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STUDIES ON INTEGRATED NUTRIENT MANAGEMENT MODULE (INM) ON PHYSICO-CHEMICAL PARAMETERS OF GUAVA CV. LUCKNOW-49

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ABSTRACT

Guava is the fourth important commercial fruit crop grown throughout India used mainly for fresh and processing purpose. Among the various factors which affect the production and productivity of guava, nutrient management assumes much more significance. The experiment entitled "Studies on integrated nutrient management module (INM) on physico-chemical parameters of guava cv. Lucknow-49 was conducted at Main Horticultural Research and Extension center (MHREC), University of Horticultural Sciences, Bagalkot. The experiment was laid out in RCBD design with 8 treatments replicated thrice. Among these treatments T_7 50 % RDF (150:60:75 g NPK/plant) + 25 % through neem cake (1.5 kg/plant) + 25 % through vermicompost (2.5 kg/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/plant) + *Azotobacter* (20 g/plant) + micronutrients spray (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1 %) was recorded maximum plant height (3.13, 3.37, 3.50 and 3.61 m), canopy volume (2.80, 3.22, 3.53 and 3.94 m^3), leaf area (37.26, 40.23, 43.26 and 48.27 cm^2), specific leaf area (57.32, 60.95, 64.57 and 69.96 cm^2/g) and chlorophyll content (19.36, 22.65, 26.25 and 29.47 SPAD). The same treatment was also favours the quality parameters such as maximum TSS (13.74 ^{0}B), minimum acidity (0.44 %), TSS: acid (31.23), ascorbic acid (277.27 mg/100g), pH (4.70), pectin (0.85 %), fruit firmness (49.44 N) and shelf life (7.25 days).
***Keywords* :** Guava, L-49, Integrated nutrient management, quality

Introduction

Guava (*Psidium guajava* L.) known as the "apple of the tropics" and it is widely cultivated fruit in tropical, subtropical and certain arid regions of India, Belonging to the family Myrtaceae. Guava is native to Mexico, Central America, the Caribbean and northern South America and it has gained popularity due to its cost-effectiveness in cultivation, resistant to drought and semi-arid conditions, as well as its ability to tolerate salinity and adapt to varying soil and climatic conditions (Khan *et al*., 2013).

In India, guava ranks 4th in area and production after mango, banana and citrus. India is the world's largest producer of guava followed by China. Guava cultivation in India occupies about 315 thousand ha of area with a production of 4916 thousand MT (NHB 2021-22).

The crop needs a large amount of essential nutrients from the soil for its productivity. Without proper management, continuous fruit production reduces nutrient reserves in the soil. Another issue of great concern is the sustainability of soil productivity, as land began to be intensively exhausted depletion decreases quality fruit production and soil fertility and leads to soil degradation. On the other hand, continuous use of inorganic fertilizers as source of nutrient in imbalanced proportion is also a problem, causing inefficiency, environment hazards were occurred ultimately it affects to the human being who consumes them. In order to meet balanced nutrient supply in guava, integrated nutrient management is the important alternative source, which is not only beneficial to maintain the soil health but also to sustain the fruit production. Keeping this in view the present investigation was carried out to investigate the combined effects of organic manures, inorganic fertilizers and biofertilizers on various aspects of guava cultivation, particularly focusing on the mrig-bahar crop.

Material and Methods

The present investigation was carried out during 2023-2024 at Main Horticultural Research and Extension Centre (MHREC), University of Horticultural Sciences, Bagalkot. The experiment was conducted in Randomized Complete Block Design (RCBD) with 8 treatments and 3 replications. The experiment was consisted of eight treatments *viz*., T_1- 100 % RDF (300:120:150 g NPK/plant), T_2- 75 % RDF (225:90:112.5 g NPK/plant) + 25 % through organic source *i.e*., vermicompost (2.5 kg/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/plant) + *Azotobacter* (20 g/plant), T_3- 50 % RDF (150:60:75 g NPK/plant) + 25 % through neem cake (1.5 kg/plant) + 25 % through vermicompost (2.5 kg/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/ plant) + *Azotobacter* (20 g/plant), T_4- 100 % RDF through organic sources, 50 % through vermicompost (5 kg/plant) + 50 % through neem cake (3 kg/plant), T_5- T_1 + foliar application of micronutrients (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1%), T_6- T_2 + foliar application of micronutrients (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1%), T_7- T_3 + foliar application of micronutrients (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1%), (T_8) 100 % RDF (300:120:150 g NPK/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/ plant) + *Azotobacter* (20 g/plant). Organic manures were applied 5 days after pruning, inorganic fertilizers were applied 15 days after pruning, biofertilizers are mixed thoroughly with the farm yard manures 15 days before the application and are applied along with the farm yard manures for better result. The combination of three micronutrients are sprayed three times during the different stages of crop growth as one month after pruning, during peak flowering period and during fruit set.

