Original Research Article

Effect of different levels of beheaded heights and foliar spray of micronutrients on flowering and fruiting attributes of mango cv. Amrapali under high density planting

Abstract

Mango plants grown under high-density planting show a progressive decline in yield after 10-11 years of planting due to overcrowding of branches. To overcome this problem rejuvenation of the orchard is generally recommended with modification of nutrients through the soil and foliar spray to increase the fruit yield. But which beheaded height is suitable for rejuvenation of plants under the high density of mango, not standardized. So this experiment was conducted to find out the effect of different levels of beheaded heights and, foliar spray of micronutrients on flowering and fruiting attributes of mango cv. Amrapali during 2019-20 and 2020-21 at the Department of Horticulture and Postharvest Technology, Institute of Agriculture, Visva-Bharati, Sriniketan, West Bengal, India. Six different beheaded height viz. T_1- 80cm, T_2-100 cm, T_3-120 cm, T_4-140 cm, T_5-160 cm, and T_6-180 cm and, two foliar sprays of micronutrients (just before flowering and fruiting) were taken as treatment. The experiment was designed in split-plot with three replication. Days to flowering, days to 50 % flowering, days to fruit set, number of panicles per plant, length of panicles, fruit length, fruit width, fruit weight, fruit volume, pulp weight, stone weight, peel weight and pulp stone ratios were taken for observation. It was found that different levels of beheaded height and foliar spray of micronutrients had a significant effect on flowering and fruiting attributes. Plant beheaded at 80 cm height from ground level showed early days to flowering, days to 50 % flowering, days to fruit set, the highest number of panicles per plant, the largest panicles length, maximum fruit length, fruit width, fruit weight, fruit volume, pulp weight, and pulp stone ratio. Foliar spray of 0.4% Zinc Sulphate, Copper Sulphate (0.2%), Borax (0.2%) [2 sprays at just before flowering and marble stage] was found to have a significant effect on flowering and fruiting attributes except for pulp stone ratio. Interaction of different levels of beheaded height and foliar spray of micronutrients showed a significant effect on flowering and fruiting attributes. Early days to flowering, 50 % flowering, fruit set, number of panicles per plant, panicles length, fruit length, fruit width, fruit weight, fruit volume, pulp weight, and pulp stone ratio was recorded highest in T_1F_2 (plant beheaded at 80 cm height with foliar spray of 0.4% Zinc Sulphate, Copper Sulphate (0.2%), Borax (0.2%). It can be concluded that a plant beheaded at 80 cm height with foliar spray of 0.4% Zinc Sulphate + Copper Sulphate (0.2%) + Borax (0.2%) [2 sprays just before flowering and marble stage] can produce higher fruit yield in terms of maximum fruit weight, fruit size, fruit volume with early flowering and fruiting.

Keywords: *beheaded height; flowering; fruiting; high density; mango*

1. INTRODUCTION:

Mango is one of the most famous fruit crops in the world and belongs to the family Anacardiaceae, which originated in the Indo-Burma region [1]. Mango plants are grown for their delicious taste and quality [2]. It is a rich source of carbohydrates, sugars, fibers, protein, vitamins, and minerals [3, 4]. In India, the high-density planting system gets momentum after the development of mango cv. Amrapali (a hybrid of Dashehri and Neelum) [5]. However, the mango plants grown under high density planting systems show a progressive decline in yield after 10-11 years of planting owing to overlapping/ intermingling of branches, poor light interception, low photosynthetic rate, and high relative humidity within the tree canopy [6, 7, 8]. For improvement of fruit quality and yield potential of old and unproductive fruit orchards rejuvenation pruning is highly recommended if trees are in healthy conditions. But in mango rejuvenation alone could not overcome the problems unless the addition or modification of micronutrients is not done. Deficiency of micronutrients like Zinc, boron, copper etc. is common resulting in yield and quality loss [9]. Hence, management of micronutrients is critical for increasing the yield. There are few researches which showed rejuvenation and foliar spray of micronutrients increased the fruit yield in term of fruit size and fruit weight. The maximum fruit size and fruit weight was reported higher in rejuvenated plant than control [10].The maximum fruit size, fruit weight and pulp weight was found in plant beheaded at primary branches [11]. Fruit size and weight were found to increase with pruning intensities in guava [12]. Foliar application of micronutrients increases the earlier bud formation by the synthesis of essential hormones and metabolite translocation to the bud of the tree [13]. The application of boron enhanced the emergence of flowers and fruits in olive [14]. Foliar application of 0.4% borax and 1% ZnSO4 in the litchi plant increased the fruit size and fruit weight [15]. Foliar application of ZnSO4 (0.4%) increased the maximum pulp weight in pomegranate [16], Maximum fruit weight was found with foliar spray of ZnSO4, FeSO4, and Borax in pomegranate [17]. Foliar application of Zinc sulphate (0.4%) and Boric acid (0.4%) gave a significant effect on the yield attributes of pomegranate [18]. Foliar application of borax (0.50 %) and ZnSO4 (0.25 %) resulted in maximum fruit weight in papaya [19]. A similar result was found with foliar spray of zinc sulphate (0.5 %) and boric acid (0.1 %) in papaya giving the highest fruit weight, fruit length, and fruit circumference [20]. In guava, foliar application of borax (0.4%) increased the fruit length, fruit width, and fruit weight [21]. Foliar application of borax 1.0 % was also found beneficial in yield attributing characters of guava [22]. Similarly, foliar application of CuSO4 (1%), FeSO4 (1%), ZnSO4 (1%), and borax (0.5%) resulted in maximum fruit weight and pulp weight in guava [23]. Foliar application of 0.75% zinc sulphate in guava resulted in maximum fruit weight, fruit length, fruit width, and high pulp and pulp seed ratio [24]. Foliar spray of 0.5% borax resulted in higher fruit weight and fruit volume in mango [25]. Considering the importance of rejuvenation pruning and foliar spray of micronutrients, this experiment was done to find out the effect of different levels of beheaded height and foliar spray of micronutrients on flowering and fruiting attributes of rejuvenated mango orchard cv. Amrapali planted under high-density planting.

