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Effect of different plant growth regulators and chemicals on growth and yield of pomegranate (*Punica granatum* L.) cv. BHAGWA

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ABSTRACT : The results of present investigation indicated that, application of GA₃ 75 ppm showed maximum height (170.75 cm), spread of plant (152.50 cm), the maximum length of fruit (8.67 cm), diameter of fruit (9.20 cm), the highest mean fruit volume (308.00 ml). The chemicals showed non-significant differences in height, spread of plant and length of fruit while. The pre-harvest spray of boron 0.3 per cent showed significantly maximum diameter of fruit (8.57 cm), highest mean fruit volume (291.00 ml), maximum number of fruits per plant (99.9), average weight of fruits (161.56 g) and fruit yield per ha (16.25 Mt/ha). Interactive treatment combination consisting of GA₃ 75 ppm + boron 0.3 per cent produced higher growth and yield of pomegranate fruits.

KEY WORDS : Growth regulators, Boron, Pre- harvest spray, Pomegranate, Fruit yield

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Area under pomegranate is increasing day by day and becoming an important crop in cropping system of Latur district in particular and Marathwada region in general of Maharashtra state. With the increase in area under pomegranate cultivation without sufficient knowledge, experience and meticulous planning, crop is facing several issues with respect to its cultivation, obtaining good yield and quality as well as marketing and sudden outbreak of devastating disease like bacterial blight. To overcome these type of problems and to increase productivity, farmers are using various technologies for producing export oriented quality fruits and using technologies recommended by agricultural universities. The use of plant growth regulators and chemicals is one of them. They are using different growth regulators and chemicals at various concentrations at different stages of growth with less knowledge about the stage of

application and proper concentration. Systematic works on use of plant growth regulators and chemical are inadequate and inconclusive in pomegranate for Marathwada region. Hence, by considering the need for producing export oriented production technology in pomegranate, the present investigation was planned.

RESEARCH PROCEDURE

The experiment entitled effect of different plant growth regulators and chemicals on growth, yield and quality of pomegranate (*Punica granatum* L.) cv. BHAGWA was conducted during *mrigbahar* in 2013-14 and 2014-15 in a well established 6 years old Bhagwa orchard planted at 4.5 x 3 m having uniform growth and productivity at the demonstration plot of KVK Latur, with a view to study the effect of different plant growth

regulators and chemicals on growth, yield and quality of pomegranate. The experiment was laid out in Factorial Randomized Block Design replicated twice with two factors consisted of growth regulators and chemicals. First factor of plant growth regulators included five levels viz., GA₃ 75 ppm (G₁), CPPU 10 ppm (G₂), 6BA 05 ppm (G₃) 2-4-D 20 ppm (G₄) and control (G₀). Second factor comprised of chemicals at five levels viz., boron (Boric acid 0.3%) (C₁), calcium nitrate 2 per cent (C₂), potassium di-hydrogen phosphate 2 per cent (C₃), calcium chloride 1.5 per cent (C₄) and control (C₀) alongwith their interaction effect consisting of 25 treatment combinations. The growth regulators were applied at the time of flowering, 45 days after flowering and 90 days after flowering while chemicals were applied at 90, 105 and 135 days after flowering. The observation on different growth and yield attributes of pomegranate plants of Bhagwa were recorded. The data collected were subjected to statistical analysis suggested by Panse

and Sukatme (1967).

RESEARCH ANALYSIS AND REASONING

Perusal of pooled data depicted in Table 1 regarding the height and spread of plant of the pomegranate plant showed statistically non-significant differences by spraying of plant growth regulators and chemicals. Whereas, the length of fruit (cm) was influenced by various plant growth regulators where maximum length of fruit was recorded by spraying GA₃ 75 ppm (8.67 cm) over other plant growth regulators. The application of chemicals and interaction effect showed non-significant differences regarding fruit length parameter. The application of different plant growth regulators and chemicals on fruit diameter and volume showed statistically significant differences. The highest diameter and volume (9.20 cm and 308.00 ml, respectively) was recorded by application of GA₃ 75 ppm. The pre-harvest spray of chemicals improved fruit diameter and volume

Table 1 : Effect of plant growth regulators and chemicals on growth and yield attributes of pomegranate

