The Pharma Innovation Journal 2022; 11(7): 1834-1839

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(7): 1834-1839

www.thepharmajournal.com
Received: 07-05-2022
Accepted: 19-06-2022

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Effect of foliar spray of potassium and micronutrients on growth, flowering and fruiting characters of papaya (*Carica papaya* L.) cv. red lady

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Abstract
The present investigation entitled that "Effect of foliar spray of potassium and micronutrients on growth, flowering and fruiting characters of papaya (*Carica papaya* L.) *cv*. Red Lady" was carried out in Farmer's field at Basur village, Sorab taluk, Shivamogga dist, during the year 2018-2019. The experiment was laid out in randomized complete block design with three replication and eleven treatments. Results reveal that the combined application of T_7 - K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25% recorded significantly maximum growth parameters *i.e.* plant height (244.44cm), plant girth (44.72cm), number of leaves per plant (48.11), petiole length (97.33 cm) and plant spread from N-S direction (241.88cm) and plant spread from E-W direction (247.24cm) and flowering and fruiting characters like days taken to first flowering, days taken to first fruiting and days taken to first fruit maturity were significantly minimum (65.11 days, 90.22 days and 224.42 days, respectively) over control and which was on par with T_8 (K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%). Among the different micronutrient application, the treatment T_7 - K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25% was found to be effective to improve the growth, flowering and fruiting characters of papaya *cv*. Red Lady.

Keywords: Papaya, growth, yield, nutrients and foliar spray

Introduction
Papaya (*Carica papaya* L.) is an important fruit of tropical and subtropical regions of the world, belonging to the family Caricaceae and also known as "wonder fruit of the tropics" (Parmar *et al.*, 2017) [20]. It is native of Tropical America was introduced to India in the 16th century from Malacca (Singh, 1990) [27]. India is the largest producer of papaya in the world producing 5.83 million MT of fruits from an area of 0.13mha with productivity of 42.3 MT/ ha (NHB, 2019). Karnataka is the third largest producer of papaya in the country. It is commercially cultivated in Andhra Pradesh, Gujarat, Karnataka, West Bengal, Madhya Pradesh, Maharashtra and Tamil Nadu. Papaya fruits are also good source of many minerals (potassium, phosphorus and magnesium) in human diet. The papaya fruit belongs to the group of low acid content fruit and the pH of pulp ranges from 5.5 to 5.9 (Chan *et al.*, 1971) [6].
Indian soils of 40 to 55% are moderately deficient in Zinc and 25-30% is deficient in Boron. Deficiency of other micronutrients occurs under 15% of soils. Deficiency of micronutrient has become a major constraint to the productivity, stability and sustainability of crops in many Indian soils and may further deteriorate due to global warming (Kumar *et al.*, 2011) [12]. Potassium stands out as a cation having the strongest influence on quality attributes that determine fruit marketability, consumer preference and the concentration of critically important human health-associated phytonutrients. It regulates the opening and closing of the stomata by a potassium ion pump. Since stomata are important in water regulation, potassium reduces water loss from the leaves and increases drought tolerance. Potassium regulates starch synthesis and sugar accumulation by activating enzymes *viz.*, starch synthetase, etc., (Lester *et al.*, 2010) [14]. The potassium increases root growth, builds cellulose, protein content of plants, food formation and reduces respiration, water loss, energy loss, lodging, wilting which leads to retard crop diseases.
Zinc is required for the activity of different enzymes, including dehydrogenases, aldolases, isomerases, transphosphorylases, RNA and DNA polymerases are involved in the synthesis of tryptophan, cell division, maintenance of membrane structure and photosynthesis, and acts as a regulatory cofactor in protein synthesis and boron play a very important role in germination of

pollen grains, elongation of pollen tube, higher fruit set and are also indirectly responsible for the activation of dehydrogenase enzymes, sugar translocation, nucleic acids and plant hormones (Marschner, 2012) [17]. Zinc and boron are essential for growth and development of papaya fruits, affecting various biological processes such as photosynthesis, synthesis of nucleic acids, proteins and carbohydrates (Bhatt *et al.*, 2012) [4]. Zinc and Boron occupies an important place due to its ability to positively influence plant growth and development and imparts resistance to biotic and abiotic stresses (Cakmak, 2008) [5].

