International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; SP6: 245-248

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(Special Issue -6)
3rd National Conference
On
PROMOTING & REINVIGORATING AGRI-HORTI, TECHNOLOGICAL INNOVATIONS [PRAGATI-2019]
(14-15 December, 2019)

Effect of pruning, organic and inorganic nutrition on yield attributing characters and yield of mango (*Mangifera indica* L.) Cv. Amrapali

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Abstract
The present study was conducted to evaluatethe "Effect of pruning, organic and inorganic nutrition on yield attributing characters and yield of mango (M*angifera indica* L.) cv. Amrapali was carried out at Main Experiment Station, Department of Horticulture, Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) during the years 2015-16 and 2016-17. The experiments were conducted in Randomized Block Design with ten treatments and three replications. The detail of treatments were as T_1-5 cm pruning+FYM@ 20 kg per plant, T_2-5 cm pruning+ Vermicompost @ 10kg per plant, T_3-5 cm pruning+ ZnSO4 @ 1.0% + Borax @ 0.4%, T_4-10 cm pruning+ FYM@ 20kg+ Zinc sulphate@ 1.0% per plant, T_5-10 cm pruning+ Vermicompost @10kg+ Borax @0.4% per plant, T_6-10 cm pruning+PSB 250g+ MgSO4 @0.5% per plant, T_7-15 cm pruning+FYM @20kg+ Zinc sulphate @1.0% per plant, T_8-15 cm pruning+ Vermicompost @10kg+ Borax@0.4% per plant, T_9-15 cm pruning+ PSB 250g+ MgSO4 @0.5% per plant, T_{10}- Control (no pruning+ water spray). The maximum fruit length(11.54 and 11.79 cm), fruit width (5.46 and 5.30 cm), fruit weight (225.36 and 222.07 g),fruit volume (237.42 and 235.77cm^3), pulp weight (171.67 and 171.80 g), stone ratio (3.89 and 4.01), fruit yield (25.65 and 26.98 kg/plant) and fruit yield (410.40 and 431.68 q/ha) was recorded with the treatment T_8 (15 cm pruning + Vermicompost @10kg+ Borax @ 0.4%). However, minimum value of all characters was found with T_{10} (no pruning + water spray) during both the years.

Keywords: Pruning, organic - inorganic nutrition, yield attributing characters, yield, mango

Introduction
Mango (*Mangifera indica* L.) is the fifth most important fruit of the world after apple, citrus, banana and grape. It is cultivated in more than 100 countries because of its delicious taste, excellent flavor, attractive fragrance and excellent source of vitamin A and C. The total annual production of mango in India is 18.43 million tones, cultivated in 2.52 million hectare with productivity (7.30 Mt/ ha).Considering the importance of mango there is dire need to initiate the nutrient management and pruning intensity programme to increase vegetative growth, fruit size, uniform ripening, fruit yield and quality of mango. In addition to nutrient intensity and pruning has also been reported to manage plant canopy and enhance the flowering, fruiting, yield and quality of many fruit crops (Ali *et al*. 2001) [1].
All the parts of the plant have various uses. Both ripe and unripe mangoes are used extensively by food processing industry to prepare a wide variety of products such as syrup, jam, squash, juice, cereals flakes and toffee etc. The ripe mango, used to prepare pickles, chutney, slices, amchur, candy, jam, jelly preserve, squash etc from unripe mango varieties such as Fazli,

Chausa, Langra, Dashari etc. Mango is one of the best exporting materials both in fresh and processed from and is being exported to U.K., U.S.A., France, Kuwait, Bahrain, Afghanistan, Malaysia, Quatar and Singapore etc.

