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EFFECT OF BIO-FERTILIZER AND ORGANIC MANURES ON YIELD AND QUALITY OF GUAVA CV. RED FLESHED

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ABSTRACT

An experiment was conducted on 4-year old guava trees during 2007-08 to study the "Effect of Bio-fertilizer and organic manures on yield and quality of guava cv. Red Fleshed". Average maximum fruit yield for the rainy and winter season crop was 38.23 kg/tree and 19.03 kg/tree respectively, with 250g Azotobactor + 20 kg FYM. Vermicompost (20kg/tree) had significantly higher yield over control and was recommended as 3rd best treatment among all regarding the yield. Highest fruit weight 198.2g and 299.2g, fruit length 5.9cm and 7.19cm and fruit breadth 7cm and 7.41cm for rainy and winter season crop, respectively, were obtained with the application of Phosphobacterin (50ml/tree), which was, however at par with that obtained with VAM (10 kg/tree). Highest TSS (16.07 ^{O}B and 17.9 ^{0}B) for rainy and winter season crop, respectively, as well as Vitamin C (189.57 mg/100g) was obtained with the application of VAM. Acidity was not influenced by the application of bio-fertilizer. However, acidity was highest (0.54 %) under FYM treatment. From the present study, it can be concluded that the application of bio-fertilizer was more effective than organic manures in enhancing fruit growth parameters in guava in both seasons. When bio-fertilizers were grouped together, P-solubilizers were found to have more beneficial influence on fruit physico-chemical characteristics of guava cv. Red Fleshed as compared to N-fixers.

Keywords: *Bio-fertilizer, organic manures, Red Fleshed guava, yield and quality.*

INTRODUCTION

Extensive and continuous use of chemicals, both fertilizers and pesticides, in crops has led to several detrimental effects on soil and environment. Chemical fertilizers, considered an expensive input for developing countries like India, are in short supply and international demand for organic produce has necessitated the need for alternative agrotechniques for cultivation of crops. Organic farming, using organic sources like FYM, animal excreta, oil cakes, green manures, crop residues etc., as source for supplying nutrients to crops in the past, is slowly regaining importance. It has more relevance to horticultural crops, which are largely consumed in fresh form immediately after harvest, unlike the field crops. Guava (*Psidium guajava* L.) is one such horticultural crop, where fruits are consumed after harvest along with skin and pulp and hence, there is feasibility of organic farming in its cultivation. Though systematic work on manuring of guava started since 1960 in India and region-wise schedules were recommended including both organic and inorganic manures however, use of biofertilizers and organic manures for enhancing crop productivity and quality especially in usar

soils have not been studied. But work has not been done on cv. Red Fleshed with application of bio-fertilizer and organic manures. Therefore the present investigation was carried out to find out the effect of bio-fertilizer and organic manures on yield and quality of guava cv. Red Fleshed in usar soils of UP.

MATERIALS AND METHODS

The investigation was carried during the year 2007-08 in guava orchard situated at the Horticultural Research Farm of the Department of Applied Plant Sciences (Horticulture), BBAU, Lucknow. The soil of the experimental site was saline as it was analyzed in the laboratory of Indian Institute of Sugarcane Research (ICAR), Lucknow. 36 four year-old plants of guava cv. Red Fleshed was taken for study. The experiment consisted of 12 treatment combinations and replicated thrice.

Table – 1. Treatments and their combinations

Treatments	Treatment combinations
T_1	20kg FYM
T_2	Dhaincha – grown under the basin of the tree
T_3	250g *Azotobactor*
T_4	250g *Azospirillum*
T_5	50ml Phosphobacterin
T_6	50g Microphos
T_7	10 kg VAM
T_8	250g *Azotobactor* + 20 kg FYM
T_9	250g *Azospirillum* + 20 kg FYM
T_{10}	20kg Vermicompost
T_{11}	Vermiwash + 20kg FYM
T_{12}	Sunhemp – grown under the basin of the tree

20 kg FYM was inoculated with 250g *Azotobactor* and 250g *Azospirillum* and were applied in a circular trench at a distance of 60 cm from the trunk on 16th March, 2007 for rainy season crop and again on 20th July, 2007 for winter season crop and Vermiwash was applied 2 times as a foliar spray in the month of April and again in September at 15 days interval in the ratio of 1:7 with water. For the determination of yield, the numbers of fruits were counted for each replication and average number of fruits per tree was calculated. Average weight of fruit was worked out by weighing 5 fruits from each treatment on electronic balance. The length and breadth of each fruit was measured with the help of vernier calipers. TSS of the fruit was recorded with the help of hand refractometer (Erma and Japan, 0-32^{0}B). The acidity and ascorbic acid in fresh fruit pulp was estimated as per methods. Data were subjected to relevant statistical analysis.

