Plant Archives Vol. 25, Supplement 1, 2025 pp. 438-449 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-1.059

THE IMPACT OF AN ORGANIC SOURCE OF NUTRIENTS ON GUAVA QUALITY

Harish Kumar[1], Sunita[2*], Tejvir Singh [3] and Jogendra Singh[3]
[1]Krishi Vigyan Kendra, Guddamalani Barmer (Agriculture University Jodhpur) 344031, India
[2]Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh-221005, India.
[3]Department of Horticulture, Aroma College Roorkee, District Haridwar, Uttrakhand-249405, India.
*Corresponding author E-mail: bherysunita98@bhu.ac.in
(Date of Receiving : 02-08-2024; Date of Acceptance : 30-09-2024)

ABSTRACT

An investigation was done to study was conducted at horticulture farm, Aroma College, Haridwar during summer season of 2022-23 to evaluate the performance of different organic source of nutrients on growth of Thai guava cv. VNR bihi. Therefore, the biofertilizers were applied as per various treatments under the tree canopy. This experiment was designed in Randomized Block Design with three replicates. The highest TSS (12.96%), acidity (0.5%), ascorbic acid (219.05 mg/100 g pulp), diameter of seed core (56.60 mm), pulp thickness index (56.74), pectin content (1.42%) to were found in T_{12} (FYM + Poultry manure + Azotobacter + PSB) From March to December every month followed by T_{11} (FYM + Poultry manure + PSB). whereas, the maximum number of fruits per plant (54.33) and yield (29.41 kg/plant) in the rainy season. Winter season fruits are more superior to rainy season fruits.
Keywords - Guava, Farmyard Manure, Phosphate Solubilizing Bacteria.

Introduction

In tropical and subtropical India, the guava (*Psidium guajava* L.), a member of the Myrtaceae family, is one of the most significant fruits. Tropical America is the native home of guavas. The smooth bark of the guava tree is distinctive. They have globose berries that are greenish-brown to brown in colour, scaly, angular juvenile stems, an inferior ovary, and a profusion of stamens. Several seeds, which might be red, pink, yellow, or white, are imbedded in the meat. About 20 of the approximately 150 species in the genus "*Psidium*" produced edible fruits. Guavas are grown up to 1500 meters above sea level. It may grow in a variety of soil conditions, from deep clay soil to very light sandy soil. Guavas are known as the "*apple of the tropics*" due to their high vitamin C content (75–260 mg/100 g pulp) and abundance of minerals. One of the most significant components of the seed is its dietary Fiber content (Anonymous, 2009). Our defines against common diseases and infections are strengthened by vitamin C. The amounts of thiamine (0.03-0.07 mg/100 g pulp) and riboflavin (0.02-0.04 mg/100 g pulp) found in guavas are suitable. guava pulp has carbohydrates, pectin (0.5–1.8%), and sugars in addition to minerals such phosphorus (22.5–40.0 mg/100 g pulp), calcium (10.0–30.0 mg/100 g pulp), and iron (20–25 mg/100 g pulp). In addition, it has polyphenols, omega-3 and omega-6 fatty acids, and carotenoids, a class of powerful antioxidants derived from unsaturated fatty acids. Growing guavas organically is an option because they are eaten raw together with their pulp and skin. while organic farming still makes up the majority of Indian agriculture, chemical fertilizers and pesticides have become considerably more common since the beginning of the green revolution a few years ago. Both the environment and human health suffered as a result of this. A gradual resurgence of organic farming is occurring. It makes use of organic materials such as animal excrement, oil cakes, farmyard manure, and residual agricultural goods. Organic farming does not utilize synthetic agrochemicals.

Materials and Method

The experiment was conducted during summer season of 2022-23 at experimental site of Horticulture Farm, Distt Haridwar, and Uttarakhand by applying difference composition of following Farmyard Manure, poultry manure and others (1.) Farmyard Manure (100% replacement of nitrogen through FYM) (2.) Vermicompost (100% replacement of nitrogen through Vermicompost (3.) FYM + Poultry manure (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure) (4.) FYM + Azotobacter (150 ml/plant) (5.) FYM + Phosphate Solubilizing Bacteria (150 ml/plant) (6.) FYM + Azotobacter + Phosphate Solubilizing Bacteria (75 ml + 75 ml/plant) (7.) Vermicompost + Azotobacter (150 ml/plant) (8.) Vermicompost + Phosphate Solubilizing Bacteria (150 ml/plant) (9.) Vermicompost + Azotobacter +Phosphate Solubilizing Bacteria (75 ml + 75 ml/ plant) (10.) FYM + Poultry manure + Azotobacter (80% replacement of nitrogen through FYM +20% replacement of nitrogen through poultry manure) (11.) FYM + Poultry manure + Phosphate Solubilizing Bacteria (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure) (12.) FYM + Poultry manure + Azotobacter + Phosphate Solubilizing Bacteria (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure) (13.) 50% FYM + organic fertilizer Jeevamrit (4 litre per plant in 21 days interval) (14.) Control (no application). Full dose of organic manures and biofertilizers were incorporated in first week of March. Jeevamrit is applied in the field at 21 days interval. During March, after applying water through drip irrigation, the biofertilizers were applied as per various treatments under the tree canopy.

Variety: Thai guava cv. VNR bihi

Replications: 3

Number of plants per replication :1

Age of plants: Two years old

Experimental Design: Randomized Block Design

Full dose of organic manures and biofertilizers were incorporated in first week of March. Jeevamrit is applied in the field at 21 days interval. During March, after applying water through drip irrigation, the biofertilizers were applied as per various treatments under the tree canopy. The chemical composition of different organic manures used for the experiment is given in Table.

Table 1: The chemical composition (N.P.K.) of different organic manures used for the experiment.

Organic Manure	Nitrogen %	Phosphorus %	Potassium %
Farmyard Manure	0.5	0.5	0.5
Vermicompost	1.8	0.7	1.5
Poultry Manure	2.8	2	2.2

Quality parameters

1. Total Soluble Solids (%): Total Soluble Solids of the fruit was measured by using a hand refractometer of 0-30 percent range. The juice was extracted from the selected fruit by placing the small piece of fruit on muslin cloth and then squeeze the fruit through muslin cloth. One drop of juice was put on the prism of glass refractometer and reading was recorded. Hand refractometer was calibrated with the help of distilled water after every reading. Due to this, the reading on hand refractometer became 0 % and ready to use for next reading. TSS was calculated for both rainy and winter season crop.

