but with modification according to weather /soil / plant condition	02	0.74
4	Non users	230	85.19
	Total	270	100.00
e)	Plant origin - Non-Edible cake		
1	Not as per recommendation	41	15.19
2	As per recommendation	15	05.55
3	As per recommendation but with modification according to weather /soil / plant condition	00	0.00
4	Non users	214	79.26
	Total	270	100.00

Table 89 contd...

Sl. No.	Timeliness in application	Respondents	
		Number (N= 270)	Percentage
f)	Animal Origin		
1	Not as per recommendation	03	01.11
2	As per recommendation	03	01.11
3	As per recommendation but with modification according to weather /soil / plant condition	03	01.11
4	Non users	261	96.67
	Total	270	100.00

It was also found that that about 11.81 per cent of Pomegranate growers were not applying the compost as per recommendation of Pomegranate growth, while 08.15 per cent respondents were applying the compost as per recommendation of growth stages and not a single respondent was applying the compost with modification according to weather /soil and plant conditions and majority 80.37 per cent respondents were non users of compost. It was also revealed from Table 85 that very negligible 02.59 per cent of Pomegranate growers were not applying the vermi-compost as per recommendation of Pomegranate growth, while less 05.18 per cent respondents were applying the vermi-compost as per recommendation of growth stages and not a single respondent was applying the vermi-compost with modification according to weather /soil and plant conditions and large majority 92.23 per cent respondents were non users of vermin-compost. It was concluded that about 10.00 per cent of Pomegranate growers were not applying the plant origin-edible oil cake as per recommendation of Pomegranate growth, while less 04.07 per cent respondents were applying the edible oil cake as per recommendation of growth stages and 0.74 per cent respondent was applying the edible oil cake with slight modification according to weather /soil and plant conditions and majority 85.19 per cent respondents were non users of edible oil cake. It was also observed that about 15.19 per cent of Pomegranate growers were not applying the plant origin - non-edible cake as per recommendation of Pomegranate growth, while less 05.55 per cent respondents were applying the non-edible cake as per recommendation of growth stages and not a single respondent was applying the non-edible cake with slight

modification according to weather /soil and plant conditions and majority 79.26 per cent respondents were non users of non-edible cake.

It was also revealed from Table 89 that about negligible 01.11 per cent of Pomegranate growers were not applying the animal origin cake as per recommendation of Pomegranate growth, while less 01.11 per cent respondents were applying the animal origin cake as per recommendation of growth stages and 01.11 per cent respondent was applying the animal origin cake with slight modification according to weather /soil and plant conditions and large majority 96.67 per cent respondents were non users of animal origin cake.

4.7.6.1 Timeliness in Application of Different Green Manures in pomegranate Cultivation

Application of the different green manures at the critical stages of Pomegranate growth has significant bearing on the nutrient uptake by the Pomegranate and ultimately on the yield. An attempt was made in this study to know as to whether the different green manures were being timely applied by the respondents or otherwise. The observation in this regard are presented in Table 90.

Table 90. Distribution of the respondents according to Timeliness in application of Green Manures in pomegranate cultivation

Sl. No.	Timeliness in application	Respondents	
		Number (N= 270)	Percentage
II	Green Manures		
a)	Leguminous crops		
1	Not as per recommendation	54	20.00
2	As per recommendation	28	10.38
3	As per recommendation but with modification according to weather /soil / plant condition	26	09.62
4	Non users	162	60.00
	Total	270	100.00
b)	Green leaf manure		
1	Not as per recommendation	56	20.74
2	As per recommendation	29	10.74
3	As per recommendation but with modification according to weather /soil / plant condition	21	07.77
4	Non users	164	60.75
	Total	270	100.00

It was observed from Table 90 that one fifth Pomegranate growers (20.00 %) were not applying the leguminous crops as green manures as per recommendation of Pomegranate growth, while 10.38 per cent respondents were applying the leguminous crops as per recommendation of growth stages and only 09.62 per cent respondents were applying the leguminous crops as per recommendation of growth stages but with slight modification according to weather /soil and plant conditions and more than half 60.00 per cent respondents were non users of leguminous crops.

It was also found that one fifth Pomegranate growers (20.74 %) were not applying the green leaf manure as green manures as per recommendation of Pomegranate growth, while 10.74 per cent respondents were applying the green leaf manure as per recommendation of growth stages and only 07.77 per cent respondents were applying the green leaf manure as per recommendation but with slight modification according to weather /soil and plant conditions and more than half 60.75 per cent respondents were non users of green leaf manure.

4.7.6.2 Timeliness in Application of Different Bio-Fertilizer in Pomegranate Cultivation

Application of the different bio-fertilizer at the critical stages of Pomegranate growth has significant bearing on the nutrient uptake by the Pomegranate and ultimately on the yield. An attempt was made in this study to know as to whether the different bio-fertilizer was being timely applied by the respondents or otherwise. The observation in this regard are presented in Table 91.

It was seen from Table 91 that near to half Pomegranate growers (43.33 %) were not applying the powder form bio-fertilizer as per recommendation of Pomegranate growth, while one third 31.85 per cent respondents were applying the powder form bio-fertilizer as per recommendation of growth stages and only 11.11 per cent respondents were applying the powder form bio-fertilizer as per recommendation of growth stages but with slight modification according to weather /soil and plant conditions and 13.71 per cent respondents were non users of powder form bio-fertilizer.

Table 91. Distribution of the respondents according to timeliness in application of Bio-fertilizer in pomegranate cultivation

Sl. No.	Timeliness in application	Respondents	
		Number (N=270)	Percentage
III	Bio-Fertilizer		
a)	Powder form		
1	Not as per recommendation	117	43.33
2	As per recommendation	86	31.85
3	As per recommendation but with modification according to weather /soil / plant condition	30	11.11
4	Non users	37	13.71
	Total	270	100.00
b)	Liquid form		
1	Not as per recommendation	30	11.11
2	As per recommendation	161	59.63
3	As per recommendation but with modification according to weather /soil / plant condition	07	02.59
4	Non users	72	26.67
	Total	270	100.00

It was also concluded that near one tenth pomegranate growers (11.11 %) were not applying the liquid form bio-fertilizer as per recommendation of Pomegranate growth, while near sixty 59.63 per cent respondents were applying the liquid form bio-fertilizer as per recommendation and only 02.59 per cent respondents were applying the liquid form bio-fertilizer as per recommendation of growth stages but with slight modification according to weather /soil and plant conditions and 26.67 per cent respondents were non users of liquid form bio-fertilizer.

4.7.6.3 Timeliness in Application of Different Chemical Fertilizers in Pomegranate Cultivation

Application of the different chemical fertilizer at the critical stages of Pomegranate growth has significant bearing on the nutrient uptake by the Pomegranate and ultimately on the yield. An attempt was made in this study to know as to whether the different chemical fertilizers were being timely applied by the respondents or otherwise. The observations in this regard are presented in Table 92.

Table 92. Distribution of the respondents according to timeliness in application of chemical fertilizers in pomegranate cultivation

Sl. No.	Timeliness in application	Respondents	
		Number (N= 270)	Percentage
IV	Chemical Fertilizers		
a)	Straight fertilizer		
1	Not as per recommendation	34	12.59
2	As per recommendation	19	07.03
3	As per recommendation but with modification according to weather /soil / plant condition	02	00.74
4	Non users	215	79.64
	Total	270	100.00
b)	Compound /Complex fertilizer		
1	Not as per recommendation	124	45.93
2	As per recommendation	46	17.03
3	As per recommendation but with modification according to weather /soil / plant condition	16	05.92
4	Non users	84	31.12
	Total	270	100.00
c)	Mixed fertilizer		
1	Not as per recommendation	157	58.15
2	As per recommendation	57	21.11
3	As per recommendation but with modification according to weather /soil / plant condition	05	01.85
4	Non users	51	18.89
	Total	270	100.00

It was concluded from Table 92 that about Pomegranate growers (12.59 %) were not applying the straight chemical fertilizer as per recommendation of critical stages of Pomegranate growth, while 07.03 per cent respondents were applying the straight chemical fertilizer as per recommendation of critical growth stages and only 0.74 per cent respondents were applying the straight chemical fertilizer as per recommendation of critical growth stages but with slight modification according to weather /soil and plant conditions and majority 79.64 per cent respondents were non users of straight chemical fertilizer.

It was also found that about Pomegranate growers, near to half (45.93 %) were not applying the compound/complex chemical fertilizer as per recommendation of critical stages of pomegranate growth, while 17.03 per cent respondents were applying the compound/complex chemical fertilizer as per recommendation of critical growth stages and less 05.92 per cent respondents were applying the compound /complex chemical fertilizer as per recommendation of critical growth stages but with slight modification according to weather /soil and plant conditions and near one third 31.12 per cent respondents were non users of compound /complex chemical fertilizer.

It was observed that about Pomegranate growers, more than half (58.15 %) were not applying the mixed chemical fertilizer as per recommendation of critical stages of Pomegranate growth, while 21.11 per cent respondents were applying the mixed chemical fertilizer as per recommendation of critical growth stages and very less 01.85 per cent respondents were applying the mixed chemical fertilizer as per recommendation of critical growth stages but with slight modification according to weather /soil and plant conditions and one fifth 18.89 per cent respondents were non users of mixed chemical fertilizer.

4.7.6.4 Timeliness in application of different micro-nutrients in pomegranate cultivation

Application of the different micro-nutrients at the critical stages of Pomegranate growth has significant bearing on the nutrient uptake by the Pomegranate and ultimately on the yield. An attempt was made in this study to know as to whether the different micro-nutrients were being timely applied by the respondents or otherwise. The observation in this regard are presented in Table 93.

It was observed from Table 93 that regarding use of micro-nutrients about one fourth Pomegranate growers (25.18 %) were not applying the Ferrous sulphate as per recommendation of Pomegranate growth, while more than half 55.94 per cent respondents were applying the Ferrous sulphate as per recommendation of growth stages and only 01.48 per cent respondents were applying the Ferrous sulphate as per recommendation of growth stages but with slight modification according to weather /soil and plant conditions and about 17.40 per cent respondents were non users of Ferrous sulphate.

Table 93. Distribution of the respondents according to Timeliness in application of Micro-nutrients in pomegranate cultivation

Sl. No.	Timeliness in application	Respondents	
		Number (N= 270)	Percentage
V	Micro-nutrients		
a)	Ferrous sulphate		
1	Not as per recommendation	68	25.18
2	As per recommendation	151	55.94
3	As per recommendation but with modification according to weather /soil / plant condition	04	01.48
4	Non users	47	17.40
	Total	270	100.00
b)	Manganese sulphate		
1	Not as per recommendation	70	25.94
2	As per recommendation	169	62.59
3	As per recommendation but with modification according to weather /soil / plant condition	12	04.44
4	Non users	19	07.03
	Total	270	100.00
c)	Zinc sulphate		
1	Not as per recommendation	52	19.23
2	As per recommendation	184	68.19
3	As per recommendation but with modification according to weather /soil / plant condition	09	03.33
4	Non users	25	09.25
	Total	270	100.00
d)	Copper sulphate		
1	Not as per recommendation	21	07.77
2	As per recommendation	174	64.46
3	As per recommendation but with modification according to weather /soil / plant condition	11	04.07
4	Non users	64	23.70
	Total	270	100.00
e)	Borax		
1	Not as per recommendation	48	17.77
2	As per recommendation	176	65.19
3	As per recommendation but with modification according to weather /soil / plant condition	15	05.55
4	Non users	31	11.49
	Total	270	100.00

It was also found that about one fourth Pomegranate growers (25.94 %) were not applying the Manganese sulphate as per recommendation of Pomegranate growth, while more than half 62.59 per cent respondents were applying the Manganese sulphate as per recommendation of growth stages and only 04.44 per cent respondents were applying the Manganese sulphate as per recommendation of growth stages but with slight modification according to weather/soil and plant conditions and about 07.03 per cent respondents were non users of Manganese sulphate.

It was concluded that about one fifth pomegranate growers (19.21 %) were not applying the Zink sulphate as per recommendation of Pomegranate growth, while more than half 68.16 per cent respondents were applying the Zink sulphate as per recommendation of growth stages and only 03.33 per cent respondents were applying the Zink sulphate as per recommendation of growth stages but with slight modification according to weather / soil and plant conditions and about 09.25 per cent respondents were non users of Zink sulphate.

It was revealed that 07.77 per cent pomegranate growers were not applying the Copper sulphate as per recommendation of pomegranate growth, while more than half 64.46 per cent respondents were applying the Copper sulphate as per recommendation of growth stages and only 04.07 per cent respondents were applying the Copper sulphate as per recommendation of growth stages but with slight modification according to weather / soil and plant conditions and about 23.70 per cent respondents were non users of Copper sulphate.

It was revealed from Table 93 that about Pomegranate growers (17.77 %) were not applying the Borax as per recommendation of Pomegranate growth, while more than half 65.19 per cent respondents were applying the Borax as per recommendation of growth stages and only 05.55 per cent respondents were applying the Borax as per recommendation of growth stages but with slight modification according to weather / soil and plant conditions and about 11.49 per cent respondents were non users of Borax.

4.7.7 Different Methods of Application of Organic fertilizers in Pomegranate Cultivation

It was found that the Pomegranate growers were applying various organic fertilizers to the Pomegranate orchard by various methods. The observations regarding the methods used by the respondents are given in Table 94.

Table 94. Distribution of the respondents according to methods of application of organic fertilizers

Sl. No.	Methods of application	Respondents	
		Number (N=270)	Percentage (100)
Ia)	FYM		
	Ring / Band placement	227	84.07
b)	Compost		
	Ring / Band placement	53	19.62
c)	Vermi-compost		
	Ring / Band placement	21	07.77
d)	Edible oil cake		
	Ring / Band placement	40	14.81
e)	Non-Edible oil cake		
	Ring / Band placement	55	20.37
f)	Animal Origin		
	Ring / Band placement	11	04.07

Ring or Band placement methods of application is found to be most common in pomegranate growers and it can be observed from Table 94 that, majority (84.07 %) respondents followed by 19.62 per cent followed by 07.77 per cent followed by 14.81 per cent followed by 20.37 per cent and 04.07 per cent of the Pomegranate growers had applied FYM, compost, vermin-compost, edible oil cakes, non-edible oil cake and animal origin cake respectively by ring or band placement methods only.

4.7.7.1 Different Methods of Application of Green Manures in Pomegranate Cultivation

It was found that the Pomegranate growers were applying various green manures to the Pomegranate orchard by various methods. The observations regarding the methods used by the respondents are given in Table 95.

Table 95. Distribution of the respondents according to methods of application of Green Manures in Pomegranate Cultivation

Sl. No.	Methods of application	Respondents	
		Number (N=270)	Percentage (100)
II a)	Leguminous Crop		
	In situ placement	108	40.00
b)	Green Leaf Manures		
	Ex-situ placement	106	39.25

It was concluded from Table 95 that near 40.00 per cent Pomegranate growers had used leguminous crop as a green manuring by in situ placement and 39.25 per cent respondents had used green leaf manures as a green manuring by ex-situ placement methods.

4.7.7.2 Different Methods of Application of Bio-fertilizers in Pomegranate Cultivation

It was found that the Pomegranate growers were applying various bio-fertilizers to the Pomegranate orchard by various methods. The observations regarding the methods used by the respondents are given in Table 96.

Table 96. Distribution of the respondents according to methods of application of Bio-Fertilizers

Sl. No.	Methods of application	Respondents	
		Number (N=270)	Percentage (100)
IIIa.	Powder form		
1.	Ring / Band placement	174	64.44
2.	Drenching	78	28.88
3.	Foliar spray	128	47.40
b.	Liquid form		
1.	Drenching	199	73.70
2.	Foliar spray	159	58.88

It was observed from Table 96 that more than half 64.44 per cent Pomegranate growers had used by ring or band placement method followed by 28.88 per cent as drenching and near half 47.40 per cent as foliar spray for powder form bio-fertilizer utilization. It was also found that 73.70 per cent respondents had used drenching methods followed by 58.88 per cent used foliar spray for application of liquid bio-fertilizer.

4.7.7.3 Different Methods of Application of Chemical fertilizers in Pomegranate Cultivation

It was found that the Pomegranate growers were applying various chemical fertilizers to the Pomegranate orchard by various methods. The observations regarding the methods used by the respondents are given in Table 97.

Table 97. Distribution of the respondents according to methods of application of Chemical Fertilizers in pomegranate cultivation

Sl. No.	Methods of application	Respondents	
		Number (N=270)	Percentage (100)
IV	Chemical fertilizers		
1.	Ring / Band placement	257	95.18
2.	Chealated/ Mix with FYM	210	77.77
3.	Drip	246	91.11

It was also revealed from Table 97 that 95.18 per cent Pomegranate growers had used ring or band placements followed by 77.77 per cent respondents had used chealed or mixing with FYM and 91.11 per cent had used drip method for application of chemical fertilizer.

4.7.7.4 Different Methods of Application of Micro-nutrients fertilizers in Pomegranate Cultivation

It was found that the Pomegranate growers were applying various micro-nutrients to the Pomegranate orchard by various methods. The observations regarding the methods used by the respondents are given in Table 98.

Table 98. Distribution of the respondents according to methods of application of fertilizers-Micronutrients in pomegranate cultivation

Sl. No.	Methods of application	Respondents	
		Number (N=270)	Percentage (100)
V	Micro-nutrients		
1.	Soil/ chealated	235	87.03
2.	Foliar spray	251	92.96

It was also concluded from Table 98 that 87.03 per cent Pomegranate growers had used soil or chealed method followed by 92.96 per cent respondents had used foliar spray for micro-nutrients utilization.

4.8 Distribution of the Pomegranate growers according to use of different combinations of nutrient management practices i.e. Users Categories

The Pomegranate growers were found using different nutrient management practices. The information regarding the different combinations used by the respondents and their users categories is given in Table 99.

It is concluded from Table 99 that maximum number of the Pomegranate growers (24.81 %) had used the combination of organic manures + green manures + bio-fertilizers + chemical fertilizers + micro-nutrients, while 22.59 per cent respondents used the combination of green manures + bio-fertilizers + chemical fertilizers + micro-nutrients. From the respondents, 19.62 per cent were the users of organic manures + chemical fertilizers. It was also observed from the Table 99 that 14.81 per cent respondents had used organic manures + micro-nutrients. The combinations of organic manures + green manures + bio-fertilizers + chemical fertilizers were also used by the 07.03 per cent respondents of the respondents, near equal number of respondents (03.70 and 03.33 %) had used the combination of organic manures + green manure + bio-fertilizers and organic manures + green manures + chemical fertilizers respectively. The 02.22 per cent respondents had used bio-fertilizers + chemical fertilizers + micro-nutrients combination and 01.11 percent used organic manures + green manures + bio-fertilizers + micro-nutrients followed by 0.74 per cent of respondents had used organic manures + green manures combination only who was following organic cropping system.

Table 99. Distribution of the Pomegranate growers according to the Users Categories

Sl. No.	Type of Fertilizers	Number (N= 270)	Percentage
1.	Users of Organic Manures + Green Manures	02	00.74
2.	Users of Organic Manures + Chemical fertilizers	53	19.62
3.	User of Organic Manures + Micro-nutrients	40	14.81
4.	Users of Organic Manures + Green Manure + Bio-Fertilizers	10	03.70
5.	Users of Organic Manures + Green Manures + Chemical Fertilizers	09	03.33
6.	Users of Organic Manures + Green Manures + Bio-Fertilizers + Chemical Fertilizers	19	07.03
7.	Users of Organic Manures + Green Manures + Bio-fertilizers + Micro-nutrients	03	01.11
8.	Users of Green Manures + Bio-fertilizers + Chemical Fertilizers + Micro-nutrients	61	22.59
9.	Users of Bio-Fertilizers + Chemical fertilizers + Micro-nutrients	06	02.22
10.	Users of Organic Manures + Green Manures + Bio-Fertilizers + Chemical Fertilizers + Micro-nutrients	67	24.81
	Total	270	100.00

4.9 Relationship of selected independent variables with their knowledge level about various nutrient management practices

To ascertain the relationship between pomegranate growers knowledge level about various nutrient management practices and their selected characteristics, the correlation test was applied. On the basis of operational measures developed for the variables, hypotheses were stated for testing the relationship and their significance on correlation.

The correlation coefficient between knowledge (dependent) and various independent variables *viz.*, personal and social variables, economic variables, situational variables, psychological variables and communication variables is depicted in Table 100.

Table 100. Coefficient of correlation between selected characteristics of Pomegranate growers with their knowledge of the nutrient management practices

Sl. No.	Variables	'r ' value
1.	Age	- 0.131 **
2.	Education	0.116 **
3.	Family size	0.125*
4.	Experience in pomegranate cultivation	0.174 ***
5.	Social participation	0.134 **
6.	Irrigation status	0.184**
7.	Cropping pattern	- 0.0262 ^{NS}
8.	Total land holding	0.043 ^{NS}
9.	Area under pomegranate	0.153**
10.	Annual income	0.161 **
11.	Cosmopolitaness	0.110*
12.	Information sources use	0.048 **
13.	Attitude	0.141*
14.	Risk preferences	0.160 **
15.	Scientific orientation	0.135*
16.	Socio-economic status	0.165**

Note : * = Significant at 0.05 % level of significance

** = Significant at 0.01 % level of significance

NS = Non-significant

4.9.1 Personal and social variables

4.9.1.1 Age and knowledge

The relationship between age and knowledge level of the respondents was found to be negative and statistically significant ($r = 0.131$). This indicates that older age hinders the acquisition of knowledge. The older aged people may have less desire to get knowledge about various nutrient management practices. Thus, it is concluded that younger respondents were having higher knowledge about various nutrient management

practices in pomegranate and vice versa. This finding is in conformity with the findings of Mehta *et al.* (1989), Shantha Sheela and Seetharaman (2002a) and Anonymous (2005).

4.9.1.2 Education and knowledge

It was observed from the study that the education and knowledge level of the respondents had highly positively significant relationship ($r = 0.116$). Education makes man to believe in science and technology and thereby rationalize his way of thinking and acting. This indicates that higher education makes farmers to change and accept innovative ideas more quickly. They have greater desire for gaining knowledge. Thus, it is concluded that the higher educated respondents were having high knowledge about nutrient management practices. Similar findings were observed by the Pande *et al.* (1994), Kalaskar (1998), Anonymous (2005) and Maulasab *et al.* (2006).

4.9.1.3 Size of family and knowledge

Size of family of the respondents showed significant and positive relationship with their knowledge level ($r = 0.125$). This shows that as the family size increases the knowledge of the individual increased about various nutrient management practices in pomegranate. This may be because of the respondents had more availability of resources and information sources and may had more capacity to acquire a knowledge.

The findings are more similar with the findings of Salunke (1994), Jalak (2002), Bite (2009) and Dhere (2012).

4.9.1.4 Experience of pomegranate cultivation and knowledge

Relationship between experience in pomegranate cultivation and knowledge level of pomegranate growers was found to be significant and positive ($r = 0.174$).

More experience of farmers about cultivation of crop leads to more exposure to various problems pertaining to crop cultivation. This might leads to great desire of the farmers to get higher knowledge. Thus, greater the experience of the person higher is the knowledge level. The findings are in conformity with Shantha Sheela and Seetharaman (2002 a) and Shantha Sheela and Seetharaman (2002 b).

4.9.1.5 Socio-economic status and knowledge

There was a positive and significant correlation ($r = 0.165$) between socioeconomic status and knowledge level of the respondents. The respondents who had higher socio-economic status are prepared to try new innovations with a view to make progress in farming. They have financial freedom and rational thinking. These facts may stimulate them to gain knowledge about the various nutrient management practices. The findings of the study are supported by the results of Reddy (1992), Mahajan (2000) and Kadam (2006).

4.9.1.6 Social participation and knowledge

The correlation between social participation and knowledge was found to be positive and significant ($r = 0.134$). The finding indicated that there was not only a positive trend in social participation and knowledge of respondents, but also knowledge of various nutrient management practices in pomegranate were influenced by the social participation.

The finding is in contradictory with the findings of Nimje *et al.* (1990) and Jalak (2002).

4.9.2 Situational variables

4.9.2.1 Irrigation status and knowledge

It was found that there was a highly significant and positive relationship between the irrigation status and knowledge level of respondents ($r = 0.184$). This indicates that irrigation status determines further gain in knowledge. In other words respondents having highly irrigated area are getting more income from Pomegranate and vice versa. The findings are in line with the findings of Dhere (2012).

4.9.2.2 Cropping pattern and knowledge

It was found that there was a negative and non significant ($r = -0.0262$) relationship between cropping pattern and knowledge level of Pomegranate growers. The findings indicated that there was a negative and non significant trend between cropping pattern and knowledge. It means that knowledge of nutrient management practices was not influenced by cropping pattern followed.

The findings are contradictory with the findings of Dhere (2012).

4.9.3 Economic variables

4.9.3.1 Total land holding and knowledge

Relationship between total land holding and knowledge level of pomegranate growers was found to be non-significant and positive ($r = 0.043$). The farmers with large farm size have generally had not higher socio-economic status and annual income. These farmers have generally tendency to develop the contacts with extension agencies or not and to obtain technical know-how from them. This enables them to acquire more knowledge. Thus, the results suggests larger the size of land holding, lower was the knowledge of various nutrient management practices. These findings are in agreement with Kubade and Kalantri (1986), Bhopale *et al.* (1996), Mehta *et al.* (1989) and Anonymous (2005).

4.9.3.2 Area under pomegranate and knowledge

The relationship between area under pomegranate and knowledge level of pomegranate growers about nutrient management practices was found to be positive and statistically significant ($r = 0.153$).

The farmers with larger area under pomegranate may be having better income level. The area brought under pomegranate cultivation by a person is an important economic parameter to assess the economic standing of that person in that society. This might have led to more knowledge about various nutrient management practices in pomegranate.

The findings of the present study are in line with the findings of Bhopale *et al.* (1996), Katole *et al.* (1996) and Kalaskar (1998).

4.9.3.3 Annual Income and knowledge

The relationship between annual income and knowledge level of pomegranate growers about nutrient management practices of the respondents was found to be positive and statistically significant ($r = 0.161$).

Income is a major determinant of the economic status of an individual. Every individual style of living is decided to a great extent by this income. His expenditure on farming, allied occupations and household matter is decided by the

income he earned. Thus, annual income motivates and influences farmers to acquire more knowledge about various nutrient management practices.

This findings is in conformity with the findings of Mehta *et al.* (1989), Katole *et al.* (1996) and Chavai (2004).

4.9.4 Psychological variables

4.9.4.1 Risk preference and knowledge

The relationship between risk preference and knowledge level of pomegranate growers about nutrient management practices was found to be positive and statistically significant ($r = 0.160$).

The farmers with more risk preference ability may be having better chances to get more knowledge about innovation.. The greater the risk taking capacity in pomegranate cultivation by a person is an important psychological parameter to assess the opinion leadership standing of that person in that society. This might have led to more knowledge about various nutrient management practices in pomegranate.

The findings of the present study are in line with the findings of Bhopale *et al.* (1996), Katole *et al.* (1996) and Kalaskar (1998).

4.9.4.2 Attitude and knowledge

Attitude of pomegranate growers and level of their knowledge were found positive and significant ($r = 0.141$) . This indicates that one's attitude towards new technology determines further gain in knowledge. In other words respondents with favourable attitude seek to get more knowledge and vice versa.

The findings are in line with the findings of Salunke (1994), Nayak (2000), Jalak (2002),Bite (2009) and Dhere (2012).

4.9.4.3 Scientific orientation and knowledge

A positive and statistically significant correlation ($r = 0.135$) was observed between scientific orientation of the respondents and the knowledge level. The farmers who are more scientific orientation leads to higher tendency of pomegranate growers to use the different nutrient management practices on larger area with view to increase production and productivity.

The results obtained by Moulasab *et al.* (2006) and Kadam *et al.* (2001) are similar to those of the present study.

4.9.5 Communicational variables

4.9.5.1 Information sources use and knowledge

Utilization of sources of information by the respondents exhibited positive and highly significant relationship with their knowledge level about various nutrient management practices in pomegranate ($r = 0.048$). This indicates that as the sources of information increased there was increase in knowledge of respondents about nutrient management practices. This may be because of the fact that the respondents are more exposed to new ideas through different sources of information and may have more capacity to acquire knowledge. This exhibits the important role of change agents I transfer of technology to the pomegranate growers.

The findings are in line with the Sherawat and Singh (2001), Bite (2009) and Sabi *et al.* (2014).

4.9.5.2 Cosmopoliteness and knowledge

A positive and statistically significant correlation was observed between cosmopoliteness of the respondents and the knowledge level ($r = 0.110$). This indicates that, the knowledge level of pomegranate growers was influenced by the cosmopoliteness. The higher cosmopoliteness leads to higher exposure to the outside world.

Similar findings were reported by the Katkar (2001) and Gangurde (2003).

4.10 Multiple regression analysis of selected independent variables of pomegranate growers with their knowledge level

The multiple regression analysis of knowledge and selected independent variables in the study is presented in Table 101.

Table 101. Regression Coefficient of selected characteristics of Pomegranate growers with their knowledge of the nutrient management practices

Sl. No.	Variables	Coefficient of Regression 'b'	SE of b	t value of b
1.	Age	0.081**	0.01	8.10
2.	Education	0.187**	0.03	6.23
3.	Family size	0.050*	0.024	2.08
4.	Experience in pomegranate farming	0.027*	0.011	1.82
5.	Social participation	0.122**	0.019	6.32
6.	Irrigation status	1.363**	0.48	2.82
7.	Cropping pattern	0.149 ^{NS}	0.03	1.08
8.	Total land holding	4.99 ^{NS}	3.52	1.41
9.	Land under pomegranate	1.99**	0.78	2.54
10.	Annual income	0.933**	0.25	3.72
11.	Cosmopolitaness	0.605**	0.13	4.62
12.	Information sources	0.328**	0.09	3.56
13.	Attitude	0.249**	0.06	4.00
14.	Risk preferences	0.340**	0.08	4.25
15.	Scientific orientation	0.656**	0.18	3.61
16.	Socio-economic status	0.816**	0.13	6.23
		R² = 0.51		
		F Value = 10.90		

Note : * = Significant at 0.05 % level of significance

** = Significant at 0.01 % level of significance

NS = Non-significant

The data revealed in Table 101 that, out of sixteen independent variables, fourteen variables viz., age, education, family size, socio-economic status, annual income, area under Pomegranate, experience in pomegranate cultivation, social participation, irrigation status, cropping pattern, information sources used, scientific orientation, risk preference, and attitude contributed significantly towards the variation in the knowledge level of pomegranate growers about various nutrient management practices. While only two variable age and cropping pattern has not contributed significantly in knowledge. The calculated R² was 0.51 which meant that the selected sixteen independent variables could explained 51.00 per cent variations in the knowledge of pomegranate growers about various nutrient management practices. Thus, the knowledge level of pomegranate

growers was determined by the selected personal, social, situational, economic, communication and psychological characteristics.

