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Effect of paclobutrazol on floral bud initiation, flowering and fruit set of jamun (*Syzygium cuminii* Skeels.)

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Abstract
Jamun (*Syzygium cuminii* Skeels.) is an important under exploited fruit tree of rich nutritive and medicinal (antidiabetic) properties. Its increasing market demand for commercial exploitation stimulates the off season concept by paclobutrazol application, added a major advantage to increase jamun fruit production. Field experiment was carried out in nine years old bearing trees of jamun to study the flowering response during 2017-18. The selected trees were drenched with paclobutrazol application during 1st week of October, 2017. The experiment results revealed least tree height (5.18m), twelve days earlier floral bud induction, days taken for flowering to harvest (97.66 days), higher fruit set per cent (56.68 per cent) and yield (69.58 kg/tree) were advanced by pruning of 25% terminal shoots with paclobutrazol (1.0 g a.i. m^{-1} of canopy diameter) treated trees compare to untreated trees. It is evident that the paclobutrazol treatment influenced early flowering and advanced the jamun fruit harvest which putforth economic value for farming community.

Keywords: Jamun, off season, paclobutrazol, early flowering, yield

Introduction
Jamun (*Syzygium cuminii* Skeels.) is the medicinally important indigenous fruit tree of India belongs to the family, Myrtaceae. It is a large, common, evergreen tree of Indian sub-continent. The tree is 25 m to 30 m tall, with oblong, opposite leaves that are smooth and glossy with a turpentine smell. The bark is scaly grey and the trunk forks or multiple stem has fragrant white blossoms in branched clusters with bisexual nature. Edible berries are purplish-black oval in colour with single seed. The antioxidant activity of jamun fruit has bestowed with total phenolic compounds including anthocyanin and seed consists of an alkaloid jambosin and a glycoside, jambolin or antimallin, which reduces diastatic conversion of starch into sugars (Singh *et al*., 1967). Generally, jamun tree flowers once in a year during the month of March-April and fruiting come during the month of June-July. Flowers borne both terminally and axillary inflorescences on about five months to one year-old branches. In jamun, only 15-30% of fruits reach maturity and fruit drop starts just after fruit set which continues upto fruit maturity (Mishra and Bajpai, 1975) [4].
The tree bears heavily in every growing season, a large number of new shoots emerge majority of which are lateral and a few are terminal. After one year most of the lateral shoots dry out, while terminal shoots put forth extension growth. Since jamun flowers and fruits are borne on current season growth, a light annual pruning is considered necessary to manage a canopy of jamun which will facilitate harvesting and also encourage new shoots after the harvest. Generally, plant growth regulators influence flower-bud initiation in both woody and herbaceous plants (Zeevart, 1978) [10]. Successful use of triazole growth regulators (anti-giberellin compound), in particular paclobutrazol retards vegetative growth and enhance flowering of fruit trees.
So far there is not much research intervention on canopy management and off season production of jamun. Due to the rich medicnal properties, its increasing demand for commercial exploitation stimulates the off season concept by paclobutrazol application, added a major advantage to increase jamun fruit production. Hence the study was conducted to standardize off season protocol with varying levels of pruning and paclobutrazol application on tree growth, early flower induction, fruit set and yield of jamun tree.

Materials and Methods
The experiment was conducted at Department of Fruit Science, Horticulture College and research Institute, Periyakulam, 2017-18. Nine years old full bearing trees of Ra-jamun, a

commercial type were selected and spaced at 8 × 8 m distance. The experiment was laid out in factorial randamized block design with three replications and twelve treatments with various combinations of pruning (no pruning, pruning of 50% terminal shoots and pruning of 25% terminal shoots) and, paclobutrazol (PBZ - 0, 0.50, 1.0 and 1.5 g a.i. m^{-1} of canopy diameter) application at different concentrations. Pruning was carried out during 2nd week of August, 2017. Paclobutrazol was applied once as soil drench during 1st week of October, 2017 by spreading in a circular band of 25 cm width at 75 cm radial distance from the tree trunk. Only water was applied to the untreated trees (control). After the emergence of new shoots, 25 randomly selected shoots were tagged in all directions and observations on days taken for flowering and percent fruit set were recorded from tagged shoots. Observations on tree height, number of days taken from flowering to harvest and yield were also recorded in both treated and untreated trees. The mean data were subjected to statistical analysis following analysis of variance procedure by Panse and Sukhathme (1985) [5].

Result and Discussion

Tree height

Tree height was significantly influenced by pruning, paclobutrazol application and their interaction (Table 1). Pruning of 50% terminal shoots with PBZ @ 1.0 g a.i. application recorded least tree height (5.18m) followed by trees pruned to 25% terminal shoots with PBZ 1.5 g a.i. application (5.24 m) compared to untreated trees (5.94 m).