Treatment No.	Treatments	Plant height (cm)	Plant spread (cm)	Fruit length (cm)	Fruit diameter (cm)	Fruit volume (ml)	No. of fruits	Fruit weight (g)	Yield mt/ha
		Pooled mean	Pooled mean	Pooled mean	Pooled mean	Pooled mean	Pooled mean	Pooled mean	Pooled mean
Plant growth regulators (G)									
G ₀	Control	129.05	110.10	7.02	7.47	207.00	65.60	191.45	10.20
G ₁	GA ₃ 75 ppm	170.75	152.50	8.67	9.20	308.00	100.30	285.05	17.07
G ₂	CPPU 10 ppm	152.35	132.40	7.62	8.35	272.30	85.40	252.85	13.78
G ₃	6BA 05 ppm	160.40	143.40	8.37	8.16	247.25	77.20	225.85	13.44
G ₄	2-4-D 20 ppm	150.90	138.35	8.06	8.63	297.50	89.60	278.50	15.98
S.E. ±		2.870	2.106	0.062	0.046	3.437	3.509	5.475	0.359
C.D. (P=0.05)		NS	NS	0.181	0.134	10.032	10.242	15.980	1.048
Chemicals (C)									
C ₀	Control	85.58	78.24	9.26	8.19	235.5	69.1	121.11	11.21
C ₁	Boron 0.3%	101.3	92	12.95	8.57	291.00	99.9	161.56	16.25
C ₂	Calcium nitrate 2 %	91.26	83.59	11.31	8.35	251.35	82.4	138.95	13.97
C ₃	KH ₂ PO ₄ 2%	92.24	83.21	10.21	8.30	263.5	77.4	151.39	13.16
C ₄	CaCl ₂ 1.5 %	94.86	88.61	12.69	8.39	290.7	89.8	173.92	15.88
S.E. ±		9.458	1.759	0.062	0.046	3.437	3.509	5.475	0.359
C.D. (P=0.05)		NS	NS	NS	0.134	10.032	10.242	15.980	1.048
Interaction (G x C)		NS	NS	NS	S	S	S	S	S
S.E. ±		-	-	-	0.069	5.519	4.185	7.475	0.515
C.D. (P=0.05)		-	-	-	0.202	16.109	12.215	21.818	1.503

NS=Non-significant

by producing the highest diameter and volume (8.57 cm and 291.00 ml, respectively) when sprayed with boron 0.3 per cent. In interaction treatments, the highest diameter and volume were recorded from treatment GA₃75 ppm + boron 0.3 per cent (9.40 cm and 337.50 ml, respectively). The treatment control showed all the minimum values for above parameter (Table 2). The result of present study are in line with those of Gajarmal (2014); *et al.* (2013); Hoda and Hoda (2013); Lal and Ahmed (2012); Reddy (2010) and Pawar *et al.* (2005) in pomegranate. The effectiveness of GA₃ might be due to its role in promoting growth and stimulated the rapid cell elongation in meristematic zone of vegetative plant organs. Due to cell elongation and division, the length and spread of branches might have increased, hence GA₃ played an

important role in enhancing the height and spread of the plant. GA₃ treated plants might be attributed to the initial rapid mobilization of the food reserves from the plants during the rapid extension of vegetative growth since the plants which received GA₃ treatments made extensive vegetative growth than other plants. Results of increasing in spread by application GA₃ are in agreement with those of recorded by Feucht and Watson (1958). They reported that, the improvement of the length of plant was due to both increased number and length of cells, but the increase in internode length was primarily caused by cell elongation. Similar results were reported by Prasad and Singh (1980).

The effect of growth regulators and chemicals on number of fruits per tree showed significant differences. Significantly, the maximum numbers of fruits (100.30),

