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STUDIES ON EFFECT OF DENSITY PRUNING AND APPLICATION OF PACLOBUTRAZOL ON VEGETATIVE GROWTH AND FLOWERING OF MANGO (*MANGIFERA INDICA* L.) CV. KESAR

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ABSTRACT

The experiment was carried out on eight-year-old mango orchard at the Fruit Research Station in Aurangabad (MH) during the 2023-2024 period on Kesar mango in a factorial randomized block design with three replications and nine treatment combinations. The experiment was framed to study the effect of density pruning and paclobutrazol on vegetative growth and flowering of Kesar mango. The experiment was laid out in FRBD (Factorial Randomized Block Design) with two factors, factor A consist of 3 levels of density pruning i.e., P_1: 10% pruning, P_2: 20% pruning and P_3: 30% pruning and factor B consist of different paclobutrazol dose i.e., T_1: 2ml pp^{333}, T_2: 2.5ml $pp^{333}$and T_3: 3ml pp^{333} applied at canopy diameter of tree with three replications. The study found that interaction effect of P_2T_2 (20% pruning + 2.5 ml of pp^{333}) had recorded minimum vegetative growth viz. plant height, plant girth, plant spread, plant volume and number of leaves of leaves per shoot and interaction effect of P_1T_3 (10% pruning + 3 ml of pp^{333}) had recorded early flower initiation and earliest 50% & 100% flowering, reduces length of panicle. While interaction effect of P_1T_2 (10% pruning + 2.5ml of pp^{333}) had recorded maximum total number of flowers, male and hermaphrodite flowers.

Keywords **:** Mango cv. Kesar, Paclobutrazol dose and pruning.

Introduction

Mango (*Mangifera indica* L.), a member of the Anacardiaceae family and it is one of the most favoured fruits due to its delicacy, flavor and nutritional value and it is also known as 'the king of fruits' (Bompard, 2009). The mango is indigenous to northeast India and north Burma, in the foot-hills of the Himalayas (Mukherjee, 1953).

The mango tree is a large evergreen that can grow between 10 to 45 meters tall. It has a dome shape with dense leaves and usually has heavy branches stemming from a thick trunk. The leaves are arranged in a spiral on the branches, are long and narrow, and taper to points at both ends. They are about 25 cm long and 8 cm wide, but can sometimes be larger. When the leaves first grow, they are reddish, thin, soft and they release a fragrant smell when crushed. The tree produces flowers in clusters, with each cluster having around 3,000 tiny whitish-red or yellowish-green flowers. The mango fruit is large and varies in shape and size. It has thick yellow flesh, a single seed and a thick yellowish-red skin when ripe. The seed is oval or oblong, enclosed in a hard, fibrous shell (Shah *et al*., 2010).

Mango trees are polygamous, producing both perfect (hermaphrodite) flowers, which have both pistil and stamen structures, as well as purely male (staminate) flowers. Both types of flowers grow on the same inflorescence, making the tree andromonoecious. The mango inflorescence is typically located at the end of branches. The number of flowers in a panicle can range from 1,000 to 6,000 depending on the variety.

Mango flowers are small, measuring 5-10 mm in diameter and have a 10-part perianth made up of four or five ovate sepals and petals. Both perfect and staminate mango flowers have one and occasionally two, fleshy stamens, along with four sterile staminode that are surrounded by glands. Pistils- ovary abortion occurs early in staminate flower development and in perfect flowers, the ovary is superior. The ovule is anatropous and pendulous. The flowers grow together on panicles, which are made up of a central axis that branches out into primary, secondary and additional pedicels. Panicles form from inactive apical buds or lateral buds when the flowers start to grow. Mango blossoms typically bloom at night and in the early morning and the flowering period usually lasts for a short time, around 2 to 3 weeks. (Mukherjee and Litz, 2009; Mukherjee, 1953; Galan-Sauco, 1999)

Mango trees are renowned for their vigorous growth, but without proper pruning, they can become dense and overcrowded. This can lead to reduced air circulation, limited sunlight penetration and increased vulnerability to pests and diseases. Pruning is essential to address these issues by thinning out the canopy, allowing sunlight to reach all parts of the tree and improving ventilation, thereby reducing the risk of fungal infections and other problems. In mango cultivation, pruning involves the deliberate removal of specific branches, shoots, or parts of the tree to enhance its health, optimize fruit production and manage its size and shape.

