“EFFECT OF ORGANIC AND INORGANIC SOURCES OF NUTRIENTS ON YIELD, QUALITY AND SHELF LIFE OF GUAVA (*Psidium guajava* L.) Cv. ALLAHABAD SAFEDA UNDER DRY LAND CONDITIONS”

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DECEMBER, 2020

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BY

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B. Sc (Hons.) HORTICULTURE

THESIS SUBMITTED TO SRI KONDA LAXMAN TELANGANA STATE HORTICULTURAL UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF

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DECEMBER, 2020

CERTIFICATE

Ms. **R. PRIYANKA** has satisfactorily prosecuted the course of research and that the thesis entitled **"EFFECT OF ORGANIC AND INORGANIC SOURCES OF NUTRIENTS ON YIELD, QUALITY AND SHELF LIFE OF GUAVA (*Psidium guajava* L.) Cv. ALLAHABAD SAFEDA UNDER DRY LAND CONDITIONS"** submitted is the result of original research work and is of sufficiently high standard to warrant is presentation to the examination.

I certify that neither the thesis nor its part there of has been previously submitted by her for a degree of any university.

Date: **(Dr.A. GOPALA KRISHNA REDDY)**

Place: Rajendranagar, Hyderabad **Chairman**

CERTIFICATE

This is to certify that the thesis entitled **"EFFECT OF ORGANIC AND INORGANIC SOURCES OF NUTRIENTS ON YIELD, QUALITY AND SHELF LIFE OF GUAVA (*Psidium guajava* L.) Cv. ALLAHABAD SAFEDA UNDER DRY LAND CONDITIONS"** submitted in partial fulfillment of the requirements for the degree of Master of Science in Horticulture (Fruit Science) of Sri Konda Laxman Telangana State Horticultural University, Rajendranagar is a record of the bonafide research work carried out by **Ms. R. PRIYANKA** under our guidance and supervision.

No part of the thesis has been submitted by the student of any other degree or diploma. The published part and all assistance received during the course of the investigations have been duly acknowledged by the author of the thesis.

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I, **Ms. R. PRIYANKA**, hereby declare that the thesis entitled **"EFFECT OF ORGANIC AND INORGANIC SOURCES OF NUTRIENTS ON YIELD, QUALITY AND SHELF LIFE OF GUAVA (*Psidium guajava* L.) Cv. ALLAHABAD SAFEDA UNDER DRYLAND CONDITIONS"** submitted to Sri Konda Laxman Telanagana State Horticultural University**,** Rajendranagar for the degree of Master of Science in Horticulture (Fruit Science) is the result of original research work done by me. I declare that no material contained in the thesis has been published earlier in any manner.

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Date:

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LIST OF SYMBOLS AND ABBREVIATIONS

g	:	Gram
Cv.	:	Cultivar
S.Em ±	:	Standard error of mean
CD	:	Critical Difference
%	:	Per cent
S	:	Significant
/	:	Per
kg/tree	:	Kilogram per tree
No.	:	Number
Kg/cm^2	:	Kilogram per centimeter square
FYM	:	Farm Yard Manure
N, P, K	:	Nitrogen, Phosphorus, Potassium
mg	:	Milligram
B:C ratio	:	Benefit Cost ratio
Fig.	:	Figure
Rs/ha	:	Rupees per hectare
^oBrix	:	Degree Brix
LDPE	:	Low density polyethylene
HDPE	:	High density polyethylene
ha	:	Hectare
MT	:	Million Tonnes

et al.	:	and others
&	:	And
pH	:	Hydrogen ion concentration
RDF	:	Recommended Dose of Fertilizer
DAP	:	Diammonium Phosphate
MOP	:	Murate of Potash
CRD	:	Completely Randomized Design
PLW	:	Physiological Loss in Weight
^{o}C	:	Degree Centigrade
ml	:	Millilitre
h	:	Hour
$<$	:	Less than
L	:	Litre
NaOH	:	Sodium Hydroxide
HCl	:	Hydrochloric Acid
µl	:	Microlitre
min	:	Minutes
Eq.wt	:	Equivalent weight
Wt.	:	Weight
Vol.	:	Volume
H_2SO_4	:	Sulphuric acid
TV	:	Titre Value
nm	:	Nanometer
FW	:	Fruit Weight

Ca	:	Calcium
K	:	Potassium
TSS	:	Total Soluble Solids
RBD	:	Randomized Block Design

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ABSTRACT

The present investigation entitled "Effect of Organic and Inorganic sources of nutrients on yield, quality and shelf life of Guava (*Psidium guajava* L.) Cv. Allahabad Safeda under dryland conditions" was carried out during the year 2018-2019 at Gunegal Research Farm, CRIDA, Santoshnagar. Two experiments were conducted. First experiment was on Effect of organic and inorganic sources of nutrients on yield and quality parameters in guava (*Psidium guajava* L.) Cv. Allahabad Safeda under dryland conditions and was laid out in Randomized Block Design (RBD) with five treatments and four replications. Second experiment was on Effect of different packaging materials on shelf life of guava Cv. Allahabad Safeda.

With respect to yield parameters, T_4- Inorganic(75%)(NPK)+Organic (25%)(FYM) recorded maximum fruit weight (185.70 g), number of fruits per tree (215), fruit yield (39.93 kg/tree) followed by T_5-Organic (50%)(FYM)+Inorganic (50%)(NPK) and minimum was recorded in T_1- Organic sole (100%)(FYM).

Highest fruit firmness, shelf life, moisture content and minimum physiological loss in weight was recorded in T_5-Organic (50%)(FYM)+Inorganic (50%)(NPK).

Quality parameters like total sugars, reducing sugars, non-reducing sugars, total soluble solids, antioxidants and potassium content were significantly maximum under T_5- Organic(50%)(FYM)+Inorganic (50%)(NPK) and minimum was recorded in T_1- Organic sole (100%)(FYM).

Highest dietary fibre content, protein content, calcium content and pectin content were recorded in T_4- Inorganic(75%)(NPK)+Organic(25%)(FYM) followed by T_5-Organic(50%)(FYM)+Inorganic(50%)(NPK). Maximum ascorbic acid and titrable acidity were recorded in T_1- Organic sole (100%)(FYM). Among the treatments, T_4- Inorganic(75%)(NPK)+Organic(25%)(FYM) recorded the highest benefit cost ratio followed by T_5-Organic (50%)(FYM)+Inorganic(50%)(NPK) and lowest benefit cost ratio was recorded in T_1- Organic sole (100%)(FYM).

Among the different packaging materials, fruits packed in 75µ LDPE bags was recorded significantly minimum spoilage (%), physiological loss in weight (%) and significantly maximum TSS(^{o}Brix), titrable acidity, ascorbic acid(mg/100g), shelf life upto 8th day. Fruits packed in 50µ LDPE bags recorded significantly lower % of sugars (total, reducing and non-reducing). Highest firmness was recorded in fruits packed in 50µ HDPE bags.

Chapter - I

INTRODUCTION

Chapter I

INTRODUCTION

Guava (*Psidium guajava* L.) is one of the most important fruit crops of Myrtaceae family grown widely in tropical and subtropical regions of India. Guava is a native of Tropical America, Mexico and Peru. In India guava was introduced by Portuguese in early 17th century.

Guava ranks as fourth most important crop in India after Mango, Banana and Citrus covering an area of about 2,64,900 ha with production of around 40,53,500 MT and productivity about 15.3 MT/ha (National Horticulture Data Base, 2018). In Telangana guava production is 76 thousand MT cultivated in an area of 4.72 thousand hectares (National Horticulture Data Base, 2018). The most important guava growing states are Bihar, Uttar Pradesh, Madhya Pradesh, Punjab, Maharashtra, Andhra Pradesh and Telangana. Uttar Pradesh is by far the most important guava producing state of India, and Allahabad has the reputation of growing the best guava in the country as well as in the world.

Guava is one of the cheapest and popular fruit of India. It can be grown satisfactorily on marginal soils with minimum care and is also called 'Apple of the Tropics'. Guava is only a delicious and nutritious table fruit but may also be utilized to make products like jam, jelly preparation. Leaves are used for curing diarrhea and also for dying and tanning.

The fruit (Berry) is an excellent source of vitamin C (210-305 mg/100 g fruit pulp) and pectin (0.5-1.8 %) but has low energy (66 cal/100 g). The ripe fruits contain 12.3-26.3 % dry matter 77.9-86.9 % moisture, 0.51-1.02 % ash, 0.10-0.70 % crude fat, 0.82-1.45 % crude protein and 2.0-7.2 % crude fiber. The fruit is also rich in mineral like Phosphorus (22.5-40.0 mg/100 g pulp), Calcium (10.0-30.0 mg/100 g pulp) and Iron (0.60-1.39 mg/100 g pulp) as well as vitamins like Niacin (0.20-2.32 mg/100 g pulp), Pantothenic acid, Thiamine (0.03-0.07 mg/100 g pulp), Riboflavin (0.02-0.04 mg/100 g pulp) and vitamin–A (Mitra and Bose, 2001).

In northern India, guava produces flowers twice in a year, Ambe Bahar and Mrig Bahar (Gupta and Nijjar, 1978) whereas in southern states *viz*., Maharashtra, Tamil Nadu Andhra Pradesh and Telangana, there is a third crop which flowers in winter and become mature fruits in spring are called Hasth Bahar (Hayes, 1970).

Cultivation of guava is getting popular due to increasing international trade, better nutritional contents and processing of its value added products. This is a well known fact that increase in productivity of tree removes large amount of essential nutrients from the soil. Without proper management, continuous fruit production reduces nutrient reserves in the soil. Another issue of great concern is the sustainability of soil productivity, as land began to be intensively exhausted causing depletion of soil fertility thereby ending up to soil degradation.

Guava is a rich and chief source of vitamin C, pectin and contains fair amounts of calcium, phosphorus and vitamin A (Phadnis, 1970). Whole fruit is eaten fresh. Thus there is possibility of entry of residues of agrochemicals into human body causing detrimental effects on human health, which can be avoided to a large extent by cultivating guava organically. The importance of guava is also due to the fact that it is a hardy fruit that can be grown in wasteland or poorly drained soils without any manuring or irrigation and adoption of organic farming produces chemical free healthy food and improves soil physical and chemical properties thereby maintaining the soil health.

Continuous use of inorganic fertilizers as source of nutrient in imbalanced proportion is also a problem, causing inefficiency, damage to the environment & in certain situations, harms the plant themselves and also to human being who consume them (Shanker *et al*.,2002).

Integrated nutrient management is the most appropriate approach for managing the nutrient input. In integrated plant nutrition supply system, the basic goal is to maintain or possibly improve the soil fertility and plant nutrient supply to an optimum level for sustaining the desired crop productivity through optimization of the benefits from all possible sources of plant nutrients in an integrated manner. Guava is very hardy to soil and agro-climatic conditions and give good response to manuring in terms of increasing fruit production and quality. Fertilizer experiments conducted in India showed that guava has given good response to balanced use of inorganic fertilizers along with organic manures. It is reported that application of organic and chemical fertilizers not only increased the yield, but also improved the fruit quality in guava (Naik and Babu,2007).

In recent years, the market for organic farming has significantly increased in response to concern over food quality and environmental matters. Organic food is quite attractive for consumers and is often associated with quality, healthy, and natural products in opposition to the more processed and artificial conventional food.

Guava has limited storage potential at ambient conditions, which leads to glut in market and poor return to the growers. Moreover, overripe fruit at ambient conditions lead to lot of wastage and economic losses.

Packaging isolates the product from the external environment and helps to reduce exposure to pathogens and contaminants thereby extending the shelf life of the produce. A package provides protection, tampers resistance and improves the shelf life and quality of fruits. The packaging of guava fruits in polyethylene film minimizes the post-harvest losses and chilling injury thereby ensures better quality of fruits. Hence, the present study was planned to standardize the technology for storage of surplus fruit with the use of different packaging materials.

Therefore keeping above points in view, the present investigation entitled "Effect of Organic and Inorganic sources of nutrients on yield, quality and shelf life of Guava (*Psidium guajava* L.) Cv. Allahabad Safeda under dryland conditions" was conducted with the following objectives.

1. To study the effect of organic and inorganic treatments on yield and yield related attributes in guava.
2. To study the effect of organic and inorganic treatments on quality parameters in guava.
3. To study the effect of different packaging materials on shelf life of guava.

Chapter - II

REVIEW OF LITERATURE

Chapter II

REVIEW OF LITERATURE

The present research work entitled "Effect of Organic and Inorganic sources of nutrients on yield, quality and shelf life of Guava (*Psidium guajava* L.) Cv. Allahabad Safeda under dryland conditions" was carried out during the year 2018-2019 at Gunegal Research Farm, ICAR-CRIDA, Santoshnagar. In this chapter an attempt has been made to study and examine critically all the available findings of previous researches and to review the salient features concerned with the effect of organic and inorganic sources of nutrients in present experiment in a well classified manner and summarized to use it as a back ground literature under the following headings.

2.1 Effect of organic and inorganic treatments on yield and yield related attributes in guava.

2.2 Effect of organic and inorganic treatments on quality parameters in guava.

2.3 Effect of different packaging materials on shelf life of guava.

2.1 EFFECT OF ORGANIC AND INORGANIC TREATMENTS ON YIELD AND YIELD RELATED ATTRIBUTES

Muhammad *et al*. (2000) studied the effect of Individual and Combined application of Organic and Inorganic manures on the productivity of guava. Result showed that combined application of farm yard manure and NPK proved to be the best in increase fruit size, weight and total yield.

Ebrahiem and Mohamed (2000) showed that application of farm yard manure (FYM) on 'Balady' mandarin trees grown in sandy soil, improved fruit set, yield, number of fruits per tree and fruit weight.

Ram and Nagar (2003) reported that higher yield (13.69 kg/plot) in 'Allahabad safeda' guava, when it was nourished with 200 kg FYM + 200 g Azotobacter.

Bhobia *et al*. (2005) conducted an experiment on effect of organic (FYM) and inorganic nitrogen (urea) on yield of guava cv. Hisar Surkha showed that highest number of fruits/tree and maximum yield/tree in the trees supplied with 40 % of total nitrogen through urea and 60 % through FYM.

Athani *et al*. (2007) conducted an experiment on effect of organic and inorganic fertilizers on yield of six years old guava cv. Sardar under Arabhavi conditions during 2003-2004. They reported that highest fruit weight (222.33 g) and highest yield per tree (33.11 kg) was found in the tree treated with 75 percent recommended dose of fertilizer along with 10 kg of vermicompost.

Ram *et al*. (2007) studied integrated plant nutrient management in Guava cv. Sardar under Lucknow conditions. They reported maximum number of fruits per tree (1200) and highest yield (150.25 kg/tree) in the trees treated with 250 g Nitrogen + 100 g Phosphorus + 250 g potash + 10 kg FYM along with 250 g azotobacter.

Shukla *et al*. (2009) studied the effect of integrated nutrient management under high density planting of guava cv. Sardar at Rajasthan College of Agriculture, Udaipur during 2005-07. The combined application of 50 percent dose of recommended NPK + 50 kg FYM + 250 g Azotobacter gave significantly higher fruit yield per plant (28.95 kg) and highest fruit weight (153.30 g).

Dheware and Waghmare (2009) conducted an experiment on the influence of organic, inorganic and biofertilizers and their interactions on fruit set of sweet orange. They reported that 75 % of recommended rates of NPK and FYM combined with the application of biofertilizers resulted in the highest number of fruits per tree (669.17) and fruit weight (171.77 g).

Bashir *et al*. (2009) studied the effect of manure and fertilizers on yield and fruit quality of guava (*Psidium guajava* L.). They found that application of 40 kg FYM + 1 kg each of N-P-K per plant recorded maximum yield per plant (63.78 kg).

Mahendra *et al*. (2009) conducted an experiment on the effect of integrated nutrient management on yield and quality of ber cv. Banarasi Karaka. They reported that the maximum fruit yield was recorded with the soil application of FYM + 100 % NPK + Azotobacter + PSB closely followed by FYM + 75 % NPK + Azotobacter + PSB during both the year of experimentation.

Kirad *et al.* (2010) observed maximum number of fruits per plant (46), average fruit weight (0.85 kg) and pulp thickness (3.5 cm) in the tree applied with 75 % RDF + 25 % vermicompost + rhizosphere bacteria culture treatment in papaya cv. Surya.

Reddy *et al.* (2010) studied the effect of organic nutrition practices on papaya cv. Surya on fruit yield and soil health. Results showed that fruit yield was higher in inorganic fertilizer treatment (55 t/ha) compared to organic treatments (26.9 to 38 t/ha).

Kumar (2010) studied the effect of integrated plant nutrient management for three years on Litchi and found that the treatment having Azotobacter (250 g/tree) with half of the recommended dose of chemical fertilizer and 50 kg of FYM proved to be the most dynamic substrate to record maximum fruit yield (96.66 kg/tree).

Baviskar *et al.* (2011) conducted an experiment to study the effect of different combinations of organic, inorganic manures and biofertilizers on yield of sapota at department of horticulture during 2010-2011. The fruit yield in terms of number of fruits per plant, fruit yield (kg/plant) was recorded maximum in plants treated with 1125:750:375 g NPK + 15 kg vermicompost + 250 g azotobacter + 250 g PSB/plant.

Varsha *et al.* (2011) reported that fruit yield in terms of number of fruits harvested per plant, fruit yield (kg/plant) of guava was recorded maximum in plants treated with 487.5 + 243.75 + 281.25 g NPK + 50 kg FYM + 250 g azotobacter + 250 g PSB/plant.

Dwivedi *et al.* (2012) studied the effect of biofertilizer and organic manures on yield and quality of red fleshed guava under lucknow conditions. Results showed that average maximum fruit yield for the rainy and winter season crop was 38.2 and 19.0 kg/tree respectively, with 250 g azotobacter + 20 kg FYM.

Yadav *et al*. (2012) reported that maximum fruit yield (195 fruits/plant and 35.12 kg/plant) in the plants treated with poultry manure @ 20 kg/tree which was at par with FYM applied @ 25 kg/tree in guava.

Gautam *et al.* (2012) found that the treatment half dose of NPK + 50 kg FYM + 10 kg vermicompost recorded the maximum number of fruits and fruit yield in mango.

Sharma *et al*. (2013) studied that effect of organic and inorganic fertilizers on quality and shelf life of guava (*Psidium guajava* L.) cv. Sardar showed that 25 % of nitrogen (per tree) through FYM + 75 % of nitrogen (per tree) through inorganic fertilizer + azotobacter recorded highest fruit weight (244.24 g).

Patil and Shinde (2013) studied the effect of integrated nutrient management on growth and yield of banana cv. Ardhapuri. They reported that the application of 50 % RDF + FYM + Azotobacter (50 g/plant) + PSB (50 g/plant) + VAM *G. fasiculatum* (250 g/plant) was found beneficial for growth and yield of banana cv. Ardhapuri.

Barne *et al.* (2013) reported that number of fruits harvested per plant and fruit yield (kg/plant) of guava was recorded maximum in plants treated with 487.5 + 243.75 + 281.25 g NPK + 50 kg FYM + 250 g Azotobacter + 250 g PSB/plant.

Rajendra *et al.* (2013) reported that the application of FYM @ 8.31 t ha^{-1} + vermicompost @ 4.16 t ha-1 + 75 % recommended NPK recorded the maximum number of fruits per plant (1284.33), yield per plant (55.63 kg) in acid lime cv. Kagzi.

Garhwal *et al*. (2014) conducted an experiment on effect of organic manure and nitrogen on yield and quality of kinnow mandarin in sandy soils of hot arid region. Results revealed that the application of 80 kg farm yard manure (FYM) per plant significantly increased fruit yield (25.22 kg/tree), number of fruits (212.75 fruits/tree), average fruit weight (118.22 g).

Goswami *et al*. (2015) reported that maximum fruit set and yield in rainy (83.33 % and 72.16 kg per tree) and winter (34.32 % and 6.53 kg per tree) were recorded with the application of 225 g of nitrogen, 195 g phosphorus and 150 g potash along with 50 kg FYM enriched with 250 g azospirillum/tree/year in guava.

Singh *et al*. (2015) conducted an experiment to study the effect of various combinations of integrated nutrient management schedules on yield in mango cv. Himsagar. Results revealed that treatment consisting 500:250:250 NPK/tree/year + 50 kg FYM + 250 g azospirillum (T_6) significantly increased total number of fruits (234.12 fruits/tree), average fruit weight (263.10 g) and yield (58.56 kg/tree).

Sahu *et al*. (2015) reported that treatment of 75 % RDF+ Cowdung Slurry resulted significantly maximum number of guava fruits per tree (250.57), fruit yield per tree (54.66 kg) and per hectare (14.31 t ha^{-1}).

Nurbhanej *et al.* (2016) conducted experiment on the effect of integrated nutrient management on yield of acid lime cv. Kagzi showed that fruit weight (53.20 g), fruit diameter (4.52 cm) and fruit yield per tree (46.92 kg) were recorded significantly highest value with the application of 75 % RDF + vermicompost 9 kg/tree + AAU PGPR consortium 3.5ml/tree.

Dutta *et al*. (2016) reported that the treatment containing biofertilizer + half of inorganic fertilizer (NPK 500:250:500 g/plant/year) produced maximum fruit weight (285.15 g), yield (57.20 kg/plant) in Himsagar mango.

Pooja *et al*. (2017) conducted experiment to study the effect of integrated nutrient management in sweet orange cv. Mosambi. The experiment was laid out in randomized block design with eight treatments comprising of inorganic, organic manures and biofertilizers replicated thrice. The treatment (T_8) comprising 75 % RDF + poultry manure (12.5 % N equivalent) + vermicompost (12.5 % N equivalent) and Arka microbial consortia resulted maximum fruit weight (179.51 g), yield per plant (61.98 kg) and number of fruits per plant (347.32).

Prabhu *et al.* (2018) conducted experiment on effect of integrated nutrient management on acid lime showed that application of 100 % RDF (600:200:300 g NPK per plant per year) + azospirillum (100 g/plant) + phosphobacteria (100 g/plant) + AMF (500 g/plant) + Trichoderma harzianum (100 g/plant) has showed a superior performance on yield and yield attributing components.

Tyagi *et al.* (2018) reported that the application of 50 % RDF + 50 kg FYM + Azospirillum (100 g/tree) + PSB (100 g/tree) (T_{10}) recorded maximum number of fruits per tree (318.23), fruit weight (238.27 g) and yield per tree (75.70 kg) in guava.

Mirjha *et al.* (2018) conducted experiment on influence of cultivars, cropping systems and nutrient levels on yield of mango. Application of tree with 100 % RDF + 100 % RD-FYM showed highest number of fruits/plant (16.5 and 24.3) and fruit weight (212 and 223 g) during 2011-2012 and 2012-2013.

Kumarawat *et al*. (2018) found that the maximum number of fruits per tree (286.91), fruit weight (209.88 g) and yield per tree (60.20 kg) were recorded with the application of 100 % NPK + 5 kg Vermicompost + 150 g VAM in guava.

Singh *et al*. (2018) reported that application of guava trees with 75 % RDF + FYM 40 kg per tree recorded highest fruit weight and pulp weight of the fruit.

Waghmare *et al*. (2018) studied the effect of inorganic and biofertilizers on fruit set, yield and quality of custard apple (*Annona squamosa* L.) cv. Balanagar. They reported that number of fruits per plant (68.00), yield per tree (13.46 kg) were recorded higher in treatment T_2 (100 % RDF + FYM + Azotobacter + PSB).

Gupta *et al*. (2019) conducted experiment on the effect of integrated nutrient management on yield of guava cv. Allahabad safeda under high density planting. They found that combined application of 75 % recommended dose of NPK with FYM (10 kg) and micronutrient gave significantly higher fruit yield per hectare (99.56 q/ha) and average fruit weight (152.84 g).

2.2 EFFECT OF ORGANIC AND INORGANIC TREATMENTS ON QUALITY PARAMETERS IN GUAVA

Muhammad *et al.* (2000) found that combined application of organic (80 kg FYM) + inorganic (NPK @ 250:125:125 g per tree) gave highest total soluble solids (9.3) in the guava fruits.

Worthington (2001) studied nutritional quality of organic versus conventional fruits, vegetables and grains. Results revealed that organic crops contained significantly more vitamin C, iron, magnesium and phosphorus and significantly less nitrates than conventional crops.

Carbonaro *et al*. (2002) studied modulation of antioxidant compounds in organic versus conventional fruits (peach and pear) and showed increase in polyphenol content and PPO activity of organic peach and pear as compared to conventional one. Ascorbic and citric acids were higher in organic than conventional peaches.

Bhobia *et al.* (2005) conducted an experiment on effect of organic (FYM) and inorganic nitrogen (urea) on quality of guava cv. Hisar Surkha. They reported that the maximum TSS (11 %), total sugars (9.89 %), reducing sugars (5.45 %) and non-reducing sugars (4.44 %) in the trees supplied with 60 percent nitrogen (480 g) through organic and 40 percent (320 g) through inorganic and maximum ascorbic acid (250 mg per 100g) was observed with the application of 20 percent nitrogen (160 g per tree) through inorganic and 80 percent (640 g per tree) through organic.

Ram *et al.* (2007) reported that TSS (13.50^{o}brix), reducing sugars (3.58 %) and acidity (0.54 %) was highest in the guava trees supplied with 250 g Nitrogen + 100 g Phosphorus + 250 g potash + 10 kg FYM along with 250 g azotobacter.

Shukla *et al*. (2009) investigated the effect of integrated nutrient management under high density planting of guava cv. Sardar at Rajasthan College of Agriculture, Udaipur during 2005-07. The combined application of 50 per cent dose of recommended NPK + 50 kg FYM + 250 g Azotobacter (T_7) gave significantly higher fruit weight (153.30 g), TSS (14 %), ascorbic acid (198.30 mg/100 g pulp), reducing sugar (4.77 %) and total sugars (8.10 %).

Bashir *et al.* (2009) conducted experiment on the manure and fertilizers effect on yield and fruit quality of guava cv. Larkana Surahi. They found that application of guava plant with 40 kg FYM + 1 kg each of N-P-K recorded maximum total soluble solids (11.35 %).

Mahendra *et al.* (2009) found that the maximum TSS, ascorbic acid, reducing sugar, non-reducing sugar, total sugar and minimum acidity content was recorded with the soil application of FYM + 100 % NPK + Azotobacter + PSB closely followed by FYM + 75 % NPK + Azotobacter + PSB in ber cv. Banarasi karaka.

Kirad *et al*. (2010) reported maximum TSS (15.8^{o}Brix), vitamin A (2280 IU/100 g of pulp) and shelf life of fruits (12 days) were recorded with 75 % RDF + 25 % vermicompost + rhizosphere bacteria culture treatment in papaya cv. Surya. Maximum vitamin C (50.22 mg/100 g) was observed with FYM @ 50 kg per plant.

Ravishankar *et al*. (2010) reported that, in papaya application of FYM 20 kg/plant recorded maximum total soluble solids, ascorbic acid, total sugars and the least value of titrable acidity as compared to intensive farming and other organic treatments.

Reddy *et al*. (2010) showed that, in papaya shelf life of the fruit was significantly higher in organic treatments (6.2 to 7.9 days) as compared to inorganic fertilizer treatment (5.1 days).

Patel and Naik (2010) studied the effect of pre-harvest treatment of organic manures and inorganic fertilizers on sapota cv. Kalipatti and found that 5 kg vermicompost + 400 + 60 + 300 g NPK/tree was found to be superior in respect of extending post-harvest shelf-life as well as other physico-chemical parameters, viz., Pulp weight, TSS, reducing sugar, non-reducing sugar, acidity and vitamin-C content, while maximum firmness of fruits was found under 25 kg FYM + 400 + 60 + 300 g NPK/tree.

Kundu *et al.* (2011) studied the effect of biofertilizer and inorganic fertilizer in pruned mango orchard Cv. Amrapali. It was concluded that the treatments NPK (100 %) + Azotobacter + VAM and NPK (75 %) + Azotobacter + VAM were effective in improving the quality of fruits in Amrapali mango.

Duarte *et al.* (2012) showed that, citrus fruits from organic farming had a higher level of vitamin C, compared with fruits from conventional production and concentration of organic acids was higher in the citrus fruits from organic farming compared to conventional system.

Katiyar *et al*. (2012) reported that the maximum superior fruit quality of ber was obtained in terms of TSS, ascorbic acid and lower titrable acidity when the trees were supplemented with 800 g N + 400 g P + 200 g K + 50 kg FYM.

Sharma *et al*. (2013) reported that application of tree with 50 % of nitrogen (per tree) through FYM + 50 % of nitrogen (per tree) through inorganic fertilizer + Azotobacter showed highest TSS (12.95°Brix), total sugars (8.61 %) and minimum physiological loss in weight (14.29 %) after ten days under ambient conditions.

Rathore *et al*. (2013) studied the effect of integrated nutrient management on yield and quality of litchi cv. Rose Scented. Results revealed that the maximum TSS, acidity and total sugars were found significantly maximum with the application of 500:250:250 g NPK/tree + 50 kg FYM/tree + 10 kg/tree vermicompost.

Garhwal *et al*. (2014) reported that application of 80 kg farm yard manure (FYM) per plant significantly increased TSS (12.11°Brix), ascorbic acid (26.37 mg/100 g edible portion), total sugars (6.63 %), reducing sugars (2.92 %) and non-reducing sugar (3.71 %) in kinnow mandarin fruit.

Vanilarasu and Balakrishnamurthy (2014) studied the effect of organic manures and amendments on quality attributes and shelf life of banana cv. Grand Naine. Results revealed that the treatment T10 (FYM @ 10 kg + Neem cake @ 1.25 kg + Vermicompost @ 5 kg and Wood ash @ 1.75 kg/plant + triple green manuring with sunhemp + double intercropping of cow pea + biofertilizers @ 50 g/plant) registered the maximum quality attributes (TSS, Acidity, sugars) besides enhancing the shelf life of banana and reduced physiological loss in weight.

Pandey *et al*. (2015) conducted experiment on the Amelioration of mineral nutrition, productivity, antioxidant activity and aroma profile in marigold (*Tagetes* *minuta* L.) with organic and chemical fertilization. Results revealed that organic amendments in combination with chemical fertilizer significantly improved the antioxidant capacity of the marigold leaf extracts.

Laxmi *et al.* (2015) studied the effect of organic manures and inorganic fertilizers on plant growth, yield, fruit quality and shelf life of tomato cv. PKM-1. Among the various treatments, TSS was found maximum in T_7 (50 % RDF + 50 % FYM) and titrable acidity, ascorbic acid, shelf life was maximum in treatment T_9 (50 % RDF + 50 % Vermicompost) followed by T_7 (50 % RDF + 50 % FYM).

Nurbhanej *et al.* (2016) studied the effect of integrated nutrient management on quality of acid lime cv. Kagzi during the year 2012-2013 at Anand agriculture university, Gujarat. They reported that total soluble solids (8.85^{o}Brix), ascorbic acid content (29.63 mg/100 g of juice) and minimum acidity (7.32 %) were recorded significantly highest value with the application of 75 % RDF + vermicompost 9 kg/tree + AAU PGPR consortium 3.5 ml/tree.

Patel *et al.* (2017) studied effect of integrated nutrient management on quality parameters of sapota cv. Kalipatti. They found that fruit quality in terms of TSS, ascorbic acid, total sugars, non-reducing sugar, reducing sugar and fruit firmness, shelf life, physiological loss in weight were recorded maximum in trees treated with 75 % NPK + 15 kg vermicompost + AAU Bio NPK 10 ml/tree.

Kumar *et al.* (2017) studied the impact of RDF, Biofertilizers and mulching on qualitative attributes of mango cv. Kesar in semi-arid conditions of central Gujarat. They found that maximum TSS (16.29^{o}Brix), total sugars (15.89 %), reducing sugar (5.56 %) and non-reducing sugar (10.34 %) were recorded when the plant treated with 75 % RDF + azotobacter (250 g/tree) + PSB (250 g/tree) + mulching with grass/straw @ 15 kg dry grass/m^2.

Vishwakarma *et al.* (2017) conducted an experiment to evaluate the response of organic manure, inorganic fertilizer and biofertilizer on physico-chemical characters of Bael fruit cv. Narendra Bael-9 during the years 2014-2015 and 2015-2016. They reported that maximum TSS (35.66^{o}Brix and 37.85^{o}Brix), ascorbic acid (20.75 mg/100 g of pulp and 21.26 mg/100 g of pulp) were recorded in the plant treated with 50 kg FYM + 100 % NPK + 200 g each (Azotobacter + PSB).

Sahu *et al.* (2017) studied the effect of cowdung slurry, chemical fertilizers and biofertilizers on fruit quality and shelf life of guava under chattisgarh plains showed that the application of 75 % RDF + vermiwash 10 litre/tree and 75 % RDF + Azospirillum + PSB was equally good for producing higher yield, ascorbic acid, TSS, reducing, non-reducing, total sugars were maximum under 75 % RDF + Cowdung slurry 10 litre/tree. The minimum physiological loss in weight (14.36 percent) after 10 days under ambient conditions was found to be maximum with the application of 75 % RDF + Cowdung Slurry.

