

**A STUDY ON DIFFUSION AND ADOPTION OF WINE
GRAPE PRODUCTION TECHNOLOGY IN
MAHARASHTRA**

Thesis submitted to the
University of Agricultural Sciences, Dharwad
in partial fulfillment of the requirements for the
Degree of

Master of Science (Agriculture)

in

Agricultural Extension Education

By

RISHIKESH BALASAHEB HINGE

**DEPARTMENT OF AGRICULTURAL EXTENSION EDUCATION
COLLEGE OF AGRICULTURE, DHARWAD
UNIVERSITY OF AGRICULTURAL SCIENCES,
DHARWAD – 580 005**

AUGUST, 2009

ADVISORY COMMITTEE

DHARWAD
AUGUST, 2009

(J. G. ANGADI)
CHAIRMAN

Approved by :

Chairman : _____
(J. G. ANGADI)

Members : 1. _____
(L. MANJUNATH)

2. _____
(H. BASAVARAJA)

3. _____
(P. A. KATARKI)

CONTENTS

Sl. No.	Chapter Particulars
	CERTIFICATE
	ACKNOWLEDGEMENT
	LIST OF TABLES
	LIST OF FIGURES
	LIST OF PLATES
1	INTRODUCTION
2	REVIEW OF LITERATURE
	2.1 Diffusion pattern of the crop technologies
	2.2 Knowledge level of farmers about recommended cultivation practices
	2.3 Extent of adoption of recommended cultivation practices by farmers
	2.4 Profile of farmers adopting various crop technology
	2.5 Relationship between independent variables of respondents and their knowledge level and extent of adoption
	2.6 Problems of farmers in crop production
3	METHODOLOGY
	3.1 Research design
	3.2 Locale of the study
	3.3 Brief description of the study area
	3.4 Selection of taluks and villages
	3.5 Selection of respondents
	3.6 Diffusion pattern of the wine grape production
	3.7 Operationalization and measurement of variables
	3.8 Quantification of problems of wine grape growers
	3.9 Procedure followed for data collection
	3.10 Statistical tools used

4	RESULTS
	4.1 Diffusion pattern of the wine grape production
	4.2 Knowledge level of the wine grape growers about recommended practices of wine grape cultivation
	4.3 Extent of adoption of recommended practices of wine grape cultivation
	4.4 Profile of the wine grape growers
	4.5 Relationship between attributes of the wine grape growers and their knowledge level and extent of adoption
	4.6 Problems as perceived by the wine grape growers
5	DISCUSSION
	5.1 Diffusion pattern of the wine grape production
	5.2 Knowledge level of the wine grape growers about recommended practices of wine grape cultivation
	5.3 Extent of adoption of recommended practices of wine grape cultivation
	5.4 Profile of the wine grape growers
	5.5 Relationship between attributes of the wine grape growers and their knowledge level and extent of adoption
	5.6 Problems as perceived by the wine grape growers
6	SUMMARY AND POLICY IMPLICATIONS
	REFERENCES

LIST OF TABLES

Table No.	Title
1	District wise area under wine grape cultivation in Maharashtra
2	Taluk and village wise selection of respondents
3	Adoption of wine grape by the farmers of Lasalgaon village
4	Overall knowledge level of the wine grape growers about recommended practices of wine grape cultivation
5	Knowledge level of the wine grape growers regarding specific recommended practices of wine grape cultivation
6	Overall adoption level of recommended practices of wine grape cultivation
7	Adoption of wine grape cultivation practices by the wine grape growers
8	Profile of the wine grape growers
9a	Extent of participation of the wine grape growers in various extension activities
9b	Distribution of the wine grape growers according to extension participation
10a	Extent of participation of the wine grape growers in various mass media
10b	Distribution of the wine grape growers according to mass media participation
11	Psychological attributes of the wine grape growers
12	Relationship between attributes of the wine grape growers and their knowledge level
13	Relationship between attributes of the wine grape growers and their extent of adoption
14	Problems as perceived by the wine grape growers

LIST OF FIGURES

Figure No.	Title
1	Map showing the selected districts of Maharashtra state for the study
2	Diffusion of wine grape production in Lasalgaon village
3	Overall knowledge level of the wine grape growers about recommended practices of wine grape cultivation
4	Overall adoption level of the wine grape growers about recommended practices of wine grape cultivation
5	Adoption of wine grape cultivation practices by the wine grape growers
6	Chemical fertilizer application (kg/acre)
7	Adoption of plant protection chemicals for control of pests
8	Adoption of plant protection chemicals for control of diseases
9	Profile of wine grape growers
10a	Extension participation of wine grape growers in various extension activities
10b	Distribution of the wine grape growers according to extension participation
11	Extent of participation of the wine grape growers in various mass media
12	Psychological attributes of the wine grape growers
13	Empirical model showing relationship between attributes of wine grape growers and their knowledge level
14	Empirical model showing relationship between attributes of wine grape growers and their adoption level
15	Problems of wine grape growers

LIST OF PLATES

Plate No.	Title
1	Researcher interviewing the respondent
2	A wine grape orchard
3	Small Y trellis training method of wine grape
4	Y method of training of wine grape
5	A pruned wine grape orchard
6	Harvested wine grape

LIST OF APPENCICES

Plate No.	Title
1.	Recommended Package of Practices for Wine Grape Cultivation
2.	Interview Schedule
3.	Interview Schedule

1. INTRODUCTION

Grape (*Vitis vinifera* L.) is one of the most commercially important crops of the world and is fairly good source of minerals like calcium, phosphorous, iron and vitamins like B₁ and B₂. Its juice is mild, laxative and acts as stimulant for kidneys. It is one of the most ancient crops known to man. Its association with man is older than that of wheat and rice. It is known since 7000 B.C. and evidence of its culture in Egypt during 4000-3000 B.C. is available. The primary centre of origin for grape is supposed to be Armenia near the Black and Caspian seas in Russia. Mention of grape has been made by Charaka and Sashruta in their medical treatises written in first century A.D. in India, but the exact picture of its cultivation during this period is not known. Evidence of its introduction to India in 1300 A.D. by Mughal invaders is available.

Globally grape production contributes about 16.00 per cent to total fruit production. Grape production occupies significance in the context that it is the third most widely cultivated fruit after citrus and banana. The total grape production in the world for the year 2006 was recorded at 68.95 million tonnes with the harvest area of 7.40 million hectares (Anon., 2008).

Grape is one of the delicious table fruits in India. It is one of the most important fruit crops of temperate zone which has acclimatized to tropical and sub-tropical agro-climatic conditions prevailing in Indian sub-continent. Grape is currently grown in three distinct regions in India namely temperate region, subtropical region and tropical region.

In India, remarkable success has been achieved in table grape production and yield levels of fresh grapes are among the highest in the world. India is the 13th largest producer of grapes appropriating 2.24 per cent of the global production (Anon., 2008). The area under grapes in India was 64,300 hectares during 2005-06 with the production of 1.63 million tonnes of fresh grapes with an average production of 25.36 tonnes per hectare (CMIE, Agriculture, 2009).

Maharashtra occupies the top slot in cultivation and production of grapes in the whole country. In 2005-06, Maharashtra contributed to about 70.00 per cent of the total Indian grape harvest area (45,100 ha) as well as about 80.00 per cent of the total Indian grape production (1.27 million tonnes) (Anon., 2009).

Despite having the world class technical know-how, suitable weather conditions, continuous research flow from grape institutes, well organized developmental assistance from the Agriculture Department and manpower to grow international quality grapes, the growers of Maharashtra, the largest grape producing state in the country are facing a bunch of problems, particularly in production and marketing of their produce both in domestic and international markets.

Grape cultivation requires heavy investment of capital on non-recurring items for a period of at least two years of pre-bearing. Also the crop production demands huge quantities of funds for inputs and labours. In addition to produce grapes of high quality the farmers have to put in hard efforts and additional investment. Pressure to keep up the high quality has put farmers constantly over the edge. Due to natural calamities and abrupt changes in weather conditions, the quality of grapes is affecting to some degree.

As grapes are of perishable nature, many times when the production of grapes is much more and sufficient domestic market is not available for sale of grapes, farmers have to sustain heavy financial losses. Thereby the grape growers are always found to suffer from the variations in the prices of grapes in the market and often fall into severe economic crisis. This led to farmers having to settle for lower prices for their exportable grapes and also in the local market; some times the average price realized by the farmer was below Rs. 8 per kg. This situation further aggravated by unscrupulous middlemen, who deceive farmers by not paying even the basic cost of cultivation.

To overcome these problems, need for value addition to the grapes and promoting grape products in both local and international markets was very much felt. Apart from grapes

used for table purpose, there are 16 bi-products which are made from grapes viz., raisin, grape juice, squash, syrup, jam, jelly, vinegar, wine, pickles, chocolates, tartaric acid, oil, cattle feed, tannin, etc.

In order to prevent losses, obtain more income and provide additional employment to grape growers in the country and also looking to the world scenario of different bi-products of grapes, it was felt necessary to consider and promote value added products from grapes and one such important product of grape is 'wine'. It was also realized that if the grape growers cultivate particular types of wine grape varieties and make good quality of wine from them, then they can get more income from domestic and export markets. By providing proper impetus to the wine grape production, it is possible for the farmers to get good remuneration to their produce.

Grape vine is grown mostly for wine making in the world over. Globally, wine grape is cultivated on an area of 5.48 million hectares, with an annual production of 58.57 million tonnes. France is the leading producer of wine grapes appropriating 8.0 million tonnes of the global production, followed by Italy, Spain, USA, Argentina, Germany, South Africa, Australia, China and Portugal. In European countries like France, Italy and Spain more than 90.00 per cent grape harvest area is under wine grape production. France, Italy, Spain and USA contribute to more than 50.00 per cent of world's total area under wine grape cultivation (Anon., 2006).

In India, while 78.00 per cent of grape produce is used for table purposes, nearly 20.00 per cent is dried for raisin production, while 1.50 per cent is used for juice and remaining 0.50 per cent is used for manufacturing of wine. In India, wine grape is grown on an area of 8,847 acres with an estimated production of 52,912 tonnes during the year 2007 (Kale, 2007). It means, out of total grape cultivation area, 5.52 per cent area is occupied by wine grape varieties and it is mainly distributed in three wine grape growing states which are Maharashtra, Karnataka and Himachal Pradesh. The bulk of India's current wine grape production comes from small holding vineyards on just 1 to 2.5 hectares.

In India, Maharashtra ranks first in wine grape cultivation with an area of 8,000 acres, which formed a proportion of 91.95 per cent in the country's wine grape area during the year 2007 (Kale, 2007). Maharashtra is one of the important states growing different varieties of wine grape such as Cabernet Sauvignon, Chenin Blanc, Sauvignon Blanc, Shiraz, Zinfandel, Merlot, Pinot Noir, Chardonnay, etc. Cultivation of wine grape is extensively carried out in the belts of Nashik, Pune, Sangli, Solapur, Latur, Buldhana, Osmanabad and Ahmadnagar districts. This region is located above 800 meter above mean sea level. Nashik district covers the largest area of harvest of 4,500 acres for wine grape in the state which makes a share of 56.25 per cent. After Nashik, Pune (1,600 acres), Sangli (550 acres), Solapur (400 acres), Latur (300 acres), Buldhana (300 acres), Osmanabad (250 acres) and Ahmadnagar (100 acres) are the other important wine grape growing districts. The success of wine grape industry is attributed to the geographical situation with amazing diversity in micro as well as macro climates in different wine grape growing regions of Maharashtra.

The government of Maharashtra not only created Grape Board, Wine Institute and Wine Parks, but also initiated several promotional activities all over the state to increase area under wine grape cultivation. Number of wine grape production technologies are recommended to get maximum benefits, yet the wine grape growers are not following all the recommended technologies and their cultivation practices vary from farmer to farmer according to their personal and socio-economic characteristics, perceived training needs, availability of factors of production and the problems in the wine grape cultivation.

It was, therefore, felt that a study with respect to level of knowledge and extent of adoption regarding recommended wine grape cultivation practices by the farmers would focus light on those areas where the cultivators lack knowledge and find difficulty in adoption of recommended practices. Keeping this in view, the present investigation was designed with the following specific objectives

Objectives of the study

1. To study the diffusion of wine grape production among farmers
2. To assess the knowledge and extent of adoption of wine grape production by farmers
3. To know the profile of wine grape growers
4. To ascertain the problems of wine grape growers

Scope of the study

This study is pioneering of its kind which focuses on diffusion of wine grape production among the farmers and the extent of adoption of the same. It also highlights the problems faced by the wine grape growers in adoption of wine grape production.

The outcomes of the study will be of much use to researchers, development departments and extension workers to understand the potential problems in adoption of wine grape technologies and design effective research and extension programmes to meet the needs of wine grape growers and promote wine grape industry in the country.

Limitations of the study

The study was confined to two major wine grape growing districts of Maharashtra state due to limitation of time to student researcher. However, considerable care and thought was exercised in making the study as scientific, systematic and objective as possible.

It is a qualitative study based on views expressed by the wine grape growers for the study. Hence, the findings have to be viewed in the specific context of the conditions prevailing in the study area.

2. REVIEW OF LITERATURE

A review of the existing relevant literature helps the researcher to design the theoretical frame of the study and also to assess the nature and quantum of studies already undertaken in that particular area of research. As the literature on wine grape is scarce, reviews that are available on grape regarding diffusion, knowledge and adoption aspects, reviews on other horticultural crops are also 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 here under following various headings in accordance with the objectives set for the study.

- 2.1 Diffusion pattern of the crop technologies
- 2.2 Knowledge level of farmers about recommended cultivation practices
- 2.3 Extent of adoption of recommended cultivation practices by farmers
- 2.4 Profile of farmers adopting various crop technology
- 2.5 Relationship between independent variables of respondents and their knowledge level and extent of adoption
- 2.6 Problems of farmers in crop production

2.1 Diffusion pattern of the crop technologies

2.1.1 Distribution of adopters over a period of time

Beal and Rogers (1960) found that distribution of 2,4-D weedicide spray adopters followed normal curve.

Rahim (1960) opined that the adopter distributions for three farm innovations in a Pakistani village were normal, although he did not use any statistical tools for testing the normality.

A study by Bose (1964) revealed that the adoption of agricultural chemicals was normally distributed in each of seven Indian villages.

Ramegowda (1983) found that the rate of adoption of Indaf-8 ragi and MR-301 paddy was not normal.

Thimmaraju (1985) reported that the adopter distribution curve for Indaf-8 ragi was not normal.

Ramakrishna Rao (1994) found that the rate of diffusion of sunflower was not normal.

Nithya Shree (1996) in a study on a critical analysis of the adopter categories and their characteristics inferred that the distribution of adopters in case of Indaf-8 ragi, Mandya Vijaya paddy, TTB-7 redgram, Kaveri coffee and Mudigere-1 cardamom innovations followed normal distribution and was bell shaped.

2.1.2 Shape of the diffusion curve (Cumulative number of adopters of an innovation)

Rogers (1962) while dealing with the diffusion of new agricultural technology among Iowa farmers, identified 'S' shape of the diffusion curve.

Alao (1981) in a study conducted on diffusion of fish ponds in Western state of Nigeria revealed that diffusion of fish ponds was approximately of 'S' shape.

Ramegowda (1983) conducted a study in Bangalore district of North taluka on the rate of adoption and innovativeness of farmers in adopting Indaf - 8 ragi and MR-301 paddy varieties and found that cumulative frequencies of diffusion of Indaf - 8 ragi and MR - 301 paddy varieties followed 'S' shape when plotted over time.

Thimmaraju (1985) reported that the adoption curve drawn by using cumulative frequency of Indaf - 8 ragi growers approaches 'S' shape.

Ramakrishna Rao *et al.* (1995) in a study in six major sunflower growing districts of Karnataka studied diffusion and adoption processes of sunflower technology and revealed that the diffusion curve followed more or less 'S' shape.

Nithya Shree (1996) studied the rate of adoption of five innovations namely Indaf-8 ragi, Mandya Vijaya paddy, TTB-7 redgram, Kaveri coffee and Mudigere-1 cardamom by farmers and concluded that the cumulative percentage of the adopters followed almost 'S' shape.

Yaligar (1997) in his study entitled, soybean cultivation by farmers of Belgaum district revealed that diffusion curve for soybean crop approached more or less like 'S' shape.

All the past researchers have observed that diffusion curve when plotted by taking into consideration the cumulative frequency over time was nearly 'S' shaped. However, there was no agreement in the shape of the adopter distribution curve. While, some reported that the curve did not approach normality, a majority of researches conducted in India and elsewhere confirmed that it followed normal distribution pattern.

2.2 Knowledge level of farmers about recommended cultivation practices

According to Ajay Kumar (1989), 38.00 per cent of the grape growers in Ranga Reddy district of Andhra Pradesh had medium level of knowledge about grape cultivation practices. Whereas, 35.00 per cent of them had high level of knowledge and remaining 27.00 per cent had low level of knowledge about grape cultivation practices.

Siddaraju (1992) in his study entitled, a study on impact analysis of Grape Development Scheme on beneficiaries and non-beneficiaries with respect to their knowledge and adoption of improved farm technology inferred that more number of beneficiary farmers (47.00%) belonged to medium knowledge level, whereas 33.00 and 20.00 per cent of the respondents had high and low knowledge levels, respectively.

From a study on correlates of knowledge of grape production technology in Bhokardhan taluk of Jalna district, Maharashtra, Ahire *et al.* (1999) revealed that more than half of the respondents (55.37%) were mediocre in possession of knowledge about improved practices of grape cultivation. Further, they observed that cent per cent respondents were better known about recommended spacing, varieties, training systems, pruning and the growth regulators.

Birajdar (1999) while analyzing knowledge and adoption behaviour of grape growing member farmers of Maharashtra Rajya Draksha Bagaitdar Sangh of Solapur found that 74.37 per cent of the respondents belonged to medium level of knowledge about improved practices of grape cultivation. Only 14.38 and 11.25 per cent of the respondents belonged to high and low knowledge levels, respectively.

Govinda Gowda and Narayana Gowda (2006) conducted a study in Bijapur and Bangalore Rural districts of Karnataka and revealed that in both Thompson Seedless and Bangalore Blue grape, sizeable number of growers (37.00 and 46.00%) belonged to high knowledge status.

Moulasab *et al.* (2006) found that majority of mango growers in North Karnataka (72.50%) had medium level of knowledge. While, 14.17 and 13.33 per cent of the respondents had low and high level of knowledge about improved mango cultivation practices.

Raut (2006) in his study on orange growers of Nagpur district in Maharashtra observed that more than half of the orange growers (53.33%) had medium level of knowledge, followed by low (28.89%) and high (17.78%) level of knowledge of orange cultivation.

Raghavendra Nayak (2007) in a study on pineapple growers of Karnataka inferred that 43.14 per cent of the respondents belonged to medium level of knowledge, whereas 33.14 and 23.74 per cent of the respondents belonged to low and high knowledge categories, respectively.

The generalization that could be drawn from the above studies is that there was variation in knowledge level of the respondents about recommended practices but most of the farmers were having medium level of knowledge. These studies have given a base to study the knowledge level of the wine grape growers with respect to recommended wine grape cultivation practices.

2.3 Extent of adoption of recommended cultivation practices by farmers

Kumbar (1983) found that the important grape cultivation practices like spacing, propagation, planting, training and pruning, manuring, irrigation frequency, gibberlic acid treatment and plant protection measures were partially adopted by the grape growers in Bijapur district of Karnataka.

Ramesh Babu (1987) conducted a study on grape growers in Bangalore and Kolar districts and witnessed that adoption pattern of grape growers with respect to each of the specific practices differed. The big farmers had higher adoption level than small farmers and similarly, the small farmers had better adoption level than marginal farmers. In general, the adoption level of all three categories was high.

From a study on adoption behaviour and information consultancy of grape growers in Ranga Reddy district, Andhra Pradesh, Ajay Kumar (1989) reported that recommended grape cultivation practices like suitable soil, recommended varieties and training method of grapes were followed fully by the all grape growers. Whereas, large majority of them fully adopted the practices like spacing, pit size, time and number of buds at pruning, fertilizers application and plant protection measures.

Chiprikar *et al.* (1992) in their study entitled, a study on grape growers with special reference to the transfer of grape technology observed that majority of grape growers were medium to low adopters of grape production technology. Improvement in the adoption behaviour was noticed with an increase in productivity of the grape commodity.

Siddaraju (1992) conducted a study on impact analysis of Grape Development Scheme and reported that nearly half of the beneficiary grape growers (49.00%) belonged to high adopter category, followed by low (29.00%) and medium (22.00%) adopter categories, respectively.

According to Birajdar (1999), as high as 76.25 per cent of the grape growers applied nitrogenous fertilizer close to 200 kg/acre and nearly 42.00 per cent of them applied phosphatic fertilizers close to 100 kg/acre, while 50.20 per cent applied potassic fertilizer close to 120 kg/acre which were close to the recommended levels during summer season. Whereas, for winter season 80.62, 67.56 and 55.00 per cent of the respondents applied nitrogenous, phosphatic and potassic fertilizers, respectively which were close to the recommended doses.

Govinda Gowda (2002) while analyzing adoption of sustainable farming practices among Thompson Seedless and Bangalore Blue grape growers, found that majority of Thompson Seedless growers (55.00%) belonged to high adoption category, followed by medium adoption category (38.00%) and only 7.00 per cent were found to be in low adoption category. In case of Bangalore Blue, the reverse trend was noticed where majority of the respondents (72.00%) were found to be in low adoption category, followed by medium adoption category (26.00%), while only 2.00 per cent of them were in high adoption category.

Gotyal (2007) in his study entitled, backward and forward linkages of grape production in Karnataka revealed that nearly an equal per cent of the respondents were distributed in high (36.50%) and low (35.00%) adoption categories. Whereas, 28.50 per cent of the respondents belonged to medium adoption category.

Govinda Gowda 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.

Patil (2008) conducted a study on constraints analysis of grape exporting farmers of Maharashtra state and found that cent per cent of the respondents had adopted nutrient management, thinning, disease management and hormone management practices to meet the exporting standards.

Thus, the studies reviewed above indicated that farmers adopted almost all simple practices. Differential levels of adoption were found with respect to other recommended cultivation practices. However, no study has been conducted on wine grape cultivators. Hence, it would be interesting to study the extent of adoption of wine grape cultivation practices by the wine grape growers.

2.4 Profile of farmers adopting various crop technology

2.4.1 Age

Birajdar (1999) stated that almost three fourth of total grape growers (74.88%) belonged to middle age category. Whereas 14.37 and 11.25 per cent respondents belonged to old age and young age categories, respectively.

Govinda Gowda and Narayana Gowda (2006) conducted a study in Bijapur and Bangalore Rural districts of Karnataka and revealed that the sizable percentage of Thompson Seedless grape growers (40.00%) belonged to young age group. In case of Bangalore Blue grape, 47.00 per cent of farmers belonged to middle age group.

Raut (2006) conducted a study in Nagpur district of Maharashtra and indicated that more than half of the orange growers (53.33%) were middle aged, followed by old age (30.00%) and young age (16.67%), respectively.

Gotyal (2007) inferred that 42.50 per cent of the grape growers belonged to old age category, followed by middle age (39.00%) and young age (18.50%) categories.

Singh and Mankar (2007) in their study conducted on mango growers of Ratnagiri district observed that nearly two-third of the respondents were from middle age group (64.55%), followed by old age (20.00%) and young age (15.45%) groups, respectively.

In a study in Chitradurga district of Karnataka state on coconut farmers, Thippeswamy (2007) found that majority of the respondents (58.12%) belonged to middle age group.

Patil (2008) conducted a study on constraints analysis of grape exporting farmers of Nashik and Sangli districts in Maharashtra state and revealed that grape growers had been

spread in all the three age groups viz., young age (36.00%), middle age (34.00%) and old age (30.00%), respectively.

2.4.2 Education

Ajay Kumar (1989) revealed that 27.00 per cent of grape growers in Ranga Reddy district of Andhra Pradesh had education upto college level, 38.00 per cent of them studied upto graduation and none of the respondents were found to be illiterate.

Birajdar (1999) reported that 28.12 per cent of the grape growers studied upto high school level and 21.88 per cent and 21.25 per cent of them had education upto college and middle school level, respectively. While, 20.63 per cent of them were graduates. None of the grape growers were illiterate and only 8.12 per cent of the grape growers had primary education.

Thiranjana Gowda (2005) conducted a study in Belgaum district of Karnataka and observed that 43.75 per cent of the cut flower growers had studied upto graduation, followed by pre-university (35.93%), while 24.43 per cent of the respondents had received education upto high school.

Govinda Gowda and Narayana Gowda (2006) noticed that majority of Bangalore Blue grape growers (48.00%) were in higher education category. While, majority of Thompson Seedless grape growers (50.00%) were in low education category.

Gotyal (2007) observed that 43.50 per cent of the grape growers belonged to low educational level, followed by higher educational level (35.00%) and middle (21.50%) educational level.

Patil (2008) conducted a study in Nashik and Sangli districts of Maharashtra and stated that 38.00 per cent of the grape exporting farmers had completed pre-university education followed by graduation (25.00%) and high school (21.00%). Very few of them (9.00%) had education upto post-graduation.

2.4.3 Orchard size

Kumbar (1983) conducted a study on grape growers in Bijapur district and observed that 51.70 per cent of the respondents possessed small land holding, while, 48.30 per cent of them had big land holding.

Lokhande (1990) in his study on adoption of selected recommended package of practices of grape cultivation by the farmers in Osmanabad district observed that majority of the respondents (76.60%) had land upto 10 ha, while 20.90 per cent owned land between 10 to 20 ha and very negligible per cent (2.50%) of them possessed land of 20 ha and above.

Raut (2006) conducted a study in Nagpur district of Maharashtra and inferred that majority (72.22%) of the orange growers were small farmers, followed by medium farmers (20.00%) and big farmers (7.78%), respectively.

Gotyal (2007) noticed that 39.50 per cent of grape growers belonged to small land holding category, followed by 31.00 per cent to medium and 24.50 per cent to big land holdings.

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 them 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.

2.4.4 Extension participation

Birajdar (1999) found that about 73.00 per cent of the grape growers belonged to medium level of extension participation, followed by 18.75 per cent and 8.75 per cent with low and high level of extension participation.

Venkataramalu (2003) conducted a study on chilli growers in Guntur district of Andhra Pradesh and indicated that majority of farmers participated in discussion with village extension workers (70.00%), krishimela (62.50%) and agricultural exhibitions (61.67%).

Raghavendra (2005) conducted a study on cauliflower growers of Belgaum district and observed that 22.50 per cent of the respondents regularly participated in agricultural exhibitions. Whereas, 40.83 and 32.50 per cent of the respondents occasionally participated in group meetings and demonstrations.

Govinda Gowda and Narayana Gowda (2006) witnessed that little more than 50.00 per cent of Thompson Seedless grape growers (55.00%) and nearly three-fourth of Bangalore Blue grape growers (74.00%) belonged to medium level of extension participation.

Gotyal (2007) revealed that 39.50 per cent of the grape growers in Bijapur and Bagalkot districts of Karnataka had high extension participation, followed by medium (36.00%) and low (24.50%) extension participation.

Patil (2008) while analyzing constraints of grape exporting farmers of Nashik and Sangli districts in Maharashtra concluded that majority (70.00%) of the respondents were from medium extension participation category, followed by low (19.00%) and high extension participation categories (11.00%), respectively.

