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Effect of Integrated Nutrient Management on Yield and Quality in Mango cv Himsagar

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Abstract

An experiment of integrated nutrient management was conducted on mango cv Himsagar during 2009—2010. The experiments were laid out in randomized block design with five replications and age of the tree is 7 years old with a spacing of 10 × 10 m. To observed the effect of integrated nutrient management on the yield and quality parameters were subjected to 1000 : 500 : 500 g NPK / tree (control) (T_1) ; T_1 + Zn (0.5%) + B (0.2%) + Mn (1%) + Ca (0.6%) as foliar application twice (August and October) (T_2) ; T_1 + Organic mulching (10 cm thick of dry leaves) (T_3) ; (iv) T_2 + Organic mulching (10 cm thick of dry leaves) (T_4) ; $^1/_2$ T_1 + 50 kg FYM + 250 g *Trichoderma* (T_5) ; $^1/_2$ T_1+ 50 kg FYM+250 g *Azospirillium* (T_6) ; $^1/_2$ T_1 + *Azotobacter* (250 g) + 250 g *Azospirillium* (T_7) ; and $^1/_2$ T_1 + *Azotobacter* (250 g) + 50 kg FYM (T_8). Observation on the pooled data of yield and quality revealed that total number of fruits per tree was maximum in T_6 and average fruit weight was also maximum in T_6 (239.40). Similarly, for quality parameters fruit length and breadth maximum in T_2 (6.78) and T_3 (5.56) respectively. Peel percentage was highest in T_1 (15.24%), stone percentage in T_4 (17.66%) but the pulp percentage was highest by T_5 (73.45%). Other quality parameters TSS, acidity, reducing sugar and total sugar was highest in T_6 (19.16 ^{0}Brix), T_5 (0.21), T_7 (4.48) and T_6 (15.54) respectively. However, the overall performance of T_6 treatment was better in yield and quality parameters which can be recommended for mango plantation in new-alluvial zone of West Bengal in the future.

Key words : Mango, Himsagar, Integrated nutrient management, Yield, Quality.

India has made a fairly good progress on the horticulture map of the world with total annual production of horticultural crops touching over 207,012 million tonnes during 2008-09 and second largest producer of fruits after China. Mango is one of the most important fruit crops known as 'king of fruits' in India is the most popular fruit in the country. Apart from its uses as desert fruit, mango has several other nutritional and industrial uses, such as consumed fresh as either green or mature ripe and processed into numerous products. It is grown in India since from ancient time and shares about 40.8% of total mango production in the world. Its production has been increasing since independence, contributing 21.7% of total fruit

Table 1. Treatment details of the experiment.

T_1—1000 : 500 : 500 g NPK/tree (control)
T_2—T_1 + Zn (0.5%) + B (0.2%) + Mn (1%) + Ca (0.6%) as foliar application twice (Aug & Oct)
T_3—T_1 + Organic mulching (10 cm thick of wheat straw)
T_4—T_2 + Organic mulching (10 cm thick of wheat straw)
T_5—$^1/_2$ T_1 + 50 kg FYM + 250 g *Trichoderma*
T_6—$^1/_2$ T_1 + 50 kg FYM + 250 g *Azospirillium*
T_7—$^1/_2$ T_1 + 50 kg FYM + 250 g *Azotobacter*
T_8—$^1/_2$ T_1 + 250 g *Azotobacter* + 250 g *Azospirillium*

Table 2. Effect of integrated nutrient management on yield parameters in mango cv Himsagar during seventh and eighth year of the tree age.

	Total number fruits/tree			Av frt wt (g)		
Treatments	2008-09	2009-2010	Pooled	2008-09	2009-10	Pooled
T_1	176.00	158.00	168.40	236.26	231.28	233.77
T_2	226.25	256.20	241.30	233.76	245.30	233.50
T_3	254.70	245.20	245.26	226.76	240.96	233.62
T_4	230.00	251.50	240.70	233.42	225.98	232.70
T_5	248.00	226.20	237.10	222.48	235.58	229.00
T_6	333.70	276.00	263.42	244.22	244.62	239.40
T_7	241.00	230.70	234.00	229.14	233.62	234.38
T_8	210.30	185.00	197.30	216.56	230.80	223.66
SE ±	32.04	36.94	23.72	5.87	15.35	8.14
CD at 5%	57.58	66.40	42.63	10.55	27.60	14.66

Table 3. Effect of integrated nutrient management on physical parameters in mango cv Himsagar during seventh and eighth year of the tree age.

