International Journal of Agricultural and Applied Sciences, December 2022, 3(2): 90-93
https://www.agetds.com/ijaas
ISSN: 2582-8053
https://doi.org/10.52804/ijaas2022.3216

Research Article

OPEN ACCESS

Special Horticultural Practices for Early Induction of Flowering in Mango (*Mangifera indica* L.) cv. Ratna

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(**Received:** 25/07/2022; **Revised:** 29/10/2022; **Accepted:** 13/11/2022)

ABSTRACT
The investigation was conducted at the College of Horticulture, Dapoli, Dist. Ratnagiri, Maharashtra during the year 2020-21 to assess the special horticultural practices on induction of flowering in mango (*Mangifera indica* L.) cv. Ratna. The experiment was laid out in Randomized Block Design with three replications and ten treatments *viz*; girdling on the first fortnight of October (T_1), girdling on the first fortnight of November (T_2), girdling on the first fortnight of October and November (T_3), girdling on first fortnight of October and tip pruning (T_4), girdling on the first fortnight of November and tip pruning (T_5), girdling on the first fortnight of October and November and tip pruning (T_6), tip pruning (T_7), removal of new shoots below old shoot (T_8), smudging (T_9) and control (T_{10}). Removal of new shoots (T_7) resulted in early panicle emergence as compared to control. Treatment girdling on the first fortnight of November and tip pruning (T_5) exhibited the highest flowering intensity and hermaphrodite flower per panicle. It also maximum fruit set and fruit retention per panicle.
Keywords: Ratna, tip pruning, girdling, flowering, fruit set.

INTRODUCTION

Mango (*Mangifera indica* L.) is one of the oldest and most popular fruits having the adorable flavour and taste of the tropical world. It belongs to the genus *Mangifera* and the family Anacardiaceae. It originated from the Indo-Burma region from the genus *Mangifera* almost all the commercial cultivars of mango are included in single species *Mangifera indica* in India. It is the most important tropical fruit in the world. Mango is called the "King of the fruits". It has been variously called *Amra, Atisourabha, Chuta, Sahakara, and Rasala,* in ancient Sanskrit literature. Among the various commercial varieties, the variety Ratna was released by DBSKKV, Dapoli (M.S.). The parentage of Ratna is Neelum and Alphonso (1981). The tree is semi-dwarf in growth habit. The fruits are large ovate (400-500g) with firm and fibreless deep orange colour pulp. It is regular in bearing. It is excellent for processing as well as table purpose. Girdling is the removal of the bark in a circular manner of either branch or trunk of woody plants. Girdling stops the basipetal movement of assimilates through the phloem which results in the accumulation of carbohydrates above the girdle which ultimately helps for induction of early and assured flowering. Urban *et al*. reported that girdling is one of the ways to improve the earliness and intensity of flowering in mango. The demand for this variety is increasing day by day owing to good keeping quality and spongy tissue-free fruits. The induction of early flowering results in the early maturity of fruits. Such fruits earn greater rates in the market as compared to late-maturing fruits. The weather during the initiation of flowering in October and November play important role in the induction of flowering at the appropriate time. It is often noticed that climatic fluctuations in October-November lead to the production of vegetative flush instead of flowering flush. This new flush requires another 80-100 days to mature as a result, flowering is considerably delayed. Late flowering leads to delayed fruit development and harvesting. The late-harvested fruits fetch low market rates. It is often noticed that many of these new shoots do not produce flowers and hence the flowering is sparse which produces poor yield (Soudagar *et al*., 2018). The young flushes are cut back up to matured wood; the resulting flush can be a floral one. It not only causes a uniform flush of growth throughout the canopy but also removes growth and flower-inhibiting factors in the stem derived from the previous season's flowering and fruiting panicles. Shoot pruning reduce the auxin synthesis at the apex of the branches, directing the transport of assimilates and cytokinin's to the axillary buds of branches under flowering condition, inducing the formation of axillary inflorescences (Srivastava, 2002). Smudging is an ancient method of inducing mango to flower. It is practised in certain parts of the

Philippines to obtain early flowering of 'Carabao' and 'Pico' mango. Ethylene has been identified as the active agent responsible for flowering during smudging (Dutcher, 1972).