2. Acidity (%): Acidity was estimated by using the method given in AOAC (1990).

Reagents prepared

- Sodium hydroxide 0.1 Normal
- Phenolphthalein indicator 1 percent

Procedure: Mash 5 g of fruit pulp in mortar and pestle using small amount of distilled water and make final volume 10 ml. 2 ml of filtrate was pipette out into a beaker and titrated against N/10 sodium hydroxide using phenolphthalein as an indicator. Light pink color was observed at the end point. Acidity was calculated for both rainy and winter season crop.

Reagents

(a) Metaphosphoric acid solution (3%)

Metaphosphoric acid (HPO_3)	15 g
Glacial acetic acid	40 ml
Final volume adjusted	500 ml

(b) 2, 6 dichlorophenol indophenol dye

2, 6-dichlorophenol indophenol dye	50 mg
Sodium bicarbonate	42 mg
Volume adjusted	200 ml

Standard ascorbic acid solution: 50 mg of ascorbic acid ($C_6H_{12}O_6$) was dissolved in 50 ml metaphosphoric acid (3%).

Estimation: Mash 5 g of guava fruit pulp using 25 ml of 3 percent metaphosphoric acid and filtered it through muslin cloth. 2 ml of filtrate was titrated against 2, 6- dichlorophenol dye. Rose pink color appeared at the end point. Concurrently, 1.0 ml of standard ascorbic acid was also titrated against the dye. The results were manifested as mg of ascorbic acid per 100 g of fruit pulp. Ascorbic acid was calculated for both rainy and winter season crop. It was determined by the given mathematical formula:

$$\text{acids (mg/100 g fruit pulp)} = \frac{\text{Titrate value x total volume}}{\text{Standard reading x ml of sample x weight of fruit take}} \times 100 \text{ Ascorbic}$$

1. Diameter of seed core (mm): From each replication of all treatments, ten fruits were collected in both rainy and winter season. Each fruit was cut into two equal half then with the help of scale, diameter of seed core up to which seeds were scattered was noted and average diameter of seed core was calculated.

2. Pulp thickness index: The fruit was cut into two equal halves. Diameter of seed core was subtracted from the diameter of the fruit and the result was divided by diameter of fruit and then multiply by 100. Pulp thickness index was calculated in both rainy and winter season crop.

$$\text{Pulp thickness index} = \frac{\text{Diameter of fruit - Diameter of seed core}}{\text{Diameter of fruit}} \times 100$$

3. Pectin content (%): Ranganna (1979) narrated the method for the estimation of total pectin as calcium pectate in fresh fruits.

Reagents

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: 25 g of fruit pulp was meshed with the help of mortar and pestle and taken in a flask. 200 ml distilled water poured into the flask having meshed fruit pulp and placed on hot plate for an hour. The water lost during boiling was restored back simultaneously. Then, the final volume was made up to 250 ml by adding distilled water after the flask was cooled. The contents of the flask were filtered using Whatman filter paper number 4.

Estimation: To 50 ml part of the filtrate, 50 ml of distilled water and 5.0 ml of 1N NaOH was added and kept overnight. The following day, 25 ml of acetic acid solution was added and after 5 minutes again 12.5 ml of 1N calcium chloride solution was added using string. After permitting it to stand for an hour, it was boiled for a minute and filtered through oven dried, previously weighed Whatman filter paper number 4. After that, the precipitates were dried at 100°C overnight, cooled in desiccators and weighed. Pectin content was calculated in both rainy and winter season crop. The amount of pectin was indicated as percent calcium pectate.

$$\text{Calciumpectate}(\%) = \frac{\text{Weightof calciumpectate x volumeof content}}{\text{Volumeof filtrate x weightof samplefor estimation}} \times 100$$

5. Leaf Nutrient status (N, P, K): Second and third mature leaf was taken from each replication of each treatment and dried in oven at 65±2°C for 72 hours. The dry samples were grounded in a stainless-steel grinder and stored in polythene bags for further analysis. Leaf samples were digested in diacid mixture of H_2So_4 and $HClO_4$ (9:1) in digestion chamber. The digested plant samples were analyzed for total N, P, K contents by adopting the following procedures:

Total nitrogen in leaf samples was determined colorimetrically by using Nessler's reagent method (Lindner, 1944). Total phosphorus was determined by ammonium molybdate yellow color method (Koenig and Johnson, 1942). Potassium content in acid digest of plant samples was estimated by using flame photometer.

Results and Discussion

Effect of organic treatment on quality parameters

1.Total Soluble Solids (%): A perusal of data presented in Table -2 during the rainy season showed that the total soluble solids of guava varied significantly due to different organic treatments. TSS values with different treatments varied from 11.11% to 9.46%. The highest TSS content (11.11%) was found in FYM + poultry manure + *Azotobacter* + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (10.96%), FYM + poultry manure + *Azotobacter* (10.85%), FYM + poultry manure (10.62%) and vermicompost + *Azotobacter* + Phosphate Solubilizing Bacteria (10.52%), however, lowest TSS content (9.46%) was observed in control. In winter season, (Table 1.2) the TSS values for different varieties ranged from 12.96% to 11.06 %. It was observed that the highest TSS (12.96%) was found in FYM + poultry manure + *Azotobacter* + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (12.95%), FYM + poultry manure + *Azotobacter* (12.55%) and FYM + poultry manure (12.39%), while, the lowest TSS (11.06%) was observed in control. Ram and Nagar (2003) assessed the effect of different organic sources and biofertilizers on TSS of three years old guava *cv*. Allahabad Safeda. They found the highest TSS with the application of vermicompost and minimum with the recommended dose of fertilizer. Dwivedi *et al.* (2010) carried out an investigation to study the effect of biofertilizers and organic manures on TSS of 4 years old 'Red Fleshed' guava fruit at Lucknow, Uttar Pradesh, India. They evaluated that application of Vesicular Arbuscular Mycorrhizae showed the highest total soluble solids for rainy and winter season crop. Devi *et al.* (2012) observed the effect of different organic and biofertilizer sources on four years old guava (*Psidium guajava* L.) *cv*. Sardar at the Horticultural Research Station, Mondouri, West Bengal. They reported that the application of poultry manure + *Azospirillum* + phosphorous solubilizers + potash mobilizers resulted in the highest total soluble solids, while, lowest with control.

