The Pharma Innovation Journal 2022; 11(11): 1160-1169

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(11): 1160-1169

www.thepharmajournal.com
Received: 17-09-2022
Accepted: 25-10-2022

Dheeraj G
College of Horticulture, Rajendranagar, Hyderabad, Telangana, India

Bhagwan A
Administrative office, Sri Konda Laxman Telangana State Horticultural University, Telangana, India

Kiran Kumar A
Administrative office, Sri Konda Laxman Telangana State Horticultural University, Telangana, India

Sreedhar M
Administrative office, Professor Jayashankar Telangana State Agricultural University, Telangana, India

Saida Naik
College of Agriculture, PJTSAU, Rajendranagar, Hyderabad, Telangana, India

Veena J
Administrative office, Sri Konda Laxman Telangana State Horticultural University, Telangana, India

Corresponding Author:
Dheeraj G
College of Horticulture, Rajendranagar, Hyderabad, Telangana, India

Studies on the effect of stem tip pruning and bioregulators on flowering, fruit set and yield of mango (*Mangifera indica* L.) cv. Banganpalli under high density planting system

Dheeraj G, Bhagwan A, Kiran Kumar A, Sreedhar M, Saida Naik and Veena J

Abstract
An experiment on the effect of bio regulators (B_1 -Gibberellic acid GA_3 @50 ppm, B_2 -6 Benzyl amino purine 6 BA@ 200 ppm, B_3 -Paclobutrazol PBZ@1500 ppm, B_4 -Napthaleine acetic acid NAA @ 100 ppm, B_5 -PBZ @1500 ppm+BA @ 200 ppm, B_6 -PBZ @1500 ppm+ NAA@100 ppm, B_7 -GA_3 @.50 ppm+ PBZ@ 1500 ppm, B_8- Untreated Control) and stem tip pruning (P_1 -with stem tip pruning, P_2 -without stem tip pruning) was conducted on flowering, fruit set and yield of mango cv. Banganpalli under high density planting system. Paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) along with stem tip pruning (P_1) during flower bud differentiation stage has significantly resulted in highest endogenous ABA, cytokinins, lowest GA_3 contents at flower bud swelling stage (510 stage of BBCH scale) which in turn resulted in early panicle initiation, increased percent flowering (23.39% increase over control), highest number of hermaphrodite flowers over control, significantly highest number of fruits, highest fruit weight which subsequently resulted in highest yield (40.40% over control).

Keywords: Hormones in mango buds benzylaminopurine, stem tip pruning combination of stem tip pruning and bioregulators

Introduction
Mango (*Mangifera indica.* L) is the premier fruit among the tropical fruits and has been in cultivation in the Indian subcontinent since several centuries. Mango occupied an area of 2.26 million hectares with a production of 21.82 million tonnes (NHB, 2018) [13]. The fruit is highly valued because of its excellent flavor, appealing aroma, delicious taste, attractive shades of colour and nutritive value, which has attracted the world market. In Telangana, mango occupies an area of 0.18 million hectares with a production of 1.68 million tonnes (NHB, 2018) [13]. In Telangana state the commercial cultivar is Banganpalli which occupies about 70% of total mango cultivated area. Of late, the production and productivity of mango cv. Banganpalli has been decreased in the past 4-5 years in Telangana (NHB, 2018) [13]. Productivity of Telangana state is 9.31 MT/ha which is very low when compared to mango growing states i.e., Uttar Pradesh (17.14 MT/ha), Andhra Pradesh (12.05 MT/ha), Karnataka (9.61 MT/ha), Bihar (16.37 MT/ha), Rajasthan (17.58 MT/ha) (NHB, 2018) [13]. Poor productivity in mango cv. Banganpalli in Telangana is influenced by several factors such as improper pruning, delayed vegetative growth, poor and erratic flowering coupled with poor fruit set. However, there is tremendous scope to boost the productivity, if this problem can be managed properly.

The flowering phenomenon in mango appears to be a complex one. It is the key developmental event for crop yield and production. The intensity and timing of flowering shows strong dependence on physiological status of growing buds, hormonal interactions, environmental factors and nutrient availability. In mango, flowering is a complex process that involves differentiation of apical buds under the influence of low temperature and/or attaining of certain degree of shoot maturity followed by bud burst and panicle emergence (Davenport, 2007) [7]. Floral induction is considered to be the result of elevated levels of up-regulated florigenic promoter (FP) and down-regulated vegetative promoter (VP), primarily gibberellins, whereas the reverse condition promotes vegetative growth (Nartvaranant *et al*. 2000 and Davenport, 2007) [12, 7]. The production of vegetative shoots in place of reproductive shoots is due to the

elevated level of gibberellin which is considered as a vegetative promoter. Over the past few years, disturbances in low temperatures, changes in the levels of florigenic promoter (FP) and vegetative promoter (VP) in the buds due to late and erratic rainfalls, which in turn lead to the extended period of vegetative growth phase over reproductive phase are the major factors that are responsible for the late, recurrent flowering in mango in Telangana.

The practice of special pruning technique, tip pruning in productive branches prevents continuous vegetative growth, which is a consequence of inappropriate climate conditions and has allowed for the high rate of flowering in axillary buds (Oliveira *et al.* 2015) [14]. Tip pruning is defined as pruning terminal stems anywhere from the apex to a point down stem that is no longer than 1 cm in diameter. This kind of pruning is done to assist in uniform flowering response in a flowering management program and to improve the productivity of bearing trees by significantly increasing the number of bearing stems (Davenport 2007) [7]. Tip pruning reduces the auxin synthesis at the apex of branches directing the transport of assimilates and cytokinins to the axillary buds of branches under flowering condition, inducing the formation of axillary inflorescences.

Various bio regulators application have been studied for enhancing uniform growth, flowering in mango. Foliar spray with GA_3 @ 100 ppm with severe pruning resulted in highest number of new flushes per shoots in zebda mango trees (Shaban, 2009) [21]. Application of 200 ppm of 6- benzyl amino purine significantly caused early flower induction, recorded highest flowering percentage, highest pure panicle percentage, and highest yield over control in mango cv. Kesar (Shankar Swamy and Neelavathi, 2016) [23]. Napthaleine Acetic Acid (NAA) @ 80 ppm spray at 30 days before flowering was found to improve flowering in mango (Davenport, 2007) [7]. Plant growth retardants like paclobutrazol controlled tree growth and significantly increased number of panicles per shoot, fruit set and improved fruit quality (Vijay Krishna *et al.* 2020) [27].

Knowledge of the periodic biological events of a particular crop – bud breaks, flushing, flowering, and fruit development is an important tool for its agronomical management in relation with climate change (Hernandez Delgado *et al.*, 2011) [9]. Three digits "extended BBCH-scale" (Hack *et al.*, 1992) [8] was proposed for certain crops like grains, rape and sunflower, vegetables, pome and stone fruits, citrus, grape, strawberry, pomegranate, coffee, olive, Musaceae, persimmon, cherimoya. Keeping above fact in view, the phenological studies were conducted to asses BBCH- scale for mango cultivars like Totapuri (Shailender rajan *et al.*, 2011) [22]. The BBCH scale distinctly separates the various vegetative flushes occurring in the mango, as well as the terminal and axillary flowerings. All of which is important for the correct timing of general orchard management, particularly for disease and pest management, physiological disorders and weed control, flowering inhibition and effectiveness of fertilizers and PGRs application (Hernandez Delgado *et al.*, 2011) [9].

