Plant Archives Vol. 25, Supplement 1, 2025 pp. 1492-1495 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-1.205

EFFECTS OF ORGANIC TREATMENTS ON QUALITY OF GUAVA (*PSIDIUM GUAJAVA* L.)

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(Date of Receiving : 22-08-2024; Date of Acceptance : 18-10-2024)

ABSTRACT

An experiment was conducted to find out the effect of organic treatments on quality of guava *cv*. "VNR bihi" during the year 2020-21. The treatments included FYM (T_1), Vermicompost (T_2), FYM + Poultry manure (T_3), FYM + *Azotobacter* (T_4), FYM + PSB (T_5), FYM + *Azotobacter* + PSB (T_6), Vermicompost + *Azotobacter* (T_7), Vermicompost + PSB (T_8), Vermicompost + *Azotobacter* + PSB (T_9), FYM + Poultry manure + *Azotobacter* (T_{10}), FYM + Poultry manure + PSB (T_{11}), FYM + Poultry manure + *Azotobacter* + PSB (T_{12}), 50% FYM +Jeevamrit (T_{13}), and Control (T_{14}). Amongst different organic treatments application, treatment (T_{12}) comprising FYM +Poultry manure + *Azotobacter* + PSB induced maximum TSS (12.96%), diameter of seed core (56.60 mm), pulp thickness index (56.74), pectin (1.42%), vitamin C (219.05 mg/100 g pulp) and minimum titratable acidity over control in winter season as well as in rainy season crop. The results also showed that winter season fruits are more superior in quality to rainy season fruits. Therefore, these results suggested that FYM + Poultry manure + *Azotobacter* + PSB offer considerable benefits over conventional farming system particularly with respect to better quality and hazard free produce.
***Keywords* :** Guava, biofertilizers, Azotobacter, PSB (Phosphate Solubilizing Bacteria), vermicompost, Poultry manure and FYM.

Introduction

Guava (*Psidium guajava* L.) is a member of Myrtaceae family and it is one of the most important fruits of tropical and subtropical parts of India. Guava is indigenous to Tropical America. It can be grown in a wide range of soil types from heavy clay to very light sandy soil and performs well in a wide range of pH *i.e.* 4.5-8.2. Guava is rich in nutrients and vitamin C content (75-260 mg/100 g pulp), hence also called the apple of the tropics. The dietary fibres are one of the most important constituents of its seed (Anonymous, 2009).

In this experiment, the emphasis was made to study the effect of organic treatments on quality parameters of Thai guava variety VNR bihi. This variety is developed by VNR nursery a private research organization in the horticulture sector. VNR bihi is India's biggest guava. It is unique in all aspects like big size attractive fruit, average fruit size vary from 300g to 1.2 kg per fruit, appealing fruit color, less seed area, very thick pericarp and an early fruiting.

The productivity rate of guava has started to decline because of the excessive use of chemical fertilizers, pesticides and insecticides in the field. Hence there is a need to find out an alternative sustainable system of farming, which is ecologically sound and economically acceptable. The answer to the problem is the traditional agricultural practices, which are based on natural and organic methods of farming. Among the various alternatives, organic agriculture is gaining acceptance throughout the world. Keeping in view, the demand for organic fruits is increasing, also the high cost of chemical fertilizers, their harmful effects on fruit quality and health of soil made the farmers shift to organic farming.

Guava is consumed fresh along with skin and pulp, so, there is the feasibility of organic farming in its cultivation. Organic farming using organic sources like farmyard manure, crop residue, oil cakes, and animal's excreta is slowly regaining its importance.

Material and Methods

The experiment was conducted during the year 2020-21 at Deen Dayal Upadhyay Centre of Excellence for Organic Farming, CCS Haryana Agricultural University, Hisar. The guava variety used was VNR bihi and the age of plant was two years. The experiment was laid out in a Randomized Block Design with fourteen treatments with three replications *viz*., T_1: FYM (100% replacement of nitrogen through FYM), T_2: Vermicompost (100% replacement of nitrogen through Vermicompost), T_3: FYM + Poultry manure (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure), T_4: FYM + *Azotobacter* (150 ml/plant), T_5: FYM + PSB (150 ml/plant), T_6: FYM + *Azotobacter* (75 ml/plant) + PSB (75 ml/plant), T_7: Vermicompost + *Azotobacter* (150 ml/plant), T_8: Vermicompost + PSB (150 ml/plant), T_9: Vermicompost + *Azotobacter* (75 ml/plant) + PSB (75 ml/plant), T_{10}: FYM + Poultry manure + *Azotobacter* (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure), T_{11}: FYM + Poultry manure + PSB (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure), T_{12}: FYM + Poultry manure + *Azotobacter* + PSB (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure), T_{13}: 50% FYM + Jeevamrit (4 litre per plant in 21 days interval), T_{14}: Control (no application).