An experiment was conducted by Kushwah *et al.* (2018) to study the effect of integrated nutrient management on TSS of strawberry *cv*. *Chandler*. The different treatments used were recommended dose of fertilizers, vermicompost, poultry manure, farmyard manure, *Azotobacter*, Phosphate Solubilizing Bacteria alone or in combination with different reducing levels of the recommended dose of fertilizer. The maximum TSS was recorded in 75% RDF + 25% vermicompost + *Azotobacter* + followed by 50% RDF + 50% vermicompost + *Azotobacter* + Phosphate Solubilizing Bacteria. The minimum TSS was recorded in control. Lodaya and Masu (2019) reported that among all the biofertilizers, manures, and chemical fertilizers used in the experiment, the combined application of 30% RDF through chemical fertilizers + 30% RDN through poultry manure + 20 ml Bio NPK Consortium per tree treatment resulted in maximum total soluble solids of guava (*Psidium guajava* L.) *cv*. Allahabad Safeda. Zothansiami and Mandal (2021) assessed the response of different organic manures and biofertilizers alone, and in combinations on fruit quality of banana *cv*. Giant Cavendish at Aizawl, Mizoram. They observed that the total soluble solids content of banana fruits was highest in plants treated with vermicompost + *Azotobacter* + Phosphate Solubilizing Bacteria + Potassium Solubilizing Bacteria followed by poultry manure + *Azotobacter* + Phospate Solubilizing Bacteria + Potassium Solubilizing Bacteria.

2. Acidity (%): From the data depicted in Table 2, it was obvious that during rainy season, the lowest acidity (0.19%) was recorded in FYM + poultry manure + *Azotobacter* + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (0.22%), FYM + poultry manure + *Azotobacter* (0.23%), FYM + poultry manure (0.24%) and vermicompost + *Azotobacter* + Phosphate Solubilizing Bacteria (0.24%), whereas, the highest acidity (0.39%) was observed with control. Similarly, in winter season (Table 2) lowest acidity (0.34%) was observed in FYM + poultry manure + *Azotobacter* + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure +Phosphate Solubilizing Bacteria (0.37%), FYM + poultry manure + *Azotobacter* (0.38%) and FYM + poultry manure (0.38%) and highest acidity of 0.50% was recorded with control. Ram and Nagar (2003) studied the effects of different organic sources and biofertilizers on the quality of three years old guava *cv*. Allahabad Safeda and found that variations in acidity due to different organic applications were non-significant. Naik and Babu (2005) observed the response of guava (*Psidium guajava* L.) *cv*. L-49 (Sardar) to different organic manures (vermicompost, FYM, pig, sheep, goat and poultry manure, and guava leaf litter) and NPK (250:350:200 g per tree). They obtained that acidity was highest under FYM treatment followed by vermicompost. Dwivedi *et al.* (2010) observed the effect of biofertilizers and organic manures on the quality of four years old *'Red Fleshed'* guava during the rainy and winter season. The different sources of biofertilizers were *Azotobactor*, *Azospirillum*, phosphobacterin, microphos, and Vesicular Arbuscular Mycorrhizae, while, sources of organic manures include -FYM, dhaincha, vermicompost, vermiwash, and sunhemp. They observed that acidity was highest when plants were treated with FYM, whereas, biofertilizers showed no effect on titrable acidity. An investigation was conducted by Devi *et al.* (2012) under sub-tropical conditions of West Bengal, to study the effect of different organic and biofertilizer sources on four years old guava (*Psidium guajava* L.) *cv.* Sardar. In the experiment, various organic sources such as farmyard manure, poultry manure, vermicompost, and neem cake along with various biofertilizer (*Azotobacter*, *Azospirillum*, phosphorus solubilizers, and potash mobilizers) combinations were tested on guava plant. They observed minimum with vermicompost + *Azospirillum* + phosphorous solubilizers + potash mobilizers and maximum acidity with the application of farmyard manure + *Azospirillum* + phosphorus solubilizers + potash mobilizers. An experiment was conducted on 6 years old guava plant (*Psidium guajava* L.) *cv.* L- 49 under Vindhyan region by Yadav *et al.* (2013).

They found that the effect of organic sources on fruit acidity was non-significant. However, the highest acidity was recorded with poultry manure (20 kg/tree). Jain *et al.* (2017) assessed the influence of organic and microbial sources of nutrients (compost, poultry manure, vermicompost, FYM, *Azotobacter*, and Phospate Solublizing Bacteria) on the acidity of strawberry *cv.* (*Fragaria* × *ananassa* Duch.). Sweet Charlie and observed that minimum acidity was found in vermicompost + poultry manure + *Azotobacter* + Phospate Solublizing Bacteria followed by vermicompost + FYM + *Azotobacter* + Phosphate Solublizing Bacteria and vermicompost + poultry manure. While maximum acidity was found with the recommended dose of nutrients through chemical fertilizers. An experiment was conducted by Rana *et al.* (2020) to find the most suitable combination of FYM and biofertilizers for the better quality of sweet orange (*Citrus sinensis* L.) *cv.* Mosambi. They observed the minimum value of titrable acidity with the application of FYM (40 kg/plant) + *Azotobacter* (10 g/plant). While the maximum value with control.

3. Ascorbic acid (mg/100 g pulp): It is perceptible from the data revealed in Table 2, that there was significant influence of different organic treatments on ascorbic acid. In rainy season crop, maximum ascorbic acid content (139.91 mg/100 g pulp) was recorded in FYM + poultry manure + Azotobacter, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria PSB (138.12 mg/100 g pulp), FYM + poultry manure + Azotobacter (137.33 mg/100 g pulp), FYM + poultry manure (132.92 mg/100 g pulp) and on other hand, minimum ascorbic acid content (103.88 mg/100 g pulp) was obtained in control. Table 1 is evident that in the winter season highest amount of ascorbic acid (219.05 mg/100 g pulp) was resulted with FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (216.97 mg/100 g pulp), FYM + poultry manure + Azotobacter (216.39 mg/100 g pulp) and FYM + poultry manure (214.46 mg/100 g pulp), whereas, control exhibited the lowest amount of ascorbic acid (165.96 mg/100 g pulp).

