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

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ABSTRACT

A field experiment was conducted at farmers' fields in Khargone during 2018-19 and 2019-20 with a view to assess the effect of integrated nutrient management on growth, yield and economics of guava (*Psidium guajava* L.) cv. Allahabad Safeda. Treatments comprised of T_1 Farmers' practice (RDF 600 g: 400 g : 300 g NPK /tree) and T_2 (50% RDF+ 50 kg FYM + *Azospirillum* 100 g/ tree + *PSB* 100 g/ tree) replicated at ten farmers' field. T_2 recorded significantly higher plant height increment (0.74 m), canopy spread N-S (0.52 m), E-W (0.57 m), shoot diameter (4.24 mm), shoot length (22.65 cm), fruit length (7.43 cm), fruit diameter (7.64 cm), number of fruits/tree (426.84), fruit weight (222.32 g), yield/tree (94.73 kg) and yield/ha (260.65 q). The maximum net return of Rs 264347/- ha and benefit cost ratio of 3.63 were recorded with treatment T_2 whereas, the minimum net return of Rs 205325/ ha and benefit cost ratio of 3.33 were recorded in T_1.

Key Words: Guava, Integrated Nutrient Management, Growth, Yield, Economics.

INTRODUCTION

Guava (*Psidium guajava* L.), popularly known as the apple of the tropics, is one of the widely grown fruit crop of tropical & sub-tropical climate including arid and semi-arid regions of India, belongs to the family Myrtaceae. In India, owing to its wider adaptability guava can be grown in diverse soils and agro-climatic regions at comparatively affordable cost of the cultivation. Profuse bearing, nutritive quality of fruits and ability to fetch good profit, have made guava popular among the growers. Guava is cultivated in many countries such as, India, Mexico, Thailand, Spain, Portugal, Southern France, Israel, Panama, Malaysia, Kenya, USA, New Zealand, Philippines, China, Pakistan, Australia and some African countries. The first three ranking countries for guava cultivation are India, Brazil and Mexico (Singh, 2009).

After Mango, Banana and Citrus, the guava stands fourth most important fruit in India (Ray, 2002). In India, guava is grown over an area of 264.9 thousand hectares and production of 4053.5 thousand Mt with a productivity of 15.3 Mt/ha. Its cultivation in India is concentrated mainly in Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal and Chhattisgarh. The area and production of guava in Madhya Pradesh are 35.08 thousand hectares and 686.70 thousand Mt, respectively (Horticultural statistics at a Glance 2018). Major guava producing districts in Madhya Pradesh are Khargone, Sehore, Rewa, Vidisha, Katni, Indore and Bhopal.

The concept of integrated nutrient management includes organic, inorganic and bio-fertilizers, which cater to the growing needs of nutrients under intensive cultivation. In integrated plant nutrition to improve the soil fertility and nutrient supply to an optimum level for sustaining the productivity. Guava plant is very hardy with respects to soil and agro-climatic conditions and responds to manuring in terms of increasing fruit production and quality. Experimental results have revealed that guava responds to balanced use of inorganic fertilizers along with organic manures. (Naik and Babu, 2007; Dwivedi *et al*, 2010 and Dutta *et al*, 2009).

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Imbalanced application of chemical fertilizers is a common practice of the farmers, which creates problem of groundwater and environmental pollution through leaching, volatilization, denitrification and wastage. Imbalanced use of fertilizers has created disturbed NPK ratio in soils. The condition of multi-nutrient deficiencies and overall decline in the fertility of soil has been reported due to non- judicious fertilizer use (Chhonkar, 2008). To overcome such problems increasing awareness is needed about an alternate agriculture system comprising integrated plant nutrient management, which would improve and maintain of soil fertility.

MATERIALS AND METHODS

The field experiment was conducted for two consecutive years i.e., during 2018-19 and 2019-20 at ten farmers' fields of district Khargone of Nimar Plains Zone of Madhya Pradesh. Situated at the Latitude of 21.833525 (DMS Lat 21° 50' 0.6900'' N) and longitude of 75.614990 (DMS Long 75° 36' 53.9640'' E). The maximum temperature ranges from 43 to 46° C during summer season and minimum temperature fluctuates between 6 to 10°C during winter season. The average annual rainfall of the region is 835 mm. The treatments comprised T_1 Farmers' practice (RDF 600 g: 400 g: 300 g NPK /tree) and T_2 (50% RDF + 50 kg FYM + Azospirillum 100 g/ tree + PSB 100 g/ tree) replicated at ten farmers' field.