Foliar application of micronutrients has gained importance because foliar application is a well-established operation to complete and enrich plant nutrition. Foliar application can meet the expense of nutrients where absorption of nutrients from the soil is unavailable due to plant stress or in adverse soil conditions. Foliar sprays with fertilizers including macro element like potassium and microelements such as Zn and B have been shown to be convenient for field use, have a good effectiveness and very rapid plant response (Fernandez *et al.*, 2013) [7].

Materials and Methods

An investigation was carried out in Farmer's field at Basur village, Sorab taluk, Shivamogga dist. with the support of Department of Fruit science at College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot during 2018-2019. The experiment was laid out in randomized block design with three replications and ten treatments *viz.*, T_1 - K_2SO_4 at 1%, T_2 - K_2SO_4 at 2%, T_3 - Borax at 0.25%, T_4 - Borax at 0.50%, T_5 - $ZnSO_4$ at 0.25%, T_6 - $ZnSO_4$ at 0.50%, T_7 - K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%, T_8 - K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%, T_9 - K_2SO_4 at 1% + Borax at 0.50% + $ZnSO_4$ at 0.50%, T_{10} - K_2SO_4 at 2% + Borax at 0.50% + $ZnSO_4$ at 0.50%, T_{11} - Control (water spray) with a spacing 2 x 2 m. Foliar application of potassium, zinc and boron were applied in six split doses with 45 days interval after transplanting. The chemicals were properly dissolved in water before spray. Three plants per replication were randomly selected and tagged in each treatment and in each replication. The fruits were harvested based on their maturity indices *viz.*, change in colour of fruit from dark green to yellowish orange. Observations were recorded and statistically analyzed as per the methods given by Panse and Sukhatme (1967) [19].

Results and Discussion

Growth attributes

In the present investigation, the data obtained on plant height (cm), plant girth(cm), number of leaves per plant, petiole length(cm), plant spread N-S (cm) and plant spread E-W (cm) were significantly influenced by spraying of different concentrations of potassium, zinc and boron at 90, 135, 180, 225 and 270 days after transplanting (DAT) are recorded and presented in Table 1, 2, 3, 4, 5 and 6 respectively.

At 45 days after transplanting (DAT), the data obtained on plant height (cm),, plant girth (cm), number of leaves per plant, petiole length (cm), plant spread N-S (cm) and plant spread E-W (cm) was found to be statistically non significant among the treatments. The results of analyzed data, pertaining to increment in plant height (94.67cm, 135.11cm, 164.78cm, 196.78cm and 244.44cm, respectively) was found to be statistically significant at 90, 135, 180, 225 and 270 days after transplanting (DAT) in treatment T_7 (K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%), which was on par (92.45cm, 133.45cm, 162.33cm, 192.12cm and 241.77cm, respectively) with T_8 (K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%) and it was followed by (84.75cm, 122.10cm, 145.77cm, 172.80cm and 219.26cm, respectively) with T_5 ($ZnSO_4$ at 0.25%), (84.50cm, 121.85cm, 145.23cm, 172.32cm and 219.03cm, respectively) with T_3 (Borax at 0.25%). Whereas, T_7, T_8, T_5 and T_3 was found significantly superior over all other treatments respectively. Whereas, the minimum plant height (74.56cm, 107.00cm, 125.02cm, 150.34cm and 193.55cm, respectively) was observed in T_{11} (control-water spray).

