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EFFECT OF PLANT GROWTH REGULATORS ON GROWTH AND YIELD OF BOTTLE GOURD (*LAGENARIASICERARIA* (MOL.) STANDL.)

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ABSTRACT

An experiment was conducted in bottle gourd to study the effect of three plant growth regulator (PGR) viz., Ethrel, Naphthalene acetic acid (NAA) and Maleic hydrazide (MH) for growth trait and fruit characters of bottle gourd foliage application of Ethrel @ 200 ppm was found beneficial for number of fruits per vine, fruit yield (kg/vine), days to 1st harvest, whereas maximum fruit length, fruits weight and fruits girth was obtained by the application of distilled water however maximum vine length, total number of node per vine was obtained by the foliage application of MH @ 150 ppm. Based on these observations, it could be suggested that the significant increase in growth and fruit characters would be obtained by the spraying of ethrel 200 ppm at 2 and 4 true leaves.

Key words : *Plant growth regulator (PGRs), growth trait, distilled water, naphthalene acetic acid and foliage application.*

Bottle gourd (*Lagenariasicenaria* (Molina) Standl.) is a photo-insensitive crop but sensitive to thermoperiodism. Thus, most of the existing bottle gourd varieties are season specific. It is rich in vitamin 'B' and source of minerals viz., P, Ca and Fe. It is also important for medicinal use as ion case of headache, urines trouble and jaundice. Bottle gourd production has been increased considerably to meet the increasing internal demands as well as to open the export market abroad. The yield of cucurbit depends to a great extent on sex expression and sex ratio. Early nodes bear male flowers and higher amounts whereas hermaphrodites and pistillate flowers are found in later nodes. These results in delaying harvesting as well as yield reduction. The problem can be defeat by exogenous application of PGRs. PGRs directly affect male and female flower ratio, fruit set, fruit drop and ultimately effects yield (Bose *et al* 1999). Therefore, the use of PGRs like Ethrel, NAA and MH in bottle gourd may become an important tool for yield increase as well as timely harvest. Sharma *et al*. (1998) revealed that spray of NAA increased vine length, female flowers and yield in bottle gourd. Ethrel is used for more number of female flowers due to its property of better development of gynoecium, fruit ripening, stress induction, lateral cell expansion (Taiz and Zeiger, 2002). The increase in female flowers, fruit and yield in bottle gourd with application of Ethrel has been reported by Belhelkar *et al*. (2006).GA_3 are responsible for shoot growth by enhancing cell elongation and cell division.

MATERIALS AND METHODS

The field trial was conducted at vegetable section of Horticulture garden under the faculty of agriculture, Agricultural College, Sabour, Bhagalpur, Bihar, India during summer season which is geographically situated between 25°C' 15'40''N latitude to 87°2'42''Elongitude at 46 m above mean sea level. The climate of this place is tropical to sub-tropical with slight semi-arid nature and is characterized by very dry summer, moderate rainfall and very cold winter. During growing season, the maximum and minimum temperatures were recorded to be 33.3^0C and 20.6^0C, respectively. Soil of the field was well drained sandy-loam in nature with rich in organic matter with good fertility status. Leveled soil surface with assured irrigation facility with expected winter and summer rain during the cropping period. The experimental material consisted of Rajendra Chamatkar cultivar of bottle gourd, which is released from Main Vegetable Research Station, BAC,RAU, Pusa, Bihar. Experiment was laid out in Randomized Block Design with three replications. Three PGRs viz., Ethrel ((2-chloroethyl phosphoric acid)), Naphthalene acetic acid (NAA)) and Maleic hydrazide (MH) were used for study. Seed treatment by carbendazim solution@ 0.2 % for 12 hours in combination with two sprays of each PGR at 2 and 4 true leaf stages with the Altogether 10 treatment

Table-1 : Effect of plant growth regulators on growth trait.