Devadas and Kuriakose (2002) noted that when different organic manures were applied in pineapple cv. Mauritius, maximum ascorbic acid was found with the application of poultry manure (250 g/plant) + Azospirillum and phosphobacterin each at 625 mg/plant and minimum in control. Binepal *et al.* (2013) observed that out of all the combinations of fertilizers, organic manures and biofertilizers applied in guava cv. L-49, 100% N 100% P2O5 + Azospirillium + Phosphate Solubilizing Bacteria + 10 kg vermicompost resulted in maximum ascorbic acid content, while, minimum ascorbic acid under control. a study was carried out on guava cv. Shweta by Shukla *et al.* (2014) and the results demonstrated that among different mineral and organic fertilizers and biofertilizers application in soil, maximum ascorbic acid in fruits was noted when plants were treated with 10 kg vermicompost + Azotobacter + Phosphate Solubilizing Microbes + Trichoderma harzianum + organic mulching. While, minimum ascorbic acid was obtained with the application of 10 kg FYM. While conducting an experiment at Horticultural Research Farm, Anand to assess the effect of biofertilizers, manures, and chemical fertilizers on ascorbic acid of guava (*Psidium guajava* L.) cv. Allahabad Safeda, Lodaya and Masu (2019) found that among all the treatments, the soil application of 30% RDF through chemical fertilizers + 30% RDN through poultry manure + 20 ml Bio NPK consortium per tree resulted in maximum ascorbic acid (177.67 mg/100 g pulp) of guava fruit.

4. Diameter of seed core (mm): It is obvious from the data demonstrated in Table 3 that in rainy season crop, the diameter of seed core varied significantly and extended from 49 mm to 51.90 mm due to the application of different treatments. Maximum diameter of seed core (51.90 mm) was observed with FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was followed by FYM + poultry manure + Phosphate Solubilizing Bacteria (50.80 mm), whereas, with FYM + jeevamrit, minimum diameter of seed core (49 mm) was obtained. In the winter season, the maximum diameter of seed core (56.60 mm) was obtained with FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria and FYM + poultry manure + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Azotobacter (56.30 mm), whereas, with FYM + Jeevamrit minimum diameter of seed core (54.00 mm) was obtained. The diameter of seed core varied significantly with organic manures and biofertilizers. The highest diameter of seed core (51.90 mm) in rainy season was observed in 80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was followed by FYM + poultry manure + Phosphate Solubilizing Bacteria (50.80 mm), whereas, with FYM + jeevamrit lowest diameter of seed core (49 mm) was obtained. Athani *et al*. (2005) studied the influence of vermicompost on 5 years old of guava cv. Sardar and found maximum pulp thickness with the application of 75 percent recommended dose of fertilizers + 10 kg vermicompost per plant followed by in situ vermiculture at 50 worms and 100 percent RDF per plant. Singh *et al*. (2008) investigated the effect of different nutrient sources on papaya (Carica papaya L.) cv. Surya and obtained maximum pulp thickness with the application of 75% RDF + 25% vermicompost + rhizobacteria culture. The experiment was conducted by Dwivedi (2013) to study the effect of integrated nutrient management on guava cv. Allahabad Safeda and results showed no significant changes in the seed cavity diameter due to different integrated nutrient management treatments. However, it was maximum with the application of 50% NPK + 25 kg FYM + 250 g *Aspergillus niger*. In the winter season, the maximum diameter of seed core (56.60 mm) was obtained with FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria and FYM + poultry manure + Phosphate Solubilizing Bacteria which was statistically at par with FYM + poultry manure + Azotobacter (56.30 mm) whereas, with FYM + Jeevamrit minimum diameter of seed core (54.00 mm) was obtained. The diameter of seed core is correlated with the weight and size of fruits. The fruit weight and size were increased with organic manures and biofertilizers; consequently, the diameter of seed core was increased.

5. Pulp thickness index: It is obvious from the data demonstrated in Table 3 that in rainy season crop, pulp thickness index varied significantly and extended from 39.62 to 45.74 due to the application of different organic treatments. The highest pulp thickness index (45.74) was observed in FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (44.21), whereas, with control lowest pulp thickness index (39.62) was obtained. All the treatments proved significantly superior over control with respect to pulp thickness index in the winter season. The data indicated that maximum pulp thickness index (56.74) was observed in FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (55.36), FYM + poultry manure + Azotobacter (54.71), FYM + poultry manure (54.94), whereas, with control lowest pulp thickness index (45.24) was obtained. Significant effect with respect to pulp thickness index was noticed through different organic treatments. Maximum pulp thickness index (45.74) in rainy season was recorded in 80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (44.21), whereas, with control. minimum pulp thickness index (39.62) was obtained. All the treatments proved significantly superior over control with respect to pulp thickness index in the winter season. The data indicated that maximum pulp thickness index (56.74) was observed in FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (55.36), FYM + poultry manure + Azotobacter (54.71), FYM + poultry manure (54.94), whereas, with control lowest pulp thickness index (45.24) was obtained. The pulp thickness is correlated with the weight of fruit and diameter. The fruit weight and diameter were increased with the organic manure and biofertilizers consequently pulp thickness index was increased. The findings are in agreement with the result of Binepal *et al*. (2013) in guava. Ratna *et al*. (2019) experimented to study the effect of chemical fertilizers, biofertilizers, and organic manures on growth, yield, and quality of guava under Prayagraj agro-climatic conditions. They found that pulp thickness was maximum with the application of Azospirillum (100 g/tree) + 50% recommended dose of fertilizers + Vesicular Arbuscular Mycorrhizae (30 g/tree) + vermicompost (10 kg/tree) followed by 50% recommended dose of fertilizers + cow dung slurry (10 liter/tree) + vermicompost (10 kg/tree) and the minimum was recorded in control.

6. Pectin content (%): The data pertaining to pectin (Table 3) was significantly influenced by various organic sources. In rainy season, the highest pectin content (0.97%) was observed in FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (0.96%), FYM + poultry manure + Azotobacter (0.95%) and FYM + poultry manure (0.93%) while, lowest pectin content (0.73%) was observed in control. It is clear from the data presented in Table 1.3 that in the winter season, pectin content varied significantly among the treatments. Azotobacter (0.95%) and FYM + poultry manure (0.93%), while, lowest pectin content (0.73%) was observed in control. In winter season, out of all the treatments, FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria contained the highest amount of pectin (1.42%), which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (1.40%) and the lowest amount of pectin (0.81%) was found in control**.** In rainy season, 80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure + Azotobacter + Phosphate Solubilizing Bacteria reported significantly highest pectin content (0.97%), which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (0.96%) FYM + poultry manure.

