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Effect of integrated nutrient management on yield and quality of papaya (*Carica papaya* L.) Cv. Taiwan Red Lady

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Abstract
A filed experiment was conducted during 2012 and 2013 at the Regional Horticultural Research Station and Krishi Vigyan Kendra of Navsari Agricultural University, Navsari, to determine the effect of integrated nutrient management (INM) with organic and inorganic fertilizers and their different combination for papaya. The study of two year indicated that the application of 25 % RDN through bio compost + 25 % RDN through castor cake + 50 % RDN through inorganic fertilizer gave higher values of yield characters viz., number of fruit (28.57), average weight of fruit (1.062 kg), yield per plant (30.24 kg), yield per hectare (83.99 t), fruit diameter (24.87 cm), fruit volume (900.23 ml) and minimum fruit cavity index (24.13 %) and initiation of flowering (105.17 day). This treatment also improve the quality characters *like*, fruit firmness (7.38 Kg/cm^2), shelf life (7.54 days), total soluble solid (8.12 %), total sugar (9.80 %), reducing sugar(8.45 %) and vit.-C (23.90 mg/100g pulp) and also lowering physiological loss in weight (11.20 %) and titrable acidity (0.016 %).

Keywords: integrated nutrient management, yield, quality, papaya, organic, inorganic

Introduction
Papaya is one among the fruits which has attained a great popularity in recent years because of gynodioecious nature, its easy cultivation, quick returns, adoptability to diverse soil and climatic conditions and above all its attractive delicious wholesome fruits having multifarious uses. Papaya (*Carica papaya* L.) is an evergreen herbaceous commercial fruit crop of family *Caricaceae*. In India, it is successfully grown all over country and is available round the year. It occupies a cultivated area of 133.36 thousand hectares (1.87 % of total fruit area) and 5639.30 thousand M.T. of production (6.64 % of total fruit production) with average productivity is 42.3 M. T. per hectare. (Anon., 2016) [1]. It is a rich source of carbohydrates, minerals and vitamins (carotene, riboflavin and vitamin A). It is used in medical field for treatment of neurotic disorders, dyspepsia and other digestive ailments like ring worm and round worm infection and to reduce the blood clotting. Papaya is also known to contain high amounts of photolytic enzyme, papain and alkaloid carpaine which have many applications in pharmaceutical, tanning and silk industries (Chadha, 1992) [3].

For sustainable soil productivity, it is very essential to strike a balance in soil biological activity, as any disturbance will affect the nutrient transformation in soil. Soil organic matter build up and balanced microbial activity contribute to a wide range of essential services to the sustainable functioning of soil. At present, intensification of production systems without maintaining the life of soil has deteriorated soil health.

Nutrient management is one of the key factor and most important cultivation practices to improve the productivity of papaya and account for 30 % of total cost of cultivation. The productivity of papaya is adversely affected if the crop is not fed properly. For maximizing yield potential, continuous sole and erratic use of chemical fertilizer in imbalance ratio leads to decline in soil fertility as well as nutrient uptake efficiency of plants resulting in either yield stagnation or decrease. The nutrition of papaya differ from other fruit crops because of its quick growth, continuous flowering and fruiting habit and heavy production as plant would exhibit sensitiveness to low supply of major and minor nutrients.

In this context, the present investigation was under taken with an objective of finding out the effect of integrated nutrient management on yield and quality of papaya cv. Red lady.

Materials and Methods

The experiment was carried out at the Regional Horticultural Research Station and Krishi Vigyan Kendra of Navsari Agricultural University, Navsari during the year 2011-2012 and 2012-2013, respectively. The treatments are T_1: 50 % RDN through bio compost + 50 % RDN through inorganic fertilizer, T_2: 50 % RDN through vermi compost + 50 % RDN through inorganic fertilizer, T_3: 50 % RDN through castor cake + 50 % RDN through inorganic fertilizer, T_4: 25 % RDN through bio compost + 25 % RDN through vermi compost + 50 % RDN through inorganic fertilizer, T_5: 25 % RDN through vermi compost + 25 % RDN through castor cake + 50 % RDN through inorganic fertilizer, T_6: 25 % RDN through bio compost + 25 % RDN through castor cake + 50 % RDN through inorganic fertilizer, T_7: 25 % RDN through bio compost + 25 % RDN through castor cake + 25 % RDN through vermi compost + 25 % RDN through inorganic fertilizer along with control (T_8) (RDF: 200-200-250 g NPK/plant) were laid out in RBD with three replications. Organic fertilizer was applied in two split (basal and 45 DAP) as per treatments. Inorganic fertilizer was applied at 2nd, 4th, 6th and 8th month after planting. The experimental plot was prepared by deep ploughing and harrowing. The pits of 30 X 30 X 30 cm were dug out at a spacing of 2.4 m X 1.5 m and well decomposed fine textured FYM @ 10 kg pit^{-1} was applied at time of planting. Common application of *Trichoderma viridi* and *Pseudomonas* culture each @ 5 kg/ha were applied at the time of planting and 2 months after planting. Recommended bio-fertilizers *Azotobacter* and PSB were applied at two time @ 5 kg/ha. as common dose. Common application of micronutrient spray @ 1.5 lit/ha (Grade-IV of GNFC) (composition are Zn-6 %, Fe- 4 %, Mn-1 %, Bo- 0.50 % and Cu- 0.50 %) was given at 90 and 120 DAP. The data recorded on yield and quality attributes were analyzed statistically (Pense and Sukhatme, 1961) [6].