2.4.5 Mass media participation

Kumbar (1983) in his study revealed that 51.70 per cent of the grape growers of Bijapur district in Karnataka had high level of mass media participation and 48.30 per cent of the grape growers had low level of mass media participation.

Ajay Kumar (1989) reported that cent per cent of the grape growers in Ranga Reddy district of Andhra Pradesh possessed radio and also subscribed to newspaper. About 83.00 per cent of the respondents possessed television sets and only 11.00 per cent of the respondents subscribed to farm magazines.

According to Birajdar (1999), a large majority of the grape growers in Solapur district (71.26%) had medium level of mass media participation, while 14.37 per cent of each of them had low and high level of mass media participation.

From a study on arecanut growers of Shimoga district in Karnataka, Veda Murthy (2002) noticed that relatively more number of arecanut growers (48.00%) belonged to medium mass media participation category. While, 37.00 per cent of them had high mass media participation and 27.33 per cent fell in low mass media participation category.

Govinda Gowda and Narayana Gowda (2006) revealed that majority of Thompson Seedless grape growers (55.00%) belonged to medium mass media use category, followed by 33.00 per cent and 12.00 per cent of the respondents who belonged to high and low mass media use categories, respectively.

Gotyal (2007) concluded that more than half of the grape growers (51.00%) had low mass media participation, 39.00 per cent had high and only 10.00 per cent had medium level of mass media participation.

2.4.6 Cosmopolitaness

Rogers and Shoemaker (1971) found that early adopters were more cosmopolite than late adopters in case of farming community.

Kumbar (1983) in his study on adoption behaviour and consultancy pattern of grape growers of Bijapur district in Karnataka indicated that a large majority of the respondents (63.27%) were found to be in high category of cosmopolitanism, while 36.73 per cent of the respondents belonged to low category of cosmopolitanism.

Shashidhara (2004) conducted a study on influencing factors and constraints in drip irrigation by horticultural farmers of Bijapur district of Karnataka and found that 41.50 per cent of farmers visited the nearest town occasionally, followed by 37.50 per cent 'once in 15 days'. Whereas, respondents who visited to town for the personal or domestic purpose were 54.10 per cent, followed by 35.00 per cent for new technology or agriculture purpose.

Raghavendra (2005) conducted a study on cauliflower growers of Belgaum district of Karnataka and observed that 40.50 per cent of the respondents visited the nearest town 'once in a fortnight', followed by 30.33 and 18.84 per cent who visited the town 'once in a month' and 'once in a week', respectively. Respondents who visited town for personal or domestic purpose were 50.83 per cent, followed by 43.84 per cent visited for want of new technology or information related to agriculture.

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.

2.4.7 Deferred gratification

Raghupathi (1994) in his study entitled, a study on agricultural modernization among farmers in Upper Krishna Project Area of Karnataka observed that 52.00 per cent of irrigated farmers in command area had medium level of deferred gratification. Whereas, 26.00 per cent were in low and 22.00 per cent of them were found in high level of deferred gratification.

Bheemappa (2001) conducted a study on comparative analysis of knowledge and technological gap in adoption of paddy and cotton cultivation practices between migrant and non-migrant farmers of TBP command area in Karnataka and witnessed that about 69.00 per cent of the migrant farmers belonged to medium level of deferred gratification category.

Palaniswamy and Sriram (2001) observed in their study on modernization characteristics of sugarcane growers that 72.11 per cent of the respondents belonged to medium level of deferred gratification category. While, 19.05 per cent and 8.84 per cent of the respondents belonged to high and low level of deferred gratification categories, respectively.

According to Govinda Gowda and Narayana Gowda (2006), majority of the Thompson Seedless grape growers (55.00%) and Bangalore Blue grape growers (65.00%) belonged to high level of deferred gratification. Whereas, 45.00 per cent and 35.00 per cent of Thompson Seedless growers and Bangalore Blue growers fell in low level of deferred gratification category.

Maraddi (2006) found that little more than half (55.55%) of the sugarcane growers possessed medium deferred gratification, followed by high deferred gratification (25.56%) and low deferred gratification (18.89%), respectively.

2.4.8 Economic motivation

Ramesh Babu (1987) in a study on grape growers of Bangalore and Kolar districts in Karnataka observed that 38.33 per cent of the respondents had high economic motivation, whereas, more number of the respondents (61.67%) had low level of economic motivation.

Birajdar (1999) revealed that majority of the grape growers (73.12%) belonged to medium level of economic motivation. While, 15.63 per cent and 11.25 per cent of the respondents belonged to low and high economic motivation categories, respectively.

Raghavendra (2005) in his study on cauliflower growers of Belgaum district of Karnataka found that more than half of the respondents (52.50%) had medium level of economic motivation. Whereas, 25.00 per cent and 22.50 per cent of them belonged to high and low level of economic motivation categories, respectively.

Govinda Gowda and Narayana Gowda (2006) revealed that more number of the Thompson Seedless grape growers (47.00%) and little more than half of the Bangalore Blue grape growers (51.00%) of Bijapur and Bangalore Rural districts possessed high level of economic motivation.

Gotyal (2007) indicated that nearly equal percentage of the grape growers belonged to medium (42.50%) and high (40.50%) level of economic motivation and 17.50 per cent to low economic motivation category.

Patil (2008) witnessed that 58.00 per cent of the grape exporting farmers belonged to medium economic motivation category followed by high (29.00%) and low (13.00%) economic motivation categories, respectively.

2.4.9 Innovative proneness

Ananda (1992) noticed that 40.00 per cent of the drip irrigating grape growers of Bangalore district had medium innovative proneness, whereas 30.00 per cent of respondents each were grouped under low and high innovative proneness.

Kumar (1998) conducted a study on banana growers in Bangalore district and pointed out that 40.00 per cent of the banana growers had low innovative proneness.

Chandrashekhara (1999) reported that majority of coffee growers were almost equally divided under low (38.50%) and high (40.00%) innovative proneness categories, while 21.50 per cent of them had medium innovative proneness.

Govinda Gowda and Narayana Gowda (2006) in their study on profile of Thompson Seedless and Bangalore Blue grape growers in Bijapur and Bangalore Rural districts of Karnataka inferred that considerable percentage of Thompson Seedless grape growers (46.00%) belonged to medium innovative proneness category. While a little more than 50.00 per cent of Bangalore Blue grape growers (52.00%) belonged to high innovative proneness category.

Thippeswamy (2007) inferred that majority of coconut growers (68.75%) were found in medium innovative proneness category, followed by 18.12 and 13.12 per cent of the respondents found in high and low innovative proneness categories, respectively.

Patil (2008) in his study on organic vegetable growers in Belgaum district indicated that more than half of the organic vegetable growers had high innovative proneness (53.57%), followed by medium (32.14%) innovative proneness and only 10.29 per cent of them belonged to low innovative proneness category.

2.4.10 Risk orientation

Ramesh Babu (1987) inferred that 43.33 per cent of the grape growers had high level of risk orientation and remaining 56.67 per cent of them had low level of risk orientation.

Ajay Kumar (1989) found that an equal per cent of the grape growers of Ranga Reddy district in Andhra Pradesh had high (32.00%), low (33.00%) and medium (35.00%) level of risk orientation.

Ananda (1992) in his study conducted on grape growers of Bangalore district in Karnataka indicated that 48.84 per cent of drip irrigation adopter had medium risk orientation, followed by 38.33 per cent of high and 13.03 per cent of them had low risk orientation.

Birajdar (1999) pointed out that the medium risk orientation was exhibited by 71.88 per cent of the grape growers. While, nearly an equal per cent of the respondents belonged to high (14.37%) and low (13.75%) categories of risk orientation, respectively.

Govinda Gowda and Narayana Gowda (2006) revealed that a great majority of both Thompson Seedless grape growers (82.0%) and Bangalore Blue grape growers (88.00%) possessed medium level of risk orientation.

Gotyal (2007) found that around half of the grape growers belonged to medium risk orientation category, followed by high risk (34.50%) and low risk (16.50%) orientation category.

From a study on constraints analysis of grape exporting farmers of Nashik and Sangli districts in Maharashtra, Patil (2008) observed that majority of the respondents (77.00%) belonged to medium risk orientation category, followed by high (12.00%) and low (11.00%) risk orientation categories, respectively.

It can be concluded from above reviews that majority of the respondents belonged to medium category of age, orchard size, extension participation, mass media participation, deferred gratification, innovative proneness and risk orientation. Whereas, in case of cosmopolitaness majority of the respondents belonged to high category.

2.5 Relationship between independent variables of respondents and their knowledge level and extent of adoption

2.5.1 Relationship between independent variables of respondents and their knowledge level

Independent variable	Year	Respondents	Nature of relationship
Age			
Kumar	1998	Banana growers	Non-significant
Birajdar	1999	Grape growers	Positively significant
Raut	2006	Orange growers	Significant
Thippeswamy	2007	Coconut growers	Non-significant
Education			
Birajdar	1999	Grape growers	Positively significant
Veda Murthy	2002	Areca nut growers	Positively significant
Kavaskar and Govind	2006	Banana growers	Positively significant
Raut	2006	Orange growers	Positively significant
Thippeswamy	2007	Coconut growers	Positively significant

Orchard size			
Ahire <i>et al.</i>	1999	Grape growers	Positively significant
Birajdar	1999	Grape growers	Positively significant
Raut	2006	Orange growers	Positively significant
Thippeswamy	2007	Coconut growers	Positively significant
Extension participation			
Ahire <i>et al.</i>	1999	Grape growers	Positively significant
Birajdar	1999	Grape growers	Positively significant
Venkataramalu	2003	Chilli growers	Positively significant
Thippeswamy	2007	Coconut growers	Positively significant
Mass media participation			
Siddaraju	1992	Grape growers	Significant
Birajdar	1999	Grape growers	Positively significant
Kavaskar and Govind	2006	Banana growers	Positively significant
Raut	2006	Orange growers	Positively significant
Thippeswamy	2007	Coconut growers	Positively significant
Cosmopolitaness			
Balasubramani	1997	Rubber growers	Significant
Raghavendra	1997	Arecanut growers	Significant
Kumar	1998	Banana growers	Positively significant

Deferred gratification			
Kantharaju	1989	Coffee and Cardamom growers	Non-significant
Bheemappa	2001	Non-migrant cotton growers	Non-significant
Maraddi	2006	Sugarcane growers	Non-significant
Economic motivation			
Birajdar	1999	Grape growers	Positively significant
Kavaskar and Govind	2006	Banana growers	Positively significant
Thippeswamy	2007	Coconut growers	Positively significant
Innovative proneness			
Kumar	1998	Banana growers	Positively significant
Kher and Halyal	1998	Sugarcane growers	Positively significant
Maraddi	2006	Sugarcane growers	Positively significant
Thippeswamy	2007	Coconut growers	Positively significant
Risk orientation			
Siddaraju	1992	Grape growers	Non-significant
Birajdar	1999	Grape growers	Positively significant
Veda Murthy	2002	Areca nut growers	Non-significant
Kavaskar and Govind	2006	Banana growers	Positively significant
Maraddi	2006	Sugarcane growers	Positively significant

Above reviews give and insight that variables like age, education, orchard size, extension participation, mass media participation, cosmopolitaness, economic motivation, innovative proneness and risk orientation were having positive and significant relationship with knowledge level of the respondents. While, deferred gratification was non-significant with knowledge level.

2.5.2 Relationship between independent variables of respondents and their extent of adoption

Independent variables	Year	Respondents	Nature of relationship
Age			
Sainath	1982	Grape growers	Non-significant
Ramesh Babu	1987	Grape growers	Non-significant
Lokhande and Wangikar	1991	Grape growers	Negatively significant
Govinda Gowda	2002	Grape growers	Non-significant
Gotyal	2007	Grape growers	Non-significant
Education			
Sainath	1982	Grape growers	Non-significant
Lokhande and Wangikar	1991	Grape growers	Positively significant
Govinda Gowda	2002	Grape growers	Positively significant
Gotyal	2007	Grape growers	Positively significant
Orchard size			
Govinda Gowda	2002	Grape growers	Positively significant
Veda Murthy	2002	Arecanut growers	Positively significant
Raut	2006	Orange growers	Significant
Gotyal	2007	Grape growers	Positively significant
Extension participation			
Govinda Gowda	2002	Grape growers	Significant
Venkataramalu	2003	Chilli growers	Positively significant
Gotyal	2007	Grape growers	Positively significant
Thippeswamy	2007	Coconut growers	Positively significant

Mass media participation			
Sainath	1982	Grape growers	Non-significant
Ajay Kumar	1989	Grape growers	Highly significant
Govinda Gowda	2002	Grape growers	Significant
Raut	2006	Orange growers	Significant
Gotyal	2007	Grape growers	Positively significant
Thippeswamy	2007	Coconut growers	Positively significant
Cosmopolitaness			
Balasubramani	1997	Rubber growers	Positively significant
Raghavendra	1997	Arecanut growers	Positively significant
Kumar	1998	Banana growers	Positively significant
Govinda Gowda	2002	Thompson Seedless Grape growers	Significant
Deferred gratification			
Kantharaju	1989	Coffee and Cardamom growers	Non-significant
Raghavendra	1997	Arecanut growers	Positively significant
Govinda Gowda	2002	Grape growers	Significant
Maraddi	2006	Sugarcane growers	Significant
Economic motivation			
Ramesh Babu	1987	Grape growers	Significant
Govinda Gowda	2002	Grape growers	Significant
Gotyal	2007	Grape growers	Significant
Thippeswamy	2007	Coconut growers	Positively significant
Innovative proneness			

Vijay Kumar	1997	Rose growers	Significant
Kumar	1998	Banana growers	Significant
Govinda Gowda	2002	Grape growers	Significant
Maraddi	2006	Sugarcane growers	Positively significant
Thippeswamy	2007	Coconut growers	Positively significant
Risk orientation			
Kumbar	1983	Grape growers	Significant
Ajay Kumar	1989	Grape growers	Significant
Lokhande and Wangikar	1991	Grape growers	Significant
Govinda Gowda	2002	Grape growers	Significant
Gotyal	2007	Grape growers	Non-significant

It can be witnessed from above reviews that education, orchard size, extension participation, mass media participation, cosmopolitaness, deferred gratification, economic motivation, innovative proneness and risk orientation were positively correlated with extent of adoption of the respondents.

2.6 Problems of farmers in crop production

Author and year	Place of the study and crop	Problems	Percentage/ranks cited
Lokhande and Wangikar (1991)	Omerga taluk, Osmanabad district, Maharashtra; Grape	<ul style="list-style-type: none"> ❖ Growth regulators are very costly ❖ Insecticides, fungicides and pesticides are costly ❖ High cost of fertilizers ❖ Unavailability of improved varietal cuttings ❖ Irregular supply of electricity ❖ Required varieties cuttings are costly 	<p>100.00</p> <p>95.83</p> <p>87.50</p> <p>76.66</p> <p>75.83</p> <p>70.16</p>
Rathakrishnan <i>et al.</i> (1992)	Tamil Nadu; Grape	<ul style="list-style-type: none"> ❖ Lack of information support for grapes ❖ High cost of pandal material ❖ Non-availability of planting material ❖ Non-availability of farm labours 	<p>90.00</p> <p>80.00</p> <p>53.33</p> <p>50.00</p>
Birajdar (1999)	Solapur district, Maharashtra; Grape	<ul style="list-style-type: none"> ❖ Irregular supply of electricity ❖ High cost of plant protection chemicals ❖ High cost of fertilizers ❖ More susceptible to diseases and pests ❖ Non-availability of timely credit ❖ Non-availability of fertilizers in time 	<p>91.25</p> <p>59.37</p> <p>52.50</p> <p>52.50</p> <p>43.37</p> <p>35.62</p>

Thirumal Valavan and Radha (2005)	Ranga Reddy district, Andhra Pradesh; Grape	<ul style="list-style-type: none"> ❖ Labour problem ❖ Non-availability of credit ❖ High establishment cost ❖ High pest and disease incidence ❖ Problems in getting planting material 	<p>I</p> <p>II</p> <p>III</p> <p>IV</p> <p>V</p>
Gotyal (2007)	Bijapur and Bagalkot districts, Karnataka; Grape	<ul style="list-style-type: none"> ❖ Irregular and insufficient electricity ❖ Very high interest rate ❖ Non-availability of credit in time ❖ High cost of soluble fertilizers and fungicides ❖ Non-coverage of grape under crop insurance ❖ Lack of support price 	<p>90.00</p> <p>92.50</p> <p>92.50</p> <p>80.00</p> <p>75.00</p> <p>69.00</p>
Patil (2008)	Sangli and Nashik districts, Maharashtra; Grape	<ul style="list-style-type: none"> ❖ Rate of interest is very high ❖ Irregular supply of electricity ❖ Non-availability of skilled labour ❖ Non-availability of manures/fertilizers in time ❖ Increased resistance in pest and diseases ❖ High cost of fertilizers ❖ High initial investment ❖ High cost of pesticides and insecticides ❖ Replacement of variety is very difficult ❖ Non-availability of credit in time ❖ High cost of planting material ❖ Lack of technical guidance 	<p>81.00</p> <p>79.00</p> <p>76.00</p> <p>74.00</p> <p>69.00</p> <p>67.00</p> <p>66.00</p> <p>62.00</p> <p>59.00</p> <p>58.00</p> <p>48.00</p> <p>46.00</p>

3. METHODOLOGY

The study was conducted during the year 2008-09 in Nashik and Pune districts of Maharashtra.

The research methodology and the procedure followed for conducting this study has been presented under following headings.

- 3.1 Research design
- 3.2 Locale of the study
- 3.3 Brief description of the study area
- 3.4 Selection of taluks and villages
- 3.5 Selection of respondents
- 3.6 Diffusion pattern of the wine grape production
- 3.7 Operationalization and measurement of variables
- 3.8 Quantification of problems of wine grape growers
- 3.9 Procedure followed for data collection
- 3.10 Statistical tools used

3.1 Research design

The research design adopted for the study was 'expost-facto' since the phenomenon had already occurred.

3.2 Locale of the study

The study was conducted in Nashik and Pune districts of Maharashtra state as these districts stood first and second, respectively in area and production of wine grape (Table 1). Hence, these districts were purposively selected to conduct the research study.

3.3 Brief description of the study area

In India, Maharashtra state occupies first position in area under wine grape cultivation. The total area under wine grape cultivation in Maharashtra was 8,000 acres with an estimated production of 47,600 tonnes in the year 2007. In Maharashtra, cultivation of wine grape is extensively carried out in the belts of Nashik, Pune, Sangli, Solapur, Latur, Buldhana, Osmanabad and Ahmadnagar districts. Nashik stands first, followed by Pune in area under wine grape cultivation. Hence, it was decided to conduct the study in both Nashik and Pune districts of Maharashtra.

Nashik district falls in north western part of Maharashtra. This district lies between 18° 33' and 20° 53' North latitude and between 73° 16' and 75° 16' East longitude. The district is surrounded by Dhule, Jalgaon, Aurangabad, Ahmadnagar, Thane districts and Gujarat state. The total geographical area of the district is 15,530 sq. km. with a population 49.94 lakhs of which 25.91 lakhs are males and 24.03 lakhs are females. The literacy rate of district is 74.40 per cent. The maximum and minimum temperature throughout the year ranges between 42.5 °C and 5.0 °C with average annual rainfall of 2600 mm.

The total cultivable area accounts for 8,64,000 ha, out of which 4,19,000 ha area is under irrigation. Bajra, rice, jowar, cotton, groundnut, black gram, green gram, tur and

Table 1: District wise area under wine grape cultivation in Maharashtra

Sl. No.	District	2006 (in acres)	2007 (in acres)
1	Nashik	3,350	4,500
2	Pune	600	1,600
3	Sangli	300	550
4	Solapur	350	400
5	Latur	350	300
6	Buldhana		300
7	Osmanabad		250
8	Ahmadnagar		100
	Total	4,950	8,000

Source: Kale, K. J., 2007, Me Draksh Wine Uddoyog Ubharu Shakto Ka?, Maharashtra Industrial Development Corporation, Mumbai.

sugarcane are the major crops grown in the district. The important fruit crops and vegetables grown were grape, sapota, onion, brinjal, cabbage, cauliflower, tomato and cucumber.

Pune district is located in western part of the state. The district lies between 17° 54' and 10° 24' North latitude and 73° 19' and 75° 10' East longitude. The district has geographical area of 15,642 sq. km. It is second largest district in the state and covers 5.10 per cent of the total geographical area. Pune district is bound by Ahmadnagar district on north-east, Solapur district on south-east, Satara district on south, Raigad district on west and Thane district on the north-west. As per the 2001 census the population of Pune district was 72.32 lakhs with literacy rate of 80.78 per cent. Pune district forms a part of the tropical monsoon land and therefore shows a significant seasonal variation in temperature as well as in rainfall conditions. The temperature ranges from 11.0 °C to 36.0 °C with the maximum temperature prevailing during March, April and May months and the minimum during November, December and January months. Average annual rainfall of the district is 840 mm.

The total cultivable area in the district is 9,98,522 ha of which 2,42,404 ha area is under irrigation. Non-irrigated area accounts for 7,56,118 ha. Rice, bajra, tur, green gram, black gram, groundnut and soybean are the major crops grown in *kharif* season whereas, jowar, wheat, pulses and sunflower are important crops in *Rabi* season. Sugarcane is the important annual crop grown in the district. The important fruit crops are mango, banana, grapes, sapota, pomegranate while, onion, potato, carrots, garlic, yams and sweet potato are the major vegetable crops.

3.4 Selection of taluks and villages

3.4.1 Selection of taluks

Among 15 taluks of Nashik district, Niphad taluk had the maximum area under wine grape cultivation (1148 acres) followed by Nashik (1027 acres), Dindori (1012 acres), Satana (313 acres), Yeola (298 acres) and Sinnar (257 acres). Similarly, out of 13 taluks of Pune district, Junnar taluk had maximum area under wine grape cultivation (610 acres) followed by Baramati (431 acres), Indapur (349 acres) and Daund (210 acres). Hence, Niphad, Nashik and Dindori taluks from Nashik district and Junnar taluk from Pune district were selected in proportion to the highest area under wine grape cultivation.

3.4.2 Selection of villages

A list of villages indicating the area and number of farmers growing wine grape was obtained from the office of the Technical Co-ordinator, Grape Wine Park, Maharashtra Industrial Developmental Corporation (MIDC), Pune. Based on highest area under wine grape cultivation, top 5 villages from each selected taluks were selected. Thus a total of 20 villages were selected for the study.

In order to study the diffusion of wine grape production, the village having maximum number of the wine grape growers in the study area was selected. Lasalgaon of Niphad taluk of Nashik district was the village chosen to study the diffusion as it was having 81 wine grape growers.

3.5 Selection of respondents

The criteria for selection of the respondents were:

1. A farmer should have minimum one acre of wine grape orchard
2. A farmer should have at least three years old wine grape orchard

From each of the selected villages, wine grape growers who fulfilled the above criteria were listed. Eight wine grape growers from each village were selected for the study by adopting simple random sampling. One hundred and sixty respondents (*i.e.*, 40 from Niphad, 40 from Nashik and 40 from Dindori taluks of Nashik districts and 40 from Junnar taluk of Pune district) constituted the sample for the study. The details are given in Table 2.

3.6 Diffusion pattern of the wine grape production

Diffusion was operationalized as the process by which the wine grape production is communicated over time among the farmers of Lasalgaon village. It was measured based on the adoption of wine grape by farmers over a period of time of Lasalgaon village.

The wine grape was introduced during the year 2000 in Lasalgaon village of Niphad taluk. The information regarding the number of farmers adopting wine grape each year from 2000 to 2008 was obtained by administrating the schedule developed for the study (Appendix-II).

The curves were arrived at taking into consideration the innovativeness of wine grape growers.

3.7 Operationalization and measurement of variables

3.7.1 Dependent variables

Knowledge and extent of adoption of wine grape growers regarding recommended wine grape cultivation practices were the dependent variables considered for the study.

3.7.1.1 Knowledge level of wine grape growers about recommended wine grape cultivation practices

English and English (1958) defined knowledge as a body of understood information possessed by an individual.

Knowledge level of the wine grape growers was operationalized as the quantum of scientific information known to the respondents about the wine grape production.

A teacher made knowledge test was employed for the measurement of the wine grape growers' knowledge level about recommended wine grape cultivation practices. The questions and answers pertaining to knowledge test were carefully designed in consultation with experts and resource persons as well as by referring to publications on recommended wine grape cultivation practices published by National Research Centre, Grapes, Pune, (Appendix-I). The test constituted 29 knowledge questions. The questions were provided with 4 alternative answers including correct one. The knowledge test was administered to the respondents. Quantification of knowledge item answers was made by giving one score and zero score for correct and incorrect answers. The scores of all the individual items were summed to get knowledge score of the respondent. The summation of scores for a particular respondent indicated his knowledge level about recommended wine grape cultivation practices. The maximum score that one should get was 29 and the minimum was zero.

Based on the total score, the respondents were classified into three categories namely, 'low', 'medium' and 'high' using mean (\bar{X}) and standard deviation (SD) as a measure of check.

Category	Score
Low	Less than $(\bar{X} - 0.425 \text{ SD})$
Medium	Between $(\bar{X} \pm 0.425 \text{ SD})$
High	More than $(\bar{X} + 0.425 \text{ SD})$

Table 2: Taluk and village wise selection of respondents

Sl. No.	District	Taluk	Village	Respondents
I	Nashik	Niphad	Vinchur	8
			Lasalgaon	8
			Hanuman Nagar	8
			Pabalwadi	8
			Ozar	8
		Nashik	Girnare	8
			Aadgaon	8
			Ambehahula	8
			Gangavarhe	8
			Shilapur	8
		Dindori	Dindori	8
			Talegaon	8
			Khedgaon	8
			Walkhed	8
			Warkheda	8
II	Pune	Junnar	Narayangaon	8
			Warulwadi	8
			Manjarwadi	8
			Rajni	8
			Golegaon	8
Total	2	4	20	160

3.7.1.2 Adoption of recommended wine grape cultivation practices

According to Rogers and Shoemaker (1971) adoption is a decision to continue full use of an innovation. In this study adoption level refers to the level of adoption of recommended wine grape cultivation practices by the wine grape growers. All the important recommended cultivation practices in wine grape were listed. Totally 21 recommended wine grape cultivation practices were selected to form an adoption test. The responses elicited from the respondents were quantified as full, partial and non adoption of the recommended practices. A score of two for full adoption, one for partial adoption and zero score for non adoption was given. Any remarkable deviation from the adoption of normal recommendation was treated as partial adoption. The maximum score that a respondent could obtain was 42 and minimum was zero.

Depending upon total score obtained by each of the respondent, they were grouped into three categories namely, 'low', 'medium' and 'high' adopter categories. Mean (\bar{X}) and standard deviation (SD) were used as measure of check.

Category	Score
Low	Less than $(\bar{X} - 0.425 \text{ SD})$
Medium	Between $(\bar{X} \pm 0.425 \text{ SD})$
High	More than $(\bar{X} + 0.425 \text{ SD})$

3.7.2 Independent variables

Based on the previous research studies, review of literature, discussion with scientists and consultation with experts in the field, the probable variables influencing directly or indirectly the knowledge and adoption of wine grape cultivation practices were identified. These were age, education, orchard size, proximity to winery unit, extension participation, mass media participation, cosmopolitaness, deferred gratification, economic motivation, innovative proneness and risk orientation.