Generally Indian soil is deficient to N and P. Nitrogen is one of the most important essential plant nutrients. It is constituents of protoplasm, protein, chlorophyll, nucleotide, alkaloids, hormones and vitamins, which play an important role in crop production and awareness on health security with use of natural food. Organic food and quality produce, the judicious use of chemicals is gaining less importance and banned by few countries. The use of chemical fertilizers for production of herbal drugs is also advisable to maintain the quality and medicinal properties of herbal species. It requires favorable soil and climate condition for properly development of plant. The yield and quality of herbs is highly affected by agro-cultural practices. In most of the Horticultural, Medicinal and Vegetable crops, FYM is the most common organic manure used for supplement the initial requirement of nutrients for better establishment such as animal, plant wastage i.e. Nitrogen, Phosphorus, Potash and micronutrients. The continuous applications of huge amount of chemical fertilizers hamper the fruit quality, soil health and generate pollution. The combination of organic and in-organic nutrients paves away to overcome of these problems. Plant nutrient can be supplied from different sources viz., organic manures and chemical fertilizers for better utilization of resources and to produce crop with less expenditure. Organic manures enhance nutrient availability in order to improve the soil health, soil structure and provide conducive environment for the treatment of soil micro flora. Potential of using organic manures along with balanced fertilizers are well established in increasing crop yield and sustained crop production (Nambiar and Abrol, 1992) [6].

The micro-nutrients play vital role in growth, development, retention and quality of fruits. The foliar feeding of micro-nutrients has gained much importance in recent years and comparatively more effective for rapid recovery of plants, as under high soil pH conditions, most of macro and micro-nutrients are unavailable. Various trials have been conducted on foliar feeding of micro-nutrients in different fruit crops and found effective in improving the vegetative growth, yield and quality of fruits (Sindhu *et al.* 1994 [9]. Banik *et al.* 1997 [3]. And Babu and Singh, 1998) [2].

Materials and Methods

The experiment was carried out on 25 year old mango orchard planted under sodic soil condition and site is located at Main Experiment Station, Horticulture, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad on the Raibareli road at the distance of 42 km away from Ayodhya district head quarter. Geographically it is situated at 26^0-47^0N latitude, 82.12^0E longitude of 113 meter away from mean sea level. This site is located in typical saline-alkaline belt of indigenous plains of eastern Uttar Pradesh.The experiment was laid out in Randomized Block Design with 3 replications. One plant was taken as unit per plot in the treatment. The detail of treatments were as T_1-5 cm pruning+FYM@ 20 kg per plant, T_2-5 cm pruning+ Vermicompost @ 10kg per plant, T_3-5 cm pruning+ ZnSO4 @ 1.0% + Borax @ 0.4%, T_4-10 cm pruning+ FYM@ 20kg+ Zinc sulphate@ 1.0% per plant, T_5-10 cm pruning+ Vermicompost @10kg+ Borax @0.4% per plant, T_6-10 cm pruning+PSB 250g+ MgSO4 @0.5% per plant, T_7-15 cm pruning+FYM @20kg+ Zinc sulphate @1.0% per plant, T_8-15 cm pruning+ Vermicompost @10kg+ Borax@0.4% per plant, T_9-15 cm pruning+ PSB 250g+ MgSO4 @0.5% per plant, T_{10}- Control (no pruning+ water spray). The yield attributing characters and yield parameters were recorded as following. Fruit length (cm): The length of fruits was recorded at the maturity with the help of meter scale and average of 10 fruits were taken and expressed in centimeter**.** Fruit breadth (cm): The breadth of fruits was recorded at the maturity with the help of meter scale and average of 10 fruits were taken and expressed in centimeter. Fruit weight (g): The fruits were weighted by physical balance at the maturity and the average weight of 10 fruits were worked out and expressed in gram. Volume of fruit (cm^3): Volume of 10 fruits were worked out by displacement method and expressed in cm [3].Stone weight (g): The weight of stones was recorded by physical balance and the average stone weight was calculated and expressed in gram. Pulp stone ratio: The pulp and stone ratio of the fruit was calculated by dividing the pulp weight by the stone weight.

$$\text{Pulp-stone ratio} = \frac{\text{Weight of pulp}}{\text{Weight of stone}}$$

Yield per plant (kg): The yield per tree was recorded at the time of fruit harvesting and expressed in kg/ tree. Yield quintal per ha: Theyield per tree was recorded at the time of fruit harvesting and expressed in kg/ tree. The yield per plant was multiplied by the number of plants and yield (q/ha) worked out. The statistical analysis of data was carried out as per method prescribed by Panse and Sukhatme (1967) [7].