Full dose of organic manures and biofertilizers were incorporated under the periphery of trees that is 30 cm away from the trunk and were mixed with soil 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 1

Table 1 : Chemical composition of organic manures

Organic manure	Nitrogen%	Phosphorus%	Potassium%
Farmyard Manure	0.5	0.2	0.5
Vermicompost	1.8	0.7	1.5
Poultry Manure	2.8	2	2.2

The observations were recorded on Total Soluble Solids (%), acidity (%), ascorbic acid (mg/100 g pulp), diameter of seed core (mm), pulp thickness index and pectin content (%). Acidity and Ascorbic acid were estimated by using the method given in AOAC (1990). Ranganna (1979) narrated the method for the estimation of total pectin as calcium pectate in fresh fruits.

Results and Discussion

Quality parameters improved with application of different organic source viz., bio-fertilizer and organic manures. This is clear from the data presented in Table 2 for rainy and winter season guava crop. Application of 80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure + *Azotobacter* + Phosphate Solubilizing Bacteria resulted in highest TSS (11.11% and 12.96%) during rainy and winter season, respectively. Acidity was also influenced by various organic treatments. It seemed to follow a reverse trend compared to the total soluble solids. The lowest acidity 0.19% in rainy season and 0.34% in winter season was observed in 80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure + *Azotobacter* + Phosphate Solubilizing Bacteria, whereas, the highest acidity (0.39% and 0.50%) during rainy and winter season respectively was observed with control. Lodaya and Masu (2019) in guava and Singh *et al.* (2008) in strawberry also observed that the treatment that attributed maximum TSS has the lowest acidity. Lower acidity might be due to the utilization of organic acids in metabolic activities like the respiration process and biodegradable processes (Ulrich, 1970). Ascorbic acid content varied from 139.91 to 103.88 mg/100 g fruit and 219.05 to 165.96 mg/100 g fruit during rainy and winter season, respectively. Highest vitamin C was recorded with 80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure + *Azotobacter* + Phosphate Solubilizing Bacteria during rainy and winter season both.

Best quality parameters with poultry manure and biofertilizers application might be due to quick metabolic conversion of pectin and starch into soluble compounds and translocation of sugars from leaves to the developing fruits. Also, poultry manure contains more potassium content as compared to other organic manures, which is an important mineral in improving fruit quality (Costa *et al.,* 2006). Similar results were also observed by Moustafa (2002) in orange; Devadas and Kuriakose (2002) in pineapple

The diameter of seed core varied significantly (Table 3) with organic manures and biofertilizers. The highest diameter of seed core (51.90 mm and 56.60 mm) in rainy and winter season respectively was observed in 80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure + *Azotobacter* + Phosphate Solubilizing Bacteria. Maximum pulp thickness index was also recorded with 80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure + *Azotobacter* + Phosphate Solubilizing Bacteria during both seasons. The fruit weight and size were increased with organic manures and biofertilizers; consequently, the diameter of seed core and pulp thickness index was increased. The findings are in agreement with the result of Binepal *et al.* (2013) in guava. Pectin content was also more (0.97% and 1.42%) with same treatment in rainy and winter season.

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 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 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), and pectin content (1.42%) during the winter season. Winter season fruits are more superior to rainy season fruits.