MATERIALS AND METHODS

The investigation was conducted on 30 years old mango trees (cv. Ratna) at the college of horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri (M.S.) India, Pin- 415712 located between 17°45' N latitude and 73°12' E longitude on West coast of Maharashtra. It has an altitude of 240 m from the MSL. The experiment laid out in randomized block design with three replications and ten treatments *viz*., girdling on first fortnight of October (T_1), girdling on first fortnight of November (T_2), girdling on the first fortnight of October and November (T_3), girdling on first fortnight of October and tip pruning (T_4), girdling on the first fortnight of November and tip pruning (T_5), girdling on the first fortnight of October and November and tip pruning (T_6), tip pruning (T_7), removal of new shoots below old shoot (T_8), smudging (T_9) and control (T_{10}). Each treatment was given two trees. The girdling was done on tertiary branches of the experimental tree by giving a circular deep cut with help of a sharp knife as per treatments. A total of 50 branches were girdled per experimental plant. On these plants, vegetative shoots emerged in November of the total new shoots. 200 shoots per experimental plant were removed at the point of emergence of mature shoots. The smudging was done in December. During smudging, the colour of newly emerged shoots was light green. Smudging was done early in the morning. On the previous day, materials like rice bran, and dry residues of the plant were collected at the base of the plant canopy. Then next day early in the morning smudging was done for about 2 hours. The entire process of smudging was performed four times at four days intervals. The data on the number of days for induction of flowering, flowering intensity (%), length of panicle (cm), the width of panicle (cm), rachis per panicle, hermaphrodite flowers percentage, fruit set (%) and fruit retention (%), number of days required for flowering to harvesting, yield was recorded. The data were analyzed by using statistical methods suggested by Panse and Sukhatme (1995)

RESULTS AND DISCUSSION

The data on the effect of girdling, tip pruning and smudging on induction of flowering presented in Table 1 indicates that they significantly influenced the flowering parameters in mango (cv. Ratna).

Days required for panicle emergence:

The early flowering (40.83 days) was observed in tip pruning (T_7) which was significantly superior over the control (131.33 days). Shoot pruning reduces the auxin synthesis at the apex of the branches, directing the transport of assimilates and cytokinins to the axillary buds of branches creating favourable conditions for flowering (Taiz and Zeiger, 2012). Gopu *et al*. (2014) found that minimum days (169 days) were required in the pruned tree as compared to the control (198 days) and showed uniform flowering per panicle in mango cv. Alphonso.

Flowering intensity:

The maximum flowering intensity (62.27%) was observed in girdling on the first fortnight of November and tip pruning (T_5) which was significantly superior over all other treatments. The minimum flowering intensity (26.67 %) was recorded in the control. Warning *et al*. (2019) recorded that maximum flowering intensity was observed by girdling in the first fortnight of September and removal of new shoots (65.67 %) as compared to control T_8 (27.33 %) in mango cv. Alphonso. Girdling is one of the ways to improve the earliness and intensity of flowering in mango cv. Cogshall (Urban *et al*., 2009). A higher percentage of flowering due to pruning treatments was mainly attributed due to the availability of photosynthetic solar radiation to the leaves which enhanced flowering (Lal and Mishra, 2007).

Panicle length (cm), Panicle width (cm) and No. of rachis per panicle:

The longest panicle (30.20 cm) was noticed in treatment girdling on the first fortnight of November and tip pruning (T_5) which was at par with T_8 (29.20 cm) and T_6 (28.83 cm). The shortest panicle (24.13 cm) was found in the treatment girdling on the first fortnight of November (T_2). The maximum width of the panicle (24.63 cm) was observed in treatment girdling on the first fortnight of November and removal of new shoots (T_5) and it was at par with T_3 (23.67cm) and T_4 (22.97 cm). The minimum panicle width (17.27cm) was found in the control (T_{10}). The highest number of rachises per panicle (31.57) was found in the treatment removal of new shoots below old shoot (T_8) which was at par with T_5 (30.63), T_4 (29.77), T_6 (29.77), T_3 (28.97). The lowest number of rachises per panicle (25.30) was recorded in girdling on the first fortnight of October (T_1) (Table 1). There was an increase in the length and width of the panicle as well as several rachides per panicle by girdling on the first fortnight of November and tip pruning (removal of new shoots). It may be due to the availability of more sugars and auxins in branches. Nachare (2020) observed the longest length of panicle in girdling on the first fortnight of September (31.37cm) in mango cv. Ratna. Shoot pruning was significantly effective in increasing the length and width of the panicle. Removal of new shoots leads to the formation of longer panicle lengths due to gross changes in endogenous hormonal levels (Singh *et al*., 2010). Shoot pruning reduces the auxin synthesis at the apex of the branches, directing the transport of assimilates and cytokinin's to the axillary buds of branches, creating favourable conditions for flowering (Taiz and Zeiger, 2012).

