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Research Note :

PERFORMANCE OF VARIOUS PLANT GROWTH REGULATORS ON YIELD AND QUALITY OF PHALSA (*Grewia asiatica* L.)

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ABSTRACT: The present investigation on "performance of various growth regulators on yield and quality of phalsa (*Grewia asiatica* L.)" was carried out at the Fruit Research Station, Junagadh Agricultural University, Junagadh. The experiment was laid out in Randomized Block Design (RBD) with three replications. There were ten treatments comprised of NAA (100, 150 and 200 ppm), GA_3 (50, 100 and 150 ppm), Ethrel (500, 750 and 1000 ppm) and control (water spray).The results of experiment revealed that an application of NAA 150 ppm significantly increased number of flowers per shoot (151.21), number of fruits per shoot (60.74), 100 fruits weight (49.80 g), juice percentage (57.78 per cent) and the maximum yield of fruits (1.71kg/plant and 5800 kg/ha) followed by NAA 200 ppm. The quality of fruits in terms of TSS (25.23 per cent), reducing sugar (2.01 per cent) and total sugar (5.74 per cent) were significantly higher in treatment with Ethrel 1000 ppm followed by Ethrel 750 ppm. Further, Ethrel 1000 ppm also significantly reduced the span of harvesting (9.76 days) and number of pickings (3.57) followed by Ethrel 750 ppm. An application of GA_3 150 ppm significantly reduced acidity (2.55 per cent) and increased ascorbic acid content (39.50 per cent).

Keywords: *Phalsa, plant growth regulators, yield, quality.*

The phalsa (*Grewia asiatica* L.), belonging to the family Tiliaceae, yields delicious fruits of edible quality. India is considered to be the home of phalsa. Phalsa is one of the most popular sub-tropical and tropical fruit crop. It is commercially cultivated in Punjab, Haryana, Uttar Pradesh and Andhra Pradesh. In Gujarat it is grown in some parts of Ahmedabad, Vadodara, Kutch, Valsad and Saurashtra region. Phalsa is the most commonly used vernacular name for these fruits in India. Botanically the fruit is a berry and highly delicious, sour to sweet in taste, with a desired pleasant flavour. Ripe fruits contain 50-60 per cent juice, 10-11 per cent sugar and 2.0-2.5 per cent acid and good source of vitamin A and C. They are also a fair source of phosphorus and iron. The phalsa is usually propagated through seeds. It can also be grown from stem cuttings but they are difficult to rooting and the best time of planting is February. Audus (1) counted three factors responsible for the growth and development of plants. These are nutritional, genetical and hormonal. Crop improvement through genetically change is rather a difficult and time-consuming task while the other two are easy. The use of plant growth regulators like GA_3 (Gibberellic acid) has proved effective for increasing the size of berry or fruit and improved quality in crop like grape, citrus, ber, litchi etc (Biswas *et al.,* 2 ; Mishra *et al.,* 6; and Singh and Chundawat, 11) In phalsa, GA_3 (40 ppm) had been found to increase the fruit size and total yield (Randhawa *et al.,* 8). As soon as the phalsa fruits are harvested, they should be sent to market immediately for sale due to its perishable nature. Sometimes growers do not get satisfactory market price for the production. So it would be desirable to delay or to hasten the maturity of fruits. To serve the above purpose growth promoters or growth retardants are used, which promote or delay the maturity of fruits. Ethrel (2-chloro ethyl phosphonic acid) hastens the maturity and significantly reduces the number of pickings in phalsa (Singh *et al.,* 12).

The present investigation was carried out at Fruit Research Station, Department of Horticulture, Junagadh Agricultural University, Junagadh, during the winter season of the year 2006-07 and 2007-08, to study the "performance of various growth regulators on yield and quality of phalsa (*Grewia asiatica* L.)". Ten treatments involving three levels of each growth regulators viz.; NAA (100, 150 and 200 ppm), GA_3 (50, 100 and 150 ppm) and Ethrel (500, 750 and 1000 ppm) and control (water spray) were embedded in Randomized Block Design with three replications. All the plants selected were uniform in growth and size at the distance of 3x3 meters. All the plants were subjected to uniform application of manures and

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fertilizers, plant protection measures and other cultural practices.

The results revealed that the application of plant growth regulators significantly increased the number of flowers and fruits per shoot (Table 1). An application of NAA 150 ppm recorded highest number of flowers (151.21) per shoot and number of fruits (60.74) per shoot followed by NAA 200 ppm. Present finding is in accordance with that of Brahmachari *et al.* (3) in guava who reported that NAA at 200 ppm induced the earliest flowering and highest number of flowers.

The results of experiment indicated that the weight of 100 fruits (50.62 g) was recorded maximum in treatment NAA 150 ppm (Table 1). This finding was supported by the results of Kher *et al.* (9) and Yadav (14) in guava.