The data obtained on plant girth was found to be significantly maximum (18.47cm, 26.52cm, 34.66cm, 39.64cm and 44.72cm, respectively) at 90, 135, 180, 225 and 270 days after transplanting (DAT) in treatment T_7 (K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%), which was on par (17.64cm, 25.74cm, 33.47cm, 37.42cm and 42.87cm, respectively) with T_8 (K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%) and it was followed by (15.98cm, 23.31cm, 30.29cm, 34.09cm and 39.02cm, respectively) with T_5 ($ZnSO_4$ at 0.25%), (15.72cm, 23.27cm, 30.08cm, 34.03cm and 38.98cm, respectively) with T_3 (Borax at 0.25%). Whereas, the minimum plant height (13.02cm, 18.92cm, 25.38cm, 28.65cm and 33.14cm, respectively) was observed in T_{11} (control-water spray).

Significant difference was observed with respect to number of leaves per plant at 90, 135, 180, 225 and 270 days after transplanting (DAT). The maximum number of leaves per plant (22.56, 31.56, 36.44, 42.89 and 48.11, respectively) was obtained in the treatment T_7 (K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%), which was on par (21.22, 30.45, 35.17, 41.72 and 46.83, respectively) with T_8 (K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%) and it was followed by (18.94, 28.42, 32.00, 38.27 and 42.00, respectively) with T_5 ($ZnSO_4$ at 0.25%), (18.90, 28.24, 31.87, 37.95 and 41.78, respectively) with T_3 (Borax at 0.25%). Whereas, the minimum number of leaves per plant (15.92, 25.22, 27.83, 33.97 and 36.02, respectively) was observed in T_{11} (control-water spray).

At 90, 135, 180, 225 and 270 days after transplanting (DAT), the perusal of the data indicates that the petiole length was obtained significantly maximum (65.20cm, 78.28cm, 83.33cm, 90.11cm and 97.33cm, respectively) in treatment T_7 (K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%), which is on par (63.98cm, 75.89cm, 82.09cm, 89.03cm and 96.38cm, respectively) with T_8 (K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%) and it was followed by (58.77cm, 68.85cm, 73.50cm, 80.32cm and 87.16cm, respectively) with T_5 ($ZnSO_4$ at 0.25%), (58.34cm, 68.52cm, 73.27cm, 80.18cm and 86.13cm, respectively) with T_3 (Borax at 0.25%). Whereas, in T_{11} (control-water spray) has registered significantly minimum petiole length (52.25cm, 59.29cm, 63.82cm, 69.61cm and 75.06cm, respectively).

The data recorded on plant height at 90, 135, 180, 225 and 270 days after transplanting (DAT) was found to be statistically significant among the treatments. The maximum plant spread N-S (123.11cm, 156.33cm, 183.67cm, 209.78cm and 241.88cm, respectively) was observed in T_7 (K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%), which was on par (121.44cm, 154.79cm, 180.99cm, 207.97cm and 240.12cm, respectively) with T_8 (K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%) and it was followed by (112.00cm,

141.88cm, 165.67cm, 187.91cm and 218.65cm, respectively) with T_5 ($ZnSO_4$ at 0.25%), (111.76cm, 141.56cm, 165.34cm, 186.90cm and 217.97cm, respectively) with T_3 (Borax at 0.25%). The minimum plant spread N-S (98.95cm, 125.01cm, 146.60cm, 165.10cm and 193.27cm, respectively) was recorded in T_{11} (control-water spray).

Significant difference was observed with respect to plant spread E-W at 90, 135, 180, 225 and 270 days after transplanting (DAT). The maximum plant spread E-W (65.20cm, 78.28cm, 83.33cm, 90.11cm and 97.33cm, respectively) was obtained in the treatment T_7 (K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%), which was on par (65.20cm, 78.28cm, 83.33cm, 90.11cm and 97.33cm, respectively) with T_8 (K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%) and it was followed by (65.20cm, 78.28cm, 83.33cm, 90.11cm and 97.33cm, respectively) with T_5 ($ZnSO_4$ at 0.25%), (65.20cm, 78.28cm, 83.33cm, 90.11cm and 97.33cm, respectively) with T_3 (Borax at 0.25%). Whereas, T_7, T_8, T_5 and T_3 was found significantly superior over all other treatments respectively. Whereas, the minimum plant height (65.20cm, 78.28cm, 83.33cm, 90.11cm and 97.33cm, respectively) was observed in T_{11} (control-water spray).