Materials and Methods

The experiment was conducted on ten year's old well grown, uniform statured trees of mango cv. Banganpalli. Trees are spaced with 5 m and planted in square system. The statistical design adopted was factorial randomised block design with 16 treatments which were replicated thrice. 200 mg of NAA was dissolved in 50 ml of ethanol and diluted it in 1 litre of water to get 200 ppm of NAA. 200 mg of 6-BA was dissolved in 50 ml of hydroxy acetone and diluted it in 1 litre of water to get 200 ppm of 6-BA. 50 mg of $GA_3$was dissolved in 50 ml of ethanol and diluted it in 1 litre of water to get 50 ppm of GA_3. 1500 mg of paclobutrazol was diluted it in 1 litre of water to get 1500 ppm of paclobutrazol. Ten grams of Potassium nitrate (KNO_3) was dissolved in 1 litre of water to get 1% of KNO_3. 10 litres solution of each treatment was sprayed per tree uniformly at the time of application.

The above bioregulators were sprayed with and without stem tip pruning to observe the flowering, fruit set and yield of the trees by using of BBCH scale.

Data on days taken for panicle initiation, percent flowering, panicle length and breath, hermaphrodite flowers, fruit set. panicle^1, fruits. Tree^1 and yield were recorded. Twenty shoots were randomly tagged (from North, South, East and West directions) and no of tagged shoots which had flowered was recorded and expressed as percentage of flowering. The panicle length and breadth, fruit set of ten randomly selected shoots were recorded the mean was calculated. Ratio of hermaphrodite and male flowers was calculated with the help of following formula and expressed in%.

$$\text{Hermaphrodite Flower}(\%) = \frac{\text{Number of hermaphrodite flowers per panicle}}{\text{Number of male flowers per panicle}} \times 100$$

The total number of fruits harvested. Tree-1 was counted after harvest and expressed as number of fruits.tree^{-1}.The average fruit weight was computed by dividing the total yield (kg per tree) and number of fruits per tree of the respective treatment.

Results and Discussion

Flowering parameters

The results on number of days taken for panicle initiation after application of stem tip pruning and different bioregulators are presented in the table 1. Significant differences were observed in interaction effect between stem tip pruning and bioregulators with respect to days taken for panicle initiation. Significantly minimum number of days taken for panicle initiation was recorded in paclobutrazol in combination with 6 Benzyl amino purine (6-BA) (B_5) with stem tip pruning (P_1). The similar minimization in time taken for panicle initiation with paclobutrazol was earlier reported by Raj Kumar *et al.* (2006) [17] in mango cv. Baneshan, Babul Sarkar *et al.* (2016) [30] in mango cv. Amrapali, Orwintinee *et al.* (2008) [15] in mango cv. Irwin, and Ankith kumar pandey *et al.* (2018) [1] in litchi cultivars. Similar minimization in time taken for panicle initiation with 6 benzyl amino purine (6-BA) was earlier reported by Shankar Swamy and Neelavathi (2016) [23] in mango cv. Kesar. Similar precocious bud break and early flowering of mango shoots in response to application of 6-BA was also reported by Chen, (1987) [4]. The application of paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) with stem tip pruning (P_1) has significantly increased the levels of endogenous ABA (91.84 ng/g), cytokinins DHZR's (302.92 pg/g), ZR's (276.63 pg/g), reduced the levels of GA_3 (1.07 ng/g) (Table 4.1.18, 4.1.20, 4.1.21 and 4.1.22) during the flower bud swelling stage (510 stage of BBCH scale). The production of elevated levels of

endogenous ABA, Cytokinins, reduced GA_3 levels during the flower bud swelling stage in the trees sprayed with paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) with stem tip pruning (P_1) might be responsible for minimization in time taken for panicle initiation in the present investigation.

The results on percent flowering (%) of mango cv. Banganpalli after application of stem tip pruning and bioregulators are presented in the table 2. There was significant difference among interaction between stem tip pruning and bioregulators with respect to percent flowering (%). The treatment paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) with stem tip pruning (P_1) has recorded highest percent flowering (71.57%) which was on par with 6 benzyl amino purine (6-BA) (B_2) with stem tip pruning (P_1) (70.72%). Minimum flowering percent was recorded in control (B_8) without stem tip pruning (P_2) (58%).

The application of paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) with stem tip pruning (P_1) has resulted in production of significantly highest endogenous ABA levels (91.84 ng/g), cytokinins DHZR levels (302.92 ng/g), ZR levels (276.63 ng/g) and lowest gibberellic acid levels (GA_3) (1.07 ng/g) (Table 10, 11, 12 and 13) at the time of flower bud swelling stage (510 stage of BBCH scale) compared to control. The production of highest levels of endogenous ABA, cytokinins DHZR's and ZR's, least GA_3 levels in the trees sprayed with paclobutrazol and in combination with 6 benzyl amino purine (B_5) with stem tip pruning (P_1) might be responsible for increase in the percent flowering in the present investigation. Cytokinins are suggested to act positively in floral bud induction by regulating cell division process, as cytokinins are well accepted stimulators of cell division (Upreti *et al.* 2013) [26] whereas GA_3 is considered to be vegetative promoter, which encourages vegetative growth (Davenport, 2007) [7]. Reduced endogenous levels of GA_3, increased endogenous levels of ABA, cytokinins (Upreti *et al.* 2013) [26] and lower auxin to cytokinins ratio in leaf and floral bud (Davenport *et al.* 2000) [6] were the conditions for reduced vegetative growth and flower induction in mango (Daruni *et al.* 2006) [5].

The results on panicle length after application of stem tip pruning and bioregulators are presented in the table 3. Significant differences were not observed in the interaction effect between stem tip pruning and bioregulators with respect to panicle length.

The results on panicle breadth after application of stem tip pruning and bioregulators are presented in the table 4. Significant differences were observed in the interaction effect between stem tip pruning and bioregulators with respect to panicle breadth. Maximum panicle breadth was recorded with application of paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) without stem tip pruning (P_2) (21.26 cm). Minimum panicle breadth was recorded with application of gibberellic acid (B_1) with stem tip pruning (P_1) (10.03 cm). Paclobutrazol could able to increase the panicle breadth compare to control and napthalein acetic acid (Table 3). However, Winston (1992) [29] in mango cv. Kensington and Orwintinee *et al.* (2008) [15] in mango cv. Irwin reported that the panicles of paclobutrazol treated trees were considerably shorter than those of control trees. The discrepancy in the finding of present investigation to the earlier reports regarding panicle may be due to varietal change, time of applications and dosage of paclobutrazol. However, increase in breadth of Paclobutrazol, benzylaminopurine treated trees might be beneficial for increase the number of hermaphrodite flowers per panicle. This may cause for better fruit set over the control.