Results and Discussion

The effect of integrated nutrient management on yield attributes such as the number of fruit per plant (28.57), average fruit weight (1.062 kg), fruit yield per plant (30.24 kg) and per hectare (83.99 t) were maximum with application of 25 % RDN through bio compost + 25 % RDN through castor cake + 50 % RDN through inorganic fertilizer (T_6) treatment, which was closely followed by 25 % RDN through bio compost + 25 % RDN through castor cake + 25 % RDN through vermi compost + 25 % RDN through inorganic fertilizer (T_7). Fruit yield increased by better availability and uptake of nutrients by plant roots and enhancing the source-sink relationship by increasing the movement of carbohydrates from the leaves to the fruits (Yadav *et al.*, 2011b) [13]. Higher yield response owing to application of organics ascribed to improved physical, chemical and biological properties of soil resulting in better supply of plant nutrients, which turn led to good crop growth and yield (Shivakumar, 2010) [8]. Decomposition of organic materials is accompanied by the release of appreciable quantities of CO2 which is dissolved in water to form carbonic acid is capable of decomposition of certain primary minerals and release of nutrients and nutrient uptake (Suresh *et al*.,2010) [11]. These results are in conformity with the findings reported be Ganeshamurthy *et al*. (2004) [4], Shivaputra *et al.* (2004) [9] and Singh *et al*. (2010) [10] in papaya.

The treatment T_6 receiving 25 % RDN through bio compost + 25 % RDN through castor-cake + 50 % RDN through inorganic fertilizers which required minimum days (105.17 days) to flower initiation and fruit cavity index (24.13%). Whereas, initiation of flowering and fruit cavity index were significantly maximum value in control treatment (T_8). Fruit diameter (24.87 cm) and fruit volume (900.23 ml) were significantly higher in treatment T_6 which was at par with treatment T_7 and T_4. This might be due to the mobility of photosynthates from source to sink *i.e.*, higher translocation was possible perhaps due to better sink capacity as indicated by the higher number of fruits per plant and weight of fruit. Similarly, improvement in fruit number, fruit weight and fruit volume with application of organic manures in combination with chemical fertilizers as against the straight fertilizer application were reported in various crops by Shivakumar (2010) [8] and Yadav *et al*. (2011a) [12] in papaya and Patel (2008) [7], Bhalerao *et al.* (2009) [2], Ziauddin (2009) [14] and Hazarika *et al*. (2011) [5] in Banana.

In case of fruit quality, highest fruit firmness (7.38 Kg/cm^2), shelf life (7.54 days), total soluble solid (8.12 %), total sugar (9.80 %), reducing sugar(8.45 %) and vit.-C (23.90 mg/100g pulp) and also lowering physiological loss in weight (11.20 %) and titrable acidity (0.016 %) were recorded in the plants treated with 25 % RDN through bio compost + 25 % RDN through castor cake + 50 % RDN through inorganic fertilizer (T_6) (table-2). While, minimum value of fruit firmness, shelf life, total soluble solid, total sugar, reducing sugar, vit.-C and also maximum physiological loss in weight and titrable acidity were recorded in treatment T_8 (control). Improvement in fruit quality might be due to increased continuous supply of nutrients, higher concentration of soil enzymes, soil microorganism, rapid mineralization and transformation of plant nutrient in soil and also growth promoting substances produced by microorganism. The results of present study are in accordance with the finding of Shivakumar, (2010) [8], Singh *et al*. (2010) [10] and Yadav *et al.* (2011a) [12] in papaya

The investigation revealed that the treatment having the soil application of 25 % RDN through bio compost + 25 % RDN through castor cake + 50 % RDN through inorganic fertilizer significantly improved the yield and quality of papaya.

Table 1: Effect of INM on yield parameters of papaya cv. Taiwan Red Lady

Treatments	Number of fruits/plant	Average weight of fruits (Kg)	Fruit yield/plant (Kg)	Fruit yield /hectare (t)	Fruit diameter (cm)	Fruit volume (ml)	Fruit cavity index (%)	Initiation of flowering (days)
T_1	24.41	0.923	22.52	62.54	22.39	857.87	24.25	109.17
T_2	24.15	0.872	21.07	58.50	21.88	757.27	27.03	110.94
T_3	23.29	0.846	19.74	54.82	19.59	754.97	26.93	117.61
T_4	26.02	1.023	26.59	73.84	22.89	856.27	24.48	107.89
T_5	24.90	1.008	25.07	69.61	20.95	769.03	27.02	113.83
T_6	28.57	1.062	30.24	83.99	24.87	900.23	24.13	105.17
T_7	26.52	1.043	27.68	76.86	24.09	877.40	24.32	107.17

