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Research article

EFFECT OF BIOREGULATORS ON FRUIT GROWTH AND DEVELOPMENT OF LOCAL MALTA (*Citrus sinensis* Osbeck) UNDER VALLEY CONDITIONS OF GARHWAL HIMALAYA

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ABSTRACT: The study was under taken to find out the effect of bioregulators on fruit growth and development of Local Malta under pre and fullbloom application. Under prebloom spray of bioregulators N_3 (NAA 100 ppm) showed the maximum fruit-set (19.61%), fruit size (8.30 × 7.87 cm, l×w), fruit weight (264.89 gm), fruit volume (275.00ml)and early maturity(211.33 days). Treatment G_3 (GA_3 100 ppm) exhibit minimum number of seeds (11.67) per fruit followed by G_2 (GA_3 50 ppm) with 12.33 seeds. Among fullbloom application of bioregulators, the maximum fruit-set (44.60%) was recorded under I_3 (IBA 100 ppm) treatment. Fruit size (8.17 × 8.03 cm, l×w), fruit weight (253.03 gm) and volume of fruit (275.00 ml) were found maximum under N_3 (NAA 100 ppm) treatment. However treatment I_3 (IBA 100 ppm) and N_1 (NAA 25 ppm) produced minimum seeds (9.00) per fruit and earliest maturity (219.33 days) respectively.
Key words: Bioregulators, Fruit growth, *Citrus sinensis*

INTRODUCTION

Among citrus fruits, sweet orange (malta) is the second most important commercially cultivated species after orange (santra). It occupies more than 12% of the area under citrus fruits. Like many other fruit trees, citrus fruits also receive a variety of Horticultural sprays during the long period of their fruit growth. Of these, the sprays of synthetic plant bioregulators often used to increase fruit-set and to decrease premature fruit drop, also have a marked effect on the final shape and size of fruits at the time of picking [1]. These characters of fruits are generally connected with the marketability; usually medium to large fruits are preferred by the consumers with other quality characters. It is, therefore, necessary to study the effect of plant bioregulators on fruit set and other quality characters of fruits.

MATERIAL AND METHODS

The present investigation was carried out under subtropical valley conditions at Horticultural Research Centre and Department of Horticulture, HNB Garhwal University, Srinagar (Garhwal), Uttarakhand during 2003-05. Eight-year-old uniform healthy trees of Local Malta under similar cultural schedule were selected for the present investigation. The experiment includes three treatment levels (25, 50 and 100 ppm) each of Indolebutyric acid (IBA), Naphthalene acetic acid (NAA) and Gibberellic acid (GA_3), and control. All the treatments were applied in the two stages i.e. prebloom and fullbloom spray.

RESULT AND DISCUSSION

Fruit-Set

Data in Table 1 show that among all the bioregulators, N_3 (NAA 100 ppm) showed highest fruit-set (19.61%), followed by N_2 (NAA 50 ppm) with 19.32% fruit-set under prebloom spray. The significantly lowest fruit-set (11.14%) was observed in G_1 (GA_3 25 ppm). However, fullbloom spray of bioregulators gives the significantly highest fruit-set (44.60%) in I_3 (IBA 100 ppm) treatment, followed by G_3 (GA_3 100 ppm) treatment with 36.02% fruit-set (Table 2 & Fig 1). The results of present dinvestigation on fruit-set clearly match with findings of Soost [2], Hield et al. [3], Randhawa et al. [4], Randhawa and Sharma [5].

Fruit Size

It is evident from Table 1 and Fig. 1 that all the treatments except G_1 (GA_3 25 ppm) when applied as prebloom spray, significantly increased fruit size over the C_0 (control). The maximum fruit size (8.30 × 7.87 cm) was obtained under N_3 (NAA 100 ppm) followed by I_3 (IBA 100 ppm) with fruit size of 7.94 × 7.83 cm. However, C_0 (control) treatment exhibit the minimum fruit size (6.17 × 5.94 and 6.28 × 5.51 cm).

Under fullbloom spray (Table 2 and Fig.1) N_3 (NAA 100 ppm) had the maximum fruit size (8.17 × 8.03 cm), followed by N_2 (NAA 50 ppm) with the average size of 8.00 × 7.93 cm. The C_0 (control) treatment showed the minimum fruit size (6.33×5.77 cm).