Paclobutrazol, a growth retardant, is utilized to manage vegetative growth and stimulate flowering and fruit development. Its application reduces terminal shoot growth, thereby enhancing efficiency. The mode of action involves inhibiting gibberellin biosynthesis, which has been instrumental in its effectiveness. The initial study on the application of paclobutrazol (pp^{333}) to mango (*Mangifera indica* L.) originated in India, where Kulkarni (1988) experimented with concentrations ranging from 1.25 to 10 g ai. per tree on varieties such as 'Dashehari' and 'Banganepalli'. PBZ, a synthetic plant growth regulator, has been utilized in fruit tree crops to manage vegetative growth and promote flowering (Sarkar and Rahim 2012). It can be administered to mango trees via foliar spray or soil drench (Burondkar and Gunjate 1993). Paclobutrazol treatment accelerated the physiological maturity of vegetative growth, leading to increased flower bud initiation and the highest flowering, fruiting and yield (Burondkar and Gunjate 1991).

Therefore, considering above points, the present investigation carried out to know the effect of density pruning and application of paclobutrazol on vegetative growth and flowering of Kesar Mango.

Materials and Methods

The experiment on Studies on effect of density pruning and application of paclobutrazol on vegetative growth and flowering of Mango (*Mangifera indica* L.) cv. Kesar was carried out at Fruit Research Station in Aurangabad (MH) during the 2023-2024 period on eight-year-old Kesar mango orchard. The experiment was laid out in FRBD (Factorial Randomized Block Design) with two factors, factor A consist of 3 levels of density pruning i.e. P_1: 10% pruning, P_2: 20% pruning and P_3: 30% pruning and factor B consist of different paclobutrazol dose i.e. T_1: 2 ml pp^{333}, T_2: 2.5 ml pp^{333} and T_3: 3 ml pp^{333} applied at canopy diameter of tree with three replications, containing nine treatment combination P_1T_1(10% pruning + 2 ml pp^{333}), P_1T_2(10% pruning + 2.5 ml pp^{333}), P_1T_3(10% pruning + 3 ml pp^{333}), P_2T_1(20% pruning + 2 ml pp^{333}), P_2T_2(20% pruning + 2.5 ml pp^{333}), P_2T_3(20% pruning + 3ml pp^{333}), P_3T_1(30% pruning + 2 ml pp^{333}), P_3T_2(30% pruning + 2.5 ml pp^{333}), P_3T_3(30% pruning + 3 ml pp^{333}). Pruning is done with the help of long reach pruner tool at different densities (10%, 20%, 30% pruning), firstly we have calculated plant canopy volume before pruning and after pruning we have again calculated plant canopy volume accordance to that we have decided pruning density and application of paclobutrazol dose by soil drenching method. The best way to ensure that the paclobutrazol is properly absorbed by the tree is to apply it in to the soil at 15 small holes having 6-inch-deep depth around the fertilizer ring. The solution was made with calculated amount of paclobutrazol (2 ml, 2.5 ml and 3 ml) by dissolving in 1.5 liter of water around 100 ml solution applied in each hole and other cultivation practices were followed as per recommendations and observations of various vegetative growth and flowering parameters were recorded periodically and data was statistically analyzed as per standard methods.

Result and Discussion

Vegetative growth parameters

Observation regarding the vegetative parameter was undertaken at initial stage before pruning, after pruning and at the time of harvesting in plant height, plant spread (east-west & north-south), canopy volume, number of axillary buds, internodal length and length of panicle was calculated and represented in Table 1 and Table 2

Plant height

Plant height was non-significantly influenced by density pruning at before pruning, after pruning, at the time of harvesting and found significant for paclobutrazol dose at the time of harvesting. This might be due to pruning which removes some of the plants leaves and stems, which decreases the amount of auxin growth hormone in the lower parts of plant. This can stimulate growth in the upper parts, making the plant grow taller. Lal and Mishra (2008) observed at first order pruned trees showed the greatest gain in tree height and largest canopy spread in Dashehari mango. Similar finding was also reported by Chandra and Govind (1995) in guava cv. L-49. Maximum height (5.42) was recorded at T_1 (2 ml of pp^{333}) and minimum (4.66) at T_3 (3 ml of pp^{333}). Paclobutrazol is a plant growth regulator that inhibits the synthesis of gibberellin hormones responsible for promoting cell elongation and overall plant height. When used higher doses of paclobutrazol more effectively inhibit gibberellin production, leading to reduced cell elongation and consequently shorter plant height. Similar result was recorded by Kulkarni (1988) and Singh (2017) in Deshehari mango. Interaction was found non-significant at before pruning, after pruning, at the time of harvesting for plant height.