In winter season FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria resulted in the highest amount of pectin (1.42%), which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (1.40%) and the lowest amount of pectin (0.81%) found in control. Poultry manure contains all essential nutrients that are needed by plants. These essential nutrients play a significant role in improving quality as reported by Prabakaran and Pichal (2003). Binepal *et al.* (2013) in guava also noted similar results. The data pertaining to pectin (Table 3) was significantly influenced by various organic sources. In rainy season, the highest pectin content (0.97%) was observed in FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (0.96%), FYM + poultry manure + Azotobacter (0.95%) and FYM + poultry manure (0.93%), while, lowest pectin content (0.73%) was observed in control. It is clear from the data presented in Table 1.3 that in the winter season, pectin content varied significantly among the treatments. In winter season, out of all the treatments, FYM + poultry manure + Azotobacter + PSB contained the highest amount of pectin (1.42%), which was statistically at par with FYM + poultry manure + PSB (1.40%) and the lowest amount of pectin (0.81%) was found in control. Sharma *et al.* (2013) analyzed the effect of organic and inorganic sources of fertilizers on pectin content of 15 years old guava cv. Sardar. The pooled data of two years showed the highest pectin content was obtained with the application of 25 percent nitrogen through FYM and the rest through urea augmented with Azotobacter. Sharma *et al.* (2016) evaluated the impact of poultry manure on fruit quality attributes and nutrient status of guava (*Psidium guajava.* L.) cv. L-49 and maximum pectin content was recorded in fruits harvested from trees receiving 50% N as poultry manure + 50% N through urea augmented with Azotobacter and lowest pectin content was recorded under control.

6. Leaf Nutrient status : Significant effects concerning leaf nutrient status were noticed through different organic treatments and are presented in Table 4 Maximum nitrogen (2.59%) was recorded in FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (2.51%), FYM + poultry manure + Azotobacter (2.48%), FYM + poultry manure (2.37%), and vermicompost + Azotobacter + Phosphate Solubilizing Bacteria (2.34%) and minimum nitrogen content (2.08%) was observed in control. Highest phosphorus content (0.18%) was recorded in FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (0.17%), FYM + poultry manure + Azotobacter (0.16%), and FYM + poultry manure (0.16%) and minimum phosphorus content (0.11%) was recorded in control. Application of FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria had resulted in maximum potassium content (1.2%), which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (1.19%), FYM + poultry manure + Azotobacter (1.17%), and FYM + poultry manure (1.08%), while, minimum potassium content (0.79%) was observed in control. The data pertaining to leaf nitrogen, phosphorus and potassium content was significantly influenced by various organic sources. The critical examination of data showed that maximum nitrogen (2.59%), content of leaf was found in plants treated with 80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (2.51%), FYM + poultry manure + Azotobacter (2.48%), FYM + poultry manure (2.37%), and vermicompost + Azotobacter + Phosphate Solubilizing Bacteria (2.34%) and minimum nitrogen content (2.08%) was observed in control. Maximum phosphorus content (0.18%) was recorded in FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria, which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (0.17%), FYM + poultry manure + Azotobacter (0.16%), and FYM + poultry manure (0.16%) and minimum phosphorus content (0.11%) was recorded in control. Application of FYM + poultry manure + Azotobacter + Phosphate Solubilizing Bacteria had resulted in maximum potassium content (1.2%), which was statistically at par with FYM + poultry manure + Phosphate Solubilizing Bacteria (1.19%), FYM + poultry manure + Azotobacter (1.17%), and FYM + poultry manure (1.08%), while, minimum potassium content (0.79%) was observed in control. Yadav *et al.* (2013) suggested that it was probably due to high nutrient and mineral content in poultry manure as compared to other organic manure in guava. Increased leaf nitrogen status could also be due to biological nitrogen fixation and production of the enzyme complex, which solubilizes unavailable forms of nutrients and makes them available to the plants (Marwaha, 1995). An increase in phosphorus content may be explained by the production of enzyme complexes by the biofertilizers, which may have solubilized an unavailable form of phosphorus and increased its availability to the plant (Singh *et al*., 2003). The increase in potassium content might be due to the combined use of organic manure and biofertilizers that improved soil physical properties. This results in better rooting and therefore, better uptake of potassium from the soil.High nitrogen and potassium content can be supported by Moustafa (2002) in orange; high nitrogen and phosphorus by Sharma *et al*. (2013) and Naik and Babu (2005) in guava and Osman and El-Rhman (2010) in fig. Naik and Babu (2005) assessed the feasibility of organic farming under the semi- arid tropics of southern Andhra Pradesh, India, in guava (*Psidium guajava* L.) cv. L-49 and observed that leaf nitrogen content remained almost the same before and after the application of various organic treatments (vermicompost, FYM, pig manure, sheep manure, goat manure, poultry manure, and guava leaf litter) and chemical treatments (NPK 250:350:200 g per tree). While, leaf phosphorus and potassium showed maximum increment when plants were treated with vermicompost closely followed by poultry manure. An experiment was conducted by Osman and El-Rhman (2010) to study the effect of organic and bio-N-fertilizer on 66 Sultani fig variety (*Ficus carica* L.) of about 20 years old, for two successive seasons.

They found that nitrogen concentration in leaf of fig tree was significantly increased by sheep manure + *Azospirillum*, poultry manure + *Azotobacter* and poultry manure + *Azospirillum* in both seasons. Poultry manure + *Azotobacter* and poultry manure + *Azospirillum* gave the highest values of leaf phosphorus and potassium content. Sharma *et al.* (2011) used two organic manures (farmyard manure and poultry manure) and two biofertilizers (*Azotobacter* and *Azospirillium*) to study their effect on leaf nutrient status on fifteen years old guava plant (*Psidium guajava* L.) *cv.* Sardar and revealed that the maximum leaf nitrogen, phosphorus and potassium content in the treatment comprising full-dose of nitrogen applied through poultry manure, augmented with *Azotobacter* and *Azospirillium.* An experiment was conducted to study the effect of organic and inorganic sources of fertilizers on the leaf nutrient status of 15 years old guava *cv.* Sardar. The pooled data of two years revealed that the highest leaf nitrogen and phosphorous content was obtained with the application of *Azotobacter* + 25% of N per tree through FYM + 75% of N per tree through inorganic fertilizers, whereas, the highest leaf potassium content was obtained with the application of *Azotobacter* + 50% of N per tree through FYM + 50% of N per tree through inorganic fertilizers (Sharma *et al.,* 2013). An experiment was conducted by Marathe *et al.* (2017) to study the response of organic sources of fertilizers (farmyard manure, vermicompost, poultry manure, and green manure) and recommended dose of inorganic fertilizers against control on pomegranate (*Punica granatum* L.) *cv.* Bhagwa, in Maharashtra, India. The pooled data of three years showed the highest phosphorus and potassium content in the leaves with the application of poultry manure, while highest nitrogen content was by FYM.