2. MATERIALS AND METHODS

The experiment was conducted on thirty years old, high-density planted (3mx3m) mango orchard cv. Amrapali during 2019-20 and 2020-21 at the Department of Horticulture and Postharvest Technology, Institute of Agriculture, Visva-Bharati, Sriniketan, West Bengal. Six different beheaded heights: T_1- 80cm, T_2-100 cm, T_3-120 cm, T_4-140 cm, T_5-160 cm, and T_6-180, with two foliar applications viz. F_1: Foliar spray of 0.2% Zinc sulphate + 0.1% Copper sulphate + 0.1% Boric acid (2 sprays at just before flowering and marble stage), F_2: Foliar spray of 0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%) [2 spray at just before flowering and marble stage] were taken as treatments. The experiment was laid out in split plot design with three replication. The following observations were recorded: Days to flowering: It was counted from the first panicle initiation days to the first flowering days. For this ten shoots from each direction were tagged before flowering. Days to 50% flowering: It was counted from the first panicle initiation days to 50 % flowering of the tagged shoot. Days to fruit set: It was counted from the first panicle initiation days to the first fruit set of the tagged shoot. Number of panicles per plant: All the panicles of individual plants were counted during flowering period. Length of panicles at anthesis: The length of the panicle was measured by measuring a scale from the shoot apex to that of the panicle apex. An average of five values was taken for computing the mean panicle length. Average fruit weight (g): Weight of ten fruits from each plant, was recorded by weighing the samples on balance and expressed in grams. Fruit length: The length of ten fruits was measured from apex to stem end by vernier calipers and expressed in centimeters. Fruit width: The width of ten fruits was recorded with the help of a vernier caliper and expressed in terms of centimeters. Volume of fruit (cc): The data on the fruit volume was recorded by the water displacement method [26]. Each mango fruit was submerged in 500 cm^3 water in eureka container and the volume of displaced water was directly measured using graduated cylinder. Water temperature was maintained at 25^OC [27]. Stone weight (g), Peel weight (g) and pulp weight (g), and pulp stone ratio: This was calculated by weighing the ripened fruits separately, followed by pulp and stone after peeling of fruits, and the ratio was calculated by dividing pulp weight by stone weight. The data was analyzed by R software.

3. RESULTS

3.1 Days to flowering: A perusal analysis of pooled data presented in table-1 showed that beheaded height and micronutrients had shown significant on days to flowering. Early days to flowering were found in T_1 (23.50 days, 23.33 days, and 23.42 days) during 2020, 2021, and pooled respectively which was found statistically superior to T_4 (25 days), followed by T_5 (25.08 days), T_3 (26.58 days) and T_5 (29.29 days).The late flowering was observed in T_6 (29.58 days). Foliar spray of micronutrients showed significant effect on days to flowering. Foliar spray of 0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%) recorded early flowering (26.04 days). Interaction of different levels of beheaded height and foliar spray of micronutrients also showed a significant effect on days to flowering. Early days to flowering were recorded in T_1F_2 (21.67 days) which was found statistically superior to T_2F_2 (24.50 days) followed

by T_4F_1 (24.83 days), T_4F_2 (25.17 days), T_1F_1 (25.16 days), T_2F_1 (25.66 days) ,T_3F_1 (26.50 days),T_3F_2 (26.67days), T_6F_2 (29.00 days),T_5F_2 (29.25 days), T_5F_1 (29.33 days). The late flowering was observed in T_6F_1 (30.17 days).

3.2. Days to 50% flowering: The pooled data presented in table-2 showed that beheaded height had shown a significant effect on days to 50 flowerings. Early days to 50 % flowering were recorded in T_1 (30.90 days) which was found statistically superior to T_2 (33.67days) and similar parity with T_4 (33.75 days), T_3 (34.08 days) and, T_5 (35.08days). The late days to 50 % flowering were observed in T_6 (39.92 days). Foliar spray, F_2 exerted a significant effect on days to 50 % flowering while the interaction of beheaded height and foliar spray of micronutrients showed a significant effect on days to flowering. Early days to 50 % flowering were recorded in T_1F_2 (30.67 days) which was found statistically superior to T_2F_2 (32.17 days), followed by T_4F_1 (34.50 days), T_5F_2 (35.00 days), and T_5F_1 (35.17 days).The late flowering was observed in T_6F_1 (37.00 days).

Table: 1 Effect of different level of beheaded heights and foliar spray of micronutrients on days to flowering

Days to flowering									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	25.00^{c}	22.00^{d}	**23.50d**	25.33^{cd}	21.33^{e}	**23.33^{d}**	25.17^{bc}	21.67^{d}	**23.42^{d}**
T2	25.00^{c}	25.00^{c}	**25.00bc**	26.33^{cd}	24.00^{d}	**25.17^{c}**	25.67^{bc}	24.50^{c}	**25.08^{b}**
T3	25.67^{bc}	27.00^{b}	**26.33b**	27.33^{bc}	26.33^{cd}	**26.83^{b}**	26.50^{b}	26.67^{b}	**26.58^{c}**
T4	25.00^{c}	24.67^{c}	**24.83cd**	24.67^{d}	25.67^{cd}	**25.17^{c}**	24.83^{c}	25.17^{bc}	**25.00^{c}**
T5	29.67^{a}	29.17^{a}	**29.42a**	29.00^{ab}	29.33^{ab}	**29.17^{a}**	29.33^{a}	29.25^{a}	**29.29^{a}**
T6	30.33^{a}	29.00^{a}	**29.67a**	30.00^{a}	29.00^{ab}	**29.50^{a}**	30.17^{a}	29.00^{a}	**29.58^{a}**
Mean	**26.78^{a}**	**26.14^{b}**	**26.46**	**27.11^{a}**	**25.94^{b}**	**26.53**	**26.94^{a}**	**26.04^{b}**	**26.49**
		SEm (±)	**CD**		**SEm (±)**	**CD**		**SEm (±)**	**CD**
F		0.70	0.62*		1.72	0.95*		0.87	0.68*
T		1.30	1.47***		1.19	1.41***		1.11	1.35***
F*T		0.70	1.52*		1.72	2.33		0.87	1.66*

*P < 0.05; **P < 0.01; *** P< 0.001

3.3. Days to fruit set: The pooled data illustrated in table-3 showed that beheaded height had shown a significant effect on days to fruit set. Early days to the fruit set were recorded in T_1 (37.05 days) followed by T_4 (38.17 days), T_2 (38.17 days), T_3 (38.25 days), and T_6 (42.39 days). The late fruit set was recorded in T_5 (42.71 days). Foliar spray of micronutrients showed a significant effect on days to fruit set. Early days to fruit set was recorded by foliar application of 0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%) during investigation 2020 (39.17), 2021 (38.32), and pooled (38.74 days) respectively. Interaction of beheaded height and foliar spray of micronutrients showed a significant effect on days to fruit set. Early days to the fruit set were found in T_1F_2 (36.43 days) which was found similar to T_4F_2 (36.50 days), T_3F_2 (37.17 days), T_2F_2 (37.17 days), followed by T_1F_1 (37.67 days), T_2F_1 (39.17 days), T_3

F_1 (39.33 days), T_4 F_1 (39.83 days), T_6 F_1 (42.33 days), T_6 F_2 (42.45 days), T_5 F_1 (42.67 days). The delayed fruit set was recorded in T_5 F_2 (42.74 days).