The various growth parameters plant height, canopy volume was measured using a measuring tape and a long stick to gauge. Leaf area was calculated by using the linear method (LBK method) by selecting ten leaves per plant and the mean was worked out and expressed in square centimeters. The mathematical equation to calculate it is as follows;

$$\text{Leaf area (LA)} = L \times B \times K\ (0.72)$$

Where

L = maximum length, B = maximum breadth and K = Correction factor

Specific leaf area represents the leaf area of a plant relative to its leaf dry weight and is typically expressed in square centimetres per gram ($cm^2\ g^{-1}$). Chlorophyll content was recorded in the matured leaf by using chlorophyll meter SPAD-502 at 30, 60, 90 and 120 days after the imposition of treatment.

For determination of chemical parameters of fruit *viz*., acidity, TSS, ascorbic acid, pH, pectin content, firmness, shelf life, five healthy fruits were selected randomly from each tree at full maturity stage. Hand refractometer was used for determination of TSS. Acidity was estimated by simple acid-alkali titration method, ascorbic acid and pH estimated by the method suggested by Ranganna (1986). Fruit firmness evaluated using the TAXT plus texture analyzer, which punctured the berry with a 2 mm cylinder probe. The peak force value displayed on the graph was utilized to determine the texture value, measured in Newton force (N). The shelf life of fruit was determined by counting the number of days from harvesting till they remained in a good edible condition without spoilage under ambient condition.

Results and Discussion

There was significant difference was recorded with respect to plant height, canopy volume, leaf area and specific leaf area and chlorophyl content as influenced by INM modules. Among the treatments, the maximum plant height (3.13, 3.37, 3.50 and 3.61 m at 30, 60, 90 and 120 DAT (days after treatment), respectively), canopy volume (2.80, 3.22, 3.53 and 3.94 m^3 at 30, 60, 90 and 120 DAT, respectively), leaf area (37.26, 40.23, 43.26 and 48.27 cm^2 at 30, 60, 90 and 120 DAT, respectively), specific leaf area (57.32, 60.95, 64.57 and 69.96 cm^2/g at 30, 60, 90 and 120 DAT, respectively) and chlorophyll content (19.36, 22.65, 26.25 and 29.47 SPAD values at 30, 60, 90 and 120 DAT, respectively) was recorded in treatment T_7

While, the lowest plant height, canopy volume, leaf area, specific leaf area and chlorophyll content was recorded in T_1 (Table 1 and 2).

In the present investigation, the increased plant height and canopy volume at different stages of the plant growth may be due to the inorganic sources coupled with organic sources for major nutrients promote better growth by increasing various macro and micro nutrients and increasing availability of soil nutrients. Probably, the application of organic sources and bio-inoculants produced variety of growth substances and antifungal substances, which ultimately helpful in promoting vegetative vigour of the plants (Pratibha *et al*., 2018). Nitrogen supply boosts the rapid synthesis of carbohydrates, which are subsequently transformed into proteins and protoplasm, leading to larger cell sizes (Gupta *et al*., 2021). Biological agents such as KSB (Potassium solubilizing bacteria) and PSB (Phosphorus solubilizing bacteria) and *Azotobacter* have positively influenced the nutrient absorption and enhance the plant physiological processes. Neem cake is another important component of the treatment which increases plant height by supplying essential nutrients, which are the crucial elements required for promotion of vegetative growth and it also protects plants from pests through its natural pesticidal properties, reducing stress and allowing more energy to be directed towards growth (Tyagi *et al*., 2021). *Azotobacter*, is a biological nitrogen fixer, which enhances the efficiency of nitrogen utilization by converting atmospheric nitrogen into available form that plants can easily absorb, thereby improving the plant's nitrogen use efficiency and overall growth (Gupta *et al.* (2019). These results are in close agreement with the finding of Mangal *et al.* (2020) and Sandhyarani *et al.* (2020) in guava *cv.* Allahabad Safeda, Mohapatra (2020), Tyagi *et al.* (2021) in guava *cv.* Alhabad safeda.