3.7.2.1 Variables and their empirical measurement

Sl. No.	Variable	Measurement tool
A	Dependent variables	
1.	Knowledge	Teacher made test developed for the study
2.	Adoption	Teacher made test developed for the study
B	Independent variables	
I	Personal attributes	
1.	Age	Procedure followed by Karpagam (2000)
2.	Education	Procedure followed by Shashidhara (2003)

3.	Orchard size	Procedure followed by Singh and Mankar (2007)
4.	Proximity to winery unit	Distance in kilometers from the winery unit
5.	Extension participation	Procedure followed by Shashidhara (2006)
6.	Mass media participation	Procedure followed by Tippeswamiah (1991)
II	Psychological attributes	
7.	Cosmopolitaness	Procedure followed by Desai (1981)
8.	Deferred gratification	Scale developed by Raghupathy (1994)
9.	Economic motivation	Scale developed by Supe (1969) followed by Padmaiah (1995)
10.	Innovative proneness	Scale developed by Moulik (1965) followed by Sakharkar (1995) and Shashidhara (2006)
11.	Risk orientation	Scale developed by Supe (1969) followed by Shashidhara (2006)

The method followed for classification and description of each variable is detailed below. The results were expressed in frequency and percentage.

3.7.2.2 Measurement of independent variables

Age

Age is operationalized as the chronological age of the wine grape growers in completed years at the time of investigation. The respondents were categorized into three age groups based on the procedure followed by Karpagam (2000).

Category	Age (years)
Young	Less than 31 years
Middle	31 to 50 years
Old	More than 50 years

Education

Education refers to the number of years of formal schooling obtained by the wine grape growers. It was quantified by using the items and weights used by Shashidhara (2003).

Education	Weightages
Illiterate	0
Primary school	1
Middle school	2
High school	3
Pre university / Diploma	4
Graduate	5

Orchard size

It refers to the number of acres under wine grape cultivation of the respondents. Further, the wine grape growers were categorized into small orchard holders, medium orchard holders and large orchard holders on the basis of the procedure followed by Singh and Mankar (2007).

Category	Score
Small	Less than 2.50 acres
Medium	2.50 - 10.00 acres
Large	More than 10.00 acres

Proximity to winery unit

It was operationalized as the nearness of vineyard in terms of distance in kilometers from the winery unit. The wine grape growers were categorized into four groups based on their vineyards' distance from the nearby winery unit.

Proximity to winery unit (kms)	Weightages
0 to 5 km	4
6 to 10 km	3
11 to 15 km	2
16 to 20 km	1

The results were expressed in frequency and percentage.

Extension participation

It refers to the extent of participation of the wine grape growers in different extension activities like krishimela, training programme, extension meetings, group discussions, etc. Quantification of this variable was done as per the procedure followed by Shashidhara (2006). A list of 6 extension activities was presented to the respondents and responses were elicited against each activity with reference to their frequency of participation. The scoring was done by assigning two score for regular, one score for occasional and zero score for never participation in each of extension activity. The individual scores for each of the respondent were obtained by summing the responses on all items, which measures degree of extension participation of the respondent.

Based on total scores obtained by each respondent, they were grouped into 'low', 'medium' and 'high' categories taking mean (\bar{X}) and standard deviation (SD) as a measure of check.

Category	Score
Low	Less than $\bar{X} - 0.425 \text{ SD}$
Medium	Between $\bar{X} \pm 0.425 \text{ SD}$
High	More than $\bar{X} + 0.425 \text{ SD}$

Mass media participation

This variable is operationalized as the exposure of an individual to different mass media channels such as newspaper, farm magazine, radio, television and his degree of participation in them. The respondent was asked to indicate whether he subscribed to or own the media said above. Then, the respondent was asked to indicate his degree of participation in terms of reading habit, listening behaviour and viewing habit. This variable was quantified on the basis of the procedure followed by TippeSwamiah (1991).

Subscription / Possession	Score
Subscriber / Owned	1
Non-subscriber / Not-owned	0
Reading / Listening / Viewing habit	Score
Regular	2
Occasional	1
Never	0

Based on the total scores of mass media participation, the respondents were classified into three categories such as 'low', 'medium' and 'high' by considering mean (\bar{X}) and standard deviation (SD) as a measure of check.

Category	Score
Low	Less than $(\bar{X} - 0.425 \text{ SD})$
Medium	Between $(\bar{X} \pm 0.425 \text{ SD})$
High	More than $(\bar{X} + 0.425 \text{ SD})$

Cosmopolitaness

Cosmopolitaness is the degree to which an individual is oriented outside to his immediate social system. This variable was measured using the procedure followed by Desai (1981). Two dimensions of the variable were considered in this case are

1. The frequency of visit to the nearest town
2. The purpose of visit to the town

The items and scoring pattern followed in quantifying the frequency of visit were as follows.

Item	Score
Twice in a week	5
Once in a week	4
Once in fifteen days	3
Once in a month	2
Seldom	1
Never	0

The items and scoring pattern to quantify the purpose of visit were

Item	Score
All visits relating to agriculture	5
Some visits relating to agriculture	4
Personal / domestic	3
Entertainment	2
Other	1
No response	0

The cumulative maximum score obtainable was 10 and minimum was 0. Depending upon total score obtained by each of the respondent, they were grouped into three categories, which were 'low', 'medium' and 'high'. Mean (\bar{X}) and standard deviation (SD) were used as measure of check.

Category	Score
Low	Less than $(\bar{X} - 0.425 SD)$
Medium	Between $(\bar{X} \pm 0.425 SD)$
High	More than $(\bar{X} + 0.425 SD)$

Deferred gratification

It refers to the postponement of immediate satisfaction by a farmer in an anticipation of future rewards (Rogers and Svenning, 1969). This variable was quantified by using the scale developed by Raghupathy (1994). The scale consists of five statements. The responses for each statement were rated on a three point continuum, namely 'agree', 'undecided' and 'disagree' with a score of 3, 2 and 1 respectively for positive statements. The scoring pattern was reversed for negative statements. Maximum and minimum scores obtainable by the wine grape grower on the scale were 15 and 5. Based on scores, respondents were grouped into three categories by using mean (\bar{X}) and standard deviation (SD) as a measure of check.

Category	Score
Low	Less than $(\bar{X} - 0.425 SD)$
Medium	Between $(\bar{X} \pm 0.425 SD)$
High	More than $(\bar{X} + 0.425 SD)$

Economic motivation

Economic motivation referred as the extent to which an individual is oriented towards achievement of the maximum economic ends such as maximization of profits. This was quantified by using the scale developed by Supe (1969), later followed by Padmaiah (1995). The scale consisted of six statements, of which first five statements were positive and the last one was negative. The responses for each statement were rated on 5 point continuum ranging from 'strongly agree', 'agree', 'undecided', 'disagree' and 'strongly disagree' with scores of 5, 4, 3, 2 and 1 for positive statements. The scoring was reversed for negative statements. Maximum and minimum scores an individual could obtain on this scale were 30 and 6 respectively. Further, the respondents were classified into three categories based on the mean (\bar{X}) and standard deviation (SD) as a measure of check.

Category	Score
Low	Less than $\bar{X} - 0.425 \text{ SD}$
Medium	Between $\bar{X} \pm 0.425 \text{ SD}$
High	More than $\bar{X} + 0.425 \text{ SD}$

Innovative proneness

It refers to the behaviour pattern of an individual who has interest and desire to seek changes in farming techniques and ready to introduce such changes into his operations when practical and feasible. For quantifying this variable, Moulik's (1965) "Self rating innovative proneness scale" as used by Sakharkar (1995) and Shashidhara (2006) was made use of. The scale consisted of three sets of statements. Each set of statements contained three sub-statements with weights 3, 2 and 1 indicating high, medium and low degree of innovative proneness. After obtaining the respondents 'most like' and 'least like' responses for each of the three sets of statements, a score of 3 was given to 'most like' response and score 1 for 'least like' response. The final scoring was arrived by summing up the scores of the weights of the 'most like' statements and the weights of the 'least like' statements. The score ranges from 18 to 54.

Then, the respondents were categorized based on mean (\bar{X}) and standard deviation (SD) as a measure of check.

Category	Score
Low	Less than $\bar{X} - 0.425 \text{ SD}$
Medium	Between $\bar{X} \pm 0.425 \text{ SD}$
High	More than $\bar{X} + 0.425 \text{ SD}$

Risk orientation

It is operationalized as the degree to which a farmer is oriented towards risk and uncertainty and has courage to face the various risk involved in farming. Risk orientation was measured with the help of risk orientation scale developed by Supe (1969) and as followed by Shashidhara (2006). The scale consisted of six statements, of which first and fifth statements were negative and all others were positive. The items were rated on a five point continuum ranging from 'strongly agree', 'agree', undecided', 'disagree' and 'strongly disagree' with weightages of 5, 4, 3, 2 and 1 for positive statements and 1, 2, 3, 4 and 5 for negative statements, respectively. The possible score ranged from 6 to 30.

Based on the scores, the respondents were grouped into three categories by using mean (\bar{X}) and standard deviation (SD) as a measure of check.

Category	Score
Low	Less than $(\bar{X} - 0.425 \text{ SD})$
Medium	Between $(\bar{X} \pm 0.425 \text{ SD})$
High	More than $(\bar{X} + 0.425 \text{ SD})$

3.8 Quantification of problems of wine grape growers

To identify the problems in the wine grape production, the probable problems of wine grape growers in the study area were listed out in discussion with scientists and consultation with experts in the field. Responses were obtained from the wine grape growers. Later on frequency and per cent were calculated to analyze each of the problems.

3.9 Procedure followed for data collection

Keeping in view the objectives and variables of the study, a structured interview schedule was developed by consulting with experts and referring to the relevant literature on the subject developed by the National Research Centre on Grapes, Pune. Pre-testing of schedule was carried out in the non-sample area for its practicability and relevancy. The final schedule was prepared by making necessary modifications, additions and deletions based on pre-testing results. The final format of the interview schedule is given in Appendix III.

The data were collected from the respondents through personal interview method in an informal atmosphere.

3.10 Statistical tools used

The following statistical tools were made use of in the study to analyze the data.

Mean: The arithmetic mean is the sum of the scores divided by their number. This measure was used to categorize the dependent and independent variables into low, medium and high categories.

Frequency: This measure was used to know the distribution pattern of respondents variable wise and to categorize the problems perceived by wine grape growers in order of importance.

Percentage: This measure was used for simple comparisons and to know the extent of adoption of wine grape growers.

Standard deviation: This measure was used to categorize the dependent and independent variables into low, medium and high categories.

Correlation test: Karl Pearson's simple correlation test was used to find out the nature of relationship between independent and dependent variables.



Fig.1. Map showing the selected districts of Maharashtra state for the study

4. RESULTS

The results of the study are presented under the following headings.

- 4.1 Diffusion pattern of the wine grape production
- 4.2 Knowledge level of the wine grape growers about recommended practices of wine grape cultivation
- 4.3 Extent of adoption of recommended practices of wine grape cultivation
- 4.4 Profile of the wine grape growers
- 4.5 Relationship between attributes of the wine grape growers and their knowledge level and extent of adoption
- 4.6 Problems as perceived by the wine grape growers

4.1 Diffusion pattern of the wine grape production

Rate of adoption over a period of time was the basis for studying the diffusion of wine grape production. An examination of Table 3 depicted the number of farmers adopting wine grape each year and the cumulative number of farmers adopting wine grape over a period of time.

As it could be observed from the Table 3, in the year 2000, the year of introduction of wine grape in Lasalgaon village, only one farmer had grown wine grape. This number rose to 2 in 2001 and to 7 in the year 2002. While, the maximum number of adopters *i.e.*, 13 farmers were observed in each of the years 2004 and 2005, respectively. Then onwards in the year 2006, 2007 and 2008 the number of adopters decreased *i.e.*, 12, 11 and 10 adopters, respectively. In the year 2008, the cumulative number of farmers adopting wine grape was 81.

Further, attempts were made to draw diffusion curve over time on a frequency basis and on cumulative basis. As evident from Fig. 2 the frequency curve of the diffusion followed almost 'bell-shape' when plotted over time. The cumulative curve of diffusion rose slowly at first where there were few adopters. Then it rised very fast with an increase in number of adopters. After that slope of the curve was slightly decreased. However, the curve nearly approached 'S-shaped' when plotted over time.

4.2 Knowledge level of the wine grape growers about recommended practices of wine grape cultivation

4.2.1 Overall knowledge level of the wine grape growers about recommended practices of wine grape cultivation

The data in Table 4 revealed that 45.00 per cent of the wine grape growers belonged to medium level of knowledge about recommended practices of wine grape cultivation with a mean score of 24.47. Whereas, 40.62 and 14.37 per cent of the wine grape growers belonged to high and low knowledge levels with mean knowledge scores of 27.7 and 23.91, respectively.

4.2.2 Knowledge level of the wine grape growers regarding specific recommended practices of wine grape cultivation

From Table 5, it can be inferred that cent per cent of the wine grape growers had correct knowledge about recommended varieties, suitable soil, opening of trenches, propagation practices, irrigation method, gibberlic acid and cycocyl application, control of various pests (thrips, flea beetle and mealy bug) and different diseases (powdery mildew, downey mildew and anthracnose) of wine grape.

Table 3: Adoption of wine grape by the farmers of Lasalgaon village

(n = 81)

Year of adoption	Number of wine grape growers	Cumulative number of wine grape growers
2000	1	1
2001	2	3
2002	7	10
2003	12	22
2004	13	35
2005	13	38
2006	12	60
2007	11	71
2008	10	81

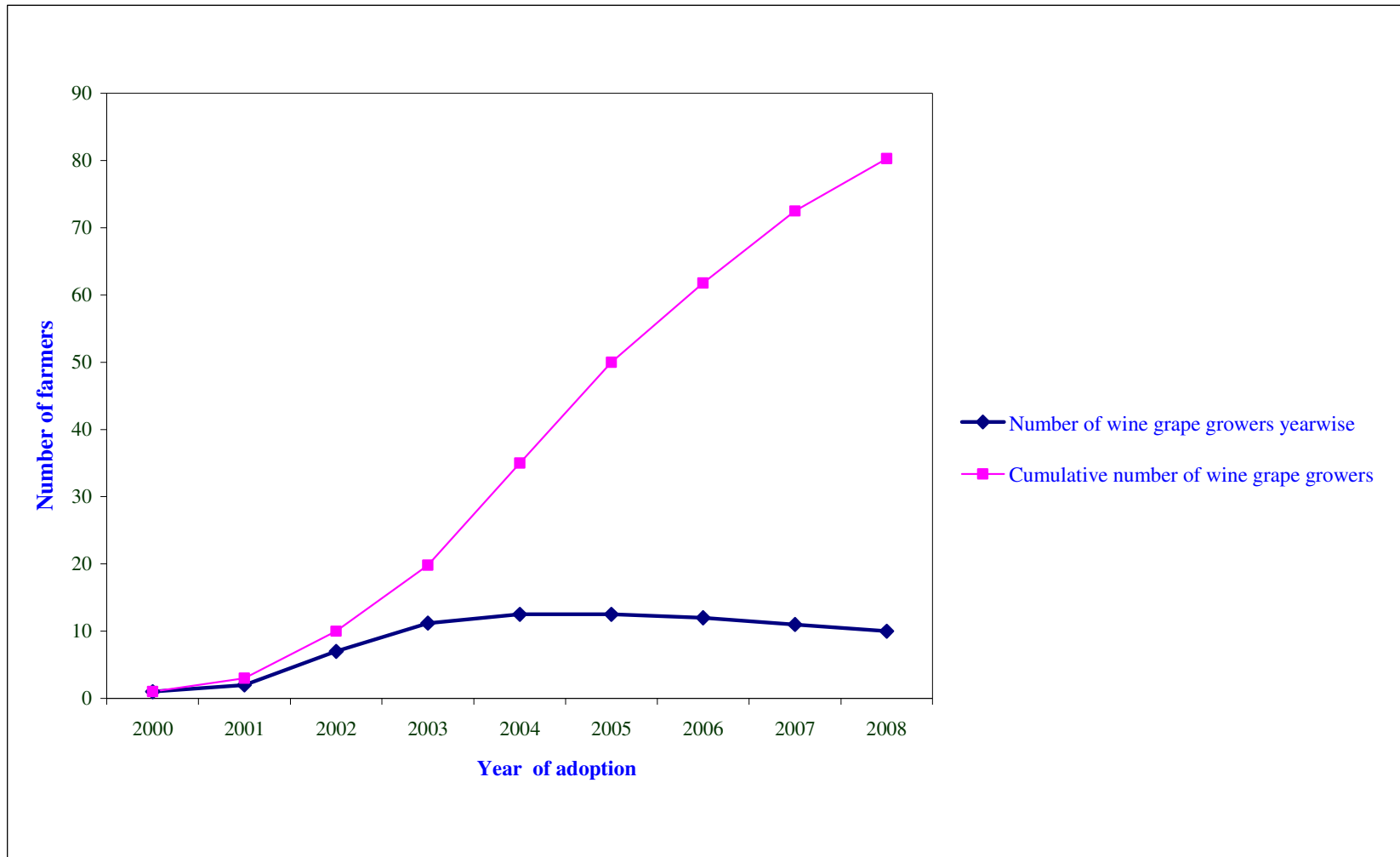


Fig.2. Diffusion of wine grape production in Lasalgaon village

More than 80.00 per cent of the wine grape growers had knowledge about training methods (81.87%) recommended for wine grape.

It is also evident from the table that more than half of the wine grape growers had knowledge about fertilizer application at winter (63.12%) and summer (53.12%).

Correct knowledge about pruning time of wine grape was possessed by 57.50 per cent of the respondents.

It is very painful to know that only 33.75 per cent of the wine grape growers had correct knowledge of application of organic manure to the wine grape. As high as 73.75 per cent of the respondents were not having knowledge about correct quantity of filling material.

4.3 Extent of adoption of recommended practices of wine grape cultivation

4.3.2 Overall adoption level of recommended practices of wine grape cultivation

The results presented in Table 6 revealed that 39.37 per cent of the wine grape growers belonged to medium adoption category with mean adoption score of 36.48 followed by 31.25 and 29.37 per cent of them in high and low adoption categories with mean adoption scores of 39.00 and 34.03, respectively.

4.3.2 Adoption of specific wine grape cultivation practices by wine grape growers

4.3.2.1 Varieties grown

From Table 7, it can be seen that 57.50 per cent of the wine grape growers had grown Cabernet Sauvignon variety. While, varying per cent of the respondents had grown Shiraz (24.37%), Chenin Blanc (22.50%), Sauvignon Blanc (20.62%) and Zinfandel (18.75%) varieties of wine grape. The varieties like Merlot and Pinot Noir were grown by only 8.75 and 5.00 per cent of the respondents.

4.3.2.2 Layout and land preparation practices

Nearly 95.00 per cent of the wine grape growers (94.37%) had grown wine grape on right type of soil.

Cent per cent of the respondents had adopted opening of recommended size of trenches. With regard to filling material used in trenches, more than 60.00 per cent of the respondents (63.75%) used both FYM and Super phosphate as per recommendation at the time of planting, while 36.25 per cent of them used FYM alone as a filling material. Only 10.00 per cent of them fully adopted the recommended quantity of filling material.

4.3.2.3 Spacing followed

A large majority of the wine grape growers (86.25%) had followed the spacing of 9 ft x 5 ft and remaining 13.75 per cent of them followed 8 ft x 4 ft spacing while planting wine grapes.

4.3.2.4 Application of FYM/organic manure

Only 11.87 per cent of the wine grape growers applied recommended dose of FYM/organic manure to their orchards. As many as 88.13 per cent of the respondents adopted partial dose of FYM/organic manure.

Table 4: Overall knowledge level of the wine grape growers about recommended practices of wine grape cultivation

(n =160)

Knowledge category	Respondents		Mean knowledge score
	Frequency	Percentage	
Low (< 24.64)	23	14.37	23.91
Medium (24.64 - 26.89)	72	45.00	25.47
High (> 26.89)	65	40.62	27.7

Mean = 26.15; S. D. = 1.51

Table 5: Knowledge level of the wine grape growers regarding specific recommended practices of wine grape cultivation

(n=160)

Sl. No.	Recommended practices	Knowledge level			
		Correct knowledge		Incorrect knowledge	
		Frequency	%	Frequency	%
1	Soil type Well drained sandy loam	160	100	0	0
2	Recommended wine grape varieties Cabernet Sauvignon Chenin Blanc Zinfandel	160	100	0	0
3	Spacing 9ft x 5ft 8ft x 4 ft	160	100	0	0
4	Trench				
i	Recommended size 1.8 - 3 m apart	160	100	0	0
ii	Material used for filling trenches FYM and Super phosphate	160	100	0	0
iii	Quantity of filling material FYM - 20 T/acre Super phosphate - 1 T/acre	42	26.25	118	73.75
5	Organic manure 16 T/acre	54	33.75	106	66.25
6	Chemical fertilizers N P K Summer - 40 + 40 + 60 Kg/acre Winter - 30 + 50 + 50 Kg/acre	85 101	53.12 63.12	75 59	46.87 36.87
7	Rootstock				
i	Recommended rootstocks Dog ridge, Salt creek, Freedom	160	100	0	0
ii	Method of rootstock grafting Wedge grafting	160	100	0	0
iii	Time for rootstock grafting September - October	160	100	0	0
8	Irrigation method Drip irrigation	160	100	0	0

Contd...

	Flood irrigation				
9	Recommended training methods	131	81.87	29	18.12
	Vertical Shoot Position (VSP)				
	Small Y trellis				
	Y system				
10	Pruning time	92	57.5	68	42.5
i	April and September				
11	Growth regulators and retardants				
i	GA application	160	100	0	0
	Conc. Stage (after winter pruning)				
	10 ppm Pre-bloom				
ii	Cycocyl application	160	100	0	0
	Conc. Stage (after winter pruning)				
	500 ppm 5 leaf stage				
12	Plant protection				
i	Pest control				
	Thrips	160	100	0	0
	Flea beetle	160	100	0	0
	Mealy bugs	160	100	0	0
ii	Disease control				
	Powdery mildew	160	100	0	0
	Downey mildew	160	100	0	0
	Anthraco nose	160	100	0	0

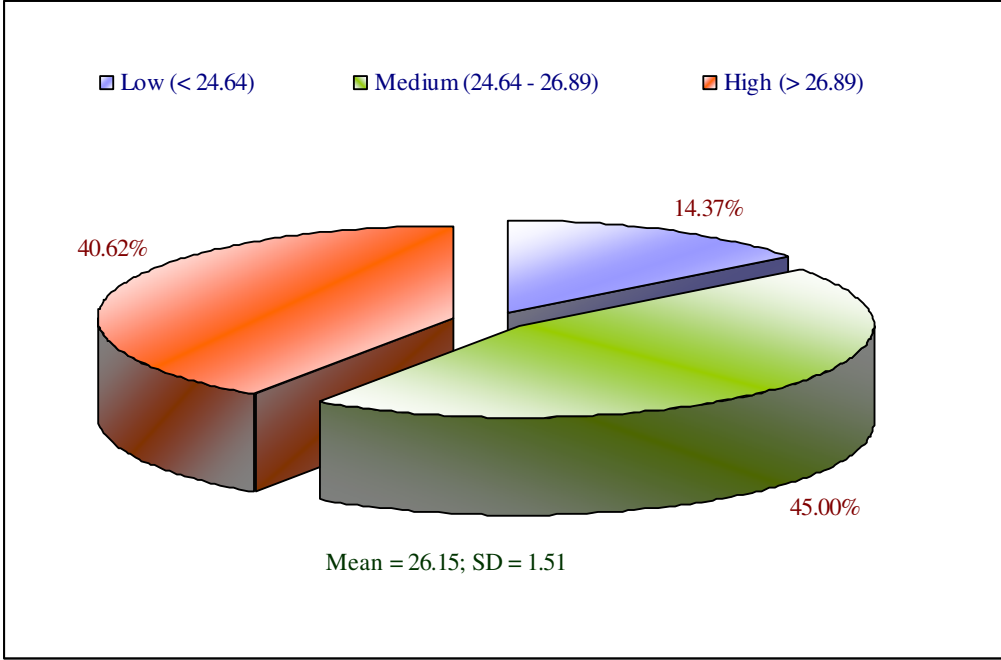


Fig.3. Overall knowledge level of the wine grape growers about recommended practices of wine grape cultivation

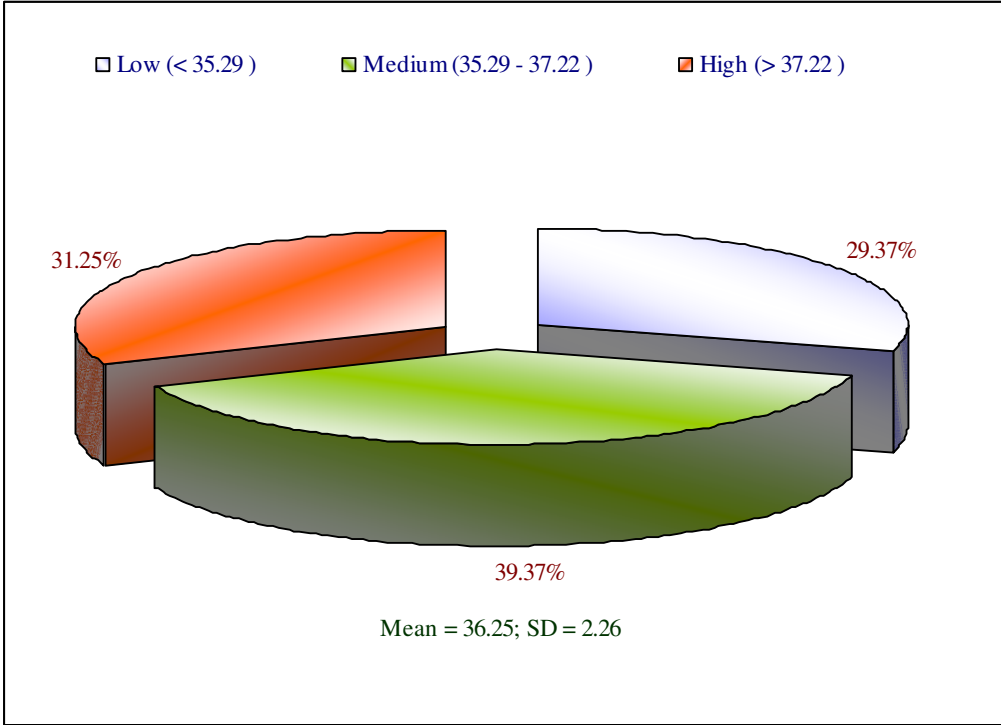


Fig.4. Overall adoption level of the wine grape growers about recommended practices of wine grape cultivation

Table 6: Overall adoption level of recommended practices of wine grape cultivation (n =160)

Adoption category	Respondents		Mean adoption score
	Frequency	Percentage	
Low (< 35.29)	47	29.37	34.03
Medium (35.29 - 37.22)	63	39.37	36.48
High (> 37.22)	50	31.25	39.00

