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Effect of pre harvest application of plant growth regulators on quality of pomegranate (*Punica granatum* L.) CV. Bhagawa

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Abstract
The present investigation was carried out at Department of Horticulture, VNMKV, Parbhani during *Mrig bahar* of the year 2017-18 and 2018-19. The experiment was laid out in Randomized Block Design (RBD) with thirteen treatments replicated thrice. Three foliar sprays of all the treatments given at 45, 90 and 135 days after flowering and observations were recorded. The results of the investigation revealed that, amongst the different treatments GA_3 100 ppm recorded maximum total soluble solids (15.77%), reducing sugar (13.87%), total sugar (15.20%), ascorbic acid (16.86 mg/ 100 g), juice content (52.50%) and minimum pH of juice (1.91), and titrable acidity (0.26%), whereas treatment control recorded minimum values for total soluble solids (13.28%), reducing sugar (11.83%), total sugar (12.85%), ascorbic acid (14.69 mg/ 100 g), juice content (40.33%) and maximum titrable acidity (0.35%), pH of juice (2.30). Significantly maximum shelf life of pomegranate fruits was observed in treatment Sperm dine 15.0 mM/Lit (26.43 days) over rest of the treatments under study Treatment control recorded minimum shelf life of pomegranate fruits (19.25 days).

Keywords: Plant growth regulators, quality parameters, pomegranate

Introduction
Pomegranate (*Punica granatum* L.) is one of the favourite table fruit of tropical and subtropical regions of the world. It belongs to the family *punicaceae* and thought to be originated in Iran. India ranks first in the world with respect to pomegranate area and production. The area under pomegranate cultivation in India is 1.97 lakh ha with annual production of 23.06 lakh tonnes in the year 2015-16.

Although, India is global leader in area and production under pomegranate but still lower having low productivity and export than some of the countries of the world. Therefore, to promote pomegranate quality production and export a multi-pronged strategy involving high-tech horticultural practices, storage and value addition are very crucial. Hence, in recent years increasing productivity coupled with quality is becoming very essential to get more returns from unit area. The farmers are become aware about the value of quality production, as quality fruits fetches higher price in the market. To achieve higher yield of pomegranate so many factors are responsible *viz.* TSS, Acidity, Sugars, Ascorbic acid, Juice content, pH, Shelf life etc. All these attributes in response to so many pre harvest practices, the application of plant growth regulator play important role, but the exact information about the specific plant growth regulator and its concentration is lacking. In view of the above specific problems, it was felt necessary to assess the effect of pre harvest application of plant growth regulators on quality of pomegranate (*Punica granatum* L.) cv. Bhagawa.

Methods and Material
The present investigation was carried out at Department of Horticulture, VNMKV, Parbhani during *Mrig bahar* of the year 2017-18 and 2018-19. The experiment was laid out in Randomized Block Design (RBD) with thirteen treatments replicated thrice. The five plant growth regulators with different concentrations included as treatments *viz.* GA_3 75 ppm (T_1), GA_3 100 ppm (T_2), CPPU 10 ppm (T_3), CPPU 15 ppm (T_4), 6BA 05 ppm (T_5), 6BA 10 ppm (T_6), Putrescine 5.0 mM/Lit (T_7), Putrescine 10.0 mM/Lit (T_8), Putrescine 15.0 mM/Lit (T_9), Spermidine 5.0 mM/Lit (T_{10}), Spermidine 10.0 mM/Lit (T_{11}), Spermidine 15.0 mM/Lit (T_{13}) and control (T_0). Three foliar sprays of all the treatments given at 45, 90 and 135 days after flowering and observations were recorded.

Result and Discussion

The results of the investigation revealed that, there were significant variations in quality contributing parameters due to application different plant growth regulators. The application of GA_3 100 ppm recorded maximum total soluble solids (15.77%), reducing sugar (13.87%), total sugar (15.20%), ascorbic acid (16.86 mg/ 100 g), juice content (52.50%) and minimum pH of juice (1.91), minimum titrable acidity (0.26%). Next best treatment was GA_3 75 ppm, whereas treatment control recorded minimum values for total soluble solids (13.28%), reducing sugar (11.83%), total sugar (12.85%), ascorbic acid (14.69 mg/ 100 g), juice content (40.33%) and maximum titrable acidity (0.35%), pH of juice (2.30).

