

Crop Regulation in Pomegranate : I. Effect of Growth Regulators on Flower Induction, Sex Expression and Flower Drop

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Abstract The studies carried out to regulate flowering in pomegranate, indicated that hand removal of flowers induces more flowers. MH (1000 ppm), Carbaryl (7000 ppm), GA (20 ppm), NAA (250 to 500 ppm) and Ethrel (250 to 500 ppm) produced less flowers than control. Ethrel at 500 ppm was the most effective in thinning the flowers. GA induced more male flowers and less hermaphrodite flowers. Ethrel, MH and Carbaryl induced more hermaphrodite flowers.

Key words Pomegranate, Flower thinning, Growth regulators

Recently, Maharashtra has become the leading province of India in pomegranate (*Punica granatum*) cultivation, occupying 25,000 ha and sharing over 90% area under the crop in the country. Under the prevailing semi-tropical conditions, pomegranate bears mostly on current seasons' shoot. Consequently, with each irrigation, shoot continues to grow and flower even up to harvest. At present, harvesting of the fruits which are set during first 75 days is advocated. The remaining flowers that appear after 75 days are removed manually, otherwise, the fruits that set late in the season do not mature and affect the quality of earlier set fruits. Expansion in cultivation, increase in labour charges and unavailability of labourers sometimes, make it difficult to carry out this by hand. Research work in other fruit crops has shown that growth regulators can be used to thin the flowers (Hoda 1984). No such studies have been reported in pomegranate. Therefore, the present investigation was taken up to regulate the flowering in pomegranate employing growth regulators.

Materials and Methods

The investigation was conducted on seven year old pomegranate cv. *Ganesh* plants at the Post Graduate farm, Department of Horticulture, Mahatma Phule Agricultural University, Rahuri. Fifteen treatments were replicated thrice each with 5 plants in a randomised block design. The treatments were imposed after 75 days of commencement of flowering. In case of control (T₁), the plants were left as such. In T₂ treatment, all the flowers present on 75th day were removed by hand and

thereafter at 14 days interval till harvest. In T₃, all the flowers were removed only on 75th day, and on the same day, 20 ppm GA was sprayed. In T₅ and T₆, the spray of the second chemical was given after 6 h of the first chemical spray.

To take the initial flower count, all the flowers and fruits present on the tree were counted. The flowers induced by the treatment were computed by subtracting the initial flower count from the total fruits and flowers either harvested or dropped. In T₂ and T₃, where the flowers were removed and such flowers were considered as dropped flowers. When the count of flowers was being taken, sex of individual flowers was noted as described by Sonawane and Desai (1989).

Results and Discussion

Hand thinning induced flower initiation, while the chemical sprays inhibited the flower induction with the maximum inhibition with Carbaryl followed by MH (Table 1). The induction of flowering by hand removal might be due to endogenous production of ethylene caused by the injury (Roberts & Hooley 1988). GA is reported to have flower inhibition effect in different fruits (Hoda 1984). Ethrel has been found as flower inducing chemical in many crops (Roberts & Hooley 1988). MH and Carbaryl act as anti-auxins and their effect on significant reduction in flower production was observed as also noted by Krishnamoorthy (1981).

Most of the treatments were found to alter the sex expression (Table 1). GA induced significantly more male flowers while Ethrel application ap-

Table 1 Flower Produced and dropped after treatment application

Treatment	Before treatment (Tree ⁻¹)	After treatment								
		Produced				Dropped				
		Total (Tree-1)	Male (%)	Her-mphro-dite	Inter-mediate	Total Tree-1	(%)	Male	Her-meph-rodite	Inter-mediate
T ₁ Control	37.2	134.5	60.7	18.9	20.4	141.3	82.2	60.7	9.5	12.1
T ₂ Hand removal	36.1	148.8	70.5	14.2	15.3	184.9	100.	70.5	14.2	15.3
T ₃ Hand removal + 20 ppm GA	37.3	82.2	79.9	99.6	10.4	108.2	90.5	79.9	5.5	5.1
T ₄ 500 ppm NAA	40.1	93.3	62.4	19.6	17.9	110.2	82.8	62.4	11.3	9.1
T ₅ 250 ppm NAA + 7000ppm carbaryl	39.4	85.3	60.8	22.9	16.3	99.3	79.7	60.8	10.1	8.8
T ₆ 500 ppm NAA + 7000 ppm carbaryl	42.4	92.1	60.9	20.3	18.7	113.3	84.3	60.9	12.2	11.1
T ₇ 500 ppm NAA + 100 ppm MH*	36.9	100.9	60.8	23.0	16.1	113.1	82.1	60.8	10.3	10.9
T ₈ 250 ppm Ethrel + 100 ppm NAA*	38.5	94.8	56.2	229	20.9	112.3	84.2	56.2	14.8	13.3
T ₉ 500 ppm Ethrel + 100 ppm NAA*	39.5	125.4	49.8	25.3	24.8	147.4	89.4	49.8	20.4	19.1
T ₁₀ 250 ppm Ethrel + 20 ppm GA*	38.5	92.4	60.9	19.1	19.9	111.9	85.6	60.8	11.6	13.1
T ₁₁ 500 ppm Ethrel + 20 ppm GA*	40.5	119.2	54.8	23.0	22.1	144.7	90.6	54.8	18.1	17.7
T ₁₂ 0.6% Carbaryl	34.3	71.5	62.8	21.0	16.2	82.3	77.8	62.8	8.5	6.5
T ₁₃ 1000 ppm MH	38.6	79.9	55.3	25.6	19.1	94.1	79.4	55.3	12.5	11.7
T ₁₄ 250 ppm Ethrel	40.2	94.6	52.6	25.2	23.1	113.3	83.8	51.6	16.3	15.9
T ₁₅ 500 ppm Ethrel	30.7	120.4	48.2	26.9	24.9	142.5	88.7	48.2	22.1	18.3
SE±	30.7	8.3	6.7	1.3	1.8	15.8	2.41	6.7	2.6	1.6
CD at 5%	NS	23.6	18.9	3.8	5.1	42.8	6.8	18.9	7.5	4.4

* Spray after 14 days

prepared to induce less male flowers. GA also reduced the percentage of hermaphrodite flowers, while Ethrel, Carbaryl and MH induced more hermaphrodite flowers. In many crops, GA has been found to favour maleness (Krishnamoorthy 1981), Ethrel to favour femaleness and suppress maleness (Patil *et al.* 1983).

Normally, in pomegranate, the flower drop is mainly constituted by male (60.7%) followed by intermediate (12.1%) and hermaphrodite (9.5%) flowers. Here, the total number of flowers dropped may not be an indication of efficacy of the chemical to thin the flowers. Because, the production of flowers differed with the chemicals and the male flowers also dropped naturally. Therefore, the percentage drop of hermaphrodite flowers which mostly set the fruits, and the drop of intermediate flowers are to be considered. On this basis, Ethrel at 500 ppm was the most effective. Ethrel is known for its abscission action (Roberts & Hooley 1988). Carbaryl has been used as thinning agent (Windle & Dam 1989). In the present study with NAA, it

could influence the flower thinning but results were not appreciable.

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