Table: 2 Effect of different level of beheaded heights and foliar spray of micronutrients on days to 50 % flowering.

Days to 50% flowering									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	31.33^{d}	31.33^{d}	31.33^{b}	30.93^{fg}	30.00^{g}	30.47^{d}	31.13^{e}	30.67^{e}	30.90 ^{c}
T2	33.00^{cd}	33.33^{cd}	33.17^{b}	37.33^{bc}	31.00^{fg}	34.17^{bc}	35.17^{abc}	32.17^{de}	33.67^{b}
T3	33.00^{cd}	32.00^{cd}	32.50^{b}	40.67^{bc}	30.67^{fg}	35.67^{bc}	36.83^{ab}	31.33^{e}	34.08^{b}
T4	32.67^{cd}	32.67^{cd}	32.67^{b}	36.33^{cd}	33.33^{ef}	34.83^{ab}	34.50^{bcd}	33.00^{cd}	33.75^{b}
T5	36.00^{b}	38.50^{a}	37.25^{a}	34.33^{de}	31.50^{efg}	32.92^{abc}	35.17^{abc}	35.00^{abc}	35.08^{b}
T6	34.00^{bc}	39.33^{a}	36.67^{a}	40.00^{ab}	34.33^{dc}	37.17^{cd}	37.00^{a}	36.83^{ab}	36.92^{a}
Mean	**33.33^{b}**	**34.53^{a}**	**33.93**	**36.60^{a}**	**31.81^{b}**	**34.20**	**34.97^{a}**	**33.17^{b}**	**34.07**
		SEm (±)	**CD**		**SEm (±)**	**CD**		**SEm (±)**	**CD**
F		1.66	0.93*		2.77	1.21***		1.75	0.96**
T		3.82	2.51**		4.55	2.74**		1.52	1.59***
F*T		1.66	2.29*		2.77	2.96**		1.75	2.35*

*P < 0.05; **P < 0.01; *** P< 0.001

Table: 3. **Effect of different level of beheaded heights and foliar spray of micronutrients on days to fruit set.**

Days to fruit set									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	38.33^{f}	38.00^{f}	38.17^{b}	37.00^{def}	34.87^{f}	35.93^{c}	37.67^{cd}	36.43^{d}	37.05^{b}
T2	40.00^{de}	39.00^{ef}	39.50^{b}	38.33^{cd}	35.33^{def}	36.83^{c}	39.17 ^{bc}	37.17^{d}	38.17^{b}
T3	40.67^{cd}	38.00^{f}	39.33^{b}	38.00^{cde}	36.33^{def}	37.17^{bc}	39.33^{b}	37.17^{d}	38.25^{b}
T4	39.67^{dc}	36.00^{g}	37.83^{b}	40.00^{bc}	37.00^{def}	38.50^{b}	39.83^{b}	36.50^{d}	38.17^{b}
T5	43.67^{a}	41.33^{c}	42.50^{a}	41.67^{ab}	44.15^{a}	42.91^{a}	42.67^{a}	42.74^{a}	42.70^{a}
T6	41.67^{bc}	42.67^{ab}	42.17^{a}	43.00^{a}	42.23^{ab}	42.62^{a}	42.33^{a}	42.45^{a}	42.39^{a}
Mean	**40.67^{a}**	**39.17^{b}**	**39.92**	**39.67^{a}**	**38.32^{b}**	**38.99**	**40.17^{a}**	**38.74^{b}**	**39.45**
		SEm (±)	**CD**		**SEm (±)**	**CD**		**SEm (±)**	**CD**
F		0.53	0.53***		2.50	1.15*		0.85	0.67***
T		2.78	2.15**		1.29	1.46**		1.19	1.40***
F*T		0.53	1.29**		2.50	2.81		0.85	1.64*

*P < 0.05; **P < 0.01; *** P< 0.001

3.4. Number of panicles per plant: The pooled analysis of data presented in table- 4 showed that beheaded height had shown a significant effect on the number of panicles per plant. The highest number of panicles per plant was recorded in T_1 (71.58) which was found statistically significant and superior to T_2 (63.08) followed by T_3 (57.92), T_4 (53.92), and T_5 (51.42). The lowest number of panicles per plant was recorded in T_6 (45.42). The foliar spray of micronutrients showed a significant effect on the number of panicles per plant during the investigation period. Foliar spray, F_2 [0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%) recorded highest number of panicles per plant during the investigation period 2020 (59.11), 2021 (59.67), and pooled (59.39) respectively. Interaction of beheaded height and foliar spray of micronutrients also showed a highly significant effect on the number of panicles per plant. The highest

number of panicles per plant was recorded in T_1F_2 (77.50) which was found statistically superior to T_2 F_2 (69.00), T_1 F_1 (65.67), T_3 F_2 (59.00), T_2 F_1 (57.17), T_3 F_1 (56.83), T_4 F_2 (54.33), T_4 F_1 (53.50), T_5 F_2 (52.33) T_5 F_1 (50.50), T_6 F_1 (46.67). The lowest number of panicles per plant was recorded in T_6 F_2 (44.17).

3.5. Length of panicles (cm): A perusal analysis of pooled data presented in table-5 reveals that beheaded height had shown a significant effect on the length of panicles. The largest panicle length was recorded in T_1 (30.52 cm) which was found statistically significant to T_2 (28.52 cm) followed by T_5 (26.18), T_6 (25.78 cm), and T_3 (25.53 cm).The lowest panicle length was recorded in T_4 (25.03 cm). The foliar spray of micronutrients had a highly significant effect on panicle length during the investigation. The maximum panicles length was recorded by foliar spray of 0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%) during the investigation period 2020 (27.12 cm), 2021 (27.99 cm), and pooled (27.56 cm) respectively. Interaction of beheaded height and foliar spray of micronutrients also showed a highly significant effect on the length of panicles. The largest panicles length were recorded in T_1 F_2 (30.53 cm) which was similar to T_1 F_1 (30.52 cm) but found significant difference over T_2 F_2 (28.68 cm) followed by T_2 F_1 (28.36 cm), T_5 F_2 (27.97 cm), T_3 F_2 (27.33 cm), T_6 F_1 (26.00 cm), T_6 F_2 (25.56 cm), T_6 F_2 (25.56) ,T_4 F_2 (25.28 cm) ,T_4 F_1 (24.78 cm), and T_5 F_1 (24.39 cm). The lowest panicle length was observed in T_3 F_1 (23.72 cm).

Table: 4. Effect of different level of beheaded heights and foliar spray of micronutrients on number of panicles per plant.

