

## Crop Regulation in Pomegranate : II. Effect of Growth Regulators on Fruit Set, Yield and Fruit Quality

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**Abstract** Studies on crop regulation were carried out on pomegranate cv. Ganesh. It involved Ethrel, GA, NAA, MH, Carbaryl as also mechanical removal of flowers. The treatments were found to influence fruit drop, total fruit number, its quality, yield, and number of fruits in different grades. On the basis of net increase in monetary returns over control, application of 250 ppm NAA followed by 0.7% Carbaryl on the same day, after 75 days of commencement of cropping was found to be the best. It also resulted in higher grade fruits of better quality with no phyto-toxic effects.

**Key words** Pomegranate, Crop regulation, GA, NAA, MH, Carbaryl

Crop regulation in pomegranate in Maharashtra's semi-arid regions is important in order to improve fruit quality and yield. Research efforts on different aspect of flowering in this region were reported earlier (Ahire *et al.* 1993). In this paper, the findings in respect of yield and related aspect are catalogued.

### Materials and Methods

The treatments and design of experimentation was the same as reported earlier (Ahire *et al.* 1993). As regard the observations, the fruits present on the tree on 75th day (at the time of treatment application) were counted. Thereafter, at regular interval, the dropped fruits were counted. As and when the fruits were matured, they were harvested. At end of cropping, the immature fruits, present on the tree were also counted and considered unmarketable. The harvested fruits, immature fruits and the dropped fruits were summed up. From this, the count of fruits present on 75th day was subtracted to work out the number of fruits set after treatment imposition.

The individual fruit was weighed to get the total yield by weight as also to sort out the fruits into A (Above 300 g), B (200 to 299 g), C (150 to 199 g) and D (below 149 g) grade as per Sonowane and Desai (1989).

To work out the receipts of produce, in terms of money, the prices prevailing in Bombay market at the time of harvesting were considered. While

working out the total cost, the expenditure incurred by the treatments, such as harvesting, packaging and marketing charges resulting from increase or decrease in crop load were also taken into consideration in addition to other expenditure items.

### Results and Discussion

In present investigation, three lines of approaches were envisaged to control the flowers that are produced after 75 days of commencement of cropping so as to have optimum harvest of high grade fruits. These were ; (1) to thin the flowers (ethrel, NAA and Carbaryl), (2) to check induction of new flowers (GA), and (3) to check shoot growth (MH), so that the flowers and ultimately the fruit production is reduced since the flowers appear on current seasons growth. Further, to avoid deleterious effects of some chemicals (Ethrel), subsequent application of 20 ppm GA or 100 ppm NAA was done. Besides, to have added effects in desired direction, NAA was followed by Carbaryl and MH.

*Number of fruits* : As anticipated, less fruits were set after the application of treatments (Table 1). The treatment of hand removal of flower was fully effective. It was followed by hand removal of flower + 20 ppm GA, 500 ppm Ethrel + 20 ppm GA, 500 ppm Ethrel + 100 ppm NAA, 500 ppm Ethrel, and 250 ppm Ethrel + 20 ppm GA. However, the treatments also had significant influence on fruit drop, production of marketable fruits (Table 2) and fruit grade (Table 3).

Table 1 Total fruits (number tree<sup>-1</sup>)

Treatment		Fruits present before treatment application	Fruits set after treatment	Total
T <sub>1</sub>	Control	84.1	30.5	114.6
T <sub>2</sub>	Hand removal of flowers	77.6	0.0	77.6
T <sub>3</sub>	Hand removal of flowers + 20 ppm GA	71.8	11.3	83.1
T <sub>4</sub>	500 ppm NAA	67.0	23.0	90.0
T <sub>5</sub>	250 ppm NAA + 0.7% Carbaryl	76.8	25.3	102.1
T <sub>6</sub>	500 ppm NAA + 0.7% Carbaryl	64.7	21.1	85.9
T <sub>7</sub>	500 ppm NAA + 1000 ppm MH	77.6	24.7	102.3
T <sub>8</sub>	250 ppm Ethrel + 100 ppm NAA	73.1	21.0	94.1
T <sub>9</sub>	500 ppm Ethrel + 100 ppm NAA	73.0	17.5	90.5
T <sub>10</sub>	250 ppm Ethrel + 20 ppm GA	80.2	18.8	99.0
T <sub>11</sub>	500 ppm Ethrel + 20 ppm GA	77.2	15.0	92.2
T <sub>12</sub>	0.7% Carbaryl	75.5	23.6	99.0
T <sub>13</sub>	1000 ppm MH	79.1	24.4	103.5
T <sub>14</sub>	250 ppm Ethrel	67.9	21.9	89.8
T <sub>15</sub>	500 ppm Ethrel	70.9	18.1	89.0
	SE±	4.0	2.5	—
	CD at 5%	N.S.	7.1	—