4.11 Relationship of selected independent variables with their extent of utilization level

The data about the relationship exists between personal, socioeconomic, situational and communication variables and utilization level was collected and presented as shown in Table 102.

Table 102. Coefficient of correlation between selected characteristics of Pomegranate growers with their utilization of the nutrient management practices

Sl. No.	Variables	'r' value
1.	Age	- 0.185**
2.	Education	0.196**
3.	Family size	0.173 **
4.	Experience in pomegranate farming	0.186**
5.	Social participation	0.118 *
6.	Irrigation status	0.163 **
7.	Cropping pattern	-0.019 ^{NS}
8.	Total land holding	0.022 ^{NS}
9.	Area under pomegranate	0.132 **
10.	Annual income	0.124 *
11.	Cosmopolitaness	0.121 *
12.	Information sources use	0.152 **
13.	Attitude	0.152 **
14.	Risk preferences	0.177**
15.	Scientific orientation	0.192**
16.	Socio-economic status	0.162**

Note : * = Significant at 0.05% level of significance

** = Significant at 0.01% level of significance

NS = Non-significant

4.11.1 Personal and social variables

4.11.1.1 Age and utilization

The relationship between age and utilization level of the respondents was found to be negative and statistically significant ($r = -0.185$). This indicates that older age hinders the utilization process. The older aged people may have less desire to utilization of various nutrient management practices. Thus, it is concluded that younger respondents were having higher utilization rate about various nutrient management practices in pomegranate and vice versa.

This finding is in contradictory with the findings of Mehta *et al.* (1989) and Sheela and Seetharaman (2002c).

4.11.1.2 Education and utilization

It was observed from the study that the education and utilization level of the respondents had positively significant relationship ($r = 0.196$). This indicates that higher education makes farmers to change and utilize innovative ideas more quickly. They have greater desire for utilization of innovations. Thus, it is concluded that the higher educated respondents were having high utilization towards nutrient management practices.

Similar findings were observed by the Pande *et al.* (1994) and Chapke (2000).

4.11.1.3 Family size and utilization

Size of family of the respondents are positive and highly significant relationship with their utilization level ($r = 0.173$). This shows that as family size increases the utilization of the respondents about nutrient management practices increased. The findings are similar to the findings of Jalak (2002), Deshmukh (1991), Salunke (1994), Joseph (2007) and Singh (1983).

4.11.1.4 Farming experience of pomegranate cultivation and utilization

Relationship between experience in pomegranate cultivation and utilization level of pomegranate growers was found to be highly significant and positive ($r = 0.186$).

More experience of farmers about cultivation of crop leads to more exposure to various problems pertaining to crop cultivation. Thus, greater the experience of the person higher is the utilization level.

The finding is in conformity with Shantha Sheela and Seetharaman (2002).

4.11.1.5 Socio-economic status and utilization

There was a positive and significant correlation between socio-economic status and utilization level of the respondents ($r = 0.162$). The respondents who had higher socio-economic status are prepared to try new innovations with a view to make progress in farming. These facts may stimulate them to utilization of nutrient management practices.

The findings of the study are supported by the results of Mahajan (2000) and Kadam (2006).

4.11.1.6 Social participation and utilization

The correlation between social participation and utilization about nutrient management practices was found to be positive and significant ($r = 0.118$). The findings indicated that there was a positive trend in social participation and utilization about nutrient management practices. In other word, there may be more social participation of respondents there more utilization of nutrient management practices. The findings are in line with the findings of Singh (1983), Modak (1992) and Jalak (2002).

4.11.2 Situational variables

4.11.2.1 Irrigation status and utilization

It was observed that there was a significant and positive relationship between the irrigation status and utilization level of respondents about nutrient management practices ($r = 0.163$).

This conclude that irrigation status determines further gain in utilization of nutrient management. In other words, respondents having highly irrigated area are getting more income pomegranate farming which enables him to get more utilization and vice versa.

The findings are in line with the findings of Reddy (2000) and Singh *et al.* (2014).

4.11.2.2 Cropping pattern and utilization

The correlation between cropping pattern and utilization was found to be negative and non-significant ($r = -0.019$). The findings indicated that there was a negative trend in cropping pattern and utilization of nutrient management practices. It was not significant, meaning thereby, that utilization about nutrient management practices not influenced by the cropping pattern. This might be because respondents grown other crops like soybean, sorghum and utilized different nutrient management as per requirement.

The findings are in line with the findings of Reddy (2000) and Verma (2008).

4.11.3 Economic variables

4.11.3.1 Total land holding and utilization

Relationship between land holding and utilization level of pomegranate growers was found to be highly significant and positive ($r = 0.022$). The farmers with large farm size have generally higher socio-economic status and annual income. These farmers have generally tendency to develop the contacts with extension agencies and to obtain technical know-how from them. Thus, the results suggests larger the size of land holding, higher was the utilization level about various nutrient management practices.

These findings are in agreement with Kubade and Kalantri (1986) and Bhopale *et al.* (1996).

4.11.3.2 Area under pomegranate and utilization

The relationship between area under pomegranate and utilization level of pomegranate growers about nutrient management practices was found to be positive and statistically highly significant ($r = 0.132$).

The farmers with larger area under pomegranate may be having better income level. The area brought under pomegranate cultivation by a person is an important economic parameter to assess the economic standing of that person in that society. This might have led to more adoption about various nutrient management practices in pomegranate.

The findings of the present study are in line with the findings of Katole *et al.* (1996) and Kalaskar (1998).

4.11.3.3 Annual income and utilization

The relationship between annual income and utilization level of pomegranate growers about nutrient management practices of the respondents was found to be positive and statistically significant ($r = 0.124$).

Every individual style of living is decided to a great extent by his income. His expenditure on farming, allied occupations and household matter is decided by the income he earned. Thus, annual income motivates and influences farmers to utilize the new nutrient management practices.

This finding is in conformity with the findings of Mehta *et al.* (1989) and Anonymous (2005).

4.11.4 Psychological variables

4.11.4.1 Risk preference and utilization

Risk preference capacity of Pomegranate growers and level of their utilization about nutrient management practices found positive and significant ($r = 0.17$). This indicates that one's risk taking capacity towards nutrient management practices determines further gain in utilization. In other words, respondents with more risk taking capacity seek to get more knowledge and vice versa and utilized the new technology easily.

The findings are in line with the findings of Salunke (1994) and Jalak (2002).

4.11.4.2 Attitude and utilization

Attitude of Pomegranate growers and level of their utilization about nutrient management practices found positive and significant ($r = 0.15$). This indicates that one's attitude towards new technology determines further gain in utilization. In other words, respondents with favourable attitude seek to get more knowledge and vice versa and utilized the technology.

The findings are in line with the findings of Salunke (1994) and Jalak (2002).

4.11.4.3 Scientific orientation and utilization

A positive and statistically significant correlation was observed between scientific orientation of the respondents and the utilization level ($r = 0.192$). The farmers who are more scientific orientation leads to higher tendency of pomegranate growers to use the different nutrient management practices on larger area with view to increase production and productivity.

The results obtained by Maulasab *et al.* (2006) and Kadam *et al.* (2010) are similar to those of the present study.

4.11.5 Communicational variables

4.11.5.1 Information sources use and utilization

Utilization sources of information by the Pomegranate growers exhibited positive and highly significant relationship with their utilization level of nutrient management practices ($r = 0.152$).

This indicates that as the sources of information increased; there was increase in nutrient management practices by the respondents. This may be because of the fact that the respondents are more exposed to new ideas through different sources of information and may have more capacity to acquire knowledge and utilizes new technologies. This exhibits the important role of change agents in transfer of technology to the farmers.

The finding is in line with the findings of Modak (1992), Kher (1991), Jalak (2002), Darandale (2010) and Singh *et al.* (2014).

4.11.5.2 Cosmopolitaness and utilization

A positive and statistically significant correlation was observed between cosmopolitaness of the respondents and the utilization level ($r = 0.121$). This indicates that, the rate of utilization among the pomegranate growers was influenced by the cosmopolitaness. The higher cosmopolitaness leads to higher exposure to the outside world.

Similar findings were reported by the Katkar (2001) and Gangurde (2003).

4.12 Multiple regression analysis of selected independent variables with extent of utilization level of pomegranate growers

The multiple regression analysis of adoption level and selected independent variables in the study is presented in Table 103.

Table 103. Regression Coefficient of selected characteristics of Pomegranate growers with their utilization of the nutrient management practices

Sl. No.	Independent variables	Coefficient of Regression ' b'	SE of b	t value
1.	Age	0.066*	0.031	1.94
2	Education	0.263**	0.100	2.623
3	Family size	0.212 ^{NS}	0.14	1.51
4	Experience in pomegranate farming	0.195**	0.07	2.710
5	Social participation	0.079**	0.11	7.18
6	Irrigation status	2.986*	1.44	2.062
7	Cropping pattern	0.058 ^{NS}	0.10	0.057
8	Total land holding	17.32 ^{NS}	10.59	1.635
9	Land under pomegranate	7.334**	2.36	3.128
10	Annual income	3.142*	1.58	1.992
11	Cosmopolitaness	2.634**	0.41	6.41
12	Information sources	0.114**	0.044	2.50
13	Attitude	0.089*	0.49	1.82
14	Risk preferences	0.813*	0.418	1.94
15	Scientific orientation	9.730**	0.55	17.690
16	Socio-economic status	1.031**	0.41	2.515
			R² = 0.89	
			F Value = 126.80	

Note : * = Significant at 0.05% level of significance

** = Significant at 0.01% level of significance

NS = Non-significant

The data revealed in Table 101 that, out of sixteen independent variables, thirteen variables *viz.*, age, education, socio-economic status, annual income, area under Pomegranate, experience in pomegranate cultivation, social participation, irrigation status, information sources used, scientific orientation, risk preference, cosmopolitaness and attitude contributed significantly towards the variation in the utilization level of pomegranate growers about various nutrient management practices. While only three variable cropping pattern, family size and total land holding has not contributed

significantly in utilization. The calculated R^2 was 0.89 which meant that the selected sixteen independent variables could explained 89.00 per cent variations in the utilization of pomegranate growers about various nutrient management practices. Thus, the utilization level of pomegranate growers was determined by the selected personal, social, situational, economic, communication and psychological characteristics.

4.13 Constraints faced by the pomegranate growers

Constraints are the causes, which prohibit the farmers to adopt improved farm technology. It has been observed from the results presented earlier that the nutrient management practices had not been fully utilized. The results with respect to the constraints faced by the respondents in utilization of nutrient management practices are discussed in this section and presented in Table 104.

Table 104. Distribution of pomegranate growers according to constraints faced by them in nutrient management

Sl. No.	Particulars	No. of respondents (N=270)		Rank
		Frequency	Per cent	
1.	Soil			
i.	Lack of soil testing laboratory	84	31.11	I
2.	Constraints in seedling/grafts			
i.	Unavailability of pure breed graft material	209	77.41	I
3.	Constraints in water management			
i.	Lack of knowledge about chemical properties of water	242	89.63	I
ii.	High investment cost of drip installment	241	89.26	II
iii.	Less knowledge about quantity of drippers and water per plant	232	85.93	III
4.	Constraints in Bahar management			
i.	Lack of knowledge about pruning management in time	249	92.22	I
ii.	Lack of knowledge about pests and diseases during bahar treatment	227	84.07	II
5.	Nutrient management constraints			
i.	Unavailability of standardisation in biological fertilizers	270	100.00	I
ii.	Insufficient knowledge of Integrated Nutrient Management	268	99.26	II

Table 104 Contd.....

Sl. No.	Particulars	No. of respondents (N=270)		Rank
		Frequency	Per cent	
iii.	Lack knowledge of recommended doses of Integrated Nutrient Management.	239	88.52	III
iv.	Unavailability of chemical fertilizers in time	222	82.22	IV
v.	Unavailability of liquid fertilizers in various grades	204	75.56	V
vi.	Unavailability of separate micronutrients in market	197	72.96	VI
vii.	Lack of knowledge of functions of nutrients	187	69.26	VII
viii.	Constraints in application of proper / balanced fertilizers dose due to insufficient knowledge	169	62.59	VIII
ix.	Lack of knowledge about spacing and dose of organic manures	129	47.77	X
x.	Unavailability of well decomposed manures	140	51.85	IX
xi.	Lack of knowledge about water soluble fertilizers	119	44.07	XI
6.	Economic constraints			
i.	High fertilizer cost	246	91.11	I
ii.	Lack of information about export standard	237	87.78	II
iii.	Unavailability of capital for cost of cultivation	221	81.85	III
iv.	Fluctuation in market rate	219	81.11	IV
v.	Presence of middleman in market	212	78.52	V
vi.	Lack of cold storages	207	76.67	VI
vii.	Lack of processing units of pomegranate	198	73.33	VII
viii.	Complicated loan procedure	182	67.41	VIII
ix.	High labour charges.	172	63.70	IX
7	General constraints			
i.	Obstacle of electricity	270	100.00	I
ii.	Unavailability of pest and disease resistance varieties.	231	85.56	II
iii.	Unavailability of labours	227	84.07	III
iv.	Confusion in selection of pesticides and fungicide	218	80.74	IV
v.	Unavailability of subsidy in time by Govt. at time of natural calamities	197	72.96	V
vi.	No authentic literature on pomegranate in Marathi	87	32.22	VI

The data presented in Table 104 shows that the 31.11 per cent of the pomegranate growers had faced lack of soil testing laboratory. Regarding unavailability of pure breed graft material 77.41 per cent faced constraints. About constraints in water management, lack of knowledge about chemical properties of water (89.63 %) followed by high investment cost of drip installment (89.26) and 85.93 per cent faced less knowledge about quantity of drippers and water per plant. 92.22 and 84.07 per cent had faced the constraints regarding lack of knowledge about pruning management in time and lack of knowledge about pests and diseases during bahar treatment respectively. However, regarding nutrient management constraints, unavailability of standardization in biological fertilizers (100.00 %) followed by Insufficient knowledge of integrated nutrient management (99.26 %) followed by lack knowledge of recommended doses of integrated nutrient management (88.52 %) followed by unavailability of chemical fertilizers in time (82.22 %) followed by unavailability of liquid fertilizers in various grades (75.56 %) followed by unavailability of separate micronutrients in market (72.96 %) followed by lack of knowledge of functions of nutrients (69.26 %) followed by constraints in application of proper / balanced fertilisers dose due to insufficient knowledge (62.59 %), followed by unavailability of well decomposed manures(51.85 %) followed by lack of knowledge about spacing and dose of organic manures (47.77 %) and lack of knowledge about water soluble fertilizers (44.07 %) respectively.

As per economic constraints concern, Pomegranate growers faced high fertilizer cost (91.11 %) followed by lack of information about export standard (87.78 %) followed by unavailability of capital for cost of cultivation (81.85 %) followed by fluctuation in market rate (81.11 %) followed by presence of middleman in market (78.52 %) followed by Lack of cold storages (76.67 %) followed by lack of processing units of pomegranate (73.33 %) followed by complicated loan procedure (67.41 %) followed by high labour charges (63.70 %) respectively. Obstacle of electricity (100.00 %) followed by unavailability of pest and disease resistance varieties (85.56 %) followed by unavailability of labours (84.07 %) followed by confusion in selection of pesticides and fungicide (80.74 %) followed by unavailability of subsidy in time by Govt. at time of natural calamities (72.96 %) and no authentic literature on pomegranate in Marathi (32.22

%) were the other general constraints faced by the pomegranate growers. Similar findings regarding the constraints in utilization of nutrient management are observed by Kaid *et al.* (2005), Christain *et al.* (2004), Kadam *et al.* (2001), Chitnis *et al.* (2000), Sharma (1997) and Iqbal *et al.* (1996).

4.14 Suggestions of pomegranate growers for overcoming the constraints

An attempt was made to obtain the suggestions from the respondents to overcome the constraints faced by them in utilization of various nutrient management practices. The respondents were requested to offer their valuable suggestions. The data regarding the suggestions are presented in Table 105.

Table 105. Distribution of Pomegranate growers according to suggestions given by them for overcoming the constraints

Sl. No.	Particulars	No. of respondents (N=270)		Rank
		Frequency	Per cent	
1.	Soil			
i.	Organization of workshop on soil health	248	91.85	I
ii.	Method and result demonstration on spacing and doses of organic manures should be organized	227	84.07	II
iii.	Availability of soil testing laboratory near the village	78	28.88	III
2	Seedling/grfts			
i.	Authentic seedlings should available in time	200	74.07	I
3	Water management			
i.	Organization of method demonstration on water testing sampling.	239	88.52	I
	Organization of workshop for farmers on Drip irrigation management in pomegranate	233	86.30	II
4	Bahar management			
	Shivar ferries should organized by extension personnel to inform the various pests and diseases during bahar treatment	232	85.93	I
	Government should organized training programme on Market oriented Bahar management	229	84.81	II
5	Nutrient management			
	Awareness of nutrient managements among farmers through farmers rally and agril. exhibitions by State Agril. Department with agril. universities	270	100.00	I
	Literature on standardization of biofertilizers should be supply towards farm community.	264	97.78	II

Table 105 contd....

Sl. No.	Particulars	No. of respondents (N=270)		Rank
		Frequency	Per cent	
	Agriculture department should conduct pre-season training for farmers regarding fertilizer doses according to growth stages of pomegranate at village levels	236	87.41	III
	Schedule of fertilizer application with their doses should provide by Agril. Asstt. of state department	230	85.19	IV
6	Economic			
	Government should provide fertilizers in time and on subsidize rate	237	87.78	I
	Government should give more subsidies to pomegranate processing units and cold storages without complicated procedure	198	73.33	II
7	General			
	There should be regular electricity supply	270	100.00	I
	Authentic literature on pomegranate in Marathi should be supply by Government agencies to Krishi Vigyan Mandals	249	92.22	II
	Agril. University should undertaken research on pest and disease resistance varieties in pomegranate pocket.	234	86.67	III

The data presented in Table 105 reveal that Organization of workshop on soil health (91.85 %) was the major suggestion of respondents and ranked first followed by Method and result demonstration on spacing and doses of organic manures should be organized (84.07 %) and Availability of soil testing laboratory near the village (28.88 %). Simple Authentic seedlings should available in time were the suggestion quoted by (74.07 %) and ranked first. Organization of method demonstration on water testing sampling were the suggestion given by (88.52 %) and Organization of workshop for farmers on Drip irrigation management in pomegranate (86.30 %) respectively. Regarding bahar management, Shivar ferries should organized by extension personnel to inform the various pests and diseases during bahar treatment (85.93 %) ranked first and Government should organized training programme on Market oriented Bahar management (84.81 %) were suggestion given and ranked second by the respondents. How ever, regarding nutrient management, Awareness of nutrient managements among

farmers through farmers rally and agricultural exhibitions by State Agriculture Department with Agricultural Universities (100.00 %) respondents were suggested and ranked first followed by Literature on standardization of biofertilizers should be supply towards farm community (97.78 %) ranked second followed by Agriculture department should conduct pre-season training for farmers regarding fertilizer doses according to growth stages of pomegranate at village levels (87.41 %) third rank and schedule of fertilizer application with their doses should provide by Agriculture Assistant of State department (85.19 %) fourth rank respectively. As per economic suggestion, Government should provide fertilizers in time and on subsidize rate (87.78 %) and ranked first followed by Government should give more subsidies to pomegranate processing units and cold storages without complicated procedure (73.33 %) respondents and ranked second respectively. There should be regular electricity supply (100.00 %) rank first followed by Authentic literature on pomegranate in Marathi should be supply by Government agencies to Krishi Vigyan Mandals (92.22 %) and Agril. University should undertaken research on pest and disease resistance varieties in pomegranate pocket (86.67 %) ranked third were general suggestion was given by the pomegranate growers, respectively.

The findings regarding suggestions to overcome the constraints in utilization of nutrient management practices are supported by Kantharaju (1989), Balasubramani (1997), Lakshmisha (2000) and Babanna (2002).

5. SUMMARY, CONCLUSIONS AND IMPLICATIONS

This chapter includes in nutshell, the description of summary, conclusions, recommendations of the study and suggestions for further study. India with diverse soil and climate comprising several agro-ecological regions provides ample opportunity to grow a variety of horticulture crops. These crops form a significant part of total agricultural produce in the country comprising of fruits, vegetables, root and tuber crops, flowers, ornamental, medicinal and aromatic plants, spices, condiments, plantation crops and mushrooms. It is estimated that all the horticulture crops put together cover nearly 11.6 million hectares area with an annual production of 91 million tonnes. Though these crops occupy hardly 7.0 per cent of the cropped area they contribute over 18.0 per cent to the gross agricultural output in the country.

Among different fruit crops, India is the leading worldwide producer of pomegranate fruit, with almost 80.00 per cent of pomegranate grown in Deccan Plateau mainly Maharashtra, Karnataka and Andhra Pradesh are the other important pomegranate growing areas. Looking into the therapeutic and commercial potential of pomegranate other states are also venturing to take pomegranate crop.

The pomegranate cultivation is in trouble because of low market rate, low production and productivity. The judicious and timely use of various nutrient management practices is of prime importance to maximizes the production and productivity. It is therefore, necessary to find out the existing level of knowledge and extent of utilization of various nutrient management practices for the pomegranate as well as to identify the constraints faced by the farmers in utilization of these nutrient management practices for pomegranate. It is also essential to identify the personal, socio, situational, economical, psychological and communication characteristics of pomegranate growers that influences the level of knowledge and extent of utilization of various nutrient management practices. Also the study helps research worker and extension functionaries involved in solving the problems being raised during pomegranate cultivation. The extension agent and other action agencies will be equipped with

guidelines of the present study, which in turn will be helpful for them to evolve a new strategy for introducing necessary changes in their action plan.

The research study entitled ‘A Study of Utilization of Nutrient Management Practices by the Pomegranate Growers’ was conducted with the following objectives.

1. To study the personal, socio-economic and psychological characteristics of the pomegranate growers.
2. To develop a scale for utilization of nutrient management practices by the pomegranate growers.
3. To study the knowledge of the pomegranate growers about nutrient management practices.
4. To study the Information Sources Use by the Pomegranate growers about nutrient management practices.
5. To study the extent of utilization of nutrient management practices by the pomegranate growers.
6. To study the relationship between personal, socio-economic and psychological characteristics of pomegranate growers with their Knowledge and extent of utilization of nutrient management practices by them.
7. To study the constraints faced by the pomegranate growers in utilization of nutrient management practices and to obtain their suggestions for overcoming the constraints.

On the basis of the review of literature having direct and indirect bearing on the problem, conceptual framework was developed for the study and various concepts were operationalised suitably. The methodological procedure consisted of measurement of knowledge and utilization level as dependent variables and selected characteristics of the pomegranate growers as independent variables, sampling techniques, selection and measurement of variables, tools and techniques of data collection and analysis of data and various statistical measures used to test the hypothes. Statistical measures such as percentage, range, coefficient of correlation and multiple regression were used. For measuring the selected dependent and independent variables, scales, tests and indices

developed by other researchers were used. The measurement of extent of utilization was done with help of specially developed utilization scale, whereas measurement of socio-economic status, social participation and cropping pattern were made with the help of scale developed by Thakare (2004) and Nirban (2004), respectively. The variables *viz.*, risk preference, attitude and scientific orientation were measured with the help of scale developed by Supe (2007), Ajore (1989) and Supe (2007). The situational variables *viz.*, irrigation status and cropping pattern were measured with the help of scale developed by Nirban (2004). A knowledge test was specially developed for measuring the knowledge of pomegranate growers about various nutrient management practices. The measurement of education, land holding and area under pomegranate was done based on existing norms of education and land holding in the state of Maharashtra. Other variables *viz.*, information source use and cosmopolitaness were measured with the scale of Bhiramkar (2009) and Nandapurkar (1981). The annual income, age, size of family, farming experiences in Pomegranate cultivation, were measured with the help of responses to appropriate questions (Appendix-V).

An interview schedule was developed in accordance with the objectives laid down in the study. The developed schedule was pretested before using it for collecting the data. A purposive and proportionate random sampling technique was used for the study. The three districts *viz.*, Sangli, Solapur, Nasik were purposively selected having highest area in their respective agriculture division. Solapur district comprise eleven tahsils, while, Nashik and Sangli comprises fifteen and ten tahsils, respectively. Out of these two tahsil having maximum area under pomegranate cultivation from each selected district was considered for the study. Hence, six tahsils were purposively selected for the study. Three villages from each tahsil were purposively selected on the basis of maximum area under pomegranate cultivation. In all total eighteen villages were selected for the present investigation. The list of the pomegranate growers were obtained from each of the selected villages with the help of village record, membership registered with Pomegranate Growers Association, Zilla Parishad and Department of Agriculture. While preparing the list, due care was taken that the pomegranate growers had at least more than five years of experience in pomegranate cultivation. Lastly, by following

proportionate random sampling method 45 pomegranate growers from three selected villages were considered from one tahsil. Hence, 270 pomegranate growers were formed the sample for the present investigation. The responses were collected by way of personal interview. The data have been presented and discussed by using the frequencies, percentages and range. The coefficient of correlation (r), was computed for finding out the relationship between the selected characteristics of pomegranate growers with their knowledge and utilization level as dependent variables. To explain the extent of variability caused by the set of independent variables in dependent variables, multiple regression analysis was used. The summary of the important findings is described hereunder.

5.1 Summary

The summary of important findings is given under the following sub-heads.

5.1.1 Personal and social characteristics of the respondents

A. Age

The age categorization of the respondents showed that approximately near half of the pomegranate growers (47.00 %) were of 'old' age. Near 35.56 per cent of the total respondents were 'middle' age followed by 17.11 per cent 'young' age respondents.

B. Education

The maximum number of respondents (34.07 %) were educated up to 'Higher Secondary' and Primary level (26.30 %) followed by respondents educated up to the 'secondary' and 'graduate' level (20.00 and 11.11 %, respectively). There were 05.56 per cent respondents educated up to 'post graduate' level of education. Respondents having 'Illiterate' level of education were only 02.96 per cent.

C. Size of family

The family size -wise distribution of respondents revealed that near three fifth of the respondents (58.89 %) belonged to medium size of family, followed by 27.41 per cent to small size and 13.70 per cent belonged to large family size category.

D. Farming experience in Pomegranate cultivation

The most of the respondents (53.70 %) had experience up to 16 years in pomegranate cultivation. It was equally followed by (19.26 %) respondents who had experience up to 11 years and from 17 to 21 years. Only (07.78 %) of the respondents had experience above 22 years in pomegranate cultivation.

E. Socio-economic status

It was observed that near one third of the pomegranate growers (27.03 %) belonged to ‘ very high ’ socio-economic status, followed by the respondents (24.81 %) belonging to ‘high ’ socio-economic status followed by 20.37 per cent respondents belonged to ‘medium’ socio-economic status followed by near one fifth (19.65 %) belonged to ‘low’ socio-economic status. While, 08.14 per cent of them had ‘very low’ socio-economic status.

F. Social participation

Near two third (63.33 %) respondents had low level of social participations followed by 30.37 per cent had medium level of social participation and few had a high level of social participations (06.30 %).

5.1.2 Situational characteristics of the respondents

A. Irrigation status

The 41.85 per cent respondents had low level of irrigation status followed by 27.77 per cent respondents had very low level of irrigation status followed by 25.18 per cent respondents had medium level of irrigation status. The very less per cent 04.44 per cent and 0.74 per cent respondents had high level and very high level irrigation status respectively.

a. Methods of irrigation followed

Near to half (46.30 %) respondents had followed ring plus drip irrigation method for irrigating the crops. More than one third, 40.74 per cent respondents had followed drip irrigation method for irrigating the crops. Nearly 12.22 per cent respondents had followed sprinkler irrigation method followed by 0.74 per cent respondents had surface irrigation method for irrigating the crops.

B. Cropping pattern

About 34.07 per cent respondents had fair cropping pattern followed by 34.07 per cent respondents had good cropping pattern and 28.15 per cent had poor cropping pattern.

5.1.3 Economic variables

A. Total land holding

Nearly fifty per cent of the respondents (47.41 %) belonged to the category of 'semi-medium' land holding ranging from 2.01 to 4.00 ha. It was followed by (30.74%) 'medium' land holding possessing land from 4.01 to 10.00 ha. and (12.22 %) respondents belongs to 'big' holding category i.e. above 10.00 ha.

B. Area under Pomegranate cultivation

Majority of pomegranate growers (60.75 %) belonged to the category of 'semi-medium' area under pomegranate cultivation from 2.01 to 4.00 ha. followed by (17.77 %) 'medium' category holding area from 4.01 ha. to 10.00 ha. and (15.18 %) respondents belongs to 'big' category i.e. 10.01 above ha.

C. Annual income

The pomegranate growers (46.30 %) had annual income between Rs.5,13,001 to Rs.8,91,000/-. However, 40.00 per cent respondents had income from Rs. 8,91,001 to Rs. 12,69,000/- While, near about equal per cent respondents 06.30 per cent had income above up to Rs. 5,13,000/- followed by 04.07 per cent had annual income Rs. 12,69,001 to Rs. 16,47,000/- .

5.1.4 Psychological characteristics of the respondents

A. Risk preference

Majority (71.48 %) of Pomegranate growers had medium level of risk preference followed by one third respondents (27.04 %) had high level of risk preference and very less 01.48 per cent had low level risk preference.

B. Attitude

Majority of the respondents were having moderate favourable attitude towards nutrient management practices followed by one third (28.52 %) were having

highly favourable attitude while, very few respondents (08.89 %) were having less favourable attitude.