The foliar application of potassium and micronutrients had significant influence on growth parameters might be due to the favourable influence of applied micronutrients on vegetative characteristics because of their catalytic or stimulatory effect on most of the physiological and metabolic process of plants and also due to improved photosynthetic activity and respiration of plants as influenced by zinc and boron. Zinc plays an essential component of enzymes responsible for metabolism of nitrogen and synthesis of auxin (tryptophan which is a precursor of indole acetic acid synthesis) in the plant and it was also involved in photosynthetic compounds and leaf chlorophyll which ultimately involved in cell division, cell enlargement, cell wall development, leaf bud formation, delayed the process of leaf senescence, gave strength for their persistency as well as enhance the plant growth and development (Lokhande and Moghe, 1991; Shekar *et al.*, 2010; Sajid *et al.*, 2010 and Modi *et al.*, 2012) [15, 22, 18] and (Khan *et al.*, 2009) [11] who reported that zinc plays an important role in starch metabolism and acts as co-factor for many enzymes, affects photosynthesis reaction, nucleic acid metabolism and protein biosynthesis, thereby positively contributing it increased tissue growth and development. Application of boron increases flower numbers and act its role in pollen tube germination and elongation and also regulates metabolism involved in translocation of carbohydrates and RNA synthesis (Gurung *et al.*, 2016; Singh *et al.*, 2002) [9] and also increases the phenolic compounds which regulate polar auxin transport. The increased auxin activity results in increased vegetative growth characters. Similar findings were reported by Yadav *et al.* (2017) [24], (Singh *et al.*, 2005) [26] and Kumar *et al.* (2017) [13].

Flowering and fruiting characters

The data obtained on days taken to first flowering, days taken to first fruiting and days taken to first maturity were significantly influenced by spraying of different concentrations of potassium, zinc and boron are recorded and presented in Table 7. Among different treatments, the results clearly showed that the days taken to first flowering, days taken to first fruiting or fruit set and days taken to first maturity were significantly minimum (65.11days, 90.22days and 224.42days) recorded in T_7 (K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%), which were on par (67.64days, 93.07days and 227.37days) with T_8 (K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%) and followed by (74.85days, 102.45days and 250.75days) with T_5 ($ZnSO_4$ at 0.25%), (75.13days, 102.91days and 251.24days) with T_3 (Borax at 0.25%). Whereas, T_7, T_8, T_5 and T_3 was registered significantly minimum over all other treatments respectively. In T_{11} (control-water spray) has registered significantly maximum days taken to first flowering (85.75days), days taken to first fruiting or fruit set (114.05days) and days taken to first maturity (277.17days). This might be due to combined effect of potassium and micronutrients played a vital role in increase of physiological activities leading to early initiation of flowering (Ghanta and Mitra, 1993; Banik and Sen, 1997 and Singh and Maurya, 2004; Sarolia *et al.*, 2007) [8, 3, 28, 23] and Alila *et al.* (2005) [1] reported that might be due to biosynthesis of auxin in the plants leads to reduced flowering duration influenced by zinc in enzymatic reaction and cell division in growth of papaya. Boron plays vital role in early flower initiation, flower bud formation, stimulation of pollen germination and growth of pollen tube, fertilization process, glucose metabolism, hydrocarbons and their transport and also regulates metabolism and translocation of carbohydrates, cell wall development and RNA synthesis (Ram and Bose, 2000) [21]. Similar findings were in conformity with the findings of Modi *et al.* (2012) [18] and Singh *et al.* (2005) [26]. Shortened the number of days taken to first flowering, days taken to first fruiting and days taken to fruit maturity might be due to the better source sink relationship of translocation of carbohydrates efficiency to the developing flowers and fruits and significant effect of boron and zinc in higher synthesis of metabolites. Furthermore, the supply of B needed for reproductive growth is more than that needed for vegetative growth (Marschner, 1986 and Hanson, 1991) [16, 10].