The results on hermaphrodite flower (%) after application of stem tip pruning and bioregulators are presented in the table 5. Maximum hermaphrodite flower (%) was recorded in the treatment of paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) with stem tip pruning (P_1) (18.17%). Minimum hermaphrodite flower (%) was recorded in control (B_8) without stem tip pruning (P_2) (8.56%). Similar increase in hermaphrodite flower (%) with the application of 6-BA was reported by Shankar Swamy and Neelavathi (2016) [23]. Similar increase in hermaphrodite flower (%) with the application of paclobutrazol was reported by Vijayalakshmi and Srinivasan (1998) [28], Hoda *et al.*, (2001) [10] in mango. Similar increase in hermaphrodite flower (%) with the application of tip pruning was reported by Swaroop mohan *et al.* (2001) [25]. As the above treatments have caused the hermaphrodite flower (%) to increase individually, combined effect of paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) with stem tip pruning (P_1) might have resulted in increase in hermaphrodite flower (%) in the present investigation.

The percentage of hermaphrodite flowers influences the fruit set and productivity of a mango variety (Ramirez *et al.* 2010) [18]. Higher percentage of hermaphrodite flowers in the panicle is an important yield attribute since it is directly related to fruit set and productivity (Iyer *et al.* 1989 and Chaikiattiyos *et al.* 1997) [11, 3]. Hence increase in hermaphrodite flowers with bioregulators and stem tip pruning might be beneficial for improving the fruitset and productivity in the present investigation.

Fruit set parameters

The results on fruit set per panicle after application of stem tip pruning and bio regulators are presented in the table 6. Significant differences were not observed in the interaction effect between stem tip pruning and bioregulators with respect to fruitset per panicle.

Yield parameters

The results on total number of fruits produced on a tree after application of stem tip pruning and bioregulators are presented in the table 7.

The data revealed that there is significant difference after application of stem tip pruning and bioregulators with respect to number of fruits per tree of mango. Maximum number of fruits per tree was recorded with application of paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) with stem tip pruning (P_1) (142). Minimum number of fruits per tree was recorded with application of control (B_8) without stem tip pruning (P_2) (108.83) which was on par with gibberellic acid (B_1) without stem tip pruning (P_2) (109.50). Similar results were reported by Patel *et al.* (2016) [16] stating that, number of fruits was significantly increased with increasing levels of paclobutrazol as compare to control in mango cv. Alphonso. Similar increase in number of fruits per tree with the application of stem tip pruning was reported in

mango cv. Banganpalli by Santoshi rani (2018) [20]. The production of significantly elevated levels of cytokinins DHZR's (302.92 pg/g), ZR's (276.63 pg/g) (Table 11, 12), increase in absicic acid (ABA content) (91.84 ng/g) (Table 10), reduced GA_3 levels (1.07 ng/g) (Table 13) during flower bud swelling stage (510 stage of BBCH scale) which caused increase in percent flowering (Table 2), panicle length, panicle breadth (Table 4), with subsequent increase in total number of hermaphrodite flowers (Table 5), might have caused better pollination, fertilization, better fruitset, better fruit retention, which might have resulted in increase in the number of fruits per tree in the trees treated with paclobutrazol in combination with 6-BA (B_5) with stem tip pruning (P_1). The combined effect of stem tip pruning and bioregulators, paclobutrazol, 6-BA might have significantly increased the number of fruits per tree in the present investigation.

The results on fruit weight (gm) of mango cv. Banganpalli after application of stem tip pruning and bioregulators are presented in the table 8. There was significant difference after application of stem tip pruning and bioregulators with respect to fruit weight (gm). Maximum fruit weight was recorded with application of paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) with stem tip pruning (P_1) (321 grams). Minimum fruit weight was recorded with application of gibberellic acid (B_1) without stem tip pruning (P_2) (297 grams). Similar increase in fruit weight was reported with the application of 6-BA was reported by Shankar Swamy and Neelavathi (2016) [23]. Similar results of increase in fruit weight with paclobutrazol were by reported by Sonam *et al.* (2017) [24], by Ankit *et al.* (2018) [1] in litchi. Similar increase in fruit weight with tip pruning was reported by Santoshi rani (2018) [20] in mango cv. Banganpalli, Soudagar *et al.* (2018) [20] in mango cv. Alphonso, Ram *et al.* (2013) [19] in mango cv. Amrapali. As the above treatments have caused the fruit weight to increase individually, combined effect of paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) with stem tip pruning (P_1) might have resulted in increase in fruit weight with respect to their interaction effect compared to control in the present investigation.

The results on yield per tree after application of stem tip pruning and bioregulators are presented in the table 8. The data revealed that there is significant difference in yield (kg. $tree^{-1}$) after application of stem tip pruning and bioregulators. Maximum yield was recorded with application of paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) with stem tip pruning (P_1) (45.59 kg). Minimum yield was recorded with application of gibberellic acid (B_1) without stem tip pruning (P_2) (32.15 kg) which was on par with application of control without stem tip pruning (P_2) (B_8) (32.47). The treatment paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) with stem tip pruning (P_1) significantly increased percent flowering (Table 2), hermaphrodite flower% (Table 5), number of fruits per tree (Table 7), fruit weight (Table 8) which might have ultimately increased the yield in the present investigation. The combined effect of stem tip pruning and bioregulators, paclobutrazol, 6-BA might have significantly increased yield kg per $tree^{-1}$ compared to control in the present investigation with respect to interaction effect.

Table 1: Effect of stem tip pruning and bio regulators on days taken for panicle initiation after rest period (days) of mango cv. Banganpalli

Days taken for Panicle Initiation (days)									
Treatments	**2019**			**2020**			**POOLED**		
	P_1	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**
B_1	48.67	51.00	49.83^{f}	45.00	49.67	47.33^{e}	47.00	49.75	48.38^{e}
B_2	33.33	35.33	34.33^{b}	32.00	33.67	32.83^{b}	32.75	34.50	33.63^{b}
B_3	34.67	35.67	35.17^{c}	31.33	32.67	32.00^{a}	33.00	34.25	33.63^{b}
B_4	44.00	44.67	44.33^{e}	41.67	43.33	42.50^{d}	42.50	44.00	43.25^{d}
B_5	32.00	33.67	32.83^{a}	30.67	32.00	31.33^{a}	31.50	32.75	32.13^{a}
B_6	38.33	41.33	39.83^{d}	37.33	40.33	38.83^{c}	37.50	40.75	39.13^{c}
B_7	44.33	43.67	44.00^{e}	42.33	43.33	42.83^{d}	43.00	44.00	43.50^{d}
B_8	52.00	53.33	52.67^{g}	50.67	50.33	50.50^{f}	51.25	51.50	51.38^{f}
Mean of P	40.92^{a}	42.33^{b}		38.88^{a}	40.67^{b}		39.81^{a}	41.44^{b}	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.39	1.12		0.30	0.88		0.19	0.54	
P	0.19	0.56		0.15	0.44		0.09	0.27	
BXP	0.55	NS		0.43	1.25		0.26	0.76	

