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EFFECTS OF DIFFERENT LEVELS OF ORGANIC AND INORGANIC FERTILIZERS ONVEGETATIVE GROWTH AND PHYSICO-CHEMICAL ATTRIBUTES OF GUAVA (*PSIDIUM GUAJAVA* L.) CV. ALLAHABAD SAFEDA

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ABSTRACT

An investigation entitled "Effects of different levels of organic and inorganic fertilizers on vegetative growth and physico-chemical attributes of guava (*Psidium guajava* L.) cv. Allahabad Safeda" was carried out at the AICRP orchard, Bihar Agricultural College, Sabour, Bhagalpur, during 2010-11. The present result revealed that the application of 50 % NPK + 5kg FYM enriched with Trichoderma (T5) recorded minimum acidity (0.259 %). Whereas, themaximum TSS (14.10% Brix), maximum fruit weight (78.20 g), yield per tree (63.18 kg) and fruit size (length 5.32, width 5.48) were recorded with the application of 100 % NPK+ Foliar spray of Zn (0.05%) + B (0.2%) + Mn (1%) Twice (August & October) + Organic Mulching (10 cm thick) (T4). The application of 50 % NPK +5kg FYM + 1 kg Vermicompost (T_8)givesmaximum number of fruits per tree (936).

Key words : *Organic, inorganic, growth, quality, yield, guava and Allahabad Safeda.*

Guava (*Psidium guajava* L.), the apple of the tropics, is one of most popular fruit grown in tropical, sub-tropical and some parts of arid regions of India. It is one of the richest and cheapest sources of vitamin-C and pectin as well as good source of vitamin A, B2 and minerals like phosphorus, calcium and iron. The major guava producing states in India are Uttar Pradesh, Maharashtra, Bihar, Andhra Pradesh, Gujarat, Madhya Pradesh, Karnataka, Punjab and Orissa. India is the leading producer of guava in the world. Madhya Pradesh has rank 1st in productivity with 35.3 t/ha (NHB, 2010).

The basic concept of supplying organic and inorganic fertilizers is the adjustment of plant nutrient supply to an optimum level for sustaining the desired crop productivity. Vermicompost improves physical, chemical and biological properties of soil in the long run on repeated application. The organic carbon in vermicompost releases the nutrient slowly and steadily into the system and enables the plant to absorb these nutrients. The multifarious effects of vermicompost influence the growth and yield of crops. The beneficial microbes in the soil, which are the greater significance to horticultural crops, are biological nitrogen fixer, phosphate solubilizers and mycorrhizal fungi which are the phosphate scavengers.

The fixed nitrogen in *Azotobacter* cell is nitrified after its death and decay and plants can utilize this nitrogen from *Azotobacter*plasma. Besides fixing nitrogen, they also secrete certain growth hormones such as IAA, GA_3 and Cytokinins which promote vegetative growth and root development. AM-fungi increase nutrient and water uptake through development of external mycelium that substitute the functions of root system and in turn preserve physiological activity of plant (Al-karaki, 1998 and Yano-Melo *et al*., 2003).

MATERIALS AND METHODS

The present experiment was carried out in the AICRP orchard, Bihar Agricultural College, Sabour, Bhagalpur, during 2010-11. The experiment was laid out in Randomized Block Design (RBD) with three replications. There were different doses of nitrogen *i.e.,* 500 g N (100%) and 250 g N (50%), phosphorus *i.e.,* 200 g P_2O_5 (100%) and 100 g P_2O_5 (50%), potassium *i.e., 5*00 g K_2O (100%) and 250 g K_2O (50%). There were eleven treatments comprised including control (T_1), T_2 (100 % NPK+ Foliar spray of Zn (0.05%) + B (0.2%) + Mn (1%) Twice: August & October), T_3 (100 % NPK + Organic Mulching, 10 cm thick), T_4 (100 % NPK + Foliar spray of Zn -0.05% + B -0.2% + Mn 1% Twice i.e., August & October + Organic Mulching -10 cm