Treatments	Fruit length (cm) 2008-09	2009-10	Pooled	Fruit breadth (cm) 2008-09	2009-10	Pooled
T_1	6.22	6.64	6.41	5.04	5.34	5.14
T_2	6.76	7.14	6.78	5.14	5.26	5.16
T_3	6.58	6.82	6.68	5.80	5.36	5.56
T_4	6.68	6.62	6.70	5.34	5.24	5.24
T_5	6.74	6.52	6.62	5.32	5.20	5.24
T_6	6.36	6.88	6.58	5.50	5.34	5.40
T_7	6.30	6.80	6.58	5.40	5.36	5.36
T_8	6.88	6.82	6.66	5.16	4.86	4.94
SE ±	0.21	0.13	0.10	0.23	0.19	0.12
CD at 5%	0.36	0.26	0.18	0.44	0.36	0.24

production of India. It is grown at least 87 countries but no where it is so greatly valued as in India. However, the productivity is only 6.30 tonnes per ha which is significantly low as compared to other mango growing countries (1). There are various factors but mainly due to improper irrigation, nutrient management, pests and diseases and continuous exhaustion which lead to decline in growth, productivity and quality in mango. So, nutrient analysis is required by leaf and soil fertility analysis for each crop for better yield and productivity. Meera and Bhargava (2) also reported that the nutrient recommendations were made considering nutrient need, plant nutrient status as assured by leaf analysis and soil fertility evaluation. Therefore, unless integrated nutrient management is taken up the soil will deteriorate and production per unit area will be decrease in the future.

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Methods

The investigations were carried out at Regional Research Station, Gayeshpur, B. C. K. V., Nadia, West Bengal during 2009-2010 for the evaluation of integrated nutrient management (INM) in mango cv. Himsagar. The experiments were laid out in randomized block design with five replications and age of the tree is 7-year old with a spacing of 10 × 10 m and the treatment details was given in Table 1. The site of the experiment Central Research Farm is situated at 22°57′ N latitude and 89° 34′ E longitudes with an average altitude 9.75 m above the mean sea level.

Every treated plant is to be supplemented with the recommended dose of each treatment from August. The treatments along with mulches (dry wheat straw leaves) are to be applied to a thickness of 8—10 cm and are to be kept in the field for 2 years.The observations like average fruit weight, yield, physical and quality parameters are estimated following the standard methods as described by Rangana (3).

Results and Discussion

The results show that the yield was signifi-

Table 4. Effect of integrated nutrient management on physical parameters in mango cv Himsagar during seventh and eighth year of the tree age.

Treatments	Peel % 2008-09	2009-10	Pooled	Seed % 2008-09	2009-10	Pooled	Pulp % 2008-09	2009-10	Pooled
T_1	12.36	18.12	15.24	15.76	19.14	17.45	71.88	62.74	67.31
T_2	12.06	13.60	12.84	14.72	15.30	15.01	73.30	70.96	72.13
T_3	14.44	14.14	14.29	14.16	17.48	15.82	72.00	68.36	70.18
T_4	14.94	10.44	12.69	21.66	13.66	17.66	63.40	75.96	69.68
T_5	13.36	13.04	12.50	16.54	14.46	13.21	74.40	72.50	73.45
T_6	14.86	11.70	13.28	16.54	12.44	12.07	68.60	76.24	72.42
T_7	11.36	15.20	10.99	16.78	15.44	16.11	72.00	69.10	70.55
T_8	13.36	13.84	13.60	17.34	15.10	16.22	68.14	70.72	69.43
SE ±	1.06	2.17	0.86	2.63	1.04	1.55	2.51	1.92	1.80
CD at 5%	1.91	4.73	1.54	4.73	1.87	2.79	4.52	3.49	3.23

Table 5. Effect of integrated nutrient management on quality parameters in mango cv. Himsagar during seventh and eighth year of the tree age.

