



## **Effect of foliar application of growth retardants for induction of flowering under climatic fluctuations in mango Cv. Alphonso**

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### **ABSTRACT**

Konkan region of Maharashtra is known for best quality mango of cv. Alphonso production which is well known in domestic market as well as export from India. The performance of Alphonso is recently influenced by climatic fluctuations such as delay rain which are quite frequent in this region. The delayed rain results in induction of vegetative flush instead of flowering during the month of November-December which is normal flowering season. The delay in flowering results in late harvesting of fruits which fetches low price in market causing considerable economic loss to mango growers. An attempt was made to hasten the maturity of this post monsoon vegetative flush by foliar application of growth retardants viz., Cycocel and paclobutrazol, so as to induce flowering at appropriate time in mango. The experiment was conducted at Department of Horticulture, College of Agriculture, Dr. BSKKV, Dapoli (MS), India, in Randomized Block Design with seven treatments of different concentrations of PGR's viz., T<sub>1</sub> (CCC @ 1500 ppm), T<sub>2</sub> (CCC @ 2500 ppm), T<sub>3</sub> (CCC @ 3500 ppm), T<sub>4</sub> (PBZ @ 500 ppm), T<sub>5</sub> (PBZ @ 1000 ppm), T<sub>6</sub> (PBZ @ 2000 ppm), T<sub>7</sub> (Control) which were replicated three times. The foliar application of Paclobutrazol @ 1000 ppm (T<sub>5</sub>) induced early flowering by two weeks as compared to control. The treatment also registered maximum flowering intensity, higher hermaphrodite flowers percentage, fruit set and fruit retention panicle<sup>-1</sup>, early harvest along with high fruit yield and maximum B:C ratio.

**Keywords:** Mango, Alphonso, paclobutrazol, cycocel, flowering, fruit set, yield.

Received 21.09.2019

Revised 20.10.2019

Accepted 05.11.2019

### **INTRODUCTION**

Mango orchards in Konkan region of Maharashtra are facing declining growth in recent time due to decrease in yield and productivity. In spite of paclobutrazol application for induction of regular flowering recently it is often observed that climatic aberrations especially delayed monsoon, abnormal rain especially during September-October delayed the arrival of winter cool nights. It lead to production of vegetative flush instead of flowering flush. This new vegetative flush take extra 80-100 days to mature and produce flowers. The delayed flowering leads to delay in fruits development and harvesting. Induction of early flowering results in early maturity of the mango fruits which fetch the greater rate in the market. The pre-monsoon rain may often spoils the appearance and quality of these late developing fruits. Hence it is utmost important to develop a practical solution so as to induce appropriate flowering from newly emerged vegetative flush. Use of foliar application of growth regulators such as paclobutrazol, cycocel for induction of proper flowering in various fruit crops. The present study was therefore taken up to study the influence of foliar application of paclobutrazol and cycocel on induction of flowering and yield attributes in mangocv. Alphonso.

### **MATERIAL AND METHODS**

The experiment was conducted in the mango orchard of cv. Alphonso at plot No. 14, Department of Horticulture, College of Horticulture, Dr. BSKKV, Dapoli (M.S.), India during 2016-2017. The mango tree of

cv. Alphonso which were of age 35 years and uniformly grown under proper management condition were selected. The trial was conducted in randomized block design with seven treatments viz., T<sub>1</sub> (CCC @ 1500 ppm), T<sub>2</sub> (CCC @ 2500 ppm), T<sub>3</sub> (CCC @ 3500 ppm), T<sub>4</sub> (PBZ @ 500 ppm), T<sub>5</sub> (PBZ @ 1000 ppm), T<sub>6</sub> (PBZ @ 2000 ppm), T<sub>7</sub> (Control). The treatments were replicated three times with unit of three plants per treatment per replication.