The highest leaf area, specific leaf area is due to leaf is the principal site of plant metabolism and the changes in nutrients supply are reflected in the composition of leaf. The adequate supply of combined application of 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 photosynthates (food material) brought about increase in the vegetative growth parameters (Sahu *et al*., 2015). Addition of biofertilizers produce the plant growth regulators in rhizosphere which are absorbed by the roots leads to better development of root system and synthesis of plant growth hormones like IAA, GA and cytokinins might have caused in increased leaf area and Boron supports cell elongation and division, leading to the expansion of leaf tissues and thus a larger leaf area (Devi *et al*., 2012). Increased chlorophyll may be attributed due to the increased biological nitrogen-fixation, better organic nitrogen utilization, better development of root system and the possible synthesis of plant growth regulators like IAA, GA_3 and cytokinins (Pratibha *et al*., 2018).

The highest TSS (13.74 ^{0}Brix), TSS: acid (31.23) and lowest titratable acidity (0.44 %) was recorded in T_7 while lowest TSS (10.37 ^{0}Brix), TSS: acid (20.34) and highest titratable acidity (0.51 %) was recorded in T_1 (Table 3). Optimum doses of NPK fertilizer along with vermicompost had given very good results on TSS of the fruit. Neem cake helps to increase fruit TSS by improving soil fertility and providing essential nutrients like nitrogen, phosphorus and potassium, which are crucial for fruit development. It enhances microbial activity in the soil, leading to better nutrient absorption by the plant. Vermicompost is another important organic fertilizer which plays a crucial role in supplying nutrients and plant hormones that directly or indirectly contribute to enhancing fruit quality (Kumar *et al*., 2022).

The highest ascorbic acid (277.27 mg/100 g), pectin (0.85 %), pH (4.70), fruit firmness (49.44 N) and shelf life of fruit (7.25 days) was recorded in T_7. While, the lowest ascorbic acid (264.12 mg/100 g), pectin (0.73 %), pH (4.13), firmness (43.24 N) and shelf life of fruit (5.79 days) was noted in T_1. The increase in ascorbic acid content could be due to the enhanced efficiency of microbial inoculants in fixing atmospheric nitrogen, increasing phosphorus availability and secreting growth-promoting substances, which accelerate physiological processes such as carbohydrate synthesis *etc*. The results obtained also got the support of the findings of Tripathi *et al.* (2010). Vermicompost and neem cake also plays a key role by providing nutrients and plant hormones that directly or indirectly contribute to improving fruit quality. INM module application may be attributed to the quick metabolic transformation of starch and pectin into soluble compounds and rapid translocation of sugars from leaves to the developing fruits led to increased pectin content in fruits.

Table 1: Plant height and canopy volume at different growth stages of guava cv. L-49 as influenced by INM module

Treatment	Plant height (m)				Canopy volume (m^3)			
	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT
T_1	2.51	2.62	2.87	3.29	1.61	1.82	2.09	2.59
T_2	2.56	2.78	3.19	3.34	1.95	2.21	2.73	3.08
T_3	2.77	3.10	3.20	3.32	2.39	2.67	2.74	3.40
T_4	2.62	2.81	3.07	3.31	1.92	2.13	2.49	2.88
T_5	2.75	2.87	3.07	3.28	2.00	2.16	2.39	2.77
T_6	3.06	3.28	3.40	3.53	2.52	2.87	3.20	3.58
T_7	3.13	3.37	3.50	3.61	2.80	3.22	3.53	3.94
T_8	2.69	3.07	3.23	3.22	1.83	2.25	2.47	2.60
S. Em ±	**0.11**	**0.08**	**0.08**	**0.04**	**0.12**	**0.10**	**0.12**	**0.09**
CD at 5 %	**0.34**	**0.25**	**0.25**	**0.12**	**0.36**	**0.32**	**0.36**	**0.28**

