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Effect of organic and inorganic nutrient on nutritional status in mango

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Abstract
The study was conducted during 2015-2016 to see the effect of organic and inorganic nutrient on nutritional status in mango of 15 years old Amrapali tree which were planted at 5m x 5m spacing. Among the ten treatments, 80% RDF and Cow dung slurry @10 lit/tree showed best results.The maximum available nitrogen (1.29%), available phosphorus (0.20%), available potassium (0.78%), calcium (1.54%), magnesium (0.47%), copper (30.97 ppm), manganese (68.20 ppm), zinc (34.50 ppm) and iron (166.77 ppm) in leaf was found in the treatment where 80% RDF + Cow dung slurry @10 lit/tree was applied.

Keywords: organic, inorganic, RDF, nutrient

1. Introduction
The mango (*Mangifera indica* L.) is the most important fruit crop belonging to the botanical family "Anacardiaceace". Due to its delicate taste, pleasant aroma and high nutritional value it is considered as king of fruits', 'heavenly fruit' and 'super fruit', However, the performance of varieties is found to vary under different climatic conditions (Singh, 1978) [7]. Amrapali is a mango hybrid (Dashehari x Neelum) and gaining popularity for its dwarf stature and regular bearing in nature. About 1,600 plants can be accommodated in one hectare area, while Mallika in semi-vigorous can be planted at 6-8 m spacing. Amrapali is highly precocious and commercial harvest can be taken after three years of planting. The fruits are sweet, fibreless, with an attractive orange red pulp colour. Amrapali pulp has the highest beta carotenoids contents and can be used for blending pulp of white pulp coloured varieties. Amrapali has already occupied a major area in newly planted mango orchard in West Bengal and replacing the traditional cultivars. Nutrition of trees is an important part of mango orchard management practices and fertilizer is one of the major inputs accounting for nearly 35 percent of the cost of cultivation. Indiscriminate use of inorganic chemical fertilizers resulted in high amount of chemical residues in field as well as in the crop produces leading to various environmental and heat hazards along with socio-economic problem (Kundu *et al*., 2011) [5] but inorganic fertilizers can not be totally avoided. Therefore, the combination of organic fertilizer with inorganic fertilizers may be the best option to minimize the chemical residues. So, the present investigation was carried to see the effect of organic and inorganic fertilizers in mango.

2. Materials and Methods
The experiment was carried out at Horticulture Research Farm, Department of Fruit Science, Indira Gandhi Krishi Vishwavidyalaya, Raipur Chhattisgarh during 2015-16 to find out the nutrient status on 15 year old mango Amrapali which were planted at 5m x 5m spacing. The experiment was laid out with ten treatments and three replications with randomized block design. Three levels of inorganic fertilizers (100% NPK, 80% NPK and 60% NPK) were applied alone and also in combinations with different organic and biofertilizers *viz.* Cowdung slurry, Vermiwash, Azospirillum, C.G. Trychome and PSB. The plant fertilized with 100% NPK revealed 500g nitrogen, 300g phosphorus and 500g potassium. Nitrogen fertilizer was applied in three split doses. First dose of Nitrogen was applied on 20th January, before flowering, while the second dose of Nitrogen was applied on 20th March, after flowering and third dose of Nitrogen was applied on 20th April after the fruit setting. Phosphorus and Potash were applied in a single application before flowering on 20th December. The fertilizers used a source of Nitrogen, Phosphorus and Potassium were Urea, Single Super Phosphate and

Potassium Sulphate, respectively. Biofertilizers @100g each was incorporated to the concerned plant and organic fertilizers @10lit/tree. Organic, inorganic and biofertilizers were applied in a ring of one meter away from the trunk and at a depth of 30 cm.

Leaf analysis

To determine leaf mineral content, 6-7 months old, 40 leaves were taken randomly (Chadha *et al*.,1980) [1] during February, May and August to find out the relationship were washed with tap water, then with distilled water and dried at 70 °C, finally ground and digested. The digested solution was used to determine N, P and K content as percentage on dry weight bases using the methods described by Cottenie *et al*., (1982) [2].

The leaf analysis of nitrogen was done by micro kjeldahls methods. Weighed accurately 5g leaf sample and ground, and added 10 ml. conc. H2SO4 and 1 g salt mixture. The mixture was kept overnight. Digestion was done the next day. The sample was cooled and the obtained aliquot was used for distillation. After distillation, titration was carried out with sulphonic acid. The analysis of phosphorus and potassium in leaf was done by Vanado Molybdate Method. Plant samples were digested in di-acid mixture (HNO3 and HClO4 in 10:4 ratio) and calcium and magnesium contents were determined by versene titration. Similarly, plant samples were digested di-acid mixture (HNO3 and HClO4 in 10:4 ratio) and Fe, Mn, Cu and Zn contents in the digest were estimated using atomic absorption spectrophotometer.

3. Result and Discussion

Major nutrients

Among ten treatments, the combination of inorganic and inorganic treatments exhibited profound effect on nutrient content in plant then inorganic fertilizers alone. Results indicated that the efficiency of 80% RDF was more when supplemented with cow dung slurry @10 lit/tree. The maximum available nitrogen (1.29%), available phosphorus (0.20%), available potassium (0.78%) in leaf was found in the treatment 80% RDF + Cow dung slurry @10 lit/tree (T_2) followed by 100% RDF (T_1) whereas minimum available nitrogen (0.99%), phosphorus (0.06%) and potassium in leaf (0.50%) was recorded in control (T_0). It seems that the combination of both organic and inorganic fertilizers is suitable for good health of plants which may flourish good flowering and fruiting.