As per the treatment the foliar spray of growth retardants were applied twice. The observations recorded were days required for induction of flowering from spraying, length and breadth of panicle (cm), flowering intensity (%), hermaphrodite flowers (%), fruit set and fruit retention (%), days required for harvesting from flowering and yield (fruits tree<sup>-1</sup> and kg tree<sup>-1</sup>). The data were analysed statistically [1]

## RESULTS AND DISCUSSION

The treatment T<sub>5</sub>(60.22) took minimum number of days required for induction of flowering and which was at par with T<sub>4</sub> (62.00 days) whereas control, it required(73.44 days)number of days for induction of flowering was recorded in (T<sub>7</sub>) which was the maximum (Table 1). Paclobutrazol is a gibberellins biosynthesis inhibitor, which results in controlling the vegetative growth of the plants and giving rest to the plants which might have resulted in accumulation of carbohydrates in the shoots leading to their maturity. The reduced endogenous levels of gibberellins resulted in early flowering in mango [2].

The maximum length of panicle was noticed in T<sub>5</sub>(18.43 cm) which was significantly superior over all the treatments and the minimum length of panicle was noticed in T<sub>7</sub>(12.46 cm). The maximum breadth of panicle was found in T<sub>5</sub>(11.60 cm) which was at par with T<sub>4</sub> (11.24 cm) whereas minimum breadth of panicle was recorded in T<sub>7</sub> (8.43 cm)[3, 4, 5].The highest (60.39 %) flowering intensity and hermaphrodite flowers(19.94 %) were observed in T<sub>5</sub> which was significantly superior over all the treatments. The lowest (43.29 %) flowering intensity and hermaphrodite flowers (11.03 %)were recorded in T<sub>7</sub>.The present findings are in accordance with the foliar application of paclobutrazol increased number of perfect flowers in mango [6, 3]. In general, foliar sprays of cycocel and paclobutrazol induce early flowering, flowering intensity, total number of flowers and higher percentage of hermaphrodite flowers as compared to control which might be due the anti-gibberellins activity, in which they reduce indigenous GA levels and increase auxin and cytokinin level which might have been resulted in production of higher percentage of hermaphrodite flowers [7].

T<sub>5</sub> exhibited the maximum fruit set panicle<sup>-1</sup>(11.51) and fruit retention (0.31%) which was significantly superior over all the treatments (Table 2). The minimum (7.78) fruit set panicle<sup>-1</sup>and fruit retention were noticed in T<sub>7</sub>. Similar findings were supported [8] for better fruit set panicle<sup>-1</sup> in paclobutrazol treated trees of mango cv. Alphonso. The exogenous foliar application of growth retardants before the initiation of floral primordial seems to have blocked the inhibitory primordial, ultimately flowering and improved fruit set is resulted in the following year, as well as fruit retention was maximum on Alphonso mango trees treated by paclobutrazol[9].It had detrimental effect on fruit retention, probably because of the reduced leaf area resulting from the treatment of paclobutrazol and maintained highest number of fruits at marble stage with lowest fruit dropping [2]. The minimum days required for harvesting from flowering inT<sub>5</sub>(101.02 days) which was significantly superior over all the treatments. The maximum days required for harvesting was T<sub>7</sub> (109.30 days) from flowering. It might be due to early induction of flowering than control in respective treatments. The advancement of harvesting time in case of paclobutrazol application in mango cv. Banganpalli has been reported in India [10].

**Table: 1. Effect of foliar application of plant growth regulators on days required for induction of flowering, length of panicle (cm), breadth of panicle (cm.), flowering intensity (%), hermaphrodite flowers (%) in mango cv. Alphonso.**

Treatments	Days required for induction of flowering	Length of panicle (cm)	Breadth of panicle (cm.)	Flowering intensity (%)	Hermaphrodite flowers (%)
T <sub>1</sub>	65.44	14.26	10.32	51.10	16.11
T <sub>2</sub>	72.87	13.46	8.81	45.44	13.48
T <sub>3</sub>	71.44	14.05	9.85	47.25	14.26
T <sub>4</sub>	62.00	17.43	11.24	54.68	17.71
T <sub>5</sub>	60.22	18.43	11.60	60.39	19.94
T <sub>6</sub>	65.37	17.11	11.06	49.82	16.86
T <sub>7</sub>	73.44	12.46	8.43	43.29	11.03
<b>Mean</b>	<b>67.26</b>	<b>15.31</b>	<b>10.18</b>	<b>50.28</b>	<b>15.63</b>
<b>S.E. ±</b>	1.10	0.32	0.39	1.85	0.32
<b>C.D. at 5%</b>	3.40	0.99	1.20	5.69	0.99

