Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(5): 1668-1670
Received: 01-07-2018
Accepted: 03-08-2018

D Kumrawat
Department of Fruit Science, College of Horticulture, Mandsaur RVS Agriculture University, Gwalior, Madhya Pradesh, India

RN Kanpure
Department of Fruit Science, College of Horticulture, Mandsaur RVS Agriculture University, Gwalior, Madhya Pradesh, India

OP Singh
Plant Physiology College of Horticulture, Mandsaur RVS Agriculture University, Gwalior, Madhya Pradesh, India

J Bhandari
Department of Fruit Science, College of Horticulture, Mandsaur RVS Agriculture University, Gwalior, Madhya Pradesh, India

B Kachouli
Plant Breeding and Genetics College of Horticulture, Mandsaur RVS Agriculture University, Gwalior, Madhya Pradesh, India

Correspondence
D Kumrawat
Department of Fruit Science, College of Horticulture, Mandsaur RVS Agriculture University, Gwalior, Madhya Pradesh, India

Effect of integrated nutrient management on quality and yield parameters of guava (*Psidium guajava* L.) cv. l-49

D Kumrawat, RN Kanpure, OP Singh, J Bhandari, and B Kachouli

Abstract
An investigation entitled "Effect of Integrated Nutrient Management on quality and yield parameters of Guava (*Psidium guajava* L.) cv. L-49" was carried out at the *Instructional cum research fruit orchard*, College of Horticulture, Mandsaur, during 2015-16. The present result revealed that the application of 100 % NPK + 5 kg vermicompost + 150 gm *Azatobactor* (T_6) recorded minimum acidity (0.23 %) and maximum TSS (12.67 ^{0}Brix), TSS/acid ratio (56.39), ascorbic acid (206.07 mg/100g pulp), pectin (0.75 %), total sugars (8.21 %), reducing sugars (4.15 %) and non-reducing sugars (4.06 %). Whereas, the maximum number of fruits per tree (286.91), fruit weight (209.88 g) and yield per tree (60.20 kg) were recorded with the application of 100 % NPK+ 5 kg vermicompost + 150 gm VAM (T_8).

Keywords: INM, quality, yield, guava and l-49

Introduction
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, B_2 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 37.6 t/ha (NHB, 2015) [15].
The basic concept of integrated nutrient management (INM) 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 [3] and Yano-Melo *et al*., 2003 [23]).

Materials and Methods
The present experiment was carried out at the *Instructional cum research fruit orchard*, College of Horticulture, Mandsaur, during 2015-16. The experiment was laid out in Randomized Block Design (RBD) with three replications. There were different doses of nitrogen *i.e.*, 600 g N (100%) and 300 g N (50%), phosphorus *i.e.*, 400 g P_2O_5 (100%) and 200 g P_2O_5 (50%), potassium *i.e.*, 300 g K_2O (100%) and 150 g K_2O (50%). There was eleven treatments comprised including control (T_0), T_1 (50 % NPK), T_2 (100 % NPK), T_3 (50 % NPK + 10 kg VC), T_4 **(**100 % NPK + 5 kg VC**),** T_5 (50% NPK + 10 kg VC + 150 g *Azotobactor*), T_6 (100% NPK + 5 kg VC+ 150 g *Azotobactor*), T_7 (50% NPK + 10 kg VC + 150 g VAM), T_8 (100% NPK + 5 kg VC+ 150 g VAM), T_9 (50% NPK + 10 kg VC + 150 g *Trichoderma*) and T_{10} (100% NPK + 5 kg VC+ 150 g *Trichoderma*). Acidity was estimated by simple acid–alkali

titration method as described in A.O.A.C. in (1970) [1]. 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) [13]. Ascorbic acid was estimated by Assay method given by Ranganna (1977) [17]. Estimation of pectin according to the methods of Kertesz (1951) [10]

Result and discussion

Quality parameters

The findings of present study revealed that the minimum titrable acidity (0.23%), maximum TSS/acid ratio (56.39), ascorbic acid (206.07 mg/100g pulp), pectin (0.75%), total soluble solids (12.67 ^{0}Brix), total sugars (8.21%), reducing sugars (4.15%) and non-reducing sugars (4.06%) were recorded with soil placement of 100% NPK + 5 kg vermicompost +150 g *Azatobactor* (T_6) which was superior to rest of the treatments. 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) [21], Sharma *et al.* (2012) [19] and Shukla *et al.* (2014) [20] in guava. Vermicompost may be attributed to better vegetative 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) [18] in guava, Bohane and Tiwari (2014) [4] in Ber and Shukla *et al.* (2014) [20] in guava.