Plant spread

Plant spread east-west was non-significantly influenced by density pruning, paclobutrazol dose and found significant at the time of harvesting. Maximum east-west plant spread (5.19), (5.17) was recorded at P_1 (10% pruning), T_1 (2 ml pp^{333}) and minimum (4.61), (4.66) was recorded at P_3 (30% pruning), T_3 (3 ml pp^{333}) respectively. Interaction was found non-significant at before pruning, after pruning and at the time of harvesting for plant spread east-west.

Plant spread north-south was non-significantly influenced by density pruning, paclobutrazol dose and found significant at the time of harvesting. Maximum north- south plant spread (5.29), (5.06) was recorded at P_1 (10% pruning), T_1 (2 ml pp^{333}) respectively and minimum (4.39), (4.59) was recorded at P_3 (30% pruning), T_2 (2.5 ml pp^{333}) respectively. Interaction was found non-significant at before pruning, after pruning and found significant at the time of harvesting. Maximum north-south plant spread (5.53) was recorded in P_1T_2 (10% pruning + 2.5 ml pp^{333}) and minimum (4.34) was recorded at P_2T_2 (20% pruning + 2.5 ml pp^{333}).

The interaction effect of pruning and paclobutrazol on plant spread were highly effective in managing plant growth and form. Pruning alone reduces plant spread by removing specific branches and directing growth, while paclobutrazol controls stem elongation and encourages a more compact structure. When used together, pruning and paclobutrazol synergistically enhance control over plant size and shape. Pruning can eliminate excessive or undesired growth, and paclobutrazol can further restrict vertical growth, leading to a denser and more uniform plant spread. Similar result was also found by Singh *et al.* (2017) in mango cv. Kesar annual pruning of tree along with paclobutrazol application showed less growth in terms of height and plant spread.

Plant volume

Plant volume was non-significantly influenced by density pruning and paclobutrazol dose at before pruning, after pruning and found significant at the time of harvesting for density pruning. Maximum plant volume was recorded (73.31) in P_1 (10% pruning) and minimum (45.63) in P_3 (30% pruning). Pruning significantly impacts canopy volume by reducing the overall size and density of the tree's foliage. When branches and stems are selectively removed, the canopy's volume decreases as the plant reallocates resources to the remaining branches and new growth. This reduction in canopy volume can improve light penetration and air circulation within the canopy, potentially enhancing the health and productivity of the plant. Lal and Mishra (2008) observed at first order pruned trees showed the greatest gain in tree height and largest canopy spread in Dashehari mango. Similar result was also found by Dhaliwal and Singh (2004) in guava cv. Sardar. Interaction was found non-significant at before pruning, after pruning, at the time of harvesting for plant volume.

Number of axillary branches

Number of axillary branches was significantly influenced by density pruning and paclobutrazol dose. Maximum number of axillary branches was recorded (2.80), (2.96) in P_3 (30% pruning), T_3 (3 ml pp^{333}) respectively and minimum (1.95), (2.04) in P_1 (10% pruning), T_2 (2.5 ml pp^{333}) respectively. Interaction was found non-significant for number of axillary branches. Different doses of paclobutrazol influence the number of axillary buds by modifying apical dominance and growth patterns. At low to moderate doses, paclobutrazol reduces gibberellin activity, which decreases apical dominance and encourages the development of axillary buds, leading to increased branching and a denser canopy. In contrast, at higher doses, paclobutrazol's strong growth inhibition can excessively suppress elongation, resulting in a very compact plant with a high number of axillary buds.

Increase in axillary branches was also finding of Singh (2000) in Dashehari mango.