Fruit Weight

Most of the treatments did not affect the fresh weight of fruit significantly when sprayed at prebloom stage. However, N_3 (NAA 100 ppm) treatment produced the highest weight of fruit (264.89 gm), followed by I_3 (IBA 100 ppm) with 249.74 gm fresh weight of fruit which were found significant over the C_0 (control) treatment owing the lowest volume with 133.41 gm fresh weight (Table 1 and Fig.1).

The fullbloom sprays of bioregulators significantly increased fresh weight of fruits with the increasing concentration of bioregulators (Table 2 and Fig.1). N_3 (NAA 100 ppm) with 253.03 gm fresh weight of fruits was found to be at top rank among all the treatments, followed by N_2 (NAA 50 ppm) treatment with 235.19 gm fruit weight, while the minimum fresh weight of fruits (141.39 gm) was recorded under G_1 (GA_3 25 ppm).

Fruit Volume

Table 1 and Fig. 1 revealed that under the prebloom spray of bioregulators, I_3 (IBA 100 pm) and N_3 (NAA 100 ppm) were recorded to give the maximum fruit volume of 275.00 ml, followed by I_2 (IBA 50 ppm) with 233.57 ml fruit volume. However, C_0 (control) treatment with 141.67 ml volume found to exhibit minimum fruit volume. The maximum volume of fruits (275.00 ml) was recorded under N_3 (NAA 100 ppm) treatment of fullbloom application. G_3 (GA_3 100 ppm) with 218.33 ml fruit volume occupied second position and found statistically at par to the N_3 (NAA 100 ppm) treatment. The minimum volume (151.67 ml) was obtained under the C_0 (control) treatment (Table 2 and Fig.1). In present study data on size, weight and volume are in close conformity with the findings of Babu and Lavania [1], Brahmachari [6], Singh et al [7].

Seeds per Fruit

It is clear from Table 1 that, bioregulators when applied as prebloom spray, resulted in reducing the number of seeds per fruit. The minimum number of seeds (11.67) per fruit was noted under G_3 (GA_3 100 ppm), followed by G_2 (GA_3 50 ppm) with 12.33 seeds per fruit. Control with 25.67 seeds per fruit was found to give the maximum number of seeds per fruit.

Under fullbloom application of bioregulators (Table 2 & Fig. 1), the minimum number of seeds (9.00) per fruit was found under I_3 (IBA 100 ppm), followed by G_3 (GA_3 100 ppm) with 9.67 seeds per fruit. The maximum number of seeds (27.67) per fruit was recorded under C_0 (control) treatment. These findings completely match with the results observed by Kumar et al. [8] and Babu et al. [9].

Maturity Period of Fruits

Data presented in Table 1 and represented graphically in Fig.1 indicated that under prebloom spray of bioregulators, all the treatments except G_3 (GA_3 100 ppm) did not show any significant difference in maturity periods of the fruits. G_3 (GA_3 100 ppm) with 265.67 days was found to take the maximum number of days to reach the fruit maturity. However, the early maturity (211.33 days after fullbloom) was recorded under N_3 (NAA 100 ppm), followed by N_2 (NAA 50 ppm) with 215.67 days. All the treatments were statistically at par to the C_0 (control).

The bioregulators when applied at fullbloom stage significantly hastened the maturity periods over control (Table2 & Fig.1). The earliest maturity with 219.33 days after fullbloom was observed under N_1 (NAA 25 ppm) treatment. N_3 (NAA 100 ppm) treatment with 220.00 days obtained second rank and C_0 (control) was recorded to delay the maturity up to 239.33 days.

Table 1: Local Malta, effect of prebloom spray of bioregulators on fruit-set, size, weight, fruit volume, seed number and maturity period.

