

Original Research Article

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Effect of Integrated Nutrient Management on Growth, Yield and Economics of Guava (*Psidium guajava* L.) cv. Allahabad Safeda

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ABSTRACT

Keywords

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A field experiment was conducted in the guava orchard of a progressive farmer, Barehi, Allahabad Road, Rewa (M.P.) during 2015 and 2016 to study the integrated nutrient management (INM) on growth, yield and economics of guava. The INM treatment T₁₃ (50% NPK (RDF) + 25 kg FYM + 5 kg vermicompost /tree gave maximum plant and canopy height, spread (E-W and N-S), plant girth, leaf length and width and tree volume. This was closely followed by T₇ [100% NPK + Zn (0.5%) + B (0.2%)] + Mn (1%) foliar spray twice to organic mulching 10 cm thick) and then T₄ (100% NPK + organic mulching). Maximum number of fruits per tree, fruit weight and yield per tree were recorded under the same treatment T₁₃, followed by T₇ and then T₄. All the treatments were significantly superior to control. The treatment T₁₃ recorded maximum fruit yield (91.8 q/ha), as well as net income up to Rs.172520/ha with B: C ratio 4.03. This was equally followed by T₇ and T₉ (88.6 to 89.4 q/ha and Rs.165020.00 and Rs.169220.00/ha).

Introduction

Guava is one of the most promising fruit crops of India and is considered to be one of the exquisite nutritionally valuable and remunerative crops (Singh *et al.*, 2000). In Rewa region, guava is grown in an area of 277.0 ha with a production of 2019.33 tones and productivity 7.29 tones/ha. The stagnation and decline in the productivity of guava in Rewa region is due to decline in the soil organic matter, over withdrawal of nutrients reserve, loss of nutrients and non-availability of cost effective fertilizers. Research evidences are encourageous towards the integrated use of organic + inorganic +

biofertilizers which may improve the soil productivity and crop yield with better quality (Singh *et al.*, 2011). Vermicompost also contains plant growth regulating materials like humic acid, auxins, gibberellins and cytokinins. Biofertilizers offers economically attractive and ecologically sound modern tool for augmenting nutrient supply to the growing plants. Such information was lacking for Rewa region hence the present work was taken up.

Materials and Methods

The present study was carried out in the guava Orchard of a Progressive Farmer, Barehi,

Allahabad Road, Rewa (M.P.) during 2015 and 2016. The experiment was conducted on clay-loam soil which was neutral in reaction (pH 7.3), high in available nitrogen (341 kg/ha) and phosphorus (26.8 kg/ha) and medium in available potash (288 kg/ha). The experiment consisted of 16 treatments (Table 1) keeping two plants in each treatment, providing total ninety six plants in the experiment. The treatments were arranged in randomized block design and replicated thrice. The guava variety Allahabad Safeda was taken as the test variety. The whole of the FYM and vermicompost was applied as a basal dose on the onset of monsoon. Required doses of fertilizers were applied in two split doses in the month of July and August and then bio-fertilizers were applied one week after each application of inorganic fertilizer.

Results and Discussion

Vegetative growth

The vegetative growth characters of 6 years old Allahabad Safeda trees have been evaluated after applying IPNM treatments by recording the observations on plant height, canopy height, circumference of rootstock, plant spread (E-W and N-S), leaf length and width and volume per tree. These vegetative growth parameters i.e. plant height, canopy height and plant girth were influenced upto significant extent due to treatments but it gave non-significant effect on leaf width.

The treatment T₁₃ resulted significant increase in the plant and canopy height, girth, plant spread in both the directions (N-S and E-W) and leaves observations and volume of tree over control and other treatments (Table 1). The second and third best treatments were T₇ and T₄, respectively. The most beneficial effect of these treatments might be due to plant growth promoters and improvement in the physical, chemical and biological

properties of the soil in long-term on repeated applications. It might have also stimulated soil micro-biological activities.