Tyagi *et al*. (2018) studied the effect of integrated nutrient management on quality of guava cv. Lucknow-49. Results revealed that the minimum acidity (0.27 %) and maximum TSS (12.44^{o}Brix), total sugars (8.32 %), reducing sugars (4.20 %) and non-reducing sugars (4.12 %), ascorbic acid (217.36 mg/100 g of pulp), pectin (0.78 %) were recorded with the application of 50 % RDF + 50 kg FYM + Azospirillum (100 g/tree) + PSB (100 g/tree) which was superior among all the treatments.

Kumrawat *et al.* (2018) reported that application of 100 % NPK + 5 kg Vermicompost + 150 g azotobacter recorded minimum acidity (0.23 %) and maximum TSS (12.67^{o}Brix), ascorbic acid (206.07 mg/100 g pulp), pectin (0.75 %), total sugars (8.21 %), reducing sugars (4.15 %) and non-reducing sugars (4.06 %) in guava.

Ravikiran *et al*. (2018) studied the effect of integrated nutrient management and micronutrients on postharvest quality parameters and shelf life of mango cv. Banganapalli under high density planting. Results revealed that maximum TSS (17.76^{o}Brix), total sugars (13.43 %), reducing sugars (5.23 %), non-reducing sugars (8.20 %), ascorbic acid (32.36 mg/100 g pulp) and shelf life (12.90 days) with minimum acidity (0.304 %) were recorded in the tree treated with 50 % RDF + 50 % VC + 250g Azotobacter + (0.8 %) $ZnSO_4$ + (0.5 %)H_3BO_3 + (0.5 %) $FeSO_4$.

Mirjha *et al*. (2018) conducted experiment on influence of cultivars, cropping systems and nutrient levels on yield and quality of mango. They reported that application of 100 % RDF + 100 % RD-FYM exhibited higher biochemical quality parameters like TSS, vitamin C and total sugars over other treatments.

Baraily and Deb (2018) reported that the application of 30 t/ha FYM + 75 % RDF of NPK + Biofertilizer as best treatment in terms of maintaining fruit bio-chemical parameters of pineapple.

Singh *et al*. (2018) conducted experiment on the effect of organic, inorganic and biofertilizers on physico-chemical properties of fruits of guava cv. L-49. They reported that maximum total soluble solids, acidity, ascorbic acid content, reducing sugars, total sugars and non-reducing sugars was observed with the soil application of 75 % RDF + 40 kg per tree (T_3) compared to treatment T_1(without nutrition).

Waghmare *et al.* (2018) found that maximum total soluble solids (23.80 %), reducing sugar (14.11 %), non-reducing sugar (3.41 %), total sugars (17.57 %), ascorbic acid (37.22 mg per 100g of pulp) and minimum acidity (0.32 %) observed in treatment T_2 (100 % RDF + FYM + Azotobacter + PSB) followed by treatment T_3 (100 % RDF + FYM + Azotobacter) in custard apple cv. Balanagar.

2.3 EFFECT OF DIFFERENT PACKAGING MATERIALS ON SHELF LIFE OF GUAVA

Adsule and Tandon (1983) conducted a study on guava cv. Allahabad safeda using LDPE polythene bags with 1%, 2% and no perforation. Among the treatments 1% ventilation LDPE bags has shown reduced PLW (5.82 %) and increased firmness (3.68 kg/cm^2).

Gautam and Neeraja (2005) revealed that maximum shelf life of banganapalli mangoes observed in polythene bags of 250 guage with 1% ventilation which delayed ripening, rotting and maintained optimum fruit quality.

Borkar *et al*. (2008) studied the effect of ethylene absorbent and different packaging materials on shelf of banana. They reported that significantly minimum weight loss, TSS and pulp/peel ratio recorded by fruits stored in 250 guaged non-perforated HDPE bags followed by 175 guaged non-perforated HDPE bags with ethylene absorbent and spoilage was recorded on 15 days of storage to the tune of 2.15 % and 1.054 %, respectively by fruits stored in 175-gauged HDPE bags and 250-gauged HDPE bags.

Rathore *et al*. (2009) reported that fruit packed either in polyethylene alone or coating with combination of protective chemicals packed in polyethylene had played a very effective role to control the weight loss and other compositional changes such as total soluble solids, titrable acidity and ascorbic acid of Chaunsa White commercial variety of mango at ambient temperature during storage.

Bindu Praveena *et al.* (2013) reported that sapota fruits stored in 200 gauge LDPE polybags with 1.2% ventilation recorded a maximum shelf life of 31.83 days and higher quality in terms of fruit firmness (2.1 kg/cm²), organoleptic score (9.93), TSS (20.11°Brix), ascorbic acid (22.34 mg/100 g), titratable acidity (0.23 %), reducing sugars (8.21 %) and total sugars (12.31 %).

Azene *et al*. (2014) studied the effect of packaging materials and storage environment on postharvest quality of papaya fruit. They found that polyethylene bag packaging combined with evaporatively cooled storage maintained the superior quality of papaya fruit for a period of 21 days.

Hailu *et al.* (2014) studied the effect of packaging materials on shelf life and quality of banana cultivars (*Poyo*, *Giant Cavendish* and *Williams I.)*. Four packaging materials, namely, perforated low density polyethylene bag, perforated high density polyethylene bag, dried banana leaf, teff straw and no packaging materials (control) were used with three banana cultivars. Banana remained marketable for 36 days in the highdensity polyethylene and low density polyethylene bags, and for 18 days in banana leaf and teff straw packaging treatments. Results concluded that packaging of banana fruits in high density and low density polyethylene bags resulted in longer shelf life and improved the quality of produce.

Jawandha *et al*. (2014) studied the Effect of modified atmosphere packaging on storage of Baramasi Lemon (*Citrus limon* (L.) Burm). Results revealed that fruits treated with Bavistin @ 0.1% and packed in LDPE bags maintained the best fruit quality in terms of high sensory quality, juice content, acidity and low spoilage and physiological loss in weight during 50 days of ambient storage.

Antala *et al.* (2014) conducted experiment on the effect of modified atmosphere packaging on shelf life of sapota fruit. They reported that the shelf life of sapota fruits could be increased up to 49 days by packaging in 25µ LDPE bags at gas concentration 5% O_2 + 10% CO_2 and stored at 6^{o}C with maximum sensory score.

Prasad *et al.* (2015) conducted a study to evaluate the effect of different packaging materials on shelf life of banana (*Musa paradisiaca*L.) cv. Harichal under different conditions. Cool chamber + Brown paper and Cool chamber + Tissue paper were found good for improving nutritional quality during storage. The treatment T_2 (CC + Brown paper), T_5 (AT + Brown paper) are well for TSS (23.70 and 24.60^{o}Brix) respectively. Treatment T_2 (CC + Brown paper) is good for ascorbic acid (15.75 mg/100g). Treatment T_4 (AT + Tissue paper) is useful for reducing sugars (6.56 %) and treatment T_5 (AT + Brown paper) was good for total sugars.

Safari *et al*. (2016) studied the evaluation of different packaging materials viz., poly propylene (PP), Low density polyethylene (LDPE), High density polyethylene (HDPE) and Metallized polyester (MP) on shelf life and quality of minimally processed pomegranate arils under cold storage conditions and room temperature. They reported that high density polyethylene 40 microns without perforations is found to be best in extending shelf life up to 22.66 days in cold storage and 4.33 days at room temperature conditions and also showed superior results pertaining to quality parameters (TSS, Acidity, sugars).

Pratap *et al*. (2017) conducted experiment on impact of different packaging materials (LDPE, HDPE, Cling film, Shrink film) on the shelf life of sapota fruits. They reported that minimum physiological loss in weight and maximum pulp: peel ratio was observed in T_3 (shrink film 10µ) and shelf life of fruit increased to 18 days compared to other treatments.

Nagaraju and Banik (2017) conducted studies on sensory quality and shelf life of Guava cv. Khaja influenced by packaging materials. Results revealed that fruits packed in 75µ LDPE proved to be the best treatment among all the treatments which not only extended the shelf life and increased marketable fruits but also reduced the post-harvest losses without adversely affecting the fruit quality of guava.

Sarkar *et al.* (2017) studied the effect of modified and active packaging on shelf life and quality of banana cv. Grand Naine. They reported that fruits packed with (LDPE + $KMnO_4$) recorded significantly lowest PLW (1.11 %) by maintaining significant amount of TSS (17.03°Brix), sugars (reducing, non-reducing and total) in longest storage observation (on day 24) with a maximum shelf life up to 26.05 days compared to 9 days only for untreated fruits.

Taduri *et al.* (2017) found that mango fruits of cv. Amrapali packed in 5% perforated LDPE polythene films can be stored for 16 days compared to unpacked control fruits which had storage life of 9 days. After two weeks of storage, fruits packed in perforated LDPE maintained lower PLW, desirable firmness and minimum spoilage and better quality compared to other treatments.

Chapter - III

MATERIAL AND METHODS

Chapter III

MATERIAL AND METHODS

The present investigation entitled "Effect of Organic and Inorganic sources of nutrients on yield, quality and shelf life of Guava (*Psidium guajava* L.) Cv. Allahabad Safeda under dry land conditions" was carried out during the year 2018-2019 at Gunegal Research Farm, ICAR-CRIDA, Santoshnagar. The details of the location, the material used and the techniques adopted during the period of experimentation are presented in this chapter in the following headings and sub headings.

3.1 GEOGRAPHICAL LOCATION OF THE EXPERIMENTAL SITE

The field experiment was conducted on the land of Gunegal Research Farm, Gunegal village, Rangareddy district, Telangana. It is situated at 78.66°E longitude and 17.08°N latitude and at 626 meter above sea level (MASL). This farm is under ICAR-CRIDA, Hyderabad.

3.2 CLIMATIC CONDITION

The climate of Rangareddy is tropical, semi-arid and dry climate. The data on weather parameters during the period of investigation recorded at Gunegal Research Farm, CRIDA are presented in Appendix I.

3.3 SOIL CHARACTERISTICS OF THE EXPERIMENTAL SITE

The soil of the orchard selected is a medium sandy clay loam with a pH of 6.78 and electrical conductivity of 0.09 dSm^{-1}. The availability of nitrogen, phosphorus and potassium per hectare is 210.20, 16 and 188 kilograms respectively.

3.4 DESCRIPTION OF THE CULTIVAR ALLAHABAD SAFEDA

The guava Cv. Allahabad Safeda is the most popular and widely grown commercial variety of Telangana. The tree is medium to tall in size, upright growth habit, heavy bearer, dense foliage and has a tendency to produce long shoots. Crown is broad and compact, often dome-shaped and rarely loose. Fruit is medium size, round in shape with smooth skin and white flesh. The fruits are relatively soft with less hard seeds. Its keeping quality is good (Singh, 2008).

3.5 EXPERIMENT DETAILS

Two experiments were carried out as per the details furnished here under.

3.5.1 Experiment-1

Title: "Effect of Organic and Inorganic sources of nutrients on yield and quality parameters in guava (*psidiumguajava* L.) Cv. Allahabad Safeda under dryland conditions".

Name of the crop : Guava

Botanical name :*Psidium guajava*

Cultivar : Allahabad Safeda

Design of the experiment : Randomized Block Design

Number of treatments : 5

Number of replications : 4

Total no. of plants : 120

Row to row distance : 6m

Plant to plant distance : 6m

System of planting : Square

Location of work : Gunegal Research Farm, ICAR-CRIDA

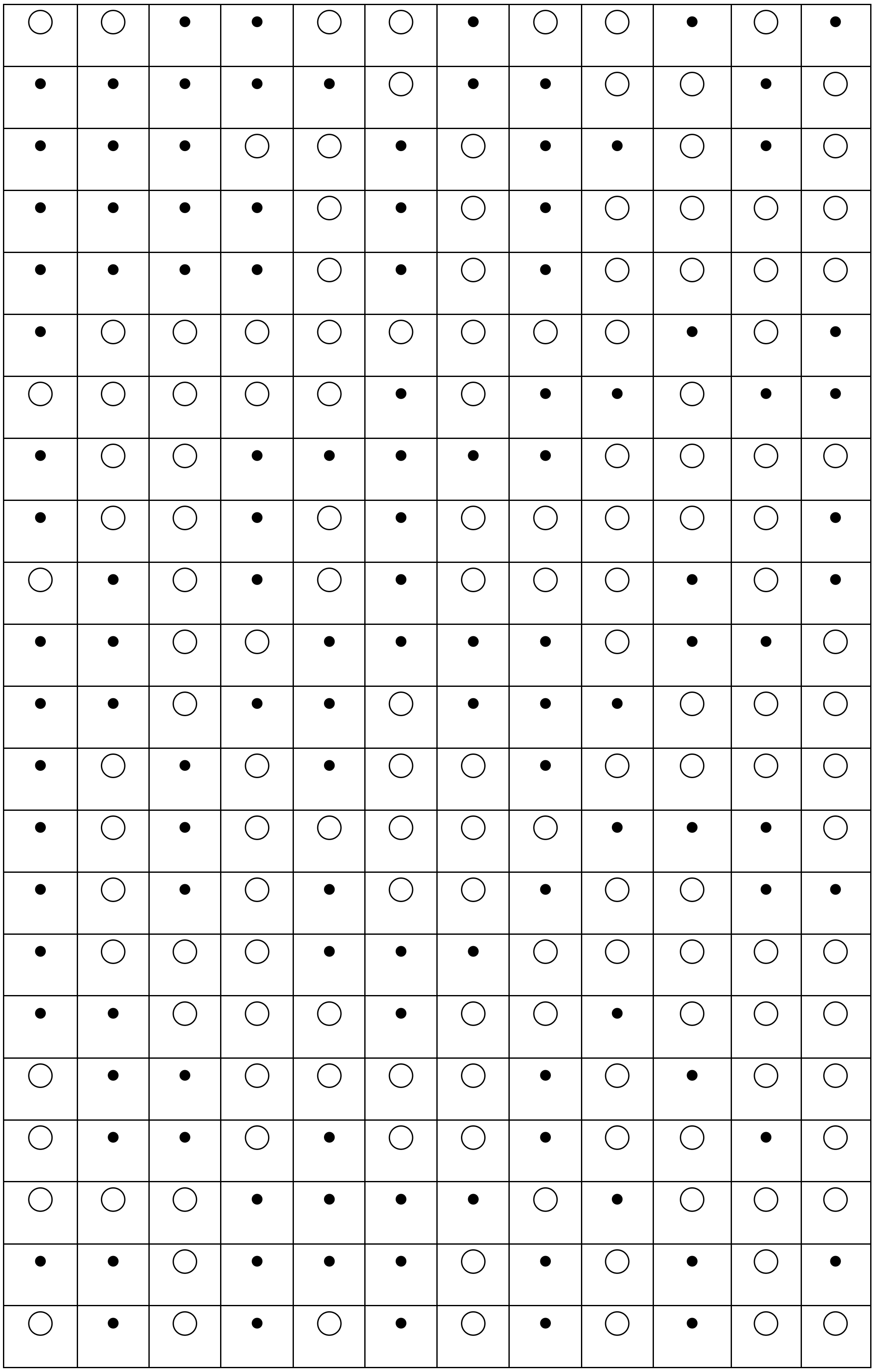

Fig. 3.1: Plan and layout of the experimental field

Plate 1. General view of the experimental field

Plate 2. Application of manures and fertilizer in guava trees

Treatment details:

1. T_1 – Organic sole (100%) (in the form of FYM)
2. T_2 – Inorganic sole (100%) (N:P:K)
3. T_3 – Organic (75%)(FYM) + Inorganic (25%)(N:P:K)
4. T_4 – Inorganic (75%)(N:P:K) + Organic (25%)(FYM)
5. T_5 – Organic (50%)(FYM) + Inorganic (50%)(N:P:K)

- RDF :- 625:300:300 g/plant (N:P:K)
- 25% RDF (Inorganic) :- 155:75:75 g/plant (N:P:K)
- 75% RDF :- 460:225:225 g/plant (N:P:K)
- 50%RDF :- 312:150:150 g/plant (N:P:K)
- Organic source of nutrient used is FYM.
- Inorganic sources of nutrients used are Urea, DAP and MOP.

Observations recorded:

A. Physical parameters:

1. Fruit weight (g)
2. Number of fruits per tree
3. Fruit yield (kg/tree)
4. Fruit firmness (kg/cm^2)
5. Shelf life (days)
6. Physiological loss in weight (%)
7. Moisture content (%)

B. Chemical parameters:

1. Total sugars (%)
2. Reducing sugars (%)
3. Non-Reducing sugars (%)
4. Ascorbic acid content (mg/100g of pulp)
5. Dietary fibre content (%)
6. Total soluble solids (^{o}Brix)
7. Titrable acidity (%)
8. Protein content (%)

9. Antioxidant (mg)
10. Mineral content(mg) (Ca, K)
11. Pectin content (%)

C. Economics of cultivation

Benefit cost ratio.

3.5.2 Experiment-2

Title: Effect of different packaging materials on shelf life of guava Cv. Allahabad Safeda.

Name of the crop : Guava

Botanical name :*Psidium guajava*

Cultivar : Allahabad Safeda

Location : Post harvest laboratory,

College of Horticulture, Rajendranagar.

Design of the experiment : Completely Randomized Design (CRD)

Number of treatments : 6

Number of replications : 4

Intervals of observation : 2 days

Treatment details:

1. T_1 - 50µ LDPE packaging
2. T_2 - 75µ LDPE packaging
3. T_3 - 100µ LDPE packaging
4. T_4 - Brown paper packaging
5. T_5 - 50µ HDPE packaging
6. T_6 – control (without packaging)

Fruits are wrapped with different packaging materials and stored at room temperature with 1% ventilation.

Observations recorded:

1. Physiological loss in weight (%)
2. Spoilage (%)
3. TSS (°Brix)
4. Titrable Acidity (%)
5. Total sugars (%)
6. Non-Reducing sugars (%)
7. Reducing sugars (%)
8. Fruit firmness (Kg/cm^2)
9. Ascorbic acid (mg/100g)
10. Shelf life (days)

3.5.1.1 Treatment application

The guava trees selected for the experimentation were subjected to preparation of basin around the canopy of tree. Half dose of urea and full dose of diammonium phosphate and muriate of potash were applied on first week of July and remaining half dose of nitrogen was applied in two equal splits one month after first dose. The whole of the organic manure (farm yard manure) was incorporated along the basin. The chemical composition of different organic manures and inorganic fertilizers used for the experiment is given in Table 3.1.

Table 3.1: Chemical composition of organic manures and fertilizers

Organic manures/fertilizers	Nutrient contents		
	N (%)	P_2O_5 (%)	K_2O (%)
Urea	46	-	-
Diammonium phosphate (DAP)	18	46	-
Muriate of potash (MOP)	-	-	60
Farm yard manure (FYM)	0.5	0.2	0.5

Table 3.2 Applied inorganic fertilizers

S.No.	Dose	Amount of NPK	Required Urea, DAP, MOP
1.	Recommended dose	625:300:300 g	1103.5 g Urea, 652.17 g DAP, 500 g MOP.

2.	75% of Recommended dose	460:225:225 g	808.61 g Urea, 489.13 g DAP, 375 g MOP.
3.	50% of Recommended dose	312:150:150 g	550.67 g Urea, 326.01 g DAP, 250 g MOP.
4.	25% of Recommended dose	155:75:75 g	273.15 g of Urea, 163.04 g DAP, 125 g of MOP.

In applied inorganic fertilizers (Table 3.2), urea applied as a source of N_2, MOP applied as a source of K_2O but DAP applied as a source of P_2O_5 and also N_2 because DAP had 18% of nitrogen. So, according to treatment and depending on requirement of P_2O_5 some part of nitrogen applied through DAP and remaining nitrogen was applied through urea.

3.5.1.2 Irrigation

Protective irrigations were given as per the need during drought period manually to all the experimental trees particularly during fruit development stage.

3.5.1.3 Weeding

The experimental plot was kept weed free by regular hand weeding and hoeing during the entire crop growth period.

3.5.1.4 Plant protection

Prophylactic plant protection measures were adopted as and when required for the control of common pests and diseases of guava during the period of investigation.

3.5.1.5 Harvesting

In guava crop, the majority of the fruits reached the maturity stage except few fruits, so staggered harvesting was followed in guava.

3.6 OBSERVATIONS RECORDED

3.6.1 Physical parameters

3.6.1.1 Fruit weight (g)

Five fruits were selected from each treatment and weighed with the help of electronic balance and average fruit weight was calculated and expressed in gram (g).

3.6.1.2 Number of fruits per tree

The number of fruits borne on each plant were counted and recorded as number of fruits per tree.

3.6.1.3 Fruit yield (kg/tree)

The total weight of fruits harvested per each tree was recorded to obtain the fruit yield per tree and expressed in kilograms.

3.6.1.4 Fruit firmness (kg/cm^2)

Penetrometer was used to record the unconfined strength of fruits and direct readings were obtained in terms of kg/cm^2.

3.6.1.5 Shelf life (days)

The shelf life of fruits was determined by recording the number of days the fruits remained in good condition during storage without spoilage. When the spoilage of fruits exceeded 50% it was considered as the end of shelf life or storage life and recorded.

3.6.1.6 Physiological loss in weight (%)

Physiological loss in weight (PLW) was determined by recording the initial weight of the fruits on the day of initiating experiment and subsequently at two days interval. The loss of weight in grams and in relation to initial weight was calculated and expressed in percentage.

$$\text{PLW}(\%) = \frac{(\text{Initial weight} - \text{weight after storage})}{\text{Initial weight}} \times 100$$

3.6.1.7 Moisture content (%)

Moisture content of the fruit is determined by oven drying method (AOAC, 2000). Dry the empty dish and lid in the oven at 105ºC for 3 h and transfer to desiccator to cool. Weigh the empty dish and lid. Weigh about 3 g of sample to the dish and note it as W_1. Spread the sample to the uniformity. Now place the dish with sample in the oven. Dry for 3 h at 105ºC. After drying transfer the dish with partially covered lid to cool, reweigh the dish and its dried sample and note it as W_2 (Athmaselvi *et al*., 2014).

$$\text{Moisture (\%)} = \frac{(W_1 - W_2)}{W_1} \times 100$$

Where:

W_1 = weight (g) of sample before drying.

W_2 = weight of sample after drying.

3.6.1.8 Spoilage (%)

The number of fruits spoiled in a replication was counted and expressed in percentage. The spoilage of fruits was determined based on the following visual observations.

1. Shrivelling of the fruits.
2. Fungal infection and subsequent rotting of fruits.
3. Over ripening and subsequent splitting of fruits.
4. Browning and discolouration of fruits.

$$\text{Spoilage (\%)} = \frac{\text{Number of spoiled fruits}}{\text{Total number of fruits}} \times 100$$

3.6.2 Chemical parameters

3.6.2.1 Total sugars (%)

Total sugars were determined following the method described by Lane and Eyon (AOAC, 1965). Fifty ml lead free filtrate was taken in a 100 ml volumetric flask and to it 5 ml of concentrated HCl was added, mixed well and then kept for 24 hours at room temperature. Acid was then neutralized with NaOH using a drop of phenolphthalein as an indicator till the pink colour persisted for at least few seconds. Then volume made up to 100 ml. Total sugars were then estimated by taking this solution in a burette and titrating it against standard Fehling' solution mixture of A and B (1:1) using methylene blue as an indicator till brick red colour is formed and noted as an end point.

$$\text{Total sugars (\%)} = \frac{\text{Factor x volume made up}}{\text{Titre value x weight of sample}} \text{ x } 100$$

3.6.2.2 Reducing sugars (%)

Reducing sugars were determined by the method of Lane and Eyon (AOAC, 1965). Ten grams of fruit pulp was taken, ground well and transferred to 250 ml volumetric flask. To this 100 ml of distilled water was added. Two ml of lead acetate solution (45%) was added to flask for precipitation of colloidal matter and 2 ml of potassium oxalate (22%) was added in this solution to precipitate the lead and the volume was made up to 250 ml using distilled water.

The contents were then filtered through Whatmann No.1 filter paper after testing a little of filtrate for its freedom from lead by adding a drop of potassium oxalate. The lead free solution was taken in a burette and titrated against 10 ml of standard Fehling's solution (mixture of A and B 1:1) using methylene blue as an indicator till brick red precipitate is formed and end point is noted. The titration was carried out by keeping the Fehling's solution boiling on the heating mantle.

Factor x volume made up

$$\text{Reducing sugars (\%)} = \frac{}{\text{Titre value x weight of sample}} \times 100$$

3.6.2.3 Non-reducing sugars (%)

Non reducing sugars in a sample is obtained by subtracting reducing sugars from total sugars.

Non-reducing sugars = Total sugars – Reducing sugars

3.6.2.4 Ascorbic acid content (mg/100g of pulp)

Ascorbic acid was estimated by Indophenol method (Ranganna, 1986). Ten grams of fresh fruit pulp was ground well and blended with 3% Meta phosphoric acid (HPO_3) and the volume was made upto 100ml with HPO_3solution. An aliquot of 10ml was taken and titrated against standard dye solution (2,6 dichlorophenol indophenol dye) till light pink colour persist for at least 15 seconds. Standardization of dye (dye factor) was done by titrating it against standard ascorbic acid diluted in 3% HPO3 solution.The ascorbic acid was calculated using the following formula and expressed as mg ascorbic acid per 100 g fresh weight.

$$\text{Ascorbic acid (mg/100g)} = \frac{\text{Titre x Dye factor x Vol. made up x 100}}{\text{Wt. of sample x Aliquot taken}}$$

$$\text{Dye factor} = \frac{0.5}{\text{Titre value}}$$

3.6.2.5 Dietary fibre content (%)

The method involves sequential enzymatic digestion of dried and defatted samples (in case of samples containing <10% fat) by heat stable α-amylase, pepsin and pancreatin enzymes to remove starch and protein present in the samples. Ethanol is added to the digest to precipitate soluble dietary fiber. The total dietary fibre (TDF) is the residue left after subsequent washing of the insoluble residue and the precipitate with alcohol and acetone, dried, weighed and corrected for protein and ash content (AOAC, 2000).

Reagents

- Ethanol solution, 95 % V/V
- Ethanol solution, 78 % V/V
- Acetone, AR grade
- 0.05 M MES-TRIS buffer solution – Dissolve 19.52 g MES and 12.2 g TRIS in 1.7 L distilled H_2O. Adjust pH to 8.2 with 6 N NaOH and dilute to 2.0 L with distilled H_2O.
- Enzymes used α-amylase, pepsin and pancreatin
    - α-amylase: 100mg/ml enzyme solution in MES-TRIS buffer prepared and stored at below 5^{o}C.
    - Pepsin: 100 mg/ml enzyme solution in MES-TRIS buffer fresh daily and store at below 5^{o}C.
    - Pancreatin: 100 mg/ml enzyme solution in MES-TRIS buffer fresh daily and store at below 5^{o}C.
- 6N Hydrochloric acid: Add 50.0 ml concentrated HCl to about 40.0 ml water and dilute to 100.0 ml with distilled water.
- 0.561 N Hydrochloric acid: Add 93.5 ml 6 N HCl to about 700.0 ml distilled water in a 1.0 L volumetric flask. Dilute to 1.0 L with distilled water.
- Standard buffer solution, pH 4.0, 7.0 and 10.0

Procedure:

One gram of sample was taken in duplicates in 400.0 ml beakers along with two blanks. 40.0 ml of 0.05 MES-TRIS buffer solution (pH 8.2) was added to each beaker and mixed well without any lumps so that the samples were accessible to the enzymes.

Firstly, 50.0 µl of α-amylase solution was added to each beaker, mixed thoroughly, covered with aluminium foil, placed in shaking water bath at 95^{o}C and incubated for 30 min. After that, beakers with samples were removed from hot water bath, cooled to 60^{o}C and covered foils were removed.

Now 100.0 µl of pepsin solution was added to each sample in the beakers and again covered with aluminium foil. Beakers were incubated in shaking water bath with continuous agitation at 60°C for 30 min. After this, beakers with samples were removed from water bath, 5.0 ml of 0.561 N HCl solution was added to each beaker and Ph adjusted between 4.0 - 4.7 using 1N NaOH solution or 1N HCl solution as required.

Next, 200.0 µl of pancreatin solution was added to each sample in the beakers, covered and incubated in shaking water bath with continuous agitation at 60°C for 30 min. After that beakers were removed and further analysis carried out.

Precipitation and filtration:

To each digest, 225.0 ml of 95% ethanol was added and was allowed to stand for 60 min for the precipitate to form at room temperature. Then it was filtered through the pre-weighed crucibles containing celite. After this the residue was washed twice with 15.0 ml portions of each of the 78% ethanol, 95% ethanol and acetone respectively.

The crucibles were dried at 105°C overnight and weighed after cooling to room temperature in a desiccator. One residue of the duplicate set was taken for protein estimation by Kjeldhal method. The other residue was incinerated at 600°C for 2 hrs and weighed after cooling in a desiccator. The total dietary fibre (TDF) was corrected for protein, ash and blank.

Calculation

$$\text{TDF} = \frac{\text{Residue(mg)} - (\text{residue protein} + \text{residue ash}) - \text{blank}}{\text{Weight of sample (g)}} \times 100$$

where

Blank = blank residue weight – (blank protein + blank ash)

3.6.2.6 Total soluble solids (°Brix)

The total soluble solids were determined by using ERMA hand refractometer and expressed as °Brix (Ranganna, 1986).

3.6.2.7 Titrable acidity (%)

Acidity was estimated by adopting the procedure described by Ranganna (1986). Ten grams of sample was ground well and transferred to volumetric flask and volume was made upto 100 ml with distilled water. The contents were filtered through Whatmann No. 1 filter paper. An aliquot of 10 ml was taken into a conical flask and 2-3 drops of phenolphthalein indicator was added and then titrated against 0.1 N NaOH. Appearance of light pink colour denotes the end point. It was calculated using the following formula and expressed in percentage. (Eq. wt. of citric acid = 0.064)

$$\text{Acidity(\%)} = \frac{\text{Titre x Normality of NaOH x Eq. wt. of acid x Vol. made up x 100}}{\text{Wt. of sample x Aliquot taken}}$$

3.6.2.8 Protein content (%)

The protein content was estimated as per micro Kjeldhal method AOAC (2005), was calculated as percent nitrogen of sample and multiplied with 6.25 to obtain the protein content.

Procedure

- Powdered sample of fruit of 0.5 g was weighed into digestion tubes and 5.0 g of digestion mixture (98 g of potassium sulphate + 2 g copper sulphate) plus 10.0 ml of concentrated H_2SO_4 were carefully added. The samples were placed in the digestion unit for 1½ hr at 375^oC.
- In a 100.0 ml conical flask, 40.0 ml of 4% boric acid was added along with few drops of mixed indicator (1.0 ml of 0.2% bromocresol green + 3.0 ml of 0.2% methyl red).
- Distillation was done for 10 minutes in the Kjeldhal distillation apparatus adding 10.0 ml of distilled water, 15.0 ml of 40% NaOH and steaming for 10 seconds.
- The contents collected in conical flask were blue in colour after distillation. Titration was done adding indicator with standard 0.1 N HCl till the contents of the flask turned to pink colour. A blank was run simultaneously.

Calculation

$$\text{Protein (\%)} = \frac{\text{(Sample TV-blank TV) x 0.014 x 0.1 N of HCl x 6.25}}{\text{Weight of the sample (g)}} \text{ X 100}$$

3.6.2.9 Antioxidant (mg)

Total antioxidant capacity was determined by Ferric Reducing Antioxidant Power (FRAP) assay (Benzie and Strain, 1999). The FRAP assay is based on the reduction of ferric TPTZ (2, 4, 6-tris (2-pyridyl)-s-triazine) complex to the ferrous form at acidic pH. Electron donating substances for which the half reaction has a lower redox potential than Fe^{+3}/Fe^{+2} – TPTZ, drive the reaction and the form the blue complex forward, which can be monitored by measuring adsorbance at 593nm.

Procedure

- FRAP reagent was prepared using 300mM/L acetate buffer, pH 3.6 (3.10 g sodium acetate trihydrate, 16 mL glacial acetic acid and made upto 1L with distilled water), 10mM/L TPTZ (3.123 g TPTZ in 40mM/L HCl), 20mM/L $FeCl_3.6H_2O$ (5.406 g/L using distilled deionised water).
- The fresh working solutions were prepared as in 10:1:1 ratio with 1mL of it was mixed with 50µl samples (triplicate) or Trolox (standard calibration) and kept in dark place for 30 minutes.
- The measurement of absorbance reading was taken at 595 nm wavelength using spectrophotometer.
- The results were determined with standard calibration curve and expressed as milligrams of Trolox equivalents per 100g of fresh weight sample (mg TE/100g FW).

3.6.2.10 Mineral content(mg)(Ca, K)

Oven dried fruit pieces were ground to fine powder and samples were taken for analyzing nutrients.