**Table: 2. Effect of foliar application of plant growth regulators on fruit set panicle<sup>-1</sup> (%), fruit retention panicle<sup>-1</sup> (%), spongy tissue (%), days required for harvesting from flowering, yield (no. of fruit plant<sup>-1</sup> and kg. of fruits plant<sup>-1</sup>) in mango cv. Alphonso.**

Treatments	Fruit set panicle <sup>-1</sup> (%)	Fruit retention panicle <sup>-1</sup> (%)	Days required for harvesting from flowering	Yield		
				No. of fruit plant <sup>-1</sup>	Kg. of fruits plant <sup>-1</sup>	Yield ha <sup>-1</sup> (t ha <sup>-1</sup> )
T <sub>1</sub>	10.70	0.29	104.88	158.77	37.81	3.78
T <sub>2</sub>	10.04	0.26	106.41	154.22	37.33	3.73
T <sub>3</sub>	10.33	0.28	105.78	155.67	37.44	3.74
T <sub>4</sub>	11.34	0.30	104.21	167.00	40.59	4.06
T <sub>5</sub>	11.51	0.31	101.02	173.00	42.88	4.29
T <sub>6</sub>	10.82	0.29	104.80	160.33	39.48	3.95
T <sub>7</sub>	7.78	0.24	109.30	140.22	33.47	3.35
<b>Mean</b>	<b>10.36</b>	<b>0.28</b>	<b>105.20</b>	<b>158.46</b>	<b>38.43</b>	<b>3.84</b>
<b>S.E. ±</b>	0.02	0.001	0.32	4.60	1.12	0.11
<b>C.D. at 5%</b>	0.05	0.003	1.00	14.17	3.44	0.34

The highest number of fruits plant<sup>-1</sup> were recorded in treatment T<sub>5</sub> (173.00 fruits plant<sup>-1</sup>) which was at par with T<sub>4</sub> (167.00 fruits plant<sup>-1</sup>) and T<sub>6</sub> (160.33 fruits plant<sup>-1</sup>). The lowest yield was found in T<sub>7</sub> (140.22 fruits plant<sup>-1</sup>). The increase in number of fruits due to higher percent of reproductive shoots, hermaphrodite flowers and more number of fruits retained till to maturity stage. The results are analogous to the findings reported by [11] in mango cv. Neelum where the Paclobutrazol applied tree recorded the maximum number of fruits.

The increase in yield may due to the growth retardants (paclobutrazol) alter the source-sink relation in the plant and directly or indirectly relocate carbohydrate resource, suppressing the vegetative growth and increasing yield [7]. It might be due to the cumulative effect of profuse flowering, increased fruit set and retention at marble and maturity stage panicle<sup>-1</sup>. An increase in production was also achieved [12] in mango by application of paclobutrazol. Application of paclobutrazol had increased the yield [13].

#### Conclusion:

The present investigation concluded that the foliar application of plant growth regulators after induction of new vegetative shoots after monsoon was beneficial to hastened the maturity of post monsoon vegetative flush and induction of early flowering, better flowering intensity and hermaphrodite flowers, fruit set and retention early harvesting in Alphonso mango. Among various treatments T<sub>5</sub> (PBZ @ 1000 ppm) was the best for early flowering 13.22 days and early harvesting by 8.28 days than control with promising yield (42.88 kg plant<sup>-1</sup>).

#### ACKNOWLEDGEMENT

The present investigation was carried out under the Niche area of Excellence project entitled "Crop regulation for increasing productivity of Alphonso mango under climatic conditions in Konkan region" sanctioned and funded by Division of Agricultural Education, Indian Council Of Agricultural Research, Pusa, New Delhi

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#### CITATION OF THIS ARTICLE

A. P. Jadhav, P. M. Haldankar, Y. R. Parulekr, B. R. Salvi, M. M. Burondkar, S. B. Thorat, A. V. Bhuwad and O. A. Nirmal. Effect of foliar application of growth retardants for induction of flowering under climatic fluctuations in mango Cv. Alphonso. *Bull. Env. Pharmacol. Life Sci.*, Vol 8 [Suppl. 1] November 2019: S32-S35