C. Scientific orientation

Majority 78.89 per cent of the respondents were in 'medium' scientific orientation category. However, less 12.22 per cent and 08.89 per cent had 'high' and 'low' scientific orientation category, respectively.

5.1.5 Communicational variables/ sources of information used by the respondents

Majority of the respondents (55.55 %) were having 'medium' level of use of information sources, while 28.52 per cent of the respondents were having 'high' level of use of information sources. Only 15.93 per cent of the respondents were having 'low' level sources of information about pomegranate cultivation with respect to nutrient management practices.

A. Personal localite source of information

The large majority of the pomegranate growers (88.15 %) had 'medium' level of information sources used through local personnel, followed by 09.26 per cent with 'higher' level of local personnel contact. The extent of local personnel contact was to be 'low' in case of 02.59 per cent respondents.

- Overall it was observed that 52.22 per cent respondents seek information once in a week from neighbours, followed by friends (47.03 %), progressive farmers (31.48 %).

B. Personal cosmopolite source of information

The near half of the pomegranate growers (47.04 %) had 'high' level of information sources used through personnel cosmopolite, followed by 43.70 per cent with 'medium' level of personnel cosmopolite contact. The extent of personnel cosmopolite contact was to be 'low' in case of 09.26 per cent respondents.

- Overall it was found that 50.00 per cent respondents obtained information from Agriculture Assistant 'once in a fortnight' followed by Circle Agriculture Officer (21.85 %), contacted by respondents 'once in a month' for getting information. Regarding contact to Panchayat Samittee officer, 56.29 per cent respondents

contacted to Gramsevak 'once in a week' for obtaining information. About Agriculture Supervisor (71.11 %) followed by Circle Agriculture Officer (61.85 %) followed by Taluka Agriculture Officer (77.77 %) followed by Sub-Divisional Agriculture Officer (89.62 %) followed by District Agriculture Officer (90.74 %) and by KVK scientists (90.00 %) respondents never contacted for getting information.

C. Electronic media as a source of information

About three fourth (75.19 %) respondents has used electronic media as a sources of information to 'medium' extent followed by (24.81 %) ' high ' extent and (0.00 %) low extent.

- Overall, it was observed that a large majority of the respondents (93.70 %) were viewing the television daily for acquiring information. Large majority of the respondents were not using computer plus internet (95.92 %) and Agril. Film CD's or VCD's (93.33 %).

D. Print media as a source of information

Majority (58.52 %) respondents had used print media as a source of information to high extent, followed by medium extent (41.48 %) and low extent(0.00 %).

- Overall, near to half of (42.22 %) respondents were reading *Agrowon* news paper daily followed by 18.51 per cent used extension publication 'sometimes'. Majority respondents (94.44 %) not read the university publication '*Shri Sugi*' and '*Krishidarshani*'(73.70 %).

E. Extension education methods as a source of information

The large majority of the respondents (80.74 %) had used extension education methods as a source of information to medium extent, followed by low extent (15.93 %) and high extent(03.33 %).

- Overall, 27.77 per cent respondents attended group discussion 'once in a month'. While, 36.29 per cent respondents who were participated in '*shivar ferries*' once in a season'. Majority (52.22 %) respondents participated and attended farmers

rallies 'in a every season', 70.74 per cent respondents visited agricultural exhibitions ' every year'.

F. Cosmopolitaness

Majority of the pomegranate growers (80.74 %) had 'medium' level of cosmopolitaness, followed by 16.67 per cent and 02.59 per cent had 'low' and 'high' level of cosmopolitaness respectively.

Dependent variables

5.1.6 Knowledge of pomegranate growers about nutrient management practices

5.1.6.1 Overall knowledge level of pomegranate growers

It is observed that majority (40.44 %) of the respondents were in the 'high' knowledge level, while 27.56 per cent and 22.00 per cent of them were having 'low' and 'medium' knowledge level of nutrient management practices respectively.

5.1.6.2 Practicewise knowledge level of pomegranate growers

A. Soil selection

Majority (87.03 %) of the pomegranate growers had 'complete knowledge' about suitability of soil for its cultivation. While, adequate respondents 81.85 per cent were having knowledge about pH limit of soil required. However, near about 40.74 per cent of respondents had no knowledge about EC of soil. As large majority (87.41 %) respondents had 'partial knowledge' regarding carbonate content of soil required for pomegranate cultivation .

B. Land preparation

Cent per cent of the respondents know about ploughing and size of pit. While, more than eighty per cent of them completely know (88.88 per cent about plant spacing and about row spacing (81.48 %) had complete knowledge followed by (54.40 %) had partial knowledge. While about contents required for filling of pit (57.40 %) had completely know. However regarding application of FYM per pit (61.85 %) completely know followed by 38.15 per cent of the respondents had partial knowledge respectively.

C. Water management

Fifty per cent respondents had 'no knowledge' followed by (27.03 %) 'partial knowledge and (22.96 %) had complete know about suitable pH of water. However, about EC of water more than half (56.29 %) had 'no knowledge' to respondents. About cent per cent of the respondents complete know about suitable irrigation methods viz. drip, sprinkler and ring. More than 90.00 per cent of respondents were complete knowledge' about dripper per plant (95.55 %). About (62.22 %) had complete know about discharge of dripper per plant /day. While about dripper spacing from plant to stem (92.59 %) had complete knowledge followed by (07.40 %) had 'partial knowledge' to respondents respectively.

D. Planting material

About 50.54 per cent of the pomegranate growers completely know followed by 29.26 per cent had no knowledge about different sources of planting material respectively. While cent per cent (100.00 %) of them having complete knowledge pertaining to best planting material use and the good quality indices of pomegranate saplings. However cent per cent respondents had complete knowledge about recommended varieties viz. *Bhagva* and *Ganesh*. Other varieties like *Mrudula* 96.29 per cent, *Arakta* 92.59 per cent, *Super Bhagva* 74.07 per cent and *G-137*, 25.92 per cent had complete knowledge respectively.

E. Bahar management

With regard to bahar management cent per cent (100.00 %) of the respondents had complete knowledge about recommended bahars viz., Ambe, Mrig and Hasta in pomegranate. However, more than eighty per cent (81.48 %) of the respondents had no knowledge about susceptible bahar for pest and diseases with respect to susceptibility for oily spot disease. With regards to chemical used for defoliation of leaves, purpose of defoliation, purpose of training and pruning, hundred per cent respondents had complete knowledge. While cent per cent respondents had complete knowledge above provide resting period to plant, bahar Initiation, improve fruit size and time of pruning.

5.1.6.3 Nutrient management wise knowledge level of pomegranate growers

The 40.38 per cent of the respondents had ‘medium ’ knowledge about soil selection. While, 54.81 per cent had ‘medium’ knowledge followed by (25.18 %) high knowledge pertaining to land preparation. With regards to water management (41.49 %) had ‘medium’ followed by one third per cent respondents (67.04 %) had ‘medium’ knowledge level followed by (20.37 %) high knowledge regarding planting material. However, 43.70 per cent followed by 35.18 per cent respondents had ‘medium’ and high level of knowledge about bahar management. It is observed from the table that most of the respondents are in medium to high knowledge category.

A. Integrated Nutrient Management

Cent per cent (100.00 %) of pomegranate growers had complete knowledge about purpose of soil testing, advantages of INM in general in Pomegranate. While, more than eighty per cent of respondents (83.33 %) had know partial knowledge about need of nutrient management after harvest and before resting period.

B. Organic manures

All the cent per cent Pomegranate growers had ‘complete knowledge’ about different types of organic manures that is bulky and concentrate, sources of bulky organic manures and advantages of manures (98.88 %). However, cent per cent of respondents had complete knowledge about functions of concentrated organic manures, time of application of organic manures at different growth stages like at planting, bahar treatment, flowering and fruit setting stages. While near about fifty per cent of respondents had ‘complete knowledge’ about year wise application of recommended doses of manures per plant per year from 1st year to 5th year that is (50.74 %), (35.18 %), (63.70 %), (41.11 %), (42.59 %) respectively. As about types of plant origin -edible oil cakes (57.04 %), had no knowledge. About non edible cake (38.14 %) had complete knowledge followed by animal origin – meals (40.72 %) had partial knowledge followed by (32.22 %) ‘complete knowledge’ respectively.

C. Green manures

Near one third of the pomegranate growers had ‘ partial knowledge’ about types of green manures that is leguminous (45.92 %) followed by types of green leaf

manures (51.85 %) had ‘partial knowledge’ followed by (35.18 %) complete respectively. While, types of leguminous crops (39.64 %) had no knowledge followed by types of green manures (59.25 %) had ‘no knowledge followed by (23.33 %) had partial knowledge respectively. About functions of green manures (84.44 %) had ‘partial knowledge’. While about recommended stage of burying green manuring crops (50.00 %) had no knowledge respectively.

D. Bio-fertilizers

Near about 90.00 per cent of the pomegranate growers had ‘complete knowledge’ regarding meaning of Bio- fertilizer(92.59 %), formulations of bio-fertilizers (96.29 %), cent per cent about types of Bio-fertilizers like Pseudomonas, Trichoderma and about Pacelomysis (96.29 %), PSB (88.88 %),VAM (85.18 %), KSB (77.77 %) and time of application of bio fertilizers at pit filling stage (100.00 %), respectively. While, more than two third had ‘complete knowledge’ about recommended doses of biofertilizers like Pseudomonas (81.48 %), Trichoderma (83.33 %), Pacelomysis (70.37 %), PSB (77.77 %), respectively. As regarding recommended dose of biofertilizers viz. VAM (50.00 %), KSB (37.03 %) respondents had partial knowledge respectively.

E. Chemical fertilizers

Cent per cent of the pomegranate growers had ‘complete knowledge’ pertaining to formulation of chemical fertilizers, types of fertilizers, types of Straight fertilizers, Compound/ Complex fertilizers and Mixed fertilizers, functions of chemical fertilizers, application of fertilizers as per recommendation of soil test report and methods of fertilizer application respectively. However, near about 50.00 per cent respondents had “complete knowledge” of different stages / time of application of major nutrients like at the time of planting (70.74 %), at Chiku size fruit stage(47.03 %), respectively. As per time of fertilizer application at bahar treatment (85.18 %), after bahar treatment (88.88 %) and as per recommended N,P₂O, and K₂O doses of fertilizers per plant for one and two year old orchard.(46.29 %), three and four years old orchard(36.29 %) and five years and above old orchard (51.11%) had “complete knowledge” respectively. For different stages / time of application of major nutrients like at bahar treatment (34.81 %), at flowering/fruit setting(38.51 %), at Chiku size fruit stage (25.55%), before harvest (1

month) (39.25 %) had ‘partial knowledge’ respectively. About As per time of N split doses at fruit setting stage (46.29 %) as per recommended N,P₂O, and K₂O doses of fertilizers per plant for 1 to 2 year old orchard, (50.00 %), 3 and 4 years old orchard (51.85 %) and 5 years and above old orchard (29.25 %) had “partial knowledge” respectively. As about stages /time of application of major nutrients, at bahar treatment (23.29 %), at flowering/fruit setting (30.74 %), at Chiku size fruit stage (27.40 %), before harvest (1 month) (29.62 %) respectively. Regarding time of N split doses at fruit setting stage (19.25 %), for three and four years old orchard (11.85 %), for five years and above old orchard (20.00 %) respondents had no knowledge respectively.

F. Fertigation

Cent per cent pomegranate growers had complete knowledge about methods fertigation, fertilizer tank, HTP pump and grades of liquid fertilizers *viz.* 0:52:34 respectively. While, regarding recommended dose of major nutrients through fertigation per plant/ year that is 500:200:200 has (48.14 %) had complete knowledge. However regarding grades of liquid fertilizers *viz.*, 19:19:19 (53.70 %), 12:52:34 (45.22 %), 13:00:45 (51.85 %) and 0:00:50 (41.85 %) respondents had partial knowledge. About recommended dose of major nutrients through fertigation per plant/ year that is 500:200:200 (51.85 %) has partial knowledge. And about doses of fertigation more than fifty per cent (60.00 %) respondents had no knowledge respectively.

G. Micronutrients

Near about thirty per cent pomegranate growers had complete knowledge regarding chelating of micronutrients with manures /compost (24.81 %). As about role of different micronutrients *viz.* Ferrous Sulphate (47.40 %) had partial knowledge followed by (31.11 %) had complete knowledge respectively. Regarding Magnese Sulphate (43.70 %) had partial knowledge. About Zink Sulphate (41.11 %) had partial knowledge followed by (37.77 %) had no knowledge respectively. For Copper Sulphate (54.07 %) had partial knowledge. For Borax (54.81 %) had partial knowledge followed by (41.11 %) had complete knowledge respectively. While, cent per cent respondents had complete knowledge regarding micronutrient formulations *viz.* Ferrous Sulphate, Magnese Sulphate, Zink Sulphate, Copper Sulphate, Borax respectively. Regarding doses of

Micronutrients *viz.* Ferrous sulphate(52.96 %) had complete knowledge. Regarding dose of Magnese Sulphate (77.77 %) had had complete knowledge and 7.40 per cent had no knowledge respectively. About Zink Sulphate (92.59 %) had complete knowledge. For Copper Sulphate (85.18 %) had complete knowledge followed by Borax (74.07 %) had complete knowledge. However regarding micronutrient used before flowering and fruit setting (48.14 %) had partial knowledge. While cent per cent respondents had complete knowledge about methods of application of micronutrients- trough Soil in Chelated form and in spray form respectively. However about useful inorganic micronutrients *viz.* EDTA (79.25 %) had no knowledge followed by EDDHA (77.77 %) had no knowledge followed by followed by HEDTA (69.25 %) had no knowledge followed by DTPA(67.77 %) had no knowledge. About Citric acid (39.63 %) had no knowledge followed by Humic acid (47.03 %) had partial knowledge and 9.26 percent had no knowledge respectively. While about Amino acid (56.29 %) had partial knowledge followed by Gluconet (37.77 %) had partial knowledge respectively.

5.1.6.4 Component wise overall knowledge level about Integrated Nutrient Management Practices

Near about fifty (51.85 %) per cent of the respondents had 'high' knowledge about integrated nutrient management. With regard to green manure 42.23 per cent respondents had 'high' knowledge level followed by 40.00 per cent had medium knowledge level respectively. Regarding Bio-fertilizers,62.59 per cent had medium knowledge level and 11.86 per cent had high knowledge level respectively. About Chemical fertilizers 64.82 per cent respondents had 'high ' knowledge level followed by 21.85 per cent had medium and 13.33 per cent had low knowledge level respectively. While about fertigation in pomegranate nearly two-third of the respondents had 'high ' knowledge level and 22.59 per cent had medium knowledge level respectively. About micronutrients 57.05 per cent respondents had 'high ' knowledge level followed by 28.88 per cent had medium and 14.07 per cent had low knowledge level respectively.

5.1.7 Utilization level of pomegranate growers about nutrient management practices

5.1.7.1 Overall utilization level of pomegranate growers

Majority 64.82 per cent respondents had ‘medium ’ utilization, while, 26.29 per cent and 8.89 per cent had ‘high ’ and ‘low’ utilization pertaining to the various nutrient management practices.

5.1.7.2 Practicewise utilization level of pomegranate growers

A. Soil selection

The large majority (73.33 %) of the pomegranate growers had complete utilization ‘as per recommendation’ about suitable soil type for its cultivation. While, adequate pH limit of soil required was partial utilized‘ not as per recommendation by 44.07 per cent followed and 27.03 percent has no utilization by respondents. However, 44.07 per cent respondents was partial utilized‘ not as per recommendation and 27.03 percent has no utilization by respondents. While, 85.55 per cent of the respondents had ‘no utilization’ and 5.93 per cent had complete utilization ‘as per recommendation’ about appropriate carbonate content of soil required for pomegranate cultivation, respectively.

B. Land preparation

More than fifty per cent of the respondents (58.51 %) had utilized ‘as per recommendation ’ followed by 41.48 per cent had utilized ‘ not as per recommendation ’ about number of ploughings. While about pit dimension 65.92 per cent had utilized ‘as per recommendation ’ followed by 34.07 per cent had utilized ‘not as per recommendation. As per spacing between plant 85.55 per cent had utilized ‘as per recommendation’ followed by 18.14 per cent had utilized ‘ not as per recommendation, while about spacing between row 80.00 per cent had utilized ‘as per recommendation’. How ever, about contents required for filling of pit 53.70 per cent had utilized ‘as per recommendation’ followed by 46.29 per cent had utilized ‘ not as per recommendation. About actual quantity of compost required for filling pit 57.40 per cent had utilized ‘as per recommendation’ followed by 42.59 per cent had utilized ‘not as per recommendation in pomegranate cultivation.

C. Water management

More than eighty per cent of the respondents 66.29 per cent had 'no utilization' followed by 18.51 per cent had partial utilization 'not as per recommendation' about pH of water. However, about EC of water 84.81 per cent had 'no utilization' followed by 15.19 per cent had complete utilization 'as per recommendation' respectively. While, 90.74 per cent respondents had complete utilization 'as per recommendation' of drip irrigation method followed by 9.26 per cent had complete utilization 'as per recommendation' of ring irrigation method. As per number of dripper per plant is concern, 93.70 per cent had complete utilization 'as per recommendation' followed by 6.30 per cent had partial utilization 'not as per recommendation'. It was also observed that 85.18 per cent had complete utilization 'as per recommendation' about drip placement from stem. While about accurate discharge of water per plant 53.70 per cent had complete utilization 'as per recommendation' followed by 41.48 per cent had partial utilization 'not as per recommendation'. About actual pressure of drip 48.14 per cent had complete utilization 'as per recommendation' followed by 11.11 per cent had 'no utilization' respectively. Lastly, about dripper spacing 90.74 per cent had complete utilization 'as per recommendation' and by 9.26 per cent had partial utilization 'not as per recommendation' in pomegranate cultivation.

D. Planting material

The only 08.88 per cent of the pomegranate growers had complete utilizes Agril. University followed by Private nursery (66.30 %) followed by KVK (10.74 %) as a sources of planting material. While, air layering had complete utilized by 56.30 per cent and tissue culture 43.70 per cent as a type of seedling. However, regarding varieties used viz., cent percent used *Bhagva* followed by *Super bhagva* (41.85 %), *Ganesh* (29.25 %) followed by *Phule Arakta* (23.70 %).

E. Bahar management

With regard to bahar management, large majority 203 (75.18 %) of the respondents had complete utilizes Hasta bahar followed by Ambe bahar 26.29 per cent and Mrig bahar 15.55 per cent respectively. While cent per cent respondents completely utilizes ethrel for defoliation and followed defoliation for better flowering as per

recommendation respectively. However, 73.33 per cent of respondents completely utilizes time of Bordeaux mixture application after pruning as per recommendation. While, cent per cent respondents completely utilizes Bordeaux mixture application on stem followed by 80.74 per cent on pruned branch followed by 57.14 per cent spraying 1% BM as per recommendation respectively. About resting period, 84.44 per cent respondents completely utilized as per recommendation.

5.1.7.3 Nutrient management wise utilization level of pomegranate growers

A. Organic fertilizers

It can be observed that 84.07 per cent pomegranate growers had Cattle as their source of manure, followed by (82.22 %) following Sheep penning for manuring crop. While, about timely application of organic manure at planting majority (59.62 %) of the respondents had not utilized the practice as per recommendation. About at bahar treatment timing, 58.51 per cent had not utilized as per recommendation followed by about flowering / fruiting stage, 60.00 per cent had not utilizes as per recommendation followed by 20.37 per cent utilized as per recommendation. However regarding organic fertilizer dose for first year of plant respondents had 54.40 per cent not utilized as per recommendation followed by for second years plant 52.96 per cent respondents had not utilized as per recommendation followed by for third years plant 52.59 per cent respondents had not utilizes as per recommendation followed by for fourth years plant 54.81 per cent respondents had not utilized as per recommendation followed by five and above years plant 55.55 per cent respondents had not utilized as per recommendation respectively. It is seen that 85.18 per cent respondents had not utilizes different sources of edible oil cakes viz. *G.nut Cake*, *Lentil*, *Sesamum*, *Mustard* followed by about non edible cakes viz. *Castor cake* 80.00 per cent had not utilizes followed by *Neem cake* 79.23 per cent had not utilizes followed by *Sunflower cake* 80.37 per cent had not utilized followed by 16.29 per cent had not as per recommendation and by *Karanj cake* 82.59 per cent respondents had not utilized. As per animal origin-blood meal 98.14 per cent respondents had not utilizes followed by Bone meal 98.14 per cent respondents had not utilized followed by Fish meal 96.66 per cent respondents had not utilizes and by 02.22 per cent had not as per recommendation respectively.

B. Green manuring

It was observed that about types of leguminous crops utilized by Pomegranate growers *viz.* *Sunhemp* 61.48 per cent had not utilized followed by 37.77 per cent has not as per recommendation. About *Mung* crop 60.37 per cent had not utilized followed by *Cowpea*, 60.00 per cent had not utilized followed by *Berseem* 60.00 per cent had not utilized followed by *Gavar* 60.00 per cent had not utilized followed by *Dhaincha* 58.88 per cent had not utilized followed by cent per cent respondents had not utilized *Black gram* as a green manures crop. Also about use of perennial plants as a green manures *viz.* *Subabhul* 59.62 per cent respondents had not utilized followed by *Glyricidea* 57.77 per cent respondents had not utilizes followed by *Karanj* 58.88 per cent respondents had not utilized followed by *Shevari* 59.25 per cent respondents had not utilized followed by 38.88 per cent has not as per recommendation. However about application stages of green manuring crop at 50 % flowering stage, 50.37 per cent respondents had not utilized as per recommendation. And about 8-10 weeks after planting stage 49.25 per cent respondents had not utilized followed by 40.00 per cent has not as per recommendation. While, dose of green manures (t/ha) 58.51 per cent respondents had not utilized followed by 40.00 per cent has not as per recommendation.

C. Bio-fertilizers

The results presented shows that, Bio-fertilizer dose used by Pomegranate growers *viz.* *Pseudomonas* 69.62 per cent had utilized as per recommendation followed by *Trichoderma* dose 67.77 per cent had utilized as per recommendation followed by 16.29 per cent had not as per recommendation respectively. About *Pasilomycene* dose, 63.70 per cent respondents had utilized as per as per recommendation followed by *PSB* dose 69.62 per cent had utilized as per recommendation followed by *VAM* dose, 45.92 per cent respondents had utilized as per as per recommendation followed by *KSB* dose, 41.48 per cent respondents had utilized as per as per recommendation respectively. However about application at planting time 59.62 per cent respondents had utilized as per as per recommendation followed by 30.37 per cent had not utilized as per recommendation respectively. Lastly about after planting time 57.03 per cent respondents had utilized as per as per recommendation.

D. Chemical fertilizers

It was revealed that majority 83.70 per cent Pomegranate growers had not utilized chemical fertilizer dose as per soil testing report followed by large majority, 95.18 per cent respondents had utilized ring method and 91.11 per cent respondents had utilized drip method of fertilizer application. However, regarding stages in which NPK are given, at planting stage 59.25 per cent respondents had not utilized NPK as per recommendation followed by bahar treatment stage 52.59 per cent respondents had not utilized NPK as per recommendation followed by flowering and fruiting stage 54.81 per cent respondents had not utilized NPK as per recommendation followed by fruits size like chikku stage 58.14 per cent respondents had not utilized followed by at one month before harvesting stage half respondents 50.00 per cent had not utilized NPK as per recommendation .It is also observed that regarding time of split dose of N fertilizer at $\frac{1}{2}$ N at bahar 60.00 per cent respondents had not utilized as per recommendation followed by $\frac{1}{2}$ N application after one month stage of orchard 55.18 per cent had not utilized as per recommendation followed by. However regarding doses of NPK g/plant for 1-2 years plant near to half 45.55 per cent respondents had not utilized NPK dose as per recommendation followed by 3-4 years plant 62.22 per cent respondents had not utilized as per recommendation followed by for 5 years and above years plant 43.70 per cent respondents had not utilized as per recommendation followed by 39.25 per cent respondents had only utilized as per recommendation dose and 17.03 had not utilized any NPK fertilizers dose.

E. Fertigation

About fertigation method, 91.11 per cent respondents had used drip method for fertigation and only. 05.55 per cent respondents used sprinkler method. While, 91.11 per cent respondents had utilized Ventury means for fertigation followed by 88.14 per cent respondents used fertilizer tank method and 82.22 per cent respondents used HTP pump means of fertigation respectively. Near about fifty to sixty per cent respondents had not utilized different grades of water soluble as per recommendation *viz.*, 19:19:19 grade (50.00 %), 0:52:34 grade (58.14 %), 12:52:34 grade (60.37 %), 13:00:45 grades (68.14 %) respectively. While, recommended dose of NPK through fertigation g /

plant/ year (500:200:200) -46.29 respondents had not utilized as per recommendation followed by NPK 20 splits dose at 7 days interval of fertigation, 80.37 per cent respondents had not utilized at all.

F. Micro-nutrients

The data revealed that chelating of micronutrients with manures / compost by Pomegranate growers had 56.77 per cent not utilized as per recommendation followed by Neem cake 79.25 per cent respondents had not utilized. While, about dose of different micronutrients *viz.* Ferrous sulphate dose, 45.55 per cent respondents had utilized as per recommendation followed by Ferrous sulphate followed by Manganese sulphate 70.37 per cent respondents had utilized as per recommendation followed by Zinc sulphate-79.25 per cent respondents had utilized as per recommendation followed by Copper sulphate 75.92 per cent respondents had utilized as per recommendation followed by Borax 68.14 per cent respondents had utilized as per recommendation respectively. However about micronutrients used at flowering and before maturity of fruit by Pomegranate growers *viz.* Boric acid 61.48 per cent had not utilized as per recommendation followed by methods of application of micronutrients - through soil (83.33 %) followed by spraying (99.60 %) and chelated (87.03 %) respectively. While about inorganic micronutrients utilization *viz.* EDTA- (79.25 %) had not utilized followed by EDDHA- (77.77 %) followed by HEDTA- (70.00 %) followed by DTPA-(67.77 %) had not utilized any inorganic micronutrients. Lastly, about organic micronutrients utilization *viz.*-Humic acid (62.59 %) followed by - Amino acid (70.74 %) and Gluconet- (47.77 %) had not utilized any above organic micronutrients as per recommendation respectively.

5.1.7.4 Overall Practice wise utilization level about pomegranate management practices

The findings indicated that, 43.34 per cent of the respondents had 'medium' utilization pertaining to soil selection. While, 31.11 per cent and 25.55 per cent respondents had 'high' and 'low' utilization about soil selection in pomegranate. The observation about water management shows that the 47.78 per cent of the respondents had 'medium' utilization. Also, an equal proportion of the respondents (26.29 %) and 25.93 per cent had 'high' and 'low' utilization about soil selection in pomegranate.

However, 58.51 per cent of them had 'medium' followed by 23.71 per cent had high and, 17.78 per cent had low utilization with regard to land preparation practices in pomegranate respectively. About 49.63 per cent respondents had 'high' utilization followed by 31.49 per cent medium utilization about selection of planting material. While, 54.81 per cent had 'medium' utilization followed by 33.71 per cent had high and 11.48 per cent had low utilization with respect to bahar management in pomegranate.

5.1.7.5 Overall component wise utilization level about Nutrient Management Practices

The data shows that, 41.86 per cent of the pomegranate growers had high utilization and 25.18 per cent had low utilization about integrated nutrient management. However, about organic fertilizer 44.07 per cent respondents had high utilization followed by 35.93 per cent had medium utilization about organic fertilizer. It was also observed from the data about green manuring, 43.33 per cent respondents had medium utilization followed by biofertilizer, 57.03 per cent of the pomegranate growers had medium utilization followed by chemical fertilizer uses, more than sixty per cent (64.44 %) respondents had high utilization followed by fertigation, more than half (52.59 %) respondents had high utilization followed by micronutrients, 54.82 per cent respondents had high utilization and 34.81 per cent had medium about micro-nutrients respectively.

5.1.8 Distribution of the Pomegranate growers according to use of different combinations of nutrient management practices i.e. Users Categories

It is concluded from Table 99 that maximum number of the Pomegranate growers (24.81 %) had used the combination of organic manures + green manures + bio-fertilizers + chemical fertilizers + micro-nutrients, while 22.59 per cent respondents used the combination of green manures + bio-fertilizers + chemical fertilizers + micro-nutrients. From the respondents, 19.62 per cent were the users of organic manures + chemical fertilizers. It was also observed from the Table 99 that 14.81 per cent respondents had used organic manures + micro-nutrients. The combinations of organic manures + green manures + bio-fertilizers + chemical fertilizers were also used by the 07.03 per cent respondents of the respondents, near equal number of respondents (03.70 and 03.33 %) had used the combination of organic manures + green manure + bio-

fertilizers and organic manures + green manures + chemical fertilizers respectively. The 02.22 per cent respondents had used bio-fertilizers + chemical fertilizers + micro-nutrients combination and 01.11 percent used organic manures + green manures + bio-fertilizers + micro-nutrients followed by 0.74 per cent of respondents had used organic manures + green manures combination only who was following organic cropping system.

5.1.9 Relationship between selected independent variables with their knowledge level about various nutrient management practices.

I. Personal and social variables

A. Age and knowledge

The relationship between age and knowledge level of the respondents was found to be negative and statistically significant ($r = 0.131$).

B. Education and knowledge

The education and knowledge level of the respondents had highly positively significant relationship ($r = 0.116$).

C. Family size and knowledge

Size of family of the respondents showed significant and positive relationship with their knowledge level ($r = 0.125$).

D. Experience of pomegranate cultivation and knowledge

Relationship between experience in pomegranate cultivation and knowledge level of pomegranate growers was found to be significant and positive ($r = 0.174$).

E. Socio-economic status and knowledge

There was a positive and significant correlation ($r = 0.165$) between socioeconomic status and knowledge level of the respondents.

F. Social participation and knowledge

The correlation between social participation and knowledge was found to be positive and significant ($r = 0.134$).

II. Situational variables

G. Irrigation status and knowledge

There was a highly significant and positive relationship between the irrigation status and knowledge level of respondents ($r = 0.184$).