Digestion of fruit for Ca, K

0.5 g powdered sample of fruit was taken in 100 ml flask and digested in di-acid mixture of nitric acid and per chloric acid in 9:4 ratio. The flask was placed on a hot plate at 115-118ºC for digestion. The digested sample was filtered and was diluted with double distilled water to make a volume of 50 ml which was ultimately used for estimation of macro and micro-nutrients.

Potassium (mg)

The wet digested sample was diluted and fed to the flame photometer to estimate potash content (Venkatesh *et al*., 2013). The results were expressed in milligrams.

Calcium (mg)

The wet digested sample was diluted and fed to the flame photometer to estimate calcium content (Venkatesh *et al*., 2013).

3.6.2.11 Pectin (%)

Total pectin as calcium pectate in fresh fruits was estimated by the methods of Ranganna (1979). Preparation of reagents are given below.

1. 1N Acetic acid	
Glacial acetic acid	30 ml
Volume	200 ml
2. 1N Calcium Chloride	
Anhydrous calcium chloride	27.5 g
Volume	500 ml
3. 1N Sodium hydroxide	
Sodium hydroxide	20 g
Volume	500 ml
4. 1% Silver nitrate	
Silver nitrate	1 g
Volume	100 ml

Extraction

For estimation of pectin, 25 g of fresh fruit macerated samples were taken in a flask. To this, 200 ml distilled water was added and kept on hot plate for one hour. The water lost during boiling was replaced simultaneously. The flask was then cooled and volume was made up to 250 ml. the contents of flask were then filtered through Whatman filter paper No. 4.

Estimation

To 50 ml portion of the fitrate, 50 ml of distilled water and 5 ml of 1 N NaOH was added and kept overnight. Next day, 25 ml of acetic acid solution was added and after 5 minutes, 12.5 ml of 1N calcium chloride solution was added with string. After allowing it to stand for one hour, it was boiled for one minute and filtered through oven dried, previously weighed Whatman filter paper No. 4. The precipitates were then dried at 100°C overnight, cooled in desiccators and weighed. The amount of pectin was expressed as per cent calcium pectate.

$$\text{Calcium pectate (\%)} = \frac{\text{Weight of calcium pectate x Volume of content}}{\text{Volume of filtrate x Wt. of sample for estimation}} \times 100$$

3.6.3 ECONOMICS

3.6.3.1 Cost of cultivation

The prices of all inputs prevailing at the time of their use were considered to work out the cost of cultivation.

3.6.3.2 Gross income

The gross income was worked out based on the prevailing market price of guava fruits.

3.6.3.3 Net income

The net income per hectare was calculated by using the following formula.

NI = Gross income – cost of cultivation.

3.6.3.3 Benefit cost ratio

The benefit cost ratio for different treatments was worked out based on the price of inputs used for cultivation and price of marketable produce in local market by using following formula and it is expressed in ratio.

$$\text{Benefit cost ratio} = \frac{\text{Net income (ha}^{-1}\text{)}}{\text{Cost of cultivation (ha}^{-1}\text{)}}$$

3.7 STATISTICAL ANALYSIS

The design adopted was randomized block design for 1st experiment and completely randomized design for 2nd experiment and the data were subjected to statistical analysis as per the procedure outlined by Panse and Sukhatme (1985).

Chapter - IV

RESULTS AND DISCUSSION

Chapter IV

RESULTS AND DISCUSSION

The present investigation entitled "Effect of Organic and Inorganic sources of nutrients on yield, quality and shelf life of Guava (*Psidium guajava* L.) Cv. Allahabad Safeda under dryland conditions" was carried out during the year 2018-2019 at Gunegal Research Farm, ICAR-CRIDA, Santoshnagar. The results showed that physical and quality characters are presented and discussed in this chapter under the following headings.

4.1 "EFFECT OF ORGANIC AND INORGANIC SOURCES OF NUTRIENTS ON YIELD AND QUALITY PARAMETERS IN GUAVA (*Psidium guajava* L.) Cv. ALLAHABAD SAFEDA UNDER DRY LAND CONDITIONS"

4.1.1 Fruit weight (g)

The effect of organic and inorganic sources of nutrients on fruit weight of guava is presented in table 4.1.1 and fig. 4.1.1.

There was significant difference was observed among the treatments with respect to fruit weight. Maximum fruit weight (185.70 g) was observed with the treatment (T_4) comprising Inorganic (75% NPK) + Organic (25% FYM) followed by T_5- Organic (50% FYM) + Inorganic (50% NPK) (173.38 g) and significantly minimum fruit weight (112.91 g) was recorded in T_1-Organic sole (100% FYM). The increase in average fruit weight was due to the combined application of inorganic and organic fertilizers in T_4 improved soil nutrient availability and triggered various biological processes at soil rhizosphere, which provided better nourishment to the plant resulting in higher fruit weight. The results are in close conformity with the findings of Sharma (2004) in papaya, Athani *et al.* (2007) and Sharma *et al.* (2013) in guava.

Table 4.1.1 Effect of organic and inorganic sources of nutrients on fruit weight (g) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Fruit weight (g)
T_1	Organic Sole (100% FYM)	112.91[e]
T_2	Inorganic Sole (100% NPK)	163.60[c]
T_3	Organic (75% FYM) + Inorganic (25% NPK)	151.54[d]
T_4	Inorganic (75% NPK) + Organic (25% FYM)	185.70[a]
T_5	Organic (50% FYM) + Inorganic (50% NPK)	172.38[b]
	F-test	S
	S.Em ±	1.785
	CD at 5%	5.561

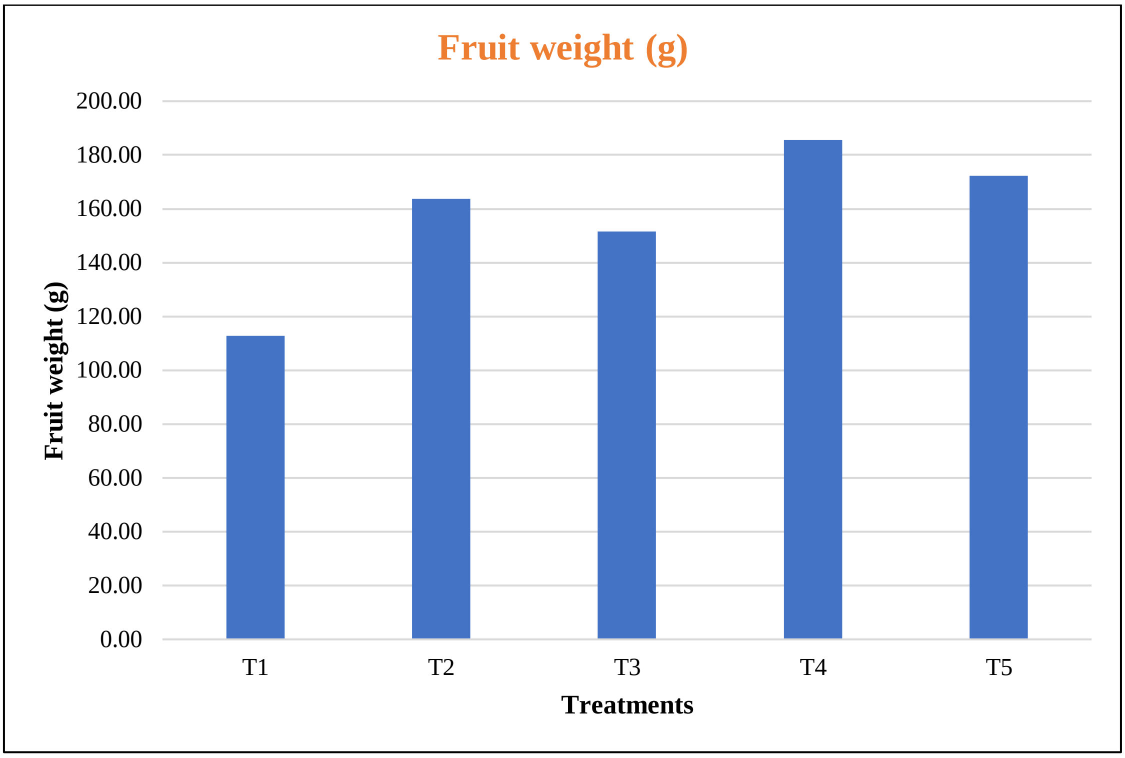

Fig. 4.1.1. Effect of organic and inorganic sources of nutrients on Fruit weight(g) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

4.1.2 Number of fruits per tree

The data related to number of fruits per tree influenced by the application of organic and inorganic sources of nutrients is presented in table 4.1.2 and fig. 4.1.2. All treatments differed significantly with respect to number of fruits per tree.

Highest number of fruits per tree was recorded in T_4- Inorganic (75% NPK) + Organic (25% FYM) (215.00) followed by T_5- Organic (50% FYM) + Inorganic (50% NPK) (206.00) and significantly minimum number of fruits per tree (160.50) was recorded in T_1-Organic sole (100% FYM).

4.1.3 Fruit yield (kg/tree)

The data pertaining to fruit yield as affected by the application of organic and inorganic sources of nutrients is presented in table 4.1.3 and fig. 4.1.3.

Significant difference was observed among the treatments for fruit yield. Highest fruit yield (39.93 kg/tree) was recorded in T_4- Inorganic (75% NPK) + Organic (25% FYM) followed by T_5- Organic (50% FYM) + Inorganic (50% NPK) (36.02 kg/tree) and significantly lowest yield (18.12 kg/tree) was recorded in T_1-Organic sole (100% FYM). Addition of FYM along with NPK fertilizers might have helped in improving soil physico-chemical and biological properties which ultimately improved plant growth and yield in terms of number of fruits, fruit weight and yield. The above results are in accordance with the findings of Singh and Banik (2011) in mango, Athani *et al.* (2007) in guava, Bhobia *et al.* (2005), Shukla *et al.* (2009) and Gupta *et al.* (2019).

4.1.4 Fruit firmness (kg/cm^2)

The result on fruit firmness of guava as affected by the application of organic and inorganic sources of nutrients is presented in table 4.1.4 and fig. 4.1.4.

There was significant difference observed among the treatments for firmness. Highest firmness (8.96) was recorded in T_5-Organic (50% FYM) + Inorganic (50% NPK) followed by T_4- Inorganic (75% NPK) + Organic (25%

Table 4.1.2 Effect of organic and inorganic sources of nutrients on number of fruits per tree of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Number of fruits per tree
T_1	Organic Sole (100% FYM)	160.50^{e}
T_2	Inorganic Sole (100% NPK)	191.25^{c}
T_3	Organic (75% FYM) + Inorganic (25% NPK)	172.75^{d}
T_4	Inorganic (75% NPK) + Organic (25% FYM)	215.00^{a}
T_5	Organic (50% FYM) + Inorganic (50% NPK)	206.00^{b}
	F-test	S
	S.Em ±	1.604
	CD at 5%	4.997

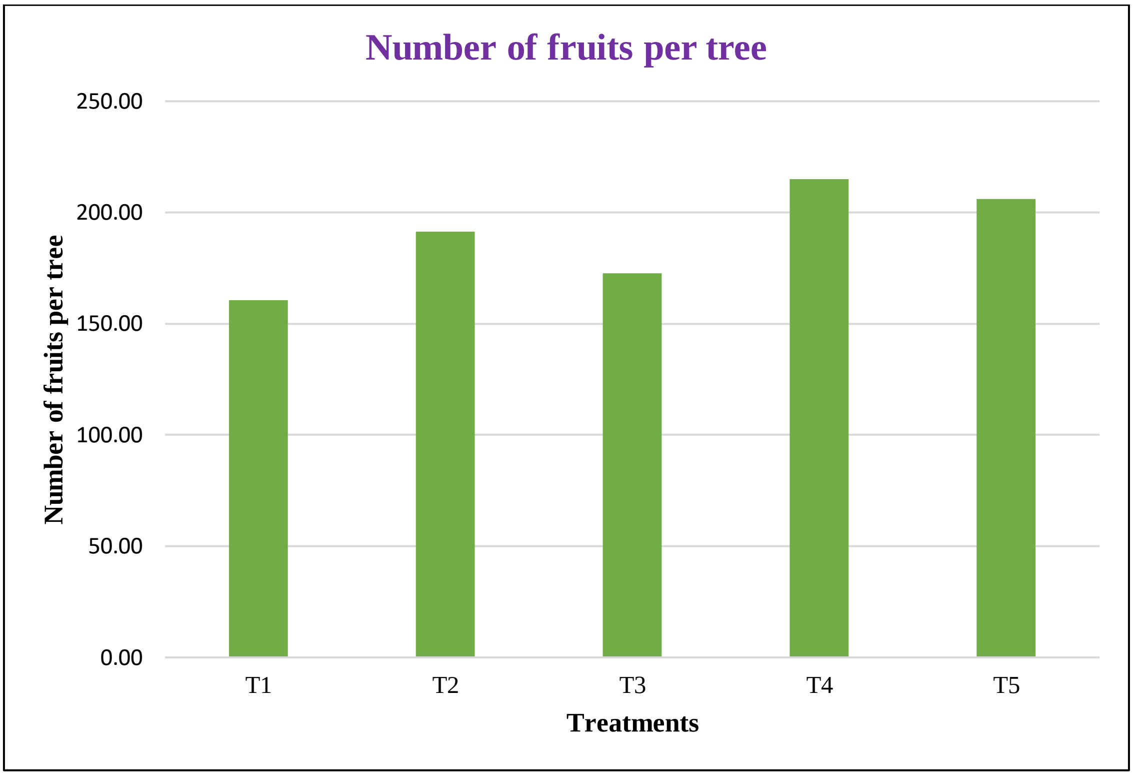

Fig. 4.1.2. Effect of organic and inorganic sources of nutrients on number of fruits per tree of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

Table 4.1.3 Effect of organic and inorganic sources of nutrients on fruit yield (kg/tree) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Fruit yield (kg/tree)
T_1	Organic Sole (100% FYM)	18.12^{e}
T_2	Inorganic Sole (100% NPK)	31.21^{c}
T_3	Organic (75% FYM) + Inorganic (25% NPK)	26.18^{d}
T_4	Inorganic (75% NPK) + Organic (25% FYM)	39.93^{a}
T_5	Organic (50% FYM) + Inorganic (50% NPK)	36.02^{b}
	F-test	S
	S.Em ±	0.512
	CD at 5%	1.595

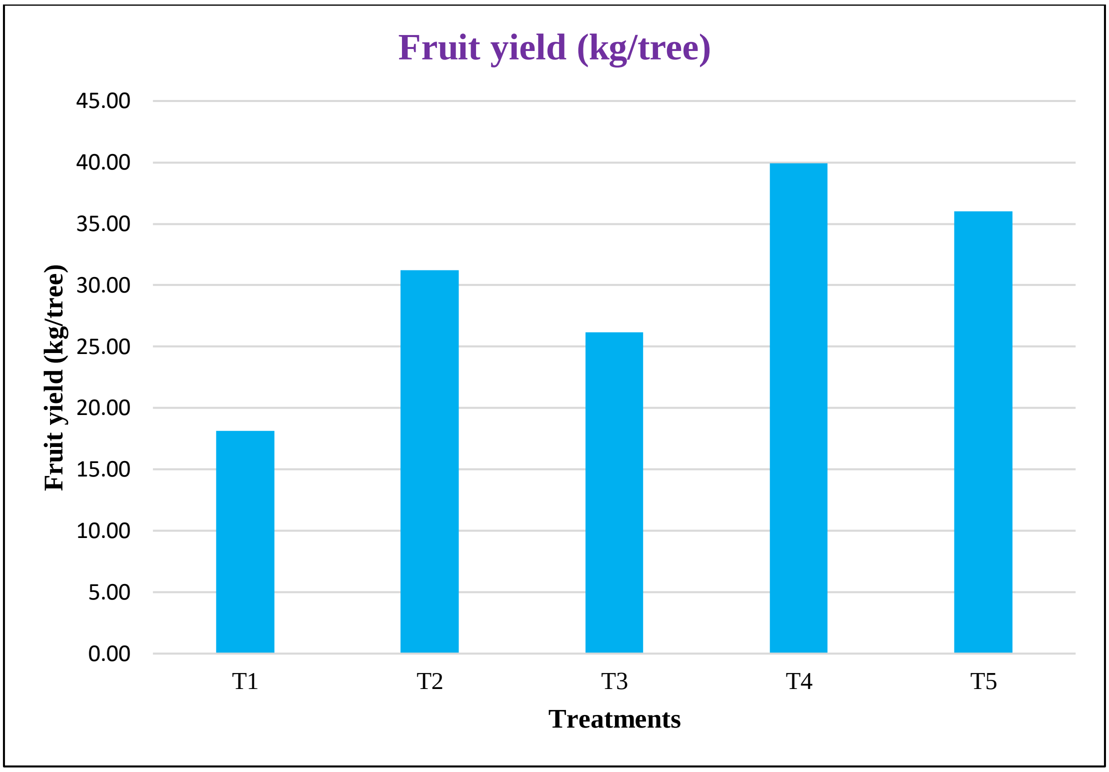

Fig. 4.1.3. Effect of organic and inorganic sources of nutrients on Fruit yield(kg/tree) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

Table 4.1.4 Effect of organic and inorganic sources of nutrients on fruit firmness (kg/cm^2) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Fruit firmness (kg/cm^2)
T_1	Organic Sole (100% FYM)	7.87^d
T_2	Inorganic Sole (100% NPK)	7.45^e
T_3	Organic (75% FYM) + Inorganic (25% NPK)	8.18^c
T_4	Inorganic (75% NPK) + Organic (25% FYM)	8.62^b
T_5	Organic (50% FYM) + Inorganic (50% NPK)	8.96^a
	F-test	S
	S.Em ±	0.048
	CD at 5%	0.148

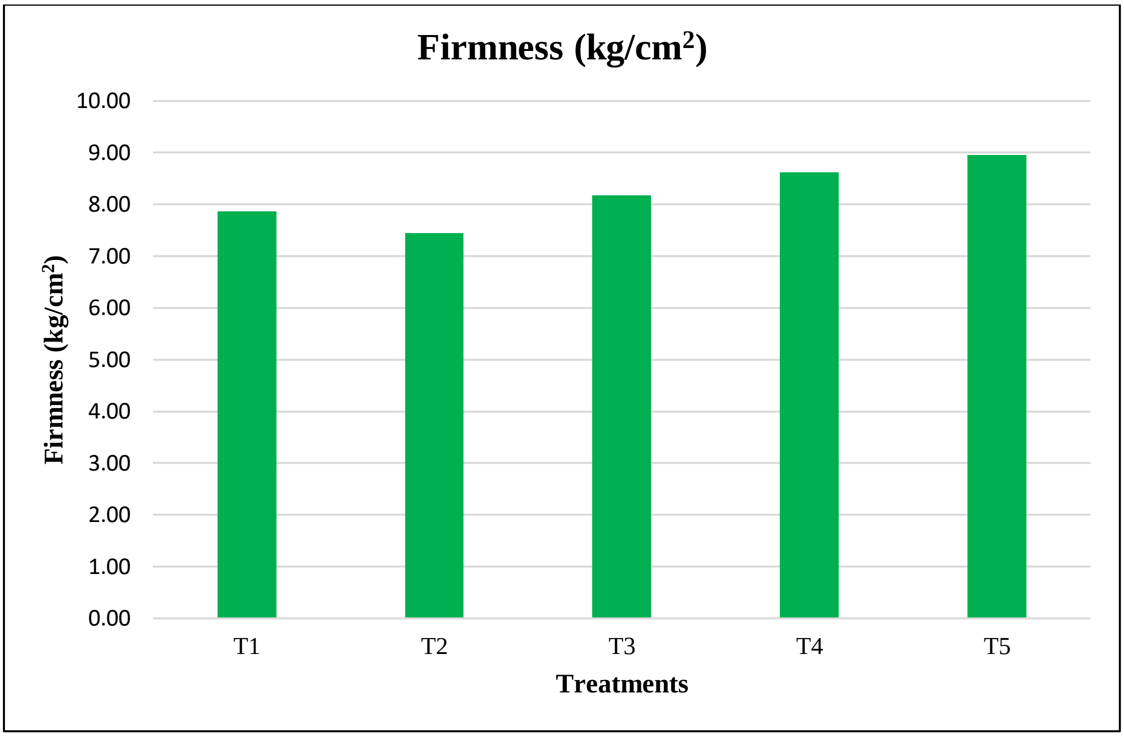

Fig. 4.1.4. Effect of organic and inorganic sources of nutrients on Fruit firmness (kg/cm^2) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

FYM) (8.62) and lowest firmness (7.45) was observed in T_2-Inorganic sole (100% NPK). The combination of organic and inorganic fertilizers increased the efficiency of micro and macro nutrients which are essential for cell wall structure and function of fruit by stabilizing peptic networks and regulating cell wall pore size which makes the fruit firm. The results are similar to the findings Patel *et al.* (2017) in sapota and Kumar *et al.* (2017) in guava.

4.1.5 Shelf life (days)

The data on shelf life of guava as influenced by the application of organic and inorganic sources of nutrients is presented in table 4.1.5 and fig. 4.1.5.

Significantly maximum shelf life (10.11) was recorded in T_5- Organic (50% FYM) + Inorganic (50% NPK) followed by T_4- Inorganic (75% NPK) + Organic (25% FYM) (9.04) and minimum shelf life was recorded in T_3- Organic (75% FYM) + Inorganic (25% NPK) (7.53). Sahu *et al.* (2017) reported that maximum shelf life might be due to altered physiology and biochemistry of the fruit as influenced by both organic and inorganic fertilizers that reduced respiration and transpiration which intern resulted in low cumulative physiological loss in weight and increased shelf life in guava. The results are in close conformity with the findings of Lodaya and Masu (2019), Kumar *et al.* (2017) in guava and Patel *et al.* (2017) in sapota.

4.1.6 Physiological loss in weight (%)

The effect of organic and inorganic sources of nutrients on physiological loss in weight (%) of guava is presented in table 4.1.6 and fig. 4.1.6.

All treatments showed significant differences with respect to physiological loss in weight. The minimum weight loss after two days (1.64 %), four days (4.08 %), six days (8.16 %), eight days (14.31 %) and after ten days (19.07 %), respectively, was observed in T_5- Organic (50% FYM) + Inorganic (50% NPK). The reduction in weight loss in fruit may be due to reduction in rate of respiration and transpiration, which delayed ripening process by supporting the ethylene synthesis during the fruit ripening. The above results are in

Table 4.1.5 Effect of organic and inorganic sources of nutrients on shelf life (days) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Shelf life (days)
T_1	Organic Sole (100% FYM)	7.91[d]
T_2	Inorganic Sole (100% NPK)	8.22[c]
T_3	Organic (75% FYM) + Inorganic (25% NPK)	7.53[e]
T_4	Inorganic (75% NPK) + Organic (25% FYM)	9.04[b]
T_5	Organic (50% FYM) + Inorganic (50% NPK)	10.11[a]
	F-test	S
	S.Em ±	0.036
	CD at 5%	0.114

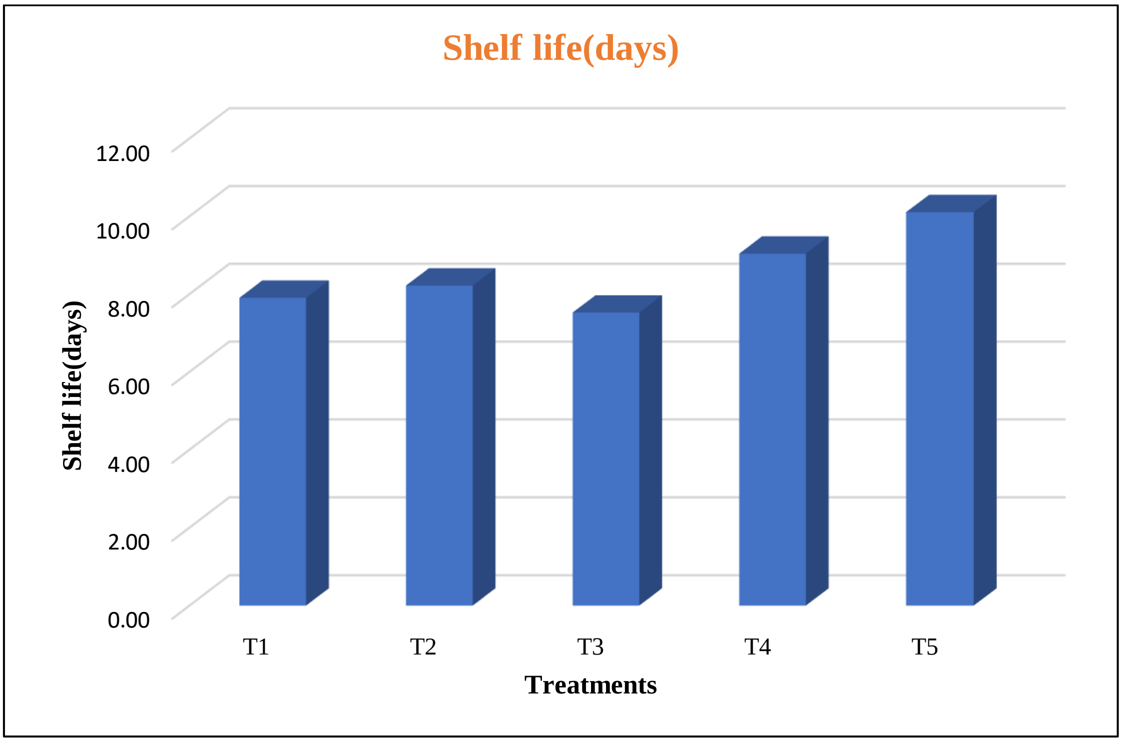

Fig. 4.1.5. Effect of organic and inorganic sources of nutrients on Shelf life (days) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

Table 4.1.6 Effect of organic and inorganic sources of nutrients on physiological loss in weight (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Physiological loss in weight (%)				
		2nd day	4th day	6th day	8th day	10th day
T_1	Organic Sole (100% FYM)	1.87[a]	7.10[a]	12.86[a]	17.78[a]	*
T_2	Inorganic Sole (100% NPK)	1.79[b]	4.24[c]	8.76[c]	15.00[c]	19.81[b]
T_3	Organic (75% FYM) + Inorganic (25% NPK)	1.83[a]	4.36[b]	8.96[b]	15.29[b]	*
T_4	Inorganic (75% NPK) + Organic (25% FYM)	1.72[c]	4.17[d]	8.55[d]	14.58[d]	21.71[a]
T_5	Organic (50% FYM) + Inorganic (50% NPK)	1.65[d]	4.08[e]	8.16[e]	14.31[e]	19.07[c]
	S.Em ±	0.023	0.027	0.060	0.044	0.129
	CD at 5%	0.072	0.083	0.188	0.137	0.403

*- end of shelf life

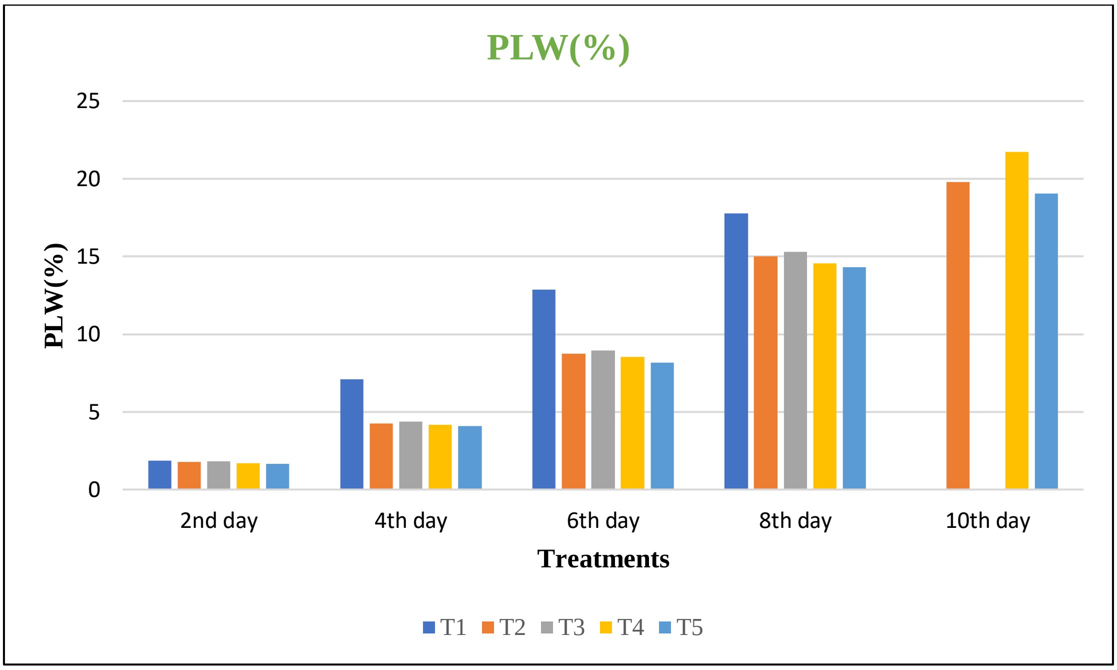

Fig. 4.1.6. Effect of organic and inorganic sources of nutrients on Physiological loss in weight (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

accordance with the findings of Patel et al. (2017) in sapota and Kumar et al. (2017) in mango.

4.1.7 Moisture content (%)

The data on the effect of organic and inorganic sources of nutrients on moisture content of guava is presented in table 4.1.7 and fig. 4.1.7. Significant difference was observed among the treatments for moisture content.

Highest moisture content (69.14) was observed in T5- Organic (50% FYM) +Inorganic (50% NPK) and lowest moisture content was recorded in T3- Organic (75% FYM) + Inorganic (25% NPK) (57.78).

4.1.8 Total sugars (%)

The data pertaining to total sugars (%) as influenced by the application of organic and inorganic sources of nutrients is presented in table 4.1.8 and fig. 4.1.8.

Significant difference was observed among the treatments with respect to total sugars. Highest total sugar content was recorded in T5- Organic (50% FYM) + Inorganic (50% NPK) (8.12) followed by T4- Inorganic (75% NPK) + Organic (25% FYM) (7.98) and significantly lowest total sugar content (7.55) was recorded in T1-Organic sole (100% FYM). The increase in total sugar content is due to the enhancement in uptake of nutrients which lead to increased catalytic activities by which the complex substances (starch) degrade into simple sugars. The results are in agreement with the findings of Bhobia et al. (2005), Shukla et al. (2009) in guava, Baraily and Deb (2018) in pineapple.

4.1.9 Reducing sugars (%)

The effect of organic and inorganic sources of nutrients on reducing sugars (%) of guava is presented in table 4.1.9 and fig. 4.1.9.