The whole organic manure was applied as a basal dose on the onset of monsoon along with bio-fertilizers. Then required doses of fertilizers were applied in two split doses in the month of July and August, respectively. Irrigation was made immediately after the application of fertilizers. Nitrogen was applied through Urea and DAP. Phosphorus was given through Diammonium phosphate and Potassium was given through Muriate of Potash. The data on plant growth, yield and yield attributes, cost of cultivation, gross return, net return and benefit cost ratio were analysed as per paired "t" test of significance.

RESULTS AND DISCUSSION

Vegetative Growth

The vegetative growth characters of guava cv. Allahabad Safeda trees have been recorded after applying INM. Attributes of plant height, canopy spread (E-W and N-S), shoot diameter, shoot length, leaf width, leaf length and number of leaves per plant were found greater over T_1. Treatment T_2 recorded significant increase in the plant height increment (0.70 m), canopy spread increment N-S (0.52 m), E-W (0.57 m), shoot diameter (4.24 mm), shoot length (22.65 cm), fruit length (7.43 cm) and fruit diameter (7.64 cm) over T_1 (Table 1). The beneficial effect of these treatments might be due to improvement in the physical, chemical and biological properties of the soil, which might have stimulated soil micro-biological activities.

Table 1. Effect of integrated nutrient management on growth of guava (average of two years).

Treatment	Plant height increment (m)	Canopy spread increment (m) N-S	Canopy spread increment (m) E-W	Shoot diameter (mm) at 90 days	Shoot length (cm) at 90 days	Fruit Length (cm)	Fruit Diameter (cm)
T_1	0.53	0.29	0.36	3.32	18.60	6.12	7.22
T_2	0.74	0.52	0.57	4.24	22.65	7.43	7.64
***t*-value**	7.2146	12.8813	12.7673	9.215	30.3489	10.5117	3.5931

The means of T_1 and T_2 are significantly different at $p < 0.05$.

Table 2. Effect of integrated nutrient management on yield of guava (average of two years).

Treatment	Number of fruits/ tree	Fruit weight (g)	Yield/tree (kg)	Yield/ha (q)	Cost of cultivation/ ha (Rs)	Gross return/ha (Rs)	Net return/ ha (Rs)	B:C Ratio
T_1	377.18	200.91	75.68	209.80	88395	293720	205325	3.33
T_2	426.84	222.32	94.73	260.65	100563	364910	264347	3.63
***t*-value**	**4.2491**	**5.5306**	**13.8258**	**18.3313**	**8.7898**	**18.3314**	**13.6828**	**4.5067**

The means of T_1 and T_2 are significantly different at $p < 0.05$.

Leaf is the factory for the conversion of solar energy into the chemical energy through photosynthesis. The adequate supply of nutrients resulted in the proper utilization during the process of photosynthesis resulted in increase of shoot length and shoot diameter. It may be concluded that the increased production of photosynthesis (food material) brought about an increase in the vegetative growth parameters. The present findings corroborated with those of Athani *et al* (2007b), Naik and Babu (2007), Ram *et al* (2007), Ram and Pathak (2007), Dutta *et al* (2009), Shukla *et al* (2009), Dwivedi *et al* (2010) and Dwivedi (2013) who found that vermicompost with FYM and inorganic fertilizers resulted increase in the vegetative growth.

Yield Parameters

It was evident (Table 2) that the highest value for fruits/tree (426.84), fruit weight (222.32g), yield/ tree (94.73 kg) and yield (260.65 q/ha) were due to components of T_2 which created better nutritional environment resulted in improved soil health through improved physico-chemical conditions and stimulated soil microbiological activities. Ram *et al* (2007) found that application of different fertilizers, organic manures and biofertilizer improved the vegetative growth, number of fruits and yield of guava cv. Allahabad Safeda. The similar effects was recorded by Dwivedi (2013).

Economics

The economics of different treatments were significantly influenced by their components. The maximum net profit/hectare was obtained from T_2 (Rs. 264347/ha), while it was least under T_1 (Rs. 205325/-ha). Benefit: Cost ratio were also towards the higher range in the T_2. Higher income was due to higher fruit yield in the T_2. Shukla *et al* (2009) observed that the combined application of 50% dose of recommended NPK + 50 kg FYM + 250 g *Azotobactor* recorded for significantly higher net returns/ha with higher B: C ratio. Similar findings have been reported by Athani *et al* (2007b), Dwivedi *et al* (2010) and Binepal *et al* (2013).

CONCLUSION

The results of present experiment on integrated nutrient management of guava cv. Allahabad Safeda revealed that the application of 50% RDF+ 50 kg FYM + *Azospirillum* 100 g/ tree + *PSB* 100 g/ tree was the most appropriate dose of integrated nutrient management for obtaining maximum growth, yield and net returns from guava.

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