H. Cropping pattern and knowledge

There was a negative and non significant ($r = -0.0262$) relationship between cropping pattern and knowledge level of Pomegranate growers.

III. Economic variables

I. Total land holding and knowledge

Relationship between total land holding and knowledge level of pomegranate growers was found to be non- significant and positive ($r = 0.043$).

J. Area under pomegranate and knowledge

The relationship between area under pomegranate and knowledge level of pomegranate growers about nutrient management practices was found to be positive and statistically significant ($r = 0.153$).

K. Annual Income and knowledge

The relationship between annual income and knowledge level of pomegranate growers about nutrient management practices of the respondents was found to be positive and statistically significant ($r = 0.161$).

IV. Psychological variables

L. Risk preference and knowledge

The relationship between risk preference and knowledge level of pomegranate growers about nutrient management practices was found to be positive and statistically significant ($r = 0.160$).

M. Attitude and knowledge

Attitude of pomegranate growers and level of their knowledge were found positive and significant ($r = 0.141$).

N. Scientific orientation and knowledge

A positive and statistically significant correlation ($r = 0.135$) was observed between scientific orientation of the respondents and the knowledge level.

V. Communicational variables

O. Information sources use and knowledge

Utilization of sources of information by the respondents exhibited positive and highly significant relationship with their knowledge level about various nutrient management practices in pomegranate ($r = 0.048$).

P. Cosmopolitanism and knowledge

A positive and statistically significant correlation was observed between cosmopolitanism of the respondents and the knowledge level ($r = 0.110$).

5.1.10 Multiple regression analysis of selected independent variables of pomegranate growers with their knowledge level

The data revealed that, out of sixteen independent variables, fourteen variables *viz.*, age, education, family size, socio-economic status, annual income, area under Pomegranate, experience in pomegranate cultivation, social participation, irrigation status, cropping pattern, information sources used, scientific orientation, risk preference and attitude contributed significantly towards the variation in the knowledge level of pomegranate growers about various nutrient management practices. While only two variable age and cropping pattern has not contributed significantly in knowledge. The calculated R^2 was 0.51 which meant that the selected sixteen independent variables could explained 51.00 per cent variations in the knowledge of pomegranate growers about various nutrient management practices.

5.1.11 Relationship of selected independent variables with their extent of utilization level

I. Personal and social variables

A. Age and utilization

The relationship between age and utilization level of the respondents was found to be negative and statistically significant ($r = -0.185$).

B. Education and utilization

It was observed from the study that the education and utilization level of the respondents had positively significant relationship ($r = 0.196$).

C. Family size and utilization

Size of family of the respondents are positive and highly significant relationship with their utilization level ($r = 0.173$).

D. Farming experience of pomegranate cultivation and utilization

Relationship between experience in pomegranate cultivation and utilization level of pomegranate growers was found to be highly significant and positive ($r = 0.186$).

E. Socio-economic status and utilization

There was a positive and significant correlation between socio-economic status and utilization level of the respondents ($r = 0.162$).

F. Social participation and utilization

The correlation between social participation and utilization about nutrient management practices was found to be positive and significant ($r = 0.118$).

II. Situational variables

A. Irrigation status and utilization

It was observed that there was a significant and positive relationship between the irrigation status and utilization level of respondents about nutrient management practices ($r = 0.163$).

B. Cropping pattern and utilization

The correlation between cropping pattern and utilization was found to be negative and non-significant ($r = -0.019$).

III. Economic variables

A. Total land holding and utilization

Relationship between land holding and utilization level of pomegranate growers was found to be highly significant and positive ($r = 0.022$).

B. Area under pomegranate and utilization

The relationship between area under pomegranate and utilization level of pomegranate growers about nutrient management practices was found to be positive and statistically highly significant ($r = 0.132$).

C. Annual income and utilization

The relationship between annual income and utilization level of pomegranate growers about nutrient management practices of the respondents was found to be positive and statistically significant ($r = 0.124$).

IV. Psychological variables

A. Risk preference and utilization

Risk preference capacity of Pomegranate growers and level of their utilization about nutrient management practices found positive and significant ($r = 0.17$).

B. Attitude and utilization

Attitude of Pomegranate growers and level of their utilization about nutrient management practices found positive and significant ($r = 0.15$).

C. Scientific orientation and utilization

A positive and statistically significant correlation was observed between scientific orientation of the respondents and the utilization level ($r = 0.192$).

V. Communicational variables

O. Information sources use and utilization

Utilization sources of information by the Pomegranate growers exhibited positive and highly significant relationship with their utilization level of nutrient management practices ($r = 0.152$).

P. Cosmopolitaness and utilization

A positive and statistically significant correlation was observed between cosmopolitaness of the respondents and the utilization level ($r = 0.121$).

5.1.12 Multiple regression analysis of selected independent variables with extent of utilization level of pomegranate growers

The data shows that, out of sixteen independent variables, fourteen variables *viz.*, age, education, family size, socio-economic status, annual income, area, experience in pomegranate cultivation, social participation, irrigation status, information sources used, risk preference, scientific orientation, cosmopolitaness and attitude contributed significantly towards the variation in the extent of utilization of of pomegranate growers about various nutrient management practices. While two variables

cropping pattern and total land holding has not contributed significantly in utilization. The calculated R² was 0.89 which meant that the selected sixteen independent variables could explain 89.00 per cent variations in the extent of utilization of pomegranate growers about various nutrient management practice.

5.1.13 Constraints faced by Pomegranate growers in nutrient management practices

- Regarding unavailability of pure graft material 77.41 per cent faced constraints. About constraints in water management, lack of knowledge about chemical properties of water (89.63 %) followed by high investment cost of drip installment (89.26 %) and 85.93 per cent faced less knowledge about quantity of drippers and water per plant. 92.22 and 84.07 per cent had faced the constraints regarding lack of knowledge about pruning management in time and lack of knowledge about pests and diseases during bahar treatment respectively.
- However, regarding nutrient management constraints, unavailability of standardization in biological fertilizers (100.00 %) followed by insufficient knowledge of integrated nutrient management (99.26 %) followed by lack knowledge of recommended doses of integrated nutrient management (88.52 %) followed by unavailability of chemical fertilizers in time (82.22 %) followed by unavailability of liquid fertilizers in various grades (75.56 %) followed by followed by followed by constraints in application of proper/balanced fertilizers dose due to insufficient knowledge (62.59 %), followed by unavailability of well decomposed manures(51.85 %) followed by lack of knowledge about spacing and dose of organic manures (47.77 %), respectively.
- As per economic constraints concern, Pomegranate growers faced high fertilizer cost (91.11 %) followed by lack of information about export standard (87.78 %) followed by unavailability of capital for cost of cultivation (81.85 %) followed by fluctuation in market rate (81.11 %) followed by presence of middleman in market (78.52 %) followed by Lack of cold storages (76.67 %) followed by lack of processing units of pomegranate (73.33 %) followed by obstacle of electricity (100.00 %) followed by unavailability of pest and disease resistance varieties

(85.56 %) followed by unavailability of labours (84.07 %) followed by confusion in selection of pesticides and fungicide (80.74 %) followed by unavailability of subsidy in time by Govt. at time of natural calamities (72.96 %) and no authentic literature on pomegranate in Marathi (32.22 %) were the other general constraints faced by the pomegranate growers.

5.1.14 Suggestions of pomegranate growers for overcoming the constraints

- Organization of workshop on soil health (91.85 %) was the major suggestion of respondents and ranked first followed by method and result demonstration on spacing and doses of organic manures should be organized (84.07 %). Simple authentic seedlings should available in time were the suggestion quoted by (74.07 %). Organization of method demonstration on water testing sampling (88.52 %) and Organization of workshop for farmers on drip irrigation management in pomegranate (86.30 %) respectively.
- Regarding bahar management, *Shivar ferries* should organized by extension personnel to inform the various pests and diseases during bahar treatment (85.93 %) ranked first and Government should organized training programme on market oriented bahar management (84.81 %) were suggestion given.
- Regarding nutrient management, Awareness of nutrient managements among farmers through farmers rally and agricultural exhibitions by State Agriculture Department with Agricultural Universities (100.00 %) respondents were suggested and ranked first followed by literature on standardization of biofertilizers should be supply towards farm community (97.78 %) ranked second followed by Agriculture department should conduct pre-season training for farmers regarding fertilizer doses according to growth stages of pomegranate at village levels (87.41 %) third rank respectively.
- As per economic suggestion, Government should provide fertilizers in time and on subsidize rate (87.78 %) and ranked first followed by Government should give more subsidies to pomegranate processing units and cold storages without complicated procedure (73.33 %) respondents respectively. There should be regular electricity supply (100.00 %) rank first followed by authentic literature on

pomegranate in Marathi should be supply by Government agencies to Krishi Vigyan Mandals (92.22 %) and Agril. University should undertaken research on pest and disease resistance varieties in pomegranate pocket (86.67 %) ranked third were general suggestion was given by the Pomegranate growers respectively.

5.2 Conclusions

5.2.1 Personal and social variables

Near half of the pomegranate growers (47.00 %) were of 'old' age group, maximum number of respondents (34.07 %) were educated up to 'Higher Secondary ', near three fifth of the respondents (58.89 %) belonged to medium size of family, most of the respondents (53.70 %) had experience up to 16 years, one third of the pomegranate growers (27.03 %) belonged to ' very high' socio-economic status and near two third (63.33 %) respondents had low level of social participations.

5.2.2 Situational variables

The 41.85 per cent respondents had low level of irrigation status, near to half (46.30 %) respondents had followed ring plus drip irrigation method, 40.74 per cent respondents had followed drip irrigation method, near equal 34.07 per cent respondents had fair and good cropping pattern.

5.2.3 Economic variables

47.41 per cent of the respondents belonged to the category of 'semi-medium ' land holding ranging from 2.01 to 4.00 ha., majority of pomegranate growers (60.75 %) belonged to the category of 'semi-medium' area under pomegranate, (46.30 %) had annual income between Rs.5,13,001 to Rs.8,91,000/-. followed by,40.00 per cent respondents had income from Rs. 8,91,001 to Rs. 12,69,000/-.

5.2.4 Psychological variables

Majority (71.48 %) of Pomegranate growers had medium level of risk preference, moderate favourable attitude towards nutrient management practices,78.89 per cent of the respondents were in 'medium' scientific orientation category.

5.2.5 Communicational variables / sources of information used by the respondents

Majority of the respondents (55.55 %) were having 'medium' level of use of information sources, (88.15 %) had 'medium' level of information sources used through local personnel, three fourth (75.19 %) respondents has used electronic media as a sources of information to 'medium' extent, majority (58.52 %) respondents had used print media as a source of information to high extent, large majority of the respondents (80.74 %) had used extension education methods as a source of information to medium extent and 80.74 per cent had 'medium' level of cosmopolitaness respectively.

Overall it was observed that 52.22 per cent respondents seek information once in a week from neighbours, followed by friends (47.03 %), progressive farmers (31.48 %), (47.04 %) had 'high' level of information sources used through personnel cosmopolite.

Overall it was found that 50.00 per cent respondents obtained information from Agriculture Assistant 'once in a fortnight' followed by contact to Panchayat Samittee officer, 56.29 per cent respondents contacted to Gramsevak 'once in a week' for obtaining information , Agriculture Supervisor (71.11 %) followed by Circle Agriculture Officer (61.85 %) followed by Taluka Agriculture Officer (77.77 %) followed by Sub-Divisional Agriculture Officer (89.62 %) followed by District Agriculture Officer (90.74 %) and by KVK scientists (90.00 %) respondents never contacted for getting information.

Overall, it was observed that a large majority of the respondents (93.70 %) were viewing the television daily for acquiring information. Large majority of the respondents were not using computer plus internet (95.92 %) and Agril. Film CD's or VCD's (93.33 %).

Overall, near to half of (42.22 %) respondents were reading *Agrowon* news paper daily followed by (94.44 %) not read the university publication '*Shri Sugi*' and '*Krishidarshani*' (73.70 %).

Overall, 27.77 per cent respondents attended group discussion 'once in a month' followed by 36.29 per cent respondents who were participated in '*shivar ferries*' once in a season', majority (52.22 %) respondents participated and attended farmers

rallies 'in a every season', 70.74 per cent respondents visited agricultural exhibitions 'every year'.

5.2.5.1 Cosmopolitaness

Majority of the pomegranate growers (80.74 %) had 'medium' level of cosmopolitaness, followed by 16.67 per cent and 02.59 per cent had 'low' and 'high' level of cosmopolitaness respectively.

5.2.6 Knowledge of pomegranate growers about nutrient management practices

5.2.6.1 Overall knowledge level of pomegranate growers

It is observed that majority (40.44 %) of the respondents were in the 'high' knowledge level, while 27.56 per cent and 22.00 per cent of them were having 'low' and 'medium' knowledge level of nutrient management practices respectively.

5.2.6.2 Practicewise knowledge level of pomegranate growers

A. Soil selection

Majority (87.03 %) of the pomegranate growers had 'complete knowledge' about suitability of soil for its cultivation, 81.85 per cent were having knowledge about pH limit of soil required, majority (87.41 %) respondents had 'partial knowledge' regarding carbonate content of soil required for pomegranate cultivation .

B. Water management

Fifty per cent respondents had 'no knowledge 'about suitable pH of water followed by about EC of water more than half (56.29 %) had ' no knowledge ' followed by cent per cent of the respondents complete know about suitable irrigation methods viz., drip, sprinkler and ring, 90.00 per cent of respondents were complete knowledge' about dripper per plant (95.55 %), (62.22 %) had complete know about discharge of dripper per plant /day. While about dripper spacing from plant to stem (92.59 %) had complete knowledge to respondents respectively.

C. Land preparation

Cent per cent of the respondents know about ploughing and size of pit., more than eighty per cent of them completely knowledge (88.88 per cent about plant spacing followed by row spacing (81.48 %) followed by (54.40 %) had partial

knowledge. While about contents required for filling of pit (57.40 %) had completely know followed by application of FYM per pit (61.85 %) completely knowledge followed by 38.15 per cent of the respondents had partial knowledge respectively.

D. Planting material

About 50.54 per cent of the pomegranate growers completely knowledge followed by 29.26 per cent had no knowledge about different sources of planting material respectively. While cent per cent (100.00 %) of them having complete knowledge pertaining to best planting material use. However cent per cent respondents had complete knowledge about recommended varieties *viz.*, *Bhagva* and *Ganesh*. Other varieties like *Mrudula* 96.29 per cent, *Arakta* 92.59 per cent, *Super Bhagva* 74.07 per cent had complete knowledge respectively.

E. Bahar management

With regard to bahar management cent per cent of the respondents had complete knowledge about recommended bahars *viz.*, *Ambe*, *Mrig* and *Hasta* in pomegranate. With regards to chemical used for defoliation of leaves, purpose of defoliation, purpose of training and pruning, hundred per cent respondents had complete knowledge.

5.2.6.2.1 Practice wise overall knowledge level about pomegranate management practices

The 40.38 per cent of the respondents had 'medium' knowledge about soil selection. While, 54.81 per cent had 'medium' knowledge followed by (25.18 %) high knowledge pertaining to land preparation. With regards to water management (41.49 %) had 'medium' followed by one third per cent respondents (67.04 %) had 'medium' knowledge level followed by (20.37 %) high knowledge regarding planting material. However, 43.70 per cent followed by 35.18 per cent respondents had 'medium' and high level of knowledge about bahar management. It is observed from the table that most of the respondents are in medium to high knowledge category.

5.2.6.3 Nutrient management wise knowledge level of pomegranate growers

A. Integrated Nutrient Management

Cent per cent (100.00 %) of Pomegranate growers had complete knowledge about purpose of soil testing, advantages of INM in general in Pomegranate.

B. Organic manures

All the cent per cent Pomegranate growers (100.00 %) had ‘complete knowledge’ about different types of organic manures that is bulky and concentrate, sources of bulky organic manures and advantages of manures (98.88 per cent, cent per cent of respondents had complete know about functions of concentrated organic manures, time of application of organic manures at different growth stages like at planting, bahar treatment, flowering and fruit setting stages. While near about fifty per cent of respondents had ‘complete knowledge’ about year wise application of recommended doses of manures per plant per year from 1st year to 5th year that is (50.74 %), (35.18 %), (63.70 %), (41.11 %), (42.59 %) respectively.

C. Green manures

Near one third of the pomegranate growers had ‘partial knowledge’ about types of green manures that is leguminous (45.92 %) followed by types of green leaf manures (51.85 %) had ‘partial knowledge’ followed by, types of leguminous crops (39.64 %) had no knowledge followed by types of green manures (59.25 %) had ‘no knowledge followed by (23.33 %) had partial knowledge respectively. About functions of green manures (84.44 %) had ‘partial knowledge’ respectively.

D. Bio-fertilizers

Near about 90.00 per cent of the pomegranate growers had ‘complete knowledge’ regarding meaning of Bio- fertilizer (92.59 %), formulations of bio-fertilizers (96.29 %), cent per cent for types of Bio-fertilizers like Pseudomonas, Trichoderma, Pacelomysis and for PSB (88.88 %), VAM (85.18 %), KSB (77.77 %) and time of application of Bio fertilizers at pit filling stage (100.00 %) respectively. While, more than two third had ‘complete knowledge’ about recommended doses of Biofertilizers like Pseudomonas (81.48 %), Trichoderma (83.33 %), Pacelomysis (70.37 %), PSB (77.77 %), respectively.

E. Chemical fertilizers

Cent per cent of the pomegranate growers had ‘complete knowledge’ pertaining to formulation of chemical fertilizers, types of fertilizers, types of Straight fertilizers, Compound/ Complex fertilizers and Mixed fertilizers, functions of chemical fertilizers, application of fertilizers as per recommendation of soil test report and methods of fertilizer application respectively. However, near about 50.00 per cent respondents had “complete knowledge” of different stages / time of application of major nutrients like at the time of planting (70.74 %) respectively. As per time of fertilizer application at bahar treatment (85.18 %), after bahar treatment (88.88 %) and as per recommended N,P₂O, and K₂O doses of fertilizers per plant for one and two year old orchard.(46.29 %), three and four years old orchard (36.29 %) and five years and above old orchard (51.11%) had “complete knowledge” respectively. As per time of N split doses at fruit setting stage (46.29 %) as per recommended N,P₂O, and K₂O doses of fertilizers per plant for 1 to 2 year old orchard. (50.00 %), 3 and 4 years old orchard (51.85 %) and 5 years and above old orchard (29.25 %) had “partial knowledge” respectively. Regarding time of N split doses at fruit setting stage (19.25 %), for three and four years old orchard (11.85 %), for five years and above old orchard (20.00 %) respondents had no knowledge respectively.

F. Fertigation

Cent per cent pomegranate growers had complete knowledge about methods fertigation, fertilizer tank, HTP pump and grades of liquid fertilizers *viz.* 0:52:34 respectively. While, regarding recommended dose of major nutrients through fertigation per plant/ year that is 500:200:200 has (48.14 %) had complete knowledge. However regarding grades of liquid fertilizers *viz.* 19:19:19 (53.70 %), 12:52:34 (45.22 %), 13:00:45 (51.85 %) and 0:00:50 (41.85 %) respondents had partial knowledge. And about doses of fertigation more than fifty per cent (60.00 %) respondents had no knowledge respectively.

G. Micronutrients

Near about thirty per cent pomegranate growers had complete knowledge regarding chelating of micronutrients with manures /compost (24.81 %).As about role of different micronutrients *viz.* Ferrous Sulphate (47.40 %) followed by Magnese Sulphate

(43.70 %) had partial knowledge. About Zink Sulphate(41.11 %) followed by Copper Sulphate (54.07 %) had partial knowledge. For Borax (54.81 %) had partial knowledge. While, cent per cent respondents had complete knowledge regarding micronutrient formulations *viz.*, Ferrous Sulphate, Magnese Sulphate, Zink Sulphate, Copper Sulphate, Borax respectively. Regarding doses of Micronutrients *viz.*, Ferrous sulphate (52.96 %) had complete knowledge. Regarding dose of Magnese Sulphate (77.77 %) had complete knowledge and 7.40 per cent had no knowledge respectively. About Zink Sulphate (92.59 %) followed by Copper Sulphate (85.18 %) and Borax (74.07 %) had complete knowledge. However about useful inorganic micronutrients *viz.* EDTA (79.25 %) followed by EDDHA (77.77 %) followed by HEDTA (69.25 %) followed by DTPA (67.77 %) had no knowledge. About Citric acid (39.63 %) followed by Humic acid (47.03 %) had partial knowledge and 9.26 percent had no knowledge respectively.

5.2.6.3 Component wise overall knowledge level about Integrated Nutrient Management Practices

Near about fifty (51.85 %) per cent of the respondents had ‘high’ knowledge about integrated nutrient management. With regard to green manure 42.23 per cent respondents had ‘high’ knowledge level followed by 40.00 per cent had medium knowledge level, respectively. Regarding Bio-fertilizers, 62.59 per cent had medium knowledge level and 11.86 per cent had high knowledge level respectively. About Chemical fertilizers 64.82 per cent respondents had ‘high’ knowledge level followed by 21.85 per cent had medium and 13.33 per cent had low knowledge level, respectively. While about fertigation in pomegranate nearly two-third of the respondents had ‘high ’ knowledge level and 22.59 per cent had medium knowledge level respectively. About micronutrients 57.05 per cent respondents had ‘high ’ knowledge level followed by 28.88 per cent had medium and 14.07 per cent had low knowledge level respectively.

5.2.7 Overall utilization level of pomegranate growers

Majority 64.82 per cent respondents had ‘medium’ utilization, while, 26.29 per cent and 8.89 per cent had ‘high ’ and ‘low’ utilization pertaining to the various nutrient management practices.

5.2.7.1 Practicewise utilization level of pomegranate growers

A. Soil selection

The large majority (73.33 %) of the pomegranate growers had complete utilization 'as per recommendation' about suitable soil type for its cultivation, adequate pH limit of soil required was partial utilized' not as per recommendation by 44.07 per cent followed by 44.07 per cent respondents was partial utilized' not as per recommendation followed by 85.55 per cent of the respondents had 'no utilization' and 5.93 per cent had complete utilization 'as per recommendation' about appropriate carbonate content of soil required for pomegranate cultivation, respectively.

B. Land preparation

More than fifty per cent of the respondents (58.51 %) had utilized 'as per recommendation' followed by 41.48 per cent had utilized 'not as per recommendation' about number of ploughings followed by pit dimension 65.92 per cent had utilized 'as per recommendation' followed by 34.07 per cent had utilized 'not as per recommendation'. As per spacing between plant 85.55 per cent followed by spacing between row 80.00 per cent followed by contents required for filling of pit 53.70 per cent had utilized 'as per recommendation'. About actual quantity of compost required for filling pit 57.40 per cent had utilized 'as per recommendation' in pomegranate cultivation.

C. Water management

More than eighty per cent of the respondents 66.29 per cent followed by pH of water followed by EC of water 84.81 per cent had 'no utilization'. And 15.19 per cent had complete utilization 'as per recommendation'. While, 90.74 per cent respondents had complete utilization 'as per recommendation' of drip irrigation method followed by number of dripper per plant followed by 93.70 per cent followed by 85.18 per cent had complete utilization 'as per recommendation' about drip placement from stem. While about accurate discharge of water per plant 53.70 per cent followed by dripper spacing 90.74 per cent had complete utilization 'as per recommendation'. And only 9.26 per cent had partial utilization 'not as per recommendation' in pomegranate cultivation.

D. Planting material

Private nursery (66.30 %) followed by KVK (10.74 %) as a sources of planting material followed by air layering had complete utilized by 56.30 per cent and tissue culture 43.70 per cent as a type of seedling. However, regarding varieties used *viz.*, cent percent used *Bhagva* followed by *Super bhagva* (41.85 %), *Ganesh* (29.25 %).

E. Bahar management

With regard to bahar management, large majority 203 (75.18 %) of the respondents had complete utilized Hasta bahar followed by Ambe bahar 26.29 per cent and Mrig bahar 15.55 per cent respectively. However, 73.33 per cent of respondents completely utilized time of Bordeaux mixture application after pruning as per recommendation. While, cent per cent respondents completely utilizes Bordeaux mixture application on stem followed by 80.74 per cent on pruned branch and 57.14 per cent spraying 1% BM as per recommendation respectively.

F. Organic fertilizers

Majority 84.07 per cent pomegranate growers had Cattle as their source of manure, followed by (82.22 %) following Sheep penning for manuring crop. About at bahar treatment timing, 58.51 per cent had not utilized as per recommendation followed by about flowering/fruited stage, 60.00 per cent had not utilizes as per recommendation followed by 20.37 per cent utilizes as per recommendation. However regarding organic fertilizer dose for first year of plant respondents had 54.40 per cent not utilizes as per recommendation followed by for second years plant 52.96 per cent respondents had not utilizes as per recommendation followed by for third years plant 52.59 per cent respondents had not utilizes as per recommendation followed by for fourth years plant 54.81 per cent respondents had not utilized as per recommendation followed by five and above years plant 55.55 per cent respondents had not utilized as per recommendation respectively. It is seen that 85.18 per cent respondents had not utilizes different sources of edible oil cakes *viz.* G.nut Cake, Lentil, Sesamum, Mustard followed by about non edible cakes *viz.* Castor cake 80.00 per cent had not utilizes followed by Neem cake 79.23 per cent had not utilizes followed by Sunflower cake 80.37 per cent had not utilizes followed by Karanj cake 82.59 per cent respondents had not utilizes. As per animal origin – blood

meal 98.14 per cent respondents had not utilizes followed by Bone meal 98.14 per cent respondents had not utilizes followed by Fish meal 96.66 per cent respondents had not utilizes as per recommendation respectively.

G. Green manuring

It was observed that about types of leguminous crops utilized by pomegranate growers *viz.* Sunhemp 61.48 per cent had not utilized followed by Mung crop 60.37 per cent had not utilizes followed by Cowpea 60.00 per cent had not utilizes followed by Berseem 60.00 per cent had not utilizes followed by Gavar 60.00 per cent had not utilizes followed by Dhaincha 58.88 per cent had not utilizes followed by cent per cent respondents had not utilizes followed by Black gram as a green manures crop. Also about use of perennial plants as a green manures *viz.*, Subabhul 59.62 per cent respondents had not utilizes followed by Glyricidea 57.77 per cent respondents had not utilizes followed by Karanj 58.88 per cent respondents had not utilizes followed by Shevari 59.25 per cent respondents had not utilizes followed by 38.88 per cent has not as per recommendation. However about application stages of green manuring crop at 50 % flowering stage, 50.37 per cent respondents had not utilizes as per recommendation. While, dose of green manures (t/ha) 58.51 per cent respondents had not utilized as per recommendation.

H. Bio-fertilizers

Bio-fertilizer dose used by Pomegranate growers *viz.* Pseudomonas 69.62 per cent had utilized as per recommendation followed by Trichoderma dose 67.77 per cent had utilized as per recommendation followed by 16.29 per cent had not as per recommendation respectively. About Pasilomycene dose, 63.70 per cent respondents had utilized as per as per recommendation followed by PSB dose 69.62 per cent had utilized as per recommendation followed by VAM dose, 45.92 per cent respondents had utilized as per as per recommendation followed by KSB dose, 41.48 per cent respondents had utilized as per as per recommendation respectively.

I. Chemical fertilizers

It was revealed that majority 83.70 per cent Pomegranate growers had not utilized chemical fertilizer dose as per soil testing report followed by large majority,

95.18 per cent respondents had utilized ring method and 91.11 per cent respondents had utilized drip method of fertilizer application. However, regarding stages in which NPK are given, at planting stage 59.25 per cent respondents had not utilized NPK as per recommendation followed by bahar treatment stage, fruiting stage 54.81 per cent respondents had not utilized NPK as per recommendation followed by fruits size like chikku stage 58.14 per cent respondents had not utilized followed by at one month before harvesting stage half respondents 50.00 per cent had not utilized NPK as per recommendation .It is also observed that regarding time of split dose of N fertilizer at $\frac{1}{2}$ N at bahar 60.00 per cent respondents had not utilized as per recommendation followed by $\frac{1}{2}$ N application after one month stage of orchard 55.18 per cent had not utilized as per recommendation followed by. However regarding doses of NPK g / plant for 1-2 years plant near to half 45.55 per cent respondents had not utilized NPK dose as per recommendation followed by 3-4 years plant 62.22 per cent respondents had not utilized as per recommendation followed by for 5 years and above years plant 43.70 per cent respondents had not utilized as per recommendation.

J. Fertigation

About fertigation method, 91.11 per cent respondents had used drip method for fertigation followed by, 91.11 per cent respondents had utilized Ventury means for fertigation followed by 88.14 per cent respondents used Fertilizer tank method and 82.22 per cent respondents used HTP pump means of fertigation respectively. Near about fifty to sixty per cent respondents had not utilized different grades of water soluble as per recommendation viz. 19:19:19 grade (50.00 %), 0:52:34 grade (58.14 %), 12:52:34 grade (60.37 %), 13:00:45 grades (68.14 %) respectively. While, recommended dose of NPK through fertigation g / plant/ year (500:200:200) - 46.29 respondents had not utilized as per recommendation followed by NPK 20 splits dose at 7 days interval of fertigation at all.

K. Micro-nutrients

The data revealed that chelating of micronutrients with manures /compost by Pomegranate growers had 56.77 per cent not utilized as per recommendation followed by Neem cake 79.25 per cent respondents had not utilized. While, about dose of different

micronutrients *viz.* Ferrous sulphate dose, 45.55 per cent respondents had utilized as per recommendation followed by Ferrous sulphate followed by Manganese sulphate 70.37 per cent respondents had utilized as per recommendation followed by Zinc sulphate-79.25 per cent respondents had utilized as per recommendation followed by Copper sulphate 75.92 per cent respondents had utilized as per recommendation respectively. However about micronutrients used at flowering and before maturity of fruit by Pomegranate growers *viz.* Boric acid 61.48 per cent had not utilized as per recommendation followed by methods of application of micronutrients through soil (83.33 %) followed by spraying (99.60 %) and chelated (87.03 %) respectively. While about inorganic micronutrients utilization *viz.* EDTA (79.25 %) had not utilized followed by EDDHA (77.77 %) followed by HEDTA (70.00 %) followed by DTPA (67.77 %) had not utilized any inorganic micronutrients respectively.