There was significant difference observed among the treatments for reducing sugars. Highest reducing sugar content was recorded in T5- Organic (50% FYM) + Inorganic (50% NPK) (4.76) followed by T4- Inorganic (75%

Table 4.1.7 Effect of organic and inorganic sources of nutrients on moisture content (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Moisture (%)
T_1	Organic Sole (100% FYM)	65.41^{b}
T_2	Inorganic Sole (100% NPK)	61.04^{d}
T_3	Organic (75% FYM) + Inorganic (25% NPK)	57.78^{e}
T_4	Inorganic (75% NPK) + Organic (25% FYM)	63.57^{c}
T_5	Organic (50% FYM) + Inorganic (50% NPK)	69.14^{a}
	F-test	S
	S.Em ±	0.376
	CD at 5%	1.172

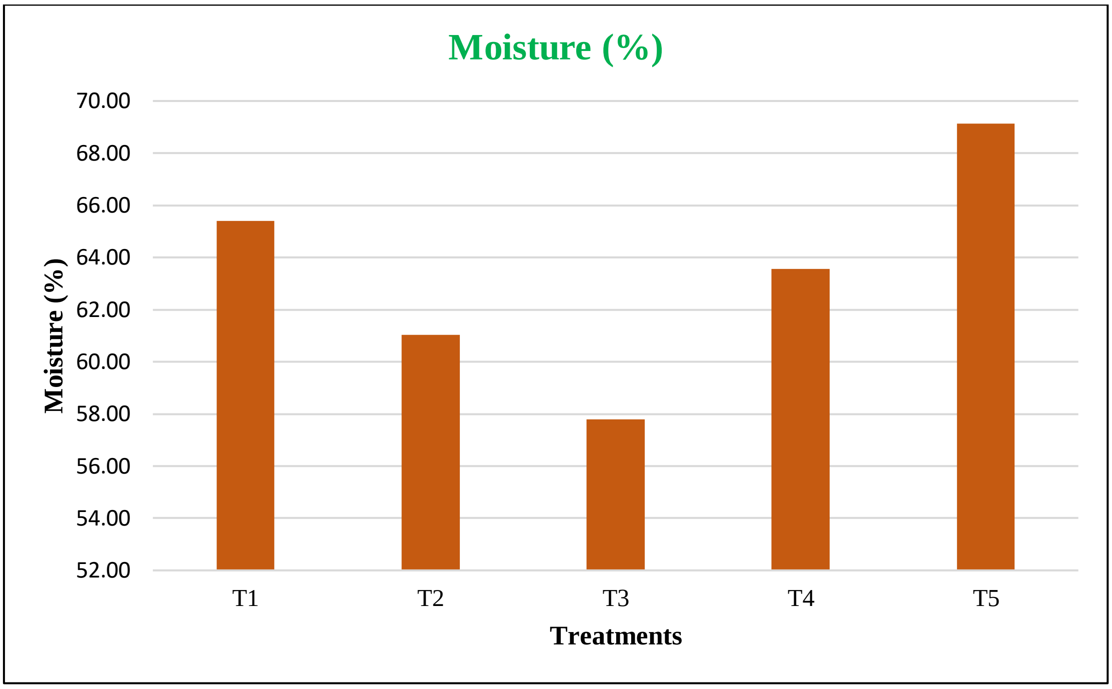

Fig. 4.1.7. Effect of organic and inorganic sources of nutrients on Moisture content (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

Table 4.1.8 Effect of organic and inorganic sources of nutrients on total sugars (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Total sugars (%)
T_1	Organic Sole (100% FYM)	7.55[e]
T_2	Inorganic Sole (100% NPK)	7.77[c]
T_3	Organic (75% FYM) + Inorganic (25% NPK)	7.69[d]
T_4	Inorganic (75% NPK) + Organic (25% FYM)	7.98[b]
T_5	Organic (50% FYM) + Inorganic (50% NPK)	8.12[a]
	F-test	S
	S.Em ±	0.017
	CD at 5%	0.052

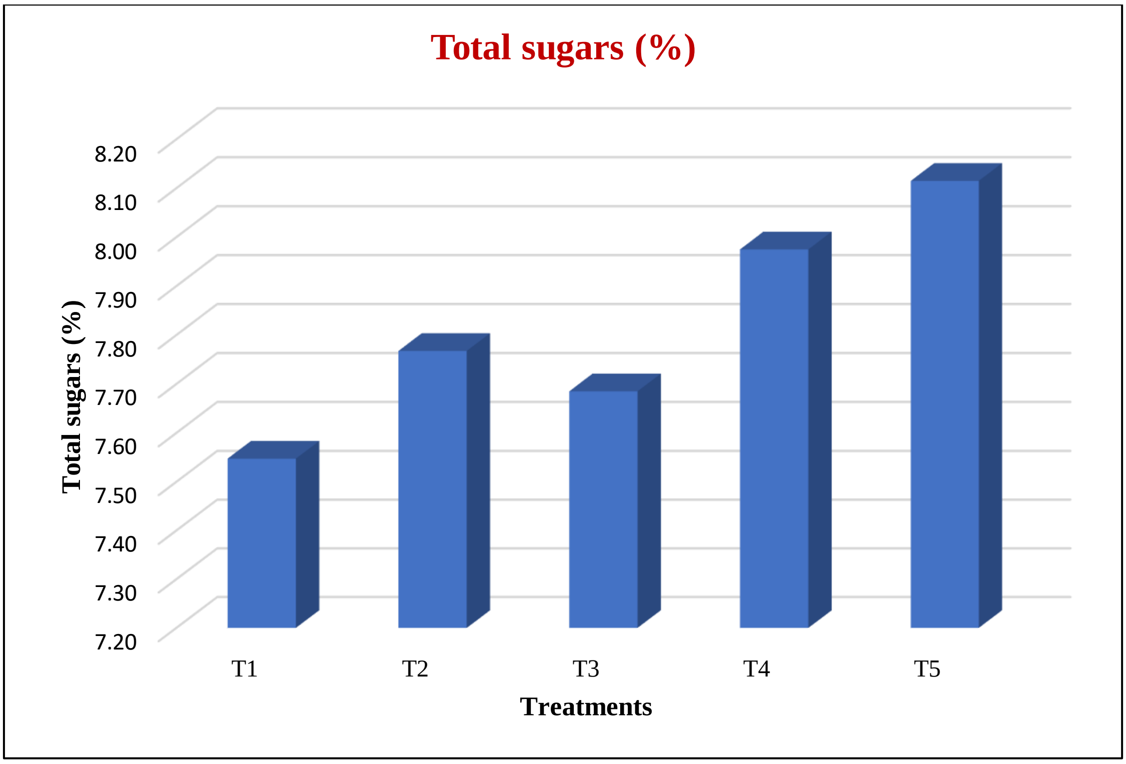

Fig. 4.1.8. Effect of organic and inorganic sources of nutrients on Total sugars (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

Table 4.1.9 Effect of organic and inorganic sources of nutrients on reducing sugars (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Reducing sugars (%)
T_1	Organic Sole (100% FYM)	4.50^{d}
T_2	Inorganic Sole (100% NPK)	4.54^{c}
T_3	Organic (75% FYM) + Inorganic (25% NPK)	4.52^{c}
T_4	Inorganic (75% NPK) + Organic (25% FYM)	4.70^{b}
T_5	Organic (50% FYM) + Inorganic (50% NPK)	4.76^{a}
	F-test	S
	S.Em ±	0.011
	CD at 5%	0.033

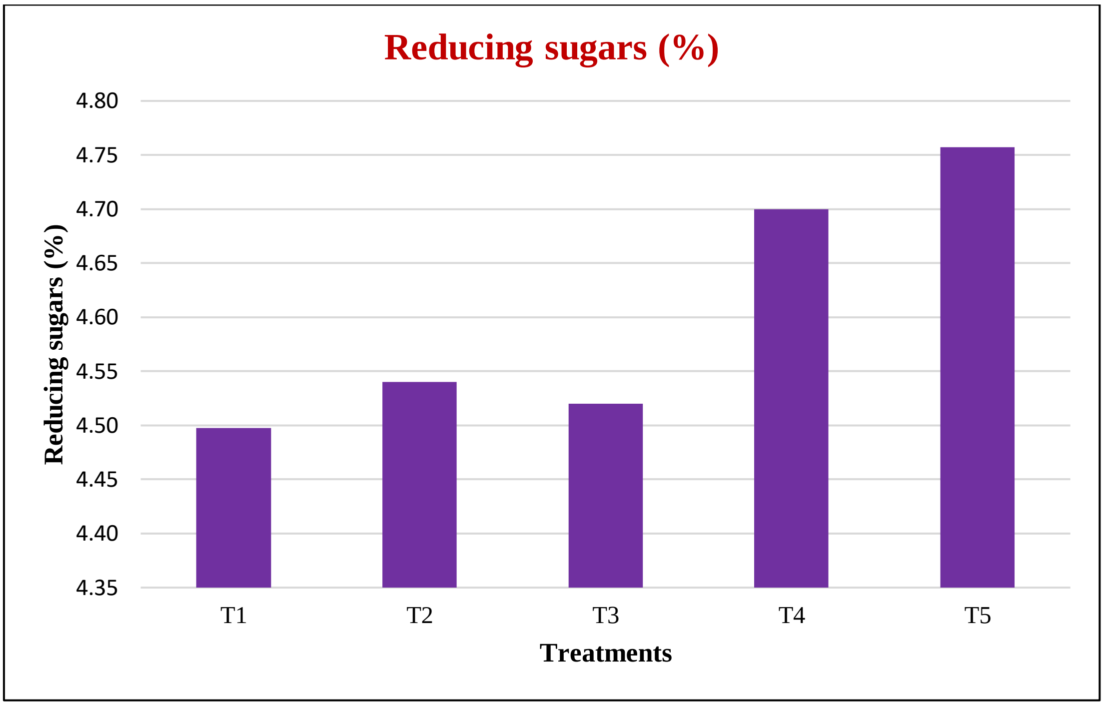

Fig. 4.1.9. Effect of organic and inorganic sources of nutrients on Reducing sugars (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

NPK) + Organic (25% FYM) (4.70) and significantly lowest reducing sugar content (4.50) was recorded in T_1-Organic sole (100% FYM). The combination of organic and inorganic fertilizers increased the nitrogen, phosphorus and potassium levels which promote sugar accumulation in fruits. The results are in close conformity with the findings of Bhobia *et al.* (2005), Shukla *et al.* (2009) in guava, Baraily and Deb (2018) in pineapple and Umar *et al.* (2009) in strawberry.

4.1.10 Non-reducing sugars (%)

The data related to non-reducing sugars is presented in table 4.1.10 and fig. 4.1.10. Significant difference was observed among the treatments with respect to non-reducing sugar content.

Highest non-reducing sugar content was recorded in T_5- Organic (50% FYM) + Inorganic (50% NPK) (3.36) followed by T_4- Inorganic (75% NPK) + Organic (25% FYM) (3.28) and significantly lowest non-reducing sugar content (3.05) was recorded in T_1-Organic sole (100% FYM). The increase in total sugar, reducing sugar and non-reducing sugar content is due to the enhancement in uptake of nutrients which lead to increased catalytic activities by which the complex substances (starch) degrade into simple sugars. The results are in agreement with the findings of Bhobia *et al.* (2005), Shukla *et al.* (2009) in guava, Baraily and Deb (2018) in pineapple.

4.1.11 Ascorbic acid content (mg/100g of pulp)

Results on ascorbic acid content of guava as affected by the application of organic and inorganic sources of nutrients is presented in table 4.1.11 and fig. 4.1.11.

All treatments differed significantly on this parameter. Maximum ascorbic acid content (226.55 mg per 100g of pulp) was recorded in T_1-Organic sole (100% FYM) and significantly minimum ascorbic acid content was recorded in T_2-Inorganic sole (100% NPK) (190.93 mg per 100g of pulp). The increase in ascorbic acid content is due to catalytic activity of several enzymes which participate in the biosynthesis of ascorbic acid. Results are in agreement with the

Table 4.1.10 Effect of organic and inorganic sources of nutrients on non-reducing sugars (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Non-reducing sugars (%)
T_1	Organic Sole (100% FYM)	3.05[e]
T_2	Inorganic Sole (100% NPK)	3.23[c]
T_3	Organic (75% FYM) + Inorganic (25% NPK)	3.17[d]
T_4	Inorganic (75% NPK) + Organic (25% FYM)	3.28[b]
T_5	Organic (50% FYM) + Inorganic (50% NPK)	3.36[a]
	F-test	S
	S.Em ±	0.018
	CD at 5%	0.057

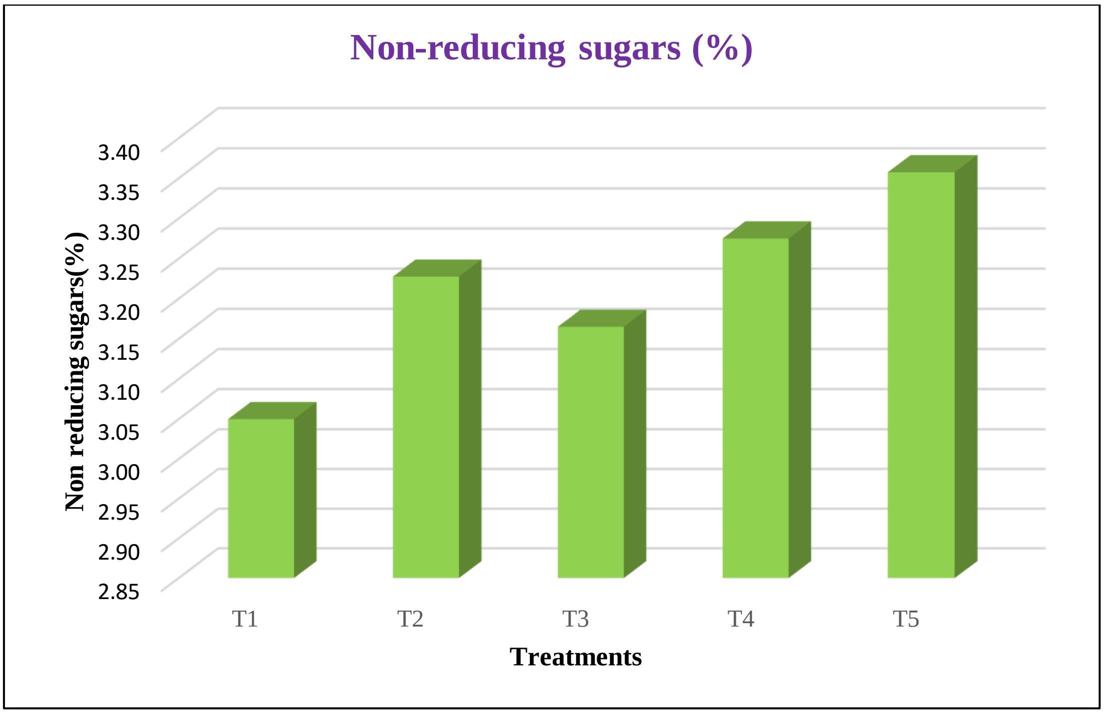

Fig. 4.1.10. Effect of organic and inorganic sources of nutrients on Non-reducing sugars (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

Table 4.1.11 Effect of organic and inorganic sources of nutrients on ascorbic acid content (mg/100g of pulp) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Ascorbic acid (mg/100g of pulp)
T_1	Organic Sole (100% FYM)	226.55[a]
T_2	Inorganic Sole (100% NPK)	190.93[e]
T_3	Organic (75% FYM) + Inorganic (25% NPK)	205.96[b]
T_4	Inorganic (75% NPK) + Organic (25% FYM)	197.70[d]
T_5	Organic (50% FYM) + Inorganic (50% NPK)	203.81[c]
	F-test	S
	S.Em ±	0.827
	CD at 5%	2.576

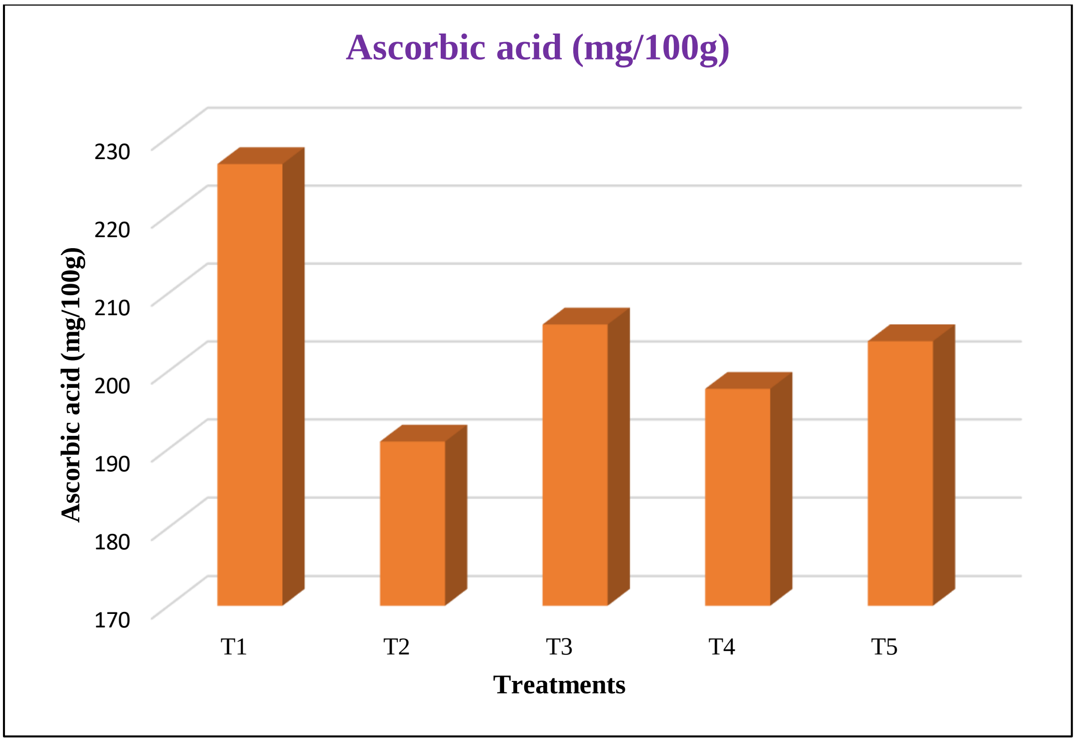

Fig. 4.1.11. Effect of organic and inorganic sources of nutrients on Ascorbic acid content (mg/100g of pulp) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

$\mathbf{T_1}$- Organic sole (100% FYM), $\mathbf{T_2}$- Inorganic sole (100% NPK),
$\mathbf{T_3}$-Organic (75% FYM) + Inorganic (25% NPK),
$\mathbf{T_4}$- Inorganic (75% NPK) + Organic (25% FYM),
$\mathbf{T_5}$- Organic (50% FYM) + Inorganic (50% NPK).

findings of Singh *et al.* (2018), Tyagi *et al.* (2018) and Sharma *et al.* (2013) in guava and Umar *et al*. (2009) in strawberry.

4.1.12 Dietary fibre content (%)

The data on the effect of organic and inorganic sources of nutrients on dietary fibre content of guava fruits is presented in table 4.1.12 and fig. 4.1.12.

Significantly highest dietary fibre content was recorded in T_4- Inorganic (75% NPK) + Organic (25% FYM) (54.88) and lowest dietary fibre content (48.46) was recorded in T_2-Inorganic sole (100% NPK). The improvement in dietary fibre content is due to the absorption of macro and micro nutrients which have exerted regulatory role as an important constituent of endogenous factors in affecting the quality of the fruits. The results are related with the finding of Anal *et al.* (2018).

4.1.13 Total soluble solids (°Brix)

The data pertaining to total soluble solids (°Brix) of guava as influenced by the application of organic and inorganic sources of nutrients is presented in table 4.1.13 and fig. 4.1.13.

Significant difference was observed among the treatments. Highest TSS (12.97°Brix) was recorded in T_5-Organic (50% FYM) + Inorganic (50% NPK)followed by T_4- Inorganic (75% NPK) + Organic (25% FYM) (12.54°Brix) and lowest TSS (11.93°Brix) was recorded in T_1-Organic sole (100% FYM). This might be due to conversion of reserved starch and other insoluble carbohydrates into soluble sugars which enhances the metabolic activity in fruits and resulted in increased TSS of the fruit. The above results are comparable with the findings of Singh *et al*. (2018) in guava, Baraily and Deb (2018) in pineapple and Baviskar *et al*. (2011) in sapota.

4.1.14 Titrable Acidity (%)

Results on titrable acidity of guava as affected by the application of organic and inorganic sources of nutrients is presented in table 4.1.14 and fig. 4.1.14. All treatments differed significantly with respect to titrable acidity.

Table 4.1.12 Effect of organic and inorganic sources of nutrients on dietary fibre content (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Dietary fibre content (%)
T_1	Organic Sole (100% FYM)	53.03^{b}
T_2	Inorganic Sole (100% NPK)	48.46^{e}
T_3	Organic (75% FYM) + Inorganic (25% NPK)	51.04^{c}
T_4	Inorganic (75% NPK) + Organic (25% FYM)	54.88^{a}
T_5	Organic (50% FYM) + Inorganic (50% NPK)	49.80^{d}
	F-test	S
	S.Em ±	0.191
	CD at 5%	0.596

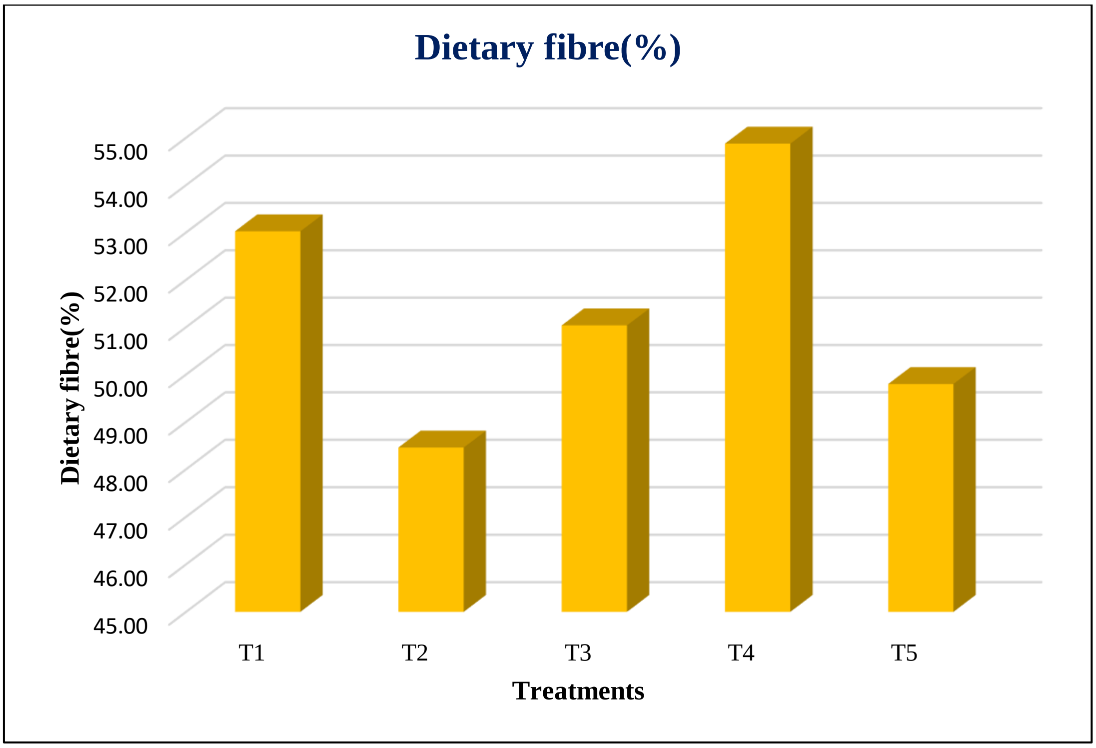

Fig. 4.1.12. Effect of organic and inorganic sources of nutrients on Dietary fibre content (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

Table 4.1.13 Effect of organic and inorganic sources of nutrients on total soluble solids (^{o}Brix) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Total soluble solids (^{o}Brix)
T_1	Organic Sole (100% FYM)	11.93^{e}
T_2	Inorganic Sole (100% NPK)	12.15^{d}
T_3	Organic (75% FYM) + Inorganic (25% NPK)	12.36^{c}
T_4	Inorganic (75% NPK) + Organic (25% FYM)	12.54^{b}
T_5	Organic (50% FYM) + Inorganic (50% NPK)	12.97^{a}
	F-test	S
	S.Em ±	0.021
	CD at 5%	0.065

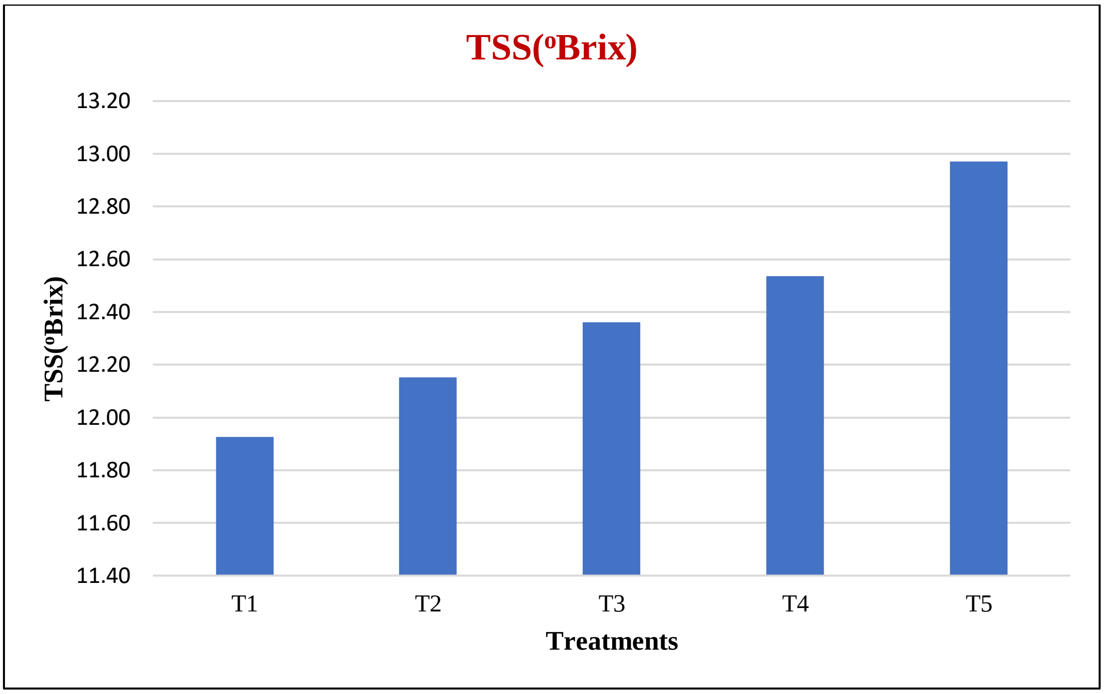

Fig. 4.1.13. Effect of organic and inorganic sources of nutrients on Total soluble solids (°Brix) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

Table 4.1.14 Effect of organic and inorganic sources of nutrients on titrable acidity (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	**Treatment**	**Titrable acidity (%)**
T_1	Organic Sole (100% FYM)	0.50[a]
T_2	Inorganic Sole (100% NPK)	0.47[b]
T_3	Organic (75% FYM) + Inorganic (25% NPK)	0.42[e]
T_4	Inorganic (75% NPK) + Organic (25% FYM)	0.46[c]
T_5	Organic (50% FYM) + Inorganic (50% NPK)	0.44[d]
	F-test	S
	S.Em ±	0.006
	CD at 5%	0.018

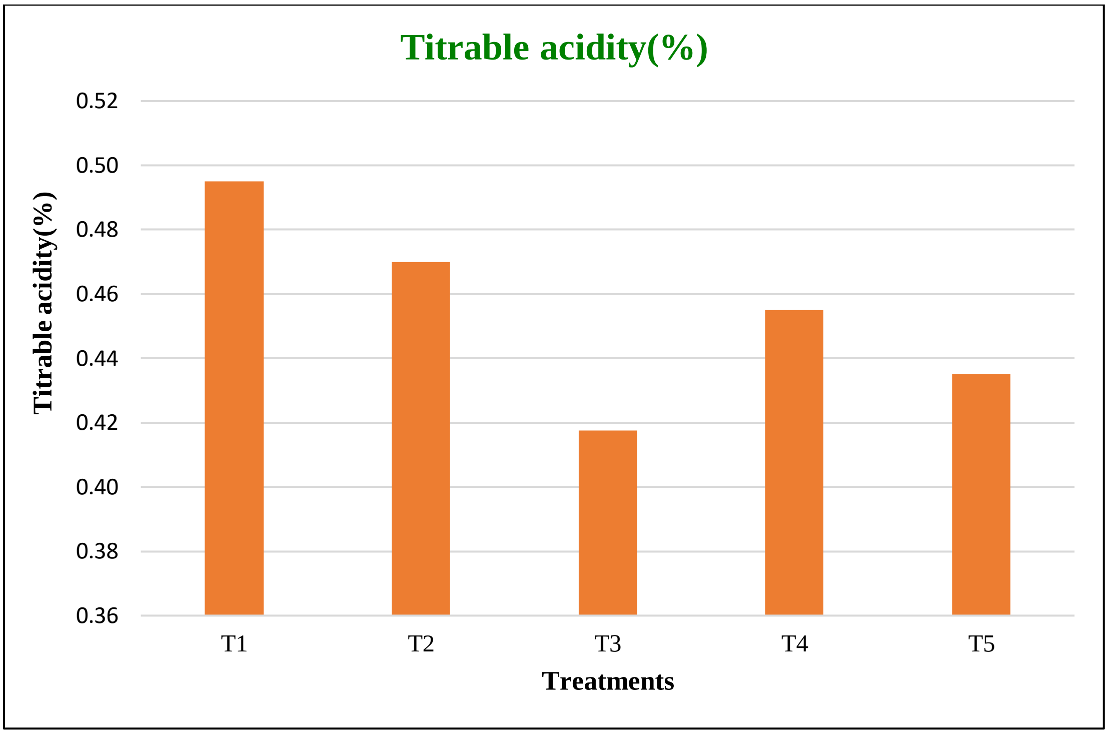

Fig. 4.1.14. Effect of organic and inorganic sources of nutrients on Titrable acidity (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

Maximum acidity was recorded in T_1- Organic sole (100% FYM) (0.50) and significantly minimum acidity was recorded in T_3- Organic (75% FYM) + Inorganic (25% NPK) (0.42). Application of integrated use of organic manure along with chemical fertilizers may be attributed for better vegetative growth which resulted in higher quantities of photosynthates (starch, carbohydrates, etc.) and its translocation to the fruits result in improvement of chemical characters of fruit. The results are similar with the findings of Singh *et al.* (2018), Tyagi *et al.* (2018) and Sharma *et al.* (2013) in guava and Umar *et al.* (2009) in strawberry.

4.1.15 Protein content (%)

The data related to protein content as influenced by the application of organic and inorganic sources of nutrients is presented in table 4.1.15 and fig. 4.1.15.

Significant difference was observed among the treatments for protein content. Highest protein content (7.94) was recorded in T_4- Inorganic (75% NPK) + Organic (25% FYM) followed byT_5- Organic (50% FYM) + Inorganic (50% NPK) (7.05) and lowest protein content (6.12) was recorded in T_2-Inorganic sole (100% NPK). This might be due to integrated application of organic and inorganic fertilizers might have improved the nutrient uptake including nitrogen nutrient being the important constituent of protein and phosphorus being component of ATP the energy carrier for the metabolic processes. This might have directly contributed to large photosynthetic activity and synthesis of higher protein content. The results are in accordance with the finding of Anal *et al.* (2018) in okra.

4.1.16 Antioxidant (mg TE/100g)

The effect of organic and inorganic sources of nutrients on antioxidant activity of guava is presented in table 4.1.16 and fig. 4.1.16. Significant difference was observed among the treatments with respect to antioxidant activity.

