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Original Research Article

Efficacy of INM with Jeevamrutha on Growth, Yield and Quality of Papaya (*Carica papaya* L.) cv. Taiwan Red Lady under Satpura Plateau Region of Madhya Pradesh District Chhindwara

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A B S T R A C T

A filed experiment was conducted at the JNKVV, Krishi Vigyan Kendra, Chhindwara, Madhya Pradesh, India, during the year 2017-2018 with Papaya (*Carica papaya* L.). The experiment was laid out in Randomized Complete Block design (RCBD) with 5 treatments and replicated four. Treatments were T_1- RDF, T_2- RDF + Farm Yard Manure (20 kg/ plant), T_3- RDF + Vermicompost (10 kg/plant), T_4- RDF + Jeevamruth (1.5 li/plant) (desi cowdung, desi cow urine, pulse flour, jaggery, rhizosphere soil solution) with excellent moisture condition, T_5- Control. Two months old seedlings were used for transplanting. The seedlings of papaya were transplanted in the field adopting a spacing of 2.5 × 2.5 m. Uniform papaya plants were selected for experiment purpose. In this experiment there no use of chemical fertilizers, pesticides or weedicides for 30 days before and after application of Jeevamrutha. Plant vegetative and reproductive characteristics like height of plants (cm), girth of stem (cm), petiole length (cm), number of leaves/plant, days of first flowering and day to fruit maturity were noted. Yield and yield attributing characteristics like number of fruits per plant, fruit weight (g), fruit diameter (cm), pulp percentage, Fruit yield (kg/plant) also recorded. Fruit quality characters were also recorded during the study. Aim of thestudy is to determine the effect of integrated nutrient management (INM) and Jeevamrutha for papaya yield and yield and yield attributing characteristics. The study indicated that the Treatment T-4 (RDF+Jeevamrutha) application gave higher values of yield and yield attributing characters viz., Maximum number of fruit per plants, average weight of fruit, Fruit yield per plant, fruit diameter and fruit quality characteristics (TSS, acidity and Ascorbic acid) content as compared to T-5 (Control).

Keywords

Papaya, Jeevamrutha, Quality, Growth, Yield

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 139.00 thousand hectares and 5831.0 thousand MT of production with average productivity is

41.94 MT/he. (*NHB Database* 2018-19, Ist advance estimate). It is a good source of protein, carbohydrate, fibre, vitamin A and C, carotene and mineral like iron, calcium, phosphorus and potassium.

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. It is one among the fruits, which has attained great popularity because of its quick returns, easy cultivation, above all, forits attractive and delicious taste, wholesome fruits have multifarious uses.

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 builds up and balanced microbial activity contributes to a wide range of essential services to the sustainable functioning of soil. The nutritional requirement of papaya is quite typical in view of its continuous growth behavior from other fruit crops 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. Owing to continuous fruiting habits, nutrient requirement of papaya is high and use of large quantity of chemical fertilizers alone is not only feasible but also costly to the poor farmers, also pollute soil and ground water. 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.

Apart from this, due to heavy use of inorganic fertilizers, fruits often eaten raw are more vulnerable to contamination with chemicals due to their residual toxicity. Hence, the present investigation is very important and opts for papaya.

As such judicious application of fertilizers is needed to meet out the nutritional requirement of the plants. The integrated nutrient nourishes papaya, which involves conjunctive use of chemical fertilizers and organic manures to sustain crop production and maintenance of soil health. 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

A filed experiment was conducted at the JNKVV, Krishi Vigyan Kendra, Chhindwara, Madhya Pradesh, India, during the year 2017-2018 with Papaya (*Carica papaya* L.). The experiment was laid out in Randomized Complete Block design (RCBD) with 5 treatments and replicated four. Treatments were T_1- RDF, T_2- RDF + Farm Yard Manure (20 kg/ plant), T_3-RDF + Vermicompost (10 kg/plant), T_4- RDF + Jeevamruth (1.5 li/plant) (desi cowdung, desi cow urine, pulse flour, jaggery, rhizosphere soil solution) with excellent moisture condition, T_5- Control. Two months old seedlings were used for transplanting.