Hermaphrodite flower (%), Fruit set and fruit retention (%):

The data on hermaphrodite flower percentage, fruit set, fruit retention, days required from flowering to harvesting and yield are presented in Table 2. Treatment T_5 resulted in maximum hermaphrodite flowers (15.01 %), fruit set (8.53 %) with 0.95 per cent fruit retention and which was significantly superior over control. The highest number of hermaphrodite flowers (%) due to the removal of new shoots was also reported in the earlier studies in mango cv. Alphonso by Gopu *et al*., (2014). The control (untreated) resulted in minimum hermaphrodite flowers (10.98%), minimum fruit set (5.03%) and fruit retention (0.50%). Warang *et al*., (2019) reported that girdling on the first fortnight of the September and removal of new shoots produced highest fruit set per panicle in mango cv. Alphonso. Nachare (2020) also found same results in mango cv. Ratna.

Table 1. Effect of girdling tip pruning and smudging on number of days required for flower induction, flowering intensity and hermaphrodite flower of mango cv. Ratna.

Treatments	Days required for panicle emergence	Flowering intensity (%)	Panicle length (cm)	Panicle width (cm)	No rachis per panicle
T_1	91.33	38.33	26.30	20.87	25.30
T_2	76.33	43.33	24.13	19.97	28.33
T_3	94.17	41.67	25.10	23.67	28.97
T_4	64.83	59.17	25.20	22.97	29.77
T_5	44.67	62.27	30.20	24.63	30.63
T_6	77.33	60.83	28.83	21.57	29.77
T_7	40.83	52.50	27.67	19.67	26.73
T_8	42.33	42.50	29.20	19.97	31.57
T_9	65.50	32.50	27.47	20.40	27.67
T_{10}	131.33	26.67	25.57	17.27	26.20
CD at 5%	6.63	6.70	1.92	2.73	2.72

Table 2. Effect of girdling tip pruning and smudging on fruit set and fruit retention per panicle of mango cv. Ratna.

Treatments	Hermaphrodite flower (%)	Fruit set	Fruit retention (%)	Days required from flowering to harvesting	Yield (no of fruits /tree)	Yield (kg/ tree)
T_1	12.43	6.30	0.64	150.33	106.67	43.08
T_2	12.17	6.00	0.59	149.67	102.50	41.81
T_3	12.07	5.73	0.57	156.33	101.50	41.48
T_4	14.50	7.30	0.77	147.50	116.33	49.45
T_5	15.01	8.53	0.95	141.07	145.00	61.58
T_6	14.75	8.23	0.87	155.73	134.67	58.10
T_7	13.30	6.70	0.72	134.87	126.33	55.23
T_8	12.10	5.97	0.57	141.67	108.50	48.45
T_9	11.31	5.42	0.55	149.33	100.00	40.52
T_{10}	10.98	5.03	0.50	165.00	88.33	29.47
CD at 5%	1.50	0.33	0.06	7.16	7.89	3.30

Days required from flowering to harvest:

The minimum days required for flowering to harvest were recorded in treatment T_7 -tip pruning (141.07 days) which was significantly superior among all other treatments. Tip pruning facilitated early flowering and harvesting in mango cv. Ratna. It increases photosynthate translocation to flower buds which result in earlier fruit set which lead to early harvest than control (Lal *et al*., 2000). Soudagar *et al*. (2018) exhibited that the minimum number of days required for harvesting in tip pruning by retaining 2 leaves in mango cv. Alphonso. Similar results were observed by Warang *et al*. (2019) in mango cv. Alphonso and Nachare (2020) in mango cv. Ratna.