Internodal length

Internodal length of shoot was significantly influenced by density pruning and paclobutrazol dose. Maximum internodal length was recorded (15.08), (14.98) in P_1 (10% pruning), T_1 (2 ml pp^{333}) respectively and minimum (12.39), (11.44) in P_3 (30% pruning), T_3 (3 ml pp^{333}) respectively. The interaction effect was found significant, among interaction P_1T_1 (10% pruning + 2 ml pp^{333}) had recorded maximum (67.67) internodal length and P_3T_2 (30% pruning + 2.5 ml pp^{333}) had recorded minimum (76.34) internodal length of shoot. Pruning generally results in a reduction in internodal length of shoots. When a plant is pruned, especially through the removal of terminal buds or older branches, it reduces apical dominance, which normally suppresses the growth of lateral buds. This reduction in apical dominance leads to a shift in the plant's growth dynamics, promoting the development of lateral shoots with shorter internodes. Large emerging shoot length due to influence of pruning was also reported by Lal et al. (2000) in mango cv. Dashehari, Dhaliwal and Singh (2004) in guava cv. Sardar and Lal and Mishra (2008) in mango cv. Dashehari. Shaban and Ibrahim (2009) who revealed that high dose of paclobutrazol decreased the shoot length and diameter. Similarly, reduction in internodal length was also finding Dharmar (2011) in Alphonso mango and Kishore *et al.* (2019) in mango.

Length of panicle

Length of panicle was significantly influenced by density pruning and paclobutrazol dose. Maximum length of panicle was recorded (22.48), (24.35) in P_1 (10% pruning), T_1 (2 ml pp^{333}) respectively and minimum (20.73), (17.88) in P_3 (30% pruning), T_3 (3 ml pp^{333}) respectively. The interaction effect was found significant, among interaction P_1T_1 (10% pruning + 2 ml pp^{333}) had recorded maximum (26.00) and P_1T_3 (10% pruning + 3 ml pp^{333}) had recorded minimum (17.56) length of panicle. This might be due to the pruning of the axillary buds increased the availability of food material to the meristematic cells which results in increasing length of panicles this was also findings reported by Thirupathi and Gosh (2016) in mango cv. Mallika. Different doses of paclobutrazol affect panicle length by inhibiting gibberellin biosynthesis, which reduces cell elongation. Increase in paclobutrazol dose reduces the panicle was also reported by Zora *et al.* (2000) in mango cv. Dashehari and Yaowarat *et al.* (2017) in mango.

Flowering parameters

Observation regarding flowering parameters viz. total days required for flower initiation, days required for 50% flowering, days required for 100% flowering, Total number of flowers per panicle, number of male flowers per panicle and number of hermaphrodite flowers per panicle calculated and represented in Table 1.2.

Days required for flower initiation, 50% flowering and 100% flowering

Significantly minimum days were recorded for flower initiation (54.83), (54.51) was at P_1 (10% pruning), T_3 (3 ml pp 333) respectively and maximum (59.92), (58.86) was recorded at P_3 (30% pruning), T_1 (2 ml pp^{333}) respectively. The interaction effect was found significant, among interaction P_1T_3 (10% pruning + 3 ml pp^{333}) had recorded less days (53.00) and P_3T_1 (30% pruning + 2 ml pp^{333}) had recorded maximum days.

Minimum days for 50% flowering were recorded (70.22), (69.39) at P_1 (10% pruning), T_3 (3 ml pp^{333}) respectively. The interaction effect was found significant, among interaction P_1T_3 (10% pruning + 3 ml pp^{333}) had recorded less days (67.67) and P_3T_1(30% pruning + 2 ml pp^{333}) had recorded maximum days (76.34).

Minimum days were recorded for 100% flowering (96.67), (97.33) was at P1 (10% pruning), T_3 (3 ml pp^{333}) respectively. The interaction effect was found significant, among interaction P_1T_3 (10% pruning + 3 ml pp^{333}) had recorded less days (93.17) and P_3T_1(30% pruning + 2 ml pp^{333}) had recorded maximum days (108.83).