RESULTS AND DISCUSSION

1. Effect of bio-fertilizer along with organic manure on yield of guava cv. Red Fleshed.

It is evident from the Table -1 that bio-fertilizer and organic manure had significant effect on fruit yield. Average maximum fruit yield (38.23kg/tree) and (19.03 kg/tree) was obtained with treatment -T8 *Azotobactor* 250g + FYM @ 20 kg/tree followed by (35.75kg/tree) and (17.21 kg/tree) with *Azotobactor* only during, rainy and winter season, respectively. Similar results have been reported with application of FYM and *Azotobactor* in Guava (40.11 kg/tree) (Ram and Rajput, 1998; Ram and Pathak, 2007). Yield and yield attributing characters viz. fruit yield, fruit weight, fruit length, and fruit breadth were significantly affected by the organic manures as well as bio-fertilizer treatments or their combination. These findings are in conformity with the findings of Ram and Nagar (2004**)** in guava who reported highest yield of 13.69 kg fruit by applying 20 kg FYM + 200 g *Azotobactor*. Vermi-compost also had significantly higher yield over control and was 3rd best treatment among all regarding the yield. Average fruit yield with Vermi-compost application was (31.93 kg/tree) and (16.23 kg/tree) for rainy and winter season, respectively. The increase in yield in vermi-culture treatments over control may be attributed to increase in level of readily available N in the presence of both dead and live worms which often enhanced growth mechanism in plants. (Barve, 1992). These findings were also in accordance with the findings of Venkatesh (1995) in grape and Athani *et al.* (2007) in guava.

Table-2. Effect of Bio-fertilizer and Organic manures on physical characteristics of guava cv. Red –Fleshed in the rainy and winter season crop.

Treatments	Yield (kg/tree)		Weight (g)		Length (cm)		Breadth (cm)	
	Rainy season	Winter season	Rainy season	Winter season	Rainy season	Winter season	Rainy season	Winter season
T_1	10.05	5.54	122.13	172.80	5.11	6.39	5.95	6.9
T_2	11.56	5.97	102.35	154.50	5.12	6.40	6.31	7.4
T_3	35.75	17.21	179.60	229.13	5.15	6.45	6.37	7.48
T_4	25.29	13.08	168.04	227.56	5.04	6.37	6.30	7.41
T_5	22.16	12.52	198.20	249.20	5.9	7.19	7.04	8.06
T_6	20.24	10.15	183.95	233.03	5.21	6.56	76.61	7.69
T_7	25.59	12.72	191.84	240.50	5.63	6.86	6.76	7.87
T_8	38.23	19.03	183.57	231.74	5.15	6.48	6.49	7.58
T_9	29.10	15.03	175.57	228.91	5.07	6.38	6.40	7.51
T_{10}	31.93	16.23	188.23	240.29	5.54	6.85	6.71	7.81
T_{11}	19.03	9.51	186.68	237.92	5.53	6.82	6.68	7.78
T_{12}	11.10	6.44	93.14	144.08	5.08	6.38	5.70	6.78
CD at 5%	1.13334	0.60923	1.83976	2.000666	0.06464	0.0339	0.0577	0.0455

Table-3- Effect of Bio-fertilizer and Organic manures on bio-chemical characteristics of guava cv. Red –Fleshed in the rainy and winter season crop.

Treatments	T.S.S. (^{0}B)		Acidity (%)		T.S.S./acidity ratio		Ascorbic acid (mg/100g)	
	Rainy season	Winter season	Rainy season	Winter season	Rainy season	Winter season	Rainy season	Winter season
T_1	11.17	13.39	0.38	0.54	29.30	24.64	61.17	158.97
T_2	8.58	10.79	0.29	0.46	29.14	23.28	68.88.	170.70
T_3	14.62	16.83	0.32	0.48	44.50	35.07	60.82	129.85
T_4	14.21	16.43	0.34	0.50	41.45	32.44	65.33	164.50
T_5	14.62	16.83	0.38	0.44	38.14	38.270	70.77	173.77
T_6	14.52	16.70	0.38	0.43	37.99	38.275	68.18	169.91
T_7	16.07	17.90	0.29	0.46	53.75	38.92	71.86	189.57
T_8	40.73	16.94	0.34	0.51	42.66	33.17	85.18	166.45
T_9	14.44	16.63	0.24	0.40	59.11	41.60	95.43	177.11
T_{10}	14.15	17.30	0.19	0.35	79.73	49.47	77.08	156.61
T_{11}	14.14	16.68	0.29	0.45	48.77	36.53	96.72	178.79
T_{12}	8.49	10.84	0.21	0.37	40.34	38.32	75.23	156.70
CD at 5%	0.1887	0.1227	0.00496	0.02860	0.97882	1.73439	0.76057	1.42184

Among the various organic manures, the minimum yield (10.05 kg/tree) was recorded with FYM during rainy season while it was nearly 5.97 kg/tree with FYM during winter season. These results are in conformity with those of Naik and Babu (2007) in guava. Increase in yield and other yield components apparently result from improved soil chemical and physical properties that were induced by organic manure application (Mahendra *et al.*, 1998).