Highest antioxidant activity was recorded in T_5- Organic (50% FYM) +Inorganic (50% NPK) (1052.75 mg TE/100g FW) followed by T_4- Inorganic

Table 4.1.15 Effect of organic and inorganic sources of nutrients on protein content (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Protein (%)
T_1	Organic Sole (100% FYM)	6.92^{c}
T_2	Inorganic Sole (100% NPK)	6.12^{e}
T_3	Organic (75% FYM) + Inorganic (25% NPK)	6.52^{d}
T_4	Inorganic (75% NPK) + Organic (25% FYM)	7.94^{a}
T_5	Organic (50% FYM) + Inorganic (50% NPK)	7.05^{b}
	F-test	S
	S.Em ±	0.016
	CD at 5%	0.050

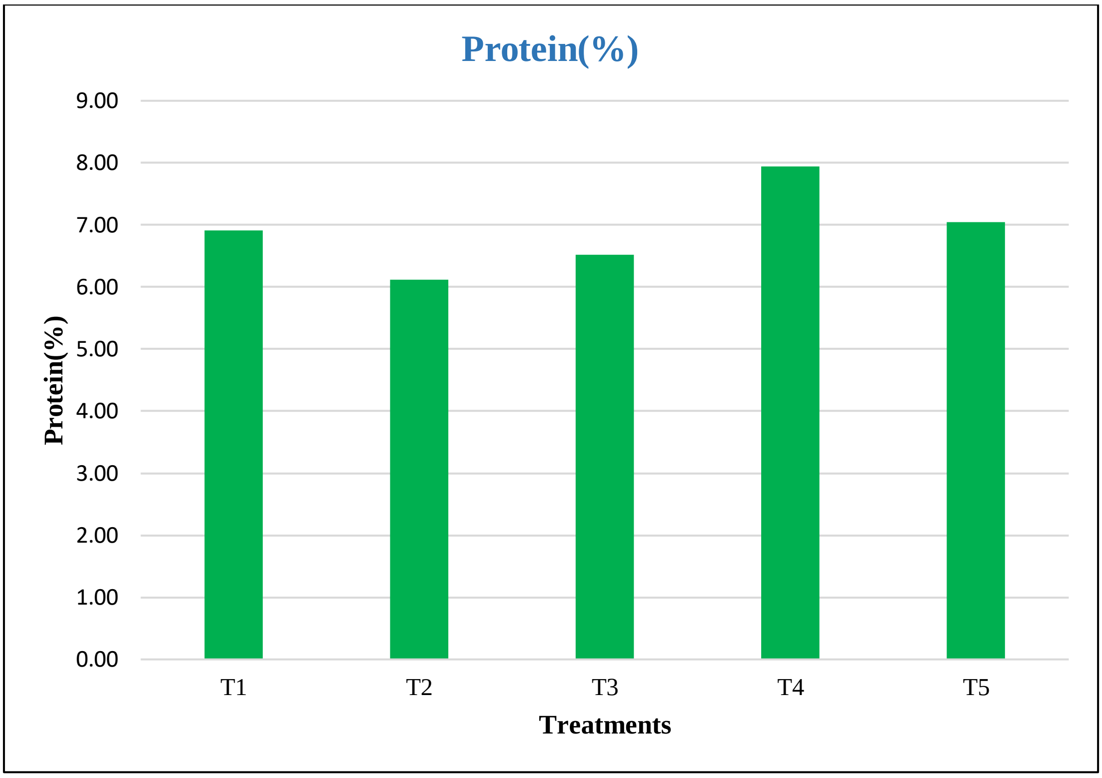

Fig. 4.1.15. Effect of organic and inorganic sources of nutrients on Protein content (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

Table 4.1.16 Effect of organic and inorganic sources of nutrients on antioxidant (mg TE/100g) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Antioxidant (mg TE/100g)
T_1	Organic Sole (100% FYM)	931.15[c]
T_2	Inorganic Sole (100% NPK)	713.44[e]
T_3	Organic (75% FYM) + Inorganic (25% NPK)	851.40[d]
T_4	Inorganic (75% NPK) + Organic (25% FYM)	954.73[b]
T_5	Organic (50% FYM) + Inorganic (50% NPK)	1052.75[a]
	F-test	S
	S.Em ±	0.861
	CD at 5%	2.682

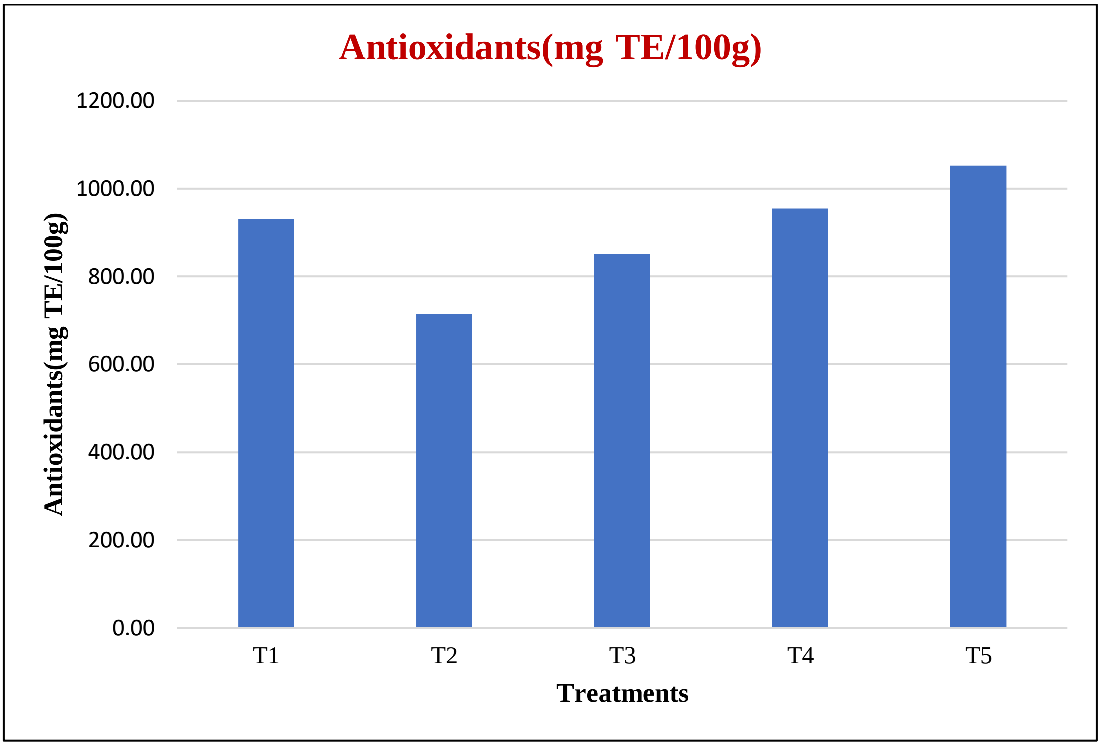

Fig. 4.1.16. Effect of organic and inorganic sources of nutrients on Antioxidants (mg TE/100g) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

(75% NPK) + Organic (25% FYM) (954.73 mg TE/100g FW) and significantly lowest antioxidant activity (713.44 mg TE/100g FW) was recorded in T_2-Inorganic sole (100% NPK). Organic fertilizer in combination with inorganic fertilizer significantly improved the antioxidant capacity of guava fruit. The increase in antioxidant capacity with the application of organic and chemical fertilizer could be due to differences in composition of organic and chemical fertilizer and their effects on soil ecology and the plant metabolism pathway. Some of the chemical reactions responsible for antioxidant activity in cells involve macro and micro elements that are supplied by integrated fertilizer treatments. The results are similar with the finding of Pandey *et al*. (2016) reported that improvement in nutritional quality and antioxidant activity of basil with the use of different organic and chemical regimes.

4.1.17 Mineral content (Ca, K) (mg)

4.1.17.1 Calcium content in fruit (mg)

The result on calcium content of guava fruit as affected by the application of organic and inorganic sources of nutrients is presented in table 4.1.17 and fig. 4.1.17.

All treatments differed significantly with respect to calcium content in fruit. Highest calcium content (221.64 mg/100g) was recorded in T_4- Inorganic (75% NPK) + Organic (25% FYM) followed by T_5-Organic (50% FYM) + Inorganic (50% NPK) (208.01 mg/100g) and lowest calcium content was recorded in T_1-Organic sole (100% FYM) (169.65 mg/100g).

4.1.17.2 Potassium content in fruit (mg)

The data on potassium content in guava fruit is presented in table 4.1.18 and fig. 4.1.18.

There was significant difference observed among the treatments with respect to potassium content in fruit. Highest potassium content was recorded in T_5- Organic (50% FYM) +Inorganic (50% NPK) (853.78 mg/100g) followed by T_4- Inorganic (75% NPK) +Organic (25% FYM) (811.61 mg/100g) and

Table 4.1.17 Effect of organic and inorganic sources of nutrients on calcium content (mg/100g) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Calcium (mg/100g)
T_1	Organic Sole (100% FYM)	169.65^e
T_2	Inorganic Sole (100% NPK)	190.35^c
T_3	Organic (75% FYM) + Inorganic (25% NPK)	184.78^d
T_4	Inorganic (75% NPK) + Organic (25% FYM)	221.64^a
T_5	Organic (50% FYM) + Inorganic (50% NPK)	208.01^b
	F-test	S
	S.Em ±	0.854
	CD at 5%	2.661

Table 4.1.18 Effect of organic and inorganic sources of nutrients on potassium content (mg/100g) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Potassium (mg/100g)
T_1	Organic Sole (100% FYM)	693.05^e
T_2	Inorganic Sole (100% NPK)	782.31^c
T_3	Organic (75% FYM) + Inorganic (25% NPK)	752.36^d
T_4	Inorganic (75% NPK) + Organic (25% FYM)	811.61^b
T_5	Organic (50% FYM) + Inorganic (50% NPK)	853.78^a
	F-test	S
	S.Em ±	1.084
	CD at 5%	3.378

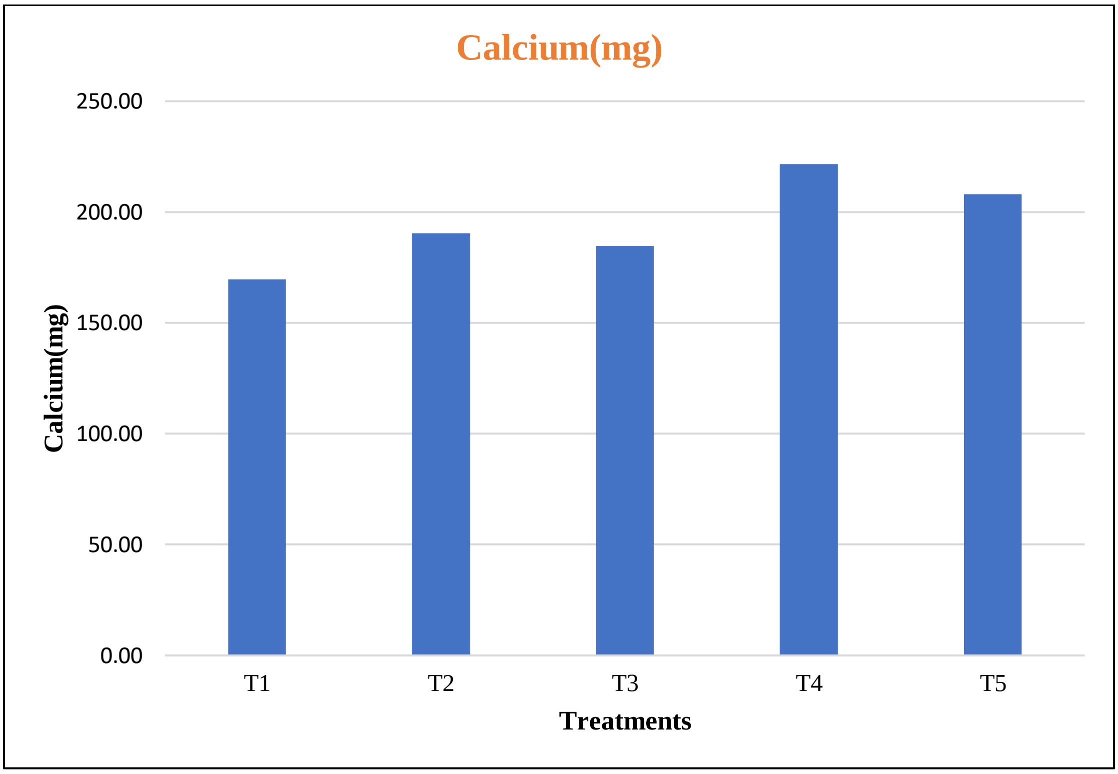

Fig. 4.1.17. Effect of organic and inorganic sources of nutrients on Calcium content (mg) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

$\mathbf{T_1}$- Organic sole (100% FYM), $\mathbf{T_2}$- Inorganic sole (100% NPK),
$\mathbf{T_3}$-Organic (75% FYM) + Inorganic (25% NPK),
$\mathbf{T_4}$- Inorganic (75% NPK) + Organic (25% FYM),
$\mathbf{T_5}$- Organic (50% FYM) + Inorganic (50% NPK).

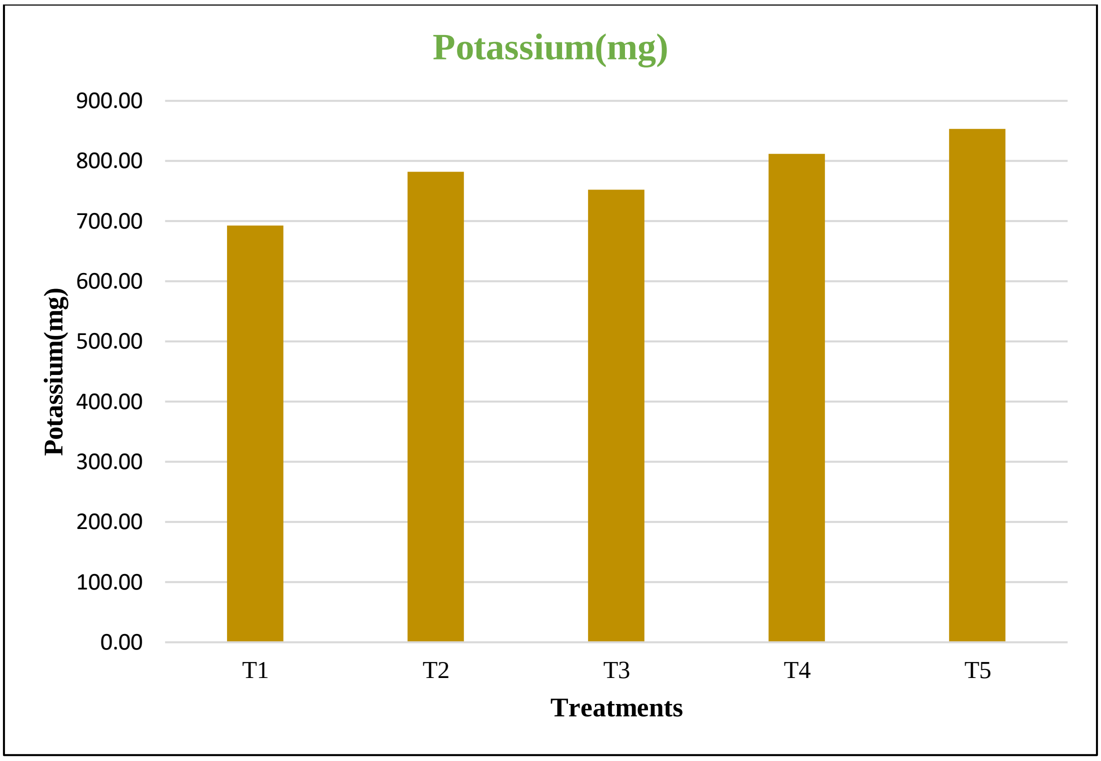

Fig. 4.1.18. Effect of organic and inorganic sources of nutrients on Potassium content (mg) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

$\mathbf{T_1}$- Organic sole (100% FYM), $\mathbf{T_2}$- Inorganic sole (100% NPK),
$\mathbf{T_3}$-Organic (75% FYM) + Inorganic (25% NPK),
$\mathbf{T_4}$- Inorganic (75% NPK) + Organic (25% FYM),
$\mathbf{T_5}$- Organic (50% FYM) + Inorganic (50% NPK).

significantly lowest calcium content was recorded in T_1-Organic sole (100% FYM) (693.05 mg/100g). The increase in potassium and calcium content in guava fruit was due to the combined application of inorganic and organic fertilizers might have improved physical, chemical and biological properties of soil higher nutrient uptake and enabled plant roots to resulting in better utilization of nutrients by crop and in turn influencing assimilation of nutrients in fruits. The above results are related with the finding of Meena *et al.* (2013) in guava.

4.1.18 Pectin content (%)

The effect of organic and inorganic sources of nutrients on pectin content (%) of guava is presented in table 4.1.19 and fig. 4.1.19.

All treatments showed significant difference with respect to pectin content. Maximum pectin content was recorded in T_4- Inorganic (75% NPK) + Organic (25% FYM) (0.55) followed by T_5- Organic (50% FYM)+ Inorganic (50% NPK) (0.49) and significantly minimum pectin content (0.41) was recorded in T_1-Organic sole (100% FYM). Application of integrated use of organic manure along with chemical fertilizers may be attributed for better vegetative growth which resulted in higher quantities of photosynthates (starch, carbohydrates, etc.) and its translocation to the fruits result in improvement of chemical characters of fruit. Results are in accordance with the findings of Tyagi *et al*. 2018, Sharma *et al.* 2013.

4.1.19 Benefit cost ratio

The data recorded on benefit cost ratio as influenced by the application of organic and inorganic sources of nutrients is presented in table 4.1.20.

Among the treatments, T_4- Inorganic (75% NPK) + Organic (25% FYM) recorded the highest gross return (Rs. 331818.3), net return (Rs. 295635.07) with benefit cost ratio (8.17) followed by T_5- Organic (50% FYM) +Inorganic (50% NPK) with gross return (Rs. 299326.2), net return (Rs. 261076.2) with benefit cost ratio (6.82), while T_1-Organic sole (100% FYM) recorded the lowest gross return (Rs. 151491.3), net return (Rs. 109161.3) with benefit cost ratio (2.57).

Table 4.1.19 Effect of organic and inorganic sources of nutrients on pectin content (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment No	Treatment	Pectin (%)
T_1	Organic Sole (100% FYM)	0.41^{e}
T_2	Inorganic Sole (100% NPK)	0.45^{c}
T_3	Organic (75% FYM) + Inorganic (25% NPK)	0.42^{d}
T_4	Inorganic (75% NPK) + Organic (25% FYM)	0.55^{a}
T_5	Organic (50% FYM) + Inorganic (50% NPK)	0.49^{b}
	F-test	S
	S.Em ±	0.004
	CD at 5%	0.018

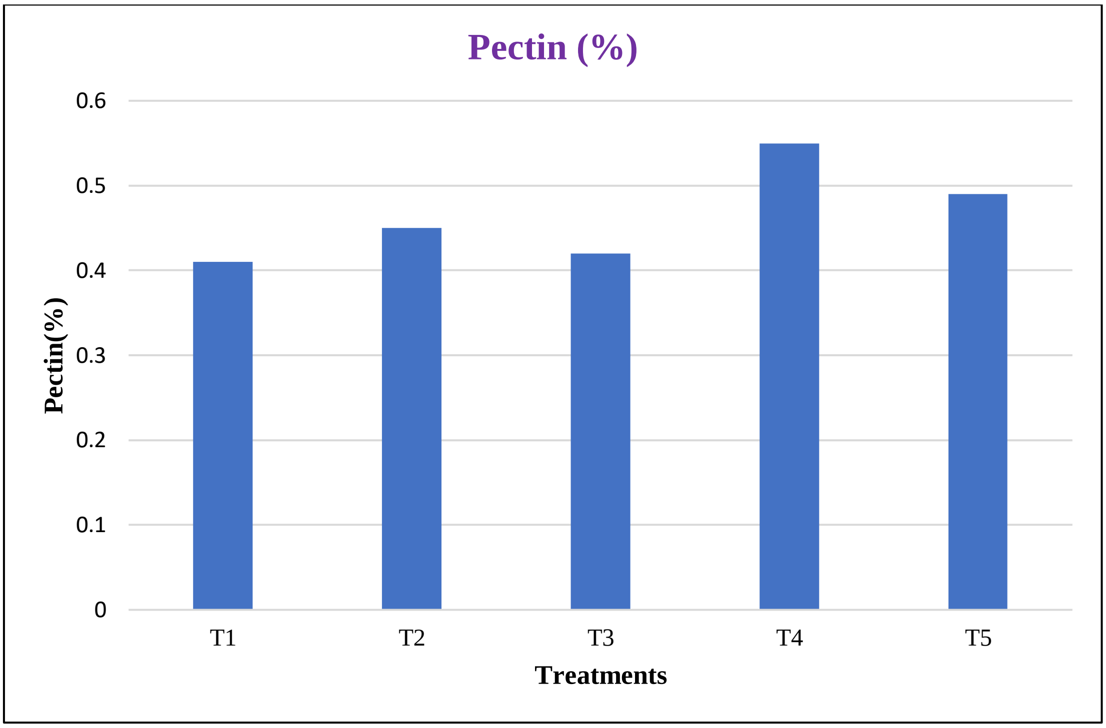

Fig. 4.1.19. Effect of organic and inorganic sources of nutrients on Pectin content (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

T_1- Organic sole (100% FYM), **T_2**- Inorganic sole (100% NPK),
T_3-Organic (75% FYM) + Inorganic (25% NPK),
T_4- Inorganic (75% NPK) + Organic (25% FYM),
T_5- Organic (50% FYM) + Inorganic (50% NPK).

Table 4.1.20 Effect of organic and inorganic sources of nutrients on Benefit:Cost ratio of guava (*Psidium guajava* L.) Cv. Allahabad Safeda.

Treatment	Total cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
T_1: Organic Sole (100% FYM)	42330	151491.3	109161.3	2.57
T_2: Inorganic Sole (100% NPK)	34176.78	259355.1	225178.32	6.58
T_3: Organic (75% FYM) + Inorganic (25% NPK)	40286.7	217555.8	177269.1	4.40
T_4: Inorganic (75% NPK) + Organic (25% FYM)	36183.23	331818.3	295635.07	8.17
T_5: Organic (50% FYM) + Inorganic (50% NPK)	38250	299326.2	261076.2	6.82

T$_1$- Organic sole (100%)(FYM)

T$_2$- Inorganic sole (100%)(NPK)

T$_3$-Organic(75%)(FYM)+Inorganic (25%)(FYM)

T$_4$-Inorganic(75%)(NPK)+Organic (25%)(FYM)

T$_5$-Organic(50%)(FYM)+Inorganic (50%)(FYM)

Plate 3. Effect of organic and inorganic sources of nutrient on guava Cv. Allahabad safeda

4.2. EFFECT OF DIFFERENT PACKAGING MATERIALS ONSHELF LIFE OF GUAVA Cv. ALLAHABAD SAFEDA.

4.2.1 Physiological Loss in Weight (%)

The data pertaining to physiological loss in weight (PLW) of guava as influenced by different packaging materials were presented in table 4.2.1 and fig. 4.2.1.

It was observed that weight losses increased significantly with increase in storage period. There was a significant difference observed among the treatments for PLW.

On 2^{nd} day of storage T_2-75µ LDPE recorded least PLW (1.03) followed by T_5-50µ HDPE (1.10) and T_3-100µ LDPE (1.75) and significantly highest PLW (%) was recorded in T_6-control (3.11).

On 4^{th} day of storage significantly lowest PLW (%) was recorded in T_2-75µ LDPE (2.02) followed by T_5-50µ HDPE (2.11) and T_3-100µ LDPE (2.24) and significantly highest PLW (%) was recorded in T_6-control (3.63).

On 6^{th} day of storage T_2-75µ LDPE recorded least PLW (3.00) followed by T_5-50µ HDPE (3.04) and T_3-100µ LDPE (3.18) and highest PLW (%) was recorded in T_6-control (5.10).

On 8^{th} day of storage T_2-75µ LDPE recorded least PLW (3.71) followed by T_5-50µ HDPE (3.90) and T_3-100µ LDPE (4.21) and highest PLW (%) was recorded in T_4-brown paper (5.14).

From the data it is revealed that, fruits packed in 75µ LDPE bags showed minimum loss of physiological weight in fruits during storage. This is probably due to lower rate of transpiration, oxygen depletion and carbon-dioxide accumulation in the polythene bags reaching on equilibrium and as a result the respiratory process was slowed down. The results are in close conformity with those results of Nagaraju and Banik (2017), Borkar *et al*. (2008).

Table 4.2.1 Effect of different packaging materials on physiological loss in weight (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment		Physiological loss in weight (%)			
		2^{nd} day	4^{th} day	6^{th} day	8^{th} day
T_1	50µ LDPE	2.20^{c}	2.35^{c}	3.31^{c}	4.30^{b}
T_2	75µ LDPE	1.03^{f}	2.02^{f}	3.00^{f}	3.71^{e}
T_3	100µ LDPE	1.75^{d}	2.24^{d}	3.18^{d}	4.21^{c}
T_4	Brown paper	2.51^{b}	3.31^{b}	4.90^{b}	5.14^{a}
T_5	50µ HDPE	1.10^{e}	2.11^{e}	3.04^{e}	3.90^{d}
T_6	Control	3.11^{a}	3.63^{a}	5.10^{a}	*
S.Em ±		0.010	0.008	0.009	0.009
CD at 5%		0.030	0.025	0.028	0.026

*- end of shelf life

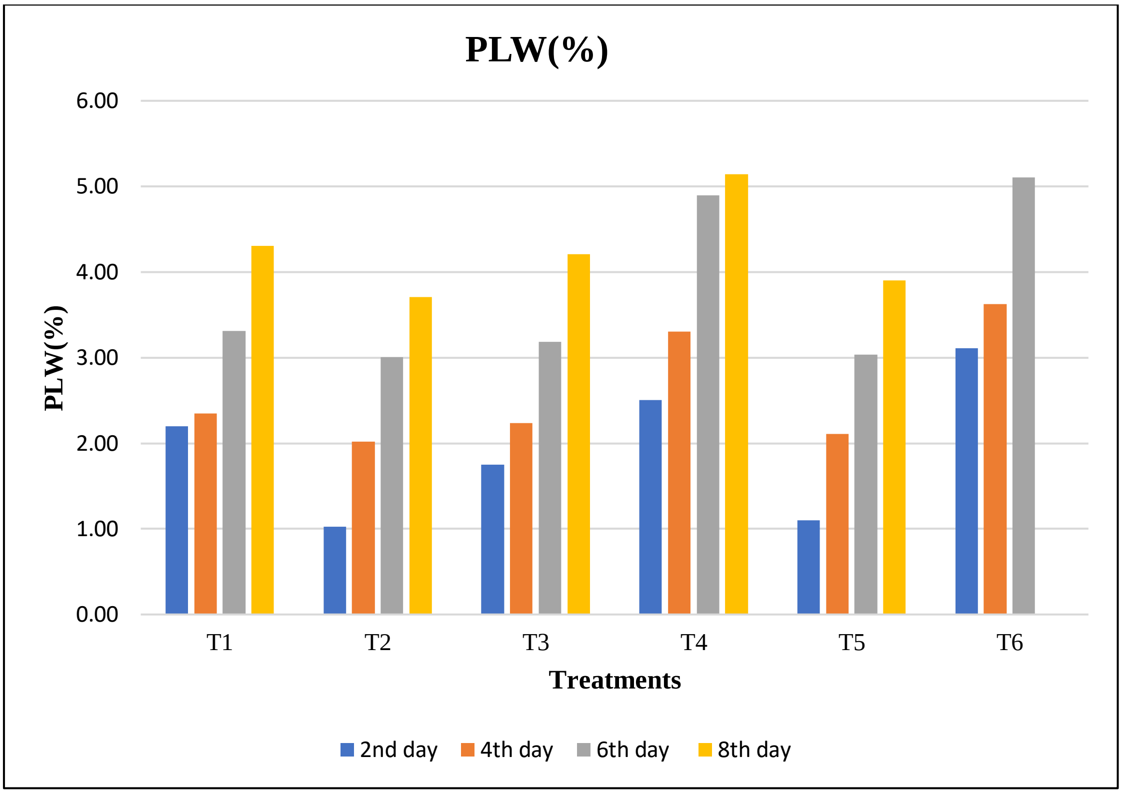

Fig. 4.2.1. Effect of different packaging materials on Physiological loss in weight (%) of guava (*Psidium guajava* L.) Cv. Allahabad safeda.

$\mathbf{T_1}$- 50µ LDPE packaging, $\mathbf{T_2}$- 75µ LDPE packaging, $\mathbf{T_3}$- 100µ LDPE packaging, $\mathbf{T_4}$- Brown paper packaging, $\mathbf{T_5}$- 50µ HDPE packaging, $\mathbf{T_6}$- Control (without packaging).

4.2.2 Spoilage (%)

Spoilage percent of guava fruits as affected by different packaging materials is presented in table 4.2.2 and fig 4.2.2.

Spoilage percent increases throughout the storage period. Initially spoilage was started on 4th day in fruits packed in T_4-brown paper and T_6-control. There were no signs of spoilage in remaining treatments. Significantly lowest spoilage was recorded in T_4-brown paper (5.35) and highest spoilage was recorded in T_6-control (9.91).

On 6th day symptoms of spoilage was noticed in all the treatments. Significantly lowest spoilage was observed in T_2-75µ LDPE (8.05) and highest spoilage was seen in T_6-control (30.38).

On 8th day significantly lowest spoilage was recorded in T_2-75µ LDPE (22.98) and highest spoilage was recorded in T_4-brown paper (43.88).

Spoilage of fruit is a major constraint in extending the shelf life of the fruits during storage. The spoilage was mainly brought about by rotting caused by pathogens. Microorganisms multiply and infect the fruit surface when congenial conditions prevail. The minimum spoilage was observed in fruits packed in 75µ LDPE bags might be due to low concentration of oxygen and high concentration of carbon dioxide, which suppressed the multiplication of spoilage causing microorganisms. The results are in close conformity with the finding of Kardile *et al*. (2014).

4.2.3 Total soluble solids (^{o}Brix)

Results on total soluble solids (^{o}Brix) of guava as affected by different packaging materials were presented in table 4.2.3 and fig. 4.2.3. Results showed that TSS increased significantly with increase in storage period up to 6th day and later started decreasing. Significant difference was observed among the treatments for TSS.

Table 4.2.2 Effect of different packaging materials on spoilage (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment		Spoilage (%)		
		4th day	6th day	8th day
T_1	50µ LDPE	0.00	11.15[e]	30.61[d]
T_2	75µ LDPE	0.00	8.05[f]	22.98[e]
T_3	100µ LDPE	0.00	20.45[c]	39.78[b]
T_4	Brown paper	5.35[b]	24.68[b]	43.88[a]
T_5	50µ HDPE	0.00	17.95[d]	35.24[c]
T_6	Control	9.91[a]	30.38[a]	*
S.Em ±		0.194	0.547	0.537
CD at 5%		0.580	1.638	1.609

*- end of shelf life

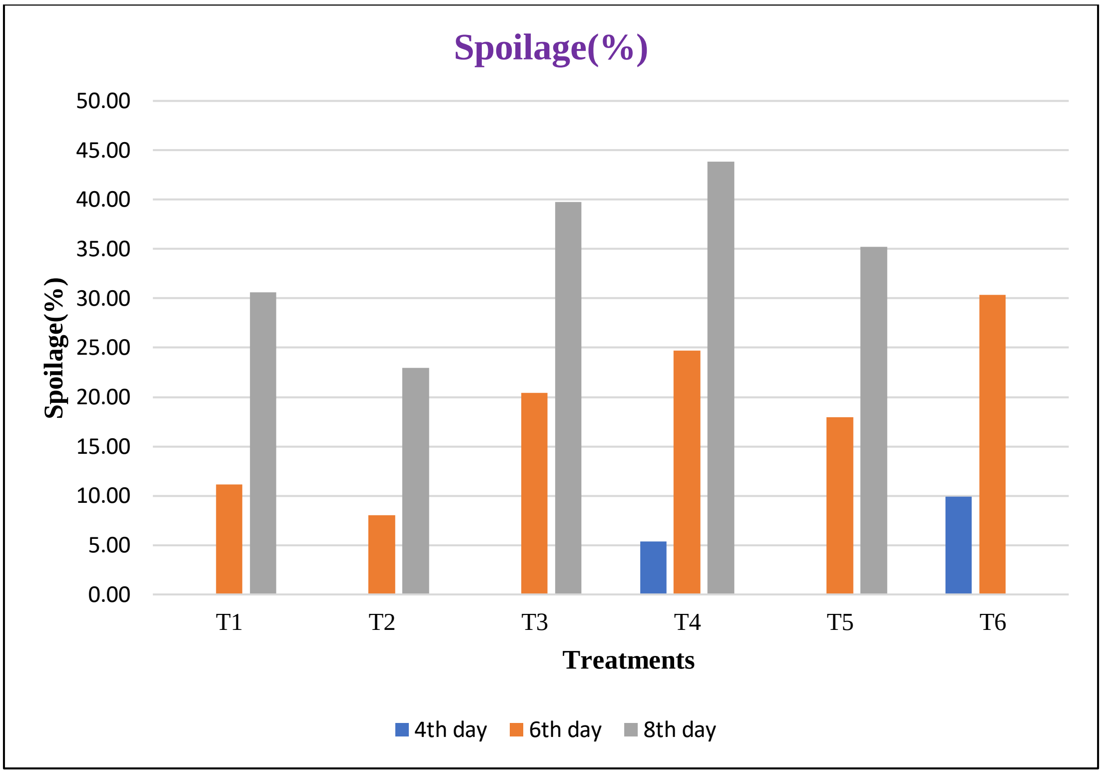

Fig. 4.2.2. Effect of different packaging materials on Spoilage (%) of guava (*Psidium guajava* L.) Cv. Allahabad safeda.

$\mathbf{T_1}$- 50µ LDPE packaging, $\mathbf{T_2}$- 75µ LDPE packaging, $\mathbf{T_3}$- 100µ LDPE packaging,
$\mathbf{T_4}$- Brown paper packaging, $\mathbf{T_5}$- 50µ HDPE packaging, $\mathbf{T_6}$- Control (without packaging).

Table 4.2.3 Effect of different packaging materials on total soluble solids (°Brix) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment		Total soluble solids (°Brix)				
		0^{th} day	2^{nd} day	4^{th} day	6^{th} day	8^{th} day
T_1	50µ LDPE	8.42	9.65^{e}	10.63^{c}	11.34^{e}	10.98^{e}
T_2	75µ LDPE	8.40	9.10^{f}	10.12^{f}	12.02^{a}	11.83^{a}
T_3	100µ LDPE	8.42	9.81^{c}	10.52^{d}	11.71^{c}	11.53^{c}
T_4	Brown paper	8.41	9.95^{b}	11.00^{b}	11.41^{d}	11.19^{d}
T_5	50µ HDPE	8.43	9.73^{d}	10.43^{e}	11.81^{b}	11.66^{b}
T_6	Control	8.41	10.06^{a}	11.15^{a}	11.00^{f}	*
S.Em ±		0.008	0.008	0.008	0.009	0.009
CD at 5%		NS	0.024	0.025	0.027	0.026

*- end of shelf life

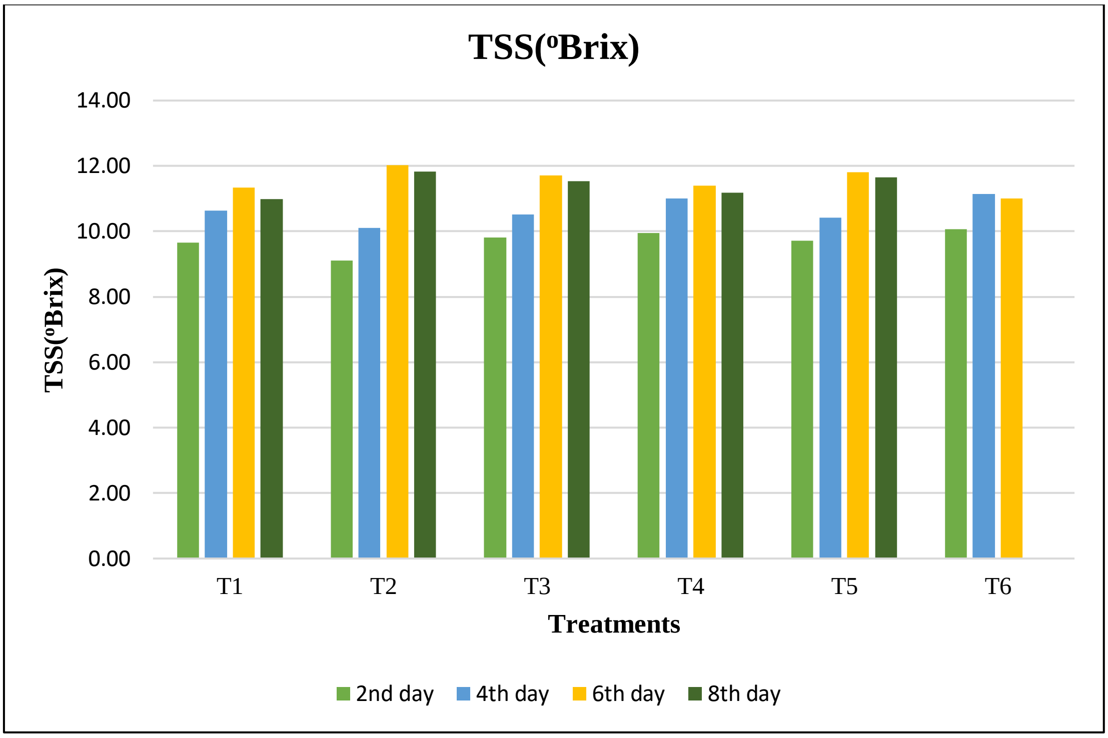

Fig. 4.2.3. Effect of different packaging materials on Total soluble solids (ºBrix) of guava (*Psidium guajava* L.) Cv. Allahabad safeda.