This might be due to pruning which stimulates the plant to redirect its energy and resources towards new shoots and flower buds. This increased focus on new growth can accelerate the flowering process. The removal of excess or competing growth reduces apical dominance and enhances the plant's ability to initiate and develop flowers more quickly. As a result, the time required for flowering stage is typically shortened, leading to earlier and more uniform flowering across the plant. Similar result was also observed by Sanjay *et al*. (2010). Positive response of paclobutrazol might be due to application of paclobutrazol encouraged early reduction of endogenous the gibberellins levels which in turn resulted in earlier maturity than untreated control as reported by Sarkar and Rahim (2012). Higher per cent of flowering due to pruning treatments was attributed mainly due to new growth and better availability of photosynthetic solar radiation to the leaves Lal and Mishra (2007) stated that, paclobutrazol

causing alteration in the IAA activities, which enhanced flowering.

Total number of flowers per panicle, male flowers and hermaphrodite flowers per panicle

Total number of flowers per panicle were recorded maximum (3199.61), (3214.56) at P_1 (10% pruning), T_3 (3 ml of pp 333) respectively and minimum (3081.00), (3067.67) at P_3 (30% pruning), T_1 (2 ml of pp^{333}) respectively. The interaction effect was found significant, among interaction P_1T_2 (10% pruning + 2.5 ml pp^{333}) had recorded maximum number flowers per panicle (3269.83) and P_3T_1(30% pruning + 2 ml pp^{333}) had recorded minimum number of flowers per panicle (3008.17). Pruning helps in reducing competition among branches and directs more resources such as nutrients and energy toward the remaining branches and buds. This often results in increased flower production and improved overall flower quality per panicle. Sheikh and Rao (2002) found that impact of pruning on pomegranate resulted highest number of flowers per shoot. Paclobutrazol treatment accelerate the physiological maturity of vegetative growth, leading to increased flower bud initiation and highest flowering was reported by Burondkar and Gunjate (1991) in Alphonso mango. Similar result was also observed by Kurian and Iyer (1993).

Highest number of male flowers per panicle were recorded (3042.67), (3044.83) at P_1 (10% pruning), T_3 (3 ml of pp^{333}) respectively and lowest (2932.28), (2928.89) at P_3 (30% pruning), T_1 (2 ml of pp^{333}) respectively. The interaction effect was found significant, among interaction P_1T_2 (10% pruning + 2.5 ml pp^{333}) had recorded maximum number of male flowers per panicle (3107.67) and P_3T_1 (30% pruning + 2 ml pp^{333}) had recorded minimum number of male flowers per panicle (2869.33).

Significantly higher number of hermaphrodite flowers per panicle were recorded (157.89), (157.83) at P_1 (10% pruning), T_3 (3 ml of pp^{333}) respectively and minimum (147.50), (144.44) at P_3 (30% pruning), T_1 (2 ml of pp^{333}) respectively. The interaction effect was found significant, among interaction P_1T_2 (10% pruning + 2.5 ml pp^{333}) had recorded maximum number of hermaphrodite flowers per panicle (162.67) and P_3T_1 (30% pruning + 2 ml pp^{333}) had recorded minimum number of hermaphrodite flowers per panicle (138.33).

This might be due to when a mango tree is pruned, particularly through the removal of older or less productive branches, it redirects the plant's energy and nutrients 68 towards the remaining branches and shoots. This concentrated resource allocation often enhances the development of flower clusters, including an increase in the number of hermaphrodite flowers per panicle. Hermaphrodite flowers are crucial for fruit production as they contain both male and female reproductive structures. By promoting a more balanced and productive flowering structure, pruning typically leads to a higher count of hermaphrodite flowers per panicle, which can improve fruit set and overall yield. Similar result was observed by Burondkar *et al.* (2000) in mango orchard. Zora *et al.* (2000) reported that application of paclobutrazol to mango cv. Dasheshari resulted in shorter panicle length while enhancing the per cent of hermaphrodite flowers. Highest number of hermaphrodite flowers were also finding of Vijayalakshmi and Srinivasan (2002) in mango cv. Alphonso, Narvariya *et al.* (2014) in Dashehari and Subbbaiah *et al.* (2017) in mango cv. Banganapalli.

Sex Ratio

Pruning density on sex ratio (%) was found non-significant. Maximum sex ratio was recorded (20.47) in treatment T_1 and (21.52) in treatment combination P_2T_1. While minimum was recorded (19.48) in treatment T_2 and (18.54) in treatment combination P_2T_2, Treatment combination P_2T_3 (19.30) were at par with each other.