In fact, leaf is the factory for the conversion of solar energy into the chemical energy by the process of photosynthesis. The adequate supply of multinutrients, resulted in their proper utilization in the process of photosynthesis due to increase in the leaf number and leaf size i.e. photosynthetic area. Thus, the increased production of photosynthates (food material) brought about increase in the vegetative growth parameters. Leaf is the principal site of plant metabolism and the changes in nutrients supply are reflected in the composition of leaf.

The present findings corroborate with those of Athani *et al.*, (2007), Naik and Babu (2007), Ram *et al.*, (2007), Ram and Pathak (2007), Kumar *et al.*, (2007), Dutta *et al.*, (2009), Patel *et al.*, (2009), Shukla *et al.*, (2009), Dwivedi (2013) and Agnihotri *et al.*, (2013) who found that vermicompost with FYM and inorganic fertilizers resulted increase in the vegetative growth.

Yield parameters

The fruits/tree and fruit weight as well as the yield of fruits per tree and per hectare were influenced significantly in T₁₃ (50 per cent dose of recommended fertilizer + 25 kg FYM + 5 kg vermicompost), followed by T₄ (100% NPK + 10 cm thick organic mulching), T₇ (100% dose of recommended fertilizer + Zn + B + Mn + organic mulch), T₉ (75% NPK + micronutrients + organic mulching) and T₁₄ (50% NPK + 25 kg FYM + 250 g *Pseudomonas fluorescence*). It might be due to better nutritional environment due to application of organic matter improve the soil health by improving physico-chemical and biological activities and also stimulate soil microbiological activity.

Table.1 Vegetative growth and yield of guava cv. Allahabad Safeda as influenced by integrated nutrient management (Mean of two years)

S. No.	Treatments	Plant height (m)	Canopy height (m)	Plant girth (m)	Plant spread E-W (m)	Plant spread N-S (m)	Leaf length (cm)	Leaf width (cm)	Tree volume (m ³)	Fruits/tree	Fruit weight (g)	Fruit yield (kg/tree)	Fruit yield (q/ha)	Net income (Rs./ha)	B:C ratio
T ₁	Control (no fertilizers)	2.48	2.08	0.26	2.13	1.89	4.96	2.24	166	128	192	20.2	46.3	73870	2.76
T ₂	100% NPK (RDF) 500:200:500NPK/tree	3.62	2.65	0.28	3.50	3.36	6.41	3.02	396	181	233	26.8	79.5	147770	3.99
T ₃	100% NPK + Zn(0.5%)+ B (0.2%)+ Mn(0.1%)	3.65	2.74	0.28	3.54	3.42	6.60	3.14	302	184	237	29.0	80.6	148520	3.80
T ₄	100% NPK + organic mulching (10 cm thick)	3.77	3.03	0.31	3.76	3.49	6.88	3.05	316	192	243	29.7	87.9	165270	4.03
T ₅	75% NPK (RDF)	3.61	2.76	0.28	3.65	3.44	5.81	2.91	274	175	221	25.3	76.7	141270	3.80
T ₆	75% NPK + Zn + B + Mn	3.65	2.70	0.28	3.62	3.49	5.98	2.93	279	180	228	27.1	78.1	143570	3.78
T ₇	100% NPK + Zn + B + Mn + organic mulching	3.86	2.94	0.31	3.79	3.62	6.70	3.31	364	195	252	32.9	88.6	165020	3.92
T ₈	75% NPK + organic mulching	3.72	2.82	0.29	3.67	3.42	6.12	3.04	286	190	229	30.6	79.7	146370	3.77
T ₉	75% NPK + Zn + B + Mn + organic mulching	3.77	2.83	0.30	3.83	3.39	6.43	3.16	306	193	241	32.1	89.4	169220	4.12
T ₁₀	50% NPK + 25 kg FYM + <i>Trichoderma</i>	3.73	2.91	0.28	3.71	3.52	6.11	3.06	300	179	230	28.6	87.5	156920	3.54
T ₁₁	50% NPK + 50 kg FYM + <i>Azospirillum</i>	3.82	2.94	0.30	3.74	3.55	6.29	3.18	299	176	228	29.1	86.6	154530	3.49
T ₁₂	50% NPK + 25 kg FYM + <i>Azotobacter</i>	3.76	2.76	0.31	3.76	3.60	6.49	3.23	295	174	231	29.6	85.5	151780	3.45
T ₁₃	50% NPK + 25 kg FYM + 5 kg vermicompost	3.93	3.06	0.33	3.85	3.66	6.99	3.51	369	200	258	34.3	91.8	172520	4.03
T ₁₄	50% NPK + 25 kg FYM + <i>Pseudomonas</i>	3.76	2.88	0.31	3.68	3.58	6.15	3.26	302	186	233	27.1	87.0	153820	3.42
T ₁₅	50% NPK + 25 kg FYM + <i>Trichoderma</i> + <i>Pseudomonas</i>	3.87	2.91	0.28	3.70	3.55	6.37	3.32	334	187	236	28.6	88.1	156570	3.46
T ₁₆	50% NPK + 25 kg FYM + <i>Aspergillus niger</i>	3.84	2.86	0.27	3.66	3.58	6.00	3.07	318	179	228	26.7	84.3	147570	3.34
	S.Em±	0.21	0.17	0.009	0.33	0.33	0.408	0.30	8.41	4.45	9.70	1.46	2.45	--	--
	C.D. at 5%	1.00	0.80	0.039	1.50	1.53	1.910	NS	39.40	20.83	45.24	6.86	11.47	--	--