Note: DAT- Days after treatment

T_1- 100 % RDF (300:120:150 g NPK/plant)

T_2- 75 % RDF (225:90:112.5 g NPK/plant) + 25 % through organic source *i.e*., vermicompost (2.5 kg/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/plant) + *Azotobacter* (20 g/plant)

T_3- 50 % RDF (150:60:75 g NPK/plant) + 25 % through neem cake (1.5 kg/plant) + 25 % through vermicompost (2.5 kg/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/ plant) + *Azotobacter* (20 g/plant)

T_4- 100 % RDF through organic sources, 50 % through vermicompost (5 kg/plant) + 50 % through neem cake (3 kg/plant)

T_5- T_1 + foliar application of micronutrients (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1 %)

T_6- T_2 + foliar application of micronutrients (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1 %)

T_7- T_3 + foliar application of micronutrients (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1 %)

T_8- 100 % RDF (300:120:150 g NPK/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/ plant) + *Azotobacter* (20 g/plant)

Table 2: Leaf area, specific leaf area and chlorophyll content at different growth stages of guava cv. L-49 as influenced by INM module

Treatment	Leaf area (cm^2)				Specific leaf area (cm^2/g)				Chlorophyll (SPAD values)			
	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT
T_1	23.32	25.34	28.34	33.35	38.87	40.87	44.28	49.09	11.14	13.23	15.34	21.32
T_2	29.25	33.24	35.53	41.33	46.43	49.61	52.25	59.04	15.27	19.45	21.43	26.42
T_3	32.46	36.65	39.36	44.26	51.52	54.70	57.04	62.34	15.14	20.12	23.41	27.54
T_4	30.26	32.22	34.36	38.27	48.81	51.14	53.69	57.98	13.23	18.45	19.32	25.14
T_5	28.67	31.36	33.25	37.26	46.24	49.00	51.15	55.61	12.51	16.32	19.25	25.54
T_6	35.36	38.43	41.26	45.16	55.25	60.05	63.48	67.40	17.08	21.33	24.36	28.65
T_7	37.26	40.23	43.26	48.27	57.32	60.95	64.57	69.96	19.36	22.65	26.25	29.47
T_8	24.36	28.25	31.25	34.36	39.93	42.80	45.96	50.53	13.14	15.66	18.42	23.54
S. Em ±	**0.35**	**0.53**	**0.61**	**0.66**	**0.93**	**0.91**	**0.83**	**0.99**	**0.13**	**0.25**	**0.24**	**0.31**
CD at 5 %	**1.07**	**1.61**	**1.84**	**2.01**	**2.81**	**2.77**	**2.51**	**3.00**	**0.40**	**0.77**	**0.73**	**0.93**

Note: DAT- Days after treatment

T_1- 100 % RDF (300:120:150 g NPK/plant)

T_2- 75 % RDF (225:90:112.5 g NPK/plant) + 25 % through organic source *i.e*., vermicompost (2.5 kg/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/plant) + *Azotobacter* (20 g/plant)

T_3- 50 % RDF (150:60:75 g NPK/plant) + 25 % through neem cake (1.5 kg/plant) + 25 % through vermicompost (2.5 kg/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/ plant) + *Azotobacter* (20 g/plant)

T_4- 100 % RDF through organic sources, 50 % through vermicompost (5 kg/plant) + 50 % through neem cake (3 kg/plant)

T_5- T_1 + foliar application of micronutrients (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1 %)

T_6- T_2 + foliar application of micronutrients (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1 %)

T_7- T_3 + foliar application of micronutrients (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1 %)

T_8- 100 % RDF (300:120:150 g NPK/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/ plant) + *Azotobacter* (20 g/plant)