The interaction between pruning and paclobutrazol can notably impact the sex ratio of flowers in mango trees. Pruning typically enhances the development of hermaphrodite flowers by concentrating the plant's resources on fewer, more productive branches. When combined with paclobutrazol, which inhibits gibberellin synthesis and promotes a more compact growth form, the overall effect on the sex ratio can be influenced by the dosage. Low to moderate doses of paclobutrazol can complement pruning by further increasing the number of hermaphrodite flowers, leading to a more favorable sex ratio**.**

Conclusion

In view of the findings and results presented above, it may be concluded that the treatment P_1 (10% pruning) and T_2 (2.5 ml pp^{333}) found significantly superior over all other treatments which was found to be statistically at par with treatments P_2 (20% pruning) and T_3 (3 ml pp^{333}). In relation to the interaction effect, treatment combination P_2T_2 (20% pruning + 2.5 ml of pp^{333}) had recorded minimum vegetative growth and P_1T_2 (10% pruning + 2.5 ml of pp^{333}) had recorded maximum total number of flowers, male and hermaphrodite flowers.

Table 1: Effect of density pruning and paclobutrazol dose on plant height, plant spread E-W, plant spread N-S and canopy volume.

Treatments	Plant height (m)			Plant spread (m^2) E-W			Plant spread (m^2) N-S			Canopy volume (m^3)		
	Before pruning	After pruning	time of harvest	Before pruning	After pruning	time of harvest	Before pruning	After pruning	time of harvest	Before pruning	After pruning	time of harvest
Factor A: Density pruning (P)												
P_1	4.40	3.93	5.10	4.77	3.93	5.19	4.52	4.20	5.32	48.93	34.72	73.31
P_2	4.81	4.01	4.76	4.66	3.89	4.61	4.41	3.87	4.60	52.50	29.38	52.18
P_3	5.16	4.09	4.90	4.79	4.17	4.82	4.55	3.87	4.39	56.21	29.39	45.63
SE m±	**0.23**	**0.20**	**0.17**	**0.19**	**0.17**	**0.13**	**0.21**	**0.15**	**0.12**	**5.03**	**3.38**	**6.31**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**0.39**	**NS**	**NS**	**0.37**	**NS**	**NS**	**18.90**
Factor B: Paclobutrazol dose (T)												
T_1	4.99	4.18	5.42	5.02	4.14	5.17	4.66	4.13	5.06	60.36	35.62	66.84
T_2	4.60	3.85	4.71	4.51	3.85	4.78	4.28	3.78	4.59	47.05	27.86	54.07
T_3	4.77	4.00	4.63	4.68	4.00	4.66	4.53	4.03	4.67	50.24	30.01	50.20
SE m±	**0.23**	**0.20**	**0.17**	**0.19**	**0.17**	**0.13**	**0.21**	**0.15**	**0.12**	**5.03**	**3.38**	**6.31**
CD at 5%	**NS**	**NS**	**0.50**	**NS**	**NS**	**0.39**	**NS**	**NS**	**0.37**	**NS**	**NS**	**NS**
Interaction A×B: Density pruning × Paclobutrazol dose (P×T)												
P_1T_1	4.15	3.73	5.20	4.89	3.73	5.20	4.33	4.06	5.47	46.85	32.56	75.32
P_1T_2	4.49	4.01	5.33	4.72	4.01	5.44	4.75	4.35	5.66	51.72	36.89	82.90
P_1T_3	4.57	4.05	4.77	4.69	4.05	4.91	4.48	4.19	4.83	48.24	34.71	61.71
P_2T_1	5.17	4.44	5.33	5.03	4.08	4.84	4.65	4.11	4.91	61.87	36.49	63.86
P_2T_2	4.40	3.61	4.25	4.01	3.61	4.35	3.89	3.31	3.97	37.98	19.64	39.50
P_2T_3	4.86	3.99	4.70	4.95	3.99	4.63	4.68	4.20	4.91	57.65	32.02	53.18
P_3T_1	4.15	3.73	5.20	5.14	4.62	5.47	5.00	4.21	4.79	72.36	37.82	61.35
P_3T_2	4.49	4.01	5.33	4.81	3.94	4.55	4.21	3.69	4.13	51.45	27.04	39.82
P_3T_3	4.57	4.05	4.77	4.41	3.94	4.43	4.44	3.71	4.27	44.84	23.32	35.71
SE m±	5.17	4.44	5.33	**0.33**	**0.29**	**0.23**	**0.36**	**0.27**	**0.22**	**8.71**	**5.86**	**10.92**
CD at 5%	4.40	3.61	4.25	**NS**	**NS**	**NS**	**NS**	**NS**	**0.65**	**NS**	**NS**	**NS**