Number of panicles per plant									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	67.00^{bc}	76.00^{a}	71.50^{a}	64.33^{c}	79.00^{a}	71.67^{a}	65.67^{b}	77.50^{a}	71.58^{a}
T2	57.67^{de}	69.00^{ab}	63.33^{b}	56.67^{de}	69.00^{b}	62.83b	57.17^{cd}	69.00^{b}	$63.b08^{c}$
T3	56.00^{def}	60.33^{cd}	58.17^{c}	57.67^{d}	57.67^{d}	57.67^{c}	56.83^{cd}	59.00^{c}	57.92^{c}
T4	54.00^{def}	55.33^{def}	54.67^{c}	53.00^{ef}	53.33^{ef}	53.17^{cd}	53.50^{de}	54.33^{cde}	53.92^{cd}
T5	48.67^{fgh}	52.00^{efg}	50.33^{d}	52.33^{f}	52.67^{f}	52.50^{d}	50.50^{ef}	52.33^{de}	51.42^{d}
T6	45.67^{gh}	42.00^{h}	43.83^{e}	47.67^{g}	46.33^{g}	47.00^{e}	46.67^{fg}	44.17^{g}	45.42^{e}
Mean	**54.83^{b}**	**59.11^{a}**	**56.97**	**55.28^{b}**	**59.67^{a}**	**57.47**	**55.06^{b}**	**59.39^{a}**	**57.22**
		SEm (±)	**CD**		**SEm (±)**	**CD**		**SEm (±)**	**CD**
F		20.47	3.29*		4.39	1.52***		4.39	1.52***
T		8.99	3.86***		13.91	4.81***		13.96	4.81***
F*T		20.47	8.05		4.39	3.73***		4.39	3.73***

*P < 0.05; **P < 0.01; *** P< 0.001

3.6. Fruit Length (cm): The pooled data presented in table-6 showed that beheaded height and micronutrients had showed a significant on the length of fruits. The maximum fruit length (13.52 cm, 12.70 cm, and 13.11 cm) was recorded in plant beheaded at 80 cm (T_1) from ground level during 2020, 2021, and pooled respectively followed by T_2 (12.68 cm),T_3 (12.67cm), T_4 (12.15 cm), T_5 (12.11 cm). The minimum fruit weight was recorded in T_5 (12.02 cm). Foliar spray of 0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%) was found to be significant effect on fruit length during the investigation

period 2020 (13.03 cm) 2021 (12.36 cm), and pooled (12.69 cm). Interaction of beheaded height and foliar spray of micronutrients showed a significant effect on fruit length. The maximum fruit length was recorded in T_1F_2 (13.50 cm) followed by T_3F_2 (13.26 cm) which was found statistically similar to T_2F_2 (12.87 cm) but significantly differ to T_1F_1 (12.71 cm) followed by T_2F_1 (12.49 cm), T_5F_2 (12.24 cm), T_4F_1 (12.16 cm), T_6F_2 (12.15 cm), T_4F_2 (12.14 cm), T_3F_1 (12.07 cm) and T_5F_1 (11.98 cm). The minimum fruit length was recorded in T_6F_1 (11.89 cm).

Table: 5. Effect of different level of beheaded heights and foliar spray of micronutrients on length of panicles.

Length of panicles(cm)									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	31.00^{a}	30.44^{ab}	30.72^{a}	30.03^{ab}	30.61^{a}	30.32^{a}	30.52^{ab}	30.53^{a}	30.52^{a}
T2	28.33^{bcd}	29.22^{abc}	28.78^{ab}	28.37^{bc}	28.13^{c}	28.25^{b}	28.35^{bc}	28.68^{c}	28.51^{b}
T3	22.00^{g}	26.33^{de}	24.17^{c}	25.44^{de}	28.33^{bc}	26.89^{c}	23.72^{dc}	27.33^{bc}	25.53^{c}
T4	22.67^{fg}	23.89^{fg}	23.28^{c}	26.89^{cd}	26.67^{cd}	26.78^{c}	24.78^{cd}	25.28^{cde}	25.03^{c}
T5	22.89^{fg}	27.83^{cd}	25.36^{c}	25.89^{dc}	28.10^{de}	26.99^{c}	24.39^{de}	27.97^{c}	26.18^{c}
T6	27.00^{cde}	25.00^{ef}	26.00^{bc}	25.00^{e}	26.12^{de}	25.56^{d}	26.00^{c}	25.56^{de}	25.78^{c}
Mean	**25.65^{b}**	**27.12^{a}**	**26.38**	**26.94^{b}**	**27.99^{a}**	**27.47**	**26.29^{b}**	**27.56^{a}**	**26.92**
		SEm (±)	**CD**		**SEm (±)**	**CD**		**SEm (±)**	**CD**
F		1.83	3.09**		0.98	0.72**		0.98	0.72**
T		7.57	0.98**		0.71	1.08***		0.71	1.08***
F*T		1.83	2.41**		0.98	1.76		0.98	1.76**

*P < 0.05; **P < 0.01; *** P< 0.001

Table: 6. Effect of different level of beheaded heights and foliar spray of micronutrients on fruit length.

Fruit Length (cm)									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	13.13 ^{abc}	13.90^{a}	13.52^{a}	12.29^{bc}	13.11^{a}	12.70^{a}	12.71^{c}	13.50^{a}	13.11^{a}
T2	13.06^{bcd}	12.64^{cd}	12.85^{bc}	11.93^{cd}	13.10^{a}	12.52^{a}	12.49^{cd}	12.87^{bc}	12.68^{a}
T3	12.27^{d}	13.80^{ab}	13.04^{ab}	11.87^{cd}	12.72^{ab}	12.30^{ab}	12.07^{de}	13.26^{ab}	12.67^{a}
T4	12.37^{cd}	12.45^{cd}	12.41^{c}	11.95^{cd}	11.82^{cd}	11.88^{bc}	12.16^{de}	12.13^{dc}	12.15^{a}
T5	12.37^{cd}	12.85^{cd}	12.61^{bc}	11.59^{d}	11.63^{d}	11.61^{c}	11.98^{e}	12.24^{de}	12.11^{b}
T6	12.31^{cd}	12.53^{cd}	12.42^{c}	11.48^{d}	11.77^{cd}	11.62^{c}	11.89^{e}	12.15^{de}	12.02^{b}
Mean	**12.59^{b}**	**13.03^{a}**	**12.81**	**11.85^{b}**	**12.36^{a}**	**12.11**	**12.22^{b}**	**12.69^{a}**	**12.46^{b}**
		SEm (±)	CD		**SEm (±)**	**CD**		**SEm (±)**	CD
F		0.22	0.34*		0.12	0.26**		0.07	0.19***
T		0.68	0.54**		0.19	0.56**		0.12	0.45**
F*T		0.22	0.82		0.13	0.64		0.07	0.47*