Table 3: Quality parameters of guava cv. L-49 as influenced by INM module

Treatment	TSS (^{0}Brix)	Titratable acidity (%)	TSS: acid	Ascorbic acid (mg/100 g)	pH	Pectin (%)	Fruit firmness (N)	Shelf life (days)
T_1	10.37	0.51	20.34	264.12	4.13	0.73	43.24	5.79
T_2	12.73	0.48	26.52	271.85	4.33	0.80	46.03	6.63
T_3	11.27	0.47	23.82	273.38	4.50	0.81	47.73	6.81
T_4	11.52	0.47	24.69	270.34	4.53	0.81	46.37	6.50
T_5	11.02	0.46	23.82	270.72	4.23	0.78	47.75	6.17
T_6	13.17	0.45	29.37	275.75	4.63	0.83	48.32	7.07
T_7	13.74	0.44	31.23	277.27	4.70	0.85	49.44	7.25
T_8	10.72	0.50	21.59	268.82	4.10	0.74	45.50	5.85
S. Em ±	**0.24**	**0.01**	**0.63**	**0.92**	**0.09**	**0.01**	**1.28**	**0.13**
CD at 5 %	**0.72**	**0.03**	**1.90**	**2.78**	**0.26**	**0.04**	**3.90**	**0.38**

T_1- 100 % RDF (300:120:150 g NPK/plant)
T_2- 75 % RDF (225:90:112.5 g NPK/plant) + 25 % through organic source *i.e*., vermicompost (2.5 kg/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/plant) + *Azotobacter* (20 g/plant)
T_3- 50 % RDF (150:60:75 g NPK/plant) + 25 % through neem cake (1.5 kg/plant) + 25 % through vermicompost (2.5 kg/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/ plant) + *Azotobacter* (20 g/plant)
T_4- 100 % RDF through organic sources, 50 % through vermicompost (5 kg/plant) + 50 % through neem cake (3 kg/plant)
T_5- T_1 + foliar application of micronutrients (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1 %)
T_6- T_2 + foliar application of micronutrients (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1 %)
T_7- T_3 + foliar application of micronutrients (Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1 %)
T_8- 100 % RDF (300:120:150 g NPK/plant) + VAM (50 g/plant) + PSB (20 g/plant) + KSB (20 g/ plant) + *Azotobacter* (20 g/plant)

The maximum fruit pH is due to biofertilizers contain beneficial microorganisms that enhance soil health and nutrient uptake. They can influence soil pH by producing organic acids or altering soil chemistry. Improved nutrient availability from biofertilizers can lead to better fruit development, potentially impacting its acidity Lall *et al.* (2017) in guava. The efficiency of most of the nutrients might have enhanced by integrating all the sources of nutrients. Boron is essential for the formation and stabilization of cell walls by aiding in the synthesis of pectin, which is crucial for cell wall integrity and fruit firmness. Manganese is involved in photosynthesis and the production of carbohydrates. It helps in the synthesis of lignin and other cell wall components, which contribute to stronger and firmer fruit tissue as reported by Mangal *et al.* (2020).

There are several factors which are directly involved in extending the shelf life of the fruit, among them enhanced water uptake by plant cell, promoting turgor pressure and reducing water loss through transpiration are important. This can lead to increase in shelf life as the fruit retains more moisture and also, it is correlated with other factors like firmness of the fruit. The application of biofertilizers improves fruit shelf life by enhancing nutrient availability and plant health. They can help plants to build natural resistance to diseases, reducing the risk of rotting. Healthier plants produce fruits with better post-harvest quality and reduced susceptibility to decay (Dheware *et al*., 2020).

Conclusion

Based on the results of the study, it was concluded that the application of different combination of organic, inorganic and micronutrients showed a significant influence on plant growth and quality parameters of the guava cv. L-49. Among the treatments the plants treated with 50 % RDF (150:60:75 g NPK/plant) + 25 % through neem cake (1.5 kg/plant) + 25 % through vermicompost (2.5 kg/plant) + VAM (50g/plant) + PSB (20g/plant) + KSB (20 g/plant) + *Azotobacter* (20g/plant) + Zinc sulphate @ 0.5 % + Boron @ 0.2 % + Manganese @ 0.1 % showed best results in the growth and quality parameters of guava cv. L-49.

