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EFFECT OF ORGANIC-CUM-INORGANIC SOURCES OF NUTRIENTS ON PLANT GROWTH AND YIELD PARAMETERS OF GUAVA (*PSIDIUM GUAJAVA* L.) cv. ALLAHABAD SAFEDA

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ABSTRACT

A field experiment was conducted during 2009-10 and 2010-11 to study the organic-cum-inorganic sources of nutrientmanagement (IPNM) on growth, yield and quality on 14 years old guava trees. Application of 50% NPK with 5 kg FYMenriched with Trichoderma (T_5) resulted in maximum plant height (3.89 m) maximum fruit weight (97.5 g), maximum average Fruits per plant (888.5 no.), maximum yield per plant (80.41 kg/plant) and maximum Fruit Size (5.18, 5.49) whereas maximum canopy height (1.4 m) was recorded with T_4 while plant Girth (66.75cm) and plant spread E-W and N-S (6.13 to 6.39 m) was found in T_{11}.

Key Words : *Organic-cum-inorganic sources of nutrients, plant growth, yield parameters, guava.*

Guava (*Psidium guajava* L.) belongs to the family Myrtaceae. Guava is known as the “apple of thetropics” or “poor man’s fruit”. Guava is one of the most promising fruit crops of India and is considered to be oneof the exquisite nutritionally valuable and remunerative crops (Singh *et al*., 2000). At present in India, it occupiesnearly 204 thousand hectares area with a production of 2460 thousand mitric tons and productivity 11.12 metrictons/hectare and in Bihar 28.2 thousand hectares area with a production of 356 thousand metric tons and productivity 12.64 tons/hectare (NBH, 2011) which is very low as compared to national average. It is due to decline in the soil organic matter, over mining ofnutrients reserve, loss of nutrients and non-practicing of regular incorporation of organic and in-organic fertilizers. Integrated nutrient management has been considered as the essential component of sustainable crop production system. Keeping in view the increasing gap between removal and supply of essential plant nutrients, search for alternative plant nutrients sources has gained momentum. The application offertilizers even in balanced form may not sustain the soil fertility and productivity in guava orchards. However, research evidences are encouraging about the integrated use of inorganic fertilizers, bio fertilizers and organic manures including crop residues, vermi compost which may improve the soil productivity and crop yield (Singh *et al.*, 2011). Vermi compost contains plant growth regulating materials, such as humic acids and plant growth and yield of strawberry fruit crops. Bio fertilizers are one of the best modern tools for agriculture and are used toimprove the fertility and quality of the soil. It offers an economically attractive and ecologically sound route for augmenting nutrient supply that enables to plant growth and development of fruit crops. Such information for guava was lacking for Bihar and other regions, hence the present work was taken up.

MATERIALS AND METHODS

The present experiment finds out result during 2009-10 and 2010-11 on 13 years old guava cv.Allahabad Safeda planted at 4 m x 4m distance. The experiment consisted of 11 treatments (Table-1) were arranged in a randomized block design with three replications keeping two uniform plants in each treatment. The entire dose of 05kg FYM enriched with bio- fertilizers/tree was applied as basal dose on the onset of monsoon. The required quantity of NPK fertilizers (50 and 100% per tree) were applied in two splits in July and November. Micronutrients (Zn, B and Mn) were foliar sprayed twice in June and October. The periodical observations were recorded on growth, yield and quality parameters under each treatment.

RESULTS AND DISCUSSIONS

Vegetative Growth Parameters : The vegetative

Table-1 : Vegetative Growth of Guava Fruits cv. Allahabad Safeda as Influenced by Integrated Nutrient Management (Mean of Two Years).

Treatments	Plant Height (m)	Canopy Height (m)	Girth (cm)	Spread E-W (m)	Spread N-S (m)	Fruit Wt. (g)	Fruits per plant (No.)	Yield per plant (kg)	Fruit Size(cm)	
									Length	Width
T_1	3.57	1.21	54.5	6.26	5.97	68.33	667.5	49.52	4.74	5.03
T_2	3.34	1.3	58.05	5.4	5.31	86.31	809.5	62.82	5.02	5.28
T_3	3.55	1.21	59.5	5.82	6	80.17	764.5	64.38	4.96	5.17
T_4	3.45	1.4	64.15	5.75	5.89	93.27	749.5	64.22	5.18	5.48
T_5	3.89	1.26	62.65	6.04	6.04	97.5	888.5	80.41	5.18	5.49
T_6	3.08	1.3	53.75	5.42	5.74	80.61	732	61.39	5.05	5.28
T_7	3.19	1.35	64.1	5.75	6.78	73.87	791.5	55.61	4.96	5.3
T_8	3.35	1.35	59.65	5.82	5.81	83.28	842	62.38	5.24	5.42
T_9	3.53	1.19	50.95	5.4	5.32	77.62	881	59.57	5.08	5.29
T_{10}	3.55	1.15	65.65	5.35	5.6	73.47	857	63.7	5.1	5.38
T_{11}	3.33	1.24	66.75	6.13	6.29	80.17	783	59.39	4.89	5.17
CD at 5%	0.10	0.03	1.59	0.11	0.14	2.49	12.07	1.64	0.08	0.10