Treatments	% age of fruit-set	Fruit size (cm)		Fresh weight of fruit (gm)	Volume of fruit (ml)	No. of seeds per fruit	days taken to maturity
		Length	Width				
IBA (I_1)	11.86	7.20	6.87	190.52	208.33	22.33	225.33
IBA (I_2)	13.85	7.68	7.48	214.49	233.57	23.67	226.00
IBA (I_3)	15.39	7.94	7.83	249.74	275.00	20.33	229.67
NAA(N_1)	12.28	6.98	6.90	159.43	183.33	18.33	217.67
NAA(N_2)	19.32	7.22	7.04	204.67	216.67	15.00	215.67
NAA(N_3)	19.61	8.30	7.87	264.89	275.00	16.33	211.33
GA_3 (G_1)	11.14	6.28	5.81	170.10	158.33	24.33	228.00
GA_3 (G_2)	11.25	6.91	6.93	181.55	191.67	12.33	230.67
GA_3 (G_3)	16.33	6.97	6.97	186.89	200.00	11.67	265.67
Conrol (C_0)	11.42	6.17	5.84	133.41	141.67	25.67	238.00
S. Em. ±	0.50	0.16	0.19	NS	11.48	1.33	9.36
C.D.at 5%	1.51	0.48	0.59	NS	34.12	3.98	27.80

Table-2: Local Malta, effect of fullbloom spray of bioregulators on fruit-set, size, weight, fruit volume seed number and maturity period.

Treatments	%age of fruit-set	Fruit size (cm)		Fresh weight of fruit (gm)	Volume of fruit (ml)	No. of seeds per fruit	days taken to maturity
		Length	Width				
IBA (I_1)	21.70	6.83	6.63	175.32	187.50	18.33	225.00
IBA (I_2)	22.06	6.97	6.73	189.19	201.67	15.00	223.67
IBA (I_3)	44.60	7.37	7.23	206.50	216.67	9.00	230.67
NAA(N_1)	11.25	7.07	7.00	193.33	203.33	15.00	219.33
NAA(N_2)	20.22	8.00	7.93	235.19	263.33	14.33	222.33
NAA(N_3)	20.97	8.17	8.03	253.03	275.00	18.33	220.00
GA_3 (G_1)	14.43	6.37	6.33	141.39	146.67	19.00	227.67
GA_3 (G_2)	25.77	6.67	6.60	163.79	173.33	14.33	231.00
GA_3 (G_3)	36.02	7.40	7.33	215.95	218.33	9.67	236.33
Conrol (C_0)	11.09	6.33	5.77	143.33	151.67	27.67	239.33
S.Em. ±	0.36	0.13	0.10	8.96	9.58	1.09	0.59
C.D.at 5%	1.06	0.39	0.31	26.63	28.46	3.22	1.76

