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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON PHYSICO-CHEMICAL PARAMETERS OF GUAVA UNDER MALWA PLATEAU CONDITIONS OF MADHYA PRADESH

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ABSTRACT

An experiment was conducted during 2011-2012 at College of Horticulture, Mandsaur (M.P.) on seven year old guava tree cv. L-49 to find out the effect of integrated nutrient management on physico -chemical parameters of guava. The results revealed that the application of 100% N + 100% P_2O_5 + Azospirillum + PSB + 10 kg vermicompost (T_9) significantly influenced the fruit length, fruit diameter, fruit volume, pulp weight, specific gravity, TSS, total sugars, reducing and non reducing sugar and other physico chemical parameters of guava. Significantly highest fruit diameter (7.91 cm), fruit length (7.52 cm), volume of fruit (217.41 ml), pulp weight (211.61 g), specific gravity (1.02), total soluble solids (11.67 ^{0}Brix), total sugars (8.06%), non-reducing sugar (3.89%), reducing sugar (4.17%) and minimum acidity (0.20%) were recorded in T_9 (100% N + 100% P_2O_5 + Azospirillum + PSB + 10 kg Vermicompost) while maximum pulp percentage (96.0) was found under the treatment T_{10} (75% N + 75% P_2O_5 + Azospirillium + PSB + 10 kg Vermicompost).

Key wards: Integrated nutrient management, guava, physico-chemical parameters, yield and quality.

INTRODUCTION

Guava (*Psidium guajava* L.), is one of most exquisite, valuable and popular fruits grown in tropical, sub-tropical and some parts of arid regions of India, which belongs to the family Myrtaceae. Due to its wider adaptability in diverse soils and agro-climatic regions, low cost of the cultivation, prolific bearing and being highly remunerative with fruit nutritive values it has gained more popularity among the fruit growers. It is the fifth most important fruit in area covering an area of 0.22 million hectare and fifth most important fruit in production with total production of 2.572 million tonnes (NHB, 2010). Besides other factors of crop production, nutrients play an important role in the production of guava. It gives good response to manuring and fertilization in increasing fruit production. A poor supply of nutrient seems to be the main cause of tree decline, low yield and poor fruit quality. Keeping the above facts in view, the effect of integrated nutrient management on physico-chemical parameters of Guava was studied on cv. L-49.

MATERIALS AND METHODS

The experiment was conducted at the Department of Fruit Science, College of Horticulture, Mandsaur (M.P.) on seven year old guava tree cv. L-49 during 2011-2012. The experiment was laid out in randomized block design with three replications. There were two levels of nitrogen i.e., 600 g N (100% N) and 450 g N (75% N), two levels of phosphorus i.e., 400 g P_2O_5 (100% P_2O_5) and 300 g P_2O_5 (75% P_2O_5) and a common dose of potassium i.e., 300 g K_2O and 30 g each of *Azospirillum* and PSB inoculation and 10 kg Vermicompost was applied to the plants. There were 11 treatment combinations, keeping each treatment on two plants, providing total sixty-six plants. The whole of the organic manure was applied as a basal dose on the onset of monsoon. Required doses of fertilizers were applied in two split doses in the month of July and August and then bio-fertilizers were applied one week after each application of inorganic fertilizer. The data on physic - chemical parameters of fruits were recorded. Physico - chemical parameters of fruits were determined using average size fruits collected randomly from each replication. The TSS (^{0}Brix) was recorded with the help of a hand refractometer. Acidity was estimated by simple acid– alkali titration method as described in A.O.A.C. (1970). Sugars in fruits were estimated by the method suggested by Nelson (1944). Assay method of ascorbic acid was followed as given by Ranganna (1977). The estimation of pectin was done as per method of Kertesz (1951).

RESULTS AND DISCUSSION

The physical characteristics (Table 1) of fruit are an expression of a plant's vegetative activity which was also significantly influenced by various

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integrated nutrient treatments. Result showed that significantly highest fruit diameter (7.91 cm), fruit length at harvest (7.52 cm), maximum volume of fruit (217.41 ml), pulp thickness (2.46 cm), pulp weight (211.61 g) and seed weight (8.76 g) were recorded with the application of T_9 (100% N + 100% P_2O_5 + *Azospirillum* + PSB + 10 kg Vermicompost) while maximum pulp percentage (96.08 %) was found under the treatment T_{10} (75% N + 75% P_2O_5 + *Azospirillum* + PSB + 10 Kg vermicompost) which were superior to control (Table 1).

Table 1: Effect of integrated nutrient treatments on physical parameters of guava fruit

Treatments	Fruit length (cm)	Fruit Diameter (cm)	Volume of fruit (ml)	Specific gravity	Pulp Thickness (cm)	Pulp weight (g)	Pulp Percent-age (%)	Seed weight (g)
	At harvest							
Control	5.85	5.89	149.68	0.97	2.26	138.98	95.3	6.7
100% N + 100% P_2O_5	5.95	6.06	154.47	0.97	2.30	144.01	95.3	6.9
75% N + 75% P_2O_5 +10 kg VC	6.22	6.22	179.81	0.99	2.39	168.98	95.5	7.7
100% N + 100% P_2O_5 + *Azos.*	6.15	6.14	157.43	1.00	2.30	147.15	95.0	7.5
75% N + 100% P_2O_5 + *Azos.*	6.05	6.09	159.80	0.97	2.33	147.23	95.1	7.4
100% N + 100% P_2O_5 + PSB	6.20	6.16	161.33	0.98	2.34	149.82	95.1	7.6
100% N + 75% P_2O_5 + PSB	6.20	6.27	163.40	0.99	2.37	152.97	95.1	7.7
100% N + 100% P_2O_5 + *Azos.* + PSB	7.01	7.13	187.70	1.01	2.41	182.51	95.8	7.8
75% N + 75% P_2O_5 + *Azos.* + PSB	6.77	6.22	182.34	1.00	2.41	174.02	95.6	7.8
100% N + 100% P_2O_5 + *Azos.* + PSB + 10 kg VC	7.52	7.91	217.41	1.02	2.46	211.61	96.0	8.7
75% N + 75% P_2O_5 + *Azos.* + PSB + 10kg VC	7.32	7.30	207.40	1.02	2.46	202.62	96.0	8.2
S.Em.±	0.18	0.07	3.65	0.04	0.04	6.30	0.29	0.27
C.D (P=0.05)	0.53	0.20	10.76	NS	0.11	18.57	NS	0.80