The promotive effect of gibberlins to increase the TSS might be due to the influence of gibberlins in activation of the amylase enzyme which is responsible for the conservation of starch into sugars have influenced the physiological process, particularly respiration and photosynthesis, which ultimately leads to accumulation of more dry matter, minerals and carbohydrates in the fruit and this may due to increase in activity of amylase. The beneficial effects of plant growth regulators in improving TSS content in pomegranate was also observed by Lal and Ahmed (2012) [3], Reddy (2010) [6] and Pawar *et al.* (2005) [4]. GA_3 plays the role in respiration and photosynthesis which accumulate carbohydrates, minerals and dry matter leads to increase the total sugar in fruits and increase in sugar conversion of reserved starch and other polysaccharides into soluble form of sugar. Similar results were also noted by Katiyar *et al.* (2010) [2] and Pawar *et al.* (2005) [4]. The increase in juice content might be attributed to increased water uptake by the GA_3 applied fruits which enhanced rate of cell enlargement increased the juice content in the fruits. Our results are in accordance with those of Digrase *et al.* (2015) [1] in pomegranate and Ratna Babu *et al.* (1984) [5] in lemon.

Significantly maximum shelf life of pomegranate fruits was observed in treatment Spermidine 15.0 mM/Lit (26.43 days) over rest of the treatments under study followed by treatment T_{11} and T_7 which were found at par with each other. Next best treatments were T_2 and T_8. The treatments T_1, T_3, T_4, and T_9 showed intermediate results. Treatment control recorded minimum shelf life of pomegranate fruits (19.25 days) in present study.

The increase in shelf life might be attributed to increased rind thickness of pomegranate fruits which keeps fruits fresh for longer time.

Table 1: Effect of pre harvest application of plant growth regulators on quality attributes of pomegranate

Treatment No.	Treatment details	TSS (%)	Titrable acidity (%)	Reducing sugar (%)	Total sugar (%)	Ascorbic acid (mg/ 100 g)	Juice content (%)	pH of juice	Shelf life of fruits (Days)
		Pooled means							
T_1	GA_3 75 ppm	15.54	0.27	13.73	14.98	16.68	50.30	1.98	23.28
T_2	GA_3 100 ppm	15.77	0.26	13.87	15.20	16.86	52.50	1.91	23.88
T_3	CPPU 10 ppm	14.63	0.28	12.75	13.85	15.97	46.67	2.05	22.82
T_4	CPPU 15 ppm	13.93	0.30	12.89	13.87	16.08	46.83	2.04	22.70
T_5	6BA 05 ppm	14.60	0.29	12.90	13.82	15.64	44.33	2.07	19.41
T_6	6BA 10 ppm	14.83	0.30	13.08	13.90	15.75	46.00	2.07	19.94
T_7	Putrescine 5.0 mM/Lit	14.61	0.29	12.71	13.60	15.48	42.33	2.16	24.49
T_8	Putrescine 10.0 mM/Lit	14.63	0.30	12.77	13.66	15.50	43.67	2.10	23.64
T_9	Putrescine 15.0 mM/Lit	14.67	0.29	12.58	13.63	15.55	42.33	2.03	22.56
T_{10}	Spermidine 5.0 mM/Lit	13.97	0.30	12.44	13.43	15.45	43.33	2.16	20.83
T_{11}	Spermidine 10.0 mM/Lit	13.88	0.30	12.50	13.59	15.57	43.00	2.14	24.56
T_{12}	Spermidine 15.0 mM/Lit	13.87	0.30	12.62	13.74	15.67	42.17	2.13	26.43
T_0	Control	13.28	0.35	11.83	12.85	14.69	40.33	2.30	19.25
SE ±		0.08	0.004	0.07	0.09	0.06	0.80	0.03	0.13
CD at 5%		0.23	0.011	0.21	0.27	0.18	2.21	0.08	0.35

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