T_1 Control – 500:200:500 g NPK/tree
T_2 500:200:500 g NPK/tree + Foliar spray of Zn (0.05%) + B (0.2%) + Mn (1%) Twice (August & October)
T_3 500:200:500 g NPK/tree + Organic Mulching (10 cm thick)
T_4 500:200:500 g NPK/tree + Foliar spray of Zn (0.05%) + B (0.2%) + Mn (1%) Twice (August & October) + Organic Mulching (10 cm thick)
T_5 250:100:250 g NPK/tree + 5kg FYM enriched with Trichoderma
T_6 250:100:250 g NPK/tree + 5kg FYM enriched with Azospirillum
T_7 250:100:250 g NPK/tree + 5kg FYM enriched with Azotobacter
T_8 250:100:250 g NPK/tree + 5kg FYM + 1 kg Vermicompost
T_9 250:100:250 g NPK/tree + 5kg FYM enriched with Pseudomonas Fluorescens
T_{10} 250:100:250 g NPK/tree + 5kg FYM enriched with Trichoderma & Pseudomonas Fluorescens
T_{11} 250:100:250 g NPK/tree + 5kg FYM enriched with Aspergillus niger

growth characters of 13 years old Allahabad Safeda trees have been evaluated after applying IPNM treatments by recording the observations on plant height, canopy height, plant spread (E-W andN-S). These vegetative growth parameters i.e. plant height, canopy height, plant girth was influenced up to significant extent due to treatments. The treatments T_5 and T_{11}, resulted in equally maximum increase in the plant height and girth respectively, T_4 results maximum canopy height. Whereas T_{11} results maximum in plant spread in the directions (N-S whereas T_1 results the maximum spread in the direction E-W over other treatments (Table-1). The most beneficial effect of these treatments might be due to plant growth promoting inputs like organic manures, organic mulching and bio fertilizers as well as improvement in the physical, chemical and biological properties of the soil in the long-term on repeated applications. It might have also stimulated micro-biological activities in the soil. 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 multi nutrients 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 photo synthates (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 collaborate with those of Athani *et al.* (2007), Naik and Babu (2007), Ram *et al.* (2007) who found that vermicompost with FYM and inorganic fertilizers resulted increase in the vegetative growth. Similar findings have been reported by Monga *et al.* (2002), Ram and Pathak (2007), Kumar *et al* (2007), Dutta *et al.* (2009), Patel *et al.* (2009) and Shukla *et al.* (2009).

Productivity Parameters : The number of fruits/tree and fruit weight, fruit size as well as the yield of fruits

per tree were increase edequally maximum in T_5, (250:100:250 g NPK/tree + 5kg FYM enriched with Trichoderma). The maximumincrease in yield parameters might be attributed to better nutritional environment due to application of organic matter which improved the soil health by improving physico-chemical and biological activities of the soil and also stimulated soil microbiological activity. Athani *et al.* (2007 a, b) reported that application of 75% RDF + 10 kg vermicompost was found significant increase in yield and fruit quality of guava cv. Allahabad Safeda. Ram *et al.* (2007) reported that the application ofdifferent fertilizers, organic manures and bio-fertilizers improved the vegetative growth, number of fruits and yield of guava cv. Sardar. Similar findings have been found by Ram and Pathak (2007), Naik and Babu (2007), Ram *et al.* (2007), Patel *et al.* (2009) and Shukla *et al.* (2009) in guava and other fruits. Mulching is very beneficial. It reduces the loss of moisture from the soil, enhances the rate of penetration of run of water and controls the growth of weeds, thus eliminating the competition between the weeds and the guava trees. It also encourages the development of better root system of young guava plants. Verma *et al.* (2005) found the good response ofmulching materials and method of P and K fertilizers application in apple cv. Red Delicious. Application of integrated inputs of fertilizers, organic manures and bio-fertilizers as in T_5 to T_{11} also increased the yield in guava cv. Allahabad Safeda. It may be due to increased rhizosphere microbial activity and larger quantity of nutrients in the soil. Ram *et al.* (2007) found that application of different fertilizers, organic manures and bio-fertilizers improved the vegetative growth, number of fruits and yield of guava cv. Sardar. The similar findings were found by Monga *et al.* (2002) and Mitra *et al.* (2007).

Fruit Yield and Economical Gain : Yield attributes and therefore economics of different treatments were significantly influenced by the application of organic manures, inorganic fertilizes, bio fertilizers and their combinations. The treatment T_5 gave the highest yield per plant (80.41kg/plant), followed by T_3 (64.38kg), T_4 (64.22 kg) whereas the lowest yield was obtainedunder T_1 (49.52kg). Automatically the similar trend will also be followed regarding the economics of different 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 + 250g *Azotobactor* gave significantly higher yield 28.95 kg per plant with higher B:C ratio 2.53. Similar findings have been reported by Athani *et al.* (2007) and Dwivedi *et al.* (2010).

CONCLUSIONS

In this over all study economical gain from guava as a source of nutrients we have found, the treatment of T_5 gave the highest yield per plant (80.41kg/plant), followed by T_3 (64.38kg), T4 (64.22 kg) whereas the lowest yield was obtainedunder T_1 (49.52kg). The same results are also found similarity between previous literatures. So, we can say that we are on the right path to gain economic benefits from natural products by artificial methods.

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