Table 1: Effect of foliar spray of potassium and micronutrients on plant height of Papaya *cv.* Red Lady at different growth periods.

Treatments	Treatment Details	Plant height (cm)					
		Days after transplanting					
		45	90	135	180	225	270
T_1	K_2SO_4 at 1%	45.22	77.12	110.43	128.82	153.78	196.93
T_2	K_2SO_4 at 2%	44.33	76.18	109.34	127.25	152.61	195.87
T_3	Borax at 0.25%	45.00	84.50	121.85	145.23	172.32	219.03
T_4	Borax at 0.50%	45.33	76.98	109.93	128.04	153.29	196.29
T_5	$ZnSO_4$ at 0.25%	46.00	84.75	122.10	145.77	172.80	219.26
T_6	$ZnSO_4$ at 0.50%	46.44	77.00	110.21	128.43	153.52	196.64
T_7	K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%	45.56	94.67	135.11	164.78	196.78	244.44
T_8	K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%	44.78	92.45	133.45	162.33	192.12	241.77

T_9	K_2SO_4 at 1% + Borax at 0.50% + $ZnSO_4$ at 0.50%	46.22	76.88	109.82	127.93	153.02	196.06
T_{10}	K_2SO_4 at 2% + Borax at 0.50% + $ZnSO_4$ at 0.50%	45.56	76.35	109.55	127.65	152.83	195.99
T_{11}	Control (water spray).	45.11	74.56	107.00	125.02	150.34	193.55
S.Em±		NS	2.44	3.86	5.12	6.12	7.29
C.D @ 5 %		NS	7.21	11.23	15.44	18.32	21.82

Table 2: Effect of foliar spray of potassium and micronutrients on plant girth of Papaya *cv.* Red Lady at different growth periods.

Treatments	Treatment Details	Plant girth (cm) Days after transplanting					
		45	90	135	180	225	270
T_1	K_2SO_4 at 1%	8.20	14.03	20.64	27.01	30.27	35.00
T_2	K_2SO_4 at 2%	8.12	13.12	20.00	26.55	29.84	34.32
T_3	Borax at 0.25%	8.00	15.72	23.27	30.08	34.03	38.98
T_4	Borax at 0.50%	8.18	13.62	20.33	26.90	30.05	34.82
T_5	$ZnSO_4$ at 0.25%	8.29	15.98	23.31	30.29	34.09	39.02
T_6	$ZnSO_4$ at 0.50%	8.33	13.93	20.57	26.97	30.18	34.94
T_7	K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%	8.19	18.47	26.52	34.66	39.64	44.72
T_8	K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%	8.22	17.64	25.74	33.47	37.42	42.87
T_9	K_2SO_4 at 1% + Borax at 0.50% + $ZnSO_4$ at 0.50%	8.36	13.44	20.18	26.83	29.97	34.67
T_{10}	K_2SO_4 at 2% + Borax at 0.50% + $ZnSO_4$ at 0.50%	8.27	13.26	20.05	26.72	29.90	34.51
T_{11}	Control (water spray).	8.29	13.02	18.92	25.38	28.65	33.14
S.Em±		NS	0.56	0.82	1.01	1.10	1.28
C.D @ 5 %		NS	1.62	2.32	3.02	3.30	3.72

Table 3: Effect of foliar spray of potassium and micronutrients on number of leaves per plant of Papaya *cv.* Red Lady at different growth periods.