Azos. = Azospirillium, VC = Vermicompost

The increase in physical parameters by the application of integrated nutrient treatments might be due to optimum supply of proper plant nutrients and growth hormones in right amount during the entire crop period caused vigorous vegetative development of the plants and ultimately production of more photosynthates and the nutrient combinations that accelerate the metabolic activities of the plant. Nitrogen positively affected the vegetative growth of the plant, phosphorus plays an important role in photosynthesis and accumulation of food material and potassium plays an important role in carbohydrate and protein synthesis, act as a catalyst in the formation of more complex substances and in the acceleration of enzyme activity. Improvement in yield attributes *i.e.* physical character of fruits on account of vermicompost application might have been attributed to the translocation of nutrients from soil to the plants and enhanced supply of macro & micro-nutrients during entire growing season. Biofertilizers encouraged better growth and accumulates optimum dry matter with induction of growth hormones, which stimulated cell division, cell elongation; activate the photosynthesis process, as well as energy transformation which in turn causes increase in physical characters of the fruit. Dey *et al*. (2005), Kumar *et al.* (2008), Athani *et al*. (2009) and Dwivedi *et al*. (2010) also reported similar results in guava.

Table 2: Effect of integrated nutrient treatments on chemical parameters of guava fruit

Treatments	Acidity (%)	TSS/ acid ratio	Ascorbic acid content (mg/100g pulp)	Pectin (%)	TSS (^{0}Brix)	Total sugars (%)	Reducing Sugars (%)	Non-reducing Sugars (%)
Control	0.41	18.01	168.3	0.48	7.33	5.44	3.24	2.21
100% N + 100% P_2O_5	0.44	18.29	173.8	0.51	8.00	5.63	3.40	2.23
75% N + 75% P_2O_5 +10 kg VC	0.23	44.96	194.7	0.66	10.33	6.94	3.65	3.29
100% N + 100% P_2O_5 + *Azos.*	0.36	23.68	188.1	0.65	8.33	6.46	3.49	2.98
75% N + 100% P_2O_5 + *Azos.*	0.35	23.22	185.9	0.58	8.00	5.79	3.43	2.36
100% N + 100% P_2O_5 + PSB	0.29	30.03	189.2	0.64	8.67	6.53	3.60	2.93
100% N + 75% P_2O_5 + PSB	0.25	40.43	193.6	0.64	10.00	6.60	3.61	2.99
100% N + 100% P_2O_5 + *Azos.* + PSB	0.23	46.68	203.5	0.70	11.00	7.31	3.84	3.47
75% N + 75% P_2O_5 + *Azos.* + PSB	0.23	47.16	202.4	0.68	10.67	7.04	3.73	3.31
100% N + 100% P_2O_5 + *Azos.* + PSB + 10kg VC	0.20	56.94	207.9	0.81	11.67	8.06	4.17	3.89
75% N + 75% P_2O_5 + *Azos.* + PSB + 10kg VC	0.22	51.46	205.7	0.79	11.33	7.65	4.00	3.65
S.Em.±	0.02	3.67	3.15	0.02	0.66	0.26	0.09	0.24
C.D (P=0.05)	0.05	10.83	9.29	0.05	1.94	0.76	0.27	0.70

Integrated nutrient treatments also improved the fruit quality (Table 2). Their application significantly influenced the chemical constituents of the fruit. The minimum acidity (0.20%) and maximum TSS/acid ratio (56.94), ascorbic acid content (207.90 mg/100g pulp), pectin (0.81%), total soluble solids (11.67 ^{0}Brix), total sugars (8.06%), reducing sugar (4.17 %) and non-reducing sugar (3.89%) (Table 2) were recorded in application of 100% N + 100% P_2O_5 + *Azospirillium* + PSB + 10 Kg vermicompost which were superior to control. The improvement in ascorbic acid content, pectin, total soluble solids, total sugars, reducing sugar and non-reducing sugar by the 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. Potassium acts as a catalyst in the formation of more complex substances and in the acceleration of enzyme activity. These carbohydrates and coenzymes are beneficial in the improvement of fruit quality. Nitrogen enhanced the uptake of phosphorus and potassium. The chain reactions in these components and beneficial effect of worms which is brought about by mucoses deposit of epidermal cells and coelomic fluids of earthworms, rich in plant growth substances and through rapid mineralization and transformation of plant nutrients in soil and also through the exertion of plant promoting substances, vitamins and amino acid content produced by microorganism of biofertilizers might have possibly been a reason of the improvement in quality of the fruit. Similar findings were also reported by Kumar *et al.* (2009), Shukla *et al.* (2009), Sharma *et al.* (2009) in guava and Yadav *et al*. (2011) in mango.

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