Treatments	TSS 2008-09	TSS 2009-10	TSS Pooled	Acidity 2008-09	Acidity 2009-10	Acidity Pooled
T_1	18.16	17.28	17.22	0.17	0.13	0.15
T_2	17.50	17.00	17.52	0.19	0.22	0.20
T_3	19.09	18.04	18.64	0.15	0.17	0.16
T_4	17.96	17.72	17.84	0.16	0.20	0.18
T_5	17.80	18.12	17.96	0.21	0.21	0.21
T_6	19.24	19.23	19.16	0.14	0.18	0.16
T_7	18.60	18.04	18.32	0.17	0.15	0.16
T_8	18.72	18.52	18.62	0.16	0.16	0.16
SE ±	0.49	0.34	0.22	0.29	0.01	0.01
CD at 5%	0.88	0.69	0.41	0.54	0.02	0.02

Table 6. Effect of integrated nutrient management on quality parameters in mango cv. Himsagar during seventh and eighth year of the tree age.

Treatments	Reducing sugar 2009	Reducing sugar 2010	Reducing sugar Pooled	Total sugar 2009	Total sugar 2010	Total sugar Pooled
T_1	4.14	3.20	3.64	14.72	13.00	13.56
T_2	3.66	3.64	3.62	15.16	13.20	14.18
T_3	3.68	3.08	3.36	15.20	15.06	15.13
T_4	3.88	3.56	3.68	14.16	15.06	14.61
T_5	4.44	3.22	3.82	14.68	14.00	14.34
T_6	3.66	3.86	3.74	15.48	15.60	15.54
T_7	4.16	4.86	4.48	14.04	13.84	13.94
T_8	3.84	3.40	3.60	15.10	14.12	14.61
SE ±	0.41	0.13	0.20	0.46	0.86	0.45
CD at 5%	0.74	0.26	0.36	0.83	1.55	0.86

cantly maximum in T_6 both in total number fruits / tree and average fruit weight and minimum in T_1 (control) for total number of fruits / tree but the average fruit weight was lower in T_8 (Table 2). However, Lal and Malhi (4) reported that there was no significant increase in yield, fruit size and weight, pulp or stone weight with any treatment of zinc sulfate in mango cv, Dashehari but total soluble solids in the fruit was significantly higher as compare with the control. Similarly, Patel et al. (5) also reported in mango cv. Amrapali that the application of 50 kg FYM + vermicompost (16.5 kg) + *Azotobacter* (10 g) + PSB (10 g) per plant give the highest number of fruits per tree, fruit weight, total soluble solids, beta carotene and ascorbic acid significantly.

Physical parameters like fruit length and breadth was maximum in T_2 (6.78) and T_3 (5.56) but lowest in T_1 (6.41) and T_8 (4.94) respectively and peel percentage was highest in T_1 (15.24%), stone percentage in T_4 (17.66%) and pulp percentage in T_5 (73.45%) but lowest in T_7 (10.99%), T_6 (12.07%) and T_1 (67.31%) respectively (Tables 3 and 4). Quality parameters like TSS, total sugar, acidity and reducing sugar are maximum in T_6 (19.16 ^{0}Brix), T_6 (15.54), T_5 (0.21) and T_7 (4.48) respectively but minimum in T_2 (17.72^{0}Brix) for TSS, T_1 (13.56) for total sugar, reducing sugar in T_3 (3.36) and acidity in T_1 (0.15) respectively (Tables 5 and 6).

In guava, Shukla et al. (6) reported that the application of 50% dose of NPK + 50 g *Azotobacter* significantly increased the canopy volume (201.43 m^3), fruit weight (153.30 g), TSS (14 ^{0}Brix), ascorbic acid (198.30 mg/100g pulp), reducing sugar (4.77%) and total sugar (8.10%) in cv Sardar guava and Dutta et al. (7) also reported in guava that *Azospirillium* + VAM inoculation along with 100% N and 100% P_2O_5 showed effective in increasing the TSS, total sugar and ascorbic acid content of fruits.

The overall performance of mango cv Himsagar was better both in yield and quality parameters in T_6 as compared with the other treatments. Therefore, from the present study, it appears that the application of biofertilizers along with inorganic and organic fertilizer of 500 : 250 : 250 g NPK / tree + 50 kg FYM + 250 g *Azospirillium* (T_6) under integrated nutrient management system of mango cultivation for achieving better yield and quality in the new alluvial zone of West Bengal.

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