



Short communication

## Effect of plant growth regulators in yield and fruit quality in pomegranate cv. Ruby

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### ABSTRACT

An investigation was carried out during 2006-07 and 2007-08 to harness beneficial effects of plant growth regulators on yield and fruit quality in pomegranate cv. Ruby. Seven treatments with three growth regulators, viz., NAA at 25, 50 ppm; GA<sub>3</sub> at 10, 20 ppm; 2,4-D at 5, 10 ppm and control (water spray) were sprayed three times starting at 50% flowering stage and, subsequently, at 21 days' interval. Results revealed that application of NAA at 25 ppm gave significantly high fruit set (44.3%) and fruit retention (44.1%) which resulted in highest fruit yield of 7.8 kg/plant at the age of 7 years, as against 1.7 kg in the control. Fruit weight and quality improved significantly due to growth regulator sprays.

**Key words:** Pomegranate, growth regulators, yield, fruit quality

Pomegranate (*Punica granatum* L.), belonging to the family Punicaceae, is one of the favourite table fruits in the world, for its refreshing juice with nutritional and medicinal properties. This fruit crop has wide adaptability and it grows in tropical, sub-tropical and even temperate regions. In India, pomegranate is commercially cultivated in Maharashtra and parts of Karnataka where good quality fruits are produced due to dry and hot climate. The crop is also being cultivated in other states. In West Bengal, the crop has been introduced in the red laterite zone of the state for its dry and hot climatic condition. Among seven cultivars studies, Ruby was found to be the best in all aspects (Tarai and Ghosh, 2006). One of the main problems under Jhargram (West Bengal) condition is that cv. Ruby exhibits heavy flowering and fruit drop by increasing the fruit set and fruit retention. Plant growth regulators are reported to play a significant role in pomegranate (Chaudhari and Desai, 1993). Hence, an attempt has been made to find suitable growth regulators and their doses for improving fruit set and yield in pomegranate cv. Ruby, under West Bengal conditions. The experiment was conducted in a private orchard at Jhargram, Paschim Midnapore, West Bengal during 2006-07 and 2007-08 on 6-year old Ruby planted at a spacing of 3 x 3 m. The soil of the experimental orchard was laterite and acidic (pH 5.8) within 2 feet depth. The plants were

fertilized every year with 20 kg FYM, 300 g N, 100 g P<sub>2</sub>O<sub>5</sub> and 200 g K<sub>2</sub>O/plant in two splits *i.e.*, in December and February, followed by watering at regular intervals. Six prophylactic sprays were given to control insect pests and diseases. Four shoots per plant were tagged in four directions for recording observations on fruit set and retention. The experiment was laid out in Randomized Block Design with four replications, and two plants per replication. There were seven treatments with three growth regulators, viz., NAA at 25, 50 ppm; GA<sub>3</sub> at 10, 20 ppm; 2,4-D at 5, 10 ppm and control (water spray). These chemicals were thoroughly sprayed after sunset, thrice, along with the control (water spray) using teepol as surfactant. The first spray was given at 50% flowering stage *i.e.*, on 20<sup>th</sup> January of 2007 and 2008 and subsequent sprays were 21-day intervals from the 1<sup>st</sup> spray. Fruit yield was calculated on the basis of actual weight of mature fruits harvested from each plant up to onset of rainy season *i.e.*, 10<sup>th</sup> June. For fruit weight 5 fruits per plant were taken and average weight was calculated. The T.S.S. was measured by hand refractometer while acidity was determined by following the standard method (A.O.A.C., 1990).

Results of two years of investigation (Table 1) revealed that application of NAA had beneficial effect on fruit retention and lower concentration *i.e.*, 25 ppm was the

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**Table 1. Effect of plant growth regulators on yield and fruit quality in pomegranate cv. Ruby (Mean of 2 years)**