Mean = 36.25; S. D. = 2.26

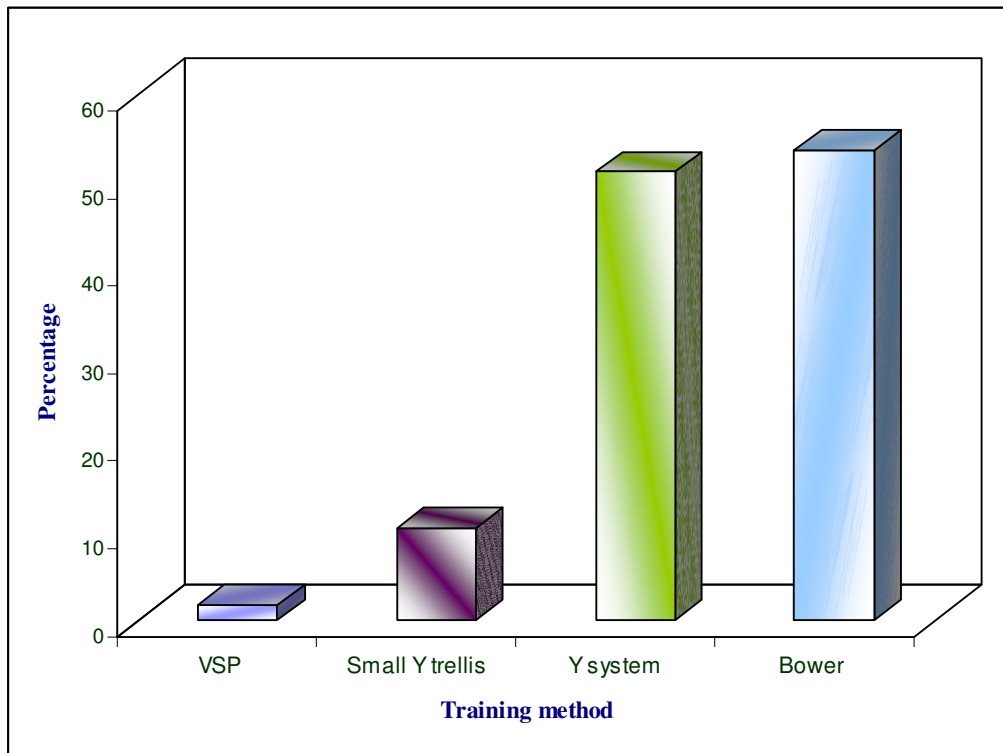
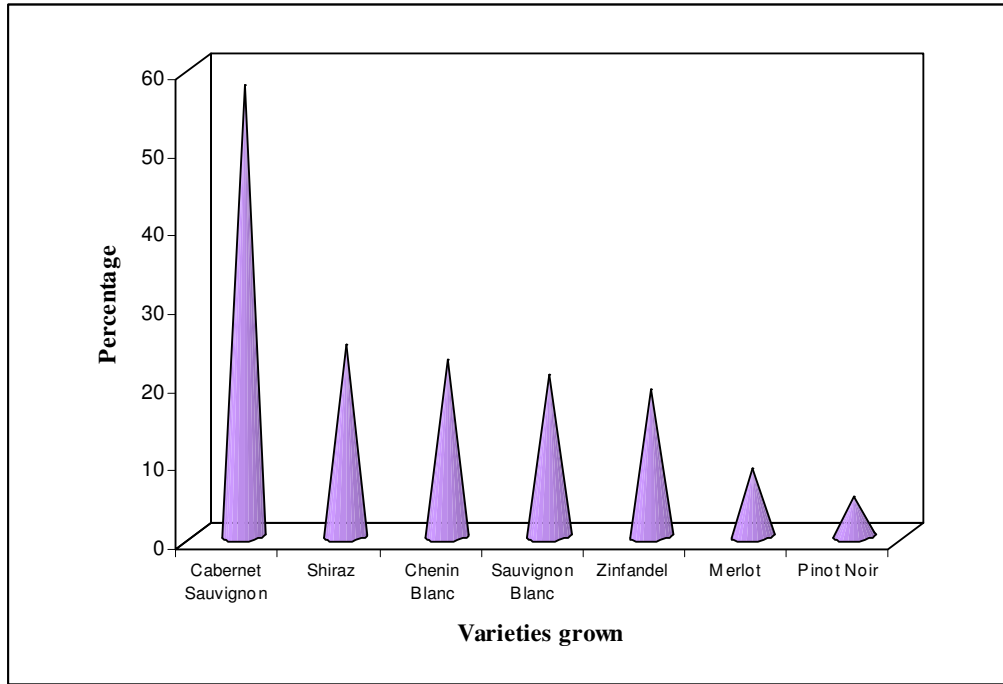


Fig.5. Adoption of wine grape cultivation practices by the wine grape growers

4.3.2.5 Application of chemical fertilizers

Summer season

It is evident from the Table 7 that during summer season 66.87 per cent of the wine grape growers applied nitrogenous fertilizers less than recommendation (<40 kg/acre). While, 10.00 and 23.12 per cent of the respondents applied nitrogenous fertilizers as per recommendation (40 kg/acre) and more than recommendation (>40 kg/acre), respectively.

In case of phosphatic fertilizers, majority of the respondents (64.37%) applied more than recommendation (>40 kg/acre). Nearly one third of the respondents (31.87%) applied phosphatic fertilizer less than recommendation (<40 kg/acre). While, very negligible per cent of the respondents (3.75%) applied it as per recommendation (40 kg/acre).

With regard to potassic fertilizers, 68.12 per cent of the respondents applied less than recommended (<60 kg/acre). While, 10.62 and 21.25 per cent of them applied potassic fertilizers as per recommended (60 kg/acre) and more than recommended (>60 kg/acre), respectively.

Winter season

During winter season, as high as 76.25 per cent of the wine grape growers applied nitrogenous fertilizers less than recommended (<30 kg/acre) and 15.00 per cent of them applied more than recommended (>30 kg/acre), respectively. While, recommended dose of nitrogenous fertilizers were applied by 8.75 per cent of the respondents.

With respect to phosphatic fertilizers, 66.25 per cent of the respondents applied less than recommendation (<50 kg/acre), whereas, 7.50 per cent applied as per recommendation (50 kg/acre) and 26.25 per cent applied more than recommendation (>50 kg/acre). With regard to potassic fertilizers, 53.75 per cent of the respondents applied more than recommended (>50 kg/acre). Only 10.62 per cent of them applied it as per recommended (50 kg/acre) and 35.62 per cent of them applied less than recommended (<50 kg/acre).

4.3.2.6 Propagation practices

Recommended root stocks were used by cent per cent of the wine grape growers for planting wine grape.

Data in Table 7 revealed that a large majority of the respondents (91.87%) adopted dog ridge root stock for wine grape planting. Only 11.25 and 2.50 per cent of the respondents adopted SO 4 and 110 R root stocks, respectively.

With regard to root stock grafting method, wedge grafting was followed by cent per cent of the respondents. In case of appropriate time for rootstock grafting, three fourth of the respondents had done the root stock grafting in September-October. Remaining 25.00 per cent of the respondents adopted this operation in August.

4.3.2.7 Irrigation method

The contents of Table 7 depicted that cent per cent of the wine grape growers adopted drip irrigation method for their orchards. It is interesting to note that none of the respondents adopted flood irrigation method.

4.3.2.8 Training method

The vertical shoot position (VSP), small Y trellis and Y system are recommended training methods of wine grape.

More than half of the wine grape growers adopted bower (53.75%) and Y method (51.25%) for their orchards. Small Y trellis system was adopted by only 10.62 per cent of the respondents. Negligible (1.87%) per cent of them adopted vertical shoot position.

4.3.2.9 Pruning time of wine grape

Nearly 72.00 per cent of the wine grape growers pruned the vines in April, while 28.12 per cent of them pruned the vines in March during summer. Whereas, 90.62 and 9.37 per cent of the wine grape growers pruned their vines in September and October, respectively during winter.

4.3.2.10 Growth regulators and growth retardants

A large majority of the wine grape growers (80.00%) did not adopt the gibberlic acid treatment, while 20.00 per cent of the respondents treated their vines with 10 ppm gibberlic acid at pre bloom stage.

With respect to cycocyl application, as high as 91.87 per cent of the respondents applied cycocyl (500 ppm) at five leaf stage. Only 8.13 per cent of the respondents did not adopt cycocyl application in their orchards.

4.3.2.11 Plant protection

Pest control (chemicals used to control)

Chemicals such as imidacloprid, dimethoate and endosulfan were used by 80.00, 20.00 and 11.87 per cent of the wine grape growers, respectively to control thrips. Flea beetle was controlled by using chemicals like malathion, cypermethrin, carbaryl and neem oil by 49.37, 42.50, 40.62 and 36.87 per cent of the wine grape growers, respectively. Verticillium, dichlorovos/dichloropyrphos, neem oil, avan and dichlorovos + fish oil raisin soap were used by 91.87, 84.37, 30.00, 23.75 and 21.87 per cent of the wine grape growers to control mealy bugs.

Disease control (chemicals used to control)

Control of powdery mildew was done by using chemicals like sulphur, systhane, hexaconozol and penconazol by 81.87, 36.25, 20.00 and 11.87 per cent of the wine grape growers, respectively. Downey mildew disease was controlled by using Bordeaux mixture, ridomill and copper oxichloride by 100.00, 97.50 and 47.50 per cent of the wine grape growers. Whereas, Bordeaux mixture, copper oxichloride, propineb, carbendazim and dithane M-45 were used by 100.00, 47.50, 40.62, 31.87 and 31.25 per cent of the wine grape growers to control anthracnose disease.

4.4 Profile of the wine grape growers

The data presented in Table 8, 9a, 9b, 10a, 10b and 11 gives a detailed account of personal and psychological attributes of the wine grape growers.

4.4.1 Age

From Table 8 it was observed that 61.87 per cent of the wine grape growers belonged to 'middle age' category. Whereas, 23.12 and 15.00 per cent of them belonged to 'old age' and 'young age' categories, respectively.

4.4.2 Education

More than one third of the wine grape growers (38.75%) studied upto 'graduation' level, while 26.87 and 23.12 per cent of the respondents had education upto 'pre-university' and 'high school' levels, respectively. Nearly an equal per cent of the respondents had studied upto 'primary school' (5.00%) and 'middle school' (4.37%) levels, respectively. It is interesting to see that, only 1.87 per cent of the respondents were illiterate.

Table 7: Adoption of wine grape cultivation practices by the wine grape growers

(n=160)

Sl. No.	Cultivation practices	Adoption level					
		Frequency			Percentage		
1	Varieties grown*						
	Cabernet Sauvignon	92			57.50		
	Shiraz	39			24.37		
	Chenin Blanc	36			22.50		
	Sauvignon Blanc	33			20.62		
	Zinfandel	30			18.75		
	Merlot	14			08.75		
2	Spacing followed						
	9ft x 5ft	138			86.25		
	8ft x 4ft	22			13.75		
3	Layout and land preparation practices						
	i Soil type						
	Well drained sandy loam	151			94.37		
	Well drained black loam	09			05.62		
	ii Trench prepared						
	Trench size	160			100		
	1.8 - 3 m apart						
	Filling material used in trenches						
FYM and Super phosphate	102			63.75			
FYM alone	58			36.25			
Quantity of filling material used							
FYM - 20 T/acre and Super phosphate - 1 T/acre	16			10.00			
4	Organic manure						
	16 T/acre	19			11.87		
5	Chemical fertilizer application (Kg/acre)	N	P	K	N	P	K
	Summer season (Su) - Fertilizers						
	[40 Kg N + 40 Kg P + 60 Kg K /acre]						
	Less than recommended	107	51	109	66.87	31.87	68.12
	Recommended	16	06	17	10.00	03.75	10.62
	More than recommended	37	103	34	23.12	64.37	21.25
	Winter season (Wi) - Fertilizers						
	[30 Kg N + 50 Kg P + 50 Kg K /acre]						
	Less than recommended	122	106	57	76.25	66.25	35.62
	Recommended	14	12	17	8.75	07.5	10.62
More than recommended	24	42	86	15.00	26.25	53.75	

Contd...

6	Propagation practices		
i	Rootstock adopted*		
	Dog ridge	147	91.87
	SO 4	18	11.25
	110 R	20	12.50
ii	Rootstock grafting method		
	Wedge	160	100
iii	Time for rootstock grafting		
	September - October	120	75.00
7	Irrigation method		
	Drip irrigation	160	100
8	Training method adopted*		
	Vertical Shoot Position (VSP)	03	01.87
	Small Y trellis	17	10.62
	Y system	82	51.25
	Bower	86	53.75
9	Pruning time		
i	Summer pruning		
	April	115	71.87
	March	45	28.12
ii	Winter pruning		
	September	145	90.62
	October	15	09.37
10	Growth regulators and growth retardants used		
i	GA application	32	20.00
	Conc. Stage (after winter pruning)		
	10 ppm Pre-bloom		
ii	Cycocyl application	147	91.87
	Conc. Stage (after winter pruning)		
	500 ppm 5 leaf stage		
11	Plant protection		
A	Pest control - Chemicals and concentrations used*		
i	Thrips		
	Dimethoate 1.5 - 2 ml / lit	32	20.00
	Imidacloprid 0.5 ml / lit	128	80.00
	Endosulfan 0.5 ml / lit	19	11.87
	Verticillium 2 ml /lit	04	02.50
ii	Flea beetle		
	Carbaryl 3 gm / lit	65	40.62
	Cypermethrin 2 ml / lit	68	42.50
	Malathion 2 ml / lit	79	49.37
	Neem oil 5 ml / lit	59	36.87
	Nuvan 2 ml / lit	07	04.37
iii			
			<i>Contd....</i>
	Mealy bug		
	Avon 1.5 - 2 ml / lit	38	23.75

	Dichloropyriphos / Dichlorovos 2 ml / lit	135	84.37
	Dichlorovos+Fish oil raisin soap (2 ml + 2 gm / lit)	35	21.87
	Neem oil 5 ml / lit	48	30.00
	Verticillium 2 ml /lit	147	91.87
B	Disease control -Chemicals & concentrations used*		
i	Powdery mildew		
	Hexaconazol 2 ml / lit	32	20.00
	Penconazol 1 ml / lit	19	11.87
	Sulphur 60 % WP 2 gm / lit	131	81.87
	Systhane 2 ml / lit	58	36.25
ii	Downey mildew		
	Bordeaux mixture 1 %	160	100
	Copper oxichloride (COC) 2.5 - 3 gm / lit	76	47.50
	Ridomill 72 % WP 2.5 gm / lit	156	97.50
iii	Anthraco nose		
	Bordeaux mixture 1 %	160	100
	Copper oxichloride (COC) 2.5 - 3 gm / lit	76	47.50
	Carbendazim 2 gm / lit	51	31.87
	Dithane M - 45 2 gm / lit	50	31.25
	Propineb 70 % WP 2 - 3 gm / lit	65	40.62

* Multiple responses obtained

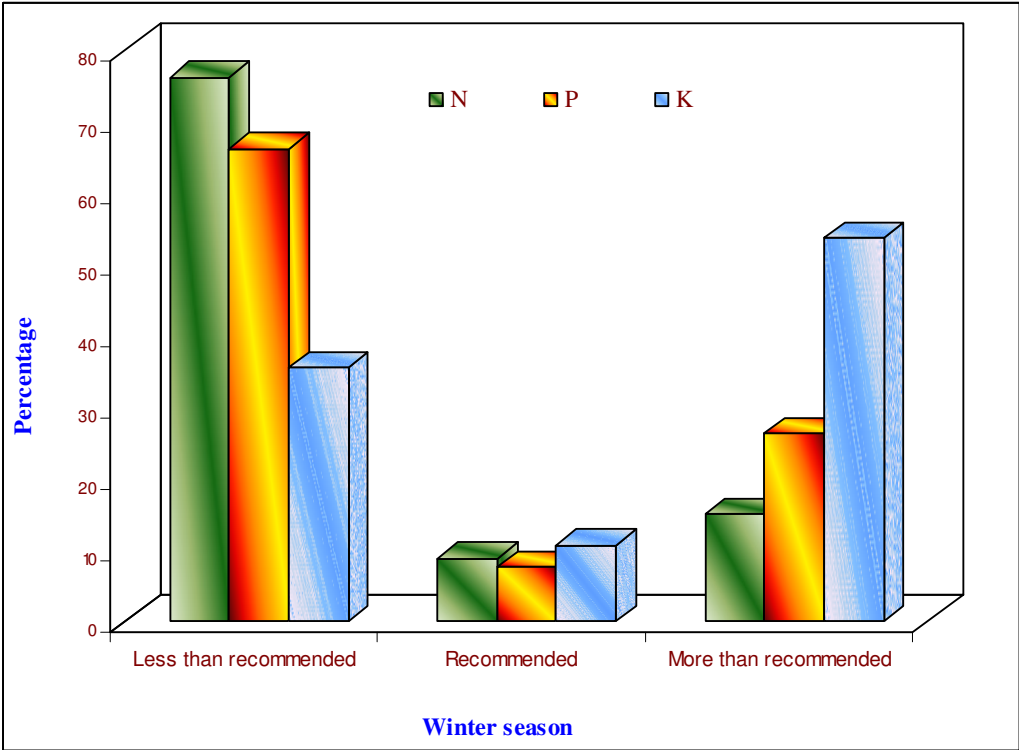
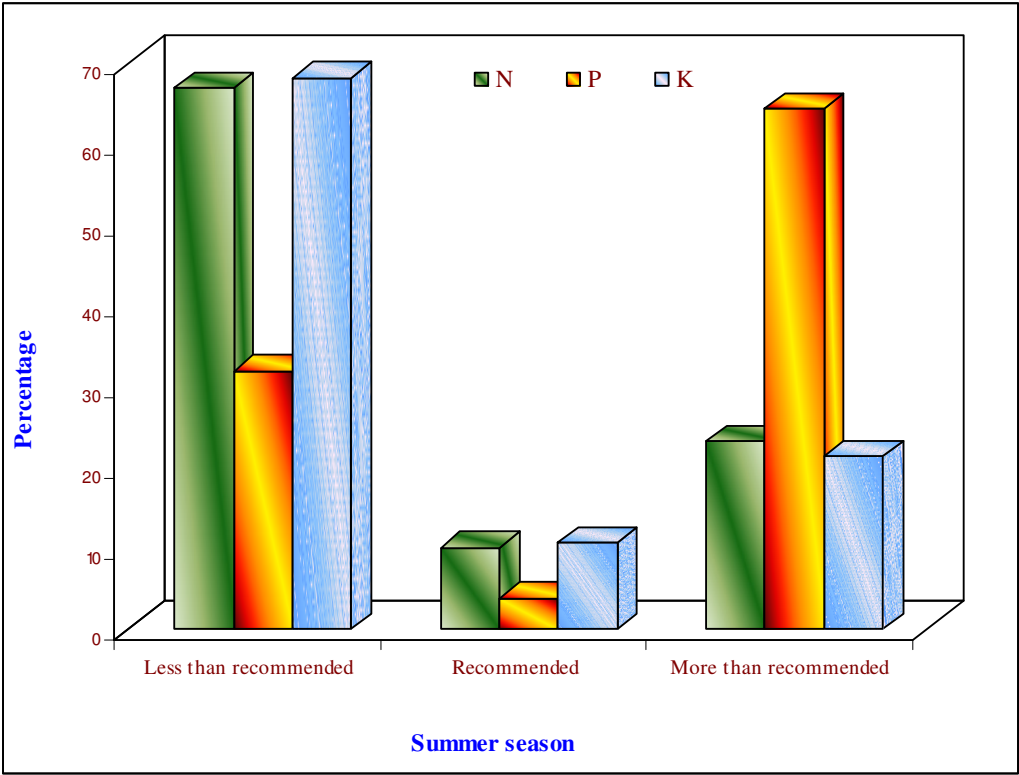


Fig.6. Chemical fertilizer application (Kg/acre)

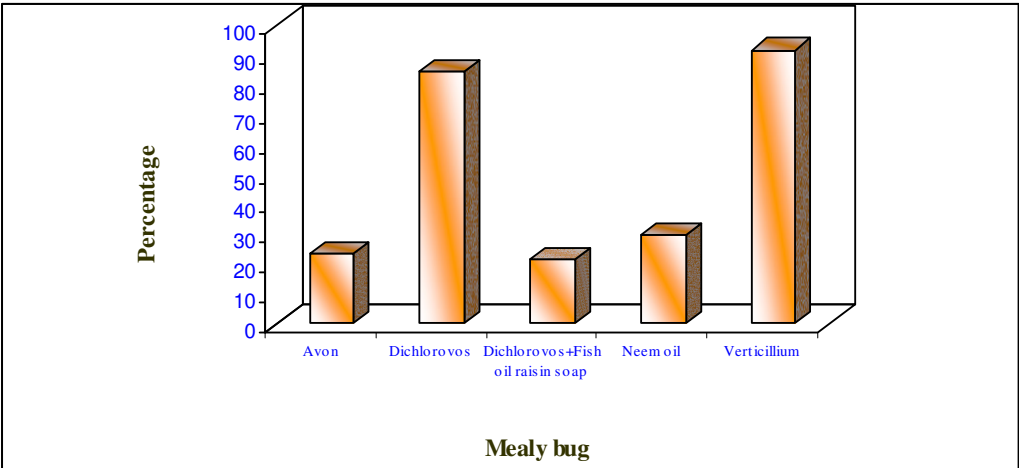
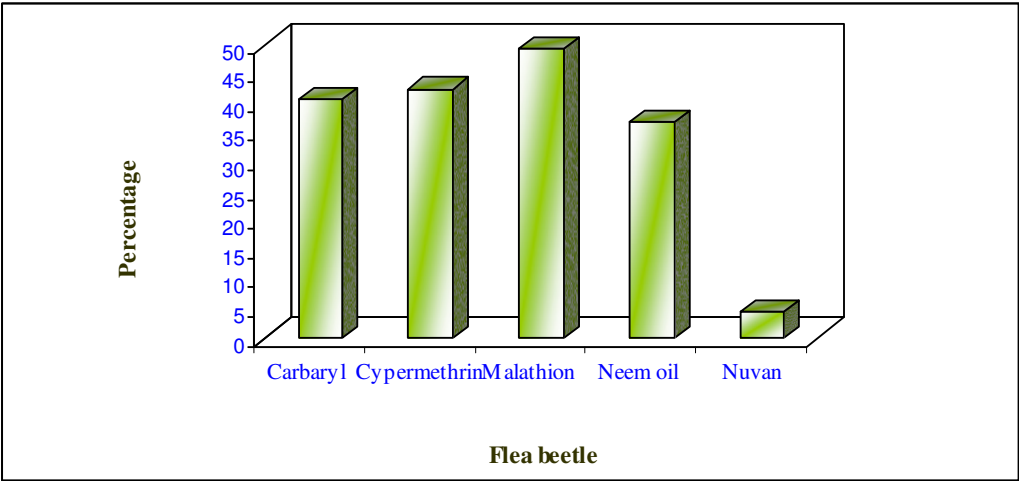
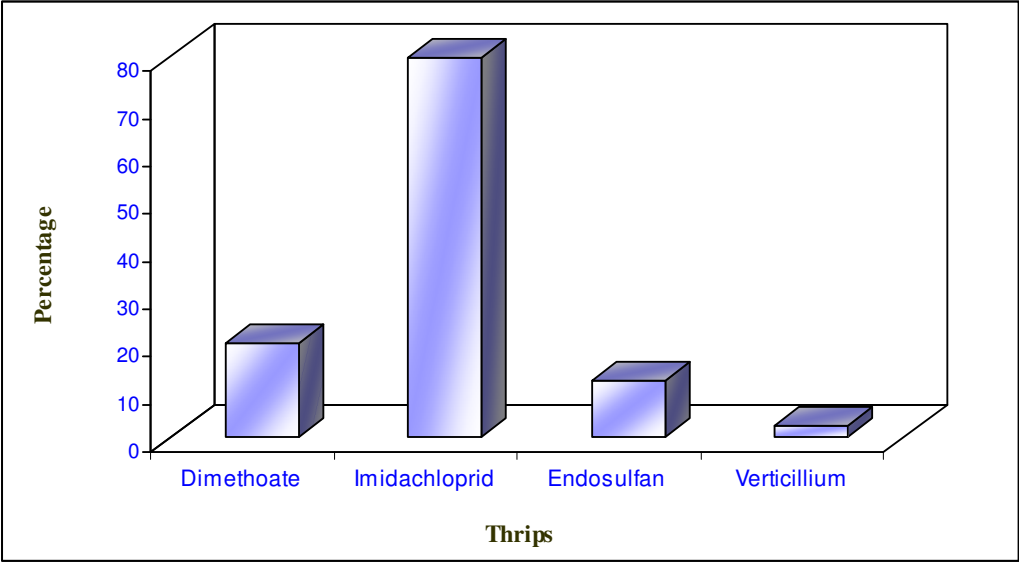


Fig.7. Adoption of plant protection chemicals for control of pests

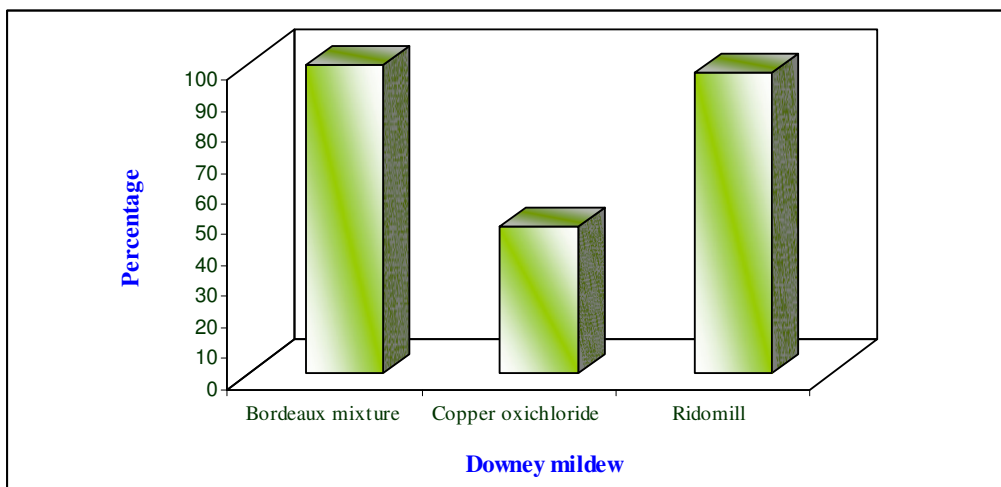
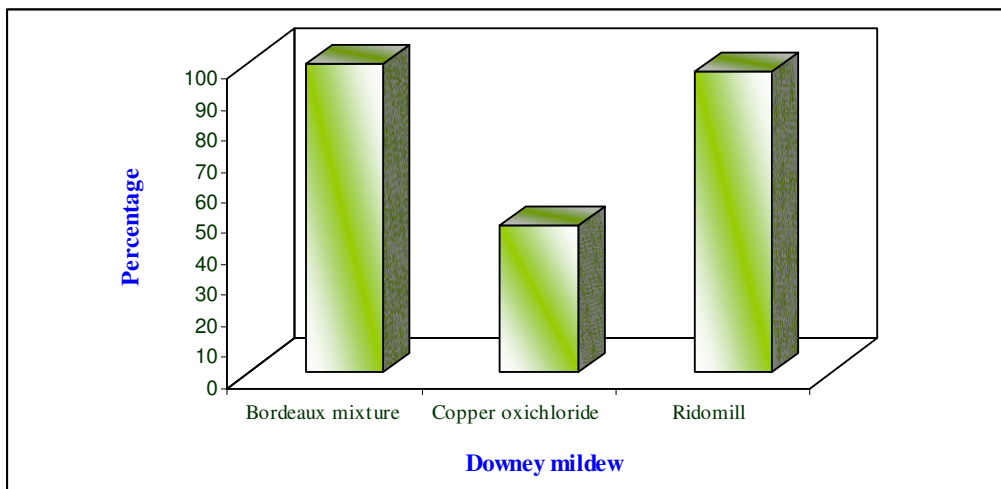
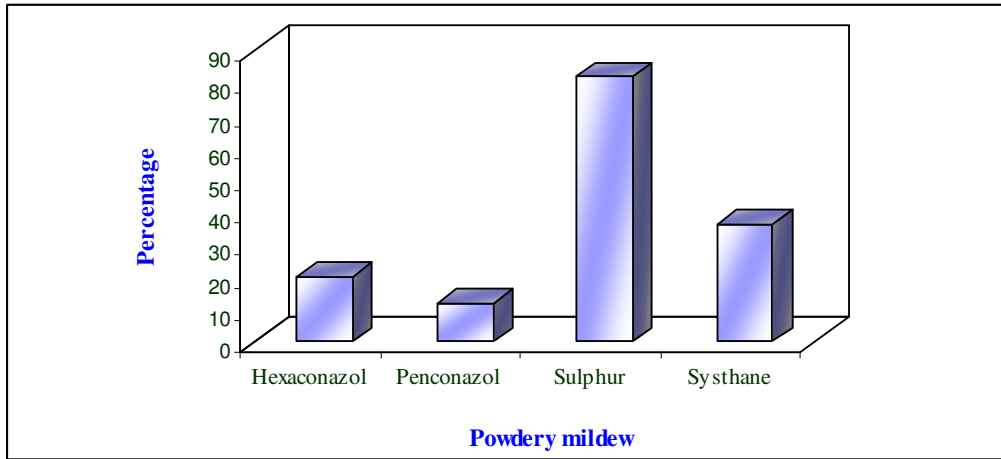


Fig.8. Adoption of plant protection chemicals for control of diseases

4.4.3 Orchard size

An equal per cent (45.62%) of the wine grape growers were having small (<2.50 acres) and medium (2.50-10.00 acres) orchard size. While, 8.72 per cent of the respondents possessed large orchard (>10.01 acres). Average orchard size was 4.62 acres.