Table 2: Effect of organic source of nutrients on TSS, acidity and ascorbic acid in guava *cv*. VNR bihi

Treatments	TSS (%)		Acidity (%)		Ascorbic Acid (mg/100 g pulp)	
	Summer	Winter	Summer	Winter	Summer	Winter
T_1 (FYM)	9.86	11.39	0.34	0.45	118.04	170.77
T_2 (Vermicompost)	9.95	11.44	0.33	0.44	119.31	180.07
T_3 (FYM + Poultry manure)	10.62	12.39	0.24	0.38	132.92	214.46
T_4 (FYM + *Azotobacter*)	10.08	11.62	0.34	0.43	117.66	180.41
T_5 (FYM + PSB)	10.10	11.61	0.33	0.43	121.05	189.73
T_6 (FYM + *Azotobacter* + PSB)	10.15	11.87	0.28	0.43	122.33	197.37
T_7 (Vermicompost + *Azotobacter*)	10.21	11.97	0.27	0.43	124.67	198.38
T_8 (Vermicompost + PSB)	10.32	12.04	0.25	0.41	126.48	205.00
T_9 (Vermicompost + *Azotobacter* + PSB)	10.52	12.12	0.24	0.41	130.98	210.38
T_{10} (FYM + Poultry manure + *Azotobacter*)	10.85	12.55	0.23	0.38	137.33	216.39
T_{11} (FYM + Poultry manure + PSB)	10.96	12.95	0.22	0.37	138.12	216.97
T_{12} (FYM + Poultry manure + *Azotobacter* + PSB)	11.11	12.96	0.19	0.34	139.91	219.05
T_{13} (50% FYM + Jeevamrit)	9.77	11.15	0.37	0.48	106.89	174.74
T_{14} (Control)	9.46	11.06	0.39	0.50	103.88	165.96
C.D. at 5%	0.75	0.70	0.05	0.06	8.66	8.31

Table 3: Effect of organic source of nutrients on diameter of seed core, pulp thickness index and pectin in guava *cv*. VNR bihi.

Treatments	Diameter of seed core(mm)		Pulp thickness index		Pectin (%)	
	Summer	Winter	Summer	Winter	Summer	Winter
T_1 (FYM)	48.90	55.50	40.57	48.11	0.77	0.85
T_2 (Vermicompost)	49.50	55.60	40.08	49.43	0.81	0.87
T_3 (FYM + Poultry manure)	50.60	56.00	43.32	54.94	0.93	1.21
T_4 (FYM + *Azotobacter*)	49.60	55.60	40.61	49.59	0.81	0.87
T_5 (FYM + PSB)	49.70	55.70	41.98	50.12	0.82	1.01
T_6 (FYM + *Azotobacter* + PSB)	49.80	55.70	42.06	52.10	0.87	1.04
T_7 (Vermicompost + *Azotobacter*)	50.00	55.80	42.45	53.11	0.88	1.09
T_8 (Vermicompost + PSB)	50.00	55.90	42.91	53.28	0.89	1.10
T_9 (Vermicompost + *Azotobacter* + PSB)	50.30	56.00	43.47	53.84	0.91	1.19
T_{10} (FYM + Poultry manure + *Azotobacter*)	50.60	56.30	43.77	54.71	0.95	1.35
T_{11} (FYM + Poultry manure + PSB)	50.80	56.60	44.21	55.36	0.96	1.40
T_{12} (FYM + Poultry manure + *Azotobacter* + PSB)	51.90	56.60	45.74	56.74	0.97	1.42
T_{13} (50% FYM + Jeevamrit)	49.00	54.00	39.76	46.51	0.75	0.82
T_{14} (Control)	49.10	54.55	39.62	45.24	0.73	0.81
C.D. at 5%	0.7	0.35	1.71	1.89	0.04	0.05

Table 4: Effect of organic source of nutrients on nitrogen, phosphorus and potassium (%) of leaf in guava cv. VNR bihi

Treatments	Nitrogen (%)	Phosphorus (%)	Potassium (%)
T_1 (FYM)	2.20	0.12	0.85
T_2 (Vermicompost)	2.21	0.13	0.86
T_3 (FYM + Poultry manure)	2.37	0.16	1.08
T_4 (FYM + *Azotobacter*)	2.23	0.13	0.89
T_5 (FYM + PSB)	2.25	0.14	0.91
T_6 (FYM + *Azotobacter* + PSB)	2.25	0.14	0.91
T_7 (Vermicompost + *Azotobacter*)	2.27	0.15	1.00
T_8 (Vermicompost + PSB)	2.30	0.15	1.01
T_9 (Vermicompost + *Azotobacter* + PSB)	2.34	0.15	1.02
T_{10}(FYM +Poultry manure + *Azotobacter*)	2.48	0.16	1.17
T_{11} (FYM + Poultry manure + PSB)	2.51	0.17	1.19
T_{12} (FYM + Poultry manure + *Azotobacter* + PSB)	2.59	0.18	1.20
T_{13} (50% FYM + Jeevamrit)	2.19	0.12	0.84
T_{14} (Control)	2.08	0.11	0.79
C.D. at 5%	0.27	0.02	0.13

Conclusion

The significant findings, as above, from the experiment carried out, bring the conclusion that organic source of nutrients had a substantial impact on two years old Thai guava cv.VNR bihi in terms of growth, yield and quality parameters of guava. It is concluded that combination of 80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure + *Azotobacter* + Phosphate Solubilizing Bacteria may be recommended to improve the growth, yield and quality parameters of guava. The results also showed maximum TSS (12.96%), acidity (0.5%), ascorbic acid (219.05 mg/100 g pulp), diameter of seed core (56.60 mm), pulp thickness index (56.74), pectin content (1.42%) during the winter season, whereas, the maximum number of fruits per plant (54.33) and yield (29.41 kg/plant) in the rainy season. Winter season fruits are more superior to rainy season fruits.

References

Amanullah, Mohamed M., Sekar, S. and Muthukrishnan, P. (2010). Prospects and potential of poultry manure. *Asian Journal of Plant Sciences*, **9**, 172-182.