5.2.7.2 Practice wise overall utilization level about pomegranate management practices

The findings indicated that, 43.34 per cent of the respondents had ‘medium’ utilization pertaining to soil selection. While, 31.11 per cent and 25.55 per cent respondents had ‘high’ and ‘low’ utilization about soil selection in pomegranate. The observation about water management shows that the 47.78 per cent of the respondents had ‘medium’ utilization. Also, an equal proportion of the respondents (26.29 %) and 25.93 per cent had ‘high’ and ‘low’ utilization about soil selection in pomegranate. However, 58.51 per cent of them had ‘medium’ followed by 23.71 per cent had high with regard to land preparation practices in pomegranate respectively. About 49.63 per cent respondents had ‘high’ utilization followed by 31.49 per cent medium utilization about selection of planting material. While, 54.81 per cent had ‘medium’ utilization followed by 33.71 per cent had high and 11.48 per cent had low utilization with respect to bahar management in pomegranate.

5.2.7.3 Overall componentwise utilization level about Nutrient Management Practices

The data shows that, 41.86 per cent of the pomegranate growers had high utilization and 25.18 per cent had low utilization about integrated nutrient management.

How ever, about organic fertilizer 44.07 per cent respondents had high utilization followed by green manuring, 43.33 per cent respondents had medium utilization followed by biofertilizer, 57.03 per cent of the pomegranate growers had medium utilization followed by chemical fertilizer uses, more than sixty per cent (64.44 %) respondents had high utilization followed by fertigation, more than half (52.59 %) respondents had high utilization followed by micronutrients, 54.82 per cent respondents had high utilization respectively.

5.2.8 The distribution of respondents according to their different types of fertilizers (INM) used in pomegranate cultivation

It was found that, in organic manuring, majority of the (84.07 per cent) Pomegranate growers had utilized FYM, followed by non-edible oil cakes 20.74 per cent followed by 19.62 per cent compost followed by edible oil cakes 14.81 per cent had utilized by the respondents respectively. About green manuring crops, an equal per cent age, 40.00 per cent had utilized leguminous crops and 39.25 per cent had utilized green leaf manure followed by majority 86.29 per cent respondents had utilized bio-fertilizers in powder form and in liquid form 73.33 per cent respectively. Regarding chemical fertilizers that large majority, 81.11 per cent respondents had utilized mixed fertilizers followed by 68.88 per cent had utilized compound / complex fertilizers respectively. About micronutrients utilization, large majority respondents had utilized Manganese Sulphate (96.96 %) followed by Copper Sulphate (96.96 %) followed by Zinc Sulphate (90.74 %) followed by Borax (88.51 %) and Ferrous Sulphate (82.59 %) utilized respectively.

a. Distribution of the respondents according to per plant per year use of organic fertilizers in pomegranate cultivation

It is observed that 48.14 per cent respondents were using less than recommended quantity of FYM per plant per year of five years old orchard with an average rate of 44.04 kg per plant. About only one fifth (20.00 %) respondents were using quantity of FYM as per recommended per plant with an average rate of 50.00 kg per plant. Only 07.77 per cent respondents were found using the FYM in accordance with

the report of soil testing / plant / leaf / tissue testing with an average rate of 46.80 kg per plant.

The average per plant per year of five years old orchard rate of application of FYM was with an average rate of 46.64 kg per plant per five years orchard.

b. Distribution of the respondents according to per plant per year use of compost in pomegranate cultivation.

It was revealed that majority (80.37 %) of Pomegranate growers had not used compost while very less of the of respondents (12.96 %) were using less than recommended quantity of compost per plant with an average rate of 35.88 kg / plant. Not a single respondents was found using the compost in accordance with the report of soil testing / plant / leaf / tissue testing.

The average per plant per year of five years old orchard rate of application of compost was with an average rate of 38.01 kg per plant per five years orchard.

c. Distribution of the respondents according to per plant per year use of vermi-compost in pomegranate cultivation

It was found that large majority (92.22 %) of Pomegranate growers had not used vermi-compost while only 01.11 per cent respondents were using quantity of vermi-compost as per recommendation per plant with an average rate of 01.00 kg per plant. The average per plant rate of application of vermi-compost was with an average of 01.16 kg per plant per five years orchard.

d. Distribution of the respondents according to per plant per year use of con. Organic fertilizer-Plant origin- Edible oil cake in pomegranate cultivation

It was concluded that majority (85.18 %) of Pomegranate growers had not used plant origin - edible oil cake, while less of the of respondents (08.14 %) were using less than recommended quantity of edible oil cake per plant with an average rate of 0.75 kg per plant.

The average per plant per year of five years old orchard rate of application of edible oil cake was with an average rate of 0.90 kg per plant per five years orchard.

e. Distribution of the respondents according to per plant per year use of Conc. Organic Fertilizer Plant Origin- Non-Edible oil cake in pomegranate cultivation

It was observed that majority (79.25 %) of Pomegranate growers had not used plant origin – non edible oil cake while about 12.22 per cent respondents were using more than recommended quantity of non edible oil cake per plant with an average rate of 01.65 kg per plant.

The average per plant rate of application of non edible oil cake was with an average of 01.16 kg per plant per five years orchard.

f. Distribution of the respondents according to per plant per year use of Con. Organic fertilizers – Animal origin in pomegranate cultivation

It was found that large majority (96.66 %) of Pomegranate growers had not used animal origin fertilizer.

The average per plant rate of application of animal origin fertilizer was with an average of 01.16 kg per plant per five years orchard.

5.2.8.1 Distribution of the respondents according to per plant per year use of Green Manures- Leguminous crop in pomegranate cultivation

It was revealed that more than half (60.00 %) of Pomegranate growers had not used green manures-leguminous crop while one third of the of respondents (31.48 %) were using less than recommended quantity of leguminous crop per hectare per year with an average rate of 11.81 tone per ha.

The average per hectare per year rate of application of leguminous crop was with an average of 12.87 tone per hectare per five years orchard.

5.2.8.2 Distribution of the respondents according to per plant per year use of Green manure –Green leaf manure in pomegranate cultivation

It was observed that more than half (60.00 %) of Pomegranate growers had not used green manures- green leaf manure while near one third of the of respondents (27.77 %) were using less than recommended quantity of green leaf manure per hectare per year with an average rate of 13.74 tone per ha. The average per hectare

per year rate of application of green leaf manure was with an average of 15.96 tone per hectare per five years orchard.

5.2.8.3 Distribution of the respondents according to per plant per year use of Bio-fertilizers –Powder form in Pomegranate cultivation

It was found that about majority 69.62 per cent respondents were using quantity of bio-fertilizers -powder form as per recommendation per plant with an average rate of 25.00 gram per plant.

The average per plant per year rate of application of bio-fertilizers - powder form was with an average of 24.93 gram per plant per five years orchard.

5.2.8.4 Distribution of the respondents according to per plant per year use of Bio fertilizer –Liquid in Pomegranate cultivation

It was concluded that about near half of (45.92 %) respondents were using quantity of bio-fertilizers - liquid form as per recommendation per plant per year with an average rate of 25.00 ml per liter per plant.

The average per plant rate of application of bio-fertilizers - liquid form was with an average of 24.94 ml. per liter per plant per five years orchard.

5.2.8.5 Distribution of the respondents according to their per plant per year use of Chemical fertilizers in pomegranate cultivation

a. Distribution of the respondents according to use of Straight fertilizers in pomegranate cultivation.

It was observed majority (79.62 %) of Pomegranate growers had not used straight fertilizers while near 07.77 per cent respondents were using quantity of straight fertilizers as per recommendation per plant with an average rate of 1375.00 g N : 1550.00 g P₂ O₅ : 400.00 K₂O per plant.

The average per plant rate of application of straight fertilizers was with an average of 1363.45 g N : 1561.99 g P₂ O₅ : 411.81 K₂O per plant per five years orchard.

b. Distribution of the respondents according to per plant per year use of Compound/Complex fertilizers in pomegranate cultivation.

It was seen that one near about 34.81 per cent respondents were using more than recommended quantity of compound/complex fertilizers per plant with an

average rate of 705.31 g N : 1434.57 g P₂ O₅ : 1434.57 g K₂O per plant. About 18.88 per cent respondents were using quantity of compound/complex fertilizers as per recommendation per plant with an average rate of 625.00 g N : 1315.00 g P₂ O₅ : 1315.00 K₂O per plant.

The average per plant rate of application of compound/complex fertilizers was with an average of 1365.19 g N : 653.62 g P₂ O₅ : 1365.19 K₂O per plant per five years orchard.

c. Distribution of the respondents according to per plant per year use of Mix fertilizers in pomegranate cultivation

It was observed that near about half 54.81 per cent respondents were using more than recommended quantity of mix fertilizers per plant with an average rate of 1223.64 g N : 1024.66 g P₂ O₅ : 1024.66 g K₂O per plant. About 12.59 per cent respondents were using quantity of mix fertilizers as per recommendation per plant with an average rate of 1150.00 g N : 0961.00 g P₂ O₅ : 0961.00 K₂O per plant.

The average per plant rate of application of mix fertilizers was with an average of 994.17 g N : 1175.10 g P₂ O₅ : 994.17 K₂O per plant per five years orchard.

5.2.8.6a. Distribution of the respondents according to per plant per year use of Micro-nutrients- Ferrous sulphate in pomegranate cultivation

It was found that about one third 30.37 per cent respondent was using less than recommended quantity of Ferrous sulphate with an average rate of 28.78 g per plant. About near to half 45.55 per cent respondents were using quantity of Ferrous sulphate as per recommendation with an average rate of 30.00 g per plant.

The average rate of application of Ferrous sulphate was 29.91 g per plant per five years orchard.

b. Distribution of the respondents according to per plant per year use of Micro-nutrients- Manganese sulphate in pomegranate cultivation

It was revealed that about one third 14.81 per cent respondent was using less than recommended quantity of Manganese sulphate with an average rate of 39.50 g per plant. About near two third 70.74 per cent respondents were using quantity of Manganese sulphate as per recommendation with an average rate of 40.00 g per plant.

The average rate of application of manganese sulphate was 40.05 g per plant per five years orchard.

c. Distribution of the respondents according to per plant per year use of Micro-nutrients- Zink sulphate in pomegranate cultivation

It was observed that about very negligible 02.96 per cent respondents were using more than recommended quantity of Zink sulphate per plant with an average rate of 42.50 g per plant. About large majority 79.25 per cent respondents were using quantity of Zink sulphate as per recommendation with an average rate of 40.00 g per plant.

The average rate of application of Zink sulphate was 40.04 g per plant per five years orchard.

d. Distribution of the respondents according to per plant per year use of Micro-nutrients- Copper sulphate in pomegranate cultivation

It was concluded that near 09.62 per cent respondent was using less than recommended quantity of Copper sulphate with an average rate of 29.19 g per plant. About near three fourth 75.92 per cent respondents were using quantity of Copper sulphate as per recommendation with an average rate of 30.00 g/plant.

The average rate of application of Copper sulphate was 30.15 g per plant per five years orchard.

e. Distribution of the respondents according to per plant per year use of Micro-nutrients- Borax in pomegranate cultivation

It was found that about a 06.29 per cent respondents were using more than recommended quantity of Borax per plant with an average rate of 23.52 g per plant. About near to seventy 68.14 per cent respondents were using quantity of Borax as per recommendation with an average rate of 20.00 g per plant.

The average rate of application of Borax was 20.20 g per plant per five years orchard.

5.2.9a. Distribution of the respondents according to timeliness in application of Organic fertilizer in pomegranate cultivation

It was observed that majority of the Pomegranate growers (60.00 %) were not applying the FYM as per recommendation of critical stages of Pomegranate growth,

while only 03.33 per cent respondents were applying the FYM as per recommendation of growth stages but with slight modification according to weather /soil and plant conditions.

It was also found that about 08.15 per cent respondents were applying the compost as per recommendation of growth stages.

It was also revealed that very less 05.18 per cent respondents were applying the vermin-compost as per recommendation of 1 growth stages and large majority 92.23 per cent respondents were non users of vermin-compost.

It was concluded that about 10.00 per cent of Pomegranate growers were not applying the plant origin - edible oil cake as per recommendation of stages of Pomegranate growth, while majority 85.19 per cent respondents were non users of edible oil cake.

It was also observed that about 05.55 per cent respondents were applying the non-edible cake as per recommendation of growth stages and majority 79.26 per cent respondents were non users of non-edible cake.

It was also revealed that about negligible equal 01.11 per cent of Pomegranate growers were not applying the animal origin cake as per recommendation, as per recommendation, with slight modification according to weather /soil and plant conditions of stages of Pomegranate and large majority 96.67 per cent respondents were non users of animal origin cake.

b. Distribution of the respondents according Timeliness in application of Green Manures in pomegranate cultivation

It was observed that 10.38 per cent respondents were applying the leguminous crops as per recommendation of growth stages and more than half 60.00 per cent respondents were non users of leguminous crops.

It was also found that one fifth Pomegranate growers (20.74 %) were not applying the green leaf manure as green manures as per recommendation of stages of Pomegranate growth, while more than half 60.75 per cent respondents were non users of green leaf manure.

5.2.9.1 Distribution of the respondents according Timeliness in application of Bio-Fertilizer in pomegranate cultivation

It was seen from that near to half Pomegranate growers (43.33 %) were not applying the powder form bio-fertilizer as per recommendation of critical stages of Pomegranate growth, only 11.11 per cent respondents were applying the powder form bio-fertilizer as per recommendation of growth stages but with slight modification according to weather /soil and plant conditions

It was also concluded that near sixty 59.63 per cent respondents were applying the liquid form bio-fertilizer as per recommendation of growth stages and only 02.59 per cent respondents were applying the liquid form bio-fertilizer as per recommendation of growth stages but with slight modification according to weather /soil and plant conditions.

5.2.9.2 Distribution of the respondents according Timeliness in application of Chemical Fertilizers in pomegranate cultivation

It was concluded from that about pomegranate growers (12.59 %) were not applying the straight chemical fertilizer as per recommendation of critical stages of Pomegranate growth, while majority 79.64 per cent respondents were non users of straight chemical fertilizer.

It was also found that about pomegranate growers, near to half (45.93 %) were not applying the compound /complex chemical fertilizer as per recommendation of critical stages of Pomegranate growth, while less 05.92 per cent respondents were applying the compound /complex chemical fertilizer as per recommendation of critical growth stages but with slight modification according to weather /soil and plant conditions.

It was observed that about pomegranate growers, more than half (58.15 %) were not applying the mixed chemical fertilizer as per recommendation of critical stages of pomegranate growth, while a very less 01.85 per cent respondents were applying the mixed chemical fertilizer as per recommendation of critical growth stages but with slight modification according to weather /soil and plant conditions.

5.2.9.3 Distribution of the respondents according Timeliness in application of Micro-nutrients in pomegranate cultivation

It was observed that about one fourth pomegranate growers (25.18 %) were not applying the micro-nutrients -Ferrous sulphate as per recommendation of stages of Pomegranate growth, while more than half 55.94 per cent respondents were applying the Ferrous sulphate as per recommendation of growth stages.

It was also found that more than half 62.59 per cent respondents were applying the Manganese sulphate as per recommendation of growth stages and only 04.44 per cent respondents were applying the Manganese sulphate as per recommendation of growth stages but with slight modification according to weather / soil and plant conditions.

It was concluded that more than half 68.16 per cent respondents were applying the Zink sulphate as per recommendation of growth stages and only 03.33 per cent respondents were applying the Zink sulphate as per recommendation of growth stages but with slight modification according to weather / soil and plant.

It was revealed that about pomegranate growers, more than half 64.46 per cent respondents were applying the Copper sulphate as per recommendation of growth stages and only 04.07 per cent respondents were applying the Copper sulphate as per recommendation of growth stages but with slight modification according to weather / soil and plant conditions.

It was revealed that about Pomegranate growers (17.77 %) were not applying the micro-nutrients – Borax as per recommendation of stages of Pomegranate growth, while more than half 65.19 per cent respondents were applying the Borax as per recommendation of growth stages.

5.2.10 Distribution of the respondents according to methods of application of Organic fertilizers

a. Organic fertilizers

It was observed that, majority (84.07 %) respondents followed by 19.62 per cent followed by 07.77 per cent followed by 14.81 per cent followed by 20.37 per cent and 04.07 per cent of the Pomegranate growers had applied FYM, compost, vermin-

compost, edible oil cakes, non-edible oil cake and animal origin cake respectively by ring or band placement methods only.

b. Distribution of the respondents according to methods of application of fertilizers Green Manures-

It was concluded that near 40.00 per cent Pomegranate growers had used leguminous crop as a green manuring by in situ placement and 39.25 per cent respondents had used green leaf manures as a green manuring by ex-situ placement methods.

c. Distribution of the respondents according to methods of application of fertilizers - Bio-Fertilizers

It was observed that more than half 64.44 per cent Pomegranate growers had used by ring or band placement method for powder form bio-fertilizer utilization followed by 73.70 per cent respondents had used drenching methods for liquid bio-fertilizer utilization.

d. Distribution of the respondents according to methods of application of fertilizers - Chemical Fertilizers

It was also revealed that 95.18 per cent Pomegranate growers had used ring or band placements followed by 77.77 per cent respondents had used chealed or mixing with FYM and 91.11 per cent had used drip method for chemical fertilizer application.

e. Distribution of the respondents according to methods of application of fertilizers - Micronutrients

It was also concluded that 87.03 per cent Pomegranate growers had used soil or chealed method followed by 92.96 per cent had used foliar method for micro-nutrients utilization.

5.2.11 Distribution of the respondents according to component wise utilization of Nutrient Management practices

a. Organic Manures

It was observed that 69.64 per cent of pomegranate growers had low extent of utilization about organic manures followed by only 07.77 per cent respondents

had high utilization and only 03.33per cent respondents had no utilization of organic manures.

b. Green Manures

It was revealed that 42.23 per cent of pomegranate growers had low extent of utilization about green manures followed by only 06.66 per cent respondents had medium utilization of green manures.

c. Bio-fertilizers

It was found that 61.48 per cent of pomegranate growers had high extent of utilization about bio-fertilizers followed by 35.92 per cent respondents had low utilization followed by only 0.37 per cent respondents had medium utilization of bio-fertilizers.

d. Chemical Fertilizers

It was concluded that 70.00 per cent of pomegranate growers had medium extent of utilization about chemical fertilizers followed by only 04.81 per cent respondents had high utilization of chemical fertilizers.

e. Micro-nutrients

It was observed that 87.40 per cent of pomegranate growers had high extent of utilization about micro nutrients followed by only 06.68 per cent respondents had no utilization of micro nutrients.

5.2.12 Distribution of the respondents according to their overall utilization of Nutrient Management practices

It was observed that 64.82 per cent of pomegranate growers had medium overall utilization about nutrient management followed by 26.29 per cent respondents had high overall utilization and only 08.88 per cent respondents had low overall utilization of nutrient management.

5.2.13 Combinations of the respondents according to use of different nutrient management practices and their Users Categories.

It is concluded that maximum number of the Pomegranate growers (24.81 %) had used the combination of organic manures + green manures + bio-fertilizers + chemical fertilizers + micro-nutrients, while 22.59 per cent respondents used the

combination of green manures + bio-fertilizers + chemical fertilizers + micro-nutrients. From the respondents, 19.62 per cent were the users of organic manures + chemical fertilizers. It was also observed from the Table 97 that 14.81 per cent respondents had used organic manures + micro-nutrients. The combinations of organic manures + green manures + bio-fertilizers + chemical fertilizers were also used by the 07.03 per cent respondents. Of the respondents, near equal number of respondents (03.70 and 03.33 %) had used the combination of organic manures + green manure + bio-fertilizers and organic manures + green manures + chemical fertilizers respectively. The 02.22 per cent respondents had used bio-fertilizers + chemical fertilizers + micro-nutrients combination and 01.11 percent used organic manures + green manures + bio-fertilizers + micro-nutrients followed by 0.74 per cent of respondents had used organic manures + green manures combination only.

5.2.14 Relationship of selected independent variables with their knowledge level about various nutrient management practices

The data revealed that, out of sixteen independent variables, fourteen variables *viz.*, age, education, family size, socio-economic status, annual income, area under Pomegranate, experience in pomegranate cultivation, social participation, irrigation status, cropping pattern, information sources used, scientific orientation, risk preference and attitude contributed significantly towards the variation in the knowledge level of pomegranate growers about various nutrient management practices. While only two variable age and cropping pattern has not contributed significantly in knowledge.

5.2.15 Relationship of selected independent variables with their extent of utilization level about various nutrient management practices.

The data shows that, out of sixteen independent variables, fourteen variables *viz.*, age, education, family size, socio-economic status, annual income, area, experience in pomegranate cultivation, social participation, irrigation status, information sources used, risk preference, scientific orientation, cosmopolitaness and attitude contributed significantly towards the variation in the extent of utilization of of pomegranate growers about various nutrient management practices. While two variables cropping pattern and total land holding has not contributed significantly in utilization.

5.2.16 Constraints faced by Pomegranate growers in nutrient management practices

- The important constraints reported by majority of respondents are regarding unavailability of pure graft material, lack of knowledge about chemical properties of water, high investment cost of drip installment, less knowledge about quantity of drippers and water per plant, lack of knowledge about pruning management in time and lack of knowledge about pests and diseases during bahar treatment respectively, regarding nutrient management constraints, unavailability of standardization in biological fertilizers Insufficient knowledge of integrated nutrient management, lack knowledge of recommended doses of integrated nutrient management, unavailability of chemical fertilizers in time, unavailability of liquid fertilizers in various grades, application of proper / balanced fertilizers dose due to insufficient knowledge,
- As per economic constraints concern, Pomegranate growers faced high fertilizer cost, lack of information about export standard, unavailability of capital for cost of cultivation, fluctuation in market rate, presence of middleman in, lack of cold storages, lack of processing units of pomegranate, obstacle of electricity, unavailability of pest and disease resistance varieties, unavailability of labours, confusion in selection of pesticides and fungicide, unavailability of subsidy in time by Govt. at time of natural calamities and no authentic literature on pomegranate in Marathi were the other general constraints faced by the pomegranate growers.

5.2.17 Suggestions of pomegranate growers for overcoming the constraints

The respondents have made various suggestion for overcoming the constraints, the suggestions were Organization of workshop on soil health, method and result demonstration on spacing and doses of organic manures, authentic seedlings should available in, organization of method demonstration on water testing sampling and workshop for farmers on drip irrigation management, *Shivar ferries* should organized by extension personnel, Government should organized training programme on market oriented bahar management, awareness of nutrient managements among farmers through

farmers rally and agricultural exhibitions by State Agriculture Department with Agricultural Universities, literature on standardization of biofertilizers, Agriculture department should conduct pre-season training for farmers regarding fertilizer doses according to growth stages at village levels, Government should provide fertilizers in time and on subsidize rate, Government should give more subsidies to pomegranate processing units, cold storages, regular electricity supply authentic literature on pomegranate in Marathi by Government agencies to Krishi Vigyan Mandals, Agril. University should undertaken research on pest and disease resistance varieties in pomegranate pocket were general suggestion was given by the Pomegranate growers respectively.

Action Implication

1. The balanced and efficient use of plant nutrients from both organic and inorganic sources in pomegranate cultivation at the farm and community levels should be emphasized; the use of local sources of organic manures and other soil amendments should be promoted; and successful cases of integrated plant nutrient management in pomegranate should be analyzed, documented and disseminated.
2. Majority of pomegranate growers partially utilizes the dose of organic and inorganic fertilizers with consideration of ages of plant. However, before deciding the dose of organic and inorganic fertilizers, the soil should be analyzed for chemical as well as physical properties and on that basis the doses should be finalized. Thus the schedule of fertilizer doses (organic and inorganic) should be provided to pomegranate grower at village level at time of planting with long term planning by State Department of Agriculture.
3. The joint efforts through farmers – scientists forum specialized with fertilizers should be vitalized and they should give attention on wider topic of plant nutrient management.
4. Encouragement should be given to pomegranate growers in cooperation with all relevant organizations like SAUs and extension agencies, a code of conduct on the effective and environmentally sound management of plant nutrients, for dissemination at local level

5. Pomegranate growers used medium source of information from Agriculture universities and state Agriculture department but the high source of information from print media. There is scope to publish the advanced technology by Agricultural University through print media and State Agriculture Department to disseminate the pomegranate technology towards farm families.
6. Near about 50 per cent respondents were not aware of complete knowledge regarding irrigation management, spacing, pit dimensions and improved varieties. Thus, the information of such parameters should be provided through various extension activities, for this extension agencies should emphasis on organization of extension activities.
7. There is below 30 % users of integrated nutrient management practices (that is Organic Manures + Green Manures + Bio-Fertilizers + Chemical Fertilizers + Micro-nutrients users) therefore, there is scope for increasing utilization level of integrated nutrient management practices through mass communication medias of extension.
8. Innovative approaches to support and promote integrated plant nutrient management in pomegranate should be pursued.
9. As the utilization level about recommended green manures is below 30%, there is need to dissemination of importance of green manures through result and method demonstration. For this extension agencies should take effort in collaboration of pomegranate growers association for dissemination of technology.

Research Implication

In light of the findings of the study, following studies can be taken up in the area of pomegranate.

1. Similar investigation may be conducted in other pomegranate growing areas of the state, so that the results of the study can be strengthened. All the aspects in relation to their marketing and post harvest technology could not be studied; therefore, other characteristics which are not included in this study need to be studied to a greater depth.

2. The area of research may be extended further and size of sample of the respondents may also be increased in any further study to draw more valid conclusions. Similar investigation may be conducted on other fruit crops to find out the constraints in utilization of integrated nutrient management practices.

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7. APPENDICES

Appendix - I

**DEPARTMENT OF EXTENSION EDUCATION
POST GRADUATE INSTITUTE
MAHATMA PHULE KRISHI VIDYAPEETH
RAHURI-413 722, DISTRICT: AHMEDNAGAR (M.S.)
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Dr. S.B. Shinde
Head

No. Extn/BTK/ /2015

Dear Sir / Madam,

I am pleased to inform you that one of my Ph.D. students Shri. **B. T. Kolgane** is presently working for his research on the topic entitled “**A Study of Utilization of Nutrient Management Practices by the Pomegranate Growers**”. He has to develop a knowledge test for measuring the knowledge level of pomegranate growers about recommended Nutrient Management Practices. After reviewing the literature and discussion with experts in the field of Horticulture, Soil Science and Extension Education some questions have been prepared for developing the knowledge test. Considering your vast experience, we feel privileged to select your good self as one of our esteemed judge for seeking help in this endeavour. The list of proposed questions is enclosed herewith. You are requested to please indicate your opinion about the degree of importance of each question as ‘most important’, ‘important’ and ‘least important’ by putting tick mark (√) in one of the columns against that question.

Please feel free to modify /change/add/delete any question, if felt necessary. The filled in questionnaire may please be returned to Shri.B.T.Kolgane,Ph.D.Scholar,Department of Extension Education, MPKV, Rahuri –413 722 (M.S.) in the self addressed stamped envelope attached herewith or **you can ask for the questionnaire by e-mail and send the filled in questionnaire to kolganebt@gmail.com / Mob. 09403009068.**

Your kind co-operation in the academic endeavor is solicited.

Thanking You,

Encl.: 1. Questionnaire (hard or soft copy)
2. Self addressed envelope

Yours faithfully,

(S.B. Shinde)

To, _____

Proposed statements for inclusion in the test to measure Knowledge of Pomegranate Growers about Nutrient Management Practices

(Note: MI = Most Important, I = Important, LI = Least Important)

Sl. No.	Questions (Items)	Importance		
		MI	I	LI
A.	Soil Selection			
1.	Which type of soil is suitable for pomegranate plantation?			
2.	Are well drained soils most suitable for pomegranate plantation?			
3.	What should be the PH of soil suitable for pomegranate plantation?			
4.	What should be the EC of soil suitable for pomegranate plantation?			
5.	What should be the limit of calcium carbonate content of soil?			
B.	Land Preparation			
1.	How many ploughings are required for pomegranate plantation?			
2.	What should be the size of pit for pomegranate plantation?			
3.	What should be the spacing between plants?			
4.	What should be the spacing between rows?			
5.	How much quantity of organic and chemical fertilizers required for filling the pit per plant ?			
6.	How much quantity of FYM / Compost per pit is required?			
C.	Selection of Planting Material			
1.	What are the sources of planting material for pomegranate?			
2.	Whether agricultural university is the best source of planting material?			
3.	What are different types of planting material used?			
4.	Which are the indices of quality planting material?			
D.	Water Management			
1.	What are the considerations for collection of water sample for testing?			
2.	What should be the PH of water suitable for pomegranate plantation?			
3.	What should be the EC of water is suitable for pomegranate plantation?			
4.	Which methods of irrigation are best for pomegranate plantation?			

Contd....

Sl. No.	Questions (Items)	Importance		
		MI	I	LI
D.	Water Management			
5.	Are you know the drip irrigation method for pomegranate plantation?			
6.	If yes, No. of dripper required per tree for pomegranate plantation?			
7.	What is the position of dripper per plant?			
8.	What is the discharge of dripper per plant?			
9.	How much pressure required for drip system in pomegranate plantation?			
E.	Bahar Management			
1.	What are the preferring bahars taken in pomegranate?			
2.	Which bahar are you generally followed in pomegranate?			
3.	Which the bahar is less susceptible to pests and diseases?			
4.	Which bahar is susceptible for attack of oily spot disease?			
5.	Which chemical is used for defoliation of leaves in pomegranate?			
6.	Is defoliation technology is efficient for better flowering?			
7.	Is training is essential in pomegranate plantation?			
8.	What are the purposes of training in pomegranate plantation?			
9.	Is pruning is essential in pomegranate plantation ?			
10.	What are the purposes of pruning in pomegranate plantation?			
11.	What should be the intensity of pruning in pomegranate plantation?			
12.	What should you spray after pruning in pomegranate?			
13.	How many months resting period are given to pomegranate?			
F.	Nutrient Management			
1.	What are the advantages of soil testing ?			
2.	What is the meaning of INM?			
3.	Whether INM maintains soil productivity and fertility in pomegranate plantation?			
4.	Whether INM conserves soils?			