4.4.4 Proximity to winery unit

The data pertaining to respondents' proximity to winery unit showed that 41.87 per cent of the wine grape growers were having their vineyards within 5 km distance from winery unit. More than one third of the respondents (35.62%) were having their vineyards located 6 to 10 km away from winery unit. Whereas, 18.75 and 3.75 per cent of the respondents were found to have vineyards in 11 to 15 km and 16 to 20 km away from winery unit.

4.4.5 Extension participation

It was clear from the Table 9b that 46.25 per cent of the wine grape growers had medium level of extension participation, while 33.75 and 20.00 per cent of them had high and low levels of extension participation, respectively.

The data in Table 9a indicated that the extension activities like agricultural exhibitions, krishimela and training programmes were regularly attended by 11.25, 9.37 and 6.25 per cent of the wine grape growers. Majority of the respondents occasionally participated in group discussions (72.50%), extension meetings (61.87%), krishimela (54.37%) and agricultural exhibitions (53.12%). As high as 71.00 per cent of the wine grape growers had never attended the training programmes, while 48.12 per cent of the respondents never participated in field visits.

4.4.6 Mass media participation

The Table 10b depicted that a higher proportion of the wine grapes growers (38.75%) had medium mass media participation and nearly one third of them (32.50%) belonged to low mass media participation category. Whereas, 28.75 per cent of them belonged to high mass media participation category.

The data (Table 10a) pertinent to mass media participation of the wine grape growers revealed that 83.75 per cent of the wine grape growers subscribed newspaper. The regular reading behaviour of the respondents was found to be 83.75, 80.62 and 48.12 per cent of total respondents with respect to news, agricultural articles and recreational articles, respectively.

Farm magazine was subscribed by 30.62 per cent of the respondents. A large proportion of the respondents (66.25, 66.00 and 65.00%) did not read the recreational aspects, news and agricultural aspects from farm magazine.

Regarding possession of radio set, 96.25 per cent of the respondents possessed radio sets. More than one third (37.50, 37.50 and 33.12%) were occasional listeners of agricultural, news and entertainment programmes, respectively. Whereas, 48.75, 45.00 and 44.37 per cent of the respondents did not listen to the agricultural, news and entertainment programmes, respectively.

Television set was possessed by 98.75 per cent of the respondents. As high as 91.25 and 66.25 per cent of the respondents were regular viewers of news and entertainment programmes. The occasional viewing behaviour of the respondents was found to be 68.12 per cent with respect to agricultural programmes.

4.4.7 Cosmopolitaness

From Table 11 it was observed that 46.25 per cent followed by 28.75 per cent and 25.00 per cent of the wine grape growers belonged to high, medium and low category of cosmopolitaness, respectively.

Table 8: Profile of the wine grape growers

(n = 160)

Sl. No.	Variable	Category	Respondents	
			Frequency	Percentage
1	Age	Young age (< 31 years)	24	15.00
		Middle age (31 - 50 years)	99	61.87
		Old age (> 51 years)	37	23.12
2	Education	Illiterate	03	01.87
		Primary school	08	05.00
		Middle school	07	04.37
		High school	37	23.12
		Pre - university/Diploma	43	26.87
		Graduate	62	38.75
3	Orchard size	Small (< 2.50 acres)	73	45.62
		Medium (2.50 - 10.00 acres)	73	45.62
		Large (> 10.00 acres)	14	08.72
		(Average 4.62 acres)		
4	Proximity to winery unit	0 km to 05 km	67	41.87
		06 km to 10 km	57	35.62
		11 km to 15 km	36	18.75
		16 km to 20 km	06	03.75

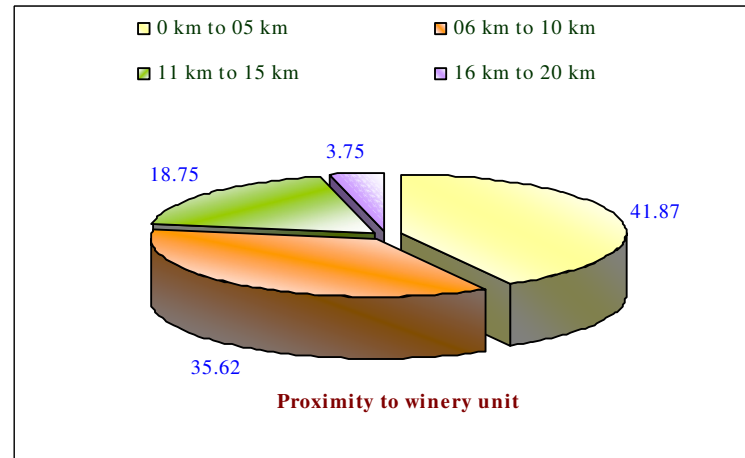
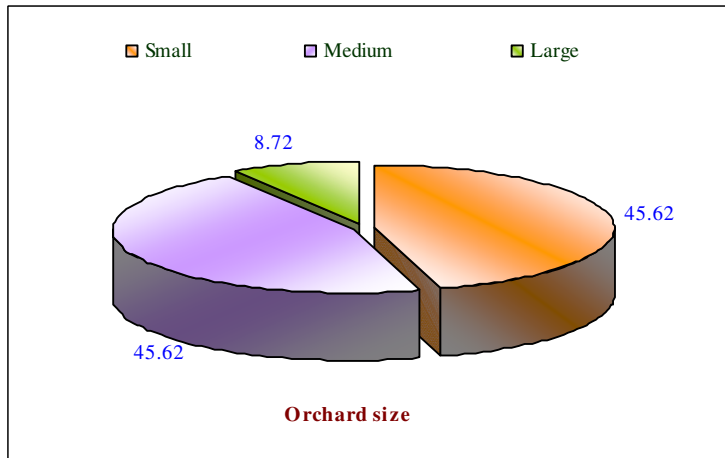
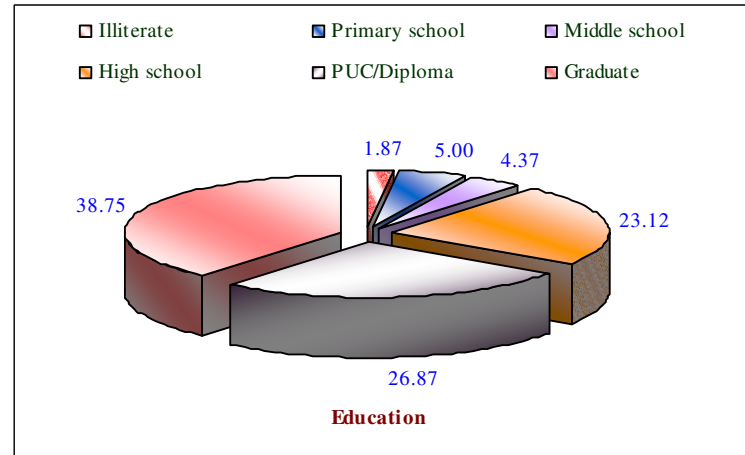
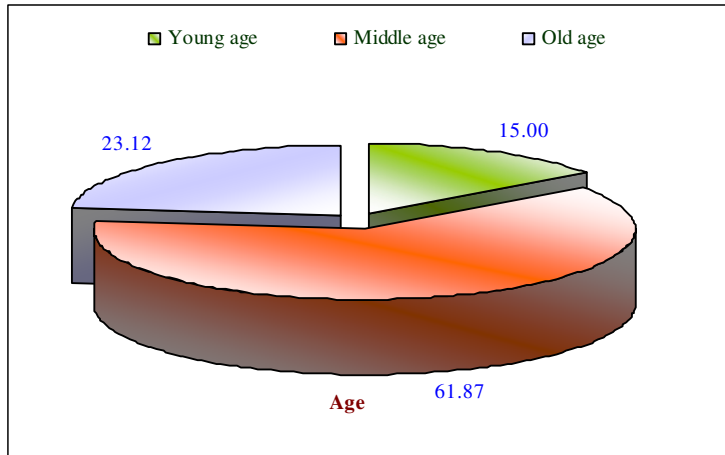


Fig.9. Profile of wine grape growers

Table 9a: Extent of participation of the wine grape growers in various extension activities
(n = 160)

Sl. No.	Extension activity	Extent of participation					
		Regular		Occasional		Never	
		No.	%	No.	%	No.	%
1	Krishimela	15	09.37	87	54.37	58	36.25
2	Training programme	10	06.25	35	21.87	115	71.87
3	Extension meetings	03	01.87	99	61.87	58	36.25
4	Group discussions	05	03.12	116	72.50	39	24.37
5	Field visits	09	05.62	74	46.25	77	48.12
6	Agricultural exhibitions	18	11.25	85	53.12	57	35.62

Table 9b: Distribution of the wine grape growers according to extension participation

(n = 160)

Sl. No.	Variable	Category	Respondents	
			Frequency	Percentage
1	Extension participation	Low (< 8.99)	32	20.00
		Medium (8.99 - 10.70)	74	46.25
		High (> 10.70)	54	33.75
		Mean = 9.85, SD = 2.01		

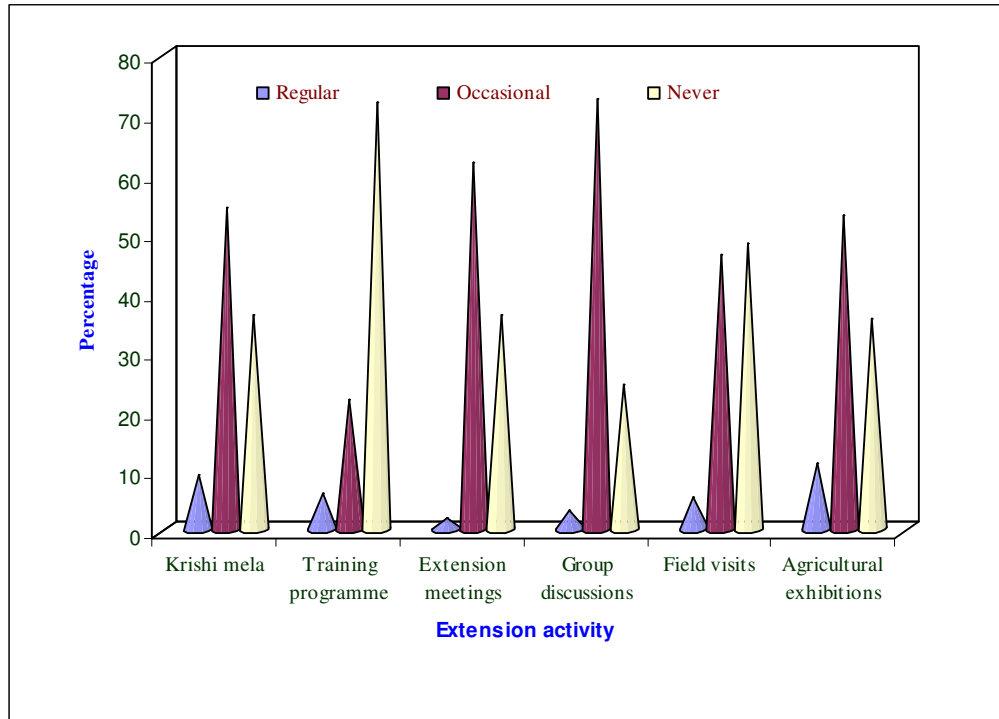


Fig.10a. Extension participation of wine grape growers in various extension activities

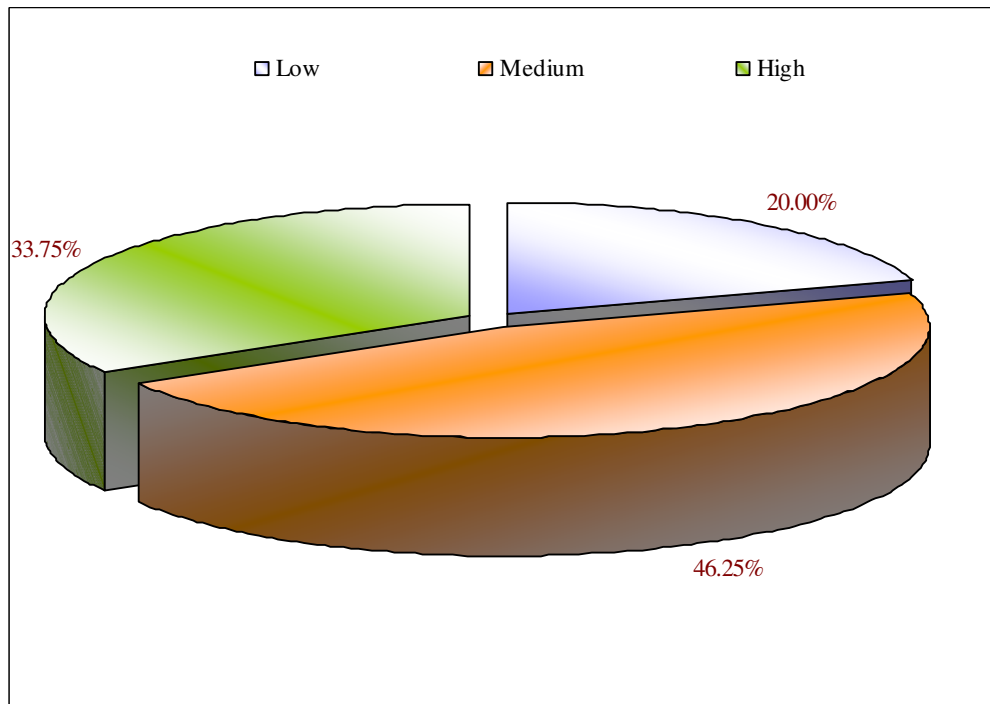


Fig.10b. Distribution of the wine grape growers according to extension participation

Table 10a: Extent of participation of the wine grape growers in various mass media

(n = 160)

Mass media	Subscriber / Possession		Reading / Listening / Viewing habit					
			Regular		Occasional		Never	
	No.	%	No.	%	No.	%	No.	%
Newspaper	134	83.75						
Agricultural articles			129	80.62	21	13.12	10	06.25
Information / News			134	83.75	18	11.25	08	05.00
Recreational articles			77	48.12	53	33.12	30	18.75
Farm magazine	49	30.62						
Agricultural articles			45	28.12	11	06.87	104	65.00
Information / News			42	26.25	14	08.75	104	65.00
Recreational articles			20	12.50	34	21.25	106	66.25
Radio	154	96.25						
Agricultural programmes			22	13.75	60	37.50	78	48.75
Information / News			28	17.50	60	37.50	72	45.00
Entertainment			36	22.50	53	33.12	71	44.37
Television	158	98.75						
Agricultural programmes			32	20.00	109	68.12	19	11.87
Information / News			146	91.25	11	06.87	03	01.87
Entertainment			106	66.25	47	29.37	07	04.37

Table 10b: Distribution of the wine grape growers according to mass media participation

(n = 160)

Sl. No.	Variable	Category	Respondents	
			Frequency	Percentage
1	Mass media participation	Low (< 23.62)	52	32.50
		Medium (23.62 - 28.74)	62	38.75
		High (> 28.74)	46	28.75
		Mean = 26.18, SD = 6.02		

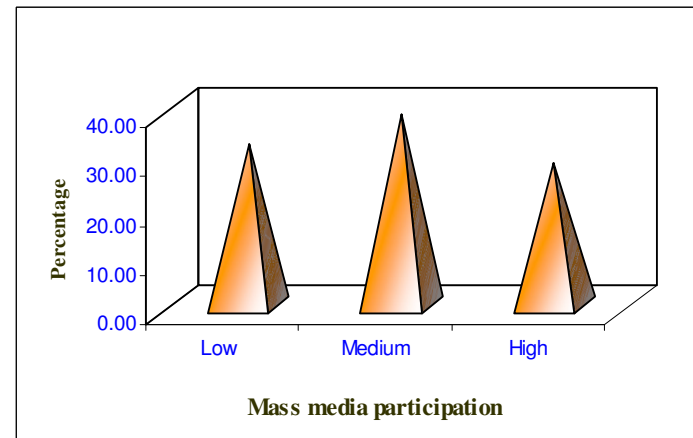
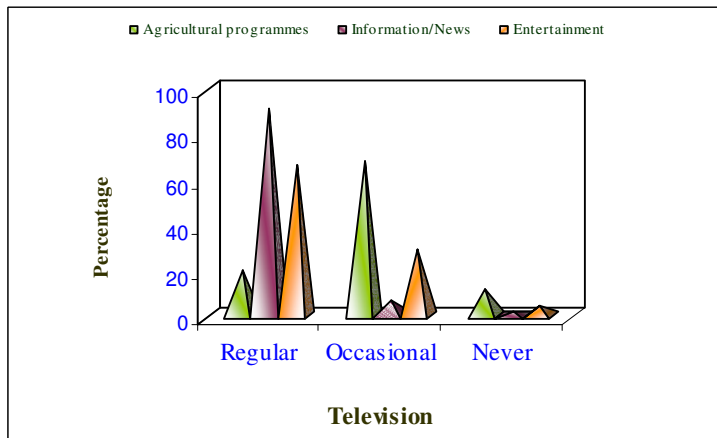
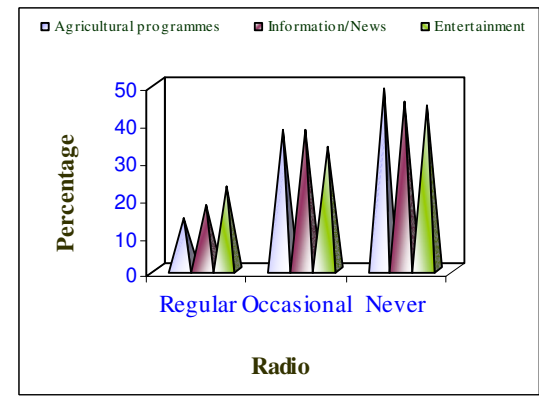
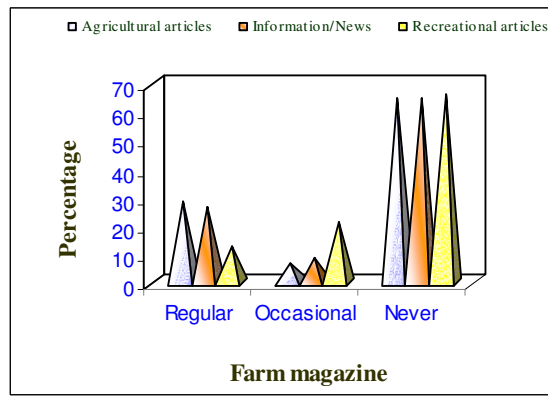
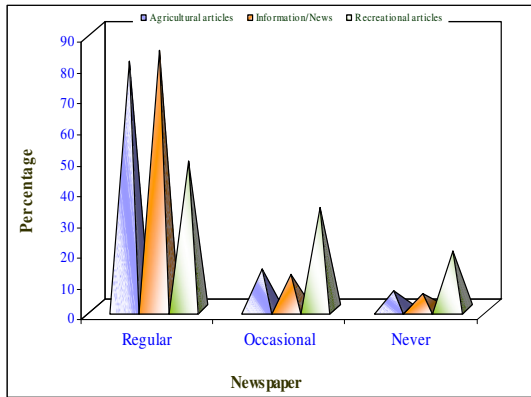


Fig.11. Extent of participation of the wine grape growers in various mass media

4.4.8 Deferred gratification

A large majority (66.25%) of the wine grape growers had medium level of deferred gratification. While, 19.37 and 14.37 per cent of the respondents were found in high and low levels of deferred gratification, respectively.

4.4.9 Economic motivation

By looking at Table 11, it could be inferred that the wine grape growers were distributed equally in all the three categories of economic motivation viz., high (34.37%), medium (33.12%) and low (32.50%), respectively.

4.4.10 Innovative proneness

It was observed from Table 11 that 43.12 per cent of the wine grape growers were found in low innovative proneness category followed by 40.62 and 16.25 per cent of the respondents in high and medium innovative proneness categories, respectively.

4.4.11 Risk orientation

Nearly an equal percentage of the wine grape growers had low (36.25%) and medium (35.62%) risk orientation and the remaining 28.12 per cent of the respondents had high risk orientation.

4.5 Relationship between attributes of the wine grape growers and their knowledge level and extent of adoption

4.5.1 Relationship between attributes of the wine grape growers and their knowledge level

The result presented in Table 12 revealed the relationship of independent variables with knowledge level of the wine grape growers about recommended wine grape cultivation practices. Out of 11 variables studied, the variables education, orchard size, extension participation, mass media participation, cosmopolitaness, economic motivation, innovative proneness and risk orientation exhibited positive and significant relationship with knowledge level of the wine grape growers. The variables age, proximity to winery unit and deferred gratification showed positive but non-significant relationship with knowledge level of the wine grape growers.

4.5.2 Relationship between attributes of the wine grape growers and their extent of adoption

It could be seen from Table 13 that out of 11 variables studied, 9 variables namely education, orchard size, extension participation, mass media participation, cosmopolitaness, deferred gratification, economic motivation, innovative proneness and risk orientation were found to have positive and significant relationship with the extent of adoption of recommended wine grape cultivation practices. While, the variables age and proximity to winery unit showed positive but non-significant relationship with extent of adoption of wine grape cultivation practices.

4.6 Problems as perceived by the wine grape growers

An appraisal of Table 14 reflected various problems faced by the wine grape growers in wine grape cultivation.