Treatment with NAA @ 150 ppm gave maximum juice percentage (57.78 %) in phalsa fruits (Table 2). These results are in accordance with that of Yadav (14) in guava. The TSS was significantly increased (25.23 %) with treatment of ethrel @ 1000 ppm followed by ethrel 750 ppm (Table 2). The results are in conformity with the results achieved by Singh and Chundawat (11) in grape and Sandhu and Bal (10) in ber.

Reducing sugars were significantly increased by ethrel @ 1000 ppm followed by ethrel 750 ppm (Table 2). This result is in conformity with the results achieved by Sandhu and Bal (10) in ber, who noticed that Ethrel (400 ppm) was found most effective in increasing the reducing sugar in ber var. Umran.

The total sugars were significantly increased with ethrel 1000 ppm followed by ethrel 750 ppm (Table 2). It might be occured due to the ethrel promoted hydrolysis of starch into sugars. Similar results were achieved by Biswas *et al.* (2) in guava and Sandhu and

Table 1: Performance of various plant growth regulators on flowering and yield parameters of phalsa.

Treatments	Number of flowers per shoot	Number of fruits per shoot	Hundred fruits weight (g)	Juice (%)
NAA 100 ppm (T_1)	134.13	54.77	47.03	53.41
NAA 150 ppm (T_2)	151.21	60.74	49.80	57.78
NAA 200 ppm (T_3)	144.12	58.02	48.30	55.41
GA_3 50 ppm (T_4)	113.68	43.88	43.61	48.15
GA_3 100 ppm (T_5)	120.27	48.22	44.31	49.93
GA_3 150 ppm (T_6)	125.02	50.49	45.59	52.19
Ethrel 500 ppm (T_7)	100.46	39.65	42.40	45.80
Ethrel 750 ppm (T_8)	91.95	36.83	41.65	43.52
Ethrel 1000 ppm (T_9)	83.45	33.77	40.74	41.49
Control (T_{10})	79.51	32.17	40.23	39.95
C.D. (P = 0.05)	19.29	10.39	NS	9.35
C.V. %	9.83	13.21	5.22	11.19

Table 2 : Performance of various plant growth regulators on TSS, reducing sugar, total sugar, acidity, ascorbic acid, harvesting span and yield of phalsa.

Treatments	T.S.S. (%)	Reducing sugar (%)	Total sugar (%)	Acidity (%)	Ascorbic acid (mg/100g)	Harvesting span (days)	Number of pickings	Yield (kg/ha)
NAA 100 ppm (T_1)	21.20	1.62	5.22	2.79	36.50	30.47	6.74	5263.67
NAA 150 ppm (T_2)	21.47	1.69	5.30	2.86	35.00	28.03	7.59	5800.33
NAA 200 ppm (T_3)	22.30	1.74	5.37	2.89	34.25	29.50	7.17	5610.33
GA_3 50 ppm (T_4)	20.27	1.60	5.15	2.62	37.60	27.39	5.43	4388.67
GA_3 100 ppm (T_5)	20.75	1.57	5.08	2.59	38.00	23.33	5.89	4787.68
GA_3 150 ppm (T_6)	20.45	1.54	4.97	2.55	39.20	25.95	6.35	5117.35
Ethrel 500 ppm (T_7)	23.60	1.79	5.44	2.67	33.50	22.91	4.68	4136.00
Ethrel 750 ppm (T_8)	23.90	1.89	5.58	2.71	32.95	22.55	4.41	3871.00
Ethrel 1000 ppm (T_9)	25.23	2.01	5.74	2.74	32.92	22.11	4.08	3506.00
Control (T_{10})	20.25	1.51	4.87	2.91	32.10	31.87	7.65	3377.00
C.D. (P = 0.05)	3.10	0.29	0.49	0.23	3.79	4.52	0.62	1426.41
C.V.%	8.24	10.0	5.45	5.0	6.1	9.9	6.0	11.1

Bal (10) in ber. GA_3 150 ppm was found superior in decreasing acidity followed by GA_3 50 ppm (Table 2). The results revealed that GA_3 150 ppm significantly increased ascorbic acid (39.20 mg/100g). which is in consonance with the results of Kher *et al.* (9) in guava.

The span of harvesting and number of pickings were influenced significantly by the application of growth regulators (Table 2). Treatment with Ethrel (1000 ppm) reduced the duration of harvesting (9.76 days) and number of pickings (3.57). Present findings are in consonance with those reported by Singh *et al.* (12) in phalsa. They reported that Ethrel (500 ppm) was found effective and economical for reducing the number of picking and improving the fruit quality of phalsa confirming to results of Parihar *et al.* (7) in phalsa.

The results revealed that significantly maximum yield per bush (1.70kg/bush) and yield per hectare (5800.33kg) was recorded under the treatment NAA @ 150 ppm (Table 2). Similar results have also been found by Dubey *et al.* (5) who reported that treatment with 250 ppm NAA resulted in the highest yield during the winter season in guava. Similar trend was also obtained by Choudhary *et al.* (4) and Singh *et al.* (13) in litchi.

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