*Figures with same et did not differ significantly

B_1: Gibberilic acid GA3 @50 ppm B_2: 6 Benzylaminopurine BA@200 ppm B_3: Paclobutrazol PBZ@1500 ppm
B_4: NapthaleineaceticacidNAA@100 ppm B_5: PBZ@1500 ppm+BA@ 200 ppm B_6: PBZ@1500 ppm+ NAA@100 ppm
B_7: GA3 @50 ppm+ PBZ@ 1500 ppm B_8: Control
P_1: With stem tip pruning P_2: without stem tip pruning

Table 2: Effect of stem tip pruning and bio regulators on percent flowering (%) of mango cv. Banganpalli

Percent Flowering (%)									
Treatments	**2019**			**2020**			**POOLED**		
	P_1	P_2	Mean of B	P_1	P_2	Mean of P	P_1	P_2	Mean of P
B_1	62.00	58.67	60.33^{d}	61.00	58.67	59.83^{d}	61.17	58.67	59.92^{d}
B_2	69.67	69.53	69.60^{a}	71.77	69.50	70.63^{a}	70.72	69.52	70.12^{a}
B_3	68.38	68.53	68.46^{b}	70.05	68.84	69.44^{b}	69.22	68.69	68.95^{b}
B_4	64.14	63.70	63.92^{c}	67.30	68.48	67.89^{c}	65.72	66.09	65.91^{c}
B_5	71.33	69.33	70.33^{a}	71.81	69.67	70.74^{a}	71.57	69.50	70.54^{a}
B_6	61.10	60.75	60.93^{d}	70.23	70.11	70.17^{a}	65.67	65.43	65.55^{c}
B_7	62.33	58.00	60.17^{d}	62.33	58.11	60.22^{d}	62.50	58.17	60.33^{d}
B_8	60.00	57.00	58.50^{e}	62.38	57.67	60.03^{d}	61.53	58.00	59.76^{d}
Mean of P	64.87^{a}	63.19^{b}		67.11^{a}	65.13^{b}		66.01^{a}	64.26^{b}	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.35	1.02		0.40	1.15		0.30	0.87	
P	0.18	0.51		0.20	0.58		0.15	0.43	
BXP	0.50	1.44		0.56	1.63		0.42	1.23	

*Figures with same alphabet did not differ significantly

B_1: Gibberilic acid GA3 @50 ppm B_2: 6 Benzylaminopurine BA@200 ppm B_3: Paclobutrazol PBZ@1500 ppm
B_4: NapthaleineaceticacidNAA@100ppm B_5: PBZ@1500 ppm+BA@ 200 ppm B_6: PBZ@1500 ppm+ NAA@100 ppm
B_7: GA3 @50 ppm+ PBZ@ 1500 ppm B_8: Control
P_1: With stem tip pruning P_2: without stem tip pruning

T**able 3:** Effect of stem tip pruning and bio regulators on panicle length (cm) of mango cv. Banganpalli

Panicle Length (cm)									
Treatments	**2019**			**2020**			**POOLED**		
	P_1	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**
B_1	20.10	20.13	20.11^{e}	19.16	20.50	19.83^{e}	19.63	20.32	19.98^{e}
B_2	28.48	29.56	29.02^{a}	29.38	29.48	29.43^{a}	28.93	29.52	29.23^{a}
B_3	28.39	29.02	28.71^{a}	27.73	29.30	28.51^{a}	28.06	29.16	28.61^{a}
B_4	24.88	24.89	24.89^{c}	25.15	25.55	25.35^{c}	25.02	25.22	25.12^{c}
B_5	28.90	30.05	29.48^{a}	29.37	29.42	29.40^{a}	29.14	29.74	29.44^{a}
B_6	26.96	27.37	27.17^{b}	27.35	27.72	27.54^{b}	27.16	27.55	27.35^{b}
B_7	23.02	23.83	23.43^{d}	23.38	24.17	23.77^{d}	23.20	24.00	23.60^{d}
B_8	18.52	19.37	18.95^{f}	19.09	19.76	19.43^{e}	18.80	19.57	19.19^{e}
Mean of P	24.91^{b}	25.53^{a}		25.08^{b}	25.74^{a}		24.99^{b}	25.64^{a}	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.33	0.96		0.34	0.99		0.30	0.86	
P	0.16	0.48		0.17	0.50		0.15	0.43	
BXP	0.47	NS		0.48	NS		0.42	NS	

*Figures with same alphabet did not differ significantly

B_1: Gibberilic acid GA3 @50 ppm B_2: 6 Benzylaminopurine BA@200 ppm B_3: Paclobutrazol PBZ@1500 ppm
B_4: NapthaleineaceticacidNAA@100ppm B_5: PBZ@1500 ppm+BA@ 200 ppm B_6: PBZ@1500 ppm+ NAA@100 ppm
B_7: GA3 @50 ppm+ PBZ@ 1500 ppm B_8: Control
P_1: With stem tip pruning P_2: without stem tip pruning

Table 4: Effect of stem tip pruning and bio regulators on panicle breadth (cm) of mango cv. Banganpalli

Panicle Breadth (cm)									
Treatments	**2019**			**2020**			POOLED		
	P_1	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**
B_1	9.67	9.74	9.70^{e}	10.38	10.55	10.47^{f}	10.03	10.15	10.09^{f}
B_2	19.65	20.47	20.06^{a}	20.34	21.38	20.86^{a}	20.00	20.93	20.46^{a}
B_3	19.81	19.85	19.83^{b}	20.15	20.41	20.28^{a}	19.98	20.13	20.06^{a}
B_4	14.32	14.41	14.36^{d}	15.46	15.59	15.53^{c}	14.89	15.00	14.95^{c}
B_5	20.43	20.99	20.71^{a}	19.59	21.52	20.56^{a}	20.01	21.26	20.63^{a}
B_6	17.29	17.77	17.53^{c}	17.92	18.27	18.10^{b}	17.61	18.02	17.81^{b}
B_7	13.90	14.08	13.99^{d}	14.56	14.82	14.69^{d}	14.24	14.45	14.34^{d}
B_8	8.91	10.53	9.72^{e}	11.47	12.37	11.92^{e}	10.19	11.45	10.82^{e}
Mean of P	15.50^{b}	15.98^{a}		16.24^{b}	16.86^{a}		15.87^{a}	16.42^{b}	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.22	0.64		0.25	0.72		0.19	0.57	
P	0.11	0.32		0.12	0.36		0.10	0.29	
BXP	0.31	NS		0.35	NS		0.27	0.81	

*Figures with same alphabet did not differ significantly

B_1: Gibberilic acid GA3 @50 ppm B_2: 6 Benzylaminopurine BA@200 ppm B_3: Paclobutrazol PBZ@1500 ppm
B_4: NapthaleineaceticacidNAA@100ppm B_5: PBZ@1500 ppm+BA@ 200 ppm B_6: PBZ@1500 ppm+ NAA@100 ppm
B_7: GA3 @50 ppm+ PBZ@ 1500 ppm B_8: Control
P_1: With stem tip pruning P_2: without stem tip pruning