Table 2: Effect of density pruning and paclobutrazol dose on no. of axillary buds, internodal length, Panicle length, No. of days for flower initiation, 50% flowering, 100% flowering, Total number of flowers/panicle, male and hermaphrodite flowers/panical

Treatments	No. of axillary buds	Internodal length (cm)	Panicle length (cm)	Days for flower initiation	Days for 50% flowering	Days for 100% flowering	Total number of flowers /panicles	No. of male flowers/ panicle	No. of hermaphrodite flowers /panicle	Sex Ratio
Factor A: Density pruning (P)										
P_1	1.95	15.08	22.48	54.83	70.22	96.67	3199.61	3042.67	157.89	20.07*(26.62)
P_2	2.44	12.55	21.56	55.45	70.59	97.94	3178.44	3020.89	152.06	19.79 (26.41)
P_3	2.80	12.39	20.73	59.92	75.11	106.28	3081.00	2932.28	147.50	19.88 (26.48)
SE m±	**0.12**	**0.22**	**0.35**	**0.29**	**0.16**	**0.36**	**11.17**	**12.76**	**0.47**	**0.17**
CD at 5%	**0.36**	**0.65**	**1.05**	**0.88**	**0.49**	**1.09**	**33.48**	**38.24**	**1.42**	**NS**
Factor B: Paclobutrazol dose (T)										
T_1	2.19	14.98	24.35	58.86	74.15	104.44	3067.67	2928.89	144.44	20.47 (26.90)
T_2	2.04	13.60	22.55	56.84	72.39	99.11	3176.83	3022.11	155.17	19.48 (26.19)
T_3	2.96	11.44	17.88	54.51	69.39	97.33	3214.56	3044.83	157.83	19.78 (26.41)
SE m±	**0.12**	**0.22**	**0.35**	**0.29**	**0.16**	**0.36**	**11.17**	**12.76**	**0.47**	**0.17**
CD at 5%	**0.36**	**0.65**	**1.05**	**0.88**	**0.49**	**1.09**	**33.48**	**38.24**	**1.42**	**0.52**
Interaction A×B: Density pruning × Paclobutrazol dose (P×T)										
P_1T_1	2.04	16.86	26.00	56.67	72.33	102.00	3081.67	2933.83	149.33	20.26 (26.75)
P_1T_2	1.33	15.95	23.88	54.83	70.67	94.83	3269.83	3107.67	162.67	20.24 (26.74)
P_1T_3	2.48	12.45	17.56	53.00	67.67	93.17	3247.33	3086.50	161.67	19.72 (26.36)
P_2T_1	2.04	14.45	24.59	56.80	72.77	102.50	3113.17	2983.50	145.67	21.52 (27.64)
P_2T_2	2.08	11.93	21.89	55.36	70.50	96.83	3172.50	3020.83	152.00	18.54 (25.50)
P_2T_3	3.21	11.26	18.19	54.19	68.50	94.50	3249.67	3058.33	158.50	19.30 (26.06)
P_3T_1	2.49	13.62	22.45	63.11	77.34	108.83	3008.17	2869.33	138.33	19.64 (26.31)
P_3T_2	2.70	12.94	21.87	60.33	76.00	105.67	3088.17	2937.83	150.83	19.68 (26.34)
P_3T_3	3.20	10.61	17.88	56.33	72.00	104.33	3146.67	2989.67	153.33	20.31 (26.79)
SE m±	**0.21**	**0.38**	**0.61**	**0.51**	**0.29**	**0.63**	19.35	22.09	0.82	0.30
CD at 5%	**NS**	**1.13**	**1.81**	**1.52**	**0.86**	**1.89**	**57.99**	**NS**	**2.46**	**0.90**

Conflict of interest

The authors declare no conflicts of interest. They bear sole responsibility for the content and composition of the paper.

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