4.6.1 Technical problems

The major technical problems perceived by the wine grape growers were inadequate guidance regarding improved technology and increased resistance of pests and diseases to

Table 11: Psychological attributes of the wine grape growers

(n = 160)

Sl. No.	Variable	Category	Respondents	
			Frequency	Percentage
1	Cosmopolitaness	Low (< 6.85)	40	25.00
		Medium (6.85 - 7.85)	46	28.75
		High (> 7.85)	74	46.25
		Mean = 7.35, SD = 1.18		
2	Deferred gratification	Low (< 10.61)	23	14.37
		Medium (10.61 - 11.62)	106	66.25
		High (> 11.62)	31	19.37
		Mean = 11.11, SD = 1.11		
3	Economic motivation	Low (< 19.28)	52	32.50
		Medium (19.28 - 22.43)	53	33.12
		High (> 22.43)	55	34.37
		Mean = 20.85, SD = 3.70		
4	Innovative proneness	Low (< 32.42)	69	43.12
		Medium (32.42 - 37.14)	26	16.25
		High (> 37.14)	65	40.62
		Mean = 34.78, SD = 5.55		
5	Risk orientation	Low (< 18.42)	58	36.25
		Medium (18.42 - 22.36)	57	35.62
		High (> 22.36)	45	28.12
		Mean = 20.39, SD = 4.62		

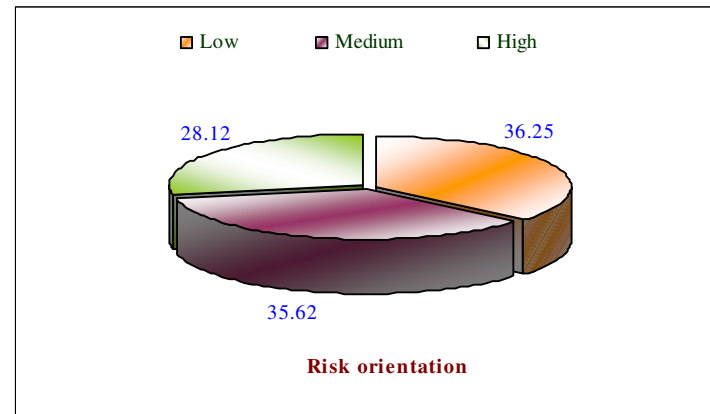
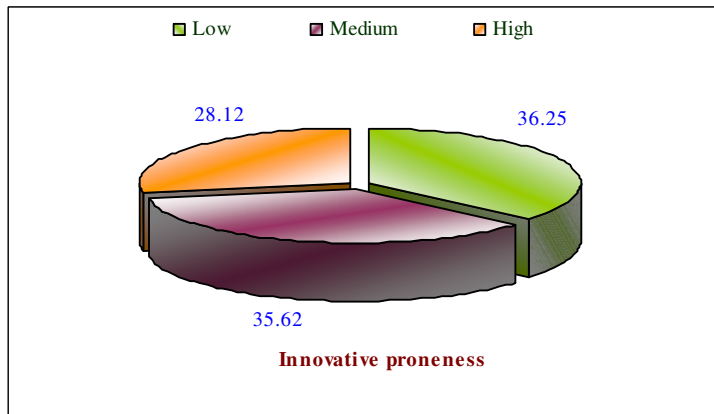
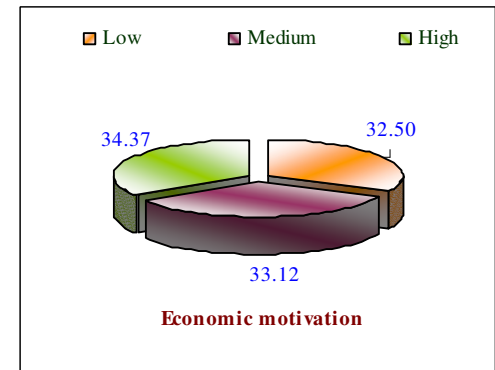
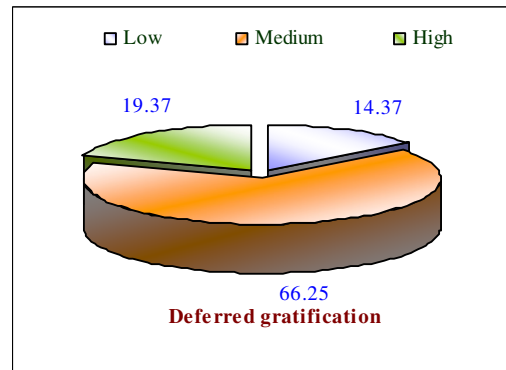
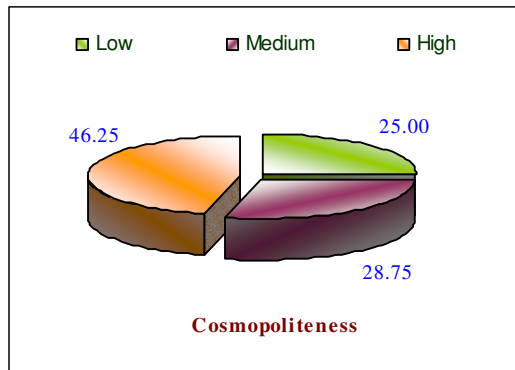


Fig.12. Psychological attributes of the wings grape growers

Table 12: Relationship between attributes of the wine grape growers and their knowledge level

(n=160)

Sl. No.	Variable	'r' value
1	Age	0.002 ^{NS}
2	Education	0.217**
3	Orchard size	0.374**
4	Proximity to winery unit	0.024 ^{NS}
5	Extension participation	0.266**
6	Mass media participation	0.339**
7	Cosmopolitaness	0.235**
8	Deferred gratification	0.143 ^{NS}
9	Economic motivation	0.233**
10	Innovative proneness	0.370**
11	Risk orientation	0.389**

^{NS} : Non significant

* : Significant at 5 % level

** : Significant at 1 % level

Table 13: Relationship between attributes of the wine grape growers and their extent of adoption

(n=160)

Sl. No.	Variable	'r' value
1	Age	0.044 ^{NS}
2	Education	0.240**
3	Orchard size	0.240**
4	Proximity to winery unit	0.016 ^{NS}
5	Extension participation	0.475**
6	Mass media participation	0.415**
7	Cosmopolitaness	0.293**
8	Deferred gratification	0.182*
9	Economic motivation	0.335**
10	Innovative proneness	0.400**
11	Risk orientation	0.556**

^{NS} : Non significant

* : Significant at 5 % level

** : Significant at 1 % level

Table 14: Problems as perceived by the wine grape growers

(n=160)

Sl. No.	Problems as perceived by the wine grape growers	Respondents	
		Frequency	Percentage
I	Technical problems		
1	Inadequate guidance regarding improved technology	137	86.62
2	Increased resistance of pests and diseases to plant protection chemicals	120	75.00
3	Labour shortage	71	44.37
4	Non availability of manures / fertilizers in time	43	26.87
5	Replacement of variety is very difficult	07	04.37
II	Problems related to the inputs		
1	High cost of planting material	160	100
2	High cost of plant protection chemicals	142	88.75
3	High cost of fertilizers	132	82.50
4	High initial cost of establishment	117	73.12
5	High cost of labour	46	28.75
III	Financial problems		
1	Insufficient credit	53	33.12
2	Very high rate of interest	51	31.87
3	Inadequate guidance on credit availability to farmers	04	02.50
4	Complex, lengthy and rigid procedure of bank finance	02	01.25
IV	Marketing problems		
1	Delayed cash payment	19	11.87
2	Wineries are far away	02	01.25
V	General problems		
1	Irregular supply of electricity for irrigation	160	100
2	Lack of information about government schemes and subsidies	72	45.00
3	Lack of insurance support	41	25.62

plant protection chemicals which were expressed by 86.62 and 75.00 per cent of the respondents, respectively. Other technical problems perceived by the respondents were labour shortage (44.37%), non-availability of manures and fertilizers in time (26.87%) and replacement of variety is very difficult (4.37%).

4.6.2 Problems related to the inputs

Cent per cent of the wine grape growers quoted high cost of planting material as the major problem, followed by high cost of plant protection chemicals (88.75%) high cost of fertilizers (82.50%), high establishment cost (73.12%) and high cost of labour (28.75%).

4.6.3 Financial problems

Inadequate quantity of credit (33.13%), very high rate of interest (31.87%), inadequate guidance on credit availability to farmers (2.50%) and complex, lengthy and rigid procedure of bank finance (1.25%) were the problems faced by the wine grape growers with respect to finance.

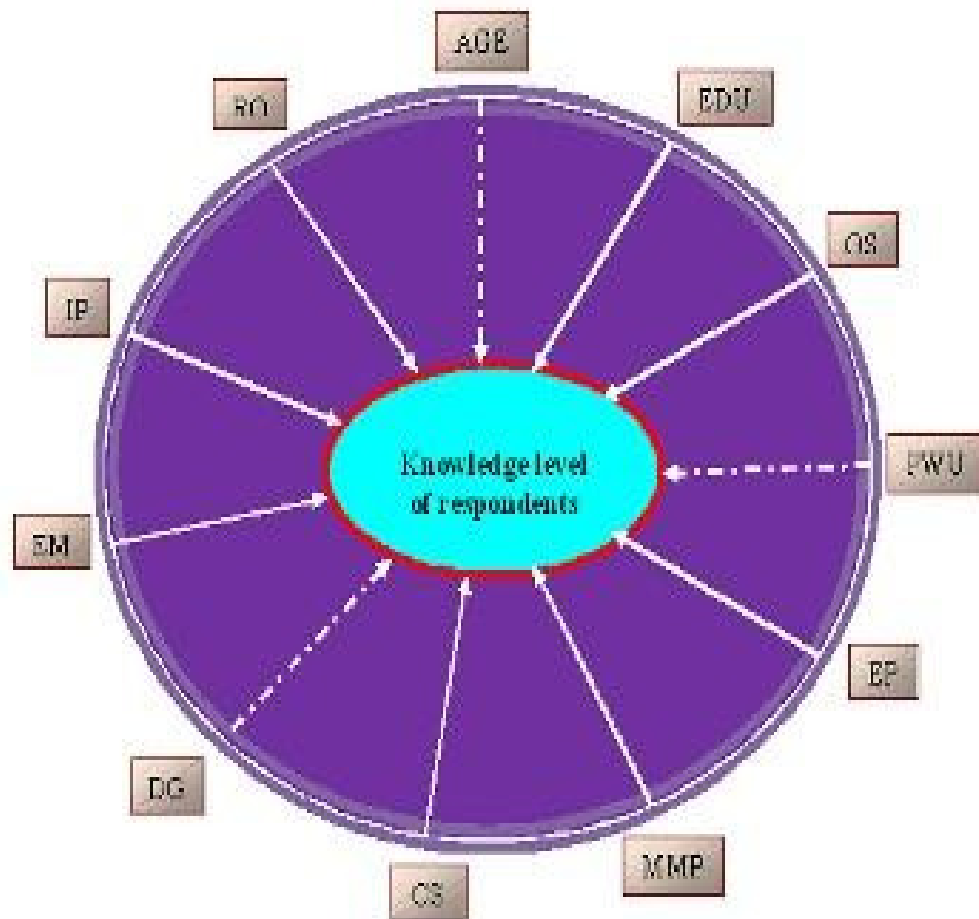
4.6.4 Marketing problems

Delayed cash payment (11.87%) was the main marketing problem as expressed by the wine grape growers, whereas, very negligible per cent of the respondents (1.25%) quoted wineries are far away.

4.6.5 General problems

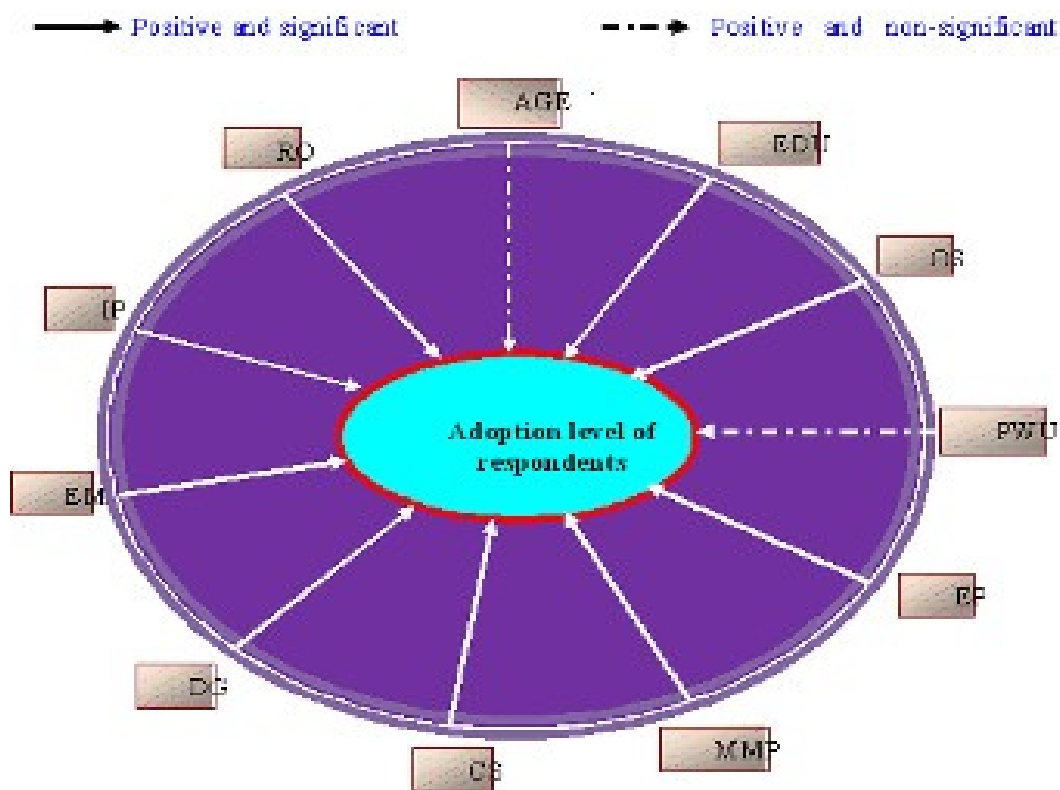
The major general problem faced by the wine grape growers was irregular and insufficient supply of electricity for irrigation (100.00%) followed by lack of information about government schemes and subsidies (45.00%) and lack of insurance support (25.62%).

→ Positive and significant
 - - - → Positive and non-significant



- | | | | |
|-----|----------------------------|----|--------------------------|
| AGE | - Age | CS | - Cosmopolitanness |
| EDU | - Education | DG | - Deferred gratification |
| OS | - Orchard size | EM | - Economic motivation |
| PWU | - Proximity to winery unit | IP | - Innovative prowness |
| EP | - Extension participation | RO | - Risk orientation |
| MMP | - Mass media participation | | |

Fig.13. Empirical model showing relationship between attributes of wine grape growers and their knowledge level



- | | |
|---------------------------------|-----------------------------|
| AGE - Age | CS - Cosmopolitanness |
| EDU - Education | DG - Deferred gratification |
| OS - Orchard size | EM - Economic motivation |
| PWFU - Proximity to winery unit | IP - Innovative proneness |
| EP - Extension participation | RO - Risk orientation |
| MMP - Mass media participation | |

Fig 14: Empirical model showing relationship between attributes of wine grape growers and their adoption level

Fig.14 Empirical model showing relationship between attributes of wine grape growers and their knowledge level

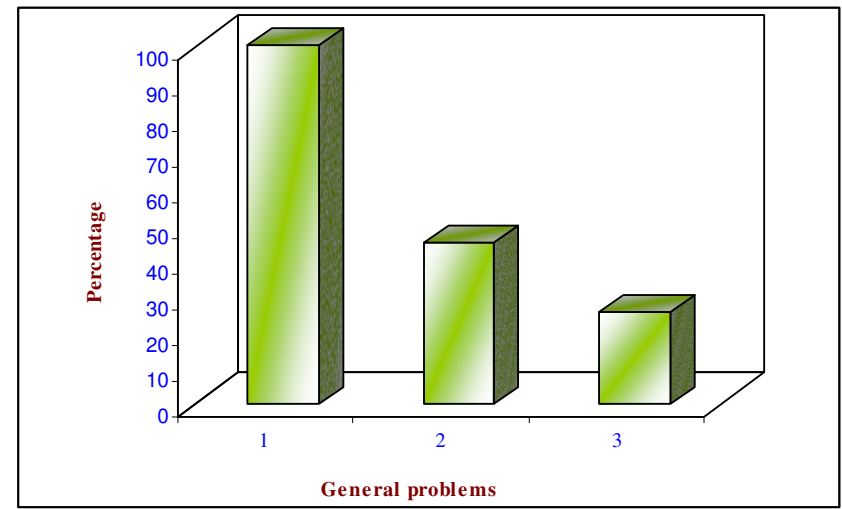
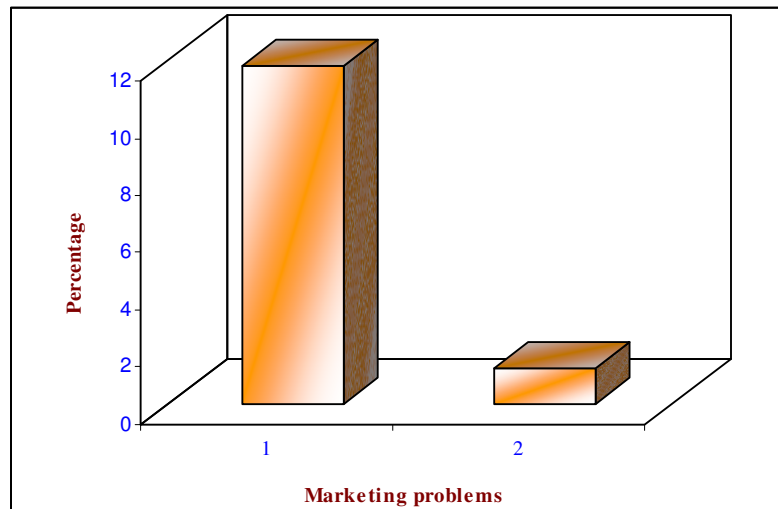
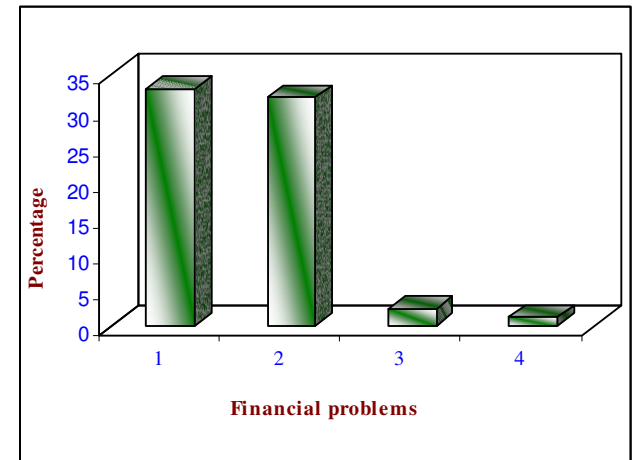
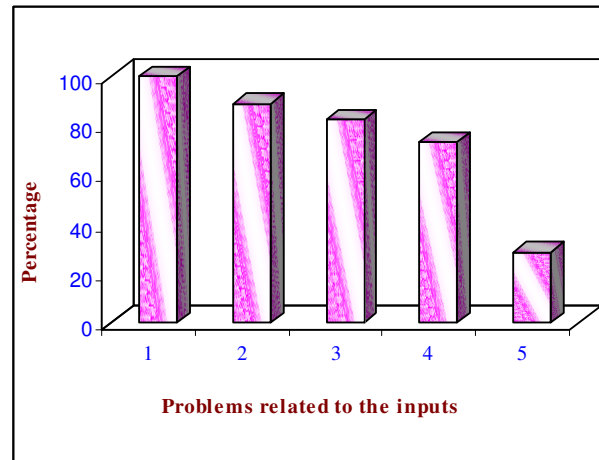
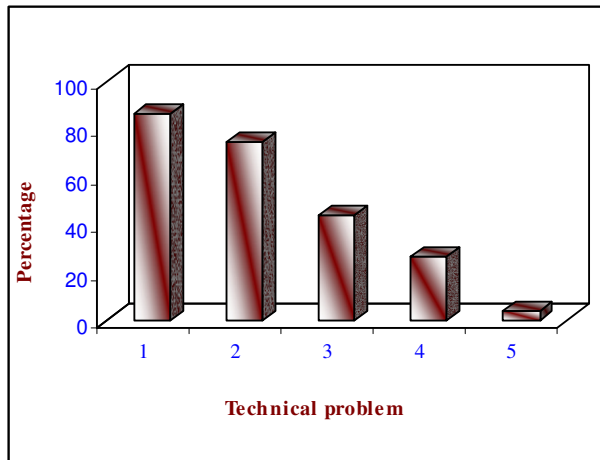


Fig.15. Problems of wine grape growers

5. DISCUSSION

The findings of the study are discussed in this chapter under following headings. Since the research studies in this particular field were very scarce, the findings of the related studies are made use of to substantiate the results wherever possible.

- 5.1 Diffusion pattern of the wine grape production
- 5.2 Knowledge level of the wine grape growers about recommended practices of wine grape cultivation
- 5.3 Extent of adoption of recommended practices of wine grape cultivation
- 5.4 Profile of the wine grape growers
- 5.5 Relationship between attributes of the wine grape growers and their knowledge level and extent of adoption
- 5.6 Problems as perceived by the wine grape growers

5.1 Diffusion pattern of the wine grape production

Diffusion pattern of the wine grape was studied in two ways, namely number of farmers adopting wine grape each year and cumulative number of farmers adopting wine grape over a period of time (Table 3 and Fig. 2).

A close observation of Table 3 and Fig. 2 showed that adoption of wine grape production (adopter distribution) followed almost normal, bell-shaped curve when plotted over time on a frequency basis.

The curve drawn for cumulative number of farmers adopting wine grape over a period of time (diffusion curve) followed almost 'S' shape. The 'S' shaped diffusion curve rose slowly at first when there were few adopters in each time period. It then accelerated to a maximum until half of the farmers in the system had adopted the wine grape. Then it increased at a gradually slower rate as the few remaining farmers finally adopted. This finding is supported by the observation that the curve drawn for adoption of wine grape (adopter distribution) was normal and bell-shaped.

Rogers has done pioneering work in describing the shape of the adoption distribution curve, based on review of a large number of research studies. His generalization that adopter curve approaches bell shape under natural conditions prevailing in the society also holds good for the present study.

As the name implies, innovation is a new idea or object or practice created by an intellectual in the society. Naturally, the details of the innovation, at the time of its creation, are known only to the discoverer. The discoverer will diffuse the information about the innovation to the people with whom he interacts closely. Some among them, having been convinced about the new idea, may adopt the innovation at the first stage. When these first adopters are convinced about the innovation, they spread the new idea to many of their followers. Thus, spread of the information progressively increases and the number of adopters will go on increasing over a period of time. When over 50.00 per cent of the individuals in the community have adopted the practice, the potential adopters available in the community will decrease in the number. Hence the number of adopters in subsequent years will go on decreasing, although there will be increase in the total number of the adopters. This reasoning holds well for both type of the curves drawn.

The finding that diffusion curve followed 'S' shape was supported by the results reported by Ramegowda (1983), Thimmaraju (1985), Ramakrishna Rao *et al.* (1995), Nithya Shree (1996) and Yaligar (1997).

The finding that adopter distribution was normal and bell-shaped was supported by Rahim (1960), Bose (1964) and Nithya Shree (1996). Some researchers had also reported that adopter distribution was not normal and bell-shaped (Ramegowda, 1983; Thimmaraju, 1985 and Ramakrishna Rao, 1995).

5.2 Knowledge level of the wine grape growers about recommended practices of wine grape cultivation

5.2.1 Overall knowledge level of the wine grape growers about recommended practices of wine grape cultivation

A perusal of Table 4 revealed that little more than 85.00 per cent of the wine grape growers belonged to medium to high level of overall knowledge regarding recommended wine grape cultivation practices. Wine grape cultivation requires awareness of specific cultivation practices. The wine grape growers had high education level as it was observed from Table 8 and farmers with high educational level expose themselves to different mass media which provide the information about new technology. In addition, it was very clear from Table 9b and 11, the variables like extension participation, cosmopolitaness and economic motivation appeared to have influenced the overall knowledge level of the wine grape growers regarding recommended wine grape cultivation practices.

The present finding is in conformity with the findings of Ajay Kumar (1989), Siddaraju (1992), Ahire *et al.* (1999) and Birajdar (1999).

5.2.2 Knowledge level of the wine grape growers regarding specific recommended practices of wine grape cultivation

An appraisal of Table 5 indicated that all wine grape growers had correct knowledge of recommended varieties, suitable soil, spacing, opening of trenches, filling material used in trenches, propagation practices, irrigation method, gibberlic acid and cycocyl application and control of various pests and diseases of wine grape.

The reason to use recommended variety may be due to the fact that only recommended varieties were being promoted for cultivation by all wineries and non-existence of local varieties in wine grape. Use of recommended variety is prerequisite for wine grape cultivation and therefore, they might have acquired knowledge to the fullest extent.

Correct knowledge about suitable soil, spacing, opening of trenches, filling material used in trenches and irrigation method can be explained by simplicity of these practices and easy to remember the information obtained from different media. Also there was a considerable percentage of consultation with various informal sources like friends, relatives and neighbours by the respondents. In turn, these sources might have passed on the information to other growers. The tendency of farmers was that they prefer to contact successful farmers and try to know as much as possible. Such horizontal flow of information is a common feature among the Indian farmers.

Possession of correct knowledge regarding propagation practices, gibberlic acid and cycocyl application and control of various pests and diseases of wine grape is due to the fact that these wine grape cultivation practices are similar to that of grape cultivation practices. And almost all the respondents had experience of grape cultivation while majority of them are still cultivating grapes. Wine grape requires special care and rigid following of certain practices this might have forced them to gain appropriate knowledge about these practices.

The various recommended training methods were demonstrated by almost all the wineries to their respective contracted farmers and hence more than eighty per cent of the wine grape growers possessed correct knowledge about this practice.

On the contrary, more than 40.00 per cent of the wine grape growers were not having correct knowledge about fertilizer dose. The information relating to fertilizer dose is a complex

phenomenon and requires additional efforts to know and understand. Therefore, farmers find it difficult to comprehend and remember.

About 43.00 per cent of the respondents were not having correct knowledge of pruning time. Wine grape growers condition to prune the commercial grape one month later as that of wine grape. So, this has a bearing on knowledge of pruning time of wine grape leading into such kind of results.

It was discouraging to observe that, a large majority of the respondents were not aware of recommended quantity of organic manure and filling material. Since many years farmers were not able to procure required quantity of organic manures and as much they got that much they have applied to their fields. They are apprehensive of getting required quantity of organic manures. Because of this they were not even bothered to know the recommended level of organic manure application.

5.3 Extent of adoption of recommended practices of wine grape cultivation

The adoption of recommended cultivation practices depends on various factors such as farmer's knowledge, situational factors, extent of support of change agent efforts, personal and socio-psychological characteristics of farmers, the characteristics of an innovation itself, timely availability of input, etc. However, it is true that all the recommended practices will not be adopted to same level by all the members in a given social system. The findings of the present study are also in line with this fact with respect to adoption of wine grape cultivation practices by the wine grape growers which are presented in Table 7.

5.3.1 Overall adoption level of recommended practices of wine grape cultivation

The result revealed that 39.37 per cent of the wine grape growers had medium level of overall adoption, followed by 31.25 and 29.37 per cent of the respondents belonging to high and low overall adoption categories, respectively (Table 6).

Knowledge limits the action of the individual as it is the basic for any individual to think of pros and cons in making a decision to adopt or reject a practice, hence reason for more number of the wine grape growers to fall under medium adoption category was medium knowledge possessed by majority of the respondents. Another reason was majority of the wine grape growers were found in low to medium innovative proneness and risk orientation categories.

Another important fact is that there is a tendency of people to adopt only those practices, which they feel are simple, involve low cost and are effective in getting good yield.

5.3.2 Adoption of specific wine grape cultivation practices by wine grape growers

A perusal of results in Table 7, revealed the individual cultivation practices adopted by the wine grape growers.

5.3.2.1 Variety

The data presented in Table 7 depicted that more than half of the wine grape growers had grown Cabernet Sauvignon variety. Whereas, other six wine grape varieties namely Shiraz, Chenin Blanc, Sauvignon Blanc, Zinfandel, Merlot and Pinot Noir were grown by varying per cent of the respondents. It is due to the fact that all the recommended varieties were being promoted by wineries and were adopted by farmers since long time. It also due to the fact that these varieties are having good demand by wineries and best suited to the study area. Non-existence of local wine grape varieties is the other major reason for above finding.

5.3.2.2 Layout and land preparation practices

Cent per cent and nearly 95.00 per cent of the wine grape growers had adopted the practices like opening of trenches and suitable soil, respectively.

Establishment of orchard is an important operation which involves selection of proper site and opening of trenches. This is also an important decision making activity for future operations. The wine grape growers normally approach fellow wine grape growers to decide trench size. Hence, the recommended practice was adopted by all wine grape growers irrespective of the size of the orchard.

Further, it was also seen that a vast majority of the respondents had partially applied filling material to trenches while, the remaining few farmers had adopted the recommended quantity. Lack of knowledge on its recommended quantity, non-availability at the time of need and finance problem were the reasons for partial adoption of recommended quantity of filling material. High cost of transportation and application also hindered the use of filling material.

5.3.2.3 Spacing followed

It was evident that 86.25 and 13.75 per cent of the respondents followed the recommended spacing of 9ft x 4ft and 8ft x 4ft. Simplicity, low cost of the practice as well as desire to obtain good quantity yield per vine prompted to follow correct spacing. It was also due to sharing of experience and guidance received from progressive farmers.

5.3.2.4 Application of organic manure

A large majority of the respondents had applied partial dose of organic manure whereas, only 11.87 per cent of them had applied recommended dose of organic manure. Non-availability of organic manure in time, manuring involves relatively more cost and also because of inadequate guidance regarding organic manure requirement of wine grape.

5.3.2.5 Chemical fertilizer application

A large number of wine grape growers did not apply the recommended dose of chemical fertilizers during summer and winter season. The reason, for non-adoption of fertilizers as per recommendation, may be because of non-availability of fertilizers at the time of need, high cost of fertilizers, inadequate guidance regarding nutrient management and also because of the fact that more number of farmers were adopting organic farming by minimizing use of chemical fertilizers in their orchards.

5.3.2.6 Propagation practices

It is clear that all the wine grape growers had adopted the recommended root stock and wedge method of root stock grafting. Three fourth of the respondents had followed recommended time of root stock grafting. Adoption of recommended root stock, grafting method and grafting time is due to the fact that these wine grape cultivation practices are similar to that of grape cultivation practices. And almost all the respondents had experience of grape cultivation, while majority of them still cultivating grapes.

Further, it was seen that over 90.00 per cent of the wine grape growers had adopted dog ridge, followed by SO 4 and 110 R as root stock which are having an advantage of drought resistance, salt tolerance and nematode tolerance.

5.3.2.7 Irrigation method

It is observed from Table 7 that cent per cent of the wine grape growers adopted drip irrigation to their orchard.