The seedlings of papaya were transplanted in the field adopting a spacing of 2.5 × 2.5 m. Uniform papaya plants were selected for experiment purpose. In this experiment there

no use of chemical fertilizers, pesticides or weedicides for 30 days before and after application of Jeevamrutha. Plant vegetative and reproductive characteristics like height of plants (cm), girth of stem (cm), petiole length (cm), number of leaves/plant, days of first flowering and day to fruit maturity were noted. Yield and yield attributing characteristics like number of fruits per plant, fruit weight (g), fruit diameter (cm) and pulp thickness, total yield (kg) per plant also recorded. Fruit quality characters were also recorded during the study.

Jeevamruth preparation

Jivamrita/jeevamrutha is a fermented microbial culture. It provides nutrients also help to prevent fungal and bacterial plant diseases. Jeevamrutha is prepared by mixing 10 kg fresh local cow dung with 10 litres aged cow urine, add 2 kg local jaggery(a local type of brown sugar), 2 kg pulse flour and handful of garden soil (rhizosphere soil)or from the bund of the farm and the volume made up to 200 litres. Stir the solution well and let it ferment for 48 hours. Keep the drum in shade covering with wet gunny bag. Now jeevamrutha is ready for application. 200 liters of jeevamruta is sufficient for one acre of land. Jevamruth, boost the plant growth and gives good yield. It gives resistance against pest and diseases with increases beneficial organism activity and promotes organic carbon in the soil.

Results and Discussion

Morphological/vegetative characteristics

Vegetative parameters such as plant height, stem girth, petiole length, number of leaves per plant, days to first flowering, day to fruit maturity at 330 days from planting were affected by various applications of organic and inorganic fertilizers in combination significantly influenced plant growth characters. It is evident from (Table 1).

Maximum plant height (210.21 cm), stem girth (50.84 cm), petiole length (51.42 cm), number of leaves per plant (45.86) was recorded in T_4 treatment. Significantly lower plant height and stem girth was recorded with T_5 (Control) treatment. The similar result was reported by Tandel *et al.,* (2014), Aneesa Rani and Sathiamoorthy (1997), Shivakumar (2010), Suresh *et al.,* (2010) and Singh *et al.,* (2010) in papaya. It could be because of continuous supply of available nutrient from organic and inorganic form and effect of bio active substance produced by common application of bio fertilizers. Organic manures along with biofertilizers also improve the aeration in the soil which ultimately might have improved the physiological activities inside the plant like plant height, stem girth and petiole length. Lower days to first flowering of (140.14 days) and days to fruit maturity (207.41 days) were recorded in T_4 treatment. Significantly higher days to first flowering were recorded with T_5 treatment (180.52 days) and. The earliness in flowering might be due to the higher net assimilation rate on account of better growth leading to the production of endogenous metabolites earlier in optimum level enabling early flower reported by Singh and Varu (2013) and (Yadav *et al.,* 2011) in papaya. Increased growth in recommended fertilizer dose with combination of Jeevamrutha treatment was mainly attributed to sufficient availability of all the nutrients during different growth stages of the plant, compared to other treatments.

Yield and yield attributing characters

Fruit yield in terms of number of fruits and their weight were found to be significantly different among various treatments (Table 2). The maximum number of fruits per plant

(30.45), Fruit weight (1479.01 g) fruit diameter (24.27 cm), pulp thickness (2.23 cm) and fruit yield (45.03 kg plant^{-1}) were recorded significantly T_4 treatment.

The significance response of INM, organic manure with part supplementation with inorganic fertilizers had positively and significantly influenced the yield attributes. It is well known that efficiency of bioagent can be well exploited with the use of organic manure with inorganic fertilizers (Suther, 2009) which might have improved the yield parameters by better availability and uptake of nutrient by plant roots and enhancing the source – sink relationship by increasing the movement of carbohydrates from the leaves to the fruits.

Similar findings have been reported by Yadav (2006) and Srivastava (2008).The results also in close conformity with the findings of Ravishanker *et al.,* (2010) and Chaudhri *et al.,* (2001) in papaya.

Fruit quality attributes

It is evident from (Table 3) significantly minimum TSS was recorded in treatment T_5 (6.77 °Brix) and maximum value of TSS was obtained with treatment T_5 (9.83 °Brix) which was followed by T_3 treatment.

Minimum ascorbic acid was recorded in T_5-control (20.12 mg/100g pulp) and maximum value of ascorbic acid was obtained with treatment T_4 (23.80 mg/100 g pulp).