Results and Discussion

The application of pruning, organic and inorganic nutrition improve the fruit size (length and breadth) as comparison to control. The maximum fruit length (11.54 and 11.79 cm) was recorded with the application of T_8 (15 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) it was statistically at par with treatment T_5 (10 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) and T_7 (15 cm pruning + FYM @20kg+ Zinc sulphate @1.0%) whereas, minimum fruit length (9.80 and 9.92 cm) was recorded in treatment T_{10} (no pruning + water spray) during both the years (2015-16 and 2016-17), respectively. The treatment T_8 (15 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) recorded significantly higher fruit length than treatments T_1, T_2, T_3, T_4, T_6, T_9 and T_{10} during both years of experimentation. As given in Table1 the maximum fruit width (5.46 and 5.30 cm) was observed with the treatment T_8 (15 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) followed by T_2 (5 cm pruning + Vermicompost @ 10 kg per plant) during 2015-16 and 2016-17. while minimum (4.85 and 4.70 cm) fruit width was recorded in control treatment during both the years of study. This was might be due to increase of fruit size could be explained on the basis of balanced nutrient supply which encouraged the vegetative growth due to supply of nutrients through inorganic and organic sources. Organic manure and bio fertilizer favored for good soil fertility status which improve availability of nutrient and improve of fruit size favored better availability. The results were also corroborated with finding of Kumar *et al.* (2012) [4]. In lemon and Sharma *et al.* (2013) [8]. in guava

The maximum fruit weight (225.36 and 222.07 g) was recorded under treatment T_8 (15 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) it statistically at par with T_5 (10 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) and T_7 (15

cm pruning + FYM @20kg+ Zinc Sulphate @ 0.1% per plant) and rest of the treatments produced significantly lesser fruit weight during both the years. However, the minimum value (165.50 and 170.40 g) was recorded T_{10} (no pruning +water spray) during 2015-16 and 2016-17, respectively. The increase in fruit weight due to increase photosynthetic ability to plant the vermicompost and borax appear to have indirect role hastening the cell division and cell elongation. Similar results have been reported by of Kumar *et al.* (2012) [4]. In lemon and Sharma *et al.* (2013) [8]. in guava.

The maximum fruit volume (237.42 and 235.77cm^3) was recorded in T_8 (15 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) followed by T_8 (10 cm pruning + Vermicompost @10kg+ Borax @ 0.4%). However, minimum (180.50 and 172.90 cm^3) was recorded with control (no pruning +water spray) during both the years, respectively. This is due to that the vermicompost and borax increase the fruit size might be due to their involvement in cell division, cell expansion and increase volume of intercellular space into mesocarpic cells. Similar results also obtained by Manjunath *et al.* (2006) in papya and Kumar *et al.* (2012) [4]. in lemon.

The data of pulp weight revealed that the application of T_8 (15 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) recorded maximum pulp weight (171.67 and 171.80 g) it was statistically at par with T_5 (10 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) and T_7 (15 cm pruning + FYM @20kg+ Zinc Sulphate @ 0.1% per plant) during both the years of experimentation. While, treatment T_8 was significantly superior to treatments T_1, T_2, T_3, T_4, T_6, T_9 and T_{10}. The minimum pulp weight (126.40 and 124.90 g) was recorded in T_{10} (control) during 2015-16 and 2016-17, respectively**.** The data of pulp: stone ratio raveled that the treatment T_8 (15 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) recorded maximum pulp: stone ratio (3.89 and 4.01) during 2015-16 and 2016-17, respectively. Treatment T_8 (15 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) found statistically at par with T_4, T_5, T_6, T_7 and T_9 during 2015-16 while, it at par with T_5, T_6 and T_9 during 2016-17. However, the minimum (3.43 and 3.33) pulp: stone ratio in treatment T_{10} during both the years of experimentation. The increase in pulp weight and pulp: stone ratio might be due to the fact that vermicompost and borax enhance the rate of cell division and multiplication to better overall food and nutrient status of the plant under the treatment. The results are close conformity with the finding of Manjunath *et al.* (2006) in papya and Kumar *et al.* (2012) [4]. in lemon.