Treatments	Treatment Details	Number of leaves per plant Days after transplanting					
		45	90	135	180	225	270
T_1	K_2SO_4 at 1%	8.78	16.47	26.33	28.43	34.25	36.94
T_2	K_2SO_4 at 2%	9.56	16.00	25.59	27.85	33.51	36.13
T_3	Borax at 0.25%	9.67	18.90	28.24	31.87	37.95	41.78
T_4	Borax at 0.50%	9.11	16.21	26.18	28.14	33.98	36.64
T_5	$ZnSO_4$ at 0.25%	9.44	18.94	28.42	32.00	38.27	42.00
T_6	$ZnSO_4$ at 0.50%	8.89	16.32	26.28	28.32	34.13	36.80
T_7	K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%	8.89	22.56	31.56	36.44	42.89	48.11
T_8	K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%	9.56	21.22	30.45	35.17	41.72	46.83
T_9	K_2SO_4 at 1% + Borax at 0.50% + $ZnSO_4$ at 0.50%	9.89	16.13	26.07	28.03	33.84	36.47
T_{10}	K_2SO_4 at 2% + Borax at 0.50% + $ZnSO_4$ at 0.50%	8.56	16.04	25.88	27.92	33.67	36.25
T_{11}	Control (water spray).	9.11	15.92	25.22	27.83	33.97	36.02
S.Em±		NS	0.75	0.64	1.02	1.03	1.38
C.D @ 5 %		NS	2.20	1.87	3.01	3.17	4.10

Table 4: Effect of foliar spray of potassium and micronutrients on petiole length of Papaya *cv.* Red Lady at different growth periods.

Treatments	Treatment Details	Petiole length (cm) Days after transplanting					
		45	90	135	180	225	270
T_1	K_2SO_4 at 1%	41.22	53.78	61.45	65.81	71.49	77.92
T_2	K_2SO_4 at 2%	40.22	52.80	60.68	65.03	70.01	77.36
T_3	Borax at 0.25%	39.67	58.34	68.52	73.27	80.18	86.13
T_4	Borax at 0.50%	40.22	53.27	61.14	65.41	71.23	77.68
T_5	$ZnSO_4$ at 0.25%	41.11	58.77	68.85	73.50	80.32	87.16
T_6	$ZnSO_4$ at 0.50%	41.67	53.54	61.30	65.57	71.38	77.80
T_7	K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%	40.67	65.20	78.28	83.33	90.11	97.33
T_8	K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%	40.33	63.98	75.89	82.09	89.03	96.38
T_9	K_2SO_4 at 1% + Borax at 0.50% + $ZnSO_4$ at 0.50%	41.67	53.08	61.00	65.29	71.12	77.59
T_{10}	K_2SO_4 at 2% + Borax at 0.50% + $ZnSO_4$ at 0.50%	39.78	52.97	60.85	65.12	71.08	77.45
T_{11}	Control (water spray).	40.11	52.25	59.29	63.82	69.61	75.06
S.Em±		NS	1.45	2.32	2.65	2.76	3.01
C.D @ 5 %		NS	4.29	6.80	7.25	8.59	9.11

Table 5: Effect of foliar spray of potassium and micronutrients on plant spread N-S of Papaya *cv.* Red Lady at different growth periods.

Treatments	Treatment Details	Plant spread N-S (cm) Days after transplanting					
		45	90	135	180	225	270
T_1	K_2SO_4 at 1%	57.89	101.86	128.89	149.64	167.84	197.16
T_2	K_2SO_4 at 2%	58.67	100.60	127.38	148.33	166.35	195.85
T_3	Borax at 0.25%	59.89	111.76	141.56	165.34	186.90	217.97
T_4	Borax at 0.50%	60.00	101.27	128.22	149.02	167.13	196.51
T_5	$ZnSO_4$ at 0.25%	59.56	112.00	141.88	165.67	187.91	218.65
T_6	$ZnSO_4$ at 0.50%	57.33	101.54	128.63	149.29	167.38	196.83
T_7	K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%	57.78	123.11	156.33	183.67	209.78	241.88
T_8	K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%	59.33	121.44	154.79	180.99	207.97	240.12
T_9	K_2SO_4 at 1% + Borax at 0.50% + $ZnSO_4$ at 0.50%	58.45	101.02	127.94	148.79	166.89	196.33
T_{10}	K_2SO_4 at 2% + Borax at 0.50% + $ZnSO_4$ at 0.50%	58.55	100.64	127.56	148.47	166.58	196.05
T_{11}	Control (water spray).	59.56	98.95	125.01	146.60	165.10	193.27
S.Em±		NS	3.12	4.10	4.95	6.23	6.88
C.D @ 5 %		NS	9.23	12.01	14.6	18.16	20.18