*P < 0.05; **P < 0.01; *** P< 0.001

3.7. Fruit width (cm): The data presented in table-7 reveals that beheaded height and micronutrients had shown a significant effect on fruit width. The maximum fruit width (9.67 cm, 9.68 cm, and 9.68 cm)

was recorded in plant beheaded at 80 cm height (T_1) from ground level during 2020, 2021, and pooled respectively followed by T_2 (9.35 cm), T3 (9.25 cm),T4 (9.08 cm), and T5 (8.76 cm). The minimum fruit width was recorded in T6 (8.66 cm). Foliar spray of micronutrients shows significant effect on fruit width. Foliar spray of 0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%) recorded highest fruit width during the investigation period 2020 (9.48 cm) 2021 (8.97 cm), and pooled 9.23 cm) respectively. Interaction of beheaded height and foliar spray of micronutrients showed a significant effect on fruit width. The maximum fruit length was recorded in T_2F_2 (9.92 cm) followed by T_2F_2 (9.63 cm), T_1F_1 (9.43 cm), T_3F_2 (9.36 cm), T_4F_2 (9.30 cm), T_3F_1 (9.13 cm), T_2F_1 (9.07 cm), T_5F_1 (8.87 cm), T_4F_1 (8.85 cm), T_6F_1 (8.83 cm) and T_5F_2 (8.64 cm)**.** The minimum fruit width was recorded in T_6F_2 (8.50 cm).

Table: 7 Effect of different level of beheaded heights and foliar spray of micronutrients on fruit width.

Fruit width (cm)									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	9.59^{abc}	9.75^{ab}	9.67^{a}	9.27^{a}	10.09^{a}	9.68^{a}	9.43^{bc}	9.92^{a}	9.68^{a}
T2	9.11^{d}	9.83^{ab}	9.47^{ab}	9.03^{b}	9.44^{ab}	9.23^{ab}	9.07^{cd}	9.63^{ab}	9.35^{ab}
T3	9.29^{cd}	9.42^{abcd}	9.35^{bc}	8.98^{b}	9.30^{ab}	9.14^{ab}	9.13^{cd}	9.36^{bc}	9.25^{b}
T4	9.10^{d}	9.42^{abcd}	9.26^{bc}	8.61^{b}	9.17^{bc}	8.89^{bc}	8.85^{de}	9.30^{bc}	9.07^{bc}
T5	9.18^{cd}	9.42^{abcd}	9.30^{bc}	8.56^{f}	7.87^{cd}	8.22^{cd}	8.87^{de}	8.64^{e}	8.76^{cd}
T6	9.35^{bcd}	9.06^{d}	9.20^{c}	8.31^{f}	7.93^{d}	8.12^{d}	8.83^{de}	8.50^{e}	8.66^{d}
Mean	**9.27^{b}**	**9.48^{a}**	**9.38**	**8.79^{a}**	**8.97^{a}**	**8.88**	**9.03^{b}**	**9.23^{a}**	**9.13**
		SEm (±)	**CD**		**SEm (±)**	**CD**		**SEm (±)**	**CD**
F		0.06	0.18*		0.07	0.19		0.04	0.15*
T		0.04	0.26**		0.28	0.67**		0.07	0.35***
F*T		0.06	0.44		0.07	0.45**		0.04	0.38*

*P < 0.05; **P < 0.01; *** P< 0.001

3.8. Fruit volume (cc): A perusal analysis of data presented in table-8 showed that beheaded height and micronutrients had showed a significant on fruit volume. The maximum fruit volume (277.07 cc, 272.64 cc, and 274.86 cc) was recorded in T_1 during 2020, 2021, and pooled respectively, and was found highly significant over T_2 (253.83 cc) followed by T_3 (252.72 cc), T_4 (251.92 cc), and T_5 (232.71 cc). The minimum fruit volume was recorded in T_6 (226.66 cc). Foliar spray of micronutrients shows significant effect on fruit volume. The highest fruit volume were observed with foliar application 0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%) during the investigation period 2020 (263.43 cc) 2021 (265.19 cc), and pooled 264.31cc). Interaction of beheaded height and foliar spray of micronutrients showed a significant effect on fruit volume. The maximum fruit volume was recorded in T_1F_2 (300.89 cc) which was statistically superior to T_3F_2 (275.95 cc) followed by T_4F_2 (268.79 cc), T_2F_2 (255.85 cc), T_2F_1 (251.80 cc), T_1F_1 (248.82 cc), T_5F_2 (243.84 cc), T_6F_2 (240.51 cc), T_4F_1 (235.04 cc), T_3F_1 (229.48 cc), T_5F_1 (221.58 cc). The lowest fruit volume was recorded in T_6F_1 (212.82 cc).

3.9. Fruit weight (g): The pooled analysis of data presented in table-9 showed that beheaded height and micronutrients had showed significant on fruit weight. The maximum fruit weight (301.91 g, 281.14 g cm, and 291.52 g) was recorded in T1 during 2020, 2021, and pooled respectively and was statistically significant over the treatment T_2 (276.68 g),followed by T_3 (262.05 g), T_4 (252.43 g), and T_5 (243.99 g). The minimum fruit weight was recorded in T_6 (228.22 g). Foliar spray of micronutrients showed a highly significant effect on fruit weight during the investigation period. Foliar spray, F_2 [0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%)] recorded highest fruit weight during the investigation period 2020 (272.48 g), 2021 (263.07g), and pooled (267.77g). Interaction of beheaded height and foliar spray of micronutrients showed a significant effect on fruit weight. The maximum fruit weight was recorded in T_1F_2 (312.83 g) which was found statistically significant over T_1F_2 (312.83 g) followed by T_2F_2 (280.22 g), T_2F_1 (273.13 g),T_3F_2 ,(272.10 g), T_1F_1 (270.21 g), T_4F_2 (263.70 g), T_5F_2 (252.86 g),T_3F_1 (252.00 g), T_4F_1 (241.17 g), T_5F_1 (235.13), T_6F_1 (231.50), The minimum fruit weight was recorded in T_6F_2 (224.93 g).

Table: 8. Effect of different level of beheaded heights and foliar spray of micronutrients on fruit volume.