The application of different treatments had no significant effect on acidity of papaya. It might be due to the addition of organic manures supplements ample of nutrients, moisture and growth promoting substances which enhances metabolic and hormonal activity of the plant and that promotes production of more photosynthates which was stored in fruits in the form of starch and carbohydrates. It is an established fact that the transformation of mature fruit into ripe form i.e., during the process of ripening in storage the fruit undergoes physical, physiological and biochemical changes. The increase in TSS, Total sugar and ascorbic acid content of papaya fruits could be attributed to the conversion of reserved starch and other insoluble carbohydrates into soluble sugars.

The reduction of titratable acidity of papaya fruits through application of different organic manure with inorganic fertilizer might be due to the positive influence of boron and zinc in conversion of acids into sugar and their derivatives by the reaction involving glycolytic path way or be used in respiration both (Singh *et al.,* 2010). These results elucidate the findings of Singh *et al.,* (2013), Shivakumar (2010), and Yadav *et al.,* (2011) in papaya.

Jeevamrutha (desi cow dung, desi cow urine, pulse flour, jaggery, rhizosphere soil solution) is a organic liquid play a key role in promoting growth and providing immunity to plant system. It promotes immense biological activity in soil and enhances nutrient availability to crop. The application of Jeevamrutha, increased the activity of microbes by solubilization and uptake of nutrients was enhanced.

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.

Table.1 Effect of INM and Jeevamruth on Vegetative and Reproductive characteristics of Papaya cv. Taiwan Red Lady

Treatments	Plant height (cm)	Trunk girth (cm)	Petiole length (cm)	No. of leaves/ Plant	Days taken to first flowering (Days)	Days taken to fruit maturity (Days)
T_1- RDF	190.12	48.00	44.10	40.15	175.10	220.10
T_2- RDF + FYM 20 kg/plant	193.36	48.41	44.30	41.92	162.82	214.11
T_3- RDF + Vermicompost 10 kg/plant	197.96	49.74	49.21	43.24	154.10	210.44
T_4- RDF+ Jeevamruth 1.5 li/plant	210.21	50.84	51.42	45.86	140.14	207.41
T_5- Control	155.08	40.18	46.10	43.70	180.52	221.22
CD	8.78	2.54	3.57	1.81	2.90	5.81

Table.2 Effect of INM and Jeevamruth on yield attributing characteristics of Papaya cv.Taiwan Red Lady

Treatments	Fruit weight (g)	Pulp thickness (cm)	Fruit Diameter (cm)	No. of fruits/ Plant	Fruit yield (Kg/plant)
T_1- RDF	1332.12	1.97	21.23	28.02	37.32
T_2- RDF + FYM 20 kg/plant	1384.44	1.99	22.02	28.69	39.71
T_3- RDF + Vermicompost 10 kg/plant	1407.30	2.22	24.06	29.89	42.06
T_4- RDF+ Jeevamruth 1.5 li/plant	1479.01	2.23	24.27	30.45	45.03
T_5- Control	1250.32	1.64	19.76	27.08	33.85
CD at 5%	72.01	0.22	1.07	0.91	3.37

Table.3 Effect of INM and Jeevamruth on fruit quality characteristics of Papaya cv. Taiwan Red Lady

Treatments	TSS (°B)	Titratable Acidity (%)	Vit.-C (mg/100g pulp)
T_1- RDF	8.79	0.023	22.94
T_2- RDF + FYM 20 kg/plant	8.80	0.022	23.04
T_3- RDF + Vermicompost 10 kg/plant	9.06	0.019	23.32
T_4- RDF+ Jeevamruth 1.5 li/plant	9.83	0.016	23.80
T_5- Control	6.77	0.027	20.12
CD at 5%	0.81	0.003	1.54

In this context, the present investigation was under taken at the JNKVV, Krishi Vigyan Kendra, Chhindwara, Madhya Pradesh, India, during the year 2017-18 with an objective of finding out the efficacy of INM with Jeevamrutha on growth, yield and quality of papaya cv. Red Lady. Results indicated that the T-4 (RDF + Jeevamrutha) gave the higher crop growth and fruit yield. There was significant variation in average fruit weight, size, and also quality of the fruit in application of RDF+Jeevamrutha treated plants as compared to other treatments.

References

Anonymous. Indian Horticulture Database, National Horticulture Board, Gurgaon. 2018-19, Ist advance estimate.