The reduction in tree height might be due to the inhibitory effect of paclobutrazol on gibberellin biosynthesis pathway which restricts vegetative growth at sub-apical meristem by reduced cell elongation, cell division rate and decreased shoot growth. Similar results were reported by Tandel and Patel (2011) [8] in mango.

Table 1: Effect of pruning and paclobutrazol application on jamun tree height (m)

Treatments	D_1(0)	D_2(0.5g)	D_3(1.0g)	D_4(1.5g)	Mean P
P_1 (0)	5.94	5.97	5.92	5.86	5.92
P_2 (50%)	5.58	5.42	5.18	5.25	5.36
P_3 (25%)	5.76	5.45	5.30	5.42	5.48
Mean D	5.76	5.61	5.47	5.51	

Factors	C.D.	SE(d)
Factor (P-Pruning)	0.05	0.03
Factor (D-Drenching)	0.06	0.03
Interaction P X D	0.10	0.05

Flowering characters

Days taken for floral initiation after paclobutrazol application were significantly influenced by pruning, application of paclobutrazol and their interaction (Table 2). The days taken for floral initiation were ranged from 121.22 (treated trees) to 133.03 (untreated trees) days. Pruning of 25% terminal shoots with PBZ 1.0 g a.i. application advanced the number of days for floral initiation by 12 days. Among the pruning levels, removal of 25% terminal shoots recorded early flowering (123.24 days) than trees pruned to 50% terminal shoots (128.40 days). This might be due to greater utilization of available carbohydrates for vegetative growth to the detriment of flowering and also took longer time to replenish the carbohydrates lost in pruning operation. Early and intense flowering induced by PBZ resulted in early shoot maturity and increased photosynthesis rate, carbohydrate accumulation and decline in flowering reducing hormone, gibberellins (Upreti *et al.*, 2013) [9]. Similar results reported by Jannoyer and Lauri (2009) [2] and Gopu *et al*. (2014) in mango. The delay in blooming of flower bud due to GA3 activity in promoting and diverting flow of metabolites towards vegetative buds which slows down floral development.

Number of days taken from flowering to harvest were ranged between 97.66 to 115.12 days (Table 3). Pruning of 25% terminal shoots along with PBZ 1.5 g a.i. application significantly reduced the number of days from flowering to harvesting. However, the interaction effects of pruning and PBZ were non-sigificant. The PBZ induced early flowering has been reported by Upreti *et al.* (2013) [9] and Srilatha and Reddy (2015) [7] in mango.

Table 2: Effect of pruning and paclobutrazol application on jamun floral initiation (days)

Treatments	D_1(0)	D_2(0.5g)	D_3(1.0g)	D_4(1.5g)	Mean P
P_1 (0)	133.00	132.12	125.87	130.34	130.33
P_2 (50%)	128.55	129.16	127.80	128.08	128.39
P_3 (25%)	123.42	123.73	121.22	123.57	123.24
Mean D	128.32	128.34	125.30	127.33	

Factors	C.D.	SE(d)
Factor (P-Pruning)	1.41	0.71
Factor(D-Drenching)	1.63	0.82
Interaction P X D	2.82	1.42

Table 3: Effect of pruning and paclobutrazol application on jamun flowering to harvest (days)

Treatments	D_1 (0)	D_2 (0.5g)	D_3 (1.0g)	D_4 (1.5g)	Mean P
P_1 (0)	115.12	113.43	109.67	107.92	111.54
P_2 (50%)	105.92	104.22	102.79	100.55	103.37
P_3 (25%)	99.82	99.27	98.85	97.66	98.90
Mean D	106.96	105.64	103.77	102.04	

Factors	C.D.	SE(d)
Factor (P-Pruning)	1.26	0.63
Factor (D-Drenching)	1.45	0.73
Interaction P X D	NS	1.27

Fruit set per cent

The higher fruit set per cent of 56.68 per cent which were significantly influenced by pruning of 25% terminal shoots along with PBZ 1.0 g a.i. application (Table 4). The least fruit set per cent of 35.61 were recorded in untreated trees. The increase in fruit set might be due to the soil drenched paclobutrazol PBZ which alter source and sink relationship by shifting assimilates, mineral element and soluble proteins in leaves, stem and root and also exerts the influence on photosynthates partitioning at the sites of flowering and fruit production along with reduced vegetative growth. This result was in accordance with Kurian *et al*., (2001) [3] in mango.