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

Treat-ments	Plant Height (m)	Canopy Height (m)	Girth (cm)	Spread		Fruit Size		Fruit Wt. (g)	Fruits per plant (No.)	Yield per plant (kg)	T.S.S. (%)	Acidity (%)
				E-W (m)	N-S (m)	Length (cm)	Width (cm)					
T1	3.43	1.20	52.3	6.20	5.63	4.70	4.98	62.00	705	52.00	11.70	0.279
T2	3.38	1.27	55.1	4.96	5.20	4.98	5.18	67.40	885	54.20	12.10	0.274
T3	3.59	1.22	56.0	5.84	5.97	4.94	5.12	67.00	711	52.50	13.00	0.275
T4	3.40	1.39	56.2	5.87	5.85	5.32	5.48	78.20	845	63.18	14.10	0.282
T5	3.62	1.24	56.0	5.98	5.87	5.15	5.40	70.00	919	60.00	13.80	0.259
T6	3.18	1.30	53.2	5.10	5.63	5.03	5.28	68.00	808	57.00	12.00	0.261
T7	2.99	1.37	57.1	5.33	6.83	5.10	5.32	69.40	915	58.25	13.20	0.274
T8	3.32	1.32	53.3	5.60	5.79	5.31	5.42	74.00	936	61.00	14.00	0.268
T9	3.33	1.11	50.2	5.43	5.12	5.07	5.29	68.23	892	57.85	13.50	0.270
T10	3.43	1.10	61.3	5.37	5.36	5.15	5.44	71.83	860	62.50	13.50	0.275
T11	3.12	1.25	62.2	5.93	6.07	4.64	5.00	66.00	810	52.50	11.30	0.272
CD at 5%	0.18	0.06	5.69	0.32	0.51	0.29	0.30	7.14	43.78	5.99	0.69	0.01
CV%	6.72	7.65	8.06	7.35	9.07	4.89	4.21	7.85	9.43	8.52	7.80	3.52

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

thick), T_5**(**50 % NPK + 5 kg FYM enriched with Trichoderma**),** T_6 (50% NPK + 5 kg FYM enriched with Azospirillum), T_7 (100% NPK + 5 kg FYM enriched with*Azotobactor*), T_8 (50% NPK + 5 kg FYM + 1 kg VC), T_9 (50% NPK + 5kg FYM enriched with Pseudomonas Fluorescens), T_{10} (50% NPK + 5kg FYM enriched with Trichoderma & Pseudomonas Fluorescens) and T_{11} (50% NPK + 5kg FYM enriched with Aspergillus niger). Acidity was estimated by simple acid–alkali titration method as described in A.O.A.C. in (1970). Hand refractometer was used for determination of TSS in ^{0}Brix. Reducing sugars in fruit juice was estimated by the method as suggested by Nelson (1944).

RESULTS AND DISCUSSION

Vegetative growth parameters : *Azotobactor* inoculation resulted better transport and uptake of nutrients, improves the nitrogen use efficiency and increases leaf N content, which resulted in increasing growth and ultimately effect on quality characters of the fruits. The treatment maximized the bio-chemical constituents of fruits over control and inorganic fertilizer alone. Therefore, it is suggested to incorporate the biofertilizer, namely,Azotobacter, Azospirillum, Pseudomonas Fluorescens, Trichoderma etc. along with partial inorganic fertilizers under sustainable systems of supplying plant nutrients forguava plantation to achieve better yield and quality of fruits.The plant height found non- significant but it was noted maximum under the treatment T_5i.e., half RDF and FYM enriched with Trichoderma which also showed highest (5.98m) significant E-W spread of canopy. The canopy height was noted maximum (1.39 m) with the application ofRDF + Foliar spray of Zn (0.05%) + B (0.2%) + Mn (1%) Twice + Organic Mulching(T_4)which isstatistically at par with 1.37m recorded under the treatment50 % RDF + 5kg FYM enriched with Azotobacter (T_7). Maximum (62.2 cm) plant girth over control (52.3 cm) was found with the

application of50 % RDF + 5kg FYM enriched with Aspergillus niger (T_{11}) (Table 1). These results are in accordance with the findings of Ram and Pathak (2007), Kumar *et al*(2007), Dutta *et al.* (2009), Patel *et al.* (2009) and Shukla *et al.* (2009) in different fruit crops.