Table 5: Effect of stem tip pruning and bio regulators on hermaphrodite flower percent (%) of mango cv. Banganpalli

Hermaphrodite Flower Percent (%)									
Treatments	**2019**			**2020**			**POOLED**		
	P1	**P2**	**Mean of B**	**P1**	**P2**	**Mean of B**	**P1**	**P2**	**Mean of B**
B1	9.40	9.00	9.20[f]	9.16	8.67	8.91[f]	9.28	8.84	9.06[g]
B2	16.86	15.33	16.10[b]	17.98	17.26	17.62[b]	17.43	16.30	16.86[b]
B3	16.15	14.20	15.18[c]	15.47	15.50	15.48[c]	15.81	14.85	15.33[c]
B4	13.61	11.44	12.53[d]	15.93	14.42	15.18[c]	14.77	12.94	13.86[d]
B5	17.33	16.44	16.89[a]	19.00	18.17	18.58[a]	18.17	17.31	17.74[a]
B6	12.75	11.42	12.08[d]	11.63	13.84	12.73[d]	12.19	12.63	12.41[e]
B 7	11.08	10.41	10.75[e]	10.57	9.92	10.25[e]	10.83	10.17	10.50[f]
B 8	8.67	7.93	8.30[g]	10.28	9.19	9.74[e]	9.48	8.56	9.02[g]
Mean of P	13.23[a]	12.02[b]		13.75[a]	13.37[a]		13.49[a]	12.70[b]	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.27	0.78		0.26	0.75		0.20	0.58	
P	0.14	0.39		0.13	0.38		0.10	0.29	
BXP	0.38	NS		0.37	1.07		0.28	0.82	

*Figures with same alphabet did not differ significantly

B1: Gibberilic acid GA3 @50 ppm B2: 6 Benzylaminopurine BA@200 ppm B3: Paclobutrazol PBZ@1500 ppm
B4: NapthaleineaceticacidNAA@100ppm B5: PBZ@1500 ppm+BA@ 200 ppm B6: PBZ@1500 ppm+ NAA@100 ppm
B7: GA3 @50 ppm+ PBZ@ 1500 ppm B8: Control
P1: With stem tip pruning P2: without stem tip pruning

Table 6: Effect of stem tip pruning and bio regulators on fruit set per panicle (number) of mango cv. Banganpalli.

Fruit set per panicle (number)									
Treatments	**2019**			**2020**			**POOLED**		
	P1	**P2**	**Mean of B**	**P1**	**P2**	**Mean of B**	**P1**	**P2**	**Mean of B**
B1	7.67	7.33	7.50[c]	7.67	8.67	8.17[c]	7.67	8.00	7.83[d]
B2	10.67	9.33	10.00[b]	10.33	11.00	10.67[a]	10.50	10.17	10.33[a]
B3	9.67	8.33	9.00[b]	10.00	9.67	9.83[b]	9.83	9.00	9.42[b]
B4	8.33	7.67	8.00[c]	9.67	8.67	9.17[b]	9.00	8.17	8.58[c]
B5	11.67	10.00	10.83[a]	10.67	9.67	10.17[a]	11.17	9.83	10.50[a]
B6	8.67	8.00	8.33[b]	9.00	7.67	8.33[c]	8.83	7.83	8.33[c]
B 7	7.00	6.67	6.83[d]	6.33	5.00	5.67[d]	6.67	5.83	6.25[e]
B 8	5.33	4.33	4.83[e]	5.67	5.33	5.50[d]	5.50	4.83	5.17[f]
Mean of P	8.63[a]	7.71[b]		8.67[a]	8.21[b]		8.65[a]	7.96[b]	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.24	0.70		0.26	0.77		0.20	0.58	
P	0.12	0.35		0.13	0.38		0.10	0.29	
BXP	0.34	NS		0.37	1.08		0.29	NS	

*Figures with same alphabet did not differ significantly

B1: Gibberilic acid GA3 @50 ppm B2: 6 Benzylaminopurine BA@200 ppm B3: Paclobutrazo PBZ@1500 ppm
B4:NapthaleineaceticacidNAA@100ppm B5: PBZ@1500 ppm+BA@ 200 ppm B6: PBZ@1500 ppm+ NAA@100 ppm
B7: GA3 @50 ppm+ PBZ@ 1500 ppm B8: Control
P1: With stem tip pruning P2: without stem tip pruning

Table 7: Effect of stem tip pruning and bio regulators on number of fruits per tree (number) of mango cv. Banganpalli

Number of fruits per tree									
Treatments	**2019**			2020			**Pooled**		
	P1	**P2**	**Mean of B**	**P1**	**P2**	**Mean of B**	**P1**	**P2**	**Mean of B**
B1	111.67	108.00	109.83[f]	114.00	111.00	112.50[f]	112.83	109.50	111.17[f]
B2	135.67	134.00	134.83[b]	138.33	136.00	137.17[b]	137.33	135.83	136.58[b]
B3	136.67	130.33	133.50[b]	140.00	134.00	137.00[b]	138.33	132.17	135.25[c]
B4	127.00	124.67	125.83[d]	132.00	128.00	130.00[c]	129.50	126.33	127.92[d]
B5	140.00	138.00	139.00[a]	144.00	140.00	142.00[a]	142.00	139.00	140.50[a]
B6	129.00	128.00	128.50[c]	130.33	128.00	129.17[d]	129.67	128.00	128.83[d]
B 7	121.00	118.67	119.83[e]	121.00	119.00	120.00[e]	121.00	118.83	119.92[e]
B 8	110.00	107.67	108.83[f]	113.00	110.00	111.50[f]	111.50	108.83	110.17[f]
Mean of P	126.38[a]	123.67[b]		129.08[a]	125.75[b]		127.77[a]	124.81[b]	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.52	1.50		0.41	1.19		0.38	1.10	
P	0.26	0.75		0.20	0.59		0.19	0.55	
BXP	0.73	2.12		0.58	1.68		0.54	1.56	

*Figures with same alphabet did not differ significantly

B1: Gibberilic acid GA3 @50 ppm B2: 6 Benzylaminopurine BA@200 ppm B3: Paclobutrazol PBZ@1500 ppm
B4: NapthaleineaceticacidNAA@100ppm B5: PBZ@1500 ppm+BA@ 200 ppm B6: PBZ@1500 ppm+ NAA@100 ppm
B7: GA3 @50 ppm+ PBZ@ 1500 ppm B8: Control
P1: With stem tip pruning P2: without stem tip pruning

Table 8: Effect of stem tip pruning and bio regulators on fruit weight (gm) of mango cv. Banganpalli