Anonymous, (2018a). Horticultural Statistic at a Glance. Department of Agriculture, Cooperation and Farmer Welfare, Ministry of Agriculture and Farmer Welfare, Government of India.

Costa Araujo da R., Bruckner, C.H., Martinez, H.E.P., Salomão, L.C.C, Alvarez, V.H., Pereira de Souza A., Pereira, W.E. and Hizumi, S. (2006). Quality of yellow passion fruit (*Passiflora edulis* Sims *f. flavicarpa* Deg.) as affected by potassium nutrition. *Fruits*, **61** (2), 109-115.

Dadashpour, A. and Jouki, M. (2012). Impact of integrated organic nutrient handling on fruit yields and quality of strawberry *cv*. Kurdistan in Iran. *Journal of Ornamental and Horticultural Plants*, **2**(4), 251- 256.

Devadas, V.S. and Kuriakose, K.P. (2002). Evaluation of different organic manures on yield and quality of pineapple var. Mauritius. *In IV International Pineapple Symposium,* **666**, 185-189.

Devi, H.L., Mitra, S.K. and Poi, S.C. (2012). Effect of different organic and biofertilizer sources on guava (*Psidium guajava* L.) 'Sardar'. In *III International Symposium on Guava and other Myrtaceae,* **959**, 201-208.

Dwivedi, V. (2013). Effect of integrated nutrient management on yield, quality and economics of guava. *Annals of Plant Soil Research*, **15,** 149-151.

Hazarika, T.K., Nautiyal, B.P., Bhattacharya, R.K. (2011). Effect of integrated nutrient management on productivity and soil characteristics of tissue cultured banana *cv*. Grand Naine in Mizoram, India. *Progressive Horticulture*, **43**(1), 30-35.

Jain, N., Mani, A., Kumari, S., Kasera, S. and Bahadur, V. (2017). Influence of integrated nutrient management on yield, quality, shelf life and economics of cultivation of strawberry (*Fragaria* × *ananassa* Duch.) *cv*. Sweet Charlie. *Journal of Pharmacognosy and Phytochemistry*, **6**(5), 1178-1181.

Jeyabaskaran, K.J., Pandey, S.D., Mustaffa, M.M. and Sathiamoorthy, S. (2001). Effect of different \organic manures with graded levels of inorganic fertilizers on ratoon of Poovan banana. *South Indian Horticulture*, **49**, 105-108.

Kamatyanatti, M., Kumar, A. and Dalal, R.P.S. (2019). Effect of integrated nutrient management on growth, flowering and yield of subtropical plum *cv*. Kala Amritsari. *Journal of Pharmacognosy and Phytochemistry*, **8**(1), 1904-1908.

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. *Hort Flora Research Spectrum*, **1**, 38-41.

Kumar, H., Sunita, Singh, T., & Singh, J. (2024). Impact of Organic Fertilizers on Guava (*Psidium guajava* L.) Yield. *Journal of Experimental Agriculture International*, **46**(7), 110–119.

Lahav, E., Bareket, M. and Zamet, D. (1981). The effects of organic manure, KNO_3 and poly-feed on the nutritional balance of a banana plantation under drip irrigation. *Fruits*, **36**(4), 209-216.

Lindner, R.C. (1944). Rapid analytical method for some of the more common inorganic constituents of plant tissues. *Plant Physiology*, **19**, 76-89.

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. *International Journal of Current Science*, **7**(4), 1209-1211.

Magwaza, L.S. and Opara, U.L. (2015). Analytical methods for determination of sugars and sweetness of horticultural products-A review. *Scientia Horticulturae*, **184**, 179-192.

Marathe, R.A., Sharma, J., Murkute, A.A. and Babu, K.D. (2017). Response of nutrient supplementation through organics on growth, yield and quality of pomegranate. *Scientia Horticulturae*, **214**, 114-121.

Marwaha, B.C. (1995). Biofertilizers- A supplementary source of plant nutrient. *Fert News,* **40**, 39-50.

Mitra, S.K., Gurung, M.R., and Pathak, P.K. (2008). Guava production and improvement in India, An overview. In, Proceedings of *International Workshop on Tropical and Subtropical Fruits,***787**, 59-66.

Moustafa, M.H. (2002). Studies on fertilization of Washington Navel orange trees (Doctoral dissertation, Ph.D. Dissertation Faculty of Agriculture, Moshtohor, Zagazig University, Benha Branch, Egypt).

Naik, M.H. and Sri Hari Babu, R. (2005). Feasibility of organic farming in guava (Psidium guajava L.). *In International Guava Symposium*, **735**, 365-372.

Ojewole, J.A., Awe, E.O. and Chiwororo, W.D. (2008). Anti diarrheal activity of *Psidium guajava* Linn. (Myrtaceae) leaf aqueous extract in rodents. *Journal of Smooth Muscle Research*, **44**(6), 195-207.

Osman, S.M. and Abd El-Rhman, I.E. (2010). Effect of organic and Bio N- fertilization on growth, productivity of Fig tree (*Ficus carica*, L.). *Research Journal of Agriculture and Biological Sciences*, **6**(3), 319-328.

Pal, A.K., Mishra, S., Singh, S., Kumar, R. and Vikram, B. (2019). Effect of different organic manure on vegetative growth, flowering and fruiting of intercropped strawberry (*Fragaria X ananassa* Duch.) *cv*. Sweet Charley inside Banana Orchard. *Asian Journal of Agricultural and Horticultural Research*, **3**(4), 1-5.

Panelo, B.C., Diza, M.T. (2017). Growth and yield performance of banana (*Musa acuminata* L.) as affected by different farm manures. *Asia Pacific Journal of Multidisciplinary Research*, **5**(2), 199-203.

Poonia, K.D., Bhatnagar, P., Sharma, M.K. and Singh, J. (2018). Efficacy of biofertilizers on growth and development of mango plants *cv*. Dashehari. *Journal of Pharmacognosy and Phytochemistry*, **7**(5), 2158-2162.

Prabakaran, C. and Pichal, G.J. (2003). Effect of different organic nitrogen sources on pH, total soluble solids, titrable acidity, crude protein reducing and non- reducing sugars and ascorbic acid content of tomato fruits. *Journal of Soils and Crops*, **13**(1), 172-175.

Ram, R.A. and Nagar, A.K. (2003). Effect of different organic treatments on yield and quality of guava *cv*. Allahabad Safeda. *Organic Farming in Horticulture for Sustainable Production*, 29-30.