Table 6: Effect of foliar spray of potassium and micronutrients on plant spread E-W of Papaya *cv.* Red Lady at different growth periods.

Treatments	Treatment Details	Plant Spread E-W (cm) Days after transplanting					
		45	90	135	180	225	270
T_1	K_2SO_4 at 1%	56.00	103.00	122.72	152.62	171.83	203.17
T_2	K_2SO_4 at 2%	55.55	101.53	121.34	150.97	170.29	201.71
T_3	Borax at 0.25%	57.89	113.24	137.28	168.35	191.05	224.33
T_4	Borax at 0.50%	58.45	102.35	122.17	152.07	171.15	202.54
T_5	$ZnSO_4$ at 0.25%	56.22	113.86	137.66	168.84	191.98	224.64
T_6	$ZnSO_4$ at 0.50%	55.66	102.68	122.48	152.27	171.37	202.87
T_7	K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%	55.78	125.11	154.89	186.93	213.68	247.24
T_8	K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%	56.11	123.75	152.28	183.90	209.64	244.79
T_9	K_2SO_4 at 1% + Borax at 0.50% + $ZnSO_4$ at 0.50%	57.00	102.11	121.87	151.78	170.88	202.31
T_{10}	K_2SO_4 at 2% + Borax at 0.50% + $ZnSO_4$ at 0.50%	55.45	101.85	121.51	151.20	170.62	201.84
T_{11}	Control (water spray).	56.33	100.17	119.86	148.46	167.55	198.16
S.Em±		NS	3.01	4.32	5.12	5.87	7.02
C.D @ 5 %		NS	9.70	14.20	16.45	17.34	20.45

Table 7: Effect of foliar spray of potassium and micronutrients on flowering and fruiting characteristics of Papaya *cv.* Red Lady.

Treatments	Treatment Details	Flowering and fruiting characteristics		
		Days taken to first flowering	Days taken to first fruiting	Days taken to first maturity
T_1	K_2SO_4 at 1%	82.61	112.34	274.27
T_2	K_2SO_4 at 2%	84.73	113.55	276.42
T_3	Borax at 0.25%	75.13	102.91	251.24
T_4	Borax at 0.50%	83.68	112.72	275.37
T_5	$ZnSO_4$ at 0.25%	74.85	102.45	250.75
T_6	$ZnSO_4$ at 0.50%	83.12	112.58	274.88
T_7	K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25%	65.11	90.22	224.42
T_8	K_2SO_4 at 2% + Borax at 0.25% + $ZnSO_4$ at 0.25%	67.64	93.07	227.37
T_9	K_2SO_4 at 1% + Borax at 0.50% + $ZnSO_4$ at 0.50%	83.99	112.97	275.50
T_{10}	K_2SO_4 at 2% + Borax at 0.50% + $ZnSO_4$ at 0.50%	84.42	113.24	275.94
T_{11}	Control (water spray).	85.75	114.05	277.17
S.Em±		3.12	2.69	7.08
C.D @ 5 %		6.48	8.14	22.14

Conclusion

From the present investigation results revealed that foliar application is an instant effective way of application of nutrients. Plants sprayed with K_2SO_4 at 1% + Borax at 0.25% + $ZnSO_4$ at 0.25% significantly increased growth, flowering and fruiting characters of papaya *cv*. Red Lady.

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