Table 2: Interaction effect of plant growth regulators and chemicals on growth and yield attributes of pomegranate					
Treatments	Fruit diameter (cm)	Fruit volume (ml)	Number of fruits	Fruit weight (g)	Yield (Mt/ha)
	Pooled mean	Pooled mean	Pooled mean	Pooled mean	Pooled mean
T ₁ - G ₀ C ₀	7.13 (0.00)	180.00 (0.00)	51.50	168.50	6.16
T ₂ - G ₀ C ₁	7.70 (24.44)	222.50 (24.44)	81.00	200.25	8.16
T ₃ - G ₀ C ₂	7.53 (13.92)	195.00 (13.92)	63.50	182.50	7.16
T ₄ - G ₀ C ₃	7.48 (9.33)	197.50 (9.33)	60.50	191.00	6.8
T ₅ - G ₀ C ₄	7.50 (29.17)	240.00 (29.17)	71.50	215.00	8.7
T ₆ - G ₁ C ₀	9.03 (21.05)	272.50 (33.94)	86.00	232.50	10.15
T ₇ - G ₁ C ₁	9.40 (24.20)	337.50 (46.67)	120.00	320.00	13.96
T ₈ - G ₁ C ₂	9.20 (22.55)	300.00 (40.00)	96.00	262.50	12.72
T ₉ - G ₁ C ₃	9.10 (21.70)	297.50 (39.50)	95.00	282.50	11.71
T ₁₀ - G ₁ C ₄	9.25 (22.97)	332.50 (45.86)	104.50	312.50	13.30
T ₁₁ - G ₂ C ₀	8.35 (14.67)	245.00 (26.53)	75.00	207.50	7.25
T ₁₂ - G ₂ C ₁	8.53 (16.42)	297.50 (39.50)	103.00	269.00	12.14
T ₁₃ - G ₂ C ₂	8.30 (14.16)	254.00 (29.13)	90.00	230.00	9.61
T ₁₄ - G ₂ C ₃	8.28 (13.90)	272.50 (33.94)	82.50	260.00	8.97
T ₁₅ - G ₂ C ₄	8.30 (14.16)	292.50 (38.46)	97.50	297.75	11.96
T ₁₆ - G ₃ C ₀	7.90 (9.81)	220.00 (18.18)	63.50	187.50	7.72
T ₁₇ - G ₃ C ₁	8.35 (14.67)	277.50 (35.14)	94.00	243.00	10.3
T ₁₈ - G ₃ C ₂	8.15 (12.58)	222.75 (19.19)	75.00	205.75	8.56
T ₁₉ - G ₃ C ₃	8.13 (12.31)	247.50 (27.27)	69.50	228.00	8.34
T ₂₀ - G ₃ C ₄	8.25 (13.64)	268.50 (32.96)	84.00	265.00	9.79
T ₂₁ - G ₄ C ₀	8.55 (16.67)	260.00 (30.77)	69.50	237.50	9.33
T ₂₂ - G ₄ C ₁	8.88 (19.72)	320.00 (43.75)	101.50	302.50	13.34
T ₂₃ - G ₄ C ₂	8.55 (16.67)	285.00 (36.84)	87.50	275.25	11.51
T ₂₄ - G ₄ C ₃	8.53 (16.42)	302.50 (40.50)	79.50	290.00	10.88
T ₂₅ - G ₄ C ₄	8.65 (17.63)	320.00 (43.75)	91.50	302.50	12.87
S.E.±	0.069	5.519	4.185	7.475	0.515
C.D. (P=0.05)	0.202	16.109	51.50	168.50	1.503

Figures in parentheses indicate arcsine values

average weight of fruits (285.05 g) and fruit yield per hectare (17.07 Mt/ha) was harvested from trees sprayed with GA₃ 75 ppm. The chemicals significantly influenced the yield attributes of the pomegranate plants. Significantly, maximum number of fruits per plant (99.9), average weight of fruits (161.56 g) and fruit yield per ha (16.25 Mt/ha) were recorded by spraying with boron 0.3 per cent (Table 1). The interaction effect of application of plant growth regulators and chemicals revealed that, the interaction combination of treatment consisting of GA₃ 75 ppm + boron 0.3 per cent recorded significantly maximum number of fruits plant (120.00), average weight of fruits (320.00 g) and fruit yield per ha (13.96 Mt/ha). The minimum values for above yield attributes were recorded from control (Table 2). Increase in yield parameters of interaction effect might be due to cumulative effect of increased performance of yield characters contributed by application of GA₃ and boron foliar application of essential growth regulators and chemicals might provide required nutrition for resulting in rapid fruit development and increasing number of fruits ultimately increasing weight, yield per plant and yield per hectare. Present results are in proximity with earlier findings of Babu and Yadav (2000) who also observed that supplementation of essential elements has brought out a significant increase in the number of fruits per plant in mandarin orange and Shukla *et al.* (2011) in phalsa.

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