Fruit volume (cc)									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	246.47^{bcde}	307.67^{a}	277.07^{a}	251.17^{cd}	294.11^{a}	272.64^{a}	248.82^{de}	300.89^{a}	274.86^{a}
T2	255.00^{bcd}	248.00^{bcde}	251.50^{b}	248.60^{cd}	263.70^{bc}	256.15^{a}	251.80^{cde}	255.85^{cd}	253.82^{b}
T3	224.17^{def}	275.89^{ab}	250.03^{b}	234.78^{def}	276.01^{b}	255.40^{ab}	229.47^{fgh}	275.95^{b}	252.71^{b}
T4	241.67^{cdef}	260.00^{bc}	250.83^{b}	228.41^{ef}	277.59^{ab}	253.00^{ab}	235.04^{efg}	268.79^{bc}	251.92^{b}
T5	217.50^{ef}	243.00^{bcde}	230.25^{c}	225.67^{f}	244.68^{de}	235.18^{bc}	221.58^{gh}	243.84^{def}	232.71^{c}
T6	208.00^{f}	246.00^{bcde}	227.00^{c}	217.63^{f}	235.02^{def}	226.33^{c}	212.82^{h}	240.51^{def}	226.66^{c}
Mean	**232.13^{b}**	**263.43^{a}**	**247.78**	**234.38^{b}**	**265.19^{a}**	**249.78**	**233.26^{b}**	**264.31^{a}**	**248.78**
		SEm (±)	**CD**		**SEm (±)**	**CD**		**SEm (±)**	**CD**
F		367.28	13.92***		96.62	7.14***		111.54	7.67***
T		226.60	19.36**		249.52	30.32**		147.53	15.62***
F*T		367.28	34.09		96.62	17.49*		111.54	18.79*

*P < 0.05; **P < 0.01; *** P< 0.001, cc=cubic centimeters

3.10. Pulp weight (g): According to the analysis of pooled data presented in table-10 showed that beheaded height and micronutrients had showed significant on pulp weight. The maximum pulp weight was recorded in T_1 (233.16 g) which was statistically superior to T_2 (216.35 g) followed by T_3 (195.89 g), T_4 (188.90 g), T_5 (178.87 g).The minimum pulp weight was recorded in T_6 (159.31 g). Foliar spray of micronutrients was found to be significant during the investigation period. Foliar spray, F_2 [0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%)] exerted highest effect on pulp weight. Interaction of beheaded height and foliar spray of micronutrients showed a highly significant effect on pulp weight. The maximum pulp weight was recorded in T_1F_2 (253.96 g) which was found to be statistically superior to T_2F_2 (221.04 g), followed by T_1F_1 (212.37 g), T_2F_1 (211.66g), T_3F_2 (203.40 g), T_4F_2 (201.91g), T_3F_1 (188.37 g), T_5F_2 (186.34 g), T_4F_1 (175.90 g), T_5F_1 (171.40 g), and T_6F_1 (165.94 g). The minimum pulp weight was recorded in T_6F_2 (152.69 g).

Table: 9 Effect of different level of beheaded heights and foliar spray of micronutrients on fruit weight.

Fruit Weight (g)									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	270.08^{bc}	333.73^{a}	301.91^{a}	270.34 ^{ab}	291.94^{a}	281.14^{a}	270.21^{b}	312.83^{a}	291.52^{a}
T2	267.17^{bcd}	288.07^{b}	277.62^{b}	279.09^{a}	272.37^{ab}	275.73^{ab}	273.13^{ab}	280.22^{b}	276.67^{b}
T3	250.40^{cdef}	265.27^{bcde}	257.83^{c}	253.61^{bc}	278.92^{a}	266.26^{bc}	252.00^{bc}	272.10^{b}	262.05^{c}
T4	242.20^{cdef}	255.17^{cdef}	248.68^{cd}	240.13^{cd}	272.22^{ab}	256.18^{c}	241.17^{de}	263.70^{b}c	252.43^{cd}
T5	239.33^{def}	258.90^{bcdef}	249.11^{cd}	230.93^{cde}	246.81^{cd}	238.87^{d}	235.13^{e}	252.86^{cd}	243.99^{d}
T6	236.33^{ef}	233.73^{f}	235.03^{d}	226.67^{de}	216.14^{e}	221.40^{e}	231.50^{e}	224.93^{e}	228.22^{e}
Mean	**250.92^{b}**	**272.48^{a}**	**261.70**	**250.13^{b}**	**263.07^{a}**	**256.60**	**250.52^{b}**	**267.77^{a}**	**259.15**
		SEm (±)	**CD**		**SEm (±)**	**CD**		**SEm (±)**	**CD**
F		292.45	12.42*		170.52	9.48***		88.04	6.81***
T		235.80	19.75***		120.23	14.10***		90.69	12.25***
F*T		292.45	30.42		170.52	23.23*		88.04	16.69*

*P < 0.05; **P < 0.01; *** P< 0.001

Table: 10 Effect of different level of beheaded heights and foliar spray of micronutrients on pulp weight (g).

Pulp weight (g)									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	208.16^{bc}	273.90^{a}	241.03^{a}	216.57^{ab}	234.02^{a}	225.29^{a}	212.37^{bc}	253.96^{a}	233.16^{a}
T2	202.41^{bcd}	229.28^{b}	215.85b	220.90^{ab}	212.79^{abc}	216.84^{a}	211.66^{bc}	221.04^{b}	216.35^{b}
T3	185.73^{cde}	194.21^{cde}	189.97^{c}	191.01^{cd}	212.59^{abc}	201.80^{b}	188.37^{de}	203.40^{c}	195.88^{c}
T4	179.20^{de}	197.83^{cd}	188.52^{c}	172.60^{de}	205.98^{bc}	189.29^{b}	175.90^{ef}	201.91^{cd}	188.90^{cd}
T5	177.74^{de}	195.09^{cde}	186.42^{cd}	165.05^{e}	177.58^{de}	171.31^{c}	171.40^{f}	186.34^{e}	178.87^{d}
T6	167.81^{e}	168.00^{e}	167.90^{d}	164.07^{e}	137.37^{f}	150.72^{d}	165.94^{fg}	152.68^{g}	159.31^{e}
Mean	**186.84^{b}**	**209.72^{a}**	**198.28**	**188.37^{b}**	**196.72^{a}**	**192.54**	**187.60^{b}**	**203.22^{a}**	**195.41**
		SEm (±)	**CD**		**SEm (±)**	**CD**		**SEm (±)**	**CD**
F		264.97	11.82**		160.59	9.20		67.66	5.97***
T		211.66	18.72***		99.94	12.86***		76.67	11.26***
F*T		264.00	28.96		160.60	22.54*		67.66	14.63**

*P < 0.05; **P < 0.01; *** P< 0.001

3.11. Stone wt (g): A perusal analysis of pooled of data presented in table-11 showed that beheaded height and micronutrients had showed significant on stone weight. The maximum stone weight (g) was found in T_5 (36.95 g), and T_6 (36.75 g and 36.66 g) during the investigation period 2020, 2021 and pooled respectively and found to be statistically parity with T_5 (36.54 g) followed by T_4 (35.02 g), T_3 (33.25 g), and T_2 (32.97 g). The minimum stone weight was found in T_1 (32.50 g). The foliar spray of micronutrients was found to be highly significant during the investigation period. The maximum stone weight was recorded with foliar application of 0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%) during the investigation period 2020 (35.67 g), 2021 (36.10 g), and pooled (35.89 g) respectively. Interaction of beheaded height and foliar spray of micronutrients showed a highly significant effect on stone weight. The maximum stone weight (g) was recorded in $T_6 F_2$ (40.49 g) which was found statistically significant and

superior to T_5 F_2 (37.78 g) followed by T_5 F_1 (35.29 g), T_4F_1 (35.14 g), T_3 F_2 (34.92), T_4 F_2 (34.90 g), T_2 F_2 (33.67 g), T_1 F_2 (33.57 g), T_6 F_1 (32.83 g), T_2 F_1 (32.27 g), and T_3 F_1 (31.59 g). The minimum stone weight was found in T_1 F_1 (31.43 g).