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References

Dheware, R.M., Nalage N.A., Sawant B.N., Haldavanekar P.C., Raut R.A., Munj A.Y. and Sawant S.N. (2020). Effect of different organic sources and biofertilizers on guava

(*Psidium guajava* L.) cv. Allahabad Safeda. *J. Pharmacogn. Phytochem.*, **9(2)**, 94-96.

Devi, H.L., Mitra S.K. and Poi S.C. (2012). Effect of different organic and biofertilizer sources on guava (*Psidium guajava* L.) Sardar. *Indian J. Hortic*., **95(8)**, 201-208.

Gupta, P., Khan M., Kumar V. and Khire A. (2021). Effect of integrated nutrient management on growth, yield and quality of guava (*Psidium Guajava* L.) cv. Allahabad Safeda under high density planting. *Progress. agric.*, **21(1)**, 57-62.

Gupta, P., Singh D., Prasad V.M. and Kumar V. (2019). Integrated nutrient management on yield and quality of guava (*Psidium guajava* L.) *cv*. Allahabad Safeda under high density planting. *J. Pharm. Innov.*, **8(1)**, 320-323.

Khan, A.S., Khan M.R.G., Malik A.U., Rajwana I.A., Tayyaba S.T. and Bakhsh A. (2013). Influence of defoliation and deblossoming on fruit quality of guava (*Psidium guajava* L.) cultivar Gola. *Pak. J. Bot*., **45(2)**, 563-570.

Kumar, V., Mukherjee S., Paliwal R. and Gupta S. (2022). Effect of integrated nutrient management on growth and quality of guava (*Psidium guajava* L). *Indian J. Hortic.*, **12(2)**, 2229-3347.

Lall, D., Prasad V.M., Singh V.K. and Kiishor S. (2017). Effect of foliar application of Biovita (Biofertilizer) on fruit set, yield and quality of guava (*Psidium guajava* L.). *Res. J. Environ. Sci.*, **10(5)**, 432-434.

Mangal, S., Singh S.S. and Sahu K. (2020). Effect of organic, inorganic and biofertilizers on yield, quality and economics of guava. *Int. J. Curr. Microbiol. App. Sci.*, **9(12)**, 1266-1272.

Mohapatra, S. (2020). Effect of integrated nutrient management on growth, yield and quality of guava (*Psidium guajava* L.) grown as a component crop in coconut-based cropping system. *Ph.D* (*Hort.*) *Thesis*, OUAT, Bhubaneswar (India).

National Horticulture Board, 2021-22, Ministry of Agriculture and farmers welfare, Government of India.

Pratibha, J., Barholia A.K. and Arjun K. (2018). Effect of integrated nutrient management strategies on quality of guava (*Psidium guajava* L.) cv. Gwalior 27. *Int. J. Chem. Stud*., **6(5)**, 2028-2030.

Ranganna, G.S. (1986). Manual of analysis of fruit and vegetables products. *Tata MC Grow Hill Publishing Co. Ltd*., New Delhi.

Sahu, P.K., Vedhika S. and Chandrakar F. (2015). Impact of organic sand chemical fertilizers on growth, yield and soil nutrient status in guava. *Biosci. Trends*. **8(8)**, 2018-2022.

Sandhyarani, M.A., Bhagwan A., Kiran K. and Sreedhar M. (2020). Studies on effect of biofertilizers and biostimulant on yield and economics parameters of guava (*Psidium guajava* L.) cv. Allahabad Safeda under meadow orcharding under meadow planting system. *Int. J. Res*., **14(2)**, 1166-1169.

Tripathi, V.K., Kumar N., Shukla H.S. and Mishra A.N. (2010). Influence of *Azotobacter, Azospirillum* and PSB on growth, yield and quality of strawberry *cv*. chandler. *Egyptian J. of Hort*., **22(6)**, 198-199.

Tyagi, S.K., Kulmi G.S. and Khire A.R. (2021). Effect of integrated nutrient management on growth, yield and economics of guava (*Psidium guajava* L.). *J. Crop Sci.*, **10(1)**, 69-70.