$\mathbf{T_1}$- 50µ LDPE packaging, $\mathbf{T_2}$- 75µ LDPE packaging, $\mathbf{T_3}$- 100µ LDPE packaging, $\mathbf{T_4}$- Brown paper packaging, $\mathbf{T_5}$- 50µ HDPE packaging, $\mathbf{T_6}$- Control (without packaging).

On 2nd day of storage lowest TSS was recorded T_2-75µ LDPE (9.10) followed by T_1-50µ LDPE (9.65) and T_5-50µ HDPE (9.73) and significantly highest TSS was recorded in T_6-control (10.06).

On 4th day of storage fruits packed in T_2-75µ LDPE recorded lowest TSS (10.12) followed by T_5-50µ HDPE (10.43) and T_3-100µ LDPE (10.52) and significantly highest TSS was recorded in T_6-control (11.15).

On 6th day of storage highest TSS was recorded in T_2-75µ LDPE (12.02) followed by T_5-50µ HDPE (11.81) and significantly lowest TSS was recorded in T_6-control (11.00).

On 8th day of storage fruits packed in T_2-75µ LDPE recorded highest TSS (11.83) followed by T_5-50µ HDPE (11.66) and significantly lowest TSS was recorded in T_1-50µ LDPE (10.98).

Total soluble solids content of the fruits reached maximum at the ripe stage and started declining towards the end of shelf life. The increase in Total soluble solids was due to breakdown of complex carbohydrates to simple sugars during ripening Padmaja and Bosco (2014). Fruits packed in T_2-75µ LDPE was best treatment with maximum TSS. Results are in agreement with the finding of Azene *et al.* (2014) in sapota fruit.

4.2.4 Titrable Acidity (%)

The data related to titrable acidity of guava influenced by different packaging materials were presented in table 4.2.4 and fig. 4.2.4. Significant difference was observed among the treatments. Titrable acidity of fruits decreases gradually from the 1st day to 8th day of storage.

On 2nd day of storage maximum acidity was recorded in T_5-50µ HDPE (0.61) followed by T_2-75µ LDPE (0.59) and significantly minimum acidity was recorded in T_6-control (0.41).

On 4th day of storage maximum acidity was recorded in T_5-50µ HDPE (0.48) followed by T_2-75µ LDPE (0.43) and significantly minimum acidity was recorded in T_6-control (0.30).

Table 4.2.4 Effect of different packaging materials on titrable acidity (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment		Titrable acidity (%)				
		0th day	2nd day	4th day	6th day	8th day
T_1	50µ LDPE	0.67	0.55^{c}	0.35^{e}	0.30^{d}	0.24^{d}
T_2	75µ LDPE	0.67	0.59^{b}	0.43^{b}	0.37^{b}	0.33^{b}
T_3	100µ LDPE	0.67	0.51^{d}	0.41^{c}	0.34^{c}	0.27^{c}
T_4	Brown paper	0.67	0.48^{e}	0.37^{d}	0.23^{f}	0.20^{e}
T_5	50µ HDPE	0.67	0.61^{a}	0.48^{a}	0.41^{a}	0.36^{a}
T_6	Control	0.67	0.41^{f}	0.30^{f}	0.28^{e}	*
S.Em ±		-	0.006	0.005	0.005	0.006
CD at 5%		-	0.018	0.015	0.014	0.017

*- end of shelf life

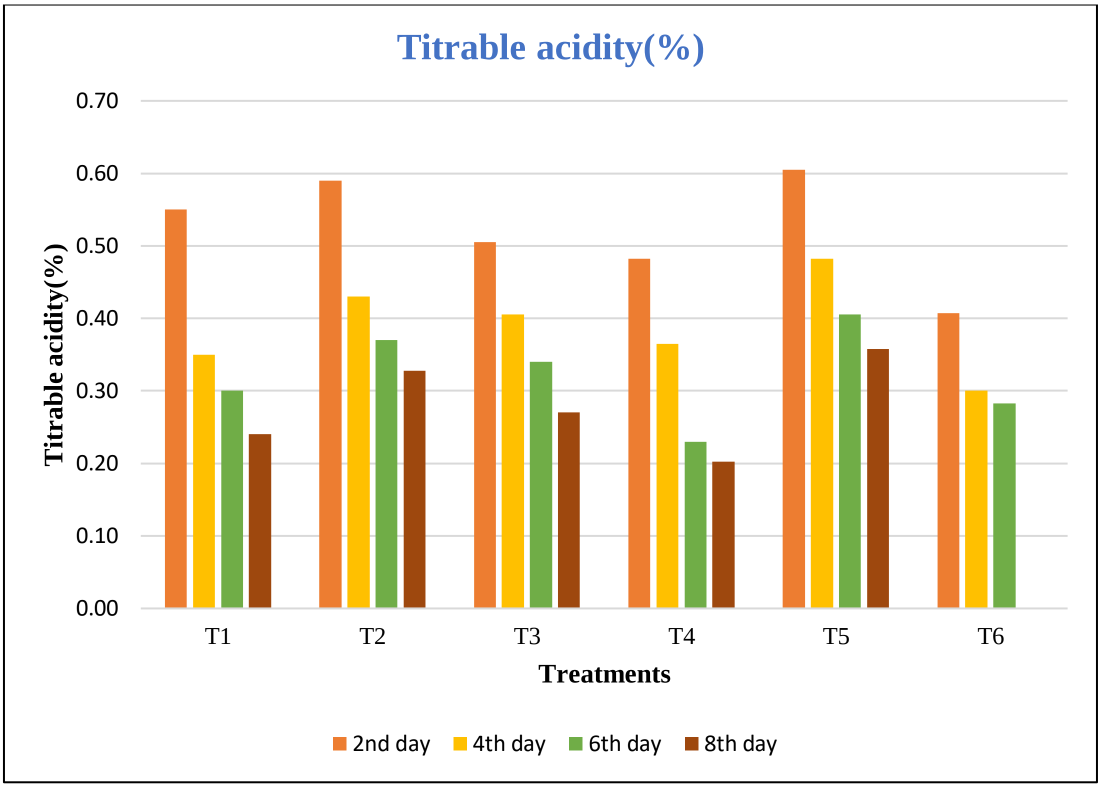

Fig. 4.2.4. Effect of different packaging materials on Titrable acidity (%) of guava (*Psidium guajava* L.) Cv. Allahabad safeda.

$\mathbf{T_1}$- 50µ LDPE packaging, $\mathbf{T_2}$- 75µ LDPE packaging, $\mathbf{T_3}$- 100µ LDPE packaging, $\mathbf{T_4}$- Brown paper packaging, $\mathbf{T_5}$- 50µ HDPE packaging, $\mathbf{T_6}$- Control (without packaging).

On 6th day of storage maximum acidity was recorded in T_5-50µ HDPE (0.41) followed by T_2-75µ LDPE (0.37) and significantly minimum acidity was recorded in T_4-brown paper (0.23).

On 8th day of storage maximum acidity was recorded in T_5-50µ HDPE (0.36) followed by T_2-75µ LDPE (0.33) and significantly minimum acidity was recorded in T_4-brown paper (0.20).

From the data, T_5-50µ HDPE was the best treatment with maximum acidity. The progressive reduction in the acidity with advancement of storage periods may be attributed to utilization of organic acid in pyruvate decarboxylation reaction occurring during the ripening process of fruits. Similar findings were reported by Goutam *et al.* (2010) in guava and Panda *et al.* (2016) in strawberry.

4.2.5 Total sugars (%)

The data on total sugars of guava as influenced by different packaging materials were presented in table 4.2.5 and fig. 4.2.5.

It was observed that total sugar content increased significantly with increase in storage period up to 6th day and later started decreasing. There was a significant difference observed among the treatments for total sugars.

On 2nd day of storage fruits packed in T_2-75µ LDPE recorded lowest total sugars content (7.76) followed by T_5-50µ HDPE (7.90) and T_1-50µ LDPE (8.12) and significantly highest total sugar content was recorded in T_6-control (8.30).

On 4th day of storage fruits packed in T_2-75µ LDPE recorded lowest total sugars content (8.13) followed by T_5-50µ HDPE (8.42) and T_1-50µ LDPE (8.51) and significantly highest total sugar content was recorded in T_6-control (9.01).

On 6th day of storage fruits packed in T_2-75µ LDPE recorded highest total sugars content (10.22) and significantly lowest total sugar content was

Table 4.2.5 Effect of different packaging materials on total sugars (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment		Total sugars (%)				
		0th day	**2nd day**	**4th day**	**6th day**	**8th day**
T_1	50µ LDPE	7.10	8.12^{d}	8.51^{d}	8.91^{f}	8.81^{e}
T_2	75µ LDPE	7.10	7.76^{f}	8.13^{f}	10.22^{a}	10.00^{a}
T_3	100µ LDPE	7.10	8.16^{c}	8.61^{c}	9.41^{c}	9.10^{c}
T_4	Brown paper	7.10	8.22^{b}	8.81^{b}	9.12^{e}	9.01^{d}
T_5	50µ HDPE	7.10	7.90^{e}	8.42^{e}	10.07^{b}	9.31^{b}
T_6	Control	7.10	8.30^{a}	9.01^{a}	9.23^{d}	⁎
S.Em ±		-	0.009	0.009	0.008	0.007
CD at 5%		-	0.026	0.026	0.024	0.020

⁎- end of shelf life

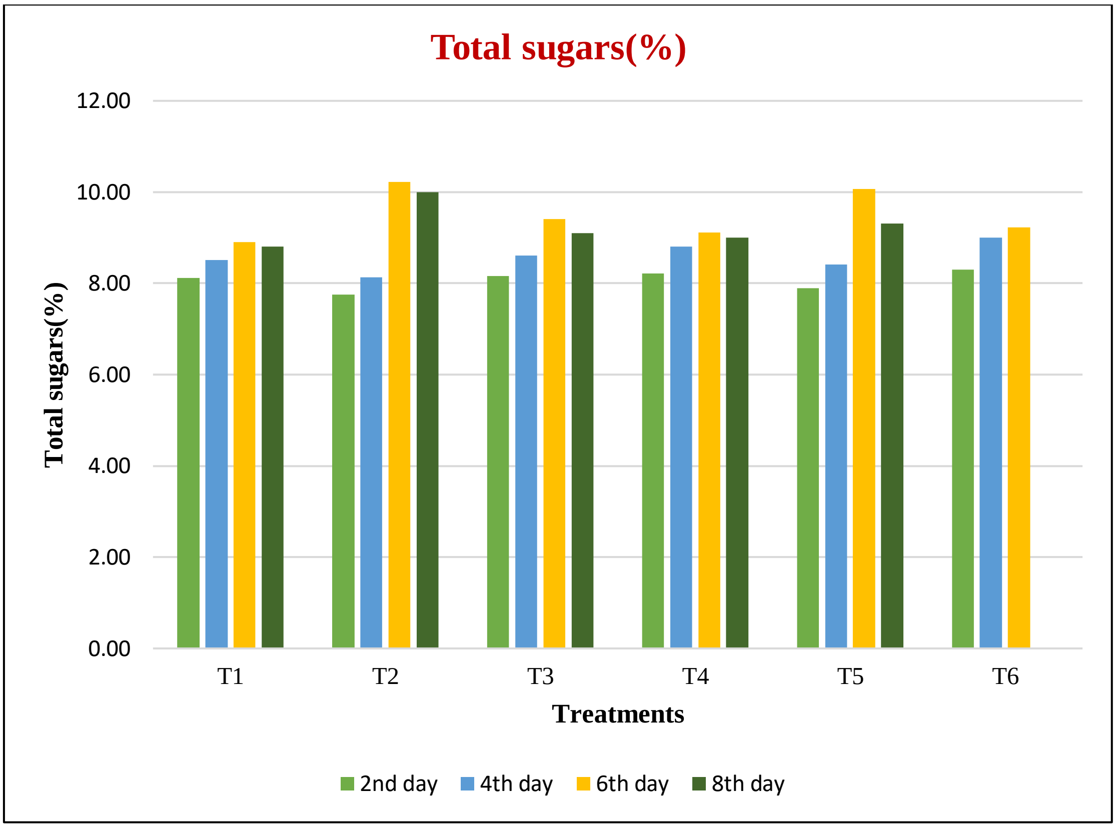

Fig. 4.2.5. Effect of different packaging materials on Total sugars (%) of guava (*Psidium guajava* L.) Cv. Allahabad safeda.

$\mathbf{T_1}$- 50µ LDPE packaging, $\mathbf{T_2}$- 75µ LDPE packaging, $\mathbf{T_3}$- 100µ LDPE packaging,
$\mathbf{T_4}$- Brown paper packaging, $\mathbf{T_5}$- 50µ HDPE packaging, $\mathbf{T_6}$- Control (without packaging).

recorded in T_1-50µ LDPE (8.91) followed by T_4-brown paper (9.12) and T_6-control (9.23).

On 8th day of storage fruits packed in T_2-75µ LDPE recorded highest total sugars content (10.00) and significantly lowest total sugar content was recorded in T_1-50µ LDPE (8.81) followed by T_4- brown paper (9.01) and T_3-100µ LDPE (9.10).

There was a decline in the total sugar content from 6th day (10.22) to 8th day (10.00) of storage recorded in fruits stored in T_2-75µ LDPE. The total and reducing sugars were increased up to ripening there after showed a decline at the end of shelf life in all the treatments. The initial raise in sugars content may be due to conversion of starch into sugars, while later the decrease was due to consumption of sugars for respiration during storage. Similar results of reducing and total sugars contents were reported by Azene *et al*. (2014) and Bindu Praveena *et al*. (2013) in sapota.

4.2.6 Non-reducing sugars (%)

The data on non-reducing sugars of guava as influenced by different packaging materials were presented in table 4.2.6 and fig. 4.2.6. Significant difference was observed among the treatments on non-reducing sugars.

On 2nd day of storage significantly highest non-reducing sugar content was recorded in T_1-50µ LDPE (3.61) and lowest non-reducing sugar content was recorded in T_4-brown paper (3.51) which was on par with T_2-75µ LDPE (3.53).

On 4th day of storage lowest non-reducing sugar content was recorded in T_2-75µ LDPE (3.22) and T_5-50µ HDPE (3.22) and significantly highest non-reducing sugar content was recorded in T_1-50µ LDPE (3.51) which was on par with T_3-100µ LDPE (3.51).

On 6th day of storage fruits packed in T_2-75µ LDPE recorded highest non-reducing sugar content (3.91) and significantly lowest non-reducing sugar content was recorded in T_4-Brown paper (2.95).

Table 4.2.6 Effect of different packaging materials on non-reducing sugars (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment		Non-reducing sugars (%)				
		0th day	2nd day	4th day	6th day	8th day
T_1	50µ LDPE	2.95	3.61[a]	3.51[a]	3.59[c]	3.61[b]
T_2	75µ LDPE	2.95	3.53[c]	3.22[d]	3.91[a]	3.88[a]
T_3	100µ LDPE	2.95	3.55[b]	3.51[a]	3.30[d]	3.30[d]
T_4	Brown paper	2.95	3.51[c]	3.39[b]	2.95[e]	3.00[e]
T_5	50µ HDPE	2.95	3.57[b]	3.22[d]	3.85[b]	3.41[c]
T_6	Control	2.95	3.23[d]	3.29[c]	3.32[d]	*
S.Em ±		-	0.012	0.010	0.011	0.010
CD at 5%		-	0.035	0.030	0.034	0.030

*- end of shelf life

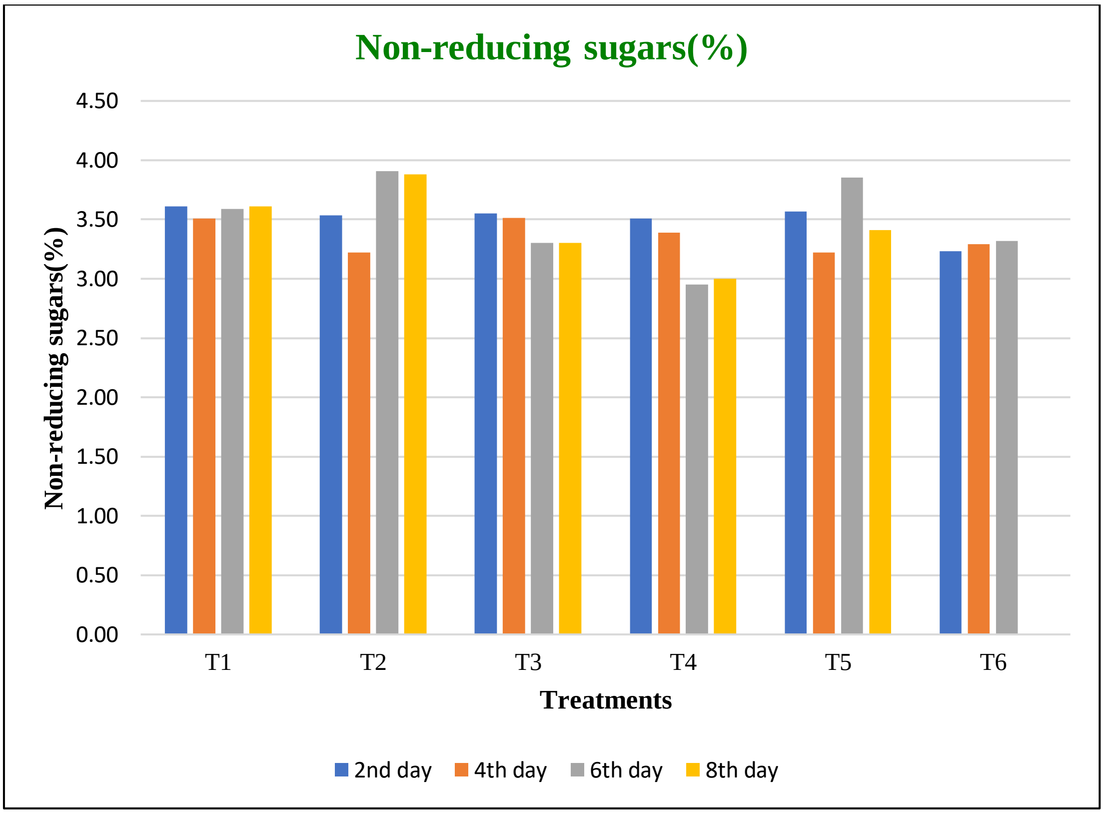

Fig. 4.2.6. Effect of different packaging materials on Non-reducing sugars (%) of guava (*Psidium guajava* L.) Cv. Allahabad safeda.

$\mathbf{T_1}$- 50µ LDPE packaging, $\mathbf{T_2}$- 75µ LDPE packaging, $\mathbf{T_3}$- 100µ LDPE packaging, $\mathbf{T_4}$- Brown paper packaging, $\mathbf{T_5}$- 50µ HDPE packaging, $\mathbf{T_6}$- Control (without packaging).

On 8th day of storage fruits packed in T_2-75µ LDPE recorded highest non-reducing sugar content (3.88) and significantly lowest non reducing sugar content was recorded in T_4-Brown paper (3.00). Results revealed thatfruits packed in T_2-75µ LDPE was best treatment with highest non-reducing sugar content.

4.2.7 Reducing sugars (%)

The results on reducing sugars of guava fruits as influenced by different packaging materials were presented in table 4.2.7 and fig. 4.2.7. It was observed that reducing sugar content increased significantly with increase in storage period up to 6th day and later started decreasing. There was a significant difference observed among the treatments for reducing sugars.

On 2nd day of storage fruits packed in T_2-75µ LDPE recorded lowest reducing sugar content (4.22) followed by T_5-50µ HDPE (4.33) and T_1-50µ LDPE (4.51) and significantly highest reducing sugar content was recorded in T_6-control (5.07).

On 4th day of storage fruits packed in T_2-75µ LDPE recorded lowest reducing sugar content (4.91) followed by T_1-50µ LDPE (5.00) and T_3-100µ LDPE (5.10) and significantly highest reducing sugar content was recorded in T_6-control (5.72).

On 6th day of storage fruits packed in T_2-75µ LDPE recorded highest reducing sugar content (6.31) and significantly lowest reducing sugar content was recorded in T_1-50µ LDPE (5.32) followed by T_6-control (5.92).

On 8th day of storage fruits packed in T_2-75µ LDPE recorded highest reducing sugar content (6.12) and significantly lowest reducing sugar content was recorded in T_1-50µ LDPE (5.19) followed by T_3-100µ LDPE (5.80).

From the results it was observed that maximum reducing sugar content values was observed with fruits packed in 75µ LDPE bags during storage. In control low sugars were recorded due to exposure of fruit to atmosphere without any treatment. But in treated fruits slow build-up of the sugars occurs. There was

Table 4.2.7 Effect of different packaging materials on reducing sugars (%) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment		Reducing sugars (%)				
		0th day	**2nd day**	**4th day**	**6th day**	**8th day**
T_1	50µ LDPE	4.15	4.51^{d}	5.00^{e}	5.32^{f}	5.19^{e}
T_2	75µ LDPE	4.15	4.22^{f}	4.91^{f}	6.31^{a}	6.12^{a}
T_3	100µ LDPE	4.15	4.60^{c}	5.10^{d}	6.11^{d}	5.80^{d}
T_4	Brown paper	4.15	4.71^{b}	5.42^{b}	6.16^{c}	6.00^{b}
T_5	50µ HDPE	4.15	4.33^{e}	5.20^{c}	6.22^{b}	5.90^{c}
T_6	Control	4.15	5.07^{a}	5.72^{a}	5.92^{e}	⁎
S.Em ±		-	0.008	0.008	0.007	0.007
CD at 5%		-	0.024	0.023	0.022	0.022

⁎- end of shelf life

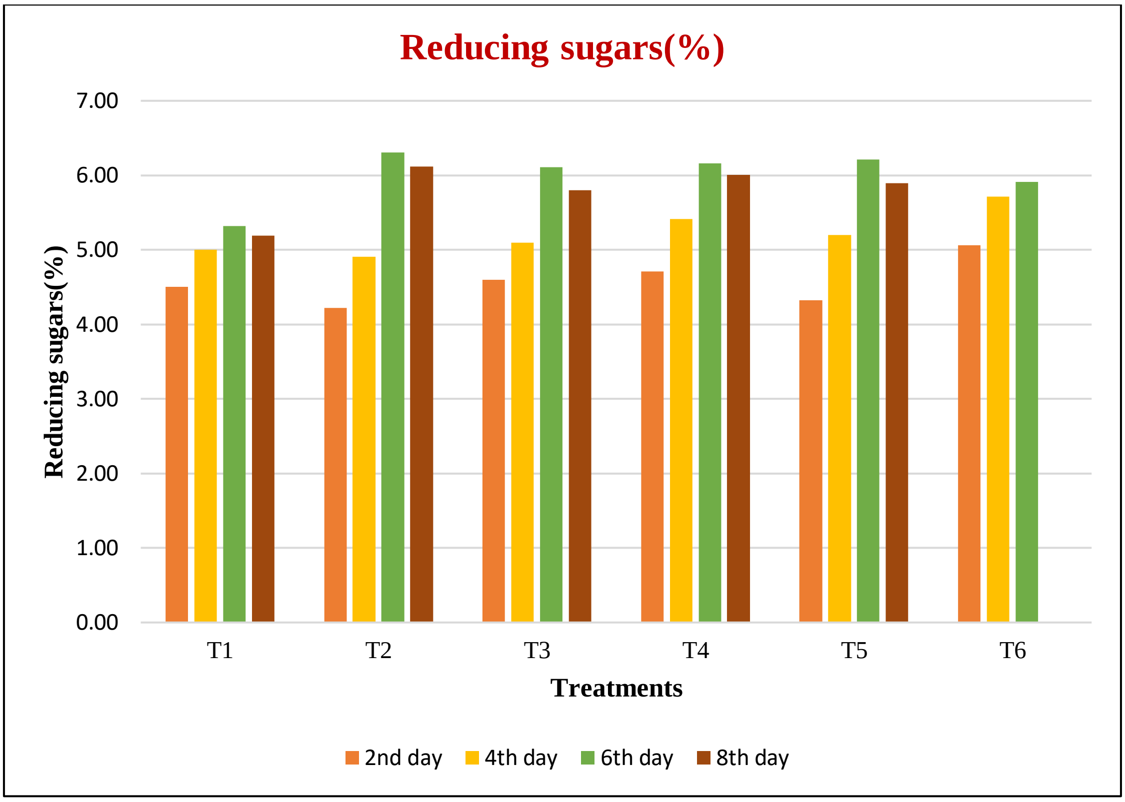

Fig. 4.2.7. Effect of different packaging materials on Reducing sugars (%) of guava (*Psidium guajava* L.) Cv. Allahabad safeda.

T_1- 50µ LDPE packaging, **T_2**- 75µ LDPE packaging, **T_3**- 100µ LDPE packaging, **T_4**- Brown paper packaging, **T_5**- 50µ HDPE packaging, **T_6**- Control (without packaging).

a gradual increase in total sugars and reducing sugars which reached its maximum at ripe stage and there after decreased gradually. The above results are in agreement with the finding of Bindu Praveena *et al*. (2013) in sapota.

4.2.8 Fruit firmness (kg/cm^2)

The effect of different packaging materials on firmness of guava fruit is presented in table 4.2.8 and fig 4.2.8. Significant difference was observed among the treatments.

Firmness of guava fruits showed decreasing tendency with increase in storage period.

On 2nd day highest firmness was recorded in T_5-50µ HDPE (9.45) and significantly lowest firmness was recorded in T_6-control (7.35).

On 4th day fruits packed in T_5-50µ HDPE (8.61) recorded highest firmness and lowest firmness was recorded in T_6-control (5.89).

On 6th day highest firmness was recorded in T_5-50µ HDPE (7.51) and significantly lowest firmness was recorded in T_6-control (4.48).

On 8th day of storage fruits packed in T_5-50µ HDPE (5.32) recorded highest firmness and lowest firmness was recorded in T_4-Brown paper (3.63).

Maximum firmness was observed in fruits packed in 50µ HDPE bags. Generally there was softening of fruits as the storage time progressed which could be due to texture modification through degradation of polysaccharides such as pectin, cellulose and hemicelluloses that takes place during ripening (Irtwange, 2006). Maximum firmness might be due to the higher concentration of carbon dioxide and low concentration of oxygen inside the package, which led to slow ripening and respiration rate. The declined firmness might be due to the loss of water from the fruits and their ripening (Rokaya *et al*., 2015). The results are similar with the finding of Azene *et al.* (2014) in sapota.

Table 4.2.8 Effect of different packaging materials on firmness (kg/cm^2) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment		Firmness (kg/cm^2)				
		0th day	**2nd day**	**4th day**	**6th day**	**8th day**
T_1	50µ LDPE	10.5	8.70^b	8.08^b	6.80^b	4.93^b
T_2	75µ LDPE	10.5	8.58^b	7.71^c	6.01^c	4.55^c
T_3	100µ LDPE	10.5	8.11^c	7.32^d	5.57^d	4.10^d
T_4	Brown paper	10.5	7.74^d	6.57^e	4.94^e	3.63^e
T_5	50µ HDPE	10.5	9.45^a	8.61^a	7.51^a	5.32^a
T_6	Control	10.5	7.35^e	5.89^f	4.48^f	*
S.Em ±		-	0.061	0.041	0.075	0.054
CD at 5%		-	0.184	0.123	0.225	0.163

*- end of shelf life

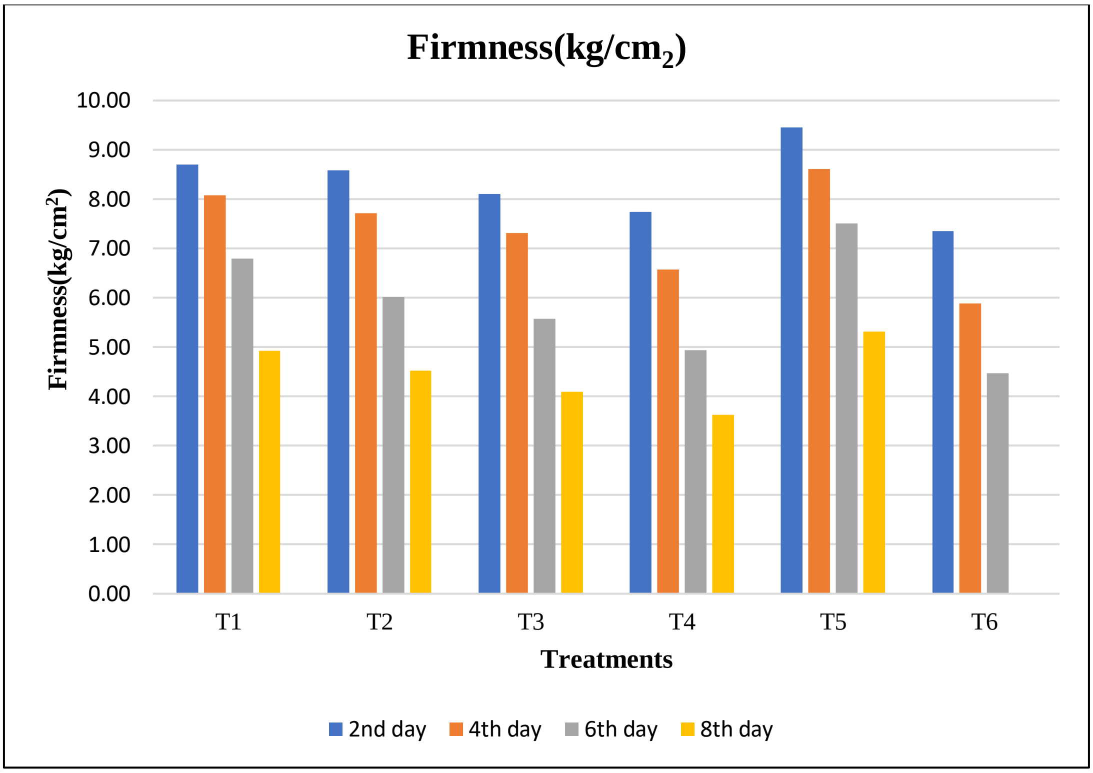

Fig. 4.2.8. Effect of different packaging materials on Fruit firmness (kg/cm^2) of guava (*Psidium guajava* L.) Cv. Allahabad safeda.

T_1- 50µ LDPE packaging, **T_2**- 75µ LDPE packaging, **T_3**- 100µ LDPE packaging, **T_4**- Brown paper packaging, **T_5**- 50µ HDPE packaging, **T_6**- Control (without packaging).

4.2.9 Ascorbic acid (mg/100g)

The data pertaining to ascorbic acid of guava as influenced by different packaging materials were presented in table 4.2.9 and fig. 4.2.9. Significant difference was observed among the treatments with respect to ascorbic acid.

From the data it was observed that the ascorbic acid of guava significantly decreased with each successive storage period.

On 2nd day of storage highest ascorbic acid was recorded in fruits packed in T_2-75µ LDPE (260.79) followed by T_5-50µ HDPE (251.00) and T_3-100µ LDPE (247.84) and significantly lowest ascorbic acid content was recorded in T_6-control (224.75).

