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Effect of plant growth regulaters on growth and sex expression of bitter gourd

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ABSTRACT : The study was conducted to know the effect of exogenous application of different plant growth regulators on grain and sex expression of bitter gourd. The treatments comprised of plant growth regulators *viz.*, NAA @ 50 mg L^{-1} and 75 mg L^{-1}, ethereal @ 50 mg L^{-1} and 100 mg L^{-1}, spermine @ 5 mg L^{-1} and 10 mg L^{-1}, putrescine @ 20 mg L^{-1} and 40 mg L^{-1} and control (water spray) were applied at 2 and 4 leaf stage of bitter gourd crop. All the treatments significantly increased flowering and thereby yield over control. However, foliar spray of NAA 75 mg L^{-1} followed by spermine @ 10 mg L^{-1} were found most significant in influencing maximum vine length, number of branches per vine, number of days taken for first male and female flower, number of male flowers, number of female flowers with highest yield of 2.25 kg/vine.

KEY **W**ORDS : Bitter gourd, PGR, NAA, Spermine, Yield

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Bitter gourd (*Momordica charantia* L.) a medicinal plant, belonging to family Cucurbitaceae is generally used in the treatment of diabetes and stomach diseases. Sex expression is a complex characteristic in plants and is influenced by genetic, environmental and hormonal factors. Crop induces greater number of male flowers than female flowers which is not advantageous and economical and significantly reduces crop yield. Several investigations were carried out to study effect of growth regulators with regard to plant growth and yield, concentration of chemical, time and method of application. Growth regulators play an important role in both morphology and physiology of the plants. Exogenous application of plant growth regulators can alter sex ratio and sequence, if applied at 2 or 4 leaf stage which is the critical stage for suppression or promotion of either sex (Shinde *et al*., 1994). The principle of sex modification in cucurbits lies in altering the sequence of flowering and sex ratio. Besides the environmental factors, endogenous levels of auxins, gibberellins, ethylene and ascorbic acid at the time and the set of ontogeny determine the sex ratio and sequence of flowering (Leopold and Kriedemann, 1975). Hence, modification of sex to desired direction has to be manipulated by exogenous application of plant growth regulators (Rudich, 1983). Hence, the present investigation was carried out to study the effect of plant growth regulators on growth and sex expression of bitter gourd.

RESEARCH PROCEDURE

The study was carried out at ASPEE Agricultural Research and Development Foundation, Tansa Farm, Tal-Wada, dist- Palghar (M.S.), India, during *Kharif* 2016 to know the effect of exogenous application of plant growth regulators on growth and yield of bitter gourd. The trial

consisted of nine treatments of plant growth regulators *viz.*, T_1- NAA @ 50 mg L^{-1}, T_2- NAA @ 75 mg L^{-1}, T_3- Ethereal @ 50 mg L^{-1}, T_4-Ethereal @ 100 mg L^{-1}, T_5- Spermine @ 5 mg L^{-1}, T_6- Spermine @ 10 mg L^{-1}, T_7- Putrescine @ 20 mg L^{-1}, T_8-Putrescine @ 40 mg L^{-1} and T_9- Control (water spray). The sprays of PGR were carried out at 2 and 4 leaf stage of plant in all treatments. The experiment was laid out in Randomized Block Design with three replications. Seeds were sown on ridges at spacing of 150 cm x 100 cm. The recommended packages of practices in vogue were adopted to raise the crop. Five plants in each net plot were randomly selected for recording growth, flowering and yield attributes. The data were statistically analyzed using 'waps statistical program' developed by ICAR research complex, Goa and critical differences were worked out at 5 % level to draw conclusions.