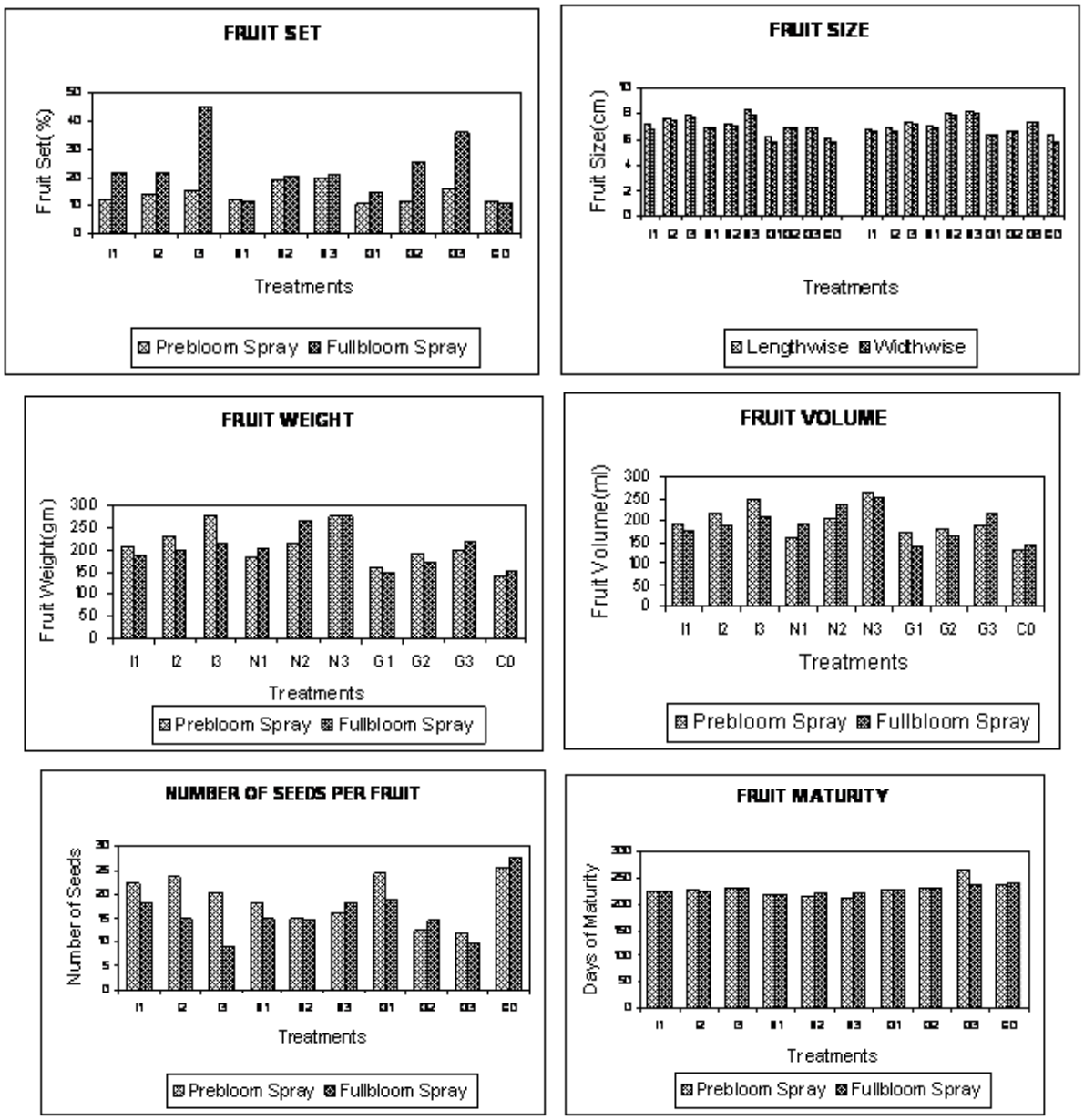

Fig-1: Effect of Bioregulators on Fruit set, Fruit Size, Weight, Volume, Number of Seeds per Fruit and Maturity

REFFERENCES

[1] Babu, R.G.H.V. & Lavania, M.L. 1985. Studies on fruit size and shape in *Citrus limon* Burm as influenced by growth regulators and number of seeds in fruit. Haryana J. Hort. Sci, 14 (3-4): 191-198.
[2] Soost, R.K. 1958. Gibberellic acid on mandarin. Calif. Agric, 12 (5): 5.
[3] Hield, H.Z.; Stewart, W.S. Coggins, C.W. and Garber, M.J. 1958. Gibberellin tested on citrus. *Calif. Agric*, 12 (5): 9-11.
[4] Randhawa, G.S. Singh, J.P. & Dhuria, H.S. 1959. Effect of Gibberellic acid, 2,4-Dichlorophenoxy acetic acid and 2,4,5-Trichlorophenoxy acetic acid on fruit-set, fruit-drop and total yield of sweet lime (*Citrus limettiodes* Tanaka). Indian J. Hort, 16 (4): 206-9.
[5] Randhawa, G.S. & Sharma, B.B. 1962. Effect of plant growth regulators on fruit-set, drop and quality of sweet orange (*Cirtus sinensis* Osbeck). Ibid, 19 (3&4): 83-91.
[6] Brahmachari, V.S.; Kumar, N. & Kumar, R. 1997. Effect of foliar feeding of calcium, potassium and growth substances on yield and quality of guava (*Psidium guajava* L.). Haryana J. Hort. Sci, 26 (3&4): 169-173.
[7] Singh, R.; Godara, N.R.; Singh, R. & Dahiya, S.S. 1999. Responses of foliar application of growth regulators and nutrients in ber (*Zizyphus mauritiana* Lamk.) cv. Umran. Haryana J. Hort. Sci., 30 (3&4): 161-164.
[8] Kumar, R.; Singh, J.P. & Gupta, O.P. 1975. Effect of growth regulators on fruit-set, fruit drop and quality of sweet lime (*Citrus limenttioides* Tanaka). Haryana J. Hort. Sci, 4 (3&4): 123-129.
[9] Babu, R.S.H. Rajput, C.B.S. & Rathor, S. 1982. Effect of zinc, 2,4-D and GA_3 on kagzi lime (*Citrus aurantifolia*) in fruit quality. Haryana J. Hort. Sci, 11 (1-2): 59-65.

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