Contd....

Sl. No.	Questions (Items)	Importance		
		MI	I	LI
5.	Whether INM using optimizes plant production of pomegranate?			
6.	Is nutrition is important after harvest and before dormancy of pomegranate?			
G.	Organic Manure			
1.	What are the sources of organic manures?			
2.	What are the different sources of FYM?			
3.	What are the main functions of application FYM ?			
4.	What are the different growth stages of application of FYM for pomegranate plantation ?			
5.	What are the recommended doses of FYM/ compost/ vermi-compost per plant per year required for 1 st year plant of pomegranate ?			
6.	What are the recommended doses of FYM/ compost/ vermi-compost per plant per year required for 2 nd year plant of pomegranate ?			
7.	What are the recommended doses of FYM/ compost/ vermi-compost per plant per year required for 3 rd year plant of pomegranate ?			
8.	What are the recommended doses of FYM/ compost/ vermi-compost per plant per year required for 4 th year plant of pomegranate ?			
9.	What are the recommended doses of FYM/ compost/ vermi-compost per plant per year required for 5 th year and above years plant of pomegranate ?			
10.	What are the recommended timing of application of different organic manures in pomegranate?			
11.	What is the main function of application of compost / vermicompost in pomegranate plantation?			
12.	What are the different types of concentrated organic manures?			
13.	What is the function of plant and animal origin cakes in Pomegranate plantation?			
H.	Green Manures			
1.	What are the various types of leguminous green manures?			
2.	What are the various types of green leaf manures?			
3.	What are the various functions of application of green manures in pomegranate ?			

Contd....

Sl. No.	Questions (Items)	Importance		
		MI	I	LI
4.	What are the recommended doses of application of green manures in pomegranate?			
5.	What are the recommended timing of application of green manures in pomegranate?			
I.	Biofertilizer			
1.	What are different types of biofertilizers applied for pomegranate plantation?			
I.	Biofertilizer			
2.	What are different types of formulation of biofertilizers applied for pomegranate plantation?			
3.	What are the various functions of application of biofertilizers in pomegranate plantation?			
4.	What are the recommended doses of application of biofertilizers in pomegranate?			
5.	What are the recommended timing of application of biofertilizers in pomegranate?			
J.	Chemical fertilizer			
1.	What are the different types of chemical fertilizer applied for pomegranate plantation?			
2.	What are different functions of chemical fertilizer in pomegranate plantation?			
3.	Whether you applied chemical fertilizer for pomegranate as per recommendations of soil test report?			
4.	What are different methods using for application of N, P ₂ O ₅ and K ₂ O in pomegranate plantation?			
5.	If drip irrigation, whether water soluble fertilizers are used for pomegranate plantation?			
6.	Whether using graded fertilizer in liquid form in pomegranate plantation?			
7.	Whether you applied N, P ₂ O ₅ and K ₂ O application at different growth stages in pomegranate plantation?			
8.	What are different growth stages of N, P ₂ O ₅ and K ₂ O application in pomegranate plantation?			
9.	Are you applied N, P ₂ O ₅ and K ₂ O fertilizer at first irrigation after bahar treatment in pomegranate plantation?			
10.	Are you applied split doses of Nitrogen fertilizers?			

Contd....

Sl. No.	Questions (Items)	Importance		
		MI	I	LI
11.	Whether application of N,P ₂ O ₅ and K ₂ O fertilizer at / after bahar treatment in pomegranate plantation is required ?			
12.	What are different sources of chemical fertilizers in pomegranate plantation?			
13.	What is the recommended dose of N,P ₂ O ₅ and K ₂ O g/plant for 1 st and 2 nd year old pomegranate orchard ?			
14.	What is the recommended dose of N, P ₂ O ₅ and K ₂ O g /plant required for 3 rd and 4 th years old pomegranate orchards?			
15.	What is the recommended dose of N,P ₂ O ₅ and K ₂ O g/plant required for 5 th and after 5 years old pomegranate orchard?			
K.	Fertigation			
1.	Do you use the drip for fertigation for pomegranate?			
2.	If yes, which method used for pomegranate fertigation?			
K.	Fertigation			
3.	Through Ventury			
4.	Through Fertilizer tank			
5.	Through HTP pump			
6.	What are the different sources of water soluble fertilizer grade used in pomegranate orchard?			
7.	19:19:19			
8.	What is the recommended dose of N,P ₂ O ₅ and K ₂ O / plant/ year required through fertigation in pomegranate plantation?			
9.	How many recommended splits of N, P ₂ O ₅ and K ₂ O are required through fertigation in pomegranate plantation?			
L.	Micronutrients			
1.	Whether you know the different micronutrient used for pomegranate plantation? 1.Ferrous Sulphate 2.Magnese Sulphate 3.Zink Sulphate 4.Copper Sulphate 5.Borax			
2.	Whether you know the use of micronutrient with FYM for pomegranate plantation is necessary?			
3.	What are different sources of micronutrient for pomegranate plantation?			

Contd....

Sl. No.	Questions (Items)	Importance		
		MI	I	LI
4.	What are the various functions of application of micronutrient for pomegranate plantation? 1.Ferrous Sulphate 2.Magnese Sulphate 3.Zink Sulphate 4.Copper Sulphate 5.Borax			
5.	What is the recommended dose of micronutrient required in pomegranate plantation?			
6.	Which micronutrients are applied at flowering and before fruit maturity in pomegranate plantation?			
7.	What are the functions of boric acid application in pomegranate plantation?			
8.	What are the various forms of micronutrients application in pomegranate plantation?			
9.	Do you know the various sources of chelated micronutrient used in pomegranate plantation? Inorganic Micronutrients 1.EDTA 2. EDDHA 3. HEDTA 4.DTPA 5. Citric acid Organic Micronutrients 1.Humic acid 2. Amino acid 3. Gluconet			

(Note: MI= Most Important, I= Important, LI= Least Important)

Sign of Judge : _____

Name of Judge : _____

Designation : _____

Name of Institute: _____

Contact No. : _____

E mail. : _____

Appendix – II

Pre-selected knowledge test items showing the overall mean and mean score calculated.

Knowledge of Pomegranate Growers about Nutrient Management Practices.

Overall Mean = 2.48

Sl. No.	Questions (Items)	Mean
A	Soil Selection	
1	Which type of soil is suitable for pomegranate plantation?	2.88
2	Are well drained soils most suitable for pomegranate plantation?	1.18
3	What should be the PH of soil suitable for pomegranate plantation?	2.56
4	What should be the EC of soil suitable for pomegranate plantation?	2.50
5	What should be the limit of calcium carbonate content of soil?	2.50
B	Land Preparation	
1	How many ploughings are required for pomegranate plantation?	2.08
2	What should be the size of pit for pomegranate plantation?	2.56
3	What should be the spacing between plants?	2.88
4	What should be the spacing between rows?	2.56
5	How much quantity of organic and chemical fertilizers required for filling the pit per plant ?	2.56
6	How much quantity of FYM / Compost per pit is required?	2.66
C	Selection of Planting Material	
1	What are the sources of planting material for pomegranate?	2.88
2	Whether agricultural university is the best source of planting material?	2.50
3	What are different types of planting material used?	2.50
4	Which are the indices of quality planting material?	1.28
D	Water Management	
1	What are the considerations for collection of water sample for testing?	2.44
2	What should be the PH of water suitable for pomegranate plantation?	2.56
3	What should be the EC of water is suitable for pomegranate plantation?	2.56
4	Which methods of irrigation are best for pomegranate plantation?	2.66
5	Are you know the drip irrigation method for pomegranate plantation?	2.44

Appendix-II contd....

Sl. No.	Questions (Items)	Mean
6	If yes, No. of dripper required per tree for pomegranate plantation?	2.88
7	What is the position of dripper per plant?	2.50
8	What is the discharge of dripper per plant?	2.50
9	How much pressure required for drip system in pomegranate plantation?	2.88
E	Bahar Management	
1	What are the preferring bahars taken in pomegranate?	2.88
2	Which bahar are you generally followed in pomegranate?	2.08
3	Which the bahar is less susceptible to pests and diseases?	2.66
4	Which bahar is susceptible for attack of oily spot disease?	2.88
5	Which chemical is used for defoliation of leaves in pomegranate?	2.50
6	Is defoliation technology is efficient for better flowering?	2.88
7	Is training is essential in pomegranate plantation?	2.50
8	What are the purposes of training in pomegranate plantation?	2.62
9	Is pruning is essential in pomegranate plantation ?	2.66
10	What are the purposes of pruning in pomegranate plantation?	
11	What should be the intensity of pruning in pomegranate plantation?	1.50
12	What should you spray after pruning in pomegranate?	2.88
13	How many months resting period are given to pomegranate orchard?	2.88
F	Nutrient Management	
1	What are the advantages of soil testing ?	2.88
2	What is the meaning of INM?	2.66
3	Whether INM maintains soil productivity and fertility in pomegranate plantation?	2.48
4	Whether INM conserves soils?	2.50
5	Whether INM using optimizes plant production of pomegranate?	2.50
6	Is nutrition is important after harvest and before dormancy of pomegranate?	2.50
G	Organic Manure	
1	What are the sources of organic manures?	1.72
2	What are the different sources of FYM?	2.72
3	What are the main functions of application FYM ?	2.66
4	What are the different growth stages of application of FYM for pomegranate plantation ?	2.72

Appendix-II contd....

Sl. No.	Questions (Items)	Mean
5	What are the recommended dose of FYM/ compost/ vermi-compost per plant per year required for 1 st year plant of pomegranate ?	2.72
6	What are the recommended dose of FYM/ compost/ vermi-compost per plant per year required for 2 nd year plant of pomegranate ?	2.88
7	What are the recommended dose of FYM/ compost/ vermi-compost per plant per year required for 3 rd year plant of pomegranate ?	2.66
8	What are the recommended dose of FYM/ compost/ vermi-compost per plant per year required for 4 th year plant of pomegranate ?	2.58
9	What are the recommended dose of FYM/ compost/ vermi-compost per plant per year required for 5 th and above 5 year old plant of pomegranate ?	2.56
10	What are the recommended timing of application of different organic manures in pomegranate?	2.50
11	What is the main function of application of compost / vermicompost in pomegranate plantation?	2.50
12	What are the different types of concentrated organic manures?	2.72
13	What is the function of plant and animal origin cakes in Pomegranate plantation?	2.88
H	Green Manures	
1	What are the various types of leguminous green manures?	2.56
2	What are the various types of green leaf manures?	2.58
3	What are the various functions of application of green manures in pomegranate ?	2.72
4	What are the recommended doses of application of green manures in pomegranate?	2.66
5	What are the recommended timing of application of green manures in pomegranate?	2.66
I	Biofertilizer	
1	What are different types of biofertilizers applied for pomegranate?	2.56
2	What are various types of biofertilizers formulation applied for pomegranate plantation?	2.84
3	What are the various functions of application of biofertilizers in pomegranate plantation?	2.88
4	What are the recommended doses of application of biofertilizers in pomegranate?	2.88
5	What are the recommended timing of application of biofertilizers in pomegranate?	2.72

Appendix-II contd....

Sl. No.	Questions (Items)	Mean
J	Chemical fertilizer	
1	What are the different types of chemical fertilizer applied for pomegranate plantation?	2.88
2	What are different functions of chemical fertilizer in pomegranate plantation?	2.56
3	Whether you applied chemical fertilizer for pomegranate as per recommendations of soil test report?	2.88
4	What are different methods using for application of N,P ₂ O ₅ and K ₂ O in pomegranate plantation?	2.56
5	If drip irrigation, whether water soluble fertilizers are used for pomegranate plantation?	2.66
6	Whether using graded fertilizer in liquid form in pomegranate plantation?	2.66
7	Whether you applied N, P ₂ O ₅ and K ₂ O fertilizer at different growth stages of pomegranate plantation?	2.08
8	What are different growth stages of N, P ₂ O ₅ and K ₂ O application in pomegranate plantation?	2.66
9	Are you applied N, P ₂ O ₅ and K ₂ O fertilizer at first irrigation after bahar treatment in pomegranate plantation?	2.56
10	Are you applied split doses of Nitrogen fertilizers?	2.66
11	Whether application of N,P ₂ O ₅ and K ₂ O fertilizer at / after bahar treatment in pomegranate plantation is required ?	2.88
12	What are different sources of chemical fertilizers in pomegranate plantation?	2.88
13	What is the recommended dose of N,P ₂ O ₅ and K ₂ O g/plant for 1 st year old pomegranate orchard ?	2.72
14	What is the recommended dose of N,P ₂ O ₅ and K ₂ O g/plant for 2 nd year old pomegranate orchard ?	2.78
15	What is the recommended dose of N, P ₂ O ₅ and K ₂ O g /plant required for 3 rd years old pomegranate orchards?	2.66
16	What is the recommended dose of N, P ₂ O ₅ and K ₂ O g /plant required for 4 th years old pomegranate orchards?	2.72
17	What is the recommended dose of N,P ₂ O ₅ and K ₂ O g/plant required for 5 th and after 5 years old pomegranate orchard?	2.50
K	Fertigation	
1	Do you use the drip for fertigation for pomegranate?	1.50
2	If yes, which method used for pomegranate fertigation?	2.56
3	Through Ventury	2.50
4	Through fertilizer tank	2.66

Appendix-II contd....

Sl. No.	Questions (Items)	Mean
5	Through HTP pump	2.72
6	What are the different sources of water soluble fertilizer grade used in pomegranate orchard?	2.66
7	Water soluble fertilizer grade : 19:19:19	2.88
8	What is the recommended dose of N,P ₂ O ₅ and K ₂ O / plant/ year required through fertigation in pomegranate plantation?	2.66
9	How many recommended splits of N, P ₂ O ₅ and K ₂ O are required through fertigation in pomegranate plantation?	2.88
L	Micronutrients	
1	Whether you know the different micronutrient used for pomegranate plantation? 1.Ferrous Sulphate 2.Magnese Sulphate 3.Zink Sulphate 4.Copper Sulphate 5.Borax	2.66
2	Whether you know the use of micronutrient with FYM for pomegranate plantation is necessary?	2.66
3	What are different sources of micronutrient for pomegranate plantation?	2.66
4	What are the various functions of application of micronutrient for pomegranate plantation? 1.Ferrous Sulphate 2.Magnese Sulphate 3.Zink Sulphate 4.Copper Sulphate 5.Borax	2.88
5	What is the recommended dose of micronutrient required in pomegranate plantation?	2.72
6	Which micronutrients are applied at flowering and before fruit maturity in pomegranate plantation?	2.72
7	What are the functions of boric acid application in pomegranate plantation?	2.50
8	What are the various forms of micronutrients application in pomegranate plantation?	2.50
9	Do you know the various sources of chelated micronutrient used in pomegranate plantation? Inorganic Micronutrients 1.EDTA 2. EDDHA 3. HEDTA 4.DTPA 5. Citric acidOrganic Micronutrients 1.Humic acid 2. Amino acid 3. Gluconet	2.88

Appendix-III

Items selected for the knowledge test

Items selected for final knowledge test according to item difficulty index, item discrimination index and Bi-serial correlation and showing their weightages for measurement of overall Knowledge of Pomegranate Growers about Nutrient Management Practices.

P = Item difficulty index E 1/3 = Item discrimination index BC = Biserial correlation

St. No.	Sl. No.	Questions (Items)	P	E 1/3	BC*
	A	Soil Selection			
1	1	Which type of soil is suitable for pomegranate plantation?	89.58	0.25	2.63*
2	2	Are well drained soils most suitable for pomegranate plantation?	25.00	0.12	1.96* NS
3	3	What should be the PH of soil suitable for pomegranate plantation?	60.41	0.43	3.43*
4	4	What should be the EC of soil suitable for pomegranate plantation?	50.00	0.25	2.78*
5	5	What should be the limit of calcium carbonate content of soil?	64.58	0.32	2.56*
	B	Land Preparation			
1	6	How many ploughings are required for pomegranate plantation?	54.14	0.32	2.84*
2	7	What should be the size of pit for pomegranate plantation?	68.75	0.31	2.76*
3	8	What should be the spacing between plants?	50.00	0.47	2.08*
4	9	What should be the spacing between rows?	58.33	0.37	2.96*
5	10	How much quantity of organic and chemical fertilizers required for filling the pit per plant ?	68.75	0.52	2.89*
6	11	How much quantity of FYM / Compost per pit is required?	64.58	0.68	2.90*
	C	Selection of Planting Material			
1	12	What are the sources of planting material for pomegranate?	64.58	0.22	2.05*
2	13	Whether agricultural university is the best source of planting material?	66.66	0.42	2.60*
3	14	What are different types of planting material used?	50.00	0.57	2.17*
4	15	Which are the indices of quality planting material?	70.83	0.55	2.47*

Appendix-III contd....

St. No.	Sl. No.	Questions (Items)	P	E 1/3	BC*
	D	Water Management			
1	16	What are the considerations for collection of water sample for testing?	22.91	0.17	1.03* NS
2	17	What should be the PH of water suitable for pomegranate plantation?	85.41	0.42	2.17*
3	18	What should be the EC of water is suitable for pomegranate plantation?	62.50	0.56	3.70*
4	19	Which methods of irrigation are best for pomegranate plantation?	64.58	0.06	2.34*
5	20	Are you know the drip irrigation method for pomegranate plantation?	47.91	0.12	0.57* NS
6	21	If yes, No. of dripper required per tree for pomegranate plantation?	60.41	0.25	3.14*
7	22	What is the position of dripper per plant?	83.33	0.31	2.87*
8	23	What is the discharge of dripper per plant?	72.91	0.62	4.10*
9	24	How much pressure required for drip system in pomegranate plantation?	68.75	0.12	2.94*
	E	Bahar Management			
1	25	What are the preferring bahars taken in pomegranate?	37.50	0.22	6.12*
2	26	Which bahar are you generally followed in pomegranate?	75.00	0.50	4.06*
3	27	Which the bahar is less susceptible to pests and diseases?	60.41	0.38	2.72*
4	28	Which bahar is susceptible for attack of oily spot disease?	64.58	0.25	3.37*
5	29	Which chemical is used for defoliation of leaves in pomegranate?	70.83	0.50	4.10*
6	30	Is defoliation technology is efficient for better flowering?	77.08	0.50	4.83*
7	31	Is training is essential in pomegranate plantation?	75.00	0.50	3.63*
8	32	What are the purposes of training in pomegranate plantation?	72.91	0.43	2.48*
9	33	Is pruning is essential in pomegranate plantation ?	77.08	0.50	4.05*
10	34	What are the purposes of pruning in pomegranate plantation?	46.12	0.72	3.25*
11	35	What should be the intensity of pruning in pomegranate plantation?	43.75	0.32	2.47*
12	36	What should you spray after pruning in pomegranate?	52.08	0.56	2.78*

Appendix-III contd....

St. No.	Sl. No.	Questions (Items)	P	E 1/3	BC*
13	37	How many months resting period are given to pomegranate ?	66.66	0.42	2.08*
	F	Nutrient Management			
1	38	What are the advantages of soil testing ?	79.16	0.31	2.64*
2	39	What is the meaning of INM?	54.16	0.25	2.41*
3	40	Whether INM maintains soil productivity and fertility in pomegranate plantation?	70.83	0.18	2.06*
4	41	Whether INM conserves soils?	19.16	0.17	1.24* NS
	F	Nutrient Management			
5	42	Whether INM using optimizes plant production opomegranate	81.25	0.37	3.03*
6	43	Is nutrition is important after harvest and before dormancy of pomegranate?	68.75	0.62	3.56*
	G	Organic Manure			
1	44	What are the sources of organic manures?	72.91	0.37	2.42*
2	45	What are the different sources of FYM?	70.83	0.56	4.19*
3	46	What are the main functions of application FYM ?	68.75	0.53	2.34*
4	47	What are the different growth stages of application of FYM for pomegranate plantation ?	45.83	0.37	3.19*
5	48	What are the recommended doses of FYM/ compost/ vermi-compost per plant per year required for 1 st year plant of pomegranate ?	68.75	0.32	2.34*
6	49	What are the recommended doses of FYM/ compost/ vermi-compost per plant per year required for 2 nd year plant of pomegranate ?	62.33	0.35	3.19*
7	50	What are the different doses of FYM/ compost/ vermi-compost per plant per year required for 3 rd year pomegrana?	36.22	0.85	2.16*
8	51	What are the recommended doses of FYM/ compost/ vermi-compost per plant per year required for 4 th year plant of pomegranate ?	47.58	0.72	2.78*
9	52	What are the recommended doses of FYM/ compost/ vermi-compost per plant per year required for 5 and more years plant of pomegranate ?	63.48	0.55	3.69*
10	53	What are the recommended timing of application of different organic manures in pomegranate?	79.16	0.50	3.56*

Appendix-III contd....

St. No.	Sl. No.	Questions (Items)	P	E 1/3	BC*
11	54	What is the main function of application of compost / vermicompost in pomegranate plantation?	68.75	0.58	2.23*
12	55	What are the different types of concentrated organic manures?	72.91	0.31	2.66*
13	56	What is the function of plant and animal origin cakes in Pomegranate plantation?	77.08	0.63	2.94*
	H	Green Manures			
1	57	What are the various types of leguminous green manures?	75.00	0.50	3.53*
2	58	What are the various types of green leaf manures crops?	37.25	32.66	3.16*
3	59	What are the various functions of application of green manures in pomegranate?	70.83	0.42	2.70*
4	60	What are the recommended doses of application of green manures in pomegranate?	79.16	0.43	2.39*
5	61	What are the recommended timing of application of green manures in pomegranate?	81.25	0.25	2.61*
	I	Biofertilizer			
1	62	What are different types of biofertilizers applied for pomegranate plantation?	81.25	0.37	2.93*
2	63	What are different formulation of biofertilizers available for pomegranate plantation?	72.48	0.44	3.25*
3	64	What are the various functions of application of biofertilizers in pomegranate plantation?	81.25	0.37	2.93*
4	65	What are the recommended doses of application of biofertilizers in pomegranate?	81.25	0.31	3.14*
5	66	What are the recommended timing of application of biofertilizers in pomegranate?	54.16	0.28	2.94*
	J	Chemical fertilizer			
1	67	What are the different types of chemical fertilizer applied for pomegranate plantation?	81.25	0.31	3.09*
2	68	What are different functions of chemical fertilizer in pomegranate plantation?	77.08	0.25	2.24*
3	69	Whether you applied chemical fertilizer for pomegranate as per recommendations of soil test report?	25.83	0.12	1.43 ^{NS}
4	70	What are different methods using for application of N, P ₂ O ₅ and K ₂ O in pomegranate plantation?	70.83	0.56	4.19*
5	71	If drip irrigation, whether water soluble fertilizers are used for pomegranate plantation?	19.58	0.11	1.27 ^{NS}

6	72	Whether using graded fertilizer in liquid form in pomegranate plantation?	27.50	0.18	1.31 [*] NS
7	73	What are different growth stages of N,P ₂ O ₅ and K ₂ O application in pomegranate plantation?	81.25	0.37	3.19 [*]
8	74	Are you applied N,P ₂ O ₅ and K ₂ O fertilizer at first irrigation after bahar treatment in pomegranate plantation?	85.41	0.32	2.71 [*]
9	75	Are you applied split doses of Nitrogen fertilizers?	83.33	0.63	2.65 [*]
10	76	Whether application of N,P ₂ O ₅ and K ₂ O fertilizer at / after bahar treatment in pomegranate plantation is required ?	81.25	0.76	2.98 [*]
11	77	What are different sources of chemical fertilizers in pomegranate plantation?	81.25	0.43	2.24 [*]
12	78	What is the recommended dose of N,P ₂ O ₅ and K ₂ O g/plant for 1 st and 2 nd year old pomegranate orchard ?	75.00	0.37	3.34 [*]
13	79	What is the recommended dose of N, P ₂ O ₅ and K ₂ O g /plant required for 3 rd and 4 th years old pomegranate orchards?	50.00	0.52	2.74 [*]
14	80	What is the recommended dose of N,P ₂ O ₅ and K ₂ O g/plant required for 5 th and after 5 years old pomegranate orchard?	85.41	0.32	2.71 [*]
	K	Fertigation			
1	81	Do you use the drip for fertigation for pomegranate?	56.25	0.52	2.32 [*]
2	82	If yes, which method used for pomegranate fertigation?	60.41	0.69	2.40 [*]
3	83	Through Ventury	48.25	0.77	3.18 [*]
4	84	Through Fertilizer tank	76.55	0.49	2.89 [*]
5	85	Through HTP pump	65.33	0.55	2.85 [*]
6	86	What are the different sources of water soluble fertilizer grade used in pomegranate orchard?	62.50	0.35	2.65 [*]
7	87	Water soluble grade 19:19:19	85.47	0.39	3.44 [*]
8	88	What is the recommended dose of N,P ₂ O ₅ and K ₂ O / plant/ year required through fertigation in pomegranate plantation?	47.91	0.25	2.55 [*]
9	89	How many recommended splits of N, P ₂ O ₅ and K ₂ O are required through fertigation in pomegranate plantation?	77.08	0.25	2.55 [*]

Appendix-III contd....

St. No.	Sl. No.	Questions (Items)	P	E 1/3	BC*
	L	Micronutrients			
1	90	Whether you know the different micronutrient used for pomegranate plantation? 1.Ferrous Sulphate 2.Magnese Sulphate 3.Zink Sulphate 4.Copper Sulphate 5.Borax	60.41	0.06	0.78* NS
2	91	Whether you know the use of micronutrient with FYM for pomegranate plantation is necessary?	83.33	0.12	2.48*
3	92	What are different sources of micronutrient for pomegranate?	52.08	0.12	2.53*
4	93	What are the various functions of application of micronutrient for pomegranate plantation? 1.Ferrous Sulphate 2.Magnese Sulphate 3.Zink Sulphate 4.Copper Sulphate 5.Borax	75.00	0.25	2.61*
5	94	What is the recommended dose of micronutrient required in pomegranate plantation?	54.16	0.43	3.43*
6	95	Which micronutrients are applied at flowering and before fruit maturity in pomegranate plantation?	85.41	0.31	3.28*
7	96	What are the functions of boric acid application in pomegranate plantation?	66.66	0.12	2.35*
8	97	What are the various forms of micronutrients application in pomegranate plantation?	81.25	0.37	2.24*
9	98	Do you know the various sources of chelated micronutrient used in pomegranate plantation? Inorganic Micronutrients 1.EDTA 2. EDDHA 3. HEDTA 4.DTPA 5. Citric acid Organic Micronutrients 1.Humic acid 2. Amino acid 3. Gluconet	68.75	0.18	2.23*

Total no. of questions selected for the farmers response test = **98**

Total no. of questions discarded as per NS Biserial correlation coefficient = **08**

Number of questions to be included in final knowledge test = **90**

Appendix- I

**DEPARTMENT OF EXTENSION EDUCATION
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No.EXTN. /BTK//2015

Date: / /2015

Dr. S.B. Shinde
Head

Subject :- Development of scale to measure the extent of utilization of nutrient management practices by the pomegranate growers.....

Dear Sir/Madam,

I am pleased to inform you that one of my Ph.D. students **Shri. B. T.Kolgane** is presently working for his research on the topic entitled “**A Study of Utilization of Nutrient Management Practices by the Pomegranate Growers**”. He has to develop a scale for utilization of nutrient management practices by pomegranate growers about recommended nutrient management practices.

Utilization of nutrient management practices refers to continuous use of recommended (by the MPKV, Rahuri) integrated nutrient management practices (organic manures, green manures, bio-fertilizers, chemical fertilizers and micro- nutrients) with regards to type of fertilizers, users categories, per hectare per plant use and timeliness in application by the pomegranate growers for optimizing the yield.

After reviewing the literature and discussion with experts in the field of Horticulture, Soil Science and Extension Education some statements have been prepared for developing the utilization scale. The list of major aspect, specific items and weightage proposed to be assigned is enclosed herewith.

Considering your vast experience, we feel privileged to select your good self as one of our esteemed judge for seeking help in this endeavour.

We need your help in identifying the relevancy of each specific items and in scoring them.Please read the enclosed documents and indicate your response.

1. Indicate the relevancy of the main specific items and its sub-components by marking (✓) in the appropriate column (Column 4,5,6).

2. Indicate your agreement to proposed scores (Column 7) for the specific items by marking

(√) in the appropriate column (Column 8,9).

1. If you do not agree with the scores proposed by us, please assign the scores as per your choice (Column 10).
2. Please feel free to modify / add/delete any specific items and their sub-components, scores as per their importance and relevance in your opinion if felt necessary.

The filled in questionnaire may please be returned to Shri.B.T.Kolgane, Ph.D. Scholar, Department of Extension Education, MPKV, Rahuri -413 722 (M.S.) in the self addressed stamped envelope attached herewith or **you can ask for the questionnaire by e-mail and send the filled in questionnaire to kolganebt@gmail.com / Mob. 09403009068.**

Your kind co-operation in the academic endeavor is solicited.

Thanking You,

With regards.

Encl.: 1. Draft scale (hard or soft copy) along with instructions for scoring.

2. Self- addressed envelope.

Yours sincerely,

(S.B. Shinde)

To, _____

Instruction for Judges

1. Please read the definitions supplied to you before assigning weightages to various specific items and their sub-components of an utilization of nutrient management practices by the Pomegranate growers i.e. integrated nutrient management (INM) practices.

Definition :

A. Conceptual definition of utilization of nutrient management practices

Integrated nutrient supply/management (INS) aims at maintenance or adjustment of soil fertility and of plant /animal nutrient supply to an optimum level for sustaining the desired crop productivity through optimization of benefit from all possible sources of plant/ animal nutrients in an integrated manner.

B. Operational definition

Utilization of nutrient management practices refers to continuous use of recommended (by the MPKV, Rahuri) integrated nutrient management practices (organic manures, green manures, bio-fertilizers, chemical fertilizers and micro- nutrients) with regards to type of fertilizers, users categories, per hectare per plant use and timeliness in application by the pomegranate growers for optimizing the yield.

2. You have to weight/score all the specific items and their sub-components of an utilization of nutrient management practices by the Pomegranate growers.

Judges Schedule

Dear judge,

This section deals with the utilization of nutrient management practices by the Pomegranate growers. This will be studied on the basis four major aspects and five specific items. You have to ascertain scores for the utilization of each specific and sub-components items by pomegranate growers.