Table 2 Number of fruits dropped and harvested tree<sup>-1</sup>

Treat- ment	Fruits dropped	Fruits harvested						
		Marketable		Unmarketable		Total		
		Number	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)	
T <sub>1</sub>	14.6	87.2	16.9	12.8	1.25	100.0	18.1	
T <sub>2</sub>	4.4	66.3	15.2	6.6	0.45	72.9	15.7	
T <sub>3</sub>	11.7	67.2	17.1	4.2	0.30	71.4	17.4	
T <sub>4</sub>	15.5	70.0	14.9	4.5	0.44	74.5	15.3	
T <sub>5</sub>	11.5	81.5	18.7	9.1	0.80	90.6	19.5	
T <sub>6</sub>	19.6	62.1	13.5	4.1	0.40	66.3	13.9	
T <sub>7</sub>	15.7	77.5	14.8	9.1	0.90	86.7	15.7	
T <sub>8</sub>	10.6	77.8	16.4	5.7	0.52	83.5	16.9	
T <sub>9</sub>	15.8	69.5	15.4	5.1	0.40	74.6	15.8	
T <sub>10</sub>	14.8	78.8	16.3	5.3	0.40	84.1	16.7	
T <sub>11</sub>	16.9	70.5	15.5	4.8	0.36	75.3	15.8	
T <sub>12</sub>	12.0	80.2	14.9	6.8	0.42	87.0	15.3	
T <sub>13</sub>	15.2	76.6	14.2	11.7	0.80	88.3	15.0	
T <sub>14</sub>	9.3	75.1	15.2	5.4	0.41	80.5	15.6	
T <sub>15</sub>	14.8	68.9	15.0	5.3	0.36	74.2	15.3	
	SE±	1.4	3.1	0.9	1.3	0.19	4.6	1.0
	CD at 5%	4.2	8.9	2.7	3.7	0.54	13.0	2.9

Table 3 Number of fruit tree<sup>-1</sup> (grade wise), average fruit weight, TSS, acidity and net returns

Treatment	Fruits harvested/tree as per fruit grade					Average fruit wt. (g)	TSS (%)	Acidity (%)	Net returns (Rs ha <sup>-1</sup> ) over control
	A (> 300 g)	B (200 to 299 g)	C (150 to 199 g)	D (< 150g)	Immature				
T <sub>1</sub>	10.1	20.1	25.9	31.2	12.7	181.2	14.5	0.44	—
T <sub>2</sub>	10.9	25.3	18.1	12.0	6.6	215.1	14.2	0.41	302.8
T <sub>3</sub>	16.5	29.4	11.3	10.0	4.2	244.2	14.8	0.42	8674.7
T <sub>4</sub>	10.3	20.9	20.3	18.4	4.5	205.5	15.9	0.42	-3497.5
T <sub>5</sub>	12.4	30.8	25.9	12.4	9.1	215.1	15.9	0.38	8834.1
T <sub>6</sub>	9.9	20.6	17.9	13.7	4.1	210.2	16.0	0.41	-7983.6
T <sub>7</sub>	11.0	21.4	20.8	24.3	9.1	181.5	16.1	0.42	-721.8
T <sub>8</sub>	10.3	27.0	25.7	14.7	5.8	203.2	15.0	0.39	4252.6
T <sub>9</sub>	11.9	22.0	19.8	15.7	5.1	211.7	16.1	0.41	-1424.2
T <sub>10</sub>	10.6	27.3	24.1	16.7	5.4	198.5	14.9	0.40	2791.5
T <sub>11</sub>	12.1	24.0	20.0	14.4	4.8	210.5	16.0	0.41	-151.3
T <sub>12</sub>	9.6	24.3	25.9	20.4	6.8	175.8	14.8	0.43	-432.4
T <sub>13</sub>	10.0	26.4	20.9	19.4	11.7	169.8	14.2	0.41	60.4
T <sub>14</sub>	10.1	26.3	23.2	15.5	5.4	194.2	13.9	0.44	1605.0
T <sub>15</sub>	11.9	23.7	19.7	13.6	5.3	207.3	15.9	0.41	194.2
SE±	1.6	1.9	1.4	2.5	1.3	11.9	0.17	0.01	—
CD at 5%	4.6	5.6	4.0	7.1	3.7	33.9	0.48	0.03	—