Treatment	Fruit set (%)	Fruit retention (%)	Yield/plant (kg)			Fruit weight (g)	Fruit length (cm)	Fruit breadth (cm)	Juice (%)	TSS ( <sup>o</sup> B)	Acidity (%)	TSS/acid ratio
			2007	2008	Mean							
NAA 25 ppm	44.3 (41.73)	44.1 (41.61)	6.2	9.4	7.8	158	6.8	7.3	71.3	14.8	0.39	37.9
NAA 50 ppm	24.1 (29.40)	36.7 (37.29)	2.0	2.6	2.3	124	6.4	6.6	70.4	14.0	0.49	28.6
GA 10 ppm	25.9 (30.59)	25.8 (30.53)	6.9	2.6	4.8	163	7.0	7.3	70.7	13.8	0.63	21.9
GA 20 ppm	20.8 (27.13)	25.0 (30.00)	5.1	1.8	3.5	161	6.9	7.2	67.9	14.0	0.42	33.3
2, 4-D 5 ppm	34.1 (35.73)	27.5 (31.63)	4.4	6.7	5.6	157	7.0	7.1	78.2	14.6	0.40	36.5
2, 4-D 10 ppm	40.5 (39.52)	29.2 (32.71)	5.9	7.5	6.7	159	6.9	7.0	77.5	14.8	0.41	36.1
Control (water spray)	20.2 (26.71)	24.2 (29.47)	2.5	0.9	1.7	128	6.3	6.8	70.0	12.5	0.44	28.4
CD( <i>P</i> =0.05)	4.5	2.5	0.5	0.2	0.4	5.2	NS	NS	NS	0.4	0.02	-

Figures in parentheses are angular transformed values

most effective which resulted maximum fruit setting (44.3%) and retention of fruits (44.1%) while, in control, these were lowest (20.2% and 24.2%, respectively). Beneficial role of NAA in reducing fruit drop may be explained from the fact that it maintain on-going physiological and biochemical process of inhibition of abscission (Tomaszewska and Tomaszewska, 1970). It was noted that 2,4-D at 10 ppm was the second best plant growth regulator for improving fruit set and retention.

Fruit yield was highest in both the years of investigation with foliar application of NAA (25 ppm) increase in yield was more than double compared to the control plants. Highest yield increment with 25 ppm NAA application was due to maximum fruit retention. The result was in close conformity with findings of Venkatesan and Kader Mohideen (1994) in pomegranate, who also obtained highest fruit yield with 2,4-D at 20 ppm, closely followed by NAA at 25 ppm. It was observed that effect of NAA in yield improvement drastically reduced from 25 ppm and similar observation was also reported by Venkatesan and Kader Mohideen (1994). Application of 2,4-D at 10 ppm was found to be the second best treatment in improving fruit yield but GA at any level showed less effectiveness in yield increment. However, Pawar *et al* (2005) recorded highest yield in cv. Mridula of pomegranate in Maharashtra with 75 ppm GA<sub>3</sub>, while, Mohamed (2004) from Assiut (Egypt) recommended 150 ppm of GA<sub>3</sub> for getting heaviest fruit with lowest fruit-splitting in cv. Manfalouty of pomegranate. These reports clearly indicate that the growth regulator and its concentration need to be standardized for a given locality to harness beneficial effects of that hormone.

Fruit weight significantly improved with the application of growth regulators excepting NAA @ 50 ppm and, the treatments were statistically at par in improving fruit weight (Table 1). Beneficial role of NAA, GA<sub>3</sub> and

2,4-D in improving fruit weight was also reported by Ghosh *et al* (1995) in sweet orange, Hasan and Chattopadhyay (1996), in litchi Pandey (1999) in ber and Pawar *et al* (2005) in pomegranate. Positive role of auxins like NAA, 2,4-D and gibberellins like GA<sub>3</sub> application on fruit weight may be explained from the fact that these are associated with cell division and cell enlargement (Leopold, 1958; Weaver, 1972).

Fruit size (length and breadth) and juice recovery parameters were not affected by growth regulator treatment. Total soluble solids (TSS) content in the fruit significantly increased with growth regulator application and highest TSS content was measured in plants sprayed with NAA 25 ppm and 2,4-D 10 ppm (14.8<sup>o</sup>B), but, was statistically at par with other treatments. In control plants the TSS content was 12.5<sup>o</sup>B. Beneficial effect of plant growth regulators in improving TSS content in pomegranate was also observed by Mohamed (2004). Fruit acidity was significantly different among treatments and it was highest (0.63%) in GA 10 ppm and lowest (0.39%) in NAA 25 ppm treatments. TSS:acid ratio, which determines organoleptic test of fruits, was highest with NAA ppm (37.9) and lowest in control (28.4). Improvement in TSS of fruits due to auxins (NAA, 2,4-D) and GA spray may be explained from the fact that application of these growth regulators after fruit set probably improved the physiology of leaves, thereby causing better translocation of vital components in the fruit and assimilation/utilization of photosynthates by the developing fruit (Pandey, 1999).

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