Table: 11. **Effect of different level of beheaded heights and foliar spray of micronutrients on stone weight.**

Stone wt (g)									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	31.00^{d}	33.50^{bc}	32.25^{c}	31.86^{ef}	33.64^{cdef}	32.75^{c}	31.43^{e}	33.57^{cde}	32.50^{b}
T2	32.78 ^{cd}	31.75^{cd}	32.27^{c}	31.75^{ef}	35.58^{b}	33.67^{abc}	32.27^{e}	33.67^{cde}	32.97^{b}
T3	32.00^{cd}	35.23^{b}	33.62^{bc}	31.17^{bcd}	34.60^{f}	32.88^{bc}	31.58^{e}	34.92^{cd}	33.25^{b}
T4	35.17^{b}	35.33^{b}	35.25^{ab}	35.11^{bcd}	34.47^{bcde}	34.79^{abc}	35.14^{c}	34.90^{cd}	35.02^{ab}
T5	35.50^{b}	38.39^{a}	36.95^{a}	35.08^{bcd}	37.17^{b}	36.13^{ab}	35.29^{c}	37.78^{b}	36.54^{a}
T6	33.33^{bc}	39.80^{a}	36.57^{a}	32.33^{def}	41.17^{a}	36.75^{a}	32.83^{de}	40.48^{a}	36.66^{a}
Mean	**33.30^{b}**	**35.67^{a}**	**34.48**	**32.88^{b}**	**36.10^{a}**	**34.49**	**33.09^{b}**	**35.89^{a}**	**34.49**
		SEm (±)	**CD**		**SEm (±)**	**CD**		**SEm (±)**	**CD**
F		1.50	0.89****		2.97	1.25***		1.63	0.93***
T		5.17	2.92*		6.61	3.31		4.85	2.83*
F*T		1.50	2.17**		2.97	3.07**		1.63	2.27**

*P < 0.05; **P < 0.01; *** P< 0.001

3.12. Peel weight (g): The polled data presented in table-12 showed that beheaded height had showed significant on peel weight. The maximum peel weight was found in T_3 (32.91 g) which shows statistical similarity with T_6 (32.25 g) but found significant in T_5 (28.59 g), and T_4 (28.51 g) followed by T_2 (27.36 g). The minimum peel weight was found in T_1 (25.86 g). Foliar spray of micronutrient and interaction showed significant effect on peel weight. Foliar spray F_1 resulted in a higher peel weight (29.83 g) than F_2 (28.67 g). Interaction of different levels of beheaded height and foliar spray show a significant effect on peel weight. The maximum peel weight (g) was found in T_3 F_2 (33.78 g), T_6 F_1 (32.73 g), T_3 F_1 (32.05 g), T_6 F_2 (31.77 g), T_4 F_1 (30.13 g),T_2 F_1 (29.21 g), T_5 F_2 (28.74 g), T_5 F_1 (28.44), T_4 F_2 (26.89 g), T_1 F_1 (26.41 g), T_2 F_2 (25.52 g). The minimum peel weight was found in T_1 F_2 (25.31 g).

3.13. Pulp stone ratio: A perusal analysis of pooled data presented in table-13 reveals that beheaded height had showed significant on pulp-stone ratio. The maximum pulp-stone ratio was recorded in T_1 (7.17) which was found statistically significant and superior to T_2 (6.60) followed by T_3 (5.91), T_4 (5.40), and T_5 (4.92). The minimum pulp weight was recorded in T_6 (4.42). Foliar spray of micronutrients was found to be non-significant during the investigation period while the interaction of beheaded height and foliar spray of micronutrients showed a significant effect on the pulp-stone ratio. The highest pulp-stone ratio (7.56) was recorded in T_1 F_2 which was found significant and superior to T_1 F_1 (6.77) followed by T_2 F_2 (6.61), T_2 F_1 (6.58), T_3 F_1 (5.97), T_3 F_2 (5.85), T_4 F_2 (5.80), T_6 F_1 (5.057), T_4 F_1 (5.01), T_5 F_2 (4.96), and T_5 F_1 (4.88), The minimum pulp-stone ratio was recorded in T_6 F_2 (3.79).

Table: 12. Effect of different level of beheaded heights and foliar spray of micronutrients on peel weight.

Peel weight (g)									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	30.92^{cd}	26.33^{e}	**28.63**	21.91^{d}	24.28^{cd}	**23.09^{d}**	26.41^{ef}	25.31^{f}	**25.86^{d}**
T2	31.97^{bc}	27.03^{e}	**29.50**	26.44^{c}	24.00^{cd}	**25.22^{c}**	29.21^{c}	25.52^{f}	**27.36^{c}**
T3	32.67^{abc}	35.82^{a}	**34.25**	31.43^{b}	31.73^{b}	**31.58^{b}**	32.05^{ab}	33.78^{a}	**32.91^{b}**
T4	27.83^{de}	22.00^{e}	**24.92**	32.42^{b}	31.78^{b}	**32.10^{ab}**	30.13^{bc}	26.89d^{ef}	**28.51^{b}**
T5	26.08^{e}	25.42^{e}	**25.75**	30.80^{b}	32.07^{b}	**31.43^{b}**	28.44^{cde}	28.74^{cd}	**28.59^{b}**
T6	35.19^{ab}	25.93^{e}	**30.56**	30.27^{b}	37.60^{a}	**33.93^{a}**	32.73^{a}	31.77^{ab}	**32.25^{a}**
Mean	**30.78^{a}**	**27.09^{b}**	**28.93**	**28.88^{b}**	**30.24^{a}**	**29.56**	**29.83^{a}**	**28.67^{b}**	**29.25**
		SEm (±)	**CD**		**SEm (±)**	**CD**		**SEm (±)**	**CD**
F		3.81	**1.42*****		2.45	**1.14***		1.68	**0.94***
T		1.28	**1.46*****		0.48	**2.02*****		0.43	**0.85*****
F*T		3.81	**3.47****		2.45	**2.79****		1.68	**2.31***

*P < 0.05; **P < 0.01; *** P< 0.001

Table: 13. Effect of different level of beheaded heights and foliar spray of micronutrients on pulp stone ratio.