T_8	22.06	0.827	18.20	50.55	15.35	699.07	27.28	126.00
S. Em.±	0.79	0.027	0.93	2.59	0.872	21.305	0.682	2.340
C. D. at 5 %	1.963	0.077	2.34	6.50	2.312	61.526	1.970	6.758
C.V. %	7.40	6.94	9.30	9.29	10.17	6.95	6.62	5.29

Table 2: Effect of INM on quality parameters of papaya cv. Taiwan Red Lady

Treatments	Physiological loss in weight (%)	Fruit firmness (Kg/cm^2)	Shelf life (days)	Total soluble solids (%)	Total sugar (%)	Reducing sugar (%)	Titrable acidity (%)	Vit.-C (mg/100g pulp)
T_1	15.03	7.06	7.22	7.46	9.70	8.28	0.021	23.04
T_2	16.51	6.99	7.14	7.80	9.61	8.20	0.022	23.31
T_3	17.50	6.18	6.34	6.83	9.47	8.05	0.025	22.72
T_4	13.97	7.15	7.26	8.03	9.64	8.31	0.020	23.32
T_5	15.87	6.92	6.97	7.79	9.39	8.23	0.023	22.58
T_6	11.20	7.38	7.54	8.12	9.80	8.45	0.016	23.90
T_7	12.36	7.22	7.38	7.85	9.76	8.42	0.018	23.25
T_8	18.61	5.42	4.60	5.83	6.49	6.20	0.027	19.57
S. Em.±	0.389	0.232	0.290	0.278	0.338	0.297	0.0011	0.507
C. D. at 5 %	1.060	0.670	0.838	0.803	0.976	0.858	0.003	1.466
C.V. %	6.38	8.38	10.76	9.13	9.23	9.14	13.02	5.63

References

1. Anonymous. Indian Horticulture Database National Horticulture Board Gurgaon. 2016, 2013, 290.
2. Bhalerao VP, Patil NM, Badgujar CD, Patil DR. Studies on integrated nutrient management for tissue cultured banana *cv*. Grand Naine. Indian J Agric. Res. 2009; 43(2):107-102.
3. Chadha KL. Scenario of Papaya production and utilization in India. Indian J. Hort. 1992; 49(2):97-119.
4. Ganeshamurthy AN, Reddy YTN, Anjaneyulu K, Kotur SC. Balanced fertilization for yield and nutritional quality in fruit crops. Fertilizer News. 2004; 49(4):71-114.
5. Hazarika TK, Nautiyal BP, Bhattacharya RK. Effect of INM on productivity and soil characteristics of tissue cultured banana *cv*. Grand Naine in Mizoram, India. Prog. Hort. 2011; 43(1):30-35.
6. Panse VG, Sukhatme PV. Statistical methods for agricultural workers, ICRA Pub; New Delhi. 1967, 152-165.
7. Patel AN. Integrated nutrient management in banana *cv*. Basrai under high density plantation. Ph. D. Thesis submitted to Navsari Agril. Univ. Navsari, Gujarat, 2008.
8. Shivakumar BS. Integrated nutrient management studies in papaya (*Carica papaya* L.)*cv*. Surya. *Ph. D. Thesis* submitted to Univ. of Agril. Science, Dharwad, Karnataka, 2010.
9. Shivaputra SS, Path CP, Swamy GSK, Patil PB. Cumulative effect of VAM fungi and vermin compost on nitrogen, phosphorus, potassium and chlorophyll content of papaya leaf. Mycorrhiza News. 2004; 16(2):15-16.
10. Singh KK, Barche S, Singh DB. Integrated nutrient management in papaya *(Carica papaya* l.) *cv*. Surya. *Acta Hort.*, (ISHS). 2010; 851:377-380
11. Suresh CP, Nath S, Poduval M, Sen SK. Studies on the efficacy of phosphate solubilizing microbes and VAM fungi with graded levels of phosphorus on growth, yield and nutrient uptake of papaya *(Carica papaya* l.). Acta Hort. 2010; 851:401-406.
12. Yadav PK, Yadav AL, Yadav AS, Yadav HC. Effect of integrated nutrient nourishment on vegetative growth and physico-chemical attributes of papaya *(Carica papaya* L.) fruit *cv*. Pusa Dwarf. Plant Archives. 2011; 11(1):327-329.
13. Yadav PK, Yadav AL, Yadav AS, Yadav HC, Singh Y. P. Effect of integrated nutrient nourishment on yield attributes and economics of papaya *(Carica papaya* L.) fruit *cv*. Pusa Dwarf. Plant Archives. 2011b; 11(1):307-309.
14. Ziauddin Syed. Integrated nutrient management studies in banana *cv*. Ardhapuri. The Asian J. Hort. 2009; 2(1):126-130.