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. Application of inorganic fertilizers along with VAM inoculation resulted in an overall increase in plant growth, fruit yield and fruit quality which reasonably can be explained from the fact that VAM contribute upto 20-30% N and 25-50% P_2O_5 respectively (Mohandas, 1996) [12]. The treatment maximized the bio-chemical constituents of fruits over control and inorganic fertilizer alone. Therefore, it is suggested to incorporate the biofertilizer, namely, VAM along with inorganic fertilizers under integrated nutrient management systems of guava plantation for achieving better yield and quality of fruits. These results are in accordance with the findings of Dadashpour and Jouki (2012) [6] in strawberry, Singh and Varu (2013) [22] in papaya, Bohane and Tiwari (2014) [4] in ber, Dutta *et al.* (2014) [7], Shukla *et al.* (2014) [20] in guava and Nazir *et al.* (2015) [14] in strawberry.

Yield parameters

The maximum number of fruits per tree (286.91), fruit weight (209.88 g) and yield per tree (60.20 kg) were obtained under T_8 (100% NPK + 5 kg vermicompost +150 g VAM). The least yield character under control treatment may be due to lack of supply of 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) [21], Sharma *et al.* (2012) [19], Shukla *et al.* (2014) [20] 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. The present findings are supported with the results reported by Singh Adak *et al.* (2014) [3] in guava, Bohane and Tiwari (2014) [4] in ber, Shukla *et al.* (2014) [20] in guava, Hussain *et al.* (2015) [8] in banana and Kundu *et al.* (2015) [11] in Ber.

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 CO_2 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) [18], Ibrahim *et al.* (2010) [9], Chandra *et al.* (2012) [5] in guava, Dadashpour and Jouki (2012) [6] in strawberry and Patil and Shinde (2013) [16] in banana.

Table 1: Effect of integrated nutrients on yield and quality parameters of guava

Treatments	Number of Fruits per tree	Fruit Weight (g)	Yield per Tree (kg)	Acidity (%)	T.S.S. (^{0}Brix)	TSS/acid ratio	Ascorbic acid (mg/100g pulp)	Pectin (%)	Total sugars (%)	Reducing sugars (%)	Non-reducing sugars (%)
T_0 (Control)	148.07	150.11	21.87	0.42	8.33	19.57	166.33	0.55	5.46	3.35	2.11
T_1 (50 % NPK)	174.14	162.07	28.22	0.41	8.67	21.77	171.80	0.58	5.57	3.39	2.18
T_2 (100 % NPK)	205.81	163.38	33.57	0.36	9.33	25.83	183.57	0.56	5.86	3.46	2.40
T_3 (50 % NPK + 10 kg VC)	206.91	163.57	33.84	0.34	9.67	28.81	186.73	0.59	6.07	3.50	2.57
T_4 (100 % NPK + 5 kg VC)	215.55	169.59	36.51	0.34	10.00	29.47	187.73	0.61	6.38	3.54	2.86
T_5 (50% NPK + 10 kg VC + 150 g *Azotobactor*)	235.60	183.42	43.03	0.26	11.33	42.90	202.37	0.73	7.38	3.94	3.44
T_6 (100% NPK + 5 kg VC+ 150 g *Azotobactor*)	275.37	195.63	53.79	0.23	12.67	56.39	206.07	0.75	8.21	4.15	4.06

T_7 (50% NPK + 10 kg VC + 150 g VAM)	244.46	198.27	48.47	0.26	10.67	41.67	200.80	0.71	7.26	3.83	3.42
T_8 (100% NPK + 5 kg VC+ 150 g VAM)	286.91	209.88	60.20	0.24	11.67	48.63	204.70	0.74	7.48	3.99	3.49
T_9 (50% NPK + 10 kg VC + 150 g *Trichoderma*)	221.14	180.23	39.86	0.34	10.33	31.07	191.63	0.62	6.88	3.73	3.14
T_{10} (100% NPK + 5 kg VC+ 150 g *Trichoderma*)	230.66	178.32	41.13	0.31	10.67	33.97	194.03	0.63	6.93	3.77	3.16
S. Em ±	8.35	5.13	1.02	0.01	0.63	2.59	3.23	0.03	0.30	0.16	0.31
C.D. at 5%	24.64	15.15	3.03	0.05	1.86	7.64	9.54	0.09	0.91	0.48	0.92

Conclusion

The results of present experiment on the 8 years old guava *cv.* L-49 showed that the T_6 (100%NPK + 5kg vermicompost + 150gm *Azatobactor*) and T_8 (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.