Though the study area received considerable amount of rainfall, prevalence of dry spell was observed to be quite often in this area. So, more emphasis is given to conserve the available water and hence farmers are forced to take up water saving measures to irrigate the orchard. To overcome this, government is providing subsidy for drip irrigation due to which 60.00 per cent of water is saved and 20.00 per cent of yield is increased. In addition to this,

drip irrigation helps to reduce salinity hazards and also helps to integrate fertigation practices. Considering the above facts all the wine grape growers have adopted drip irrigation method to their orchards.

5.3.2.8 Pruning time for wine grape

Removal of any vegetative part is called pruning. It is done to concentrate the growth activity of the vine in the parts left after pruning and to induce sprouting of the fruitful buds located in the middle portion of the canes. Pruning is done twice in the year, once in summer and again in winter.

A large majority of the wine grape growers pruned the vine in April and September. Pruning during this period helps to get a good cane development and bud burst due to hot temperature and clear weather. It enables growers to harvest the fresh fruits little early which are having good demand from wineries and also fetch better price.

5.3.2.9 Training method

The data from Table 7 brought out the fact that more than half of the wine grape growers adopted bower method and 'Y' system of training. The training methods like small 'Y' trellis and vertical shoot position (VSP) were adopted by few numbers. Relatively big wine grape growers having high educational and economic status have tried small 'Y' trellis and VSP. However, bower and 'Y' methods were most preferred and widely adopted systems, because of their simplicity and affordability. Small 'Y' trellis and VSP are recent training methods which are improvements over the other methods. However, there is an additional cost involved in adoption of these training methods. Training is a unique practice in wine grape cultivation which enables viticulturist to maintain the stature and spread of the vine and it will be convenient to carry out the operations like pruning, inter culture, spraying and harvesting.

5.3.2.10 Growth regulators and growth retardants

Only 20.00 per cent of the wine grape growers used 10 ppm gibberlic acid at the pre bloom stage. Application of 10 ppm gibberlic acid at pre bloom stage increases berry size and results in low TSS (total soluble solids) of wine grape produce which fetch less price in wineries.

Growth retardant 'cycocyl' was used by nearly 92.00 per cent of the wine grape growers @ 500 ppm at five leaf stage to control vigour of vine. The reason for adoption of cycocyl treatment by majority of the respondents may be to control the excess vegetative growth which ultimately improves the quality of wine grape.

5.3.2.11 Plant protection

Pests noticed and chemicals used to control

Most of the wine grape growers applied chemicals like imidacloprid, dimethoate, endosulfan, verticillium to control thrips and chemicals like malathion, carbaryl, neem oil, nuvan were used to control flea beetle. While, to control mealy bugs chemicals like dichlorovos, verticillium, neem oil, avon and dichlorovos + fish oil raisin soap were applied by the wine grape growers.

Cent per cent of the wine grape growers possessed correct knowledge as mentioned earlier in the chapter to control pests. In addition to this, discussions and extension meetings organized by wineries before the crop period might have also helped wine grape growers to apply the right chemicals to control pests.

Disease noticed and chemicals used to control

The important diseases noticed by the wine grape growers were powdery mildew, downey mildew and anthracnose.

Most of the wine grape growers used chemicals like sulphur, sythane, hexaconazol and penconazol to control powdery mildew. Bordeaux mixture, ridomill, copper oxychloride

were used to control downy mildew. Anthracnose was controlled by using Bordeaux mixture, copper oxychloride, propineb, carbendazim and dithane M-45. These diseases affect the quantity and quality of wine grapes. Apart from that cent per cent of wine grape growers were aware of this fact.

5.4 Profile of the wine grape growers

5.4.1 Age

The data in Table 8 pertaining to the age showed that more than 60.00 per cent of the wine grape growers (61.87%) were middle aged. Middle aged farmers are more enthusiastic, had more knowledge and experience about wine grape cultivation. Further, respondents between 31 to 50 years of age group have physical vigour and also more responsibility towards family than younger ones. Thus, most of the wine grape growers fell in the middle age group could be justified.

The result was in line with the research findings reported by Birajdar (1999) and Gotyal (2007).

5.4.2 Education

An overview of Table 8 revealed that more than 98.00 per cent of the wine grape growers had formal education ranging from primary to graduation level, while very negligible per cent of the respondents (1.87%) were illiterates. Further, it was found that 38.75 per cent of respondents had completed graduation, followed by the respondents who had received education upto pre-university (26.87%) and high school (23.12%) level. The reasons that could be offered for the above finding is that high socio-economic status of farmers and their family background. Further, the facilities of schooling available might be the other reason.

The result was in conformity with the findings of Ajay Kumar (1989), Birajdar (1999) and Patil (2008).

5.4.3 Orchard size

An equal per cent of the wine grape growers (45.62% each) were having small (< 2.50 acres) and medium (2.50 - 10.00 acres) orchard size. Only 8.72 per cent of the respondents possessed large orchard (>10.01 acres). Because of more labour requirement, high wages and low price for agricultural produce, majority have diversified their farming by establishing orchards which could be maintained easily and achieve good economic stability.

Similar findings were reported by Lokhande (1990) and Patil (2008).

5.4.4 Proximity to winery unit

About eighty per cent of the wine grape growers were having their vineyards within 10 km distance from winery unit. Whereas, 18.75 and 3.75 per cent of the respondents were found to have vineyards in 11 to 15 km and 16 to 20 km away from winery unit. The efforts of nearby wineries had great influence in this regard.

5.4.5 Extension participation

It was evident from Table 9b that 80.00 per cent of the wine grape growers were grouped under medium and high level of extension participation. Majority of the respondents participated actively in extension activities like krishimela, agricultural exhibitions, extension meetings and group discussions organized by various extension agencies, extension personnel, grape association and wineries.

This finding was in accordance with the findings of research studies reported by Birajdar (1999), Govinda Gowda and Narayana Gowda (2006), Gotyal (2007) and Patil (2008).

The results in the table 9a indicated that 11.25, 9.37 and 6.25 per cent of the wine grape growers were regularly participated in extension activities like agricultural exhibitions, krishimela and training programmes, respectively. While more than half of the respondents occasionally participated in group discussions, extension meetings, krishimela and agricultural exhibitions. Majority of the respondents' regular to occasional participation in above activities was because of their high educational status, higher economic motivation and there is room for exposure to new agricultural technologies.

5.4.6 Mass media participation

As high as 67.00 per cent of the wine grape growers were found in medium to high level of mass media participation. This indicates that mass media like television, radio, news paper and farm magazine were utilized by a large majority of the respondents. It might be due to high educational level and sound economic status of the wine grape growers.

The above finding was in agreement with the findings of Birajdar (1999) and Govinda Gowda and Narayana Gowda (2006).

The results pertaining to mass media participation presented in Table 10a revealed that television was the most effective common medium which was possessed by a large majority of the wine grape growers (98.75%). Increasing popularity and monopolization of television dominated in its use over the other mass media. Radio, the other most popular mass media was possessed by 96.25 per cent of the respondents. A common man easily affords to possess radio. Moreover, these two media overcome the barrier of illiteracy.

The television viewing and radio listening were used mainly for the purposes other than agricultural programmes. The less utility, lack of practicability and inconvenient timing of the agricultural programmes were the reasons that could be attributed to this finding.

As one of the cheapest mass communication media, newspaper was subscribed by 83.75 per cent of the respondents. This was due to the fact that about cent per cent of the respondents were literate and they tend to expose themselves to print media like newspaper. Among the total respondents, more than 80.00 per cent of the respondents were regular readers of news and agricultural articles.

The farm magazine was subscribed by 30.62 per cent of the respondents and nearly thirty per cent of the respondents were regular readers of agricultural articles. Lack of applicability and monotonous agricultural information resulted in this kind of result.

5.4.7 Cosmopolitaness

The data presented in Table 11 indicated that three fourth of the wine grape growers were found in medium to high categories of cosmopolitaness. The study area in both districts is very nearer to taluks and district places and hence the wine grape growers regularly visit towns to purchase necessary goods and obtain services.

The above finding got support from the studies conducted by Kumbar (1983) and Govinda Gowda and Narayana Gowda (2006).

5.4.8 Deferred gratification

Majority of the wine grape growers (66.25%) belonged to medium deferred gratification category. The respondents are characterized by high educational status and high economic motivation. Such people generally curb their immediate wants and needs for future long term developments. People who went for wine grape cultivation have cut short many of their expenses keeping future needs in consideration.

This finding was in conformity with the findings of Govinda Gowda and Narayana Gowda (2006).

5.4.9 Economic motivation

As high as 67.49 per cent of the wine grape growers had medium to high level of economic motivation. Economic motivation is an individual's motivation to attain maximum profit. Wine grape is one such crop where higher returns are always expected. So, it is quite natural that majority of wine grape growers had medium to high level of economic motivation.

Similar findings were reported by Gotyal (2007) and Patil (2008).

5.4.10 Innovative proneness

It was evident from Table 11 that about 57.00 per cent of the wine grape growers were grouped under medium to high levels of innovative proneness. Innovative proneness is a cognitive aspect of change, which affects the readiness of an individual to accept new technology. The medium to higher levels of the respondents might be owing to their higher educational status, better knowledge level, higher cosmopolitanism, extension participation and economic motivation. Further, majority of the respondents possessed small to medium orchard size and hence they would like to achieve higher returns by adopting the innovations intensively.

The finding was in inconformity with the findings of Kumar (1998) and Chandrashekhara (1999).

5.4.11 Risk orientation

Nearly 72.00 per cent of the wine grape growers had low to medium risk orientation. Wine grape is less intensive crop than table grape and it requires less care, labour, nutrients and management as compare to table grape. In addition to this, a large majority of the respondents had buy back contract with wineries, so they were having better price assurance for their wine grape. Hence, various production and marketing risks were minimized owing to the wine grape production.

The result was in line with the findings of Ramesh Babu (1987), Ajay Kumar (1989) and Ananda (1992).

5.5 Relationship between attributes of the wine grape growers and their knowledge level and extent of adoption

5.5.1 Relationship between attributes of the wine grape growers and their knowledge level

Findings in Table 12 enlightened that out of 11 variables, 8 variables were found to be positively significant in influencing the knowledge level of the respondents about recommended practices of wine grape cultivation. They are education, orchard size, extension participation, mass media participation, cosmopolitanism, economic motivation, innovative proneness and risk orientation. As discussed in the preceding part of this chapter, each of these variables have considerable influence on the knowledge level of recommended wine grape cultivation practices of the respondents and hence the results.

It is of general opinion that education of the farmers favours acquisition of knowledge and widens the horizon of knowledge by proper understanding of the importance of recommended cultivation practices by getting exposed to extension agencies and contacting other informal sources.

It means that these variables play an important role in acquiring knowledge of wine grape cultivation. This implies that farmers who had favourable orientation towards new technology (i.e., wine grape cultivation), would like to know new ideas to adopt, got higher exposures to different mass media, had better opportunities to expose to contrived experiences, look for credit and look for delayed but complete satisfaction which ultimately leads into higher information seeking and acquiring behaviour.

Supportive findings

It is obvious that, though different researcher studies may have some similarities, however, they are not exactly identical in terms of all the conditions. Accordingly the findings of the study are in conformity with the following studies, which are given in terms of independent variables.

Age

Kumar (1998) on banana growers and Thippeswamy (2007) on coconut growers had noticed non-significant relationship between age and knowledge of cultivation practices of these crops.

Education

Birajdar (1999) on grape growers, Kavaskar and Govind (2006) on banana growers, Raut (2006) on orange growers and Thippeswamy (2007) on coconut growers had observed significant relationship between education and knowledge level of cultivation practices of these crops.

Orchard size

Ahire *et al.* (1999) on grape growers, Birajdar (1999) on grape growers and Raut (2006) on orange growers found significant relationship between orchard size and knowledge level of cultivation practices of these crops.

Extension participation

Ahire *et al.* (1999) on grape growers, Birajdar (1999) on grape growers and Thippeswamy (2007) on coconut growers had noticed significant relationship between extension participation and knowledge level of crop cultivation practices.

Mass media participation

Siddaraju (1992) on grape growers and Birajdar (1999) on grape growers had revealed significant relationship of mass media participation with knowledge level of cultivation practices of these crops.

Cosmopolitaness

Raghavendra (1997) on arecanut growers and Kumar (1998) on banana growers and had reported significant relationship between cosmopolitaness and knowledge level.

Deferred gratification

Kantharaju (1989) on coffee and cardamom growers and Maraddi (2006) on sugarcane growers had observed non-significant relationship between deferred gratification and knowledge level.

Economic motivation

Birajdar (1999) on grape growers, Kavaskar and Govind (2006) on banana growers and Thippeswamy (2007) on coconut growers had reported significant relationship between economic motivation and knowledge level.

Innovative proneness

Maraddi (2006) on sugarcane growers and Thippeswamy (2007) on coconut growers had observed significant relationship of innovative proneness with knowledge level of cultivation practices of these crops.

Risk orientation

Birajdar (1999) on grape growers, Kavaskar and Govind (2006) on banana growers and Maraddi (2006) on sugarcane growers found significant relationship between risk orientation and knowledge level.

5.5.2 Relationship between attributes of the wine grape growers and their extent of adoption

Social psychologists, management experts and economists have confirmed that factors such as biography of experiences, education, income, motives, aspirations of an individual can modify his extent of adoption. In other words, ones extent of adoption cannot be understood and accounted for without reference to his social environment and to the character of his interpersonal relations.

The findings of this study have shown that the respondents' extent of adoption was positively and significantly related with nine personal and psychological factors, which were education, orchard size, extension participation, mass media participation, cosmopolitanism, deferred gratification, economic motivation, innovative proneness and risk orientation. The result of each of these factors is discussed in the ensuing paragraphs.

Education

The wine grape growers' extent of adoption had positive and significant relationship with their education level. Education exposes farmers to more communication media or methods. Better perception and comprehension could be observed among well educated wine grape growers than others. Acquisition of formal education may also help to interpret ideas in a rational manner resulting in pragmatic decision making. Thus, education provides a persistent reorientation to the wine grape growers, wherein, they gradually subsume science and innovation and ultimately reflecting on better adoption of practice. Therefore, the finding seemed to be logical.

This finding is in agreement with the findings of Lokhande and Wangikar (1991), Govinda Gowda (2002) and Gotyal (2007).

Orchard size

The orchard size was positively and significantly correlated with extent of adoption of wine grape growers. The wine grape growers with larger orchard size will have more opportunities and potentialities to try and adopt large number of technological innovations. As a result, it is quite possible that wine grape growers with larger orchards evince keen interest to know about new farm practices and be more receptive to such ideas thus leading to better acquisition of knowledge, skills and other management factors, which in turn reflect on their extent of adoption.

The finding is in accordance with the findings expressed by Govinda Gowda (2002) and Gotyal (2007).

Extension participation

Extension participation of wine grape growers found to have positive and significant relationship with their extent of adoption. The previous research studies demonstrated a positive and significant relationship between extension participation and extent of adoption (Govinda Gowda, 2002 and Gotyal, 2007).

It is obvious that wine grape growers with higher level of extension participation are generally favourably predisposed to acquire more information, skills and other factors relating to wine grape cultivation consequently, raising their extent of adoption. In addition, extension participation provides opportunity for gaining contrived experiences, which necessarily act as a strong motivational factor for higher adoption. Thus, in the present study positive and significant relationship has been established between extent of adoption and extension participation.

Mass media participation

There existed a positive and significant relationship between mass media participation and extent of adoption. The higher levels of exposure to mass media would

facilitate the individual to develop habits of gathering more information about innovations through television, radio, news paper and other literature related to wine grape cultivation. Such individuals will be in readiness to accept the practices than others, who do not have exposure to mass media. In other words, exposure to mass media modernise farmers, make them more efficient in acquiring, retaining and evaluating the effective factors of adoption. Mass media also provides enormous opportunity for repeated exposure to new technology, motivating the wine grape growers to reacquire and to take positive steps relevant for adoption of wine grape cultivation practices. This view could be supported by Festingers (1957), 'Dissonance theory' which states that, due to accumulation of information in the individual, a dissonance stage is created and in order to maintain homeostasis, the individual will be motivated to adopt technologies. Thus, the findings of the present study seemed to be on right lines.

Similar findings were reported by Ajay Kumar (1989), Govinda Gowda (2002), and Gotyal (2007).

Cosmopoliteness

Positive and significant relationship was noticed between cosmopoliteness of the wine grape growers and their extent of adoption. Cosmopolite farmers are brought into an atmosphere of broader perspectives where there is a better scope for exchange of new ideas and facts. Further, the individuals who interact with other people outside their systems are likely receive cues from other people that would serve as further reinforcer supporting the concepts of legitimization and reinforcement. Thus the wine grape growers might have been tempted to acquire the effective factors of adopting the technology and profit maximization techniques on their orientation outside the social system. Rogers and Svenning (1969) consider cosmopoliteness as an important antecedent variable to bring about modernization. In this context, a cosmopolite individual will have tendency to achieve higher ranks with respect to socio-economic aspects through adoption of recommended wine grape cultivation practices.

The finding of this study gets the support of findings reported by Govinda Gowda (2002).

Deferred gratification

The deferred gratification had a significant and positive relationship with extent of adoption. The present finding can be substantiated by the reason that the wine grape growers get a handsome income from the wine grape production. Even though, the part of it is spent on food, clothes and social obligations of urgent needs, a considerable amount might have been utilized for productive purposes like purchase of inputs to vine yard, equipments and modernizing the vine yard, at the cost of luxury. This might have facilitated the wine grape growers to practice new technology acquired related to wine grape, consequently reflecting on higher extent of adoption. Therefore, the present finding seemed to be natural.

The finding of the study is in agreement with the finding reported by Govinda Gowda (2002).

Economic motivation

The economic motivation had positive and significant relationship with extent of adoption. Economic motivation is the basic character upon which other motives, drives and other attributes are built. It psychologically conditions an individual to orient himself to achieve higher income. Wine grape cultivation being a highly remunerative enterprise, one could develop higher levels of economic motivation. When one develops higher levels of economic motivation and wants to achieve it, he would strive hard and get internalize himself about different aspects of wine grape cultivation practices besides aiming at profit maximization. Hence, it is quite natural to expect this type of relationship.

Similar findings were reported by Ramesh Babu (1987), Govinda Gowda (2002) and Gotyal (2007).

Innovative proneness

The innovative proneness was found to have positive and significant relationship with extent of adoption. Similar finding was reported by Govinda Gowda (2002).

The most important cause of innovative proneness is an underlying willingness to change and to try new ideas. This is treated as psychological trait which manifests in all behavioural aspects of a wine grape grower, which also serves as an indicator of the wine grape growers' orientation to excel in wine grape production and succeed in his activities. Further, the individual who is prone to innovations generally will have higher orientation towards risks, scientific technology and competition. It also acts as an indicator of person's evaluative perception of activities with different dimensions such as practicability leading to rational decision making thus, it helps an individual to realize maximum economic profits from wine grape production. Thus, innovative proneness has established positive and significant relationship with extent of adoption.

Risk orientation

Risk orientation was found to be positively and significantly related to extent of adoption. It could be explained that, the wine grape growers with higher levels of risk orientation would be much ahead of others in exploiting the potentialities of wine grape production technology. Such individuals would possess more entrepreneurial characteristics like cosmopolitanism, economic motivation, innovative proneness etc. These individuals will be very much critical and cautious in understanding different aspects of this technology which directly or indirectly might have helped them to acquire different components essential for better adoption of wine grape production. Hence, it is reasonable to expect positive and significant relationship of risk orientation with extent of adoption.

Similar views were expressed by Kumbar (1983), Ajay Kumar (1989), Lokhande and Wangikar (1991), Govinda Gowda (2002) and Gotyal (2007).

5.6 Problems as perceived by the wine grape growers

A perusal of Table 14 gives detailed information on technical, financial, inputs, marketing and general problems faced by the wine grape growers.

5.6.1 Technical problems

Inadequate guidance regarding improved technology was prime technical problem (86.62%) of the wine grape growers. Non-availability of desired number of wine grape production experts within study area and lack of competency in field extension personnel resulted in perception of this problem.

Three fourth of the respondents expressed increased resistance of pests and disease to plant protection chemicals as another prime technical problem. Poor management of plant protection with respect to dosage, timing and repetition resulted in resistance of pests and diseases which needs to be addressed meticulously.

More than 44.00 per cent of the respondents expressed the problem of labour shortage. Wine grape is labour intensive crop and requires skilled labourers. Non availability of labourers during critical stages and lack of skill resulted in shortage of labours. While, non availability of manures and fertilizers in time (26.87%) and difficulty in replacing variety (4.37%) were the other technical problems as expressed by the wine grape growers.

5.6.2 Problems related to the inputs

High cost of planting material (100.00%), high cost of plant protection chemicals (88.75%), high cost of fertilizers (82.50%), high establishment cost (73.152%) and high cost of labour (28.75%) were the major problems related to the inputs as expressed by the wine grape growers.

Planting material is domestically unavailable and is imported from France and Germany, marketed by wineries, so it is very costly. In addition to this, prices of plant protection chemicals, fertilizers, hormones and labour have been increasing day by day. Thus, the cost of every input was perceived as high by the wine grape growers.

5.6.3 Financial problems

Insufficient credit and very high rate of interest were the important financial problems as expressed by the wine grape growers.

Wine grape being a heavy investment crop requires finance for vine yard establishment, production and for expansion of area. So, wine grape growers need lot of credit facilities in time at low rate of interest and with minimum formalities or procedures from financial institutions. The present state of credit facility is not satisfactory as rate of interest is very high and tedious procedures in advancing loan. Therefore, these problems were expressed by many of the wine grape growers.

5.6.4 Marketing problems

It can be seen from Table 14 that the marketing problems were delayed cash payment by wineries and wineries are far away as expressed by 11.97 and 1.25 per cent of the respondents.

Though, majority of the wine grape growers had buy back contract with wineries some of the respondents were not able to get their payment on time. Hence, the result.

5.6.5 General problems

General problems expressed by the wine grape growers were irregular and insufficient supply of electricity for irrigation (100.00%), lack of information about government schemes and subsidies (45.00%) and lack of insurance support (25.62%).

Irregular and insufficient supply of electricity for irrigation was major problem faced by the wine grape growers because of more demand for electricity by the industrial area resulted in frequent power cut, as all the wine grape growers had drip irrigation system for which regular electricity was necessary.

The findings of this part of the study were in accordance with the findings of Birajdar (1999), Thirumal Valavan and Radha (2005), Gotyal (2007) and Patil (2008).



Plate.1. Researcher interviewing the respondent



Plate.2. A wine grape orchard



Plate.3. Small Y trellis training method of wine grape



Plate.4. Y method of training of wine grape



Plate.5. A pruned wine grape orchard



Plate.6. Harvested wine grapes

6. SUMMARY AND POLICY IMPLICATIONS

In India, Maharashtra ranks first in wine grape cultivation with an area of 8,000 acres, which formed a proportion of 91.95 per cent in the country's wine grape area during the year 2007. It is one of the important states growing different varieties of wine grape. Cultivation of wine grape is extensively carried out in the belts of Nashik, Pune, Sangli, Solapur, Latur, Buldhana, Osmanabad and Ahmadnagar districts.

The government of Maharashtra not only created Grape Board, Wine institute and Wine Parks but also initiated several promotional activities all over the state to increase area under wine grape cultivation. Numbers of wine grape production technologies are recommended to get maximum benefits, yet the wine grape growers are not following all the recommended technologies and their cultivation practices vary from farmer to farmer according to their personal and socio-economic characteristics, perceived training needs, availability of factors of production and the problems in the wine grape cultivation.

Keeping this in view, the present investigation was designed with the following specific objectives

1. To study the diffusion of wine grape production among farmers
2. To assess the knowledge and extent of adoption of wine grape production by farmers
3. To know the profile of wine grape growers
4. To ascertain the problems of wine grape growers

The study was conducted in Nashik and Pune districts of Maharashtra during the year 2008-09. These two districts were selected purposively, since these districts have larger area under wine grape cultivation. Further, Niphad, Nashik and Dindori taluks from Nashik district and Junnar taluk from Pune district were selected in proportion to the highest area under wine grape cultivation. There after, five villages having the highest area under wine grape cultivation and also having maximum number of wine grape growers were selected from each taluk. One hundred and sixty respondents were selected from the selected 20 villages by adopting simple random sampling.

In the light of the objectives set for the study, knowledge and extent of adoption of wine grape growers about recommended wine grape cultivation practices were the two dependent variables. The variables age, education, orchard size, proximity to winery unit, extension participation, mass media participation, cosmopolitaness, deferred gratification, economic motivation, innovative proneness and risk orientation were the independent variables.

A pre-tested interview schedule was used to collect the data from the wine grape growers by personal interview method. The data collected were scored, tabulated and analyzed by using frequency, percentage, mean, standard deviation and correlation.

The salient findings of the present study are:

1. The frequency curve of the diffusion followed almost 'bell-shape' when plotted over time. The cumulative curve of diffusion nearly approached 'S-shape' when plotted over time.
2. Forty five per cent of the wine grape growers had medium level of knowledge about recommended practices of wine grape cultivation. Whereas, 40.62 and 14.37 per cent of the respondents belonged to high and low knowledge levels, respectively.
3. Cent per cent of the respondents had correct knowledge about recommended varieties, suitable soil, spacing, opening of trenches, propagation practices, irrigation method, gibberlic acid and cycocyl application, control of various pests and different diseases of wine grape.

4. As high as 73.75 per cent of the respondents were not having knowledge about correct quantity of filling material.
5. Little more than one third of the respondents had correct knowledge of application of organic manure to the wine grape.
6. More than 80.00 per cent of the wine grape growers had knowledge about training methods recommended for wine grape.
7. More than half of the wine grape growers had correct knowledge about fertilizer application at winter and summer.
8. Correct knowledge about pruning time of wine grape was possessed by 57.50 per cent of the respondents.
9. About 40.00 per cent of the respondents belonged medium level of adoption category followed by 31.25 and 29.37 per cent of them in high and low adoption categories, respectively.
10. As high as 57.50 per cent of the respondents had grown Cabernet Sauvignon variety. While considerable per cent of the respondents had grown Shiraz, Chenin Blanc, Sauvignon Blanc and Zinfandel varieties.
11. A large majority (94.37%) of the respondents irrespective of orchard size had grown wine grape on suitable soil.
12. Only 10.00 per cent of the respondents fully adopted the recommended quantity of filling material.
13. Spacing was adopted by cent per cent of respondents as per recommendation.
14. Nearly 12.00 per cent of the wine grape growers applied recommended dose of organic manure to their orchards.
15. During summer, only 10.00, 3.75 and 10.62 per cent of the respondents applied nitrogenous, phosphatic and potassic fertilizers as per recommendation. For winter season 8.75, 7.50 and 10.62 per cent of the respondents applied nitrogenous, phosphatic and potassic fertilizers as per recommendation, respectively.
16. Dog ridge root stock was adopted by 91.87 per cent of the respondents. While, very few of them adopted SO 4 and 110 R root stock.
17. Cent per cent of the respondents adopted drip irrigation method to their vine yards.
18. A large majority of the respondents followed summer pruning in April (71.87%) and winter pruning in September (90.62%).
19. With respect to training method, more than half of the respondents adopted bower and Y system and 10.62 per cent small Y trellis system, while very negligible per cent of the respondents adopted VSP training system for wine grape cultivation.
20. A large majority of the respondents (80.00%) did not adopt the gibberlic acid treatment.
21. Cycocyl application was adopted by more than 90.00 per cent of the respondents.
22. Chemicals like imidacloprid, dimethoate and endosulfan were used as preventive and curative measure against thrips, whereas different chemicals such as malathion, cypermethrin, carbaryl, neem oil, nuvan were used to control flea beetle. Verticillium, dichlorovos, neem oil, avon, dichlorovos + fish oil raisin soap were used to control mealy bugs.