Athani *et al.*, (2007 a, b) reported that organic and inorganic fertilizers on guava cv. Sardar. Application of 75% RDF + 10 kg vermicompost was found significant in yield and fruit quality. Ram *et al.*, (2007) reported that the application of different fertilizers, organic manures and biofertilizers improve the vegetative growth, number of fruits and yield of guava cv. Sardar. Similar findings have been reported by Kumar *et al.*, (2009), Dutta *et al.*, (2009), Patel *et al.*, (2009), Shukla *et al.*, (2009), Agnihorti *et al.*, (2013) and Dwivedi (2013).

Mulching is very beneficial. It reduces the loss of moisture from soil, enhances the rate of penetration of run water and control of growth of weeds, thus eliminating the competition between the weeds and the guava trees. It also encourage the development of better root system of young guava plants. Verma *et al.*, (2005) found that response of mulching materials method of P and K fertilizers in apple cv. Red Delicious. It was conspicuous and significant in yield and soil health.

Application of integrated fertilizers, organic manure and biofertilizers as in T₇ to T₁₆ also increased the yield in guava cv. Allahabad Safeda. It may be due to increased the rhizosphere microbial activity and larger quantity of nutrients of the soil. Ram *et al.*, (2007) found that application of different fertilizers, organic manures and biofertilizer improve the vegetative growth, number of fruits and yield of guava cv. Sardar. The similar effect were found by Monga *et al.*, (2002), Mitra *et al.*, (2007), Agnihotri *et al.*, (2013) and Dwivedi (2013).

Yield and economics

Yield attributes and therefore economics of different treatments were significantly influenced by the application of organic

manures, inorganic fertilizes, biofertilizers and their combinations. The treatment T₁₃ gave the highest yield (91.8 q), followed by T₇ (89.4 q), T₁₄ (88.1 q) and T₆ (88.6 q/ha), whereas the lowest yield was obtained under T₁ (46.3 q/ha). Eventually the similar trend was also observed regarding the economics of different treatments. The maximum net profit per hectare was obtained from T₁₃ (Rs. 172520/ha), followed by T₉ (Rs.169220/ha) and then T₄ and T₇, while it was minimum under T₁ control (Rs.73870/ha). Benefit: Cost ratios were also in the higher range in these treatments. The higher income was due to higher fruit yield in these treatments. Shukla *et al.*, (2009) observed that the combined application of 50 per cent dose of recommended NPK + 50 kg FYM + 250 g *Azotobactor* gave significantly higher yield per plant 28.95 kg with higher B: C ratio 2.53. Similar findings have been reported by Athani *et al.*, (2007), Dwivedi *et al.*, (2010) and Binopal *et al.*, (2013).

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