Fruit drop in different treatments was 4.77 to 19.65 (Table 2). The marketable fruit number varied from 62.13 to 87.25 and the yield from 13.53 to 18.52 kg tree<sup>-1</sup> (Table 2). The unmarketable fruits varied from 4.15 to 12.76 and the yield from 0.30 to 1.25 kg tree<sup>-1</sup> (Table 2). The total fruit number was from 66.28 to 100.01 and weight from 13.93 to 18.12 kg tree<sup>-1</sup>. Thus, treatments showed significant influence on the production attributes mainly monitored by their effect on flower drop (Ahire *et al.* 1993). Effectiveness of chemicals in crop regulation have also been reported by Basak *et al.* (1988), Gupta and Nijjar (1982) and Windle and Dam (1989).

The highest number of marketable and unmarketable, and consequently the total fruit number was more in control (Table 2). However, the highest marketable fruit weight (18.72 kg) was in 250 ppm NAA + 0.7% Carbaryl followed by hand removal of flowers + 20 ppm GA (17.13 kg).

**Fruits size and grade :** Besides influencing fruit drop, fruit number and total yield, the chemicals also have a role in fruit size and quality of individual

fruit. Fruit size is normally influenced by the crop load. However, growth regulators also have promoting or inhibiting effect on fruit size. In present investigation, the overall fruit size was significantly reduced by 1000 ppm MH (169.8 g), 0.7% Carbaryl (175.8 g) and 500 ppm NAA + 1000 ppm MH, though they had less crop load than control. On the contrary, T<sub>3</sub> (244.2 g), T<sub>5</sub> (210.5 g), T<sub>2</sub> (215.1 g), T<sub>11</sub> (210.5 g) and T<sub>6</sub> (210.2 g) gave higher overall average fruit weight (Table 3).

The price fetched by the fruits is much influenced by fruit grade in pomegranate. In present study, the fruits were classified into four grades and the economics was worked out. Since the number of fruits of different grades vary in different treatments (Table 3), the net returns over control was the test criterion, rather than total fruit number or yield, to evaluate the efficacy of the treatments for economic returns. It was observed (Table 3) that eight treatments (T<sub>2</sub>, T<sub>3</sub>, T<sub>5</sub>, T<sub>8</sub>, T<sub>10</sub>, T<sub>13</sub>, T<sub>14</sub> and T<sub>15</sub>) revealed increased net returns over the control. The treatment-5 and Treatment-3 had more fruits of higher grade (Table 3) and fetched Rs. 8834.10 and 8674.7 ha<sup>-1</sup> as net return over control

(Table 3). Furthermore there were no phytotoxic effects with these treatments and the fruit quality (Table 3) in terms of TSS and acidity was not impaired, but was rather better with T<sub>5</sub>. On the contrary, in the treatment T<sub>5</sub> brilliant orange red fruit rind colour was noticed. It is therefore, recommended to spray 250 ppm NAA + 0.7% carbaryl after 75 days of commencement of cropping to obtain optimum cropping of better fruit grade and consequently with higher net returns in pomegranate.

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(Received December 1991 Accepted July 1993)