References

1. AOAC. Methods of analysis of the association of official agricultural chemists. Washington, DC, 1970.
2. Adak T, Kumar K, Singha A, Shukla SK, Singh VK. Assessing soil characteristics and guava orchard productivity as influenced by organic and inorganic substrates. J Ani. Pl. Sci. 2014; 24**(**4):1157-1165.
3. Al-Karaki GN. Benefit, cost and water-use efficiency of arbuscular mycorrhizal durum wheat growth under drought stress. Mycorrhiza 1998; 8:41-45.
4. Bohane L, Tiwari R. Effect of integrated nutrient management on physico-chemical parameters of ber under malwa plateau conditions. Ann. Pl. Soil Res. 2014; 16(4):346-348.
5. Chandra KK, Pandey SK, Singh AK. Influence of tree rejuvenation, IPNM and VA-Mycorrhizal fungi on shoot emergence, yield and fruit quality of *Psidium guajava* under farmers field condition. Int. J Bio. sci. 2012; 2(11):9-17.
6. Dadashpour A. Jouki M. Impact of integrated organic nutrient handling on fruit yields and quality of strawberry cv. Kurdistan in Iran. J Orna. Horti. Pl. 2012; 2(4):251-256.
7. Dutta P, Kundu S, Bauri FK, Talang H, Majumder D. Effect of bio-fertilizers on physico-chemical qualities and leaf mineral composition of guava grown in alluvial zone of West Bengal. J Crop Weed Sci. 2014; 10(2):268-271.
8. Hussain SF, Naresh S, Rao AVD and Reddy MLN. The growth, yield and quality parameters of banana cultivar Grand naine (AAA) as influenced by different organic amendments. Pl. Archives. 2015; 15(2):723-727.
9. Ibrahim HIM, Zaglol MMA, Hammad AMM. Response of Balady Guava trees cultivated in sandy calcareous soil to bio fertilization with phosphate dissolving bacteria and /or VAM Fungi. J American Sci. 2010; 6(9):399-404.
10. Kertesz ZI. The Pectic Substances. Interscience Publishers, 1951. New York.
11. Kundu S, Chakraborty S, Roy D, Ghosh B, Dutta P. Studies on organic nutrition in improving yield and quality of ber cv. BAU Kul-1. J Crop Weed. 2015; 11(2):14-18.
12. Mohandas S. Bio-fertilizer in banana cultivation. Proc. Conference on Challenges for Banana Production and Utilization in 21 Century. National research centre on Banana, Sept, 1996; 22-25, Trichy.
13. Nelson N. A photometric adoption of the somogui method for the determination of glucose. J Biol. Chem. 1944; 153:375-380.
14. Nazir N, Kumar A, Khalil A and Bandey SA. Effect of integrated organic nutrient management on fruit yield and quality of strawberry cv. Senga Sengana. Int. J Farm Sci. 2015; 5(2):83-89.
15. NHB. Statwise area, production and productivity of guava. 2015. WWW.nhb.gov.in.
16. Patil VK, Shinde BN. Studies on integrated nutrient management on growth and yield of Banana cv. Ardhapuri (*Musa* AAA). J Horti. Forestry. 2013; 5(9)130-138.
17. Ranganna S. Manual of analysis of fruit and vegetable products. Tata McGraw Hill, New Delhi, 1977, 9-13.
18. Rubee L, Dwivedi DH, Ram RB, Meena ML. Response of organic substrates on growth, yield and physiochemical characteristics of Guava cv. Red Fleshed. Ind. J Ecol. 2011; 38(1):81-84.
19. Sharma VK, Tiwari R, Gupta BS. Quantitative and qualitative enhancement in guava cv. L-49 by the application of NPK fertilizers under Malwa plateau conditions of Madhya Pradesh. Asian J Hort. 2012; **7**(2):493-496.
20. Shukla SK, Adak T, Singha A, Kumar K, Singh VK and Singh A. Response of guava trees (*Psidium guajava* L.) to soil applications of mineral and organic fertilizers and bio fertilizers under conditions of low fertile soil. J Hort. Res. 2014; 22(2):105-114.
21. Singh V, Dashora LK, Karatha KM, Ahalawat TR and Barad AV. Growth, flowering, fruiting and yield of guava (*Psidium guajava* L.) cv. 'Sardar' grown under high-density-planting system as influenced by various organic and inorganic sources. Asian J Hort. 2008; 3(2):382-385.
22. Singh JK and Varu DK. Effect of integrated nutrient management in papaya (*Carica papaya* L.) cv. Madhu bindu. Asian J Horti. 2013; 8(2):667-670.
23. Yano-Melo AM, Saggin Jr, OJ and Maia LC. Tolerance of mycorrhized banana (*Musa* sp. cv. Pacovan) plantlets to saline stress. Agriculture, Ecosystem and Environment. 2003; 95:343-348.