On 4th day of storage highest ascorbic acid was recorded in fruits packed in T_2-75µ LDPE (161.25) followed by T_5-50µ HDPE (155.29) and T_3-100µ LDPE (149.89) and significantly lowest ascorbic acid content was recorded in T_6-control (120.20).

On 6th day of storage significantly highest ascorbic acid was recorded in fruits packed in T_2-75µ LDPE (135.11) followed by T_5-50µ HDPE (122.36) and T_3-100µ LDPE (115.09) and significantly lowest ascorbic acid content was recorded in T_6-control (100.24).

On 8th day of storage highest ascorbic acid was recorded in fruits packed in T_2-75µ LDPE (115.00) followed by T_3-100µ LDPE (107.22) and significantly lowest ascorbic acid content was recorded in T_1-50µ LDPE (103.11).

Fruits packed in T_2-75µ LDPE bags recorded higher level of ascorbic acid content. This might be due to reduced activities of oxidizing enzymes and also due to low O_2 permeability of this film that result in higher retention of ascorbic acid up to last day of storage. Ascorbic acid content decreased as the storage period increased. This may be attributed to the degradation of ascorbic acid to dehydro ascorbic acid by oxidative enzymes. Decrease in vitamin C during storage had been reported in guava by Goutam *et al.* (2010). Results are in agreement with the finding of Panda *et al*. (2016) in strawberry.

Table 4.2.9 Effect of different packaging materials on ascorbic acid (mg/100g of pulp) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment		Ascorbic acid (mg/100g of pulp)				
		0th day	2nd day	4th day	6th day	8th day
T_1	50µ LDPE	266.45	241.37[d]	140.78[d]	109.12[d]	103.11[c]
T_2	75µ LDPE	266.45	260.79[a]	161.25[a]	135.11[a]	115.00[a]
T_3	100µ LDPE	266.45	247.84[c]	149.89[c]	115.09[c]	107.22[b]
T_4	Brown paper	266.45	231.00[e]	131.20[e]	103.26[e]	99.79[d]
T_5	50µ HDPE	266.45	251.00[b]	155.29[b]	122.36[b]	105.50[c]
T_6	Control	266.45	224.75[f]	120.10[f]	100.24[f]	*
S.Em ±		-	0.417	0.509	0.433	1.314
CD at 5%		-	1.247	1.523	1.296	3.935

*- end of shelf life

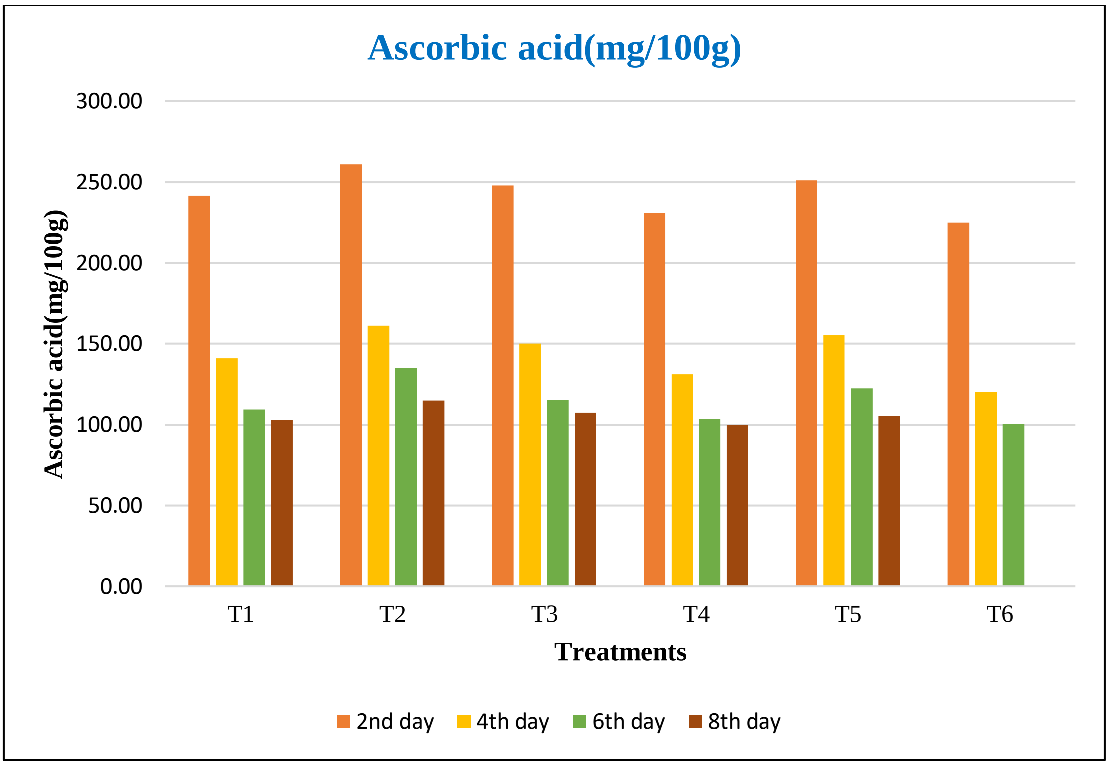

Fig. 4.2.9. Effect of different packaging materials on Ascorbic acid (mg/100g) of guava (*Psidium guajava* L.) Cv. Allahabad safeda.

$\mathbf{T_1}$- 50µ LDPE packaging, $\mathbf{T_2}$- 75µ LDPE packaging, $\mathbf{T_3}$- 100µ LDPE packaging, $\mathbf{T_4}$- Brown paper packaging, $\mathbf{T_5}$- 50µ HDPE packaging, $\mathbf{T_6}$- Control (without packaging).

4.2.10 Shelf life (days)

Shelf life of guava fruits as affected by different packaging materials were presented in table 4.2.10 and fig. 4.2.10.

Significant difference was observed among the treatments for shelf life. Maximum shelf life was recorded in fruits packed in T_2-75µ LDPE bags (8.09 days) followed by T_5-50µ HDPE (7.71 days). Significantly minimum shelf life was recorded in T_6-control (6.00 days). This might be due to accumulation or maintenance of high relative humidity in the polythene bags there by reduced rate of transpiration. The results are in close conformity with the finding of Nagaraju and Banik (2017).

Table 4.2.10 Effect of different packaging materials on shelf life (days) of guava (*Psidium guajava* L.) Cv. Allahabad Safeda

Treatment		**Shelf life (days)**
T_1	50µ LDPE	7.08[d]
T_2	75µ LDPE	8.09[a]
T_3	100µ LDPE	7.51[c]
T_4	Brown paper	6.99[e]
T_5	50µ HDPE	7.71[b]
T_6	Control	6.00[f]
S.Em ±		0.020
CD at 5%		0.059

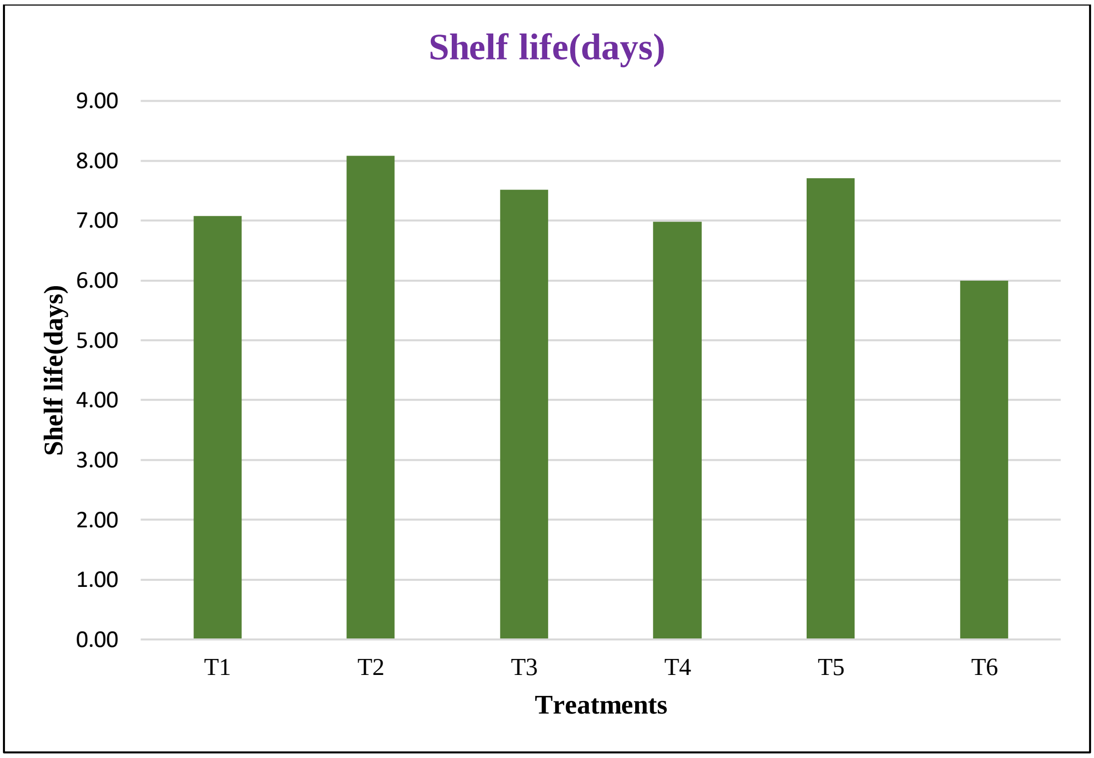

Fig. 4.2.10. Effect of different packaging materials on Shelf life (days) of guava (*Psidium guajava* L.) Cv. Allahabad safeda.

$\mathbf{T_1}$- 50µ LDPE packaging, $\mathbf{T_2}$- 75µ LDPE packaging, $\mathbf{T_3}$- 100µ LDPE packaging, $\mathbf{T_4}$- Brown paper packaging, $\mathbf{T_5}$- 50µ HDPE packaging, $\mathbf{T_6}$- Control (without packaging).

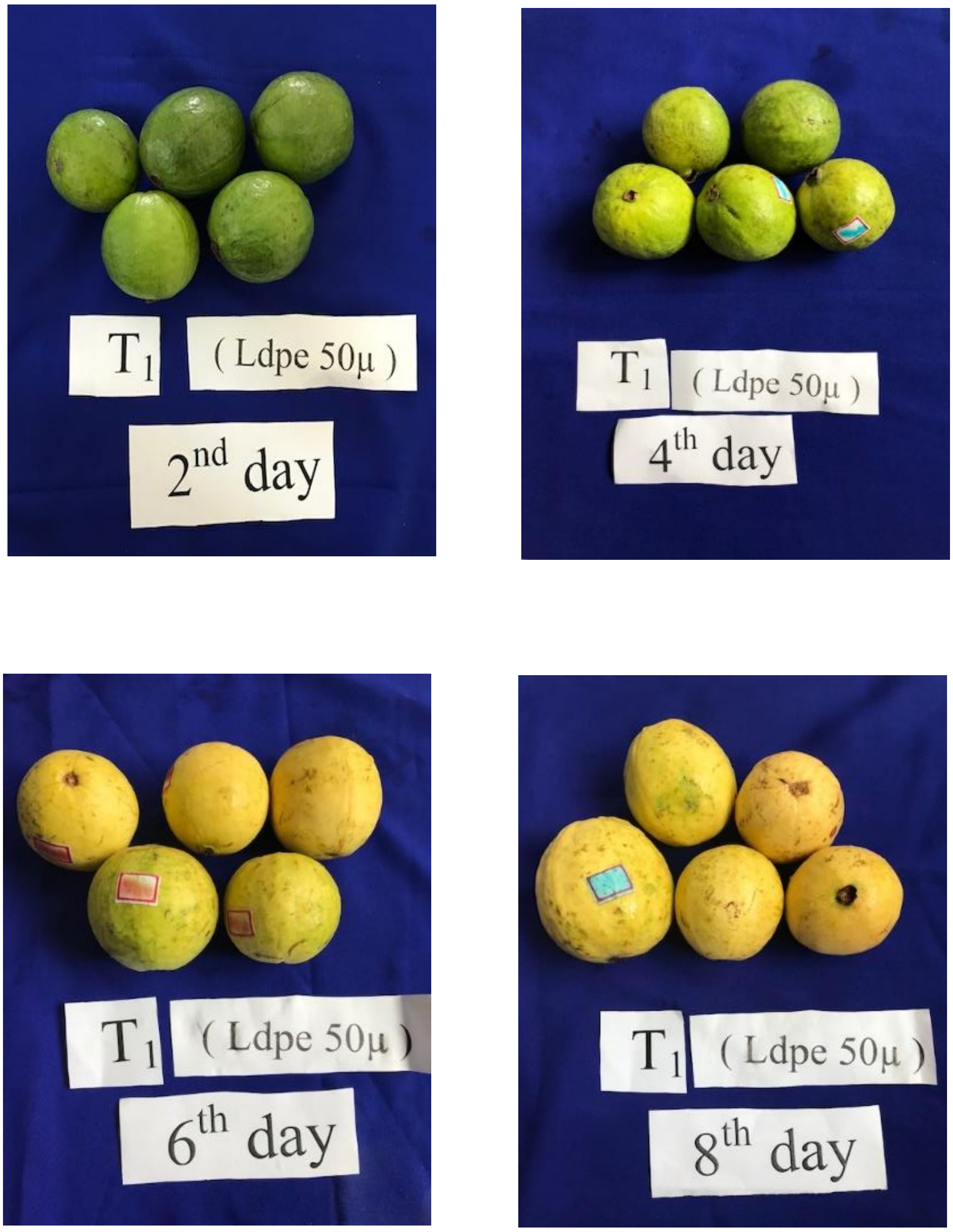

Plate 4. Guava Cv. Allahabad safeda fruits packed in LDPE 50µ bags (T_1) at 2nd, 4th, 6th, 8th day of storage.

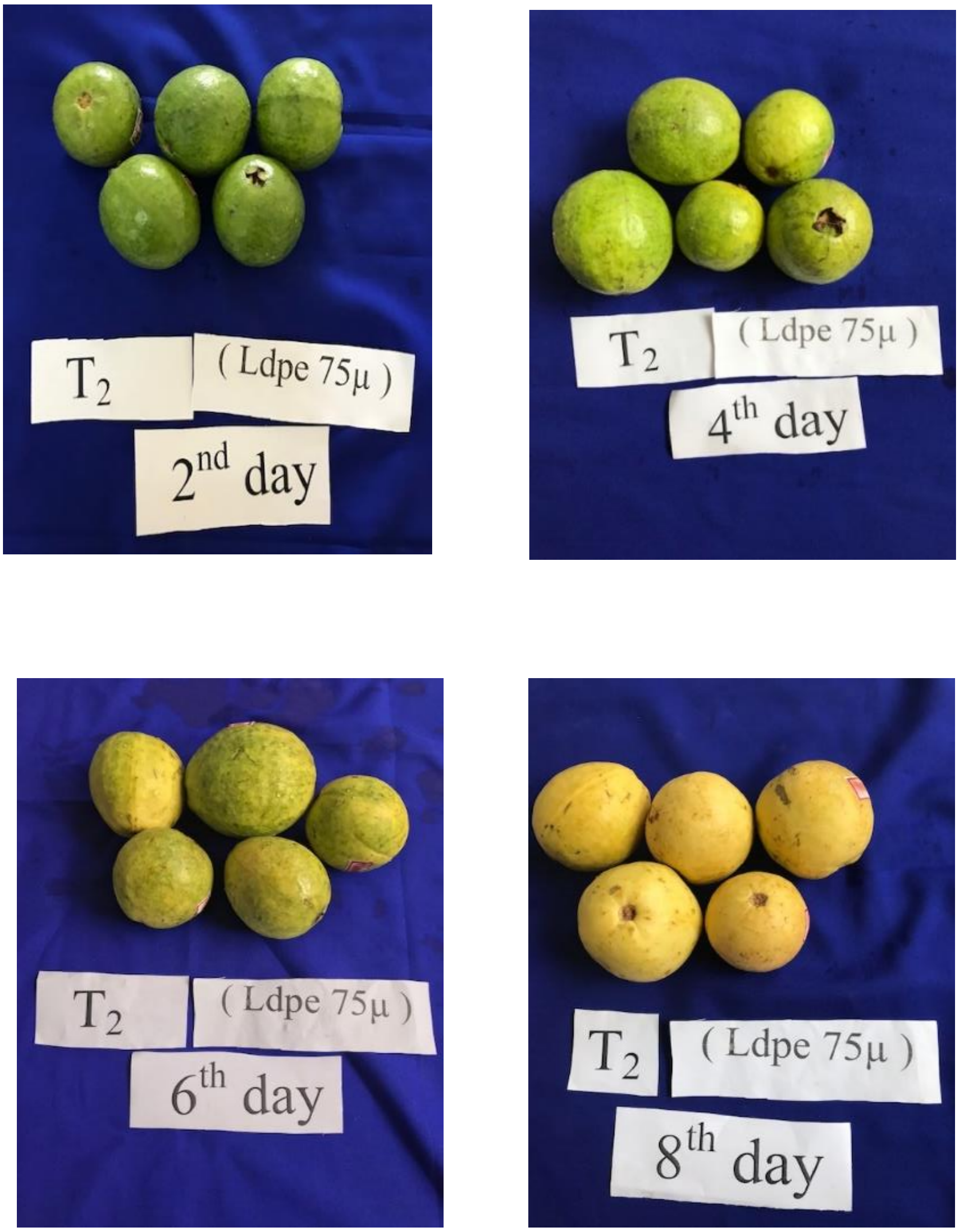

Plate 5. Guava Cv. Allahabad safeda fruits packed in LDPE 75µ bags (T_2) at 2^{nd}, 4^{th}, 6^{th}, 8^{th} day of storage.

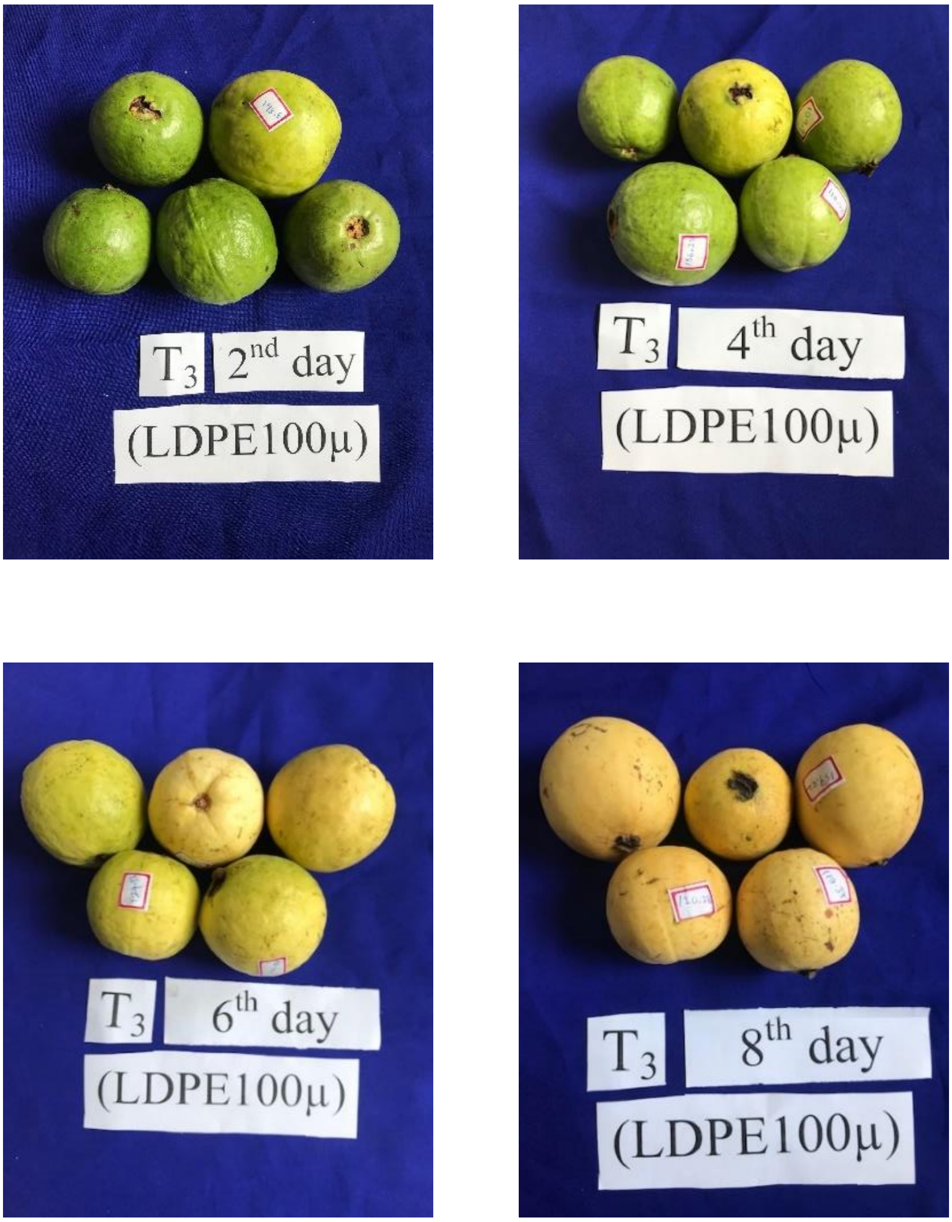

Plate 6. Guava Cv. Allahabad safeda fruits packed in LDPE 100μ bags (T_3) at 2nd, 4th, 6th, 8th day of storage.

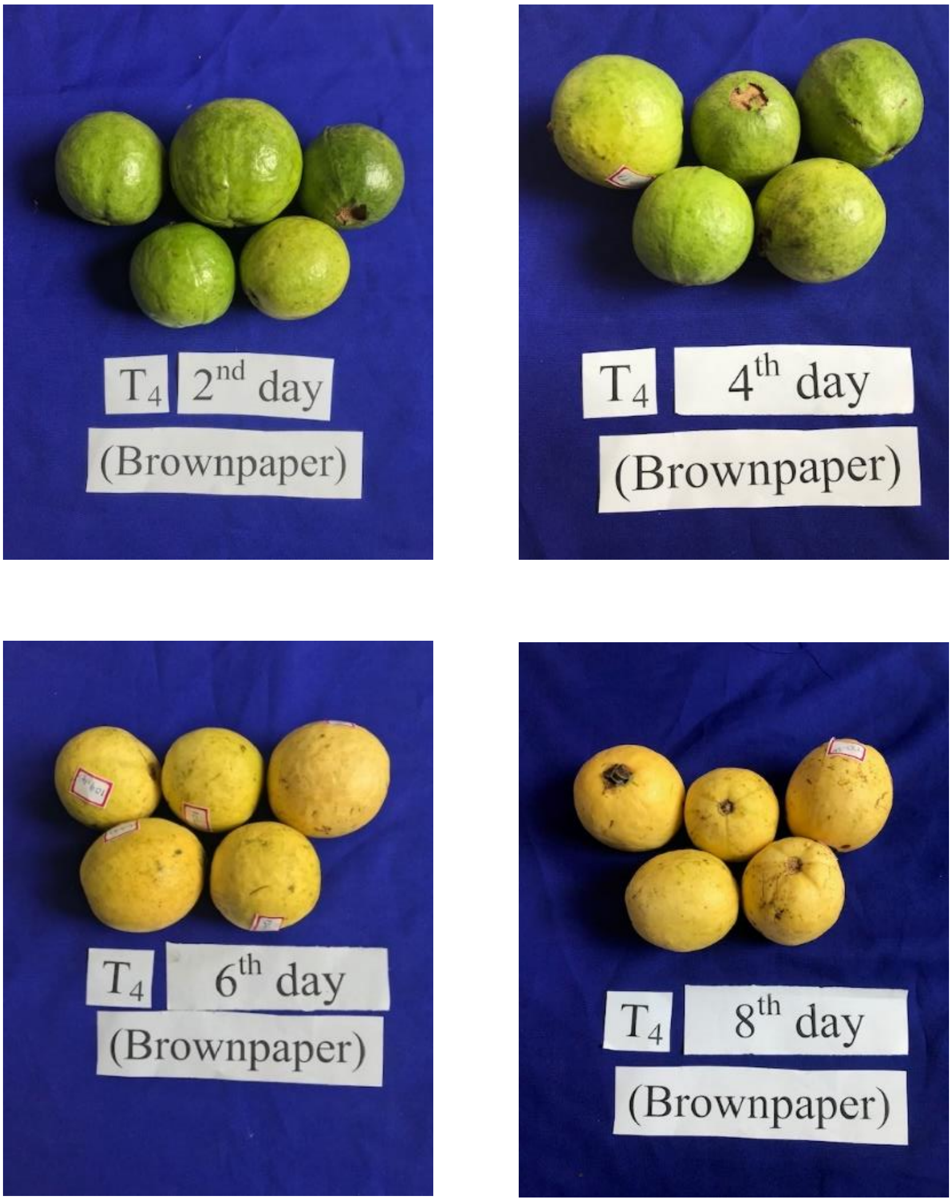

Plate 7. Guava Cv. Allahabad safeda fruits packed in brownpaper (T_4) at 2nd, 4th, 6th, 8th day of storage.

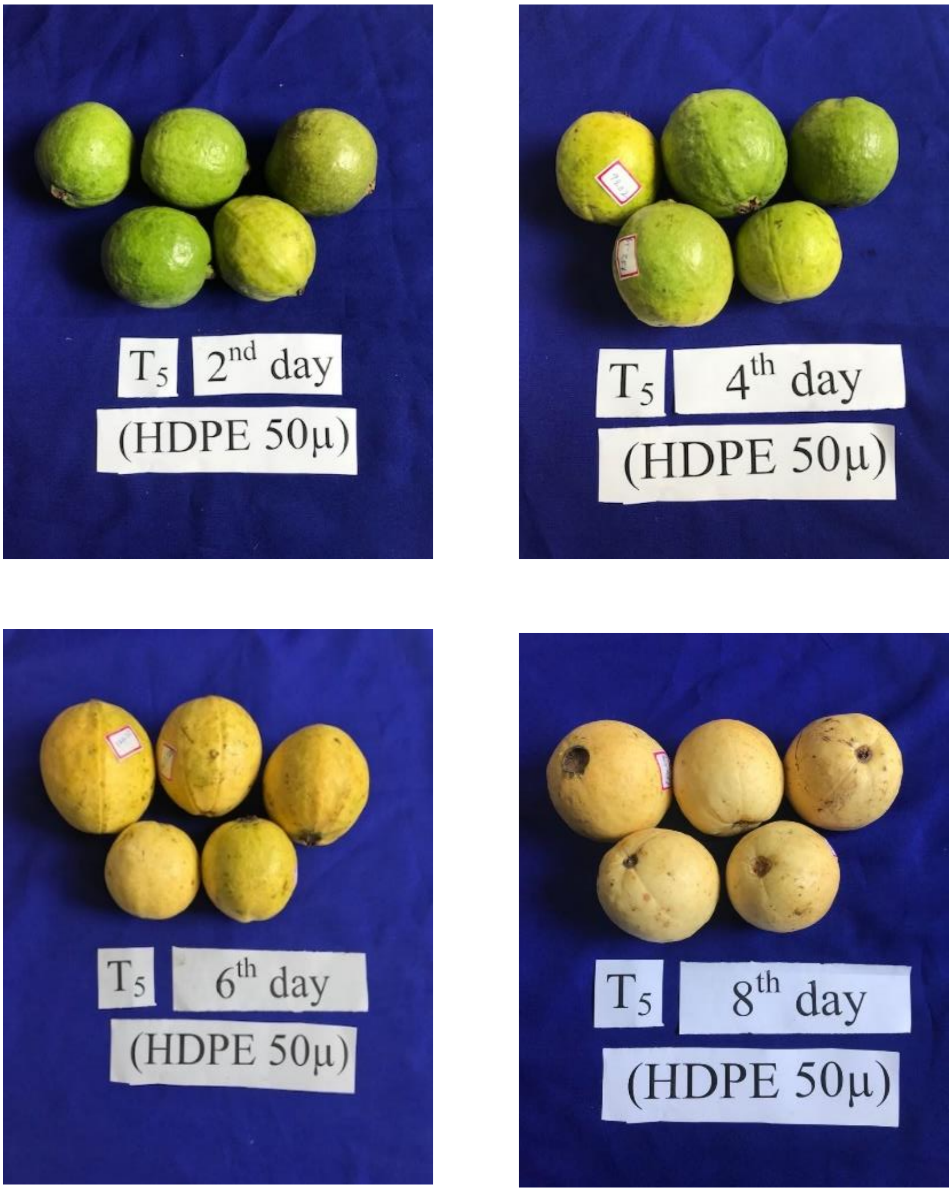

Plate 8. Guava Cv. Allahabad safeda fruits packed in HDPE 50μ (T_5) at 2nd, 4th, 6th, 8th day of storage.

Chapter - V

SUMMARY AND CONCLUSION

Chapter V

SUMMARY AND CONCLUSIONS

Two experiments were conducted on “Effect of Organic and Inorganic sources of nutrients on yield, quality and shelf life of Guava (*Psidium guajava* L.) Cv. Allahabad Safeda under dryland conditions” was carried out during the year 2018-2019.

First experiment on “Effect of Organic and Inorganic sources of nutrients on yield and quality parameters in guava (*psidium guajava* L.) Cv. Allahabad Safeda under dryland conditions” was undertaken at the Gunegal Research Farm, CRIDA, Santoshnagar. The experiment was laid out in Randomized Block Design (RBD) with four replications and five treatments. The salient features of the results obtained are summarized below.

- Maximum fruit weight (185.70 g) was recorded with the treatment (T_4) comprising Inorganic (75% NPK) + Organic (25% FYM) followed by T_5-Organic (50% FYM) + Inorganic (50% NPK) (173.38 g) and significantly minimum fruit weight (112.91 g) was recorded in T_1-Organic sole (100% FYM).
- Among the treatments, T_4- Inorganic (75% NPK) + Organic (25% FYM) recorded significantly maximum number of fruits per tree and fruit yield as compared to the other treatments.
- The highest firmness of the guava fruit was recorded inT_5- Organic (50% FYM) + Inorganic (50% NPK) (8.96 kg/cm^2) followed by T_4- Inorganic (75% NPK) + Organic (25% FYM) (8.62 kg/cm^2) and lowest firmness (7.45 kg/cm^2) was observed in T_2-Inorganic sole (100% NPK).
- The maximum shelf life of fruits was observed in T_5- Organic (50% FYM) + Inorganic (50% NPK) (10.11 days) followed by T_4- Inorganic (75% NPK) + Organic (25% FYM) (9.04 days) and minimum shelf life was recorded in T_3- Organic (75% FYM) + Inorganic (25% NPK) (7.53 days).
- A continuous increase in physiological loss in weight (PLW) of fruits during storage was observed in all treatments. Among the treatments, T_5-

Organic (50% FYM) + Inorganic (50% NPK) recorded the minimum PLW over other treatments.

- The maximum moisture content (69.14) was observed in T_5- Organic (50% FYM) +Inorganic (50% NPK) and minimum moisture content was recorded in T_3- Organic (75% FYM) + Inorganic (25% NPK) (57.78).
- Among the treatments, T_5- Organic (50% FYM) + Inorganic (50% NPK) recorded maximum total sugars, reducing sugars and non-reducing sugars as compared to other treatments. The minimum total sugars, reducing sugars and non-reducing sugars recorded in T_1-Organic sole (100% FYM).
- Maximum ascorbic acid content (226.55 mg per 100g of pulp) was recorded in T_1-Organic sole (100% FYM) and significantly minimum ascorbic acid content was recorded in T_2-Inorganic sole (100% NPK) (190.93 mg per 100g of pulp).
- Among the treatments, T_4- Inorganic (75% NPK) + Organic (25% FYM) recorded highest total dietary fibre content and protein content over the other treatments.
- Highest TSS (12.97 ^{o}Brix) was recorded in T_5- Organic (50% FYM) + Inorganic (50% NPK) followed by T_4- Inorganic (75% NPK) + Organic (25% FYM) (12.54^{o}Brix) and lowest TSS (11.93^{o}Brix) was recorded in T_1-Organic sole (100% FYM).
- Minimum acidity was recorded in T_3- Organic (75% FYM) + Inorganic (25% NPK) (0.42) and significantly maximum acidity was recorded in T_1-Organic sole (100% FYM) (0.50).
- Among the treatments, T_5- Organic (50% FYM) +Inorganic (50% NPK) recorded highest antioxidant activity and potassium content as compared to other treatments.
- Among the treatments, T_4- Inorganic (75% NPK) + Organic (25% FYM) recorded highest calcium content, pectin content and benefit cost ratio over the other treatments.

Second experiment was carried on "Effect of different packaging materials on shelf life of guava Cv. Allahabad Safeda" was undertaken at the College of

Horticulture, Rajendranagar. Results of physical and quality parameters were recorded at every two days interval are briefly summarized below.