The **major five aspects** are :

1. Type of fertilizers
2. Users categories
3. Per plant per year use
4. Timeliness in application
5. Methods of application

The **five major specific items** are

1. Organic fertilizers
2. Green manures
3. Bio-fertilizers
4. Chemical fertilizers
5. Micro-nutrients.

NB. (If you feel to add any specific items or sub-components in the above list you can do it, but see that the total score does not exceeds the limit set at each place).

Step No. 1

Assigning scores to specific items for utilization of nutrient management practices by pomegranate growers.

First you have to assign a score to each of specific items in the utilization of nutrient management practices out of 100 in integrated nutrient manner. The total score given to major specific items should not exceed 100.

Example : Type of fertilizers

Sl. No.	Specific items	Score suggested by students (out of 100)
I.	Organic manure	30
II.	Green manure	05
III.	Bio-fertilizers	10
IV.	Chemical fertilizers	50
V.	Micro-nutrients	05
	Total Score	100

Step No. 2.

Assigning scores to sub-components for utilization of nutrient management practices by pomegranate growers.

Each major specific items of utilization of nutrient management practices by pomegranate growers is divided into sub-components for e.g. chemical fertilizers are divided into straight fertilizers, compound fertilizer, complex fertilizer and mixed fertilizer. Please assign score to each sub-components out of total score given to a particular specific items in step no.1. The judge has to assign score to sub-components of each major specific items out of 50 and 50 respectively. Suppose, the specific item chemical fertilizer is assign 50 score, assign the score to sub-components out of 50 so that the score to sub-components out of 50 so that the score given to sub-component does not exceeds 50.

Example : Chemical fertilizers (total 50 score)

Sl. No.	Specific items	Sub-components	Score suggested by students
IV	Chemical fertilizers	1. Straight	15
		2. Compound/ Complex	20
		3. Mixed	15
		Total Score	50

Scale to Measure the Extent of Utilization of Nutrient Management Practices by the Pomegranate Growers.

(Note : **MR** = Most Relevant, **R** = Relevant, **NR**= Not Relevant)

Sl. No.	Parameter (s)	Relevancy			Proposed Score	Do you agree with proposed scores		If disagree suggest change
		MR	R	NR		Agree	Dis-agree	
A.	Type of fertilizers							
I.	Organic manures				(30)			
1	Bulky organic manures				(20)			
i.	FYM				8			
ii.	Compost				6			
iii.	Vermi compost				6			
2.	Concentrated organic manure				(10)			
i.	Plant origin				(8)			
a.	Edible oil cakes				4			
b.	Non edible oil cakes				4			
ii.	Animal origin (meal)				2			
II.	Green manures				(5)			
1.	Leguminous crops				3			
2.	Green leaf manures				2			
III.	Bio-fertilizers				(10)			
1.	Powder form				6			
2.	Liquid form				4			
IV.	Chemical fertilizers				(50)			
1.	4.1. Straight				15			
2.	4.2. Compound/ Complex				20			
3.	4.3. Mixed				15			
V.	Micro-nutrients				(5)			
1.	Ferrous sulphate				1			
2.	Manganese's sulphate				1			
3.	Zinc sulphate				1			
4.	Copper Sulphate				1			
5.	Borax				1			
6.	Any other (Pl. specify)							
B.	Users categories							
1.	Users of organic manure				4			
2.	Users of green manure				3			
3.	Users of bio-fertilizers				2			
4.	Users of chemical fertilizers				5			
5.	Users of micro-nutrients				1			
6.	Users of Organic Manures + Green Manures				7			
7.	Users of Organic Manures + Bio-fertilizers				6			
8.	Users of Organic Manures + Chemical fertilizers				9			

Contd.....

Sl. No.	Parameter (s)	Relevancy			Proposed Score	Do you agree with proposed scores		If disagree suggest change
		MR	R	NR		Agree	Dis-agree	
C.	Type of fertilizers							
9.	Users of Organic Manures + Micro-nutrients				5			
10.	Users of Organic Manures + Green Manures + Bio-fertilizers				9			
11.	Users of Organic Manures + Green Manures + Chemical fertilizers				12			
12.	Users of Organic Manures + Green Manures + Micro-nutrients				8			
13.	Users of Organic Manures + Green Manures + Bio-fertilizers + Chemical fertilizers				13			
14.	Users of Organic Manures + Green Manures + Bio-fertilizers + Micro-nutrients				10			
15.	Users of Green Manures + Bio-fertilizers				5			
16.	Users of Green Manures + Chemical fertilizers				8			
17.	Users of Green Manures + Micro-nutrients				4			
18.	Users of Green Manures + Bio-fertilizers + Chemical fertilizers				10			
19.	Users of Green Manures + Bio-fertilizers + Micro-nutrients				6			
20.	Users of Green Manures + Bio-fertilizers + Chemical fertilizers + Micro-nutrients				11			
21.	Users of bio-fertilizers + Chemical fertilizers				7			
22.	Users of bio-fertilizers + Micro-nutrients				3			
23.	Users of bio-fertilizers + Chemical fertilizers + Micro-nutrients				8			
24.	Users of Chemical fertilizers + Micro-nutrients				6			

Contd.....

Sl. No.	Parameter (s)	Relevancy			Proposed Score	Do you agree with proposed scores		If disagree suggest change
		MR	R	NR		Agree	Dis-agree	
25.	Users of Organic Manure + Green Manure + Bio-fertilizers + Chemical fertilizers + Micro-nutrients				15			
26.	Any other (Pl. specify)				-			
C.	Per plant Per year use							
1.	Less than recommended				1			
2.	More than recommended				2			
3.	As per recommendation				3			
4.	As per the reports of soil testing / plant leaf tissue test				4			
D.	Timeliness in application							
1.	Not as per recommendation				1			
2.	As per recommendation				2			
3.	As per recommendation but with modifications according to weather /soil/ plant conditions				3			
4.	4. Any other (Pl. specify)				-			
E.	Methods of application							
1.	Not as per recommendation				1			
2.	As per recommendation				2			
3.	As per recommendation but with modifications according to weather / soil / plant conditions.				3			
4.	Any other (Pl. specify)							

(Note : **MR** = Most Relevant, **R** = Relevant, **NR**= Not Relevant)**Sign of Judge** : _____**Name of Judge** : _____**Designation** : _____**Name of Institute** : _____**Contact No.** : _____**E mail.** : _____

Appendix- II

Scale Values of Nutrient Management and Modified Utilization Scale

Sl. No.	Parameter (s)	Relevancy weight	Relevancy percentage	Mean relevancy score	Final score
A.	Type of fertilizers				
I.	Organic manures				(30)
1.	Bulky organic manures	0.762	76.18	1.524	(20)
a.	FYM	0.725	72.50	1.450	8
b.	Compost	0.806	80.64	1.612	6
c.	Vermi compost	0.744	74.38	1.488	6
2.	Concentrated organic manure	0.838	83.75	1.675	(10)
a.	Plant origin	0.800	80.00	1.600	(8)
i.	Edible oil cakes	0.875	87.50	1.750	4
ii.	Non edible oil cakes	0.894	89.38	1.788	4
b.	Animal origin (meal)	0.956	95.63	1.913	2
II.	Green manures				(5)
a.	Leguminous crops	0.875	87.50	1.750	3
b.	Green leaf manures	0.688	68.75	1.375	2
III.	Bio-fertilizers				(10)
1.	Powder form	0.863	86.25	1.725	6
2.	Liquid form	0.812	81.18	1.624	4
IV.	Chemical fertilizers				(50)
1.	Straight	0.813	81.25	1.625	15
2.	Compound/ Complex	0.719	71.88	1.438	20
3.	Mixed	0.750	75.00	1.500	15
V.	Micro-nutrients				(5)
1.	Ferrous sulphate	0.831	83.13	1.663	1
2.	Manganese's sulphate	0.869	86.88	1.738	1
3.	Zinc sulphate	0.956	95.63	1.913	1
4.	Copper Sulphate	0.750	75.00	1.500	1
5.	Borax	0.875	87.50	1.750	1

6.	Any other (Pl.specify)	0.569	56.88	1.138	Rejected
B.	Users categories				
1.	Users of organic manure	0.721	72.09	1.442	4
2.	Users of green manure	0.868	86.82	1.437	3
3.	Users of bio-fertilizers	0.956	95.62	1.913	2
4.	Users of chemical fertilizers	0.813	81.25	1.625	5
5.	Users of micro-nutrients	0.723	72.35	1.448	1
6.	Users of Organic Manures + Green Manures	0.863	86.38	1.728	7
7.	Users of Organic Manures + Bio-fertilizers	0.761	76.12	1.523	6
8.	Users of Organic Manures + Chemical fertilizers	0.891	89.15	1.783	9
9.	Users of Organic Manures + Micro-nutrients	0.931	93.13	1.863	5
10.	Users of Organic Manures + Green Manures + Bio-fertilizers	0.735	73.54	1.471	9
11.	Users of Organic Manures + Green Manures + Chemical fertilizers	0.713	71.34	1.427	12
12.	Users of Organic Manures + Green Manures + Micro- nutrients	0.863	86.37	1.728	8
13.	Users of Organic Manures + Green Manures + Bio-fertilizers + Chemical fertilizers	0.751	75.13	1.503	13
14.	Users of Organic Manures + Green Manures + Bio-fertilizers + Micro-nutrients	0.894	89.38	1.789	10
15.	Users of Green Manures + Bio-fertilizers	0.763	76.25	1.525	5
16.	Users of Green Manures + Chemical fertilizers	0.868	86.79	1.760	8
17.	Users of Green Manures + Micro-nutrients	0.807	80.65	1.620	4
18.	Users of Green Manures + Bio-fertilizers + Chemical fertilizers	0.831	83.18	1.664	10
19.	Users of Green Manures + Bio-fertilizers + Micro-nutrients	0.765	76.45	1.521	6
20.	Users of Green Manures + Bio-fertilizers + Chemical fertilizers + Micro-nutrients	0.856	85.58	1.712	11
21.	Users of bio-fertilizers + Chemical fertilizers	0.723	72.28	1.446	7
22.	Users of bio-fertilizers + Micro-nutrients	0.764	76.38	1.528	3

23.	Users of bio-fertilizers + Chemical fertilizers + Micro-nutrients	0.844	84.38	1.688	8
24.	Users of Chemical fertilizers + Micro-nutrients	0.956	95.57	1.912	6
25.	Users of Organic Manure + Green Manure + Bio-fertilizers + Chemical fertilizers + Micro-nutrients	0.895	89.47	1.789	15
26.	Any other(Pl. specify)	0.573	57.27	1.146	Rejected
C.	Per plant Per year use				
1.	Less than recommended	0.883	88.27	1.766	1
2.	More than recommended	0.923	92.27	1.846	2
3.	As per recommendation	0.800	80.00	1.600	3
4.	As per the reports of soil testing / plant leaf tissue test	0.845	84.48	1.687	4
5.	Any other(Pl. specify)	0.367	36.60	7.34	Rejected
D.	Timeliness in application				
1.	Not as per recommendation	0.755	75.48	1.501	1
2.	Asper recommendation	0.719	71.88	1.438	2
3.	Asper recommendation but with modifications according to weather / soil / plant conditions.	0.965	96.48	1.923	3
4.	Any other (Pl. specify)	0.187	18.67	0.374	Rejected
E.	Methods of application				
1.	Not as per recommendation	0.863	86.28	1.726	1
2.	Asper recommendation	0.843	84.27	1.686	2
3.	Asper recommendation but with modifications according to weather / soil / plant conditions.	0.957	95.67	1.914	3
4.	Any other (Pl. specify)	0.575	57.47	1.145	Rejected

Appendix- III

Final Scale for Measuring Extent of Nutrient Management Utilization

Sl. No.	Major aspect	Parameter (s)	Final Score
1.	Type of fertilizers	<u>I. Organic manures</u>	(30)
		1.1. Bulky organic manures	(20)
		1.1.1. FYM	8
		1.1.2. Compost	6
		1.1.3. Vermi compost	6
		1.2. Concentrated organic manure	(10)
		1.2.1. Plant origin	(8)
		1.2.1.1. Edible oil cakes	4
		1.2.1.2. Non edible oil cakes	4
		1.2.2 Animal origin (meal)	2
		<u>II. Green manures</u>	(5)
		2.1. Leguminous crops	3
		2.2. Green leaf manures	2
		<u>III. Bio-fertilizers</u>	(10)
		3.1. Powder form	6
		3.2. Liquid form	4
		<u>IV. Chemical fertilizers</u>	(50)
		4.1. Straight	15
		4.2. Compound/ Complex	20
		4.3. Mixed	15
		<u>v. Micro-nutrients</u>	(5)
		5.1. Ferrous sulphate	1
5.2. Manganese's sulphate	1		
5.3. Zinc sulphate	1		
5.4. Copper Sulphate	1		
5.5. Borax	1		
2.	Users categories	1. Users of organic manure	4
		2. Users of green manure	3
		3. Users of bio-fertilizers	2
		4. Users of chemical fertilizers	5
		5. Users of micro-nutrients	1
		6. Users of Organic Manures + Green Manures	7
		7. Users of Organic Manures + Bio-fertilizers	6
		8. Users of Organic Manures + Chemical fertilizers	9
		9. Users of Organic Manures + Micro-nutrients	5
		10. Users of Organic Manures + Green Manures + Bio-fertilizers	9
		11. Users of Organic Manures + Green Manures + Chemical fertilizers	12
		12. Users of Organic Manures + Green Manures + Micro-nutrients	8

Contd.....

Sl. No.	Major aspect	Parameter (s)	Final Score
		13. Users of Organic Manures + Green Manures + Bio-fertilizers + Chemical fertilizers	13
		14. Users of Organic Manures + Green Manures + Bio-fertilizers + Micro-nutrients	10
		15. Users of Green Manures + Bio-fertilizers	5
		16. Users of Green Manures + Chemical fertilizers	8
		17. Users of Green Manures + Micro-nutrients	4
		18. Users of Green Manures + Bio-fertilizers + Chemical fertilizers	10
		19. Users of Green Manures + Bio-fertilizers + Micro-nutrients	6
		20. Users of Green Manures + Bio-fertilizers + Chemical fertilizers + Micro-nutrients	11
		21. Users of bio-fertilizers + Chemical fertilizers	7
		22. Users of bio-fertilizers + Micro-nutrients	3
		23. Users of bio-fertilizers + Chemical fertilizers + Micro-nutrients	8
		24. Users of Chemical fertilizers + Micro-nutrients	6
		25. Users of Organic Manure + Green Manure + Bio-fertilizers + Chemical fertilizers + Micro-nutrients	15
3.	Per plant Per year use	1. Less than recommended	1
		2. More than recommended	2
		3. As per recommendation	3
		4. As per the reports of soil testing / plant leaf tissue test	4
4.	Timeliness in application	1. Not as per recommendation	1
		2. As per recommendation	2
		3. As per recommendation but with modifications according to weather / soil / plant conditions.	3
5.	Methods of application	1. Not as per recommendation	1
		2. As per recommendation	2
		3. As per recommendation but with modifications according to weather / soil / plant conditions.	3

Appendix-IV



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PART – A

INTERVIEW SCHEDULE

A Study of Utilization of Nutrient Management Practices By the Pomegranate Growers

Shri. B.T. Kolgane

Dr. S.B. Shinde

Ph.D. Research Scholar

Head and Research Guide

A) General information

1. Name of farmer : -----

2. Age :Years

Village : ----- Taluka: ----- Dist: ----- Land line/ Mb.No.-----

II) Personal, Socio-economic and psychological characteristics

3. Education -----

4. Size of family (Number of members)=.....

Adult : Male.....Female.....Children.....

5. Size of land holding

a. Irrigated (acres) : b. Dryland (acres) : c. Fallow (acres) :

Total (Acres) :

6. Area under pomegranate cultivation (Acres) :-----

7. Experience in pomegranate cultivation (years) :-----

8. Cropping Pattern :

Sl.No.	Crop	Variety	Area (ha.) /Acre			Production (Qt. / MT)	Income (Rs.)
			Rainfed	Irrigated	Total		
A. Kharif crops							
1.							
2.							
Total (A)							
B. Rabi crops							
1.							
2.							
Total (B)							
C. Summercrops							
1.							
2.							
Total (C)							
D. Perennial/ Annual crops							
1.							
2.							
Total (D)							
Grand Total (A + B+ C+D)							

9 . Irrigation status**6.1 Source of irrigation**

Sl.No.	Source	Number	Area under irrigation(ha)
1	Well		
2	Bore		
3	Canal		
4	Other		

6.2 Water lifting devices use

Sl.No.	Water lifting devices	Number	Total horse power
1	Electric pump(s)		
2	Disel pump(s)		
3	Submersible pump(s)		

6.3 Method of irrigation

Sl.No.	Method of irrigation	Area under irrigation (ha)
1	Surface irrigation	
2	Sprinkle irrigation	
3	Drip irrigation	
	Total irrigation	

10. Socio-economic status

Please state your socio-economic status.

Sl. No.	Particulars
1.	Occupation
a)	Occupation of Family Head: Agriculture + labour/ Agriculture (Farming) /Agriculture + allied occupation(Goat Farming/Poultry/Apiculture/Sericulture) /Agriculture + business(Professional/non professional) /Agriculture + Service (Job with monthly salary)
b)	Occupation of other dependent (Son/Brother etc.) Landless labour (Daily wage earner)/ Agriculture + labour/ Agriculture (Farming)/ Agriculture + allied occupation (Goat Farming/ Poultry/ Apiculture/ Sericulture)/ Agriculture + business (Professional/non professional) /Agriculture + Service (Job with monthly salary)
2 .	Land Holding
a)	Farm Size : Marginal (Upto 1 ha) Small (1.01 to 2.00 ha) Semi-medium(2.01 to 4.00 ha) Medium (4.01 to 10.00 ha) Large (Above 10 ha)
b)	Type of cultivation Rainfed/ Irrigated
c)	Cropping pattern Seasonal cropping / single cropping / Double / Multiple cropping /Biannual cropping /Orchards
d)	Source of irrigation : No source River/ Well /Canal
e)	Ownership of land : Land leased out / Land leased in
f)	Contingency paid : yearly worker No / Yes
3.	Family education :
a)	Husband's education Illiterate /Elementary (can read and write only)/Primary/ Middle school/ High school/Technical college/Non technical college/ Professional (Medical/Engineering/Agriculture.)
b)	Wife's education Illiterate /Elementary (can read and write only)/ Primary/Middle school/ High school /Technical college/Non technical college/ Professional(Gardening/Training for Entrepreneurship)
4.	Annual Income : Upto Rs. 2,00, 000/- / Rs. 2,00,001/- to Rs. 4,00,000/-/Rs. 4,00,001 to 7,00,000/- /Rs. 7,00,001/- to 10,00,000/ 10,00,001 and Above
5.	Socio – Political Participation : Without any position in social or political organization /Membership of one social or political organization /Membership of one social and political organization /Involved in community work though not having membership or official position in any social or political organization. / Financial contribution / Raising common funds./ Official position in social or political organization / Village leader/opinion leader/ Wide public leader

Contd.....

Sl. No.	Particulars
6.	Household
a)	Type of house Shed : Thatched (Stalk frames)/ Mud wall and thatched /Brick wall and tiled Concrete house /Double storied
b)	Ownership of house : Rented / Own
c)	Other facilities : Toilet / Soak pit available /Well inside the yard Bio Gas connection / LPG connection /No other facilities
d)	Condition of the house : Need much repair/ Need some repair/ Neat and well kept without court yard/ Neat and well kept with court yard
e)	Lightning facility : Kerosene lamp / Petromax / Electricity
f)	Family Type : Single /Joint
g)	Family size : Small (1 to 3 members)/ Medium (4 to 6 members)/ Large (7 to 9 members)/ Very large (10 and above)
h)	Storage house available : No/ Yes
7.	Material possession :
a)	Farm implements / Equipments No Farm Implements / Equipments/Harrow /Hoe/ Wooden plough/ Wooden seed-drill /Mould – bould plough/Ferti-hoe /Iron seed – cum – fertilizer drill /Duster /Sprayer/ Diesel engine/Electric pump/ Thresher / Harvester
b)	Household equipments -- Grain Storage No Grain Storage facility /Silo pits/ Pev /Kangi /Metallic bins Furniture No Furniture Availability/ Chair/ Tables/ Almirah/ Devan /Sofa Other House hold equipments No Other House hold equipments/Watch/Torch/Fan/Camera/CD player /Mixer /grinder /Tape-recorder/Telephone/Cooler/Refrigerator
c)	Animal possession -- Farm animals (Bullock)--No Farm Animals/Non Discrete (Domestic) /Discrete (Breeds) Milch animals No Milch Animals /Non Discrete (Domestic) Discrete (Breeds) Goat / sheep No Goat / sheep/ NonDiscrete (Domestic)/Discrete (Breeds) Poultry No Poultry Possession / Possesses Poultry
d)	Information sources -- No Information Sources /Books Farm publications Agricultural bulletins / magazines / News paper –Daily / Weekly / Fortnight // Radio /TV – Black and white / coloured / Internet access (common)
e)	Farm structure --Cattle shed No Cattle Shed /Katcha / Pucca Implements shade No implement Shed /Katcha /Pucca
f)	Transport No Transport Facility/Cycle /Bullock cart/ Motor cycle/ moped/ Jeep/Lorry/VanTractor / truck
g)	Farm visits/Exhibitions/Extension activities Always /Sometimes /Never/ Other attributes
8.	Special attribute :
a)	No Other Attributes/ Seed producer / Progressive farmer / Prize winner village / Tahsil/ District level / Krishi Pandit
b)	Loans : Borrowed / Not Borrowed
c)	Repayment behavior : Defaulter/ Non defaulter

11. Please state your Cosmopolitaness (Nandapurkar- 1981)

- a. Have you lived for sometime in the past in a larger town/cities for any purpose
Yes/No.

If yes, please state -----

- b. Whether you have visited the following places during last three months ?
Yes/No.

If yes, give following details :

Please indicate your degree of linking on hearing statements under different items.

Sl. No.	Place	No of times	Purpose of visit
1.	Tahsil		
2.	District place		
3.	Metropolitan city		
4.	Foreign country		

- c. Have you visited the subject matter specialists during last season? Yes / No.

If yes, please give following details

Sl. No.	Subject Matter Specialist	No of times	Purpose of visit
1.	Agril. Assistant		
2.	Agril. Supervisor		
3.	Taluka Agril. Officer		
4.	Extension Officer		
5.	Supervisor of Co-operative society		
6.	Officers of pomegranate growers Association		
7.	Agriculture University scientists		
8.	Others (Pl. Specify)		

12. Social Participation (Nirban-2004)

Are you a member or office bearer of any social / economic organization ? Yes/ No.
If yes, please give the details. (Please put \checkmark mark in appropriate column)

Sl. No.	Organization	Member	Office bearer	Nature of participation		
				Regular	Occasional	Never
1.	Gram Panchyat					
2.	Co-operative Society					
3.	School Committee					
4.	Farmers Club					
5.	Bhajani Mandal					
6.	Womens' Club					
7.	Panchyat Samiti					
8.	Zilla Parishad					
9.	Sales Purchase Society					
10	Any other					

13. Annual income (Rs.)

Sl. No.	Particulars	Income in Rs.
1.	Farming	
2.	Pomegranate	
3.	Service	
4.	Subsidiary Occupation	
a)	Dairy	
b)	Poultry	
c)	Goat keeping etc.	
5.	Business	
6.	Any other (Pl. specify)	
Total income (Rs.)		

14. Risk Preference (Supe -2007) (Plese put \surd mark in appropriate colum)

Sl. No.	Statements	SA	A	UD	DA	SDA
1.	A pomegranate growers should rather take more of a chance in making a big profit than to be contented with a smaller, but less risky profit.					
2.	A pomegranate growers who iswilling to take greater risks than the average farmer, usually do better financially.					
3.	It is a good for a pomegranate growers to take risks when he knows his chance to success is fairly high.					
4.	Trying an entirely new method in farming by a pomegranate growers r involves risk, but it is worth doing it.					
5.	A pomegranate growers should grow large number of crops to avoid greater risks involved in growing one or two crops.					
6.	It is better for a pomegranate growers not to try new farming method unless most other farmers have used them with success.					

SA= Strongly Agree A= Agree UD= Undecided DA=Disagree SDA= Strongly Disagree

15. Attitude (Ajore-1989)

(Plese put \surd mark in appropriate column)

Sl. No.	Statements	SA	A	UD	DA	SDA
1.	Use of integrated nutrient management practices /chemical fertilizers makes the soil poor.					
2.	Use of integrated nutrient management practices /chemical fertilizers is the easiest way to increase crop yield.					
3.	Use of integrated nutrient management practices /chemical fertilizers for food crops is harmful for health.					
4.	Use of integrated nutrient managementpractices/ chemical fertilizers improves the quality of grains which fetches more price in the market.					
5.	Use of integrated nutrient management practices /chemical fertilizers is less profitable in relation to cost involved.					
6.	As no adequate F.Y.M. is available, use of integrated nutrient management practices /chemical fertilizers is essential.					
7.	Use of integrated nutrient management practices /chemical fertilizers deteriorates the taste of food.					

Sl. No.	Statements	SA	A	UD	DA	SDA
8.	Yield of crops is very much increased by the use of integrated nutrient management practices /chemical fertilizers					
9.	The integrated nutrient management practices /fertilized crops become more susceptible to diseases and pests.					
10.	It is good to use of chemical fertilizers because they act more quickly as compared to F.Y.M.					
11.	Integrated nutrient management practices /Chemical fertilizers are useless because their effects are confined to the crop to which they are applied.					
12.	Use of integrated nutrient management practices /chemical fertilizers is essential for better crop yield.					

SA= Strongly Agree A= Agree UD= Undecided DA=Disagree SDA= Strongly Disagree

16. Information sources used by pomegranate growers:

(Please put \checkmark mark in appropriate column)

Sl. No.	Information Source	Seeking Behaviour		
		Regular	Occasional	Never
A.	Personal localite			
1.	Friends			
2.	Neighbours			
3.	Relatives			
4.	Progressive farmers			
5.	Local leaders			
6.	Others (Pl. specify)			
B.	Personal cosmopolite			
1.	Single window scheme			
1.	Agril. Assistant			
2.	Agril. Supervisor			
3.	Agril. Officer			
4.	Circle Agril. Officer			
5.	Taluka Agril. Officer			
6.	Sub-Div. Agril. Officer			
2.	Panchyat Samiti			
1.	Gramsevak			
2.	Rural Dev. Officer			
3.	Agril. Extn. Officer			
4.	Agril. Officer			
5.	Block Dev. Officer			

Contd....

Sl. No.	Information Source	Seeking Behaviour		
		Regular	Occasional	Never
3.	Agricultural University			
1.	Agril. Assistant			
2.	Subject matter specialists			
3.	Scientists			
4.	Bank			
1.	Agril. Officer			
2.	Branch Manager			
3.	Bank Manager			
C.	Extension Education Method			
1.	Meetings			
2.	Group discussion			
3.	Demonstration			
4.	Trial			
5.	Field Day			
6.	Field visit			
7.	Farmers' rally			
8.	Agril. Campaign			
9.	Farmers tour			
10.	Workshop			
D.	Electronic media			
1.	Radio			
2.	Television (T.V.)			
3.	Internet			
4.	Agril. film			
E.	Print media			
1.	Newspapers			
2.	Extension literature			
3.	Publications			
4.	Farm magazines			

17. Scientific Orientation : (Supe 2007)

Please indicate your degree of linking on hearing 6 statements under different items.
(Please put \checkmark mark in appropriate column)

Sl. No.	Statements	SA	A	UD	DA	SDA
1.	New methods of farming give results to a pomegranate grower than the old methods.					
2.	Even a pomegranate growers with lots of experience should use new methods of farming.					
3.	Though it takes time for a pomegranate grower to learn new methods in farming is worth the efforts.					
4.	A good pomegranate grower experiments with new ideas in farming.					
5.	Traditional methods of farming have to be changed in order to raise the level of living of pomegranate grower.					
6.	The way of pomegranate grower fore fathers framed is still the best way to farm today.					