Yield:

The treatment T_5 was maximum fruit yield 145 (fruits per tree) or 61.58 kg/ tree. Treatment T_7 were required minimum days (134.67 days) from flowering to harvesting which was superior over all other treatments. Girdling can improve carbohydrate availability to fruits and as a consequent lead to an increased fruit set percentage with decreased bud drop due to branch girdling it also leads to increase maximum number of fruit per shoots and maximum fruit weight which help to increased fruit yield kg per plant and fruit yield kg per hectare (Goren *et al*., 2003). Shinde *et al*. (2014) noticed the highest number of fruits per plant in T_1 (ringing during the first fortnight of May) in cv. Alphonso. Ghadage *et al*. (2017) girdling on 15th July produced a

significantly maximum yield (94.20kg/plant) in mango cv. Alphonso. This may be due to girdling which improved carbohydrate availability to earlier development of fruit and even the removal of new shoots may have stopped the translocation of food to new vegetative growth. The present findings are similar lines with Warnag *et al*., (2019) in mango cv. Alphonso and Nachare (2020) in mango cv. Ratna.

CONCLUSION

The trial conducted those special horticultural practices viz. girdling, removal of new shoots (tip pruning) and smudging in mango cv. Ratna was beneficial for early induction of flowering and early harvesting. Among all treatments, T_7 (removal of new shoots) was best for early induction of flowering and early harvesting. Treatment T_5 (girdling on the first fortnight of November and tip pruning) was best for the highest hermaphrodite flowers, maximum fruit set and retention and also contributed to the highest yield with greater appreciation concerning rate in the market. Girdling, removal of new shoots and smudging did not influence the physiochemical composition of mango.

REFERENCES

Dutcher, R.D. 1972. Induction of early flowering in 'Carabao' mango in the Philippines by smudging and ethephon application. *Hort. Science*. **7**: 343.

Ghadage, N. J., Patil, S. J., Khopade, R. Y., Shah, N. I. and Hiray, S. A. 2017. Effect of time and width of girdling on flowering and yield of mango (*Mangifera indica* L.) cv. Alphonso. *International Journal of Chemical Studies*; **5**(6): 1580-1583.

Gopu, B., Balamohan, T. N., Soman, P. and Jeyakumar, P. 2014. Canopy management in mango (*Mangifera indica* L.) cv. Alphonso with reference to flowering, yield and quality characters under ultra-high-density planting. *Journal of Applied Horticulture*., **16**(1): 50-53.

Lal, B. and Mishra, D. 2007. Effect of pruning on growth and bearing behaviour of mango cv. Chausa. *Indian J. Hort*., **64**: 268-70.

Nachare, S. 2020. Effect of various non-chemical means on induction of flowering, fruit set and yield of mango (*Mangifera indica* L.) cv. Ratna. M.Sc. Thesis, Dr.B.S.K.K.V. Dapoli, India.

Panse, V. G. and Sukhatme, P. V. 1995. Statistical methods for Agricultural Workers. ICAR Rev. Ed. By Sukhatme, P. V. and Amble, V. N. pp. 97 - 156.

Singh, S. K., Singh, S. K. and Sharma, R. R. 2010. Pruning alters fruit quality of mango cultivars (*Mangifera indica* L.) under high density planting. *J. Trop. Agric*., **48**: 55-57.

Soudagar, T. P., Haldankar, P. M., Parulekar, Y. R., Dalvi, V. V. and Ghule, V. S. 2018. Study on effect of tip pruning on induction of flowering and harvesting in Alphonso mango. *Indian J. Hort*. **75**(4): 709-712.

Srivastava, L. M. 2002. Plant growth and development: hormones and the environment. New York: Academic Press.

Taiz, L. and Zeiger, E. 2012. *Fisiologia vegetal*. 5. *ed*. Porto Alegre: Artmed.

Urban, L. M., Lechaudel, M. and Alphonsout, L. 2009. The effect of girdling on flowering and leaf net photosynthesis in mango cv. Cogshall. *Acta Horticulturae*, **820**: 251-258.

Citation: R.D. Aghav*, P.M. Haldankar, Y.R. Parulekar, K.V. Malshe and V.V. Dalvi 2022. Special Horticultural Practices for Early Induction of Flowering in Mango (*Mangifera indica* L.) cv. Ratna**.** *International Journal of Agricultural and Applied Sciences*, 3(2): 90-93.
https://doi.org/10.52804/ijaas2022.3216