Ram, R.A., Bhriguvanshi, S.R., Garg, N. and Pathak, R.K. (2005). Studies on organic production of guava (*Psidium guajava* L.) *cv*. Allahabad Safeda. *In International Guava Symposium*, **735**, 373-379.

Rana, H., Sharma, K. and Negi, M. (2020). Effect of organic manure and biofertilizers on plant growth, yield and quality of sweet orange (*Citrus sinensis* L.). *International Journal of Current Microbiology and Applied Sciences*, **9**, 2064- 2070.

Rana, R.K. and Chandel, J.S. (2003). Effect of bio-fertilizer and nitrogen on growth yield and fruit quality of strawberry. *Progressive Hort*iculture, **35**(1), 25-30.

Ranganna, S. (1979). Handbook of analysis and quality control for fruit and vegetables products, 2nd Edition. Tata McGraw Hill Publication Company Limited, West Patel Nagar, New Delhi, , 9- 10 and 105-106.

Rashid, M.H.A. (2018). Optimization of growth yield and quality of strawberry cultivars through organic farming. *Journal of Environmental Science and Natural Resources*, **11**(1-2), 121-129.

Rathore, D.S. and Singh, R.N. (1974). Flowering and fruiting in three cropping patterns of guava. *Indian Journal of Horticulture*, **3**, 331-336.

Ratna, S.M. and Bahadur, V. (2019). Effect of chemical fertilizers, bio-fertilizers and organic manure on growth, yield and quality of guava under Prayagraj agro- climatic condition. *Journal of Pharmacognosy and Phytochemistry*, **8**(4), 3154-3158.

Sahu, P. and Sahu, T.R. (2019). Biodiversity and Sustainable Utilization of Biological Resources. Scientific Publisher, Jodhpur, India. **205.**

Sharma, A., Kher, R., Wali, V.K. and Bakshi, P. (2009). Effect of biofertilizers and organic manures on physico-chemical characteristics and soil nutrient composition of guava (*Psidium guajava* L.) *cv*. Sardar. *Journal of Research, SKUAST-J*, **8**(2), 150-156.

Sharma, A., Wali, V.K., Bakshi, P. and Jamwal, M. (2011). Effect of organic manures and biofertilizerson leaf and fruit nutrient status in guava (*Psidium guajava* L.) *cv*. Sardar. *Journal of Horticultural Sciences*, **6**(2), 169-171.

Sharma, A., Wali, V.K., Bakshi, P. and Jasrotia, A. (2013). Effect of integrated nutrient management strategies on nutrient status, yield and quality of guava. *Indian Journal of Horticulture*, **70**(3), 333-39.

Sharma, A., Wali, V.K., Bakshi, P., Sharma, V., Sharma, V., Bakshi, M. and Rani, S. (2016). Impact of poultry manure on fruit quality attributes and nutrient status of guava (*Psidium guajava*) *cv*. L- 49 plant. *Indian Journal of Agricultural Sciences*, **86**(4), 533-40.

Sunita, Meena. M. L., Choudhary A, and Meena N ,2021 Impact of plant growth regulator on root development of dragon fruit cuttings (*Hylocereus costaricensis* (Web.) britton and rose) *Journal of Plant Development Sciences* Vol. **14**(1), 51-58.

Sunita, Meena. M. L., Choudhary A, Nagori, A. Nishad, U. 2022 Impact of Plant Growth Regulator on Development of Dragon fruits cutting. *Annals of Horticulture*.,**15**(2),162-167.

Shukla, S.K., Adak, T., Singha, A., Kumar, K., Singh, V.K. and Singh, A. (2014). Response of guava trees (*Psidium guajava*) to soil applications of mineral and organic fertilizers and biofertilizers under conditions of low fertile soil. *Journal of Horticultural Research*, **22**(2), 105-11

Sidahmed, O.H. and Kliewer, W.M. (1980). Effects of defoliation, gibberellic acid and 4-chloro pheno xyacetic acid on growth and composition of Thompson Seedless grape berries. *American Journal of Enology and Viticulture*, **31**, 149.

Singh, A., Patel, R.K. and Singh, R.P. (2003). Correlation studies of chemical fertilizers and biofertilizers with growth, yield and nutrient status of olive trees (*Olea europea). Indian Journal of Hill Farming*, **16**, 99-100.

Singh, G. (2013). Guava. Westville Publishing House, New Delhi, 64-65

Singh, J.P., Tomar, S., Chaudhary, M. and Shukla, I.N. (2018). Effect of organic, inorganic and bio- fertilizers on physic-chemical properties of fruits of guava *cv.* L-49. *International Journal of Current Science*, **6**(3), 3233-3238.

Singh, Kirad, K., Barche, S. and Singh, D.B. (2008). Integrated nutrient management in papaya (*Carica papaya* L.) *cv.* Surya. *In II International Symposium on Papaya*, **851**, 377-380.

Singh, R., Sharma, R.R., Kumar, S., Gupta, R.K. and Patil, R.T. (2008). Vermicompost substitution influences growth, physiological disorders, fruit yield and quality of strawberry (*Fragaria* x *ananassa* Duch.). *Bioresource technology*, **99** (17), 8507-8511.

Soni, S., Amit, K., Rajkumar, C., Praval, S.C. and Rahul, K.S.D. (2018). Effect of organic manure and biofertilizers on growth, yield and quality of strawberry (*Fragaria* X *ananassa* Duch) *cv*. Sweet Charlie. *Journal of Pharmacognosy and Phytochemistry*, **2**, 128-132.

Subba Rao, N.S. (1993). Biofertilizers in Agriculture and Forestry. Oxford Publishing Company Private Limited, New Delhi,72-73.

Ulrich, R. (1970). Organic acids, the biochemistry of fruit and their products. Hulme., **1**, 89-115.

Yadav, R.I., Singh, R.K., Jat, A.L., Choudhary, H.R., Pal, V. and Kumar, P. (2013). Effect of nutrient management through organic sources on productivity and profitability of guava (*Psidium guajava* L.) under Vindhyan region. *Environment and Ecology*, **31**(2A), 735-737.

Zothansiami, A. and Mandal, D. (2021). Organic Nutrition with Biofertilizer Enriched Poultry Manure Caused High Yield of Quality Giant Cavendish Banana. *Research Journal of Agricultural Sciences,* **12**(1), 303-306.