2. Effect of bio-fertilizer along with organic manure on physical characteristics viz. fruit weight, fruit length and fruit breadth of guava fruit cv. Red Fleshed.

The fruit growth parameters responded significantly to various treatments. The data in Table-1 for rainy and winter season, respectively, indicated that the application of bio-fertilizer was more effective than organic manures in enhancing fruit growth parameters. The increased availability of nutrients improved the fruit growth parameters which might have reflected and increase in fruit weight, length and breadth. Highest fruit weight (198.2 g and 299.2g), length (5.9 and 7.19 cm) and breadth (7 and 7.41 cm) were obtained with the application of Phosphobacterin during rainy and winter seasons, respectively, which was, however at a par with that obtained with VAM. Similar results have been obtained by Dey *et al.* (2005) in guava. Among the different organic manures viz. FYM, sunhemp, Dhaincha, Vermicompost and vermiwash; Vermicompost application proved best and the fruit growth was superior. The fruit of Vermicompost ranked 3rd in average fruit weight while treatment-T_{12} sunhemp resulted in minimum fruit growth. Almost similar results were obtained by Baphana (1992) in Sapota and by Athani *et al*. (2007) in guava. Improved fruit size viz. length, breath was also observed with application of FYM inoculated with *Azotobactor*. Similar results were also observed by Ram and Rajput (1998) in guava cv. Allahabad Safeda.

3. Effect of bio-fertilizer along with organic manures on Chemical characteristics viz. TSS, Acidity, TSS/Acidity ratio and Ascorbic acid content of guava fruit cv. Red Fleshed. Quality parameters were 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. All the treatments increased the TSS, acidity and ascorbic acid over control. Such result may be attributed to the better vegetative growth of the treated plants which resulted in higher quantities of photosynthates (starch, carbohydrates etc.) and their translocation to the fruits, thus increasing the contents of various quality parameters (Naik and Babu, 2007). In the present study, application of VAM resulted in highest TSS (16.07 ^{0}B) and (17.9 ^{0}B) during rainy and winter season, respectively. Among the various bio-fertilizers, application of P - solubilizers significantly influenced the physico - chemical characteristics of fruits compared with control. Ascorbic acid content varied from 96.72 to 60.82 mg/100g and 189.5 to 158.97 mg/100g during rainy and winter season respectively. Application of P – solubilizers significantly influenced Vitamin C content in guava over the control (61.17 and 158.97 mg/100g) during rainy and winter season, respectively. Highest Vitamin C was recorded with VAM (189.57 mg/100g) during winter season while 96.72mg/100g with application of Vermiwash followed by Vermicompost and VAM during rainy season. This is in conformity with the results of Dey *et al.,* 2003 which was 149.3 mg/100g. Kadam and Patil (1993) also observed positive effect of P in Sardar guava. Ram and Rajput (2004) observed good response of *Azotobactor* under U.P. condition, however their study did not include P-solubilizers. When bio-fertilizer were grouped together, P – solubilizers were found to have more beneficial influence on fruit physico-chemical parameters of guava cv. Red Fleshed than that of N-fixers. Beneficial effect for quality parameters of Vermicompost is due to the presence of macro and micro-nutrients and vital plant promoting substance (Bano *et al.,* 1987). Results similar to present investigation was also obtained earlier by Athani and Ustad *et al.* (2007) in guava cv. Sardar. The activity of earthworms in the soil might have helped for increased yield in the above treatments. Similar results were also obtained by Venkatesh (1995) in grapes.

Acidity was not influenced by the application of bio-fertilizer. Acidity content in fruits varied from the 0.38 to 0.19 per cent and 0.54 to

0.35 per cent during rainy and winter season, respectively, due to the application of different treatments but variation among treatments did not differ significantly. Acidity was highest (0.54 per cent) under FYM treatments. This is in conformity with results of Naik and Babu (2007). Ram and Pathak (2004) and Ram and Rajput (1998) also reported improvement in fruit quality parameters with application of organic manures and bio-fertilizer. Linder (1985) noticed quality improvement in organically grown guava fruit. Thus, based on physico-chemical characteristics of fruits, efficacy of bio-fertilizer followed the order: Phosphobacterin > VAM > microphos > *Azotobactor* > *Azospirillum*. This is in conformity with the findings of Dey *et al.* (2005).