Fruit Weight (gm)									
Treatments	**2019**			**2020**			**Pooled**		
	P_1	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**
B_1	298.00	295.00	296.50^{h}	298.00	296.00	297.00^{h}	299.50	297.00	298.25^{g}
B_2	315.67	310.00	312.83^{c}	315.33	310.67	313.00^{c}	317.33	313.50	315.42^{b}
B_3	310.67	309.00	309.83^{e}	310.33	309.00	309.67^{e}	311.83	309.50	310.67^{d}
B_4	313.00	309.67	311.33^{d}	312.67	309.67	311.17^{d}	315.00	313.33	314.17^{c}
B_5	319.00	313.00	316.00^{b}	319.00	313.33	316.17^{b}	321.00	316.00	318.50^{a}
B_6	320.00	315.00	317.50^{a}	320.00	315.33	317.67^{a}	318.33	313.67	316.00^{b}
B_7	306.33	301.67	304.00^{f}	307.33	301.67	304.50^{f}	307.17	302.33	304.75^{e}
B_8	300.00	298.00	299.00^{g}	299.67	297.67	298.67^{g}	300.50	298.33	299.42^{f}
Mean of P	310.33^{a}	306.42^{b}		310.29^{a}	306.67^{b}		311.33^{a}	307.96^{b}	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.43	1.24		0.40	1.16		0.28	0.80	
P	0.21	0.62		0.20	0.58		0.14	0.40	
BXP	0.60	1.75		0.56	1.64		0.39	1.14	

*Figures with same alphabet did not differ significantly

B_1: Gibberilic acid GA3 @50 ppm B_2: 6 Benzylaminopurine BA@200 ppm B_3: Paclobutrazol PBZ@1500 ppm
B_4: NapthaleineaceticacidNAA@100ppm B_5: PBZ@1500 ppm+BA@ 200 ppm B_6: PBZ@1500 ppm+ NAA@100 ppm
B_7: GA3 @50 ppm+ PBZ@ 1500 ppm B_8: Control
P_1: With stem tip pruning P_2: without stem tip pruning

Table 9: Effect of stem tip pruning and bio regulators on yield (kg per tree) of mango cv. Banganpalli

Yield (kg per tree)									
Treatments	**2019**			**2020**			**Pooled**		
	P_1	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**
B_1	33.28	31.86	32.57g	32.98	32.44	32.71h	33.13	32.15	32.64f
B_2	42.83	41.54	42.18b	44.34	43.64	43.99b	43.58	42.59	43.09b
B_3	42.46	40.27	41.37c	43.92	41.54	42.73c	43.19	40.91	42.05c
B_4	39.75	38.60	39.18e	41.84	40.57	41.21d	40.80	39.59	40.20e
B_5	44.66	43.20	43.93a	46.51	44.66	45.59a	45.59	43.93	44.76a
B_6	41.28	40.32	40.80d	41.27	39.98	40.63e	41.28	40.15	40.71d
B 7	37.07	35.80	36.43f	37.27	36.06	36.66f	37.17	35.93	36.55e
B 8	33.00	32.08	32.54g	34.01	32.85	33.43g	33.51	32.47	32.99f
Mean of P	39.29a	37.96b		40.27a	38.97b		39.78a	38.46b	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.16	0.48		0.18	0.53		0.14	0.40	
P	0.08	0.24		0.09	0.27		0.07	0.20	
BXP	0.23	NS		0.26	0.75		0.20	0.57	

*Figures with same alphabet did not differ significantly

B_1: Gibberilic acid GA3 @50 ppm B_2: 6 Benzylaminopurine BA@200 ppm B_3: Paclobutrazol PBZ@1500 ppm
B_4:NapthaleineaceticacidNAA@100ppm B_5: PBZ@1500 ppm+BA@ 200 ppm B_6: PBZ@1500 ppm+ NAA@100 ppm
B_7: GA3 @50 ppm+ PBZ@ 1500 ppm B_8: Control
P_1: With stem tip pruning P_2: without stem tip pruning

Table 10: Effect of stem tip pruning and bio regulators on endogenous abscisic acid (ABA) (ng /g) concentration at flower bud swelling stage (510 stage of BBCH scale) of mango cv. Banganpalli

Absicic acid (ABA) (ng /g)									
Treatments	**2019**			**2020**			**Pooled**		
	P_1	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**
B_1	65.13	62.70	63.92^{g}	69.47	67.60	68.53^{f}	67.30	65.15	66.23^{h}
B_2	82.90	80.55	81.73^{d}	85.74	84.58	85.16^{c}	84.32	82.57	83.45^{d}
B_3	91.13	87.97	89.55^{b}	90.13	87.65	88.89^{b}	90.63	87.81	89.22^{b}
B_4	80.83	78.47	79.65^{e}	81.50	79.45	80.48^{d}	81.17	78.96	80.06^{e}
B_5	92.73	90.80	91.77^{a}	90.94	89.48	90.21^{a}	91.84	90.14	90.99^{a}
B_6	85.83	85.23	85.53^{c}	86.83	83.95	85.39^{c}	86.33	84.59	85.46^{c}
B_7	74.50	71.53	73.02^{f}	76.85	74.05	75.45^{e}	75.68	72.79	74.23^{g}
B_8	81.03	78.67	79.85^{e}	79.17	72.48	75.83^{e}	80.10	75.58	77.84^{f}
Mean of P	81.76^{a}	79.49^{b}		82.58^{a}	79.91^{b}		82.17^{a}	79.70^{b}	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.29	0.85		0.25	0.72		0.18	0.54	
P	0.15	0.42		0.12	0.36		0.09	0.27	
BXP	0.41	NS		0.35	1.01		0.26	0.76	

*Figures with same alphabet did not differ significantly

B_1: Gibberilic acid GA3 @50 ppm B_2: 6 Benzylaminopurine BA@200 ppm B_3: Paclobutrazol PBZ@1500 ppm
B_4: NapthaleineaceticacidNAA@100ppm B_5: PBZ@1500 ppm+BA@ 200 ppm B_6: PBZ@1500 ppm+ NAA@100 ppm
B_7: GA3 @50 ppm+ PBZ@ 1500 ppm B_8: Control
P_1: With stem tip pruning P_2: without stem tip pruning

Table 11: Effect of stem tip pruning and bio regulators on endogenous cytokinins (DHZR's) (Pg /g) concentration at flower bud swelling stage (510 stage of BBCH scale) of mango cv. Banganpalli

Dihydro Zeatin Ribose DHZR (Pg/g)									
Treatments	**2019**			**2020**			**Pooled**		
	P_1	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**
B_1	263.77	259.83	261.80h	266.33	261.80	264.07g	265.05	260.82	262.93g
B_2	300.22	298.63	299.43c	303.00	300.30	301.65b	301.61	299.47	300.54b
B_3	300.68	299.50	300.09b	302.00	300.17	301.08b	301.34	299.83	300.59b
B_4	296.27	293.83	295.05e	298.27	295.83	297.05d	297.27	294.83	296.05d
B_5	302.00	299.83	300.92a	303.83	301.50	302.67a	302.92	300.67	301.79a
B_6	297.03	295.50	296.27d	298.83	296.83	297.83c	297.93	296.17	297.05c
B 7	289.67	288.13	288.90f	291.17	289.25	290.21e	290.42	288.69	289.56e
B 8	267.63	264.97	266.30g	268.50	267.00	267.75f	268.07	265.98	267.03f
Mean of B	289.66a	287.53b		291.49a	289.09b		290.58a	288.31b	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.25	0.73		0.19	0.55		0.18	0.53	
P	0.13	0.37		0.09	0.27		0.09	0.27	
BXP	0.36	1.04		0.27	0.77		0.26	0.75	