Pulp stone ratio									
Treatments	**2020**			**2021**			**Pooled**		
	F1	**F2**	**Mean**	**F1**	**F2**	**Mean**	**F1**	**F2**	**Mean**
T1	6.72^{bc}	8.16^{a}	**7.44^{a}**	6.83^{ab}	6.96^{a}	**6.89^{a}**	6.77^{b}	7.56^{a}	**7.17^{a}**
T2	6.17^{cd}	7.23^{b}	**6.70^{b}**	6.99^{a}	5.99^{c}	**6.49^{ab}**	6.58^{b}	6.61^{b}	**6.60^{b}**
T3	5.80^{cde}	5.55^{de}	**5.68^{c}**	6.13^{bc}	6.16^{bc}	**6.14^{b}**	5.97^{c}	5.85^{c}	**5.91^{c}**
T4	5.11^{ef}	5.60^{de}	**5.35^{c}**	4.91^{d}	5.99^{c}	**5.45^{c}**	5.01^{d}	5.79^{c}	**5.40^{d}**
T5	5.04^{ef}	5.12^{ef}	**5.08^{cd}**	4.71^{d}	4.80^{de}	**4.75^{d}**	4.88^{d}	4.96^{d}	**4.92^{e}**
T6	5.04^{ef}	4.22^{f}	**4.63^{d}**	5.07^{d}	3.35^{e}	**4.21^{d}**	5.06^{d}	3.79^{e}	**4.42^{f}**
Mean	**5.65^{b}**	**5.98^{a}**	**5.81**	**5.77^{a}**	**5.54^{a}**	**5.66**	**5.71^{a}**	**5.76^{a}**	**5.74**
		SEm (±)	**CD**		**SEm (±)**	**CD**		**SEm (±)**	**CD**
F		0.27	0.38		0.20	0.33		0.04	0.14
T		0.27	0.67***		0.24	0.63***		0.13	0.47***
F*T		0.27	0.92*		0.20	0.80**		0.04	0.35***

*P < 0.05; **P < 0.01; *** P< 0.001

4. DISCUSSION:

4.1. Effect of different levels of beheaded height on flowering and fruiting attributes of mango cv. Amrapali.

Different levels of beheaded height and foliar application of micronutrients (Cu, Zn, and Boron) had shown significant effects on days to flowering, 50% flowering, days to fruit set, number of panicles per plant, panicles length, fruit weight, fruit size, fruit volume, and pulp-stone ratio. Among the treatments,

plant beheaded at 80 cm height from ground level showed early days to flowering (23.42), days to 50 % flowering (31.07), days to fruit set (37.05), the highest number of panicles per plant (71.58), largest panicles length (30.52 cm), fruit length (13.11 cm), fruit width (9.68 cm), maximum fruit weight (291.52 g), fruit volume (274.86 cc), pulp weight (233.16 g), pulp stone ratio (7.17) and minimum peel weight (25.86 g). This might be due to lower canopy volume which received maximum light penetrance within the canopy [28] leading to higher mobilization of nutrients within the canopy [5, 6] which resulted in to increase in fruit weight and fruit size. Earlier flowering in plants beheaded at 80 cm height is also due to the boron and zinc effect [29]. An increase in fruit weight, fruit size, fruit volume, pulp weight, and pulp stone ratio may also be due to more absorption of water, and nutrients which increase the volume of intercellular spaces in the pulp [30]. Such type of results is also reported by [16, 31, 32].

4.2. Effect of foliar spray of micronutrients on flowering and fruiting attributes of mango cv. Amrapali.

Foliar spray of micronutrients had shown a significant effect on flowering and fruiting attributes of mango except pulp stone ratio. Foliar application of 0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%) [2 sprays at just before flowering and marble stage] showed highest effect on days to flowering (26.04 days), days to fruit set (38.74), number of panicles per plant (59.39), length of panicles (27.56 cm), fruit length (12.15 cm), fruit width (9.23 cm) ,fruit volume (264.31 cc), fruit weight (267.77 g), peel weight (28.67 g) and, stone weight (35.89 g). An increase in fruit size, fruit volume and fruit weight might be due to the combined effect of Zinc and boron because zinc had vital role in the starch formation, and boron is actively involved in the transportation of carbohydrates in plants [30] which lead to increase the fruit size and volume. Foliar spray of 0.2 % zinc at the flowering and pea stage of mango recorded highest fruit length and width by [33]. These results are also in conformity with the earlier findings by [24, 35, 36, 37, 38]

4.3. Interaction of different levels of beheaded height and micronutrients (Zn, Cu, and Boron) on flowering and fruiting attributes of mango cv. Amrapali.

Interaction of different levels of beheaded height and foliar spray of micronutrients exerted a significant effect on flowering and fruiting attributes. Early days to flowering (21.67), 50 % flowering (30.67 days), days to fruit set, (36.43 days) maximum number of panicles per plant (77.50), panicles length (30.53 cm), fruit length (13.50 cm), fruit width (9.92 cm), fruit weight (312.83 g), fruit volume (300.89 cc), pulp weight (253.96 g) and pulp stone ratio (7.56) was recorded in highest in $T_1 F_2$ (Plant beheaded at 80 cm height with foliar spray of 0.4% Zinc sulphate + Copper sulphate (0.2%) + Borax (0.2%). This might be due to the interaction effect of beheaded height and foliar spray of micronutrients which lead to increase in the fruit size, fruit weight and, fruit volume with early flowering and fruiting. This finding is supported by [27, 39, 40, 41, 42, 43, 44]. The highest peel weight

was found in T_3F_2 (33.78 g) which might be due to the effect of zinc, because zinc helps in the synthesis of tryptophan, a precursor for the synthesis of indoleacetic acid responsible higher thickness of peel [45].

5. CONCLUSIONS

Different levels of beheaded height and foliar spray of micronutrients had a significant effect on flowering and fruiting attributes. Based on the results obtained from the present investigations it was found that plant beheaded at 80 cm height from ground level and foliar spray of micronutrients (0.4% Zinc Sulphate + Copper Sulphate (0.2%) + Borax (0.2%) [2 sprays at just before flowering and marble stage] had significant effect on flowering and fruiting attributes individually or in combination. Hence, it was concluded that a plant beheaded at 80 cm height with foliar spray of 0.4% Zinc Sulphate + Copper Sulphate (0.2%) + Borax (0.2%) [2 sprays just before flowering and marble stage] can produce higher fruit yield in terms of maximum fruit weight, fruit size, fruit volume with early flowering and fruiting.

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