Available calcium in mango leaf is affected significantly by different nutrient application. Significantly maximum available calcium in leaf (1.54%) was observed in the treatment 80% RDF + Cow dung slurry @ 10 lit/tree (T_2) followed by 100% RDF (T_1). However, the treatment T_3 and T_6, T_7 and T_5, T_9 and T_8 were found statistically at par. The similar result was also found by Sankar *et al*., (2013) [6]. The significantly maximum available magnesium (0.47%) was observed in the treatment of 80% RDF + Cow dung slurry@10 lit/tree (T_2) fallowed by 100% RDF (T_1). Significantly the minimum available magnesium in mango leaf (0.29%) was recorded in control (T0).

Table 1: Effect of organic and inorganic fertilizers on major nutrient content in mango

Treatments	Nitrogen (%)	Phosphorus (%)	Potassium (%)	Calcium (%)	Magnesium (%)
T_0 (Control without nutrient application)	0.99	0.06	0.50	1.31	0.29
T_1 (100% RDF, Without fertilizer)	1.27	0.18	0.75	1.49	0.45
T_2 (80% RDF+ Cowdung slurry 10lit/tree)	1.29	0.20	0.78	1.54	0.47
T_3 (80% RDF+ Vermiwash 10 lit/tree)	1.26	0.16	0.73	1.47	0.42
T_4 (80% RDF + C.G Trychome)	1.22	0.14	0.67	1.40	0.39
T_5 (80% RDF + Azospirillum+PSB)	1.19	0.11	0.65	1.37	0.35
T_6 (60% RDF +Cowdung slurry 10lit/tree)	1.23	0.15	0.69	1.43	0.40
T_7 (60% RDF + Vermiwash 10lit/tree)	1.20	0.13	0.66	1.39	0.37
T_8 (60% RDF + C.G. Trychome)	1.00	0.08	0.52	1.32	0.33
T_9 (60% RDF+ Azospirillum +PSB)	0.01	0.10	0.54	1.34	0.34
SEm ±	0.01	0.005	0.02	0.04	0.03
CD (5%)	0.04	0.01	0.08	0.13	0.09
CV (%)	2.13	6.72	7.57	5.72	14.82

The enhanced availability of K may be due to the combined application of inorganic fertilizers and cowdung slurry. The application of cowdung slurry has a beneficial effect on the availability of nutrients. Moreover, cowdung is rich in nutrients and addition of organic manures increases the concentration of H+ ions in the soil which further improves the cation exchange capacity (CEC) of the soil colloids, hence increasing the availability of N, P, K ions in the soil. The results are support the earlier findings of Kanwar *et al*., (1987) [4] and Hamdy *et al*., (2007) [3].

Minor nutrients

Copper

The data present in table 2 is showing that significantly maximum available copper in leaf (30.97 ppm) was observed in the treatment 80% RDF + Cow dung slurry @10 lit/tree (T_2) followed by 100% RDF (T_1) while minimum copper (15.67 ppm) was observed under the treatment control (T_0).

Manganese

It is evident from the data that maximum available manganese in leaf (68.20 ppm)was observed in the treatment 80% RDF + Cow dung slurry @10 lit/tree (T_2) followed by 100% RDF (T_1) whereas the minimum available manganese in mango leaf (50.10 ppm) was recorded in control (T_0).

Zinc

The maximum available zinc in leaf (34.50 ppm) was observed in the treatment 80% RDF + Cow dung slurry @10 lit/tree (T_2) followed by 100% RDF (T_1). Significantly minimum available zinc in mango leaf (20.53 ppm) was recorded in control (T_0).

Iron

From the table 2, it is clear that the maximum available iron in leaf (166.77 ppm) was observed in the treatment 80% RDF + Cow dung slurry @10 lit/tree (T2) followed by 100% RDF (T1) and the minimum available iron in mango leaf (130.63 ppm) was recorded in control (T0).

The beneficial effect of micro nutrient on fruiting quality and availability of micro-nutrient could be attributed due to their positive action on producing IAA and activating the enzymes, the biosynthesis of chlorophyll and carbohydrates and the germination of pollen and uptake of water and nutrient by trees. These results are agreement with the finding of Hamdy *et al*., (2007) [3].

Table 2: Effect of organic and inorganic fertilizers on minor nutrient content in mango

Treatments	Copper (ppm)	Manganese (ppm)	Zinc (ppm)	Iron (ppm)
T_0 (Control without nutrient application)	15.67	50.10	20.53	130.63
T_1 (100% RDF, Without fertilizer)	27.93	64.37	33.30	164.83
T_2 (80% RDF+ Cowdung slurry 10lit/tree)	30.97	68.20	34.50	166.77
T_3 (80% RDF+ Vermiwash 10 lit/tree)	26.70	63.93	30.10	162.90
T_4 (80% RDF + C.G Trychome)	23.67	58.73	26.47	156.53
T_5 (80% RDF + Azospirillum+PSB)	21.17	55.40	24.20	143.60
T_6 (60% RDF +Cowdung slurry 10lit/tree)	24.57	60.27	27.40	158.97
T_7 (60% RDF + Vermiwash 10lit/tree)	22.20	56.80	24.33	146.50
T_8 (60% RDF + C.G. Trychome)	17.59	51.73	23.37	135.10
T_9 (60% RDF+ Azospirillum +PSB)	18.33	53.97	24.00	136.70
SEm ±	1.26	0.87	0.22	2.92
CD (5%)	3.77	2.59	0.67	8.67
CV (%)	9.60	2.58	1.46	3.38

4. Conclusion

It can be concluded that 80% RDF along with Cow dung slurry @10 lit/tree is most suitable for good content of nutrients in plants. It may increases productivity and quality of fruit.

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