Aneesa Rani, M. S. and Sathiamoorthy, S. 1997. Effect of organics and bio fertilizers on root enzyme activity, nematode, total biomass and growth enhancement of papaya cv. Co - 6.South Indian Hort., 45(5 & 6): 217 - 223.

Boraiah, B., N. Devakumar, S. Shubha and Palanna, K.B. 2017. Effect of Panchagavya, Jeevamrutha and Cow Urine on Beneficial Microorganisms and Yield of Capsicum (*Capsicum annuum* L. var. grossum). *Int.J.Curr.Microbiol.App.Sci.* 6(9): 3226-3234.

Chadha KL. Scenario of Papaya production and utilization in India. Indian J. Hort. 1992; 49(2): 97-119

Chaudhri, S. M., Shinde, S. H., Dahiwalkar, S.D., Dana wale, N. J., Shiras, H. K. and Berad, S. M. 2001. Effect of fertigation through drip on productivity of papaya. J. Maharashtra Agric. Univ., 26 (1): 18-20.

Ravishankar, H., Karunakaran, G. and Hazarika, S. 2010. Nutrient availability and biochemical properties in soilas influenced by organic farming of papaya under coorg region of Karnataka. Acta Horticuturae. (ISHS) 851:419 -424.

Shivakumar, B. S. 2010. Integrated nutrient Management studies in papaya (*Carica papaya* L.) cv. Surya. Ph.D. Thesis submitted to Univ. of Agril. Science, Dharwad, Karnataka.

Srivastava, A. 2008. Integrated nutrient management (*Carica papaya* L.). Ph.D. Thesis submitted. N. D. University of Agriculture and Technology. Faizabad (U.P.), India.

Shwetha, B. N., 2008, Effect of nutrient management through the organics in soybean-wheat cropping system. M. Sc (Agri.) Thesis, Univ. Agric. Sci. Dharwad.

Siddaram, 2012. Effect of FYM and bio-digester liquid manure on the performance of aerobic rice – field bean cropping sequence, Ph.D. Thesis, Univ. of Agric. Sci., Bangalore, Karnataka.

Singh, S. K. and Varu. D. K. 2013. Effect of Integrated nutrient management in Papaya (*Carica papaya L.*) *cv.*Madhubindu. The Asian journal of Horticulture. (8). Iss: 2. 667 - 670.

Singh, K. K.; Barche, S. and Singh, D. B. 2010. Integrated nutrient management in papaya (*Carica papaya* L.) cv.Surya. Acta Hort., (ISHS) 851: 377-380.

Srinu. B, Manohar Rao. A, Veenajoshi. K, Narender Reddy. S And Harish Kumar Sharma. Effect Of Different Integrated Nutrient Management On Growth, Yield And Quality Of Papaya (*Carica papaya* L.) *Cv.* Red Lady. Bull. Env. Pharmacol. Life Sci., Vol 6 Special issue 1, 2017: 132-135

Srinu, B., Manohar Rao, A., Veenajoshi, K., Effect of Integrated Nutrient Management on Fruit Characters and Economics of Papaya (*Carica papaya* L.) Cv. Red Lady, *Int. J. Pure App. Biosci*. 5(4): 1463-1467 (2017)

Suresh,C. P.; Nath, S.; Poduval, M. and Sen, S. K. 2010. 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 papayaL.). Acta Hort., 851:401- 406.

Suther, S. 2009. Impact of vermicompost and composted FYM on growth and yield of garlic (*Allium stivum L*.) field crops. International Journal of Plant Production. 3 (1): 27- 38.

Tandel, B. M, Patel B. N and B. B., Patel. 2014. Effect of Integrated Nutrient Management on Growth and Physiological Parameters on Papaya cv. Taiwan Red lady. Trends in Bioscience. 7 (16): 2175-2178.

Yadav, M. K., Singh, P., Patel, N. L. and Bhardhan, K. 2006. Response of GA3, Ca (NO3)2 bavistin and neem extraction the storage life of Nagpur mandarin. Indian J. Arid Hort., 1 (1): 80-82.

Yadav, P. K, A. L. Yadav, A. S. Yadav and H. C. Yadav. 2011. Effect of Integrated nutrient nourishment on vegetative growth and physic - chemical attributes of Papaya (*Carica papaya* L.) fruit. cv. Pusas dwarf. Plantarchives, 11(1): 327-329.