*Figures with same alphabet did not differ significantly

B_1: Gibberilic acid GA3 @50 ppm B_2: 6 Benzylaminopurine BA@200 ppm B_3: Paclobutrazol PBZ@1500 ppm
B_4: NapthaleineaceticacidNAA@100ppm B_5: PBZ@1500 ppm+BA@ 200 ppm B_6: PBZ@1500 ppm+ NAA@100 ppm
B_7: GA3 @50 ppm+ PBZ@ 1500 ppm B_8: Control
P_1: With stem tip pruning P_2: without stem tip pruning

Table 12: Effect of stem tip pruning and bio regulators on endogenous (ZR's) (Pg /g) concentration at flower bud swelling stage (510 stage of BBCH scale) of mango cv. Banganpalli

Zeatin Ribose (ZR P g/g)									
Treatments	**2019**			**2020**			**Pooled**		
	P_1	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**
B_1	233.60	232.30	232.95^{g}	230.80	228.63	229.72^{g}	232.20	230.47	231.33^{g}
B_2	259.97	257.50	258.73^{e}	257.90	254.50	256.20^{e}	258.93	256.00	257.47^{e}
B_3	269.50	267.30	268.40^{c}	270.92	268.83	269.88^{c}	270.21	268.07	269.14^{c}
B_4	263.83	262.63	263.23^{d}	263.83	261.47	262.65^{d}	263.83	262.05	262.94^{d}
B_5	275.63	272.73	274.18^{a}	277.63	275.90	276.77^{a}	276.63	274.32	275.48^{a}
B_6	270.75	269.42	270.08^{b}	272.57	270.42	271.49^{b}	271.66	269.92	270.79^{b}
B_7	251.27	250.18	250.73^{f}	255.20	253.42	254.31^{f}	253.24	251.80	252.52^{f}
B_8	236.80	228.97	232.88^{g}	232.82	226.00	229.41^{g}	234.81	227.48	231.15^{g}
Mean of P	257.67^{a}	255.13^{b}		257.71^{a}	254.90^{b}		257.69^{a}	255.01^{b}	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.26	0.76		0.24	0.68		0.19	0.56	
P	0.13	0.38		0.12	0.34		0.10	0.28	
BXP	0.37	1.07		0.33	0.96		0.27	0.79	

*Figures with same alphabet did not differ significantly

B_1: Gibberilic acid GA3 @50 ppm B_2: 6 Benzylaminopurine BA@200 ppm B_3: Paclobutrazol PBZ@1500 ppm
B_4: NapthaleineaceticacidNAA@100ppm B_5: PBZ@1500 ppm+BA@ 200 ppm B_6: PBZ@1500 ppm+ NAA@100 ppm
B_7: GA3 @50 ppm+ PBZ@ 1500 ppm B_8: Control
P_1: With stem tip pruning P_2: without stem tip pruning

Table 13: Effect of stem tip pruning and bio regulators on endogenous Gibberellic acid (GA_3) (ng/g) concentration at flower bud swelling stage (510 stage of BBCH scale) of mango cv. Banganpalli

Gibberrellic acid GA_3 (ng/g)									
Treatments	**2019**			**2020**			**POOLED**		
	P_1	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**	**P_1**	**P_2**	**Mean of B**
B_1	1.43	1.53	1.48^{d}	1.42	1.52	1.47^{f}	1.43	1.53	1.48^{g}
B_2	1.15	1.15	1.15^{b}	1.17	1.18	1.18^{c}	1.16	1.17	1.17^{d}
B_3	1.08	1.10	1.09^{a}	1.07	1.07	1.07^{a}	1.07	1.09	1.08^{a}
B_4	1.14	1.14	1.14^{b}	1.15	1.16	1.16^{b}	1.15	1.15	1.15^{c}
B_5	1.07	1.09	1.08^{a}	1.06	1.07	1.07^{a}	1.07	1.08	1.08^{a}
B_6	1.12	1.13	1.12^{b}	1.13	1.14	1.14^{b}	1.13	1.13	1.13^{b}
B_7	1.31	1.33	1.32^{c}	1.27	1.21	1.24^{d}	1.30	1.27	1.28^{e}
B_8	1.28	1.31	1.30^{c}	1.30	1.37	1.33^{e}	1.30	1.34	1.32^{f}
Mean of P	1.20^{a}	1.22^{b}		1.20^{a}	1.21^{a}		1.20^{a}	1.22^{b}	
Factors	S.Em±	C.D. at 5%		S.Em±	C.D. at 5%		S.Em±	C.D. at 5%	
B	0.01	0.02		0.01	0.02		0.00	0.01	
P	0.00	0.01		0.00	0.01		0.00	0.01	
BXP	0.01	0.02		0.01	0.03		0.01	0.02	

*Figures with same alphabet did not differ significantly

B_1: Gibberilic acid GA3 @50 ppm
B_2: 6 Benzylaminopurine BA@200 ppm
B_3: Paclobutrazol PBZ@1500 ppm
B_4: NapthaleineaceticacidNAA@100ppm
B_5: PBZ@1500 ppm+BA@ 200 ppm
B_6: PBZ@1500 ppm+ NAA@100 ppm
B_7: GA3 @50 ppm+ PBZ@ 1500 ppm
B_8: Control
P_1: With stem tip pruning
P_2: without stem tip pruning

Conclusion

The present study indicated that application of paclobutrazol in combination with 6 benzyl amino purine (6-BA) (B_5) along with stem tip pruning (P_1) during flower bud differentiation stage has significantly resulted in highest endogenous ABA, cytokinins, lowest GA_3 contents at flower bud swelling stage (510 stage of BBCH scale) which in turn resulted in early panicle initiation, reduced the number of days taken for 50% flowering, increased percent flowering (23.39% increase over control), highest number of hermaphrodite flowers over control. The treatment gibberellic acid (B_1) and control (B_8) have significantly reduced the endogenous hormone levels, *viz*, ABA content, cytokinins and increased gibberellic acid (GA_3) contents at the time of flower bud swelling stage (510 stage of BBCH scale) which in turn has significantly reduced the percent flowering, indicating that endogenous hormone levels of ABA, cytokinins (DHZR's and ZR's), gibberellic acid play a key role in flowering of mango. The same treatment paclobutrazol in combination with 6 benzyl aminopurine (6-BA) (B_5) along with stem tip pruning (P_1) has also resulted in significantly highest number of fruits, highest fruit weight which subsequently resulted in highest yield (40.40%) compared to control.