Table 4: Effect of pruning and paclobutrazol application on jamun fruit set per cent

Treatments	D_1 (0)	D_2 (0.5g)	D_3 (1.0g)	D_4 (1.5g)	Mean P
P_1 (0)	38.57	40.20	43.74	35.62	39.530
P_2 (50%)	55.33	55.77	56.49	55.55	55.78
P_3 (25%)	55.54	56.46	56.36	56.68	56.26
Mean D	49.81	50.81	52.20	49.28	

Factors	C.D.	SE(d)
Factor(P - Pruning)	0.59	0.29
Factor(D - Drenching)	0.68	0.34
Interaction P X D	1.17	0.59

Yield per plant (kg tree^{-1})

Yield per tree was significantly influenced by pruning, paclobutrazol application and their interaction (Table 5). Among different treatments, Pruning of 25% terminal shoots (68.07 kg tree^{-1}) with PBZ 1.0 g a.i. application (61.89 kg tree^{-1}) resulted in higher yield per tree. Interaction effect was significantly influenced in higher yield per tree of about 69.58 kg tree^{-1}. The lowest yield per plant was recorded in untreated trees (50.7 kg tree^{-1}). This may be due to high flowering intensity which resulted in higher fruit number; more number of fruits per plant which ultimately increased fruit yield in PBZ treated plants. The yield increase in treated trees was due to higher fruit set from enhanced flowering along with the alteration of source sink relationship in the tree which directly reallocates carbohydrate reserves by suppressing vegetative growth. Application of paclobutrazol before the bud break during vegetative growth will not only suppress the enhanced growth but also promote the yield. Similar results were also reported by Upreti *et al.* (2013) [9] and Sarkar and Rahim (2012) [6] in different mango varieties.

Table 5: Effect of pruning and paclobutrazol application on jamun yield per tree (Kg)

Treatments	D_1 (0)	D_2 (0.5g)	D_3 (1.0g)	D_4 (1.5g)	Mean P
P1	50.70	48.10	53.06	52.02	51.20
P2	60.31	58.44	63.03	58.60	60.10
P3	66.31	68.04	69.58	68.35	68.07
Mean D	59.11	58.49	61.89	59.66	

Factors	C.D.	SE(d)
Factor (P - Pruning)	0.66	0.33
Factor (D - Drenching)	0.76	0.38
Interaction P X D	1.32	0.66

Conclusion

From the experiment, it was concluded that pruning and Paclobutrazol application aided in early induction of flowering which advanced jamun fruit harvest during off season showed beneficial effects of treatments and put forth for commercial exploitation and also brings economic value for farming community.

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Reference

1. Gopu B, Balamohan TN, Soman P, Jeyakumar P. Canopy management in mango (*Mangifera indica* L.) cv. Alphonso under high density planting system. Madras Agri. J. 2014; 101(10-12):396-400.
2. Jannoyer M, Lauri P. Young flush thinning in mango cv. Cogshall controls canopy density and production. Acta Hort. 2009; 820:395-402.
3. Kurian RM, Reddy YTN, Sonkar RK, Reddy PP. Effect of paclobutrazol on source-sink relationship in mango (*Mangifera indica* L.). J Appl. Hort. 2001; 3(2):88-90.
4. Mishra RS, Bajpai PN. Studies on Floral Biology of Jamun (Java Plum) [*Syzygium cuminii* (L) Skeels]. Indian J Hort. 1975; 32(1&2):15-24.
5. Panse M, Sukhathme K. Statistical methods for agriculture workers. Indian Council of Agriculture Research Publications. 1985, 48-67.
6. Sarkar CB, Rahim MA. Vegetative groth, harvesting time, yield and quality of mango (*Mangifera indica* L.) as influenced by soil drench application of paclobutrazol. Bangladesh J Agri. 2012; 37(2):335-348.
7. Srilatha V, Reddy TN, Upreti KK, Jagannath S. Pruning and paclobutrazol induced vigour, flowering and hormonal changes in mango (*Mangifera indica* L.). The Bioscan. 2015; 10(1):161-166.
8. Tandel YN, Patel NL. Effect of chemicals on growth, yield and economics of mango (*Mangifera indica* L.). Karnataka J Agric Sci. 2011; 24:362-365
9. Upreti KK, Reddy YTN, Prasad SRS, Bindu GV, Jayaram HL, Rajan S. Hormonal changes in response to paclobutrazol induced early flowering in mango cv. Totapuri. Sci. Hort. 2013; 150:414-418.
10. Zeevart JAD. Phytohormones and flower formation. In: Lethmi, DS; Goomvin, PB; Higgins TJ. (Eds.): Phytohormones and Related Compounds-A Comprehensive Treatise, Elsevier, North Holland, Biochemical Press. 1978; 2:191-327.