SA= Strongly Agree A= Agree UD= Undecided DA=Disagree SDA= Strongly Disagree

PART- B

General information about pomegranate garden

1. Year of establishment:
2. Age of garden:
3. Bahar followed : Mrig / Hasta / Ambe
4. No. of bahars followed in a year :
5. Age of orchard when first bahar taken: ---
6. Direction of planting:
7. Spacing followed: Row to Row -----ft, Plant to Plant -----ft
8. Method of irrigation followed : only Drip / only Flow irrigation / Drip +Flow irrigation
9. Whether you use mulching? Yes / No
If yes give details -----
10. Source of irrigation water : Well / Canal / Tube well /Farm Pond/Water tank/KT wears
11. Time of application of water : Morning / Afternoon / Night / As per electricity schedule
12. Whether you export pomegranate fruits : Yes / No
If yes Name the countries
a. ----- b. ----- c. -----
13. Whether you attended training programme for pomegranate cultivation ? Yes /No
If yes,give details -----
14. Whether you use any biopesticide in pomegranate ? Yes /No
If yes give details
15. Whether you use any biofertilizer in pomegranate ? Yes /No
If yes give details

Nutrient management

- 1) Have you tested the
 - i. Soil before establishing the pomegranate garden? Yes /No
 - ii. Is water tested? Yes /No
- 2) Mention weather your soil is acidic/saline/alkaline Yes /No
If yes, mention the measures taken to improve the soil condition
a. ----- b -----c. -----d. -----
- 3) Does your soil have micronutrient deficiency? Yes /No
If yes, mention the measures taken to improve the micronutrient deficiency
a. ----- b -----c. -----d. -----
- 4) Mention the quantity of FYM/ compost applied per acre during bahar treatment -----
- 5) When you apply the FYM/ compost
 - a) Before bahar treatment b) At the time of bahar c) After bahar treatment or pruning
- 6) Have you applied vermicompost /press mud /poultry mud /any other organic manure to your pomegranate garden? Yes /No
If yes give details -----

7) Are you following green manuring in pomegranate? Yes/No

If yes mention the green manuring crops grown

a. ----- b -----c. -----d. -----

8) Are you taking any intercrop in the orchard? Yes/No

If yes give details -----

9) a. Mention the name and quantity of nitrogenous fertilizers applied

Sl. No.	Name	Qty/acre	Method
1			
2			
3			

Sl. No.	Name of bio- fertilizer	Qty/acre	Method
1			
2			
3			
4			

10) Mention the name and quantity of phosphatic fertilizers applied

Sl. No.	Name	Qty/acre	Method
1			
2			
3			

11) Mention the name and quantity of potash fertilizers applied

Sl. No.	Name	Qty/acre	Method
1			
2			
3			
4			

12) Are you following fertigation? Yes/No

Mention the name and quantity of liquid/ soluble fertilizers applied

Sl. No.	Name	Qty/acre	Method
1			
2			
3			
4			

Yield/ Income

Sl. No.	Year	Production in MT	Rate (Rs.)	Total income in (Rs.)	Expenditure in (Rs.)	Profit
1	2013					
2	2014					
3	2015					
4	2016					

Knowledge and Utilization of Nutrient Management Practices by the Pomegranate Growers

(APR –As per recommendation, NAPR- Not as per recommendation)

Sl. No.	Recommended Technology/ Practices	Knowledge			Utilization		
		Full	Partial	No	APR	NAPR	No
A.	Soil Selection						
1	Which type of soil is suitable for pomegranate plantation?						
2	What should be the PH of soil suitable for pomegranate plantation?						
3	What should be the EC of soil suitable for pomegranate plantation?						
4	What should be the limit of calcium carbonate content of soil?						
B.	Land Preparation						
1	How many ploughings are required for pomegranate plantation?						
2	What should be the size of pit for pomegranate plantation?						
3	What should be the spacing between plants?						
4	What should be the spacing between rows?						
5	How much quantity of organic and chemical fertilizers required for filling the pit per plant ?						
6	How much quantity of FYM / Compost per pit is required?						
C.	Selection of Planting Material						
1	What are the sources of planting material for pomegranate?						
2	Whether agricultural university is the best source of planting material?						
3	What are different types of planting material used?						

Contd.....

Sl. No.	Recommended Technology/ Practices	Knowledge			Utilization		
		Full	Partial	No	APR	NAPR	No
4	Which are the indices of quality planting material?						
D	Water Management						
1	What should be the PH of water suitable for pomegranate plantation?						
2	What should be the EC of water is suitable for pomegranate plantation?						
3	Which methods of irrigation are best for pomegranate plantation?						
4	No. of dripper required per tree for pomegranate plantation?						
5	What is the position of dripper per plant?						
6	What is the discharge of dripper per plant?						
7	What is the discharge of dripper per plant?						
8	How much pressure required for drip system in pomegranate plantation?						
E	Bahar Management						
1	What are the preferring bahars taken in pomegranate?						
2	Which bahar are you generally followed in pomegranate?						
3	Which the bahar is less susceptible to pests and diseases?						
4	Which bahar is susceptible for attack of oily spot disease?						
5	Which chemical is used for defoliation of leaves in pomegranate?						
6	Is defoliation technology is efficient for better flowering?						
7	Is training is essential in pomegranate plantation?						
8	Is pruning is essential in pomegranate plantation ?						
9	What should be the intensity of pruning in pomegranate plantation?						
10	What should you spray after pruning in pomegranate?						
11	How many months resting period are given to pomegranate orchard?						

Contd.....

Sl. No.	Recommended Technology/ Practices	Knowledge			Utilization		
		Full	Partial	No	APR	NAPR	No
F	Nutrient Management						
1	What are the advantages of soil testing ?						
2	What is the meaning of INM?						
3	Whether INM maintains soil productivity and fertility in pomegranate plantation?						
4	Whether INM conserves soils?						
5	Whether INM using optimizes plant production of pomegranate?						
6	Is nutrition is important after harvest and before dormancy of pomegranate?						
G	Organic Manure						
1	What are the sources of organic manures ?						
2	What are the different sources of FYM?						
3	What are the main functions of application FYM?						
4	What are the different growth stages of application of FYM for pomegranate plantation ?						
5	How much quantity of FYM/compost/ vermi-compost per plant is required for 1 year pomegranate plantation ?						
6	How much quantity of FYM/compost/ vermi-compost per plant is required for 2 years pomegranate plantation ?						
7	How much quantity of FYM/compost/ vermi-compost per plant is required for 3 years pomegranate plantation ?						
8	How much quantity of FYM/compost/ vermi-compost per plant is required for 4 years pomegranate plantation ?						
9	How much quantity of FYM/compost/ vermi-compost per plant is required for 5 and above years pomegranate plantation ?						
10	What are the recommended timing of application of different organic manures in pomegranate plantation ?						

Contd.....

Sl. No.	Recommended Technology/ Practices	Knowledge			Utilization		
		Full	Partial	No	APR	NAPR	No
11	What is the main function of application of compost/vermicompost in pomegranate plantation?						
12	What are the different types of concentrated organic manures?						
13	What is the function of plant and animal origin cakes in Pomegranate plantation?						
H	Green Manures						
1	What are the various types of green manures?						
2	What are the various functions of application of green manures in pomegranate ?						
3	What are the recommended doses of application of green manures in pomegranate?						
4	What are the recommended timing of application of green manures in pomegranate?						
I	Biofertilizer						
1	What are different types of biofertilizers applied for pomegranate plantation?						
2	What are the various functions of application of biofertilizers in pomegranate plantation?						
3	What are the recommended doses of application of biofertilizers in pomegranate?						
4	What are the recommended timing of application of biofertilizers in pomegranate?						
J	Chemical fertilizer						
1	What are the different types of chemical fertilizer applied for pomegranate plantation?						
2	What are different functions of chemical fertilizer in pomegranate plantation?						
3	Whether you applied chemical fertilizer for pomegranate as per recommendations of soil test report?						

Contd.....

Sl. No.	Recommended Technology/ Practices	Knowledge			Utilization		
		Full	Partial	No	APR	NAPR	No
4	What are different methods using for application of N, P ₂ O ₅ and K ₂ O in pomegranate plantation?						
5	If drip irrigation, whether water soluble fertilizers are used for pomegranate plantation?						
6	Whether using graded fertilizer in liquid form in pomegranate plantation?						
7	What are different growth stages of N, P ₂ O ₅ and K ₂ O application in pomegranate plantation?						
8	Are you applied N, P ₂ O ₅ and K ₂ O fertilizer at first irrigation after bahar treatment in pomegranate plantation?						
9	Are you applied split doses of Nitrogen fertilizers?						
10	Whether application of N, P ₂ O ₅ and K ₂ O fertilizer at / after bahar treatment in pomegranate plantation is required ?						
11	What are different sources of chemical fertilizers in pomegranate plantation?						
12	What is the recommended dose of N, P ₂ O ₅ and K ₂ O g/plant for 1 year old pomegranate orchard ?						
13	What is the recommended dose of N, P ₂ O ₅ and K ₂ O g/plant for 2 years old pomegranate orchard ?						
14	What is the recommended dose of N, P ₂ O ₅ and K ₂ O g/plant for 3 years old pomegranate orchard ?						
15	What is the recommended dose of N, P ₂ O ₅ and K ₂ O g/plant for 4 years old pomegranate orchard ?						
16	What is the recommended dose of N, P ₂ O ₅ and K ₂ O g/plant for 5 and above years old pomegranate orchard ?						

Contd.....

Sl. No.	Recommended Technology/ Practices	Knowledge			Utilization		
		Full	Partial	No	APR	NAPR	No
K	Fertigation						
1	What are the various methods used for pomegranate fertigation?						
2	What are the different sources of water soluble fertilizer grade used in pomegranate orchard?						
3	What is the recommended dose of N, P ₂ O ₅ and K ₂ O/plant/year required through fertigation in pomegranate plantation?						
4	How many recommended splits of N, P ₂ O ₅ and K ₂ O are required through fertigation in pomegranate plantation?						
L	Micronutrients						
1	Whether you know the use of micronutrient with FYM for pomegranate plantation is necessary?						
2	What are different sources of micronutrient for pomegranate plantation?						
3	What are the various functions of application of micronutrient for pomegranate plantation?						
4	What is the recommended dose of micronutrient required in pomegranate plantation?						
5	Which micronutrients are applied at flowering and before fruit maturity in pomegranate plantation?						
6	What are the functions of boric acid application in pomegranate plantation?						
7	What are the various forms of micronutrients application in pomegranate plantation?						
8	Do you know the various sources of chelated micronutrient used in pomegranate plantation?						

(APR –As per recommendation, NAPR- Not as per recommendation)

Constraints faced by Pomegranate growers in nutrient management Practices.

(Please put $\sqrt{\quad}$ mark in appropriate column)

Sl. No.	Particulars	Responses
1.	Soil	
	Lack of soil testing laboratory	
2.	Constraints in seedling / grafts	
	Unavailability of pure breed graft material	
3.	Constraints in water management	
	Lack of knowledge about chemical properties of water	
	High investment cost of drip instalment	
	Less knowledge about quantity of drippers and water per plant	
4.	Constraints in Bahar management	
	Lack of knowledge about pruning management in time	
	Lack of knowledge about pests and diseases during bahar treatment	
5.	Nutrient management constraints	
	Unavailability of standardization in biological fertilizers	
	Insufficient knowledge of Integrated Nutrient Management	
	Lack knowledge of recommended doses of Integrated Nutrient Management.	
	Unavailability of chemical fertilizers in time	
	Unavailability of liquid fertilizers in various grades	
	Unavailability of separate micronutrients in market	
	Lack of knowledge of functions of nutrients	
	Constraints in application of proper / balanced fertilisers dose due to insufficient knowledge	
	Lack of knowledge about spacing and dose of organic manures	
	Unavailability of well decomposed manures	
	Lack of knowledge about water soluble fertilizers	
6.	Economic constraints	
	High fertilizer cost	
	Lack of information about export standard	
	Unavailability of capital for cost of cultivation	
	Fluctuation in market rate	
	Presence of middleman in market	
	Lack of cold storages	
	Lack of processing units of pomegranate	
	Complicated loan procedure	
	High labour charges.	
7.	General constraints	
	Obstacle of electricity	
	Unavailability of pest and disease resistance varieties.	
	Unavailability of labours	
	Confusion in selection of pesticides and fungicide	
	Unavailability of subsidy in time by Govt. at time of natural calamities	
	No authentic literature on pomegranate in marathi	

Suggestions given by Pomegranate growers for overcoming the constraints.

(Please put \checkmark mark in appropriate column)

Sl. No.	Particulars	Response
1.	Soil	
	Organization of workshop on soil health	
	Method and result demonstration on spacing and doses of organic manures should be organized	
	Availability of soil testing laboratory near the village	
2.	Seedling/grafts	
	Authentic seedlings should available in time	
3.	Water management	
	Organization of method demonstration on water testing sampling.	
	Organization of workshop for farmers on Drip irrigation management in pomegranate	
4.	Bahar management	
	Shivar ferries should organized by extension personnel to inform the various pests and diseases during bahar treatment	
	Government should organized training programme on Market oriented Bahar management	
5.	Nutrient management	
	Awareness of nutrient managements among farmers through farmers rally and agril. exhibitions by State Agril. Department with agril. universities	
	Literature on standardisation of biofertilizers should be supply towards farm community.	
	Schedule of fertilizer application with their doses should provide by Agril. Asstt. of state department	
6.	Economic	
	Government should provide fertilizers in time and on subsidize rate	
	Government should give more subsidies to pomegranate processing units and cold storages without complicated procedure	
7.	General	
	There should be regular electricity supply	
	Authentic literature on pomegranate in Marathi should be supply by Government agencies to Krishi Vigyan Mandals	
	Agril. University should undertaken research on pest and disease resistance varieties in pomegranate pocket.	

Thank you !

APPENDIX-V

List of respondents

Sr. No.	Name of Farmers	Contact No.
	Village- Sonyal, Tal – Jat Dist. Sangli	
1	Shri Sidhanna Gadmapa Patil	7768823770
2	Shri Shivanad Lokappa Bagali	7411904461
3	Shri Shrimant Sangappa Birajdar	9844591343
4	Shri Girmalla Aapparama Birajdar	7798713736
5	Shri Malleshappa Bhimanna Birajdar	8002941433
6	Shri Sidhanna Shivgonda Hatti	9767132748
7	Shri Mahadevi Nagappa Kolagiri	9730897038
8	Shri Yogesh Manikappa Pandhare	9975631196
9	Shri Subhash Ramappa Pujari	9923298198
10	Shri Dnyaneshwar Pattappa Malavadi	9767132748
11	Shri Shivkumar Vasappa Biradar	9767746790
12	Shri Basavraj Kumbhar	9421292252
13	Shri Santosh Kumar Chaughule	9421185757
14	Shri Dodappa Pujari	8698286196
15	Shri Hari Pandurang Kore	7030107156
16	Shri Shivanad Annaraya Birajdar	9730815656
17	Shri Sidhanna Adyappa Madnyal	9049719466
18	Shri Sidrava Devappa Soudagar	9764197599
	Village- Jatbab, Tal – Jat Dist. Sangli	
19	Shri Chanbasppa Parana Arali	9766399082
20	Shri Haidar Miraso Rajuri	9503643731
21	Shri Shrishetra Ramna Jamkhandi	9011224437
22	Shri Kalana Mahadev Ankalgi	9765689888
23	Shri Ashok Shivgonda Malabadi	9860642119
24	Shri Dayanand Shivgonda Malabadi	7219063609
25	Shri Sidmlla Sidrama Mlabdi	9545875236
26	Shri Gireappa Chrdshekher Sawgaon	9765084590
27	Shri Dhanaji Sadashiv Lohar	9657049161
28	Shri Shivanand Parappa Arali	9823238535
29	Shri Babusahab Madilisahab Mulla	9766003139
30	Shri Vitthal Dhareppa Hattargi	9766003265
31	Shri Yallapa Govind Chikodi	9545930316
	Village- Daribadchi, Tal – Jat Dist. Sangli	
32	Shri Shitaram Bhimappa Mali	8888841951
33	Shri Sanjay Shitaram Mali	9405580283
34	Shri Kasaya Bhimanna Mali	9420792237

Contd.....

Sr. No.	Name of Farmers	Contact No.
35	Shri Nigappa Bhima Mali	9860209613
36	Shri Pundalik Govind Chikodi	8600940795
37	Shri Abanna Tukaram Mali	9766654253
38	Shri Malku Somling Mali	9404225515
39	Shri Hanumant Kasappa Mali	9404371001
40	Shri Bhagvan Parappa Mali	8600473203
41	Shri Adappa Bhimanna Mali	9503643731
42	Shri Kadappa Gurubal Jabgonda	9766740102
43	Shri Sharanappa Nigappa Yadbhavi	9049512774
44	Shri Ramu Gurubasu Chikari	9775359329
45	Shri Murlidhar Basvant Chikodi	9503085980
	Village -Atpadi, Tal –Atpadi Dist- Sangli	
46	Shri Mohan Bappu Pujari	9421226521
47	Shri Vishnu Pandurag Pujari	9470792126
48	Shri Satish Aaba Bhole	8623906428
49	Shri Sachin Narayan Nagave	9423830145
50	Shri Dattatray Namdev Pujari	8275377841
51	Shri Atmaram Aaba Pujari	9421225137
52	Shri Deelip Hariba Pujari	9970221518
53	Shri Ramesh Babaso Jadhav	9975130693
54	Shri Vitthal Janardhan Deshmukh	9922997623
55	Shri Babaso Kakaso Patil	9511769999
56	Shri Dattatray Kundlik Patil`	9423337095
57	Shri Ravsaheb Bhivaji Sagar	9423026796
58	Shri Aanand Ravi Kisanro Aibade	9421124844
59	Shri Gorak Chandru Chavhan	9657984642
60	Shri Shivaji Ramchandra Baler	9423254601
61	Shri Banaji Nivrutti Galve	9975501874
62	Shri Gajendra Bhagvan Galve	9175528755
63	Shri Tulshiram Vithoba Patil	9552050666
64	Shri Someshwar Kisan Galve	9975734829
65	Shri Balghim Ishwara Galve	9096771280
66	Shri Gajendra Chilappa Galve	7218538717
67	Shri Baban Chilappa Galve	9970021601
68	Shri Satyavan Sukhdeo Godase	7588328062
69	Shri Dajiram Vithoba Galve	9561658423

Contd.....

Sr. No.	Name of Farmers	Contact No.
	Village-Galvevadi, Tal – Atpadi, Dist – Sangali	
70	Shri Kundalik Baban Kalel	9503862405
71	Shri Vishal Motiram Kalel	9561612251
72	Shri Sharadchandra Prallhad Kalel	9970977220
73	Shri Dajiram Murlidhar Galve	9890473137
74	Shri Jagganath Baba Galve	8208356892
75	Shri Macchindra Ramchandra Galve	7786451236
76	Shri Balaso Dhodi Patil	9423830239
	Village-Bobewadi, Tal – Atpadi, Dist – Sangali	
77	Shri Mahadeo Vithoba Narale	9730203874
78	Shri Dadasaheb Vithoba More	9403005783
79	Shri Gorak Ramchadra Vibhute	9403780007
80	Shri Gorak Yetala Sangolkar	9766053349
81	Shri Prakash Bhanudas Surwanshi	8855808182
82	Shri Sharad Murlidhar Vibhute	9975130670
83	Shri Dattatraya Prabhu Vibhute	7841833615
84	Shri Samadhan Jalidar Pawar	9423830231
85	Shri Abhimannu Arjun Vibhute	9766542276
86	Shri Rajaram Mahadeo Gurav	9623049308
87	Shri Uttam Nivrutti Jedage	9403383421
88	Shri Balasaheb Dashrath Suryawanshi	9403005834
89	Shri Popat Sukhdeo Suryawanshi	8805343131
90	Shri Sanjay Pandurang Jadhav	9975589899
	Village – Chinke, Tal – Sangola, Dist – Solapur	
91	Shri Lakshaman Shivram Misal	9763576262
92	Shri Sahebrao Pitambar Misal	9770927307
93	Shri Satish Vishnu Misal	9096399041
94	Shri Haribhau Pandurang Kharade	8888519314
95	Shri Namdeo Bhanudas Patil	9665027996
96	Shri Dattatray Kundlik Shitode	9172377255
97	Shri Chandrakant Shamrao Mohite	9923343083
98	Shri Pramod Ashok Misal	7219456246
99	Shri Mane Ramhari Misal	9860389132
100	Shri Jalindar Prallhad Misal	9975502825
101	Shri Babaso Manik Chavhan	9860577060
102	Shri Jaganath Sadashiv Shitole	9423967430
103	Shri Manik Mahadeo Shitole	8600367391
104	Shri Vishnu Rama Kharade	7506038156
105	Shri Shivaji Sadashiv Mane	7745123654

Contd.....

Sr. No.	Name of Farmers	Contact No.
	Village-Anjanale, Tal – Sangola, Dist – Solapur	
106	Shri Harish Lakshaman Lande	9890825645
107	Shri Lakshaman Balu Yelpale	7588412356
108	Shri Uttam Dadu Lande	7845123698
109	Shri Prallhad Bhagvan Yelpale	8208312564
110	Shri Dattatray Sambhaji Yelpale	9895959654
111	Shri Arjun Sambhaji Yelpale	7080123652
112	Shri Vasant Babu Yelpale	9970123652
113	Shri Chagan Babu Yelpale	9865231254
114	Shri Arjun Mahadeo Yelpale	9960124778
115	Shri Pandurang Baliram Lande	7712456521
116	Shri Sharad Prabhakar Yelpale	9890213265
117	Shri Nitin Maruti Yelpale	8605123562
118	Shri Tanaji Tulsiram Kolvate	9056231542
119	Shri Prabhakar Shivaji Yelpale	8201326562
120	Shri Mahadeo Lande	9665979944
121	Shri Rajendra Nanaso Bandgar	8805048787
122	Shri Tatoba Jano Bandgar	9637743877
	Village- Anakdhal, Tal – Sangola, Dist – Solapur	
123	Shri Uttam Bhimrao Patil	9096585865
124	Shri Ramesh Dattatray Bandgar	7757914544
125	Shri Ashok Sopan Bandgar	9765385156
126	Shri Dattatray Pitambar Bandgar	8425858510
127	Shri Vikas Bhanudas Bandgar	9890573870
128	Shri Namdeo Lakshaman Bandgar	9423334541
129	Shri Chandrakath Raosaheb Bandgar	8265669852
130	Shri Sachin Suresh Bandgar	9975994287
131	Shri Sunil Suresh Bandgar	9049545934
132	Shri Vijay Damodar Bandgar	9422234073
133	Shri Sudhir Madhukar Bandgar	7387128102
134	Shri Balaso Mahadeo Bandgar	9561802505
135	Shri Ananda Sopan Bandgar	9765535156
	Village- Umbargaon, Tal – Pandharpur, Dist – Solapur	
136	Ramchandra Kundalik pawar	9011675499
137	Bhaskar Shamrao Kusmude	9623865412
138	Bandu Audumber Jadhav	7775956718
139	Tanhaji Maruti Gaikwad	9146780091
140	Nagnath Baba Naik	9527749703
141	Raju Sadashiv Galme	8698927742

Contd.....

Sr. No.	Name of Farmers	Contact No.
142	Shamrao Kundlik Pawar	9921833772
143	Kiran Manik Pawar	9881288366
144	Nitin Ramchandra Pawar	8888958691
145	Narayan Sukhdeo Gaikwad	8888147274
146	Tukaram Lakshman Pawar	9623657116
	Village- Bohaki, Tal – Pandharpur, Dist – Solapur	
147	Aba Pratap Salunkhe	8888432403
148	Vijay Ankush Pawar	9130535203
149	Rahul Haridas Pawar	8975576462
150	Rajendra Kalidas Pawar	9518508078
151	Shamrao Dhondiba Kusmude	8888318939
152	Santosh Lakshuman Shinde	9767291075
153	Sachin Jaganath Shinde	9689281242
154	Popat Lakshman Gaikwad	9763741284
155	Sachin Popat Jadhav	9075749143
156	Gopal Jagganath Jadhav	9921531771
157	Raosaheb Shivram Yadav	9822941352
158	Vilas Appa Devkate	9921035207
159	Vikas Dharma Kusmude	9130589673
160	Kumar Dinkar Nalvade	9689661255
161	Shivaji Shankar Jadhav	9623657116
162	Rahul Popat Gaikwad	8888432403
163	Nitin Tukaram Jadhav	9130535203
164	Lakshman Hariba Jadhav	8975576462
165	Nagesh Lakshman Shinde	9518508078
166	Pandit Shivraj Shevale	8208310990
	Village- Kasegaon, Tal – Pandharpur, Dist – Solapur	
167	Shri Rajaram Mahadeo Gurav	9623049308
168	Shri Uttam Nivrutti Jedage	9403383421
169	Shri Balasaheb Dashrath Suryawanshi	9403005834
170	Shri Bhika Nimba Shevale	9422903722
171	Shri Satish Jibhau Shevale	9970253502
172	Shri Vishvas Murlidhar Shevale	9890851772
173	Shri Atmaram Aaba Pujari	9421225137
174	Shri Deelip Hariba Pujari	9970221518
175	Shri Vasant Babu Yelpale	9970123652
176	Shri Chagan Babu Yelpale	9865231254

Contd.....

Sr. No.	Name of Farmers	Contact No.
	Village-Nampur, Tal – Satana, Dist – Nashik	
177	Shri Nanaji Jaganath Savant	9890581601
178	Shri Sachin Eknath Ahire	9423523056
179	Shri Sudam Daga Kapadnis	7276919295
180	Shri Harshad Pandit Ahire	9888152462
181	Shri Kailas Bhima Ahire	7244122565
182	Shri Deepakarao Gopalrao Savant	8751245263
183	Shri Sanjay Bajirao Kapadnis	9970256544
184	Shri Tulsiram Dhanaji Ahire	9890213652
185	Shri Suresh Nimba Savant	8208321365
186	Shri Aaba Jibhau Savant	7244124565
187	Shri Satish Jaganath Savant	7702316598
188	Shri Daga Ragho Ahire	9096123659
189	Shri Bandu Krishna Ahire	8272154212
190	Shri Gaurav Prakash Savant	9623569841
191	Shri Deepak Abhiman Kakuate	9970524879
192	Shri Murlidhar Maharu Shevale	7030161314
193	Shri Daga Namdeo Shevale	7387893099
194	Shri Deepak Kashinath Gangurde	9860602846
195	Shri Keval Yadav Gangurde	9860618025
196	Shri Sahebrao Nimba Shevale	9420903711
197	Shri Bhika Nimba Shevale	9422903722
198	Shri Satish Jibhau Shevale	9970253502
	Village – Chaugav, Tal – Baglan / Satana, Dist - Nashik	
199	Shri Vishvas Murlidhar Shevale	9890851772
200	Shri Pandit Shivraj Shevale	8208310990
201	Shri Ramchandra Karbhari Mandale	9970656510
202	Shri Sanjay Parshuram Shevale	9890668264
203	Shri Mithabhau Ananda Mandave	9423584712
204	Shri Shantaram Abhiman Shevale	8208345457
205	Shri Yashvant Nanaji Shevale	9890121321
206	Shri Ramdas Punjaram Shevale	9970154221
207	Shri Dadaji Dhani Bhamte	8888805909
208	Shri Dattatray Abhimanyu Bhamte	897553024
209	Shri Vasant Parsuram Bhamte	8806006997
210	Shri Vasant Sadashiv Bhamte	7785889261
211	Shri Himmat Sadashiv Bhamte	9421602473

Contd.....

Sr. No.	Name of Farmers	Contact No.
	Village – Phopir, Tal – Satana Dist – Nashik	
212	Shri Bausaheb Narayan Bhamte	9657275926
213	Shri Nanaji Deoman Bhamte	8805288086
214	Shri Ulhas Ramrao Bhamte	8805801746
215	Shri Pandurang Nimba Pawar	9970821546
216	Shri Appaji Yadav Pawar	9763123562
217	Shri Nandalal Ramrao Bhamare	7207312135
218	Shri Baban Tukaram Bhamate	9096123656
219	Shri Babaji Mahadu Pawar	7207315245
220	Shri Bappu Vitthal Bhamte	8202312213
221	Shri Mothabhau Mahadu Pawar	8888122356
	Village –Dabli, Tal – Malegaon, Dist – Nashik	
222	Shri Mansaram Honaji Nikam	9527123456
223	Shri Ashok Shankar Nikam	9850235696
224	Shri Ashok Daga Bachhav	9096661253
225	Shri Ramesh Daga Bachhav	8208235698
226	Shri Bharat Vasant Vagh	9096123256
227	Shri Kailas Limba Shinde	7276123564
228	Shri Sandeep Ramdas Ahire	9096123652
229	Shri Ritesh Bhausahab Nikam	9890122356
230	Shri Somnath Pandit Thakare	9421142971
231	Shri Pratap Keru Thakare	9763247569
232	Shri Vishvas Trimbak	9890833773
	Village –Satmani, Tal – Malegaon, Dist – Nashik	
233	Shri Subhash Shankar Thakare	9623636880
234	Shri Santosh Gajanan Thakare	7709708119
235	Shri Rajendra Krushna Devate	7588739721
236	Shri Jayprakash Punjaram Pachore	9960648697
237	Shri Ashok Tuka Londhe	7350591238
238	Shri Anna Dhondu Lahamge	9850758286
239	Shri Madhav Karbhari More	9637458237
240	Shri More Kashinath Karbhari	9823887020
241	Shri Sanjay Devram Lahamge	9764129053
242	Shri Hemraj Madhukar Lahamge	9970757797
243	Shri Anil Limba Darade	9850483781
244	Shri Gorak Ganpat Bacchav	9689484168
245	Shri Ravindra Madhukar Lahamge	9075756312
246	Shri Ganesh Ravindra Lahamge	9095721212
247	Shri Kisan Balu Lahamge	9657151407

Contd.....

Sr. No.	Name of Farmers	Contact No.
248	Shri Namdev Karbhari More	9029293253
249	Shri Sunil Raghunath Shevale	8530367020
250	Shri Ravindra Shitaram Pagare	9823887020
251	Shri Uddhav Daulat Londhe	9403164361
252	Shri Manoj Murlidhar Thakare	9860627248
253	Shri Vasant Chintu Thakare	9146388076
254	Shri Mangulal Bapu Sonavane	9860864419
255	Shri Aandasingsh Nanaji Sonavane	8698136207
	Village –Khaphurdi, Tal – Malegaon, Dist – Nashik	
256	Shri Mohan Tanaji Karnkal	9657528963
257	Shri Krushna Narayan Amrutkar	9230391988
258	Shri Ramchandra Bapu Kathavade	9096329864
259	Shri Bhausahab Dattatray Jadhav	9860562408
260	Shri Pratik Krushnarao Thakare	9960648702
261	Shri Yogesh Bapulal Pawar	9889470560
262	Shri Dama Keru Thakare	9960501702
263	Shri Kapil Vikas Thakare	9975213421
264	Shri Nandkishor Shankar Thakare	9665174408
265	Shri Shivaji Pundalik Thakare	7557818229
266	Shri Rajendra Vinayak Thakare	9860525949
267	Shri Sanjay Bajirao Kapadnis	9970256544
268	Shri Babaji Mahadu Pawar	7207315245
269	Shri Santosh Lakshuman Shinde	9767291075
270	Shri Pandurang Baliram Lande	7712456521

9. VITAE

Kolgane Bharat Taterao

**DOCTOR OF PHILOSOPHY (AGRICULTURE)
IN
AGRICULTURAL EXTENSION
2019**

Title of thesis		:	A Study of Utilization of Nutrient Management Practices by the Pomegranate Growers
Major field		:	Agricultural Extension
Biographical information		:	
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	Place of Birth	:	Sonna, Tal. & Dist. Parbhani
	Father's Name	:	Kolgane Taterao Bhaurao
	Mother's Name	:	Kolgane Kantabai Taterao
Educational	Bachelor Degree Obtained	:	College of Agriculture, Parbhani
	Class	:	Second
	Name of University	:	MAU, Parbhani
	Master Degree Obtained	:	College of Agriculture, Parbhani
	Class	:	Second
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