References

1. Ankith kumar pandey, Prabhakar singh, Sanjay KS. Impact of different doses and methods of application of paclobutrazol on leaf area and flush length of litchi cultivars. International journal of chemical studies. 2018;6(1):1422-1425.
2. Babul Sarker C, Mohammed AR, Dogulas D. Combined effect of fertilizers, irrigation, and Paclobutrazol on yield and fruit quality of mango. Horticultarae. 2016;14(2):1-10.
3. Chaikiattiyos S, Pongsomboon W, Dasanonda M, Anupunt P. Floral sex expression of Khieo Sawoei and Nam Dok Mai mangoes in tropical and subtropical climates of Thailand. Acta Hortiulturae. 1997;455:202-208.
4. Chen WS. Endogenous growth substances in relations to shoot growth and flower bud development of mango. J Am. Soc. Hortic. Sci. 1987;112:360-363.
5. Daruni N, Pittaya Sruamsiri, Martin Hegele, Nopporn B, Fritz Bangerth. Hormonal Changes in Various Tissues of Mango Trees during Flower Induction Following Cold Temperature. Acta Hort. 2006;727:453-457.
6. Davenport TL. Processes influencing floral initiation and bloom: the role of phytohormones in a conceptual flowering model. Hort Technol. 2000;10:733-739.
7. Davenport TL. Reproductive physiology of mango. Brazilian journal of plant physiology. 2007;19(4):363-376.
8. Hack H, Bleiholder H, Buhr L, Meier U, Schnock-Frick U, Weber E, *et al*. Einheitliche Codierung der phänologischen Entwicklungsstadien mono- und dikotyler Pflanzen – Erweiterte BBCH-Skala, Allgemein. Nachrichtenbl. Deut. Pflanzenschutzd. 1992;44:265-270.
9. Hernandez Delgado PM, Aranguren M, Reig C, Fernandez Galvan D, Mesejo C, Martinez Fuentes A, *et al*. Phenological growth stages of mango (*Mangifera indica* L.) according to the BBCH scale. Scientia Horticulturae. 2011;130:536-540.
10. Hoda MN, Singh S, Singh J. Effect of cultar on flowering, fruiting and fruit quality of mango cv. Langra. Indian J of Hort. 2001;58 (3):224-227.
11. Iyer CPA, Subbaiah MC, Subramanyam MD, Rao GSP. Screening of germplasm and correlation among certain characters in mango. Acta Horticulture. 1989;231:83-90.
12. Nartvaranant P, Subhadrabandhu S, Tongumpai P. Practical aspects in producing off-season mango in Thailand. Acta Horticulturae. 2000;509:661-668.
13. NHB (National Horticulture Board). Indian Horticulture Database-2018. Ministry of Agriculture, Government of India 85, Institutional Area, Sector-18, Gurgaon - 122 015. Website; c2018. www.nhb.gov.in.
14. Oliveira MB, Pereira MCT, Mizobutsi GP, Maia VM, Silva JF, Oliveira JAA, *et al*. Paclobutrazol and tip pruning in the management of palmer mango trees in the semi-arid region of Brazil. Department of Agricultural Sciences; 2015.
15. Orwintinee, Chusri NK, Tatsushi O, Hirokazu H, Yoshimi Y. Application of paclobutrazol for flowering and fruit production of Irwin mango (*Mangifera indica* L.) in Okinawa. Trop. Agr. Develop. 2008;52(3):69-73.
16. Patel AH, Tandel YN, Bhatt AH, Parmar AB, Bhoomika Patel A. Effect of Nutrients and Thiourea on Yield and Quality of Mango cv. Kesar. Advances in life sciences. 2016.;5(2):490-492.
17. Raj Kumar M, Reddy YN, Chandrasekhar R, Srihari D. Effect of calcium and plant growth regulators on flowering and yield of mango (*Mangifera indica* L.) cv. Baneshan. Journal of Research ANGRAU. 2006;34(1):21-25.
18. Ramirez F, Davenport TL, Fischer G. The number of leaves required for floral induction and translocation of the florigenic promoter in mango (*Mangifera indica* L.) in a tropical climate. Sci. Hortic. 2010;123:443-453.
19. Ram A, Vishwa BP, Kalyan B, Ram KP. Pruning affects fruit yield and post-harvest quality in mango (*Mangifera indica* L.) cv. Amrapali. EDP Sciences. 2013;68(5):367-380.
20. Santoshi rani. Effect of branch tip pruning in combination of paclobutrazol on flowering induction, yield and quality of mango (*Mangifera indica* L.) Cv. Banganpalli M.sc thesis submitted to SKLTSHU-Mulugu, College of Horticulture, Rajendranagar; c2018.
21. Shaban AEA. Effect of summer pruning and GA_3 spraying on inducing flowering and fruiting of Zebda mango trees. World Journal of Agricultural Sciences. 2009;5(3):337-344.
22. Shailender Rajan, Divya Tiwari, Singh VK, Reddy YTN, Upreti KK, Burondkhar, MM, *et al*. Application of extended BBCH scale for Phenological studies in mango (*Mangifera indica* L). Journal of Applied Horticulture; c2011;13-2.
23. Shankar Swamy J, Neelavathi R. Effect of growth regulators, nutrients, seaweed extract and pruning on induction of early flowering in mango (*Mangifera indica* L) cv. Kesar. Indian Journal of Agricultural Sciences. 2016;86(9):1175-8.
24. Sonam OB, Choudhury AG, Md Abu Hasan. Paclobutrazol in Improving Productivity and Quality of Litchi. Int. J Curr. Microbiol. App. Sci. 2017;6(8):1622-1629.
25. Swaroop mohan, Ram Sant, Singh CP, Shukla P. Effect of pruning on growth, flowering and fruiting in mango. Indian Journal of Horticulture. 2001;58 (4):303-308.
26. Upreti KK, Reddy YTN, Shivu Prasad SR, Bindu GV, Jayaram HL, Shailendra Rajan. Hormonal changes in response to paclobutrazol induced early flowering in mango cv. Totapuri. Scientia Horticulturae. 2013;150:414-418.
27. Vijay Krishna G, Bhagwan A, Kiran Kurmar A, Girwani Anabheri. Plant Bio regulators and chemical exogenous application impact on flowering and yield attributes of mango (Mangifera indica L) cv. Banganpalli. International Journal Of Current Microbiology and Applied Sciences. 2020;9(7):3325-3338.
28. Vijayalakshmi D, Srinivasan PS. Induction of flowering in off year mango cv. Alphonso as influenced by chemicals and growth regulators. Ann. Plant Physiol. 1998;12(2):93-97.
29. Winston EC. Evaluation of paclobutrazol on growth, flowering and yield of mango cv. Kensington pride. Australian Journal of

Experimental Agriculture. 1992;32(1):97-104.
30. Sarkar A, Lehto SM, Harty S, Dinan TG, Cryan JF, Burnet PW. Psychobiotics and the manipulation of bacteria–gut–brain signals. Trends in neurosciences. 2016 Nov 1;39(11):763-81.