Yield parameters : The maximum fruit size (length 5.32, width 5.48), fruit weight (78.20 g) and yield per tree (63.18 kg)were recorded with the application of 100 % NPK+ Foliar spray of Zn (0.05%) + B (0.2%) + Mn (1%) Twice (August & October) + Organic Mulching (10 cm thick) (T_4). Whereas the maximum number of fruits per tree (936),was recorded with soil placement of 50 % NPK +5kg FYM + 1 kg Vermicompost (T_8)givesmaximum number of fruits per tree (T_8) which was superior to rest of the treatments. The least yield character under control treatment may be due to lack of supply of organic and inorganic nutrients.

It is well known that nitrogen is the constituent of proteins, enzymes and chlorophyll and involves in all the processes associated with photosynthesis and growth, hence increase in weight and yield due to nitrogen application is obvious. The increase in weight and yield by addition of adequate quantity of phosphorus was possibly due to its association with various chemical reactions in the cell and is responsible for the synthesis of protoplasm. Hence, an increase in the vegetative growth was resulted in more carbohydrates assimilation, which may partly be responsible for higher yields. It is assumed that potassium plays an important part in carbohydrate and protein synthesis and in the regulation of water relations in living cells. It may also act as a catalyst in the formation of more complex substances and in the acceleration of enzyme activity. Carbohydrates and co-enzymes are beneficial in increasing size of fruits and ultimately weight of the fruit. Singh *et al.* (2008), also reported similar results in guava. The increase in yield in vermicompost treatment may be attributed to increase in level of readily converted available form of essential micro & macro nutrient in the presence of either dead or live worms and offered growth mechanism in plants, resulting in increased yield parameters. Vermicompost has also beneficial effects on physical and chemical soil structure and water up take, resulting in improving plant growth and productivity.

Besides nitrogen fixing abilities of the microbial inoculants, the capacity to releasing phyto-hormones especially gibberellins should be regarded which increases the fruit size. The yield attributes or the sink capacity of a crop is determined by its vegetative growth throughout the life cycle of the plant. Vigorous growth is associated with higher sink capacity of a crop. The increase in yield can be resulted from better root proliferation. In addition, increased nutrient elements in the soil enhanced uptake of nutrients and water caused to higher photosynthesis leading to an increase of the assimilation rates. The generation of CO2 during compost decomposition has also been found responsible for increasing yield. The present findings are in agreed with those workers of Rubee*et al.* (2011), Ibrahim *et al.* (2010) in strawberry.

Quality parameters : The findings of present study revealed that the minimum acidity (0.259 %) was recorded with soil placement of 50 % NPK + 5kg FYM enriched with Trichoderma (T_5) which was superior to rest of the treatments. Whereas, the maximum TSS (14.10^{o}Brix) was recorded with the application of 100 % NPK+ Foliar spray of Zn (0.05%) + B (0.2%) + Mn (1%) Twice (August & October) + Organic Mulching (10 cm thick) (T_4). The improvement in various quality characteristics by application of optimum dose of NPK may be explained by the fact that phosphorus enters into the composition of phospholipids and nucleic acids, the latter combines with proteins and result in the formation of nucleo-proteins which are important constituents of the nuclei of the cells. Similar results have also been reported by Singh *et al.* (2008) and Shukla *et al.* (2009) in guava.

The maximum increase in TSS parameters might be attributed to better nutritional environment due to application of organic and inorganic matter as well as Trichoderma which improved the soil health by improving physico-chemical and biological activities of the soil and also stimulated soil microbiological activity. Vermicompost may be attributed to better fruits growth of the treated plants and which resulted in higher quantities of photosynthates (starch, carbohydrates, etc.) and the translocation to the fruits, thus increasing the various contains of fruit hence quality improvement reflected in fruit chemical character. Similar findings were also reported by Rubee*et al.* (2011)and Shukla *et al.* (2009) in guava.

CONCLUSIONS

The results of present experiment on the 14 years old guava *cv.* L-49 showed that the application of T_4 (100 % NPK+ Foliar spray of Zn (0.05%) + B (0.2%) + Mn

(1%) Twice (August & October) + Organic Mulching (10 cm thick))and T8 (100% NPK + 5kg vermicompost + 150gm VAM) was found most appropriate integrated nutrient dose under agro-climatic conditions of malwa plateau for obtaining maximum quality and yield of guava fruits.

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