The maximum (25.65 and 26.98 kg/plant) fruit yield was recorded in T_8 (15 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) during 2015-16 and 2016-17, respectively. Treatment T_8 was statistically at par with T_5 (10 cm pruning + Vermicompost @10kg+ Borax @ 0.4%), T_7 (15 cm pruning + FYM @20kg+ Zinc Sulphate @ 0.1%) and significantly than rest of the treatments during both the years of investigation. However, minimum (15.50 and 16.80 kg) fruit yield per plant was recorded under the treatment T_{10} (no pruning + water spray) during both the years of experimentation. The maximum (410.40 and 431.68 q/ha) fruit yield was recorded in T_8 (15 cm pruning + Vermicompost @10kg+ Borax @ 0.4%) during 2015-16 and 2016-17, respectively. Treatment T_8 was statistically at par with T_5 (10 cm pruning + Vermicompost @10kg+ Borax @ 0.4%), T_7 (15 cm pruning + FYM @20kg+ Zinc Sulphate @ 0.1%) and significantly than rest of the treatments during both the years of investigation. The increase in number of fruit and fruit size which ultimately increased fruit yield; similar results also obtained by Manjunath *et al.* (2006) in Papyaand Kumar *et al.* (2012) [4]. in lemon.

Table 1: Effect of pruning, organic and inorganic nutrition at number of panicles, Fruit width, fruit weight, stone weight, pulp stone ratio, volume of fruit, yield per plant and yield q/ha in mango cv. Amrapali.

Treatments	Fruit length (cm)		Fruit width (cm)		Fruit weight (g)		Volume of fruit (cm^3)		Stone weight (g)		Pulp stone ratio		Yield per plant (kg)		Yield (q/ha)	
	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17
T_1	10.61	10.66	5.35	5.15	192.41	200.69	220.99	217.76	41.81	42.52	3.44	3.45	20.91	21.70	334.56	347.20
T_2	10.81	10.90	5.25	5.25	196.22	204.66	225.36	222.07	42.80	43.40	3.58	3.60	21.32	22.15	341.12	354.40
T_3	10.75	10.99	5.09	4.90	182.88	190.75	210.05	206.98	39.90	40.55	3.43	3.46	19.87	20.64	317.92	330.24
T_4	10.40	10.45	5.05	4.93	210.99	207.96	225.84	227.65	43.08	42.85	3.77	3.66	23.63	24.65	378.08	394.40
T_5	11.31	11.56	5.15	5.03	220.99	217.76	232.81	232.16	44.63	43.80	3.71	3.87	24.15	25.13	385.60	402.08
T_6	9.89	9.93	4.80	4.68	200.54	197.66	214.66	216.38	40.94	41.52	3.77	3.78	23.80	24.15	380.80	386.40
T_7	11.02	11.12	5.15	5.20	215.17	212.08	230.31	231.19	43.28	43.33	3.87	3.70	24.10	25.06	386.40	400.96
T_8	11.54	11.79	5.46	5.30	225.36	222.07	237.42	235.77	44.14	43.55	3.89	4.01	25.65	26.98	410.40	431.68
T_9	10.27	10.36	4.90	4.94	210.05	206.98	221.28	219.74	41.14	39.98	3.87	3.73	22.45	23.42	359.20	374.72
T_{10}	9.80	9.92	4.85	4.70	165.50	171.40	180.50	172.90	36.90	37.50	3.43	3.33	15.50	16.80	248.00	268.80
SEm±	0.22	0.23	0.09	0.14	3.80	5.18	6.05	7.01	0.77	0.79	0.10	0.10	3.80	5.18	8.78	10.20
CD at 5%	0.72	0.78	0.28	0.41	11.38	14.02	17.98	20.84	2.33	2.35	0.27	0.29	11.38	14.83	26.30	32.17

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