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**
T1 (FYM)	9.86	11.39	0.34	0.45	118.04	170.77
T2 (Vermicompost)	9.95	11.44	0.33	0.44	119.31	180.07
T3 (FYM + Poultry manure)	10.62	12.39	0.24	0.38	132.92	214.46
T4 (FYM + *Azotobacter*)	10.08	11.62	0.34	0.43	117.66	180.41
T5 (FYM + PSB)	10.10	11.61	0.33	0.43	121.05	189.73
T6 (FYM + *Azotobacter* + PSB)	10.15	11.87	0.28	0.43	122.33	197.37
T7 (Vermicompost + *Azotobacter*)	10.21	11.97	0.27	0.43	124.67	198.38
T8 (Vermicompost + PSB)	10.32	12.04	0.25	0.41	126.48	205.00
T9 (Vermicompost + *Azotobacter* + PSB)	10.52	12.12	0.24	0.41	130.98	210.38
T10 (FYM + Poultry manure + *Azotobacter*)	10.85	12.55	0.23	0.38	137.33	216.39
T11 (FYM + Poultry manure + PSB)	10.96	12.95	0.22	0.37	138.12	216.97
T12 (FYM + Poultry manure + *Azotobacter* + PSB)	11.11	12.96	0.19	0.34	139.91	219.05
T13 (50% FYM + Jeevamrit)	9.77	11.15	0.37	0.48	106.89	174.74
T14 (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

T1= FYM (100% replacement of nitrogen through FYM), T2 = Vermicompost (100% replacement of nitrogen through Vermicompost), T3= FYM + Poultry manure (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure, T4= FYM + *Azotobacter* (150 ml/plant) T5= FYM + PSB (150 ml/plant), T6= FYM + *Azotobacter* + PSB (75 ml + 75 ml/plant), T7= Vermicompost + *Azotobacter* (150ml/plant), T8= Vermicompost + PSB (150 ml/plant), T9= Vermicompost + *Azotobacter* + PSB (75 ml + 75 ml/plant), T10= FYM + Poultry manure + *Azotobacter* (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure), T11= FYM + Poultry manure + PSB (80% replacement of nitrogen through FYM+20% replacement of nitrogen through poultry manure + PSB, T12= FYM + Poultry manure + *Azotobacter* + PSB (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure), T13= 50% FYM +Jeevamrit (4 litre Per plant in 21 days interval), T14= Control (no application).

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
T1 (FYM)	48.90	55.50	40.57	48.11	0.77	0.85
T2 (Vermicompost)	49.50	55.60	40.08	49.43	0.81	0.87
T3 (FYM + Poultry manure)	50.60	56.00	43.32	54.94	0.93	1.21
T4 (FYM + *Azotobacter*)	49.60	55.60	40.61	49.59	0.81	0.87
T5 (FYM + PSB)	49.70	55.70	41.98	50.12	0.82	1.01
T6 (FYM + *Azotobacter* + PSB)	49.80	55.70	42.06	52.10	0.87	1.04
T7 (Vermicompost + *Azotobacter*)	50.00	55.80	42.45	53.11	0.88	1.09
T8 (Vermicompost + PSB)	50.00	55.90	42.91	53.28	0.89	1.10
T9 (Vermicompost + *Azotobacter* + PSB)	50.30	56.00	43.47	53.84	0.91	1.19
T10 (FYM + Poultry manure + *Azotobacter*)	50.60	56.30	43.77	54.71	0.95	1.35
T11 (FYM + Poultry manure + PSB)	50.80	56.60	44.21	55.36	0.96	1.40
T12 (FYM + Poultry manure + *Azotobacter* + PSB)	51.90	56.60	45.74	56.74	0.97	1.42
T13 (50% FYM + Jeevamrit)	49.00	54.00	39.76	46.51	0.75	0.82
T14 (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

T1= FYM (100% replacement of nitrogen through FYM), T2 = Vermicompost (100% replacement of nitrogen through Vermicompost), T3= FYM + Poultry manure (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure, T4= FYM + *Azotobacter* (150 ml/plant) T5= FYM + PSB (150 ml/plant), T6= FYM + *Azotobacter* + PSB (75 ml + 75 ml/plant), T7= Vermicompost + *Azotobacter* (150ml/plant), T8= Vermicompost + PSB (150 ml/plant), T9= Vermicompost + *Azotobacter* + PSB (75 ml + 75 ml/plant), T10= FYM + Poultry manure + *Azotobacter* (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure), T11= FYM + Poultry manure + PSB (80% replacement of nitrogen through FYM+20% replacement of nitrogen through poultry manure + PSB, T12= FYM + Poultry manure + *Azotobacter* + PSB (80% replacement of nitrogen through FYM + 20% replacement of nitrogen through poultry manure), T13= 50% FYM +Jeevamrit (4 litre Per plant in 21 days interval), T14= Control (no application).

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