CONCLUSION:

Thus, on the basis of results, summarized above, it can be concluded that the application of bio-fertilizer was more effective than organic manures in enhancing fruit growth parameters. When bio-fertilizer were grouped together, P – solubilizers were found to have more beneficial influence on fruit physico-chemical characteristics of guava cv. Red Fleshed than that of N-fixers. Based on physico-chemical characteristics of fruits, efficacy of bio-fertilizer followed the order: Phosphobacterin > VAM > microphos > *Azotobactor* > *Azospirillum*. Among the different organic manures viz. FYM, Sunhemp, Dhaincha, Vermi-compost and Vermiwash; Vermi-compost application proved best and the fruit growth was superior. The fruit of Vermi-compost ranked 3rd in average yield and fruit weight among all the treatments applied. Winter season guavas were found better in terms of quality or physico-chemical characteristics than rainy season guava fruits. However, further repetition of the experiment is needed to get more improvement in the results.

REFERENCES:

Athani, S.I., Ustad, A. I., Prabhuraj, H.S., Swamy, G.S.K., Patil, P.B. and Kotikal, Y.K. (2007). Influence of Vermi-compost on Growth, Fruit Yield and Quality of Guava cv. Sardar. Proceedings of the Ist International Guava Symposium at CISH, Lucknow. *Acta Horticulturae*. 735: 381-385.

Baphna, P.D. (1992). Organic farming in sapota. Proc. National Seminar on Organic Farming. MPKVOCA, Pune, pp. 55-57.

Barve, J.V. (1992). Vermiculture experience in grape cultivation. Congress on Traditional Science and Technology, Inst. Tech., Mumbai, pp.10-13.

Dey, P.; Rai M.; Kumar, S.; Nath V.; Das, B. and Reddy, N. (2005). Effect of bio-fertilizer on physico - chemical characteristics of guava (*Psidium guajava* L.) fruit. Indian Journal of Agriculture Sciences, 75(2):95-96.

Kadam, A.S. and Patil, V.K. (1993). Phosphorus nutrition studies in guava. Annals of Plant Physiology. 7(2): 150-2.

Mahendra, S.B.; Kenneth, S.D.; Venkateswara, R.S. and Vencent, E.P. (1998). Application of poultry manure influence Thompson Seedless grape production and soil properties. Hort. Sci., 23 (6): 1010 – 1012.

Naik, M.H. and Babu, H.R. (2007). Feasibility of Organic Farming in guava (*Psidium guajava* L.). Proceedings of the Ist International Guava Symposium at CISH, Lucknow. *Acta Horticulturae*. 735. pp. 365-372.

Ram , R.A., and Pathak, R.K. (2007). Integration of Organic Farming Practices for Sustainable Production of Guava: A Case Study. Proceedings of the Ist International Guava Symposium at CISH, Lucknow. *Acta Horticulturae*. 735. pp. 357-363.

Ram, R.A., Bhriguvanshi, S.R., Garg, N. and Pathak, R.K. (2007). Studies on Organic Production of guava (*Psidium guajava* L.) cv. Allahabad Safeda. Proceedings of the Ist International Guava Symposium at CISH, Lucknow. *Acta Horticulturae*. 735. pp. 393-379.

Ram, R.A. and Nagar, A.K. (2004). Effect of different organic treatments on yield and quality of guava (*Psidium guajava* L.) cv. Allahabad Safeda. National symposium on organic farming in horticultural crops for sustainable production, 29-30 August, CISH, Lucknow , Proceeding, pp. 25-26.

Ram , R.A. and Rajput, M.S. (2004). Role of bio-fertilizer and manures in production of guava (*Psidium guajava* L.) cv. Allahabad Safeda. Haryana Journal of Horticultural Sciences. 29 (3-4):193-4.

Ram , R.A. and Rajput, M.S. (1998). Effect of organic manures and bio-fertilizers on growth, yield and quality of guava cv. Allahabad Safeda. Int. J. Mendel, 15 (1-2) : 17-18.

Ranganna, S. (1991). Handbook of analysis and quality control for fruit and vegetable products third edition, Tata Mc Graw Hill Pub. Co. Ltd. New Delhi, India.

Singh, A. and Singh, S.P. (2004). Response of banana (Musa sp.) to Vescicular – Arbuscular Mycorrhizae and varied levels of inorganic fertilizers. Indian Journal Horticulture 61 (2):109-113.

Venkatesh, (1995). Response of grapes (cv. Thompson Seedless) to Vermicompost and in-situ vermiculture. M.Sc. (Agri.) Thesis, Univ. Agri. Sci., Dharwad.