23. Powdery mildew was controlled by using chemicals like sulphur, systhane, hexaconazol and penconazol. Bordeaux mixture, ridomill and copper oxichloride chemicals were used to control downy mildew. While, Bordeaux mixture, copper oxichloride, propineb, carbendazim and dithane M-45 were used to control anthracnose.
24. Education, orchard size, extension participation, mass media participation, cosmopolitaness, economic motivation, innovative proneness and risk orientation exhibited positive and significant relationship with knowledge level of wine grape growers.
25. Education, orchard size, extension participation, mass media participation, cosmopolitaness, deferred gratification, economic motivation, innovative proneness and risk orientation were found to have positive and significant relationship with extent of adoption of wine grape cultivation practices.
26. The major technical problems perceived by the wine grape growers were inadequate guidance regarding improved technology, increased resistance of pests and diseases to plant protection chemicals, labour shortage and non-availability of manures and fertilizers in time
27. High cost of planting material, high cost of plant protection chemicals, high cost of fertilizers, high establishment cost and high cost of labour were the important problems related to the inputs.
28. The important financial problems expressed by the wine grape growers were inadequate quantity of credit and very high rate of interest.
29. The general problems denoted by the wine grape growers were irregular and insufficient supply of electricity for irrigation, lack of information about government schemes and subsidies and lack of insurance support.

Implications of the findings of the study for field extension work

1. The differential rate of adoption of wine grape among farmers calls for intensification of efforts by the extension agencies. It pin points that the extension agencies should not wait for a technology to take its own time to 'trickledown' in a social system, however promising the technology may be, they should contact farmers belonging to different categories and persuade them to adopt the innovations in the shortest possible time.
2. The findings of the study indicated that 59.37 per cent of the wine grape growers had low to medium level of knowledge about recommended wine grape cultivation practices. Hence, it is imperative that the State Department of Agriculture and National Research Centre on Grapes, Pune should make integrated and coordinated extension efforts to impart the required knowledge about recommended cultivation practices to wine grape growers.
3. The study indicated a vast gap in adoption of key practices such as fertilizer application, organic manure application, filling material application, pruning time, training methods, gibberlic acid treatment, as they are not being followed by many, as per the recommendation. Both method and result demonstrations need to be conducted to educate and motivate wine grape growers for the adoption of these practices.
4. Recommended dose of organic manure was not applied by majority of wine grape growers. They expressed non-availability of organic manure when required as the main reason for the present status. This is to be viewed seriously and concerted efforts are needed to develop extension strategy for every village so that organic manures are available within the village in required quantity and at required time.

5. Extension participation, cosmopolitaness and mass media participation have shown positive and significant relationship with adoption level of wine grape growers. The line department in collaboration with National Research Centre on Grapes, Pune, Grape Board, Wine Institute and Wine Parks should essentially organize extension activities during off season followed by regular field visits and interaction meetings to promote increased adoption of wine grape production technologies.
6. There is need to have a consortium of progressive grape growers, scientists from different institutes, representatives of grape grower associations and lead input providers to tackle the genuine problems of wine grape growers in an organized manner and develop appropriate strategy for wine grape production.

Suggestions for the future research

The present study was confined to only two districts of Maharashtra; hence findings of this study could not be generalized to other regions. Therefore, a comprehensive research study covering all the wine grape growing districts of the state need to be carried in order to draw a comprehensive generalization and to make concrete recommendations for planners and policy makers to formulate an effective diffusion and production strategy for wine grape.

Further, researchers may think of conducting studies on diffusion of various crops and also they may think of grouping the adopters into different categories based on the innovativeness and study the characteristics of each category.

REFERENCES

- Ahire, R. D., Kulkarni, R. R. and Lambat, A. H., 1999, A study on correlates of knowledge of grape technology. *Maharashtra J. Ext. Edu.*, 18: 193-195.
- Ajay Kumar, P., 1989, A study on adoption behaviour and information consultancy of grape growers in Ranga Reddy district, Andhra Pradesh. *M.Sc. (Agri.) Thesis*, Univ. of Agric. Sci., Bangalore.
- Alao, J. A., 1981, The diffusion of fish ponds in Western state Nigeria. *In Extension and Rural Development (Volume I)*, Edited by Gouch, B.C. and Shankaraiah. John Wiley and Sons, New York, pp. 209-224.
- Ananda, T. N., 1992, Farmers perception of drip irrigation efficiency in grapes in Bangalore district in Karnataka. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Anonymous, 2006, *Present scenario of wine industry in India*. National Research Centre for Grapes, Pune.
- Anonymous, 2008, *Grape profile*, National Research Centre for Grapes, Pune.
- Anonymous, 2009, *Agriculture*. Centre for Monitoring Indian Economy, Mumbai, pp. 334-336.
- Balasubramani, N., 1997, Knowledge and adoption behaviour of rubber growers in Belthangadi taluk of Dakshina Kannada district. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Beal, G. M. and Rogers, E. M., 1960, The adoption of two farm practices in a central Iowa community. *Iowa Agric. and Home Eco. Exp. Sta., Spec. Rep.*, 26.
- Bheemappa, A., 2001, Comparative analysis of knowledge and technological gap in adoption of paddy and cotton cultivation practices between migrant and non-migrant farmers of TBP command area in Karnataka. *Ph.D. Thesis*, Univ. Agric. Sci., Dharwad.
- Birajdar, S. R., 1999, A study on knowledge and adoption behaviour of grape growing member farmers of Maharashtra Rajya Drasha Bagiatar Sangh, Solapur. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.
- Bose, S. P., 1964, Diffusion of a farm practice in Indian villages. *Rural Soc.*, 29: 53-66.
- Chandrashekhara, P., 1999, Knowledge and adoption gaps in coffee cultivation practices among coffee growers. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Chiprikar, B. P. and Khupse, T. S., 1992, A study of grape growers with special reference to the transfer of grape technology. *Maharashtra J. Ext. Edu.*, 11: 313-318.
- Desai, G. R., 1981, A critical analysis of the orientation of education and extension guidance to economic performance of cotton farmers of Karnataka state. *Ph.D. Thesis*, Univ. Agric. Sci., Bangalore.
- English, H. B. and English, A. C., 1958, *A Comparative Dictionary of Psycho Analytical Terms*. Longermans, Greens and Co., New York.
- Festinger, Z., 1957, *A Theory of Cognitive Dissonance*, Stafford University Press, California.
- Gotyal, S. H., 2007, Backward and forward linkages of grape production in Karnataka. *Ph.D. Thesis*, Univ. Agric. Sci., Dharwad.

- Govinda Gowda, V., 2002, A study on sustainable grape cultivation practices adopted by Bangalore Blue and Thompson Seedless growers in Bijapur and Bangalore rural districts in Karnataka. *Ph.D. Thesis*, Univ. Agric. Sci., Bangalore.
- Govinda Gowda, V. and Narayana Gowda, K., 2006, Profile of Thompson Seedless and Bangalore Blue grape growers. *Mysore J. Agric. Sci.*, 40 (3): 424-429.
- Govinda Gowda, V. and Narayana Gowda, K., 2007, Adoption of integrated nutrient management (INM) practices by grape growers. *Mysore J. Agric. Sci.*, 41 (2): 278-281.
- Kale, K. J., 2007, *Me Draksh Wine Uddoyog Ubharu Shakto Ka?*, Maharashtra Industrial Development Corporation, Mumbai
- Kantharaju, 1989, A study on adoption of improved practices of coffee and cardamom by small farmers in Hassan district of Karnataka. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Karpagam, C., 2000, A study on knowledge and adoption behaviour of turmeric growers in Erode district of Tamil Nadu state. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.
- Kavaskar, M. and Govind, S., 2006, Correlates of independent variables with knowledge level of banana growers. *Asian J. Ext. Edu.*, 25 (1&2): 64-67.
- Kher, A. O. and Halyal, K. G., 1991, Factors associated with farmers about sugarcane production technology. *Indian J. Ext. Edu.*, 24 (1&2): 70-74
- Kumar, H. S., 1998, A study on knowledge, adoption and economic performance of banana growers. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Kumbar, S.V., 1983, A study on adoption behaviour and consultancy pattern of grape growers of Bijapur district in Karnataka State. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Lokhande, V. D., 1990, A study on the adoption of selected recommended package of practices of grape cultivation by the farmers in Omerga taluk, Osmanabad district of Maharashtra state. *M.Sc. (Agri.) Thesis*, Marathwada Agric. Univ., Parbhani.
- Lokhande, V. D. and Wangikar, S. D., 1991, Constraints in the adoption of selected scientific grape technologies. *Maharashtra J. Ext. Edu.*, 10 (2): 138-142.
- Maraddi, G. N., 2006, An analysis of sustainable cultivation practices followed by sugarcane growers in Karnataka. *Ph.D. Thesis*, Univ. Agric. Sci., Dharwad.
- Moulasab, I., Jahagirdar, K. A., Hirevenkanagoudar, L. V. and Chandragi, D. M., 2006, A study on knowledge level of improved cultivation practices by mango growers of North Karnataka. *Karnataka J. Agric. Sci.*, 19 (2): 435-436.
- Moulik, T. K., 1965, A study of the predictive values of some factors of adoption of nitrogenous fertilizers and the influence of sources of information on adoption behaviour. *Ph.D. Thesis*, IARI, New Delhi.
- Nithya Shree, D. A., 1996, A critical analysis of the adopter categories and their characteristics. *Ph. D. Thesis*, Univ. Agric. Sci., Bangalore.
- Padmaiah, M., 1995, Watershed development programme in Mahabubnagar district of Andhra Pradesh - A diagnostic study. *Ph.D. Thesis*, Univ. Agric. Sci., Dharwad.

- Palaniswamy, K. and Sriram, M.S., 2001, A scale to measure extension participation of farmers. *Ind. J. Ext. Edu.*, 19: 325-328.
- Patil, A. B., 2008, A study on constraints of grape exporting farmers of Maharashtra state. *Ph.D. Thesis*, Univ. Agric. Sci., Dharwad.
- Patil, M., 2008, A study on production and marketing management behaviour of organic vegetable growers in Belgaum district. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.
- Raghavendra, H. N., 1997, A study on knowledge and adoption behaviour of Arecanut farmers of South Canara district, Karnataka state. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Raghavendra Nayak, B., 2007, A study on management practices of pineapple growers in Karnataka. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.
- Raghavendra, R., 2005, Knowledge and adoption of recommended cultivation practices of cauliflower growers in Belgaum district of Karnataka. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.
- Raghupathy, D., 1994, A study on agricultural modernization among farmers in upper Krishna project area of Karnataka. *Ph.D. Thesis*, Univ. Agric. Sci., Bangalore.
- Rahim, S. A., 1960, Diffusion and adoption of agricultural practices - A study in a village in East Pakistan. Pakistan academy for village development, *Technical Publi.*, 7: 66.
- Ramakrishna Rao, L., 1994, A critical analysis of the factors influencing diffusion of sunflower crop in Karnataka. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Ramakrishna Rao, L., Sethurao, M. K., Shivamurthy, M. and Gangadharappa, N. R., 1995, An analysis of diffusion and adoption process of sunflower technology. *J. Ext. Edu.*, 6 (4): 1271-1278.
- Ramegowda, B. L., 1983, A study on the rate of adoption and innovativeness of farmers in adopting Indaf-8 ragi and MR-301 paddy varieties. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Ramesh Babu, 1987, A study on adoption behaviour and economic performance of grape growers of Bangalore and Kolar District. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Rathakrishnan, Vijayaragavan, T. R. and Ravichandran, V., 1992, A study on major problems of viticulturists in grape cultivation. *Tamil Nadu J. Ext. Edu.*, 3 (2): 496.
- Raut, P. N., 2006, Production constraints of orange cultivation in Nagpur district of Maharashtra. *Asian J. Ext. Edu.*, 25 (1&2): 1-4.
- Rogers, E. M., 1962, *Diffusion of Innovations*, Free Press, New York.
- Rogers, E.M. and Shoemaker, F.F., 1971, *Communication of innovation: A cross cultural approach*. The Free Press, Collier MacMillan Publishers, London.
- Rogers. E. M. and Svenning, L., 1969, *Modernization among peasants - The impact of communication*, Halt Rinchart and Winston International, New York.
- Sainath, S., 1982, A study on adoption behaviour and motivational pattern of grape cultivators in Bangalore district of Karnataka State. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.

- Sakharkar, V. S., 1995, A study on knowledge, fertilizer use pattern and constraints in cultivation of soybean by farmers of Nagpur district, Maharashtra. *Ph.D. Thesis*, Univ. Agric. Sci., Dharwad.
- Shashidhara, D. N., 2004, A study on influencing factors and constraints in drip irrigation by horticulture farmers of Bijapur district of Karnataka. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.
- Shashidhara, K. K., 2003, A study on socio-economic profile of drip irrigation farmers in Shimoga and Davanagere district of Karnataka. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.
- Shashidhara, K. K., 2006, A study on management of eco-friendly practices by vegetable growers of North Karnataka. *Ph.D. Thesis*, Univ. Agric. Sci., Dharwad.
- Siddaraju, G. C., 1992, Impact analysis of Grape Development Scheme on beneficiaries and non-beneficiaries with respect to their knowledge and adoption of improved farm technology. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Singh, M. and Mankar, D. M., 2007, Adoption of Paclobutrazol technology by mango growers. *Asian J. Ext. Edu.*, 26 (1&2): 64 - 71.
- Supe, S.V., 1969, Factors related to different degree of rationality in decision making among farmers, *Ph.D. Thesis*, IARI, New Delhi.
- Thimmaraju, N., 1985, A study on adopter categories and sources of information consulted at different stages of innovation - decision process, *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Thippeswamy, R., 2007, A study on knowledge and adoption of plant protection measures in coconut cultivation by farmers of Chitradurga district. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.
- Thiranjana Gowda, B., 2005, A study on cultivation and marketing pattern of selected cut flowers in Belgaum district. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.
- Thirumal Valavan, V. and Radha, Y., 2005, Constraint analysis in production, marketing and export of grape in Ranga Reddy district of Andhra Pradesh. *J. Res. ANGRAU*, 33 (2): 60-63.
- Tippeswamiah, J. M., 1991, A study on the job performance and job satisfaction of subject matter specialists working in NAEP, Karnataka. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.
- Veda Murthy, H. J., 2002, A study on management of areca gardens and marketing pattern preferred by the arecanut farmers of Shimoga district in Karnataka. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.
- Venkataramalu, 2003, A study on knowledge level, adoption and marketing behaviour of chilli growers in Guntur district of Andhra Pradesh. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.
- Vijay Kumar, A. C., 1997, A study on knowledge and adoption of improved cultivation practices among rose growers. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore.
- Yaligar, S. S. P., 1997, Soybean cultivation by farmers of Belgaum district, an analytical study. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.

Appendix II: Interview Schedule

A Study on Diffusion and Adoption of Wine Grape Production Technology in Maharashtra
Respondent No.:

1. Name of the respondent :
2. Age :
3. Land holding (in acres) :
 - a) Dry land :
 - b) Irrigated land :
4. Size of the wine grape orchard :
5. Variety :
5. When did you come to know for the first time about the wine grape production technology?

6. When did you first adopt the wine grape production technology?

Appendix III : Interview schedule

A Study on Diffusion and Adoption of Wine Grape Production Technology in Maharashtra
Respondent No.:

PART-I

- A. General Information :
1. Name of the respondent :
 2. Village :
 3. Taluk :
 4. District :
- B. Profile of Respondent :
1. Age :
 2. Education : Illiterate / Primary school / Middle school /
High school / Pre-university / Graduate
 3. Land holding (in acres) :
 - a) Dry land :
 - b) Irrigated land :
 4. Size of the wine grape orchard :
 5. Proximity to winery unit :
 - a) Nearest winery unit : _____ km
 - b) Distance of other winery units :
 1. _____ km
 2. _____ km
 6. Extension participation

Please, indicate your response to following statements

Sl. No.	Extension activity	Subject matter	Organised by whom	Extent of participation		
				Regular	Occasional	Never
1.	Krishimela					
2.	Training programme					
3.	Extension meetings					
4.	Group discussions					
5.	Field visits					
6.	Agricultural exhibitions					

7. Mass media participation

Please, indicate your response to following statements

Sl. No.	Mass media sources	Subscriber/ Possession	Programmes	Frequency of use		
				Regular	Occasional	Never
1.	Newspaper		Agricultural articles			
			Information/News			
			Recreational articles			
2.	Farm magazine		Agricultural articles			
			Information / News			
			Recreational articles			
3.	Radio		Agricultural programmes			
			Information / News			
			Entertainment			
4.	Television		Agricultural programmes			
			Information / News			
			Entertainment			

8. Cosmopolitaness:

a) Please indicate the number of times, you visit the nearest town:

- | | |
|------------------------|--------------------|
| 1) Twice per week | 4) Once in a month |
| 2) Once per week | 5) Seldom |
| 5) Once in a fortnight | 6) Never |

b) What generally would be the main purpose of visit?

- | | |
|---------------------------------|------------------|
| 1) All relating to agriculture | 4) Entertainment |
| 2) Some relating to agriculture | 5) Other |
| 5) Personal/domestic | 6) No response. |

9. Deferred gratification:

Please, indicate your response to following statements

Sl. No.	Statements	Responses		
		A	UD	DA
1.	A farmer should not postpone his desires rather fulfill it with savings			
2.	Today what we are is more important than tomorrow what we would be			
3.	Invest when a farmer has money and no investment when he does not have money is the best of farming			
4.	Savings often invite trouble as theft and robbery are very common now-a-days			
5.	A farmer should be like an ant than grass hopper (spend thrift) to save the money for future (farming)			

A - Agree, UD - Undecided, DA - Disagree

10. Innovative proneness:

Please, indicate your response to following statements

Sl. No.	Statements	Responses	
		Most like	Least like
1. a	I try to keep myself up to date with information on new farm practices but that does not mean that I try out all the new methods on my farm		
b	I feel restless till I try out a new farm practice, I have heard about		
c	They talk of many farm practices these days, but who knows if they are better than the old ones		
2. a	From time to time I have heard of several new farm practices and I have tried out most of them in the last few years		
b	I usually wait to see that what results my neighbours obtain before I try out the new farm practices		
c	Some how I believe that traditional ways of farming are the best		
3. a	I am cautious about trying a new practice		
b	After all our fore-fathers were wise in their farming practices and I do not see any reason for changing these old methods		
c	Often new farm practices are not successful, however, if they are promising I would surely like to adopt them		

11. Economic motivation:

Please, indicate your response to following statements

Sl. No.	Statements	Responses				
		SA	A	UD	DA	SDA
1.	A farmer should work towards larger yields and economic profits					
2.	The most successful farmer is one who makes the best profits					
3.	A farmer should try any new farming idea which may earn more money					
4.	A farmer should grow cash crops to increase monetary profits in comparison to growing of food crops for home consumption					
5.	It is difficult for the farmer's children to make a good start unless he provides them with economic assistance					
6.	A farmer must earn his living, but the most important thing in life can not be defined in economic terms					

SA - Strongly agree, A - Agree, UD - Undecided, DA - Disagree, SDA - Strongly disagree

12. Risk orientation:

Please, indicate your response to following statements

Sl. No.	Statements	Responses				
		SA	A	UD	DA	SDA
1.	A farmer should grow large number of crops to avoid greater risks involved in growing one or two crops					
2.	A farmer should rather take more of a chance in making a big profit than to be content with a smaller but less risky profits					
3.	A farmer who is willing to take greater risks than the average farmers usually does better financially					
4.	It is good for a farmer to take risk when he knows his chance of success is fairly high					
5.	It is better for a farmer not to try new farming methods unless most of the other farmers have used them with success					
6.	Trying an entirely new method in farming by a farmer involves risks but it is worthy					

SA - Strongly agree, A - Agree, UD - Undecided, DA - Disagree, SDA - Strongly disagree

PART-II

1. Knowledge Level of Wine Grape Growers about Recommended Cultivation Practices of Wine Grape

1. Which soil type is best suited for wine grape cultivation?
 - a) Shallow, medium black
 - b) Well drained sandy loam
 - c) Deep black
 - d) Deep loam
2. Which are the wine grape varieties recommended for your area?
 - a) Cabernet Sauvignon
 - b) Chenin blanc
 - c) Zinfandel
 - d) All of the above
3. What is the spacing recommended for wine grape planting?
 - a) 10 ft x 5 ft
 - b) 9ft x 5 ft
 - c) 8 ft x 4 ft
 - d) 2m x 1.25 m
4. What is recommended size of the trench?
 - a) 1.8 - 3 m apart
 - b) 1 - 1.8 m
 - c) 3 - 4 m
 - d) Do not now
5. Name the material used for filling the trenches?
 - a) Super phosphate
 - b) FYM
 - c) Both
 - d) Do not know
6. What is the quantity of super phosphate and FYM used for filling the trenches?
 - a) 2.5 T / ha super phosphate
50 T / ha FYM
 - b) 1.5 T / ha super phosphate
25 T / ha FYM
 - c) 3.5 T / ha super phosphate
75 T / ha FYM
 - d) Do not know
7. What is the recommended dose of FYM / ha?
 - a) 40 T / ha
 - b) 20 T / ha
 - c) 60 T / ha
 - d) Do not know
8. What is the recommended dose of fertilizers applied after summer pruning (kg/acre)?
9. What is the recommended dose of fertilizers applied after winter pruning (kg/acre)?
10. Which are the rootstocks recommended for your area?
 - a) Salt creek
 - b) Dog ridge
 - c) Freedom
 - d) All of the above
11. Which method of rootstock grafting is recommended for wine grape varieties?
 - a) Approach grafting
 - b) Wedge grafting
 - c) Stone grafting
 - d) Do not know
12. What is appropriate time for rootstock grafting?
 - a) Nov - Dec
 - b) Sept - Oct
 - c) July - Aug
 - d) Do not know
13. Which method of irrigation is recommended for wine grape?

- a) Drip irrigation b) Flood irrigation c) Both d) Do not know
14. Which months are suitable for pruning of wine grape?
 a) March & Oct b) April & Sept c) March & Sept d) April & Oct
15. How many buds are maintained at summer pruning?
 a) 1 - 2 buds b) 3 - 4 buds c) 2 - 3 buds d) Do not know
16. How many buds are maintained at winter pruning?
 a) 1 - 2 buds b) 3 - 4 buds c) 4 - 7 buds d) Do not know
17. What is concentration of cycocyl application?
 a) 500 ppm b) 100 ppm c) 300 ppm d) Do not know
18. What is the stage of cycocyl application?
 a) 5 leaf stage b) Prebloom stage c) 2 - 3 leaf stage d) Do not know
19. What is concentration of GA application?
 a) 10 ppm b) 20 ppm c) 30 ppm d) Do not know
20. What is the stage of GA application?
 a) 5 leaf stage b) Prebloom stage c) 2 - 3 leaf stage d) Do not know
21. Name the methods of training wine grape?
 a) Vertical Shoot Position c) Y system
 b) Small Y trellis d) All of the above
22. Which are the major pests of wine grape?
 a) Thrips b) Flea beetle c) Mealy bug d) All of the above
23. Which are the major diseases of wine grape?
 a) Powdery mildew b) Downey mildew c) Anthracnose d) All of the above

24. What are the control measures for the following pests?

Sl. No.	Name of the pest	Chemical and its Concentration used	Stage / Time of application
a.	Thrips		
b.	Flea beetle		
c.	Mealy bug		

26. What are the control measures for the following diseases?

Sl. No.	Name of the disease	Chemical and its Concentration used	Stage / Time of application
a.	Powdery mildew		
b.	Downey mildew		
c.	Anthraco nose		

2. Adoption of Recommended Wine Grape Cultivation Practices

1. Year of establishment :
2. Size of the wine grape orchard (in acres) :
3. Soil type :
4. Variety :
5. Spacing :
6. Trench size :
- 7.

a) Material used for filling trenches :

b) Its quantity :

8. Fertilizer application

a) FYM application

Time :

Quantity :

b) Chemical fertilizers

Name of the fertilizer	Time	Quantity
1.		
2.		
3.		
4.		
5.		
6.		

9. Grafting:

Rootstock	Method of grafting	Time of grafting
1.		
2.		

10. Irrigation:

Method	Frequency of irrigation	
	Summer	Winter

11. Pruning:

	Months of pruning	No. of buds
1. Summer		
2. Winter		

12. Training method:

13. Growth regulators and growth retardants:

Name	Concentration used	Time of application
1.		
2.		

14. Pest management:

Pest	Chemical used	Concentration used	Stage / Time of application
1.			
2.			
3.			
4.			

15. Disease management:

Disease	Chemical used	Concentration used	Stage / Time of application
1.			
2.			
3.			
4.			

16. Yield:

a) Yield / acre :

b) Total yield :

PART-III

Problems of Wine Grape Growers

I. Technical problems:

- 1.
- 2.
- 3.

II. Problems related to the inputs:

- 1.
- 2.
- 3.

III. Financial problems:

- 1.
- 2.
- 3.

IV. Marketing problems:

- 1.
- 2.
- 3.

V. General problems:

- 1.
- 2.
- 3.

A STUDY ON DIFFUSION AND ADOPTION OF WINE GRAPE PRODUCTION TECHNOLOGY IN MAHARASHTRA

Rishikesh Balasaheb Hinge 2009

Dr. J. G. Angadi
(Major Advisor)

ABSTRACT

A study on diffusion and adoption of wine grape production technology in Maharashtra was carried out during 2008-09. Simple random sampling method was employed to select 160 respondents from two districts. The data was elicited through personal interview method.

The frequency curve of the diffusion followed almost 'bell-shape' when plotted over time. The cumulative curve of diffusion nearly approached 'S-shape'.

Forty five per cent of the wine grape growers had medium level of knowledge about recommended practices of wine grape cultivation. More than half of the wine grape growers had knowledge about fertilizer application at winter (63.12%) and summer (53.12%). Only 36.75 and 33.75 per cent of the wine grape growers had correct knowledge of application of filling material and organic manure to the wine grape, respectively.

About 40.00 per cent of the respondents belonged to medium level of adoption category. As high as 57.50 per cent of the respondents had grown Cabernet Sauvignon variety. A large majority of the respondents followed summer pruning in April (71.87%) and winter pruning in September (90.62%). Very negligible per cent of the respondents applied the filling material (10.00%), organic manure (11.87%) and chemical fertilizers to their orchards as per recommendation. A large majority of the respondents (80.00%) did not adopt the gibberlic acid treatment.

Education, orchard size, extension participation, mass media participation, cosmopolitaness, deferred gratification, economic motivation, innovative proneness and risk orientation were found to have positive and significant relationship with extent of adoption of wine grape cultivation practices.

The major problems perceived by the wine grape growers were high cost of planting material (100.00%), irregular and insufficient supply of electricity for irrigation (100.00%), high cost of plant protection chemicals (88.75%), inadequate guidance regarding improved technology (86.62%) and high cost of fertilizers (82.50%).