

Original Research Article

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Response of Fertilizer Application on Growth of Papaya Var. Red Lady

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ABSTRACT

Keywords

Red Lady, Grade-IV micronutrient, Novel organic liquid fertilizer, Foliar spray and split application.

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The present experiment entitled “Response of fertilizer application on growth of papaya var. Red Lady” was conducted during the year 2016-17 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat). The experiment was laid out with nine treatments in a Randomized Block Design (RBD) and replicated thrice. The treatments included 100 % RDF (200:200:250 g NPK/plant) as control in four equal splits (2nd, 4th, 6th, and 8th MAP), 100 and 80 % recommended dose of nitrogen and potash in 8 equal splits starting from 2nd month after planting in 30 days interval with or without foliar application of 1 % Grade-IV micronutrient and novel organic liquid fertilizer at 2nd, 4th, 6th and 8th month after planting. Results of present investigation revealed that papaya var. Red Lady plants fed with 100 % RDNK (200:250 g/plant) and applied in 8 equal splits starting from 2nd month after planting in 30 days interval with foliar application of 1 % Grade-IV micronutrient at 2nd, 4th, 6th and 8th month after planting gave maximum growth characters like plant height, plant girth and leaf area and minimum days required for first flower initiation.

Introduction

Papaya (*Carica papaya* L.) is an important fruit of tropical and subtropical regions of the world, it belonging to family Caricaceae and also known as papita, pawpaw and true melon. Papaya is a heavy feeder and needs heavy doses of manures and fertilizers. Apart from the basal dose of manures applied in the pits, 200 g each of N and P₂O₅ and 250 g K₂O are recommended for getting high yield. Application of 200 g N is optimum for fruit yield but papain yield increases with increase in N up to 300 g. Micronutrients can tremendously boost crop yield and improve quality and post-harvest life of produce. They play an important role in disease resistance, since they function as enzyme activators and

also play a role in lignin biosynthesis. The decline in availability of organic manures due to greater use of inorganic fertilizer has made micronutrient supply precarious. Hence replacing micronutrients that have been removed or increasing organic matter to make native nutrients available, has not received sufficient attention. Foliar application of micronutrients has gained importance in recent years, because the nutrients are sprayed directly to leaves, and can be made available to the plants at proper time when needed. Successful commercial cultivation of improved high yielding varieties of papaya crop depends on critical nutrient management due to its continuous growth, flowering and

fruiting habit. Papaya requires high amounts of nutrients for growth and fruit production, and it was estimated that papaya removes about 989 mg B, 300 mg Cu, 3364 mg Fe, 1847 mg Mn, 8 mg Mo and 1385 mg Zn per tonne of fruit. While, separating fibers from the banana pseudo stem, the liquid available is known as banana pseudostem sap which contains amount of essential macro and micro plant nutrients. Hence, there is a vast scope to utilize banana pseudostem sap as a liquid fertilizer. Apart from direct use of sap as liquid fertilizer, an enrichment process was developed (patented) for preparing Novel Organic Liquid Fertilizer (NOLF) suitable for foliar and soil application. It was tested in mango, banana, wheat and paddy crops. The OLF has been prepared using only organic inputs and hence suitable for use in organic farming system as liquid formulation. Organic liquid fertilizer is good source of plant nutrient along with growth promoting substances like cytokine, GA, etc. (Anon., 2014).

Materials and Methods

The present experiment entitled “Response of fertilizer application on growth and yield of papaya var. Red Lady” was conducted during the year 2016-17 at Regional Horticultural Research Station, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari (Gujarat). The experiment was laid out with nine treatments in a Randomized Block Design (RBD) and replicated thrice. The treatments included 100 % RDF (200:200:250 g NPK/plant) as control in four equal splits (2nd, 4th, 6th, and 8th MAP), 100 and 80 % recommended dose of nitrogen and potash in 8 equal splits starting from 2nd month after planting in 30 days interval with or without foliar application of 1 % Grade-IV micronutrient and novel organic liquid fertilizer at 2nd, 4th, 6th and 8th month after

planting. Growth parameters were recorded and analyzed statistically.

Results and Discussion

The data presented in table 1 showed the growth parameters like plant height (cm), girth of plant (cm), total leaf area (cm²) and initiation of flowering at 6th, 8th and 10th month after planting which were affected due to split application of N and K and foliar applications of Grade-IV micronutrient and novel organic liquid fertilizer. All these parameters had significant difference through various treatments.

Plant height and stem girth are considered to be an important factor to judge the vigour in papaya crop. The robust vegetative growth is an essential prerequisite for higher yield. The plants fed with 100 % RDNK through 8 equal split application + foliar application of 1 % Grade - IV micronutrients resulted in maximum plant height and girth of papaya plant. The beneficial effect of nitrogen in promoting plant growth was mainly due to enhanced synthesis of protein and amino acids. The increased in girth of plant under high levels of nitrogen and potassium was due to more uptake and accumulation of potassium in leaf tissues, which in turn improve the photosynthetic efficiency, causing greater synthesis, translocation and accumulation of carbohydrates. In present investigation, there was significant effect of different treatments on total leaf area (cm²) of papaya var. Taiwan Red Lady. The maximum total leaf area was recorded with 100 % RDNK through split application + foliar application of 1 % Grade - IV micronutrients. The split application with 100% recommended dose of N and P give higher mean value for total leaf area. This might have attributed to more availability of nutrient particularly nitrogen and subsequent uptake by crop.