RESEARCH ANALYSIS AND REASONING

Exogenous application of growth regulators affect at Root and flower buds initiation, development of flowers and fruits and also sex expression by increasing production of female flowers and suppressing male flower production especially in cucurbitaceous plants. Exogenous application of PGR's significantly affected growth and flowering of bitter gourd. Maximum number of branches per vine (23.26) and minimum number of days taken for first male (32.13) and female flower (37.81) appearance were recorded in treatment NAA @ 75 mg/l followed by spermine @ 10 mg/l (Table 1). Exogenous application of plant regulators altered sex ratio and sequence, when applied at 2 or 4 leaf stage, the critical stage at which the suppression or promotion of either sex is possible. Hence, modification of sex to desired direction was manipulated by exogenous application of plant growth regulators once, twice or even thrice at different intervals in bitter gourd (Devies, 1987). The control treatment recorded minimum number of branches per vine (13.30), maximum number of days taken for male (40.73) and female (51.63) flowers. Maximum vine length (2.74 m) was recorded in spemine @ 20 mg/l followed by NAA @ 50 mg/l (Table

Table 1: Effect of growth regulators on number of branches/vine, vine length (m) and days to first male flower and first female flower

Treatments	No. of branches/vine	Vine length, m	No. of days to first flower	
			Male flower	Female flower
T_1- NAA 50 mg L^{-1}	17.64	2.03	34.18	46.23
T_2- NAA 75 mg L^{-1}	23.26	2.10	32.12	37.81
T_3- Ethereal 50 mg L^{-1}	16.91	2.68	37.13	43.84
T_4- Ethereal 100 mg L^{-1}	18.77	2.42	39.49	44.39
T_5- Spermine 5 mg L^{-1}	18.17	2.38	35.34	45.27
T_6- Spermine 10 mg L^{-1}	21.25	2.74	33.66	39.88
T_7- Putrescine 20 mg L^{-1}	14.93	2.47	34.70	42.64
T_8- Putrescine 40 mg L^{-1}	16.82	2.57	38.00	41.72
T_9- Control	13.30	1.59	40.73	51.63
C.D. (P=0.05)	2.47	0.59	5.23	7.65

Table 2 : Effect of growth regulators on number of male flowers/vine, number of female flowers/vine, sex ratio and fruit yield kg/vine

Treatments	No. of flowers per vine		Sex ratio	Fruit yield (kg/vine)
	Male	Female		
T_1- NAA 50 mg L^{-1}	184.38	28.46	6.48	2.03
T_2- NAA 75 mg L^{-1}	143.62	38.70	3.71	2.25
T_3- Ethereal 50 mg L^{-1}	196.16	32.89	5.96	1.94
T_4- Ethereal 100 mg L^{-1}	226.79	36.28	6.25	1.81
T_5- Spermine 5 mg L^{-1}	262.36	33.84	7.75	1.92
T_6- Spermine 10 mg L^{-1}	174.97	37.70	4.64	2.18
T_7- Putrescine 20 mg L^{-1}	252.61	34.66	7.29	1.73
T_8- Putrescine 40 mg L^{-1}	211.64	32.41	6.53	2.12
T_9- Control	271.00	24.70	10.97	1.69
C.D. (P=0.05)	38.74	5.17	-	0.26

1). Minimum number of male flowers (143.62) and maximum number of female flowers (38.70) were recorded in NAA @ 75 mg/l followed by spemine @ 10 mg/l (Table 2). Choudhury and Singh (1970) also reported that NAA 100 ppm was effective in suppressing male flowers and increasing the number of female flowers in cucumber. The effects subsequently increased percentage of fruit set and ultimately the yield. Similarly foliar spray of NAA at 100 ppm increased the number of female flowers per plant and the sex ratio was reduced in cucurbits (Bisaria, 1974). Minimum sex ration was recorded in NAA @ 75 mg/l where as maximum sex ration was recorded in control. Highest yield (2.25 kg/ vine) was recorded in treatment NAA @ 75 mg/l followed by spermine @ 10 mg/l, while control recorded minimum yield (1.69 kg/vine). The increase in the fruit yield with NAA may be attributed to the effect of auxins to induce physiological modifications in the plants mainly on sex ratio, increased fruit set, fruit weight and higher photosynthetic activity, synthesis and translocation of metabolites from source to sink points (Hilli *et al*., 2010). Plant growth regulators control various physiological and biochemical processes in plant. This shift in sex expression increases the number of fruits per plant with an increase in fruit weight as well as total yield. Spermine is a common polyamine used as plant growth regulator. Polyamine increases length of internode, number of internode and increase in growth of seedlings (Amri *et al*., 2011).Thus, increase in plant height which is clearly seen in result seems to be the effect of spermine in bitter gourd.

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