- A continuous increase in physiological loss in weight (PLW) of fruits during storage was observed in all treatments. Among the different treatments, fruits packed in T_2-75μ LDPE bags showed minimum loss of physiological weight in fruits during storage.
- Spoilage of fruits increases throughout the storage period. Among the treatments, lowest spoilage was recorded in T_2-75μ LDPE (22.98) and highest spoilage was recorded in T_4-brown paper (43.88) at 8^{th} day of storage.
- TSS of fruits increases with the storage period up to 6^{th} day and later started decreasing. Fruits packed in T_2-75μ LDPE recorded highest TSS (11.83) followed by T_5-50μ HDPE (11.66) at 8^{th} day of storage.
- Titrable acidity of fruits decreased with storage period. Among the treatments, maximum acidity was recorded in T_5-50μ HDPE (0.36) followed by T_2-75μ LDPE (0.33) at 8^{th} day of storage.
- Total sugar content increased with increase in storage period up to 6^{th} day and later started decreasing. T_2-75μ LDPE recorded highest total sugars content followed by T_2-50μ HDPE.
- Among the treatments, fruits packed in T_2-75μ LDPE recorded highest reducing sugar and non-reducing sugar content as compared to other treatments.
- Firmness of fruit decreased as the storage increased, highest firmness was recorded in fruits packed in T_5-50μ HDPE and lowest firmness was recorded in T_4-brown paper at 8^{th} day of storage.
- Maximum ascorbic acid was recorded in fruits packed in T_2-75μ LDPE (115.00) followed by T_3-100μ LDPE (107.22) and minimum ascorbic acid content was recorded in T_1-50μ LDPE (103.11) up to 8^{th} day of storage.
- Among the treatments, maximum shelf life was recorded in fruits packed in T_2-75μ LDPE bags (8.09 days) followed by T_5-50μ HDPE (7.71 days).

CONCLUSION:

From the present investigation it is concluded that among the treatment combinations the treatment T_5- Organic (50% FYM) +Inorganic (50% NPK) showed positive effect on quality parameters and shelf life and also best in yield parameters followed by T_4- Inorganic (75% NPK) + Organic (25% FYM). With respect to economics, T_4- Inorganic (75% NPK) + Organic (25% FYM) recorded maximum benefit cost ratio and higher net returns followed by T_5- Organic (50% FYM) +Inorganic (50% NPK). Among the different packaging materials, fruits packed in T_2-75µ LDPE bags was best treatment in terms of shelf life and quality parameters.

LITERATURE CITED

LITERATURE CITED

Adsule, P. G. and Tandon, D. K. 1983. The assessment of LDPE bags for enhancing the shelf life of guava. *Indian Food Packer*. 37(3):82-87.

Aishwath, O. P., Khurana, H. P. and Anwer, M. M. 2011. A review on the effect of integrated nutrient management on yield and quality of major seed spices in India. *Better crops- South Asia*. 19-21.

Anal, P. M., Luikham, E., Munsi, P. and Meitei, W. I. 2018. Growth, productivity and quality of okra cv. Prabhani Kranthi and nutrient balance in soil under chemical fertilizers, organic manures and biofertilizers in sub-tropical condition. *International Journal of Current Microbiology and Applied Sciences.* 7(10):1686-1696.

Anitha, M., Swami, D. V. and Salomi Suneetha, D. R. 2015. Seed yield and quality of fenugreek (*Trigonella foenum-graecum* L.) cv. Lam Methi-2 as influenced by integrated nutrient management. *The bioscan.* 10(1): 103-106.

Antala, D. K., Satasiya, R. M., Akabari, P. D., Bhuva, J. V., Gupta, R. A. and Chauhan, P. M. 2014. Effect of modified atmosphere packaging on shelf life of sapota fruit. *International Journal of Agricultural Science and Technology*. 2(1):32-38.

AOAC, 1965. Associate of Official Analytical Chemists, *Official Methods of Analysis*, AOAC, Washington DC.

AOAC, 2000. Associate of Official Analytical Chemists, *Official Methods of Analysis*, AOAC, Washington DC.

AOAC, 2000. Method of analysis, 17th Edition. *Association of Official Analytical Chemists*. Washington DC. USA.

AOAC, 2005. Official Methods of Analysis for protein. *Association of Official Analytical Chemists*. 18th Ed. Arlington VA 2209, USA. AOAC 984.13, chap 04, pp 31.

Athani, S. I., Prabhuraj, H. S., Ustad, A. I., Swamy, G. S. K., Patil, P. B. and Kotikal, Y. K. 2007. Effect of organic and inorganic fertilizers on growth, leaf, major nutrient and chlorophyll content and yield of Guava cv. Sardar. *Acta Horticulture*. 735:351-356.

Athmaselvi, K. A., Pandian, J., Pavithra, C. and Ishita, R. 2014. Physical and biochemical properties of selected tropical fruits. *International Agrophysics.* 28:383-388.

Azene, M., Workneh, T. S. and Woldetsadik, K. 2014. Effect of packaging materials and storage environment on postharvest quality of sapota fruit. *Journal of Food Science and Technology*. 51(6):1041-1055.

Baraily, P. and Deb, P. 2018. Influence of integrated nutrient management on yield and bio-chemical parameters of pineapple cv. Kew. *Journal of pharmacognosy and phytochemistry*. 7(5): 1339-1342.

Barne, V. G., Bharad, S. G., Dod, V. N. and Baviskar, M. N. 2013. Effect of integrated nutrient management on yield and quality of guava. *Asian Journal of Horticulture*. 6(2):546-548.

Bashir, M. A., Ahmad, M., Salik, M. R. and Awan, M. Z. 2009. Manure and fertilizers effect on yield and fruit quality of guava (*Psidium guajava* L.). *Journal of Agricultural Research.* 47(3):201-205.

Baviskar, M. N., Bharad, S. G., Dod, V. N. and Barne, V. G. 2011. Effect of integrated nutrient management on yield and quality of sapota. *Plant Archives.* 11(2):661-663.

Benzie, I. F. and Strain, J. J. (1999). Ferric reducing/antioxidant power assay: Direct measure of total antioxidant activity of biological fluids and modified version for simultaneous measurement of total antioxidant power and ascorbic acid concentration. Methods in Enzymology, 299:15-27.

Bhobia, S. K., Godara, R. K., Singh, S., Beniwal, L. S. and Kumar, S. 2005. Effect of organic and inorganic nitrogen on growth, yield and NPK content of guava cv. Hisar Surkha during winter season. *Haryana Journal of Horticultural Sciences*. 34(3-4):232-233.

Bindu Praveena, R., Sudha Vani, V. and Rajasekhar, M. 2013. Influence of low temperature on shelf life and quality of sapota fruits packed in polybags. *Acta Horticulturae.* 873-879.

Borkar, P. A., Jadhao, S. D., Bakane, P. H., Borkar, S. L. and Murumkar, R. P. 2008. Effect of ethylene absorbent and different packaging materials on storage life of banana. *Asian Journal of Bio Science.* 3(2):233-236.

Carbonaro, M., Mattera, M., Nicoli, S., Bergamo, P. and Cappelloni, M. 2002. Modulation of antioxidant compounds in organic vs conventional fruit (Peach, *Prunus persica* L., and Pear, *Pyrus communis* L.). *Journal of Agricultural and Food Chemistry.* 50(19):5458-5462.

Dheware, R. M. and Waghmare, M. S. 2009. Influence of organic, inorganic and biofertilizers and their interactions on flowering and fruit set of sweet orange (*Citrus sinensis* Osbeck L.). *Asian Journal of Horticulture*. 4(1):194-197.

Duarte, A. M., Caixeirinho, D., Miguel, M. G., Sustelo, V. and Nunes, C. 2012. Organic acids concentration in citrus juice from conventional versus organic farming. *Acta Horticulturae.* 933:601-606.

Dutta, P. K., Das, K. and Patel, A. 2016. Influence of organics, inorganic and biofertilizers on growth, fruit quality and soil characters of Himsagar Mango grown in new alluvial zone of West Bengal, India. *Advances in Horticultural Science.* 30(2): 81-85.

Dwivedi, D. H., Lata, R., Ram, R. B. and Babu, M. 2012. Effect of bio-fertilizer and organic manures on yield and quality of Red Fleshed Guava. *Acta Horticulturae.* 933:239-244.

Ebrahiem, T. A. and Mohamed, G. A. 2000. Response of Balady mandarin trees growing on sandy soil to application of filter mud and farmyard manure. *Assiut Journal of Agricultural Sciences*. 31(5):55-69.

Garhwal, P. C., Yadav, P. K., Sharma, B. D., Singh, R. S. and Ramniw, A. S. 2014. Effect of organic manure and nitrogen on growth, yield and quality of Kinnow mandarin in sandy soils of hot arid region. *African Journal of Agricultural Research.* 9(34): 2638-2647.

Gautam, B. and Neeraja, G. 2005. Effect of polythene bag storage on shelf life and quality of Banganapalli mangoes. *Orissa Journal of Horticulture*. 33(2):89-93.

Gautam, U. S., Singh, R., Tiwari, N., Gurjar, P. S. and Kumar, A. 2012. Effect of integrated nutrient management in mango cv. Sunderja. *Indian Journal of Horticulture.* 69(2):151-155.

Goswami, A. K., Lal, S. and Mishra, K. K. 2012. Integrated nutrient management improves growth and leaf nutrient status of Guava cv. Pant prabhat. *Indian journal of horticulture*. 69(2): 168-172.

Goutam, M., Dhaliwal, H. S. and Mahajan, B. V. C. 2010. Effect of preharvest calcium sprays on postharvest life of winter guava (*Psidium guajava* L.). *Journal of Food Science and Technology*. 47(5):501-506.

Gupta, M, R. and Nijjar, G. S. 1978. Crop regulation on guava. *Indian Journal of Horticulture.* 35:23-27.

Gupta, P., Singh, D., Prasad, V. M. and Kumar, V. 2019. Effect of integrated nutrient management on growth and yield of Guava (*Psidium guajava* L.) cv. Allahabad Safeda under high density planting. *Journal of pharmacognosy and phytochemistry*. 8(1): 1233-1236.

Hailu, M., Workneh, T. S. and Belew, D. 2014. Effect of packaging materials on shelf life and quality of banana cultivars (*Musa spp*.). *Journal of Food Science and Technology*. 51(11):2947-2963.

Hayes, W. B. (1970). *Fruit growing in India*. Kitabmahal, Allahabad.

Irtwange, S. V. 2006. Application of modified atmosphere packaging and related technology in postharvest handling of fresh fruits and vegetables. *Agriculture Engineering International.* 4:1-12.

Jawandha, S. K., Singh, H., Arora, A. and Singh, J. 2014. Effect of modified atmosphere packaging on storage of Baramasi Lemon (*Citrus limon* (L.) Burm). *International Journal of Agriculture, Environment and Biotechnology*. 7(3):635-638.

Kardile, R. S., Patel, N. L. and Tandel, Y. N. 2014. Effect of precooling, packaging material and storage conditions on storage behaviour of sapota fruits, *Trends in Biosciences.* 7(4):595-600.

Katiyar, P. N., Tripathi, V. K., Sachan, R. K., Singh, J. P. and Chandra, R. 2012. Integrated nutritional management affects the growth, flowering and fruiting of rejuvenated Ber. *HortFlora Research Spectrum*. 1(1):38-41.

Kirad, K. S., Barche, S. and Singh, D. B. 2010. Integrated Nutrient Management in Papaya (*Carica papaya* L.) cv. Surya. *Acta Horticulturae*. 851:377-380.

Kumar, R. (2010). Evaluation of Dynamic Substrates under Integrated Plant Nutrient Management Affecting Growth Yield and Quality of Litchi (*Litchi chinensis* Sonn.). *Acta Horticulturae*. 863.

Kumar, R. K., Jaganath, S., Guruprasad, T. R. and Ulla, H. M. T. 2017. Planting geometry, Integrated nutrient management and Its effect on postharvest quality of guava cv. Lalit during rainy season. *International Journal of Pure and Applied Bioscience.* 5(1):720-728.

Kumar, R., Jadav, J. K., Rai, A. K., Khajuria, S. and Lata, K. 2017. Efficacy of integrated nutrient management in mango (*Mangifera indica*) cv. Kesar under semi-arid conditions of central Gujarat. *Indian Journal of Agricultural Sciences*. 87(7):947-952.

Kumrawat, D., Kanpure, R. N., Singh, O. P., Bhandari, J. and Kachouli, B. 2018. Effect of integrated nutrient management on quality and yield parameters of guava (*Psidium guajava* L.) cv. L-49. *Journal of Pharmacognosy and Phytochemistry*. 7(5):1668-1670.

Kundu, S., Datta, P., Mishra, J., Rashmi, K. and Ghosh, B. 2011. Influence of biofertilizer and inorganic fertilizer in pruned mango orchard cv. Amrapali. *Journal of Crop and Weed.* 7(2):100-103.

Laxmi, P. R., Saravanan, S. and Naik, M. L. 2015. Effect of organic manures and inorganic fertilizers on plant growth, yield, fruit quality and shelf life of tomato (*Solanum Lycopersicon* L.) cv. PKM-1. *International Journal of Agricultural Science and Research.* 5(2):7-12.

Lodaya, B. P. and Masu, M. M. 2019. Effect of biofertilizer, manures and chemical fertilizers on fruit quality and shelf life of guava (*Psidium guajava* L.) cv. Allahabad safeda. *Internatinal Journal of Chemical Studies*. 7(4):1209-1211.

Mahendra., Singh, H. K. and Singh, J. K. 2009. Effect of integrated nutrient management on yield and quality of ber (*Zizypjus mauritiana* Lank.) cv. Banarasi Karaka. *Asian Journal of Horticulture.* 4(1):47-49.

Meena, R. K., Mahwer, L. N., Sarolia, D. K., Saroj, P. L. and Kaushik, R. A. 2013. Improving yield and nutrient status of rejuvenated guava orchard by integrated nutrient management under semi-arid conditions. *International Journal of Plant Research.* 26(1):233-242.

Mirjha, P. R., Rana, D. S., Choudhary, A. K. and Dubey, A. K. 2018. Influence of cultivars, cropping systems and nutrient levels on yield and quality of mango in north India. *Indian Journal of Horticulture.* 75(1):21-26.

Mitra, S. K. and Bose, T. K. 2001. *Fruits: Tropical and Sub Tropical.* 610-611.

Muhammad, F., Shakir, M. A. and Salik, M. R. 2000. Effect of individual and combined application of organic and inorganic manures on the productivity of guava (*Psidium guajava* L.). *Pakistan Journal of Biological Sciences.* 3(9):1370-1371.

Nagaraju, S. and Banik, A. K. 2017. Studies on sensory quality and shelf life of guava cv. Khaja influenced by packaging materials. *International Journal of Pure and Applied Bioscience.* 5(4):1491-1497.

Naik, M. H. and Babu, R. S. 2007. Feasibility of organic farming in guava (*Psidium guajava* L.). *Acta Horticulturae*. 735:365-372.

NHB, 2018, National Horticulture Board, Gurgaon, India.

Nurbhanej, K. H., Patel, M. J., Barot, H. R., Thakkar, R. M. and Gadhavi, A. V. 2016. Effect of integrated nutrient management on growth, yield and quality of acid lime cv. Kagzi. *International Journal of Agriculture Sciences.* 8(51):2360-2363.

Padmaja, N. and Bosco, S. J. 2014. Preservation of Jujube fruits by edible aloe vera gel coating to maintain quality and safety. *Indian Journal of Science Research and Technology.* 2(3):79-88.

Panda, A. K., Goyal, R. K., Godara, A. K. and Sharma, V. K. 2016. Effect of packaging materials on the shelf life of strawberry cv. Sweet Charlie under room temperature storage. *Journal of Applied and Natural Science.* 8(3):1290-1294.

Pandey, V., Patel, A. and Patra, D. D. 2015. Amelioration of mineral nutrition, productivity, antioxidant activity and aroma profile in marigold (*Tagetus minuta* L.) with organic and chemical fertilization. *Industrial Crops and Products.* 76:378-385.

Pandey, V., Patel, A. and Patra, D. D. 2016. Integrated nutrient regimes ameliorate crop productivity, nutritive value, antioxidant activity and volatiles in basil (*Ocimum basilicum* L.). *Industrial Crops and Products.* 87:124-131.

Panse, V. G. and Sukhatme, P. V. 1985. Statistical methods for agricultural workers. *Indian council of Agricultural Research New Delhi*. 87-89.

Patel, D. R. and Naik, A. G. 2010. Effect of pre-harvest treatment of organic manures and inorganic fertilizers on postharvest shelf-life of sapota cv. Kalipatti. *Indian Journal of Horticulture*. 67(3):381-386.

Patel, M., Vihol, N. J., Patel, A. D. and Patel, H. C. 2017. Effect of integrated nutrient management on quality parameters of sapota cv. Kalipatti. *International Journal of Chemical Studies*. 5(6):889-891.

Patil, V. K. and Shinde, B. N. 2013. Studies on integrated nutrient management on growth and yield of Banana cv. Ardhapuri. *Journal of horticulture and forestry*. 5(9): 130-138.

Phadnis, N. A. (1970). Improvement of guava (*Psidium guajava* L.) by selection in Maharastra. *Indian Journal of Horticulture*. 27(3/4): 99-105.

Pooja, N. U., Salimath, S. B., Shivakumar, B. S., Sutagatti, S. M. and Rudregouda, F. C. 2017. Effect of INM on vegetative growth and yield of sweet orange (*Citrus sinensis* Osbeck) cv. Mosambi under central dry zone of Karnataka. *Green Farming.* 8(6):1343-1346.

Prabhu, M., Parthiban, S., Kumar, A. R., Rani, B. U. and Vijayasamundeeswari, A. 2018. Effect of integrated nutrient management on acidlime (*Citrus aurantifolia.* Swingle(L.)). *Indian Journal of Agricultural Research.* 52(3):290-294.

Prasad, R., Ram, R. B., Kumar, V. and Rajvanshi, S. K. 2015. Study on effect of different packaging materials on shelf life of banana (*Musa paradisiaca* L.) cv. Harichal under different conditions. *International Journal of Pure and Applied Bioscience.* 3(4):132-141.

Pratap, S., Kumar, A., Sujeeta., Vikas., Singh, R., Singh, B. and Singh, H. 2017. Impact of different packaging materials on the shelf life of sapota fruits (*Acharus zapota* L.). *International Journal of Current Microbiology and Applied Sciences*. 6(8):1124-1130.

Rajendra, B. N., Kurubar, A. R., Anasubai, G. H. and Swamy, K. M. 2013. Influence of organic manures and inorganic fertilizers on vegetative development, yield, shelf-life traits and sensory evaluation score of acid lime (*Citrus aurantifolia* Christm.) cv. Kagzi. *Asian Journal of Horticulture.* 8(1):183-187.

Ram, R. A. and Nagar, A. K. 2003. Effect of different organic treatments on yield, quality of Guava cv. Allahabad safeda. In: *National seminar on organic farming in Horticulture for Sustainable Horticulture Production,* 29-30 August 2003, CISH, Lucknow, Abstract No. 25, pp. 32.

Ram, R. A., Bhriguvansi, S. R. and Pathak, R. K. 2007. Integrated nutrient management in guava (*Psidium guajava* L.) cv. Sardar. *Acta Horticulturae.* 735:345-350.

Ranganna, S. 1979. *Hand Book of Analysis and quality control of fruit and vegetable products*. Tata McGraw Hill Publishing Company Limited, New Delhi.

Ranganna, S. 1986. *Hand Book of Analysis and quality control of fruit and vegetable products*. Tata McGraw Hill Publishing Company Limited, New Delhi.

Rathore, H. A., Masud, T., Sammi, S. and Majeed, S. 2009. Effect of polyethylene packaging and coating having fungicide, ethylene absorbent and antiripening agent on the overall physico-chemical composition of Chaunsa White variety of mango at ambient temperature during storage. *Pakistan Journal of Nutrition.* 8(9):1356-1362.

Rathore, N., Mishra, N. K., Lal, R. L. and Mishra, D. S. 2013. Effect of integrated nutrient management on yield and quality of litchi cv. Rose Scented. *Pantnagar Journal of Research.* 11(3):369-372.

Ravikiran, Y., Nayak, M. H., Joshi, V. and Naik, D. S. 2018. Effect of integrated nutrient management and micronutrients on postharvest quality parameters and shelf life of Mango (*Mangifera indica* L.) cv. Banganpalli under high density planting. *International Journal of Chemical Studies,* 6(6): 858-861.

Ravishankar, H., Karunakaran, G. and Hazarika, S. 2010. Nutrient availability and biochemical properties in soil as influenced by organic farming of papaya under coorg region of Karnataka. *Acta Horticulturae.* 851:419-424.

Reddy, Y. T. N., Kurian, R. M., Ganeshamurthy, A. N. and Pannerselvam, P. 2010. Effect of organic nutrition practices on papaya cv. Surya fruit yield, quality and soil health. *Journal of Horticultural Sciences*. 5(2): 124-127.

Rokaya, P. R., Baral, D. R., Gautam, D. M. and Paudyal, K. P. 2015. Effect of packaging materials on fruit quality and shelf life of mandarin (*Citrus reticulata* Blanco). *Nepalese Journal of Agricultural Sciences.* 13:151-158.

Safari, M., Joshi, V., Girwani, A., Rajagoud, C. H., Reddy, R. K. and Kumar, A. T. 2016. Evaluation of different packaging materials on shelf life and quality of minimally processed Pomegranate arils (*Punica granatum* L.). *International Journal of Agricultural Science and Research.* 6(3):423-432.

Sahu, P. K., Chandrakar, O., Sahu, V. and Jain, M. 2015. Influence of chemical fertilizers and organics on growth, flowering, fruit yield and quality of guava (*Psidium guajava* L.) cv. L-49 under Chhattisgarh plains. *Journal of Plant Development Sciences*. 7(1):83-86.

Sahu, P. K., Dikshit, S. N. and Sharma, H. G. 2017. Studies on the effect of cowdung slurry, chemical fertilizers and biofertilizers on fruit quality and shelf life of guava (*Psidium guajava* L.) under Chhattisgarh plains. *International Journal of Chemical Studies.* 5(5):1669-1672.

Sarkar, T., Sau, S., Joshi, V., Sarkar, T. and Sarkar, S. 2017. Effect of modified and active packaging on shelf life and quality of banana cv. Grand Naine. *The Bioscan.* 12(1):95-100.

Shanker, Uma., Pathak, R. A., Pathak, R. K., Ojha, C. M. 2002. Effect of NPK on the yield and fruit quality of guava cv. Sardar. *Progressive Horticulture*. 34(1):49-55.

Sharma, A., Wali, V. K., Bakshi, P. and Jasrotia, A. 2013. Effect of organic and inorganic fertilizers on quality and shelf life of guava (*Psidium guajava* L.) cv. Sardar. *The Bioscan*. 8(4):1247-1250.

Sharma, H. G. 2004. Studies on blending impact of nutrients under different fertigation levels on growth, yield and quality of papaya (*Carica papaya* L.). Ph.D Thesis, IGKV, Raipur.

Shukla, A. K., Sarolia, D. K., Kumari, B., Kaushik, R. A., Mahawer, L. N. and Bairwa, H. L. 2009. Evaluation of substrate dynamics for integrated nutrient management under high density planting of guava cv. Sardar. *Indian Journal of Horticulture.* 66(4):461-464.

Singh, G. 2008. High Density and Meadow orcharding of Guava, CISH Lucknow, Extension Bulletin-35, 2, 11, 20p.

Singh, J. P., Tomar, S., Chaudhary, M. and Shukla, I. N. 2018. Effect of organic, inorganic and biofertilizers on physico-chemical properties of fruits of guava cv. L-49. *International Journal of Chemical Studies.* 6(3):3233-3238.

Singh, S. R. and Banik, B. C. 2011. Response of integrated nutrient management on flowering, fruit setting, yield and fruit quality in mango cv. Himsagar. *Asian Journal of Horticulture*. 6(1):151-154.

Singh, S. R., Banik, B. C. and Hasan, M. A. 2015. Effect of integrated nutrient management on vegetative growth and yield in mango cv. Himsagar. *Journal of Horticultural Sciences*. 10(1):120-124.

Taduri, M., Reddy, N. N., Lakshmi, N. J. and Joshi, V. 2017. Studies on the effect of packaging materials on shelf life of mango cv. Amrapali. *The Pharma Innovation Journal.* 6(7):54-57.

Tyagi, S. K., Singh, S. S., Mishra, S. P., Sirothia, P. and Gautam, S. S. 2018. Studies on effect of integrated nutrient management in improving yield and quality of guava (*Psidium guajava* L.) cv. L-49. *International Journal of Tropical Agriculture.* 36(4):979-983.

Umar, I., Wali, V. K., Kher, R. and Jamwal, M. 2009. Effect of FYM, Urea and Azotobacter on growth, yield and quality of strawberry cv. Chandler. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca.* 37(1):139-143.

Vanilarasu, K. and Balakrishnamurthy, G. 2014. Effect of organic manures and amendments on quality attributes of banana cv. Grand Naine. *Agrotechnology*. 3(1).

Varsha, G. B., Bharad, S. G., Dod, V. N. and Baviskar, M. N. 2011. Effect of integrated nutrient management on yield and quality of Guava. *Asian Journal of Horticulture*. 6(2):546-548.

Venkatesh, K. Mutalik., Jagadish, G. Baragi., Somaraddi, B., Mekali, C., Veeresh, G. and Vardhaman, N. B. 2013. *Journal of Chemical and Pharmaceutical Research.* 3(6): 1097-1102.

Vishwakarma, G., Yadav, A. L., Kumar, A., Singh, A. and Kumar, S. 2017. Effect of integrated nutrient management on physico-chemical characters of Bael (*Aegle marmelos* Correa) cv. Narendra Bael-9. *International Journal of Current Microbiology and Applied Sciences.* 6(6):287-296.

Waghmare, D. B., Bhosale, A. M. and Syed, S. J. 2018. Effect of inorganic and biofertilizers on fruit set, yield and quality of custard apple (*Annona squamosa* L.) cv. Balanagar. *International Journal of Chemical Studies.* 6(4):1196-1200.

Worthington, V. 2001. Nutritional quality of organic versus conventional fruits, vegetables and grains. *Journal of Alternative and Complementary Medicine.* 7:161-173.

Yadav, R. I., Singh, R. K., Kumar, P. and Singh, A. K. 2012. Effect of nutrient management through organic sources on the productivity of guava (*Psidium guajava* L.). *HortFlora Research Spectrum.* 1(2):158-161.

APPENDICES

APPENDICES – I

Weekly meteorological data recorded at Gunegal Research Farm (GRF), CRIDA, Hyderabad during 2018-2019

Date		Month	Temperature(°C)		Relative Humidity (%)		Rainfall (mm)	Evaporation (mm)
From	To		Max.	Min.	I	II		
01-01-18	06-01-18	January	27.8	9.3	62	26.2	0	3.6
07-01-18	13-01-18	January	28.4	9.9	69.2	36.4	0	3.2
14-01-18	20-01-18	January	30.1	11.2	70.7	23.6	0	4.0
21-01-18	27-01-18	January	29.3	10.5	76.3	28.6	0	3.6
28-01-18	03-02-18	January	30.6	10.9	75.4	31	0	4.2
04-02-18	10-02-18	February	30.8	13.2	78	28.7	0	3.4
11-02-18	17-02-18	February	30.2	13.8	71	27.1	0	3.6
18-02-18	24-02-18	February	32.3	14.7	68.3	34	0	5.1
25-02-18	03-03-18	February	33.7	16.1	76.3	39	0	6.1
04-03-18	10-03-18	March	34.7	17	75.3	38.7	0	6.1
11-03-18	17-03-18	March	33.6	16.1	60	42.1	15	6.0
18-03-18	24-03-18	March	34.4	17.1	62.6	43	0	4.6
25-03-18	31-03-18	March	36.9	18.4	66.4	32.9	0	5.4
01-04-18	07-04-18	April	35	18.3	60.0	38.7	4	3.4
08-04-18	14-04-18	April	35.8	19.1	64.9	43	12.4	5.8
15-04-18	21-04-18	April	37.6	21.8	67.1	37.1	0	6.8
22-04-18	28-04-18	April	39.5	21.6	67.3	33.0	0	7.4
29-04-18	05-05-18	April	41.4	21.8	74.7	31.7	0	6.2
06-05-18	12-05-18	May	37.1	22.4	71	35.3	9	9.3
13-05-18	19-05-18	May	45.6	22.3	69.9	20.3	0	9.8
20-05-18	26-05-18	May	44.4	22.9	73.3	21	0	9.1
27-05-18	02-06-18	May	41.9	21.4	71.7	25.4	12.4	7.1

03-06-18	09-06-18	June	37.9	20.4	70.6	32.3	19.8	4.1
10-06-18	16-06-18	June	33.1	21	62.1	42.7	4.4	4.8
17-06-18	23-06-18	June	35.4	20.9	64.1	43	18	6.8
24-06-18	30-06-18	June	31.8	19.6	64.7	51.6	0	3.9
01-07-18	07-07-18	July	31.5	19.4	60.1	56.1	7	4.3
08-07-18	14-07-18	July	27.6	17.7	64.6	70.1	13.3	2.0
15-07-18	21-07-18	July	29.4	18.9	69.9	57.6	4.2	4.1
22-07-18	28-07-18	July	30.7	19.2	65.7	55.1	0	4.1
29-07-18	04-08-18	July	31.9	20.2	71.0	48.4	3	4.7
05-08-18	11-08-18	August	31.1	19.1	79.7	45.1	40	3.1
12-08-18	18-08-18	August	28.2	17.3	80	46.3	29.2	2.4
19-08-18	25-08-18	August	28.4	18.5	80.1	57.1	9.2	3.8
26-08-18	01-09-18	August	30.0	18.8	76.7	48.7	0	4.7
02-09-18	08-09-18	September	30.8	19.4	80.0	50.7	0	3.4
09-09-18	15-09-18	September	31.2	18.8	73.9	55.6	0	2.8
16-09-18	22-09-18	September	29.6	19.0	79.7	57.0	11	2.5
23-09-18	29-09-18	September	31.7	19.4	79.3	48.4	20	4.4
30-09-18	06-10-18	September	31.6	19.0	59.6	59.6	0	4.5
07-10-18	13-10-18	October	32	18.4	79.9	39.4	0	5.4
14-10-18	20-10-18	October	31.8	18.6	79.0	40.3	5	4.9
21-10-18	27-10-18	October	31.8	18.2	74.0	47.0	7	4.6
28-10-18	03-11-18	October	30.1	14.6	77.6	39.4	0	3.9
04-11-18	10-11-18	November	31.3	16.9	84.3	41.6	0	5.3
11-11-18	17-11-18	November	31.4	13.1	77.7	33.3	0	4.4
18-11-18	24-11-18	November	30.8	16.4	78.1	32.3	0	5.1
25-11-18	01-12-18	November	29	14.6	77.7	36.4	0	4.1
02-12-18	08-12-18	December	28.2	13.9	81.3	32.6	0	3.4

09-12-18	15-12-18	December	28.3	14.1	82.0	33.7	0	3.9
16-12-18	22-12-18	December	27.2	12.1	80.7	36.5	0	2.9
23-12-18	29-12-18	December	28.9	12.9	84.1	35.7	0	4.6
30-12-18	05-01-19	December	27.6	10.3	75.7	30.1	0	3.9
06-01-19	12-01-19	January	28.2	9.8	80.1	30.7	0	3.3
13-01-19	19-01-19	January	28.7	10.0	78.6	33.3	0	4.3
20-01-19	26-01-19	January	29.4	10.2	78.0	34.9	0	3.8
27-01-19	02-02-19	January	26.7	9.6	79.1	30.6	20	3.2

APPENDICES - II

Cost of cultivation of different treatments on guava Cv. Allahabad safeda

Treatment Particulars	T_1	T_2	T_3	T_4	T_5
Land preparation	3000	3000	3000	3000	3000
Levelling & basin preparation	3600	3600	3600	3600	3600
Cost of planting material(Rs.)	5540	5540	5540	5540	5540
Weeding	4000	4000	4000	4000	4000
Pruning	1400	1400	1400	1400	1400
Irrigation	1400	1400	1400	1400	1400
Spraying of insecticides	1000	1000	1000	1000	1000
FYM	16620	-	12465	4155	8310
Urea	-	1834.02	453.73	1343.73	915.21
DAP	-	4624.51	1156.04	3468.32	2311.56
MOP	-	2008.25	501.92	1506.19	1004.12
Application of fertilizer	2000	2000	2000	2000	2000
Harvesting	1770	1770	1770	1770	1770
Miscellaneous	2000	2000	2000	2000	2000
Total cost of cultivation	42330	34176.78	40286.7	36183.23	38250
Gross returns (Rs/ha)	151491.3	259355.1	217555.8	331818.3	299326.2
Net returns (Rs/ha)	109161.3	225178.32	177269.1	295635.07	261076.2
B:C ratio	2.57	6.58	4.40	8.17	6.82

FYM-Rs.500/tonne, Urea-Rs.6/kg, DAP-Rs. 25.60/kg. MOP-Rs.14.50/kg, labour wage-Rs.200/day. Marketing of fresh guava fruits-Rs.30/kg