Table.1 Response of fertilizer application on growth of papaya var. Red Lady

Treatments	Plant height (cm)			Girth of plant (cm)			Total leaf area (cm ²)			Initiation of flowering (days)
	6 th MAP	8 th MAP	10 th MAP	6 th MAP	8 th MAP	10 th MAP	6 th MAP	8 th MAP	10 th MAP	
T ₁	93.18	150.53	162.49	23.55	30.29	37.52	421.29	623.44	826.11	130.54
T ₂	127.51	168.01	162.49	24.26	39.17	41.25	439.76	639.80	933.19	122.71
T ₃	133.52	178.88	178.25	26.06	36.31	44.59	445.93	711.29	883.76	122.02
T ₄	127.64	180.18	183.01	27.91	36.02	43.65	563.32	660.39	849.36	118.51
T ₅	133.00	177.36	189.05	29.06	38.91	43.92	503.27	730.37	920.13	114.82
T ₆	139.45	187.20	198.02	29.31	41.09	46.26	489.13	742.62	969.90	105.76
T ₇	131.82	170.93	190.39	30.07	37.38	41.49	453.79	656.08	1035.59	116.30
T ₈	144.60	202.12	211.19	36.13	42.81	47.10	582.46	788.27	1045.87	101.64
T ₉	135.20	184.20	195.18	32.19	38.71	43.30	547.83	728.09	914.02	109.18
S.Em±	4.78	8.78	8.67	1.84	1.61	1.54	30.29	32.56	47.00	5.60
CD at 5%	14.34	26.31	26.00	5.51	4.82	4.60	90.82	97.63	140.89	16.79
CV%	6.39	8.55	8.02	11.08	7.36	6.15	10.62	8.08	8.74	8.38

This result in higher biomass production has reflected by production of additional leaves and simultaneously increased the total leaf area. These findings are in conformity with above mentioned growth parameters have also been reported by Purohit (1977), Reddy *et al.*, (1986), Ghanta *et al.*, (1995) and Bisht *et al.*, (2010) in papaya

On the contrary, initiation of flowering (days) was utmost advanced (101.64 days) under the treatment receiving 100 % RDNK through 8 equal split application + foliar application of 1 % Grade - IV micronutrients. 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. These results are in conformity with the findings reported by Ghanta *et al.*, (1995). Whereas, the control *i.e.* RDF needed maximum days for flowering in papaya var. Red Lady.

Vegetative growth of papaya plants in terms of height and girth of plant at 6th, 8th and 10th MAP were influenced by the micronutrient treatments. The plants treated with 1 % micronutrient treatment produced taller plants.

It might be due to zinc present in micronutrient which enhanced the synthesis of auxin in the plants. Copper also activates several enzymes in plant helps in chlorophyll synthesis and involves in carbohydrate and protein metabolism.

In the present investigation, total leaf area per plant was significantly influenced by micronutrients. Foliar application of 1 % Grade – IV micronutrient at 2nd, 4th, 6th and 8th month after planting were resulted in maximum total leaf area per plant at 6th, 8th and 10th MAP. It might be due to zinc which stimulates photosynthetic activity and its

presence is important for protein synthesis resulted in increased in size and number of leaves

Micronutrient sprays increased the concentration of Fe and Zn micronutrient. However, Foliar application of 1 % Grade – IV micronutrient when applied at 2nd, 4th, 6th and 8th month after planting significantly increased Fe as well as Zn content in leaves. The plants absorb nutrients and water present in the soil through active salt absorption. However, the nutrient content in soil may or may not be available to the plant at each and every stage of growth and development. This situation may lead to the deficiency resulting into reduction or inactivation in different physiological processes and thereby control the flowering and fruiting in plants. Similar results were reported by Shekhar *et al.*, (2010), Singh *et al.*, (2010), Modi *et al.*, (2012), Bhalerao *et al.*, (2014) and Manjunatha *et al.*, (2014) in papaya.

From the present investigation, it was observed that there was significant response of height and plant girth in 1 % novel organic liquid fertilizer. This might be due to nitrogen which present in novel organic liquid fertilizer is responsible for the formation, growth and development of the cells and accelerating the synthesis of chlorophyll and amino acid which are associated with major photosynthesis process of plants, it causes an increased in the formation of meristematic tissues (Mustaffa, 1988).

From the present investigation, it was observed that the total leaf area at 6th, 8th and 10th MAP was highest in 1 % novel organic liquid fertilizer. This might be due to nitrogen which present in novel organic liquid fertilizer increased the rate of vegetative growth, which resulted in leaf area. Similar results were recorded by Anon. (2014) in banana and Deore *et al.*, (2010) in chilli.

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