Chemical	Concentration	Vine length (m)	No of prim.branches/vine	Number of node per vine	Days to first male flower	Days to first female flower	Node no of first male flower	Node no of first female flower
Ethrel	100 ppm	6.85	16.53	46.76	47.25	42.84	8.96	11.12
Ethrel	200 ppm	6.41	20.05	45.20	46.33	40.37	8.20	11.02
Ethrel	300 ppm	7.04	18.05	46.12	48.73	41.37	8.36	11.64
NAA	50 ppm	7.26	16.26	48.00	50.55	43.82	9.85	12.75
NAA	100 ppm	7.74	15.04	48.40	52.35	44.14	10.10	13.00
NAA	150 ppm	8.05	15.38	48.60	54.12	45.43	10.64	13.08
MH	50 ppm	8.15	14.26	49.18	54.76	47.65	10.84	13.15
MH	100 ppm	9.25	13.30	49.60	55.33	48.38	11.45	13.45
MH	150 ppm	9.85	12.68	52.11	55.71	50.38	11.65	13.85
Distilled water spray (control)	-	8.02	11.32	44.06	53.86	46.13	10.62	12.68
S.Em. ±	0.426	0.894	2.335	2.410	2.238	0.526	0.739	0.426
C.D. at 5%		0.895	1.878	NS	5.064	4.702	1.105	1.554
C.V. %		6.64	7.16	5.98	5.69	6.08	6.40	7.21

Table-2 : Effect of plant growth regulators on fruit character.

Chemical	Concentration	Days to first harvesting	Fruit Length (cm)	Fruit diameter (cm)	Avg fruit weight (kg)	No of fruit per vine	Fruit yield (Kg/vine)	Yield/ Plot
Ethrel	100 ppm	54.80	34.86	27.64	1.32	8.66	11.43	55.15
Ethrel	200 ppm	54.00	36.62	27.84	1.45	10.36	15.02	70.28
Ethrel	300 ppm	55.33	35.16	28.16	1.40	9.78	13.69	65.39
NAA	50 ppm	56.78	34.08	26.21	1.30	7.85	10.20	49.84
NAA	100 ppm	57.66	33.26	25.70	1.25	7.58	9.47	46.78
NAA	150 ppm	58.00	31.06	22.26	1.15	7.46	8.58	43.04
MH	50 ppm	60.66	33.54	25.86	1.28	7.65	9.79	48.12
MH	100 ppm	61.33	32.12	24.35	1.18	7.42	8.75	43.75
MH	150 ppm	63.66	30.74	21.18	1.12	7.18	8.04	40.77
Distilled water spray (control)	-	59.60	37.86	29.22	1.48	6.84	10.12	49.51
S.Em. ±		2.558	1.647	1.324	0.060	0.374	0.701	3.140
C.D. at 5%		5.375	3.461	2.782	0.128	0.786	1.473	6.597
C.V. %		5.39	5.95	6.28	5.77	5.68	8.17	7.50

combination was made for the field trial. Plant geometry of 3.0 x 0.5 m was maintained with pit planting of 10 seed sowing in each pit. Pit was dug before 15 days of planting with 30 x 30 x 30 cm^3 and applied 20 ton/ha compost, 120 kg/ha N, 60 kg/ha p and 60 kg/ha K. Recommended package of practices was followed to raise the normal crops. Data were recorded on 14 important characters related to Growth and fruit characters during the course of investigation which were subjected to statistical analysis using suitable techniques of different characters. The technique of analysis of variance for randomized block design was adopted following Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

The analysis of variance for various attributes revealed significant differences among the PGRs. it can be concluded that the foliage application of Ethrel @ 200 ppm was found beneficial for number of fruits per vine, fruit yield (kg/vine), days to 1st harvest, whereas maximum fruit length, fruits weight and fruits girth was obtained by the application of distilled water however maximum vine length, total number of node per vine was obtained by the foliage application of MH @ 150 ppm.

Growth Character : Vine Length was increased significantly by PGR application (Table 1). Maximum length (9.85m) was observed with MH 150 ppm being significantly superior while minimum (6.41m) in Ethrel 200 ppm. Number of primary branches per vine was significantly increased by PGR application and ethrel 200 ppm was found most effective (20.05). Number of nodes per vine was found significantly higher (52.11) in MH 150 ppm while their interaction was non-significant. Among the treatment combination number of nodes was maximum in MH -150ppm (52.11).

PGR significantly reduced the number of days taken for appearance of first male flower. Ethrel 200 ppm was found the best with minimum of 46.33 days. Similarly, Ethrel 200 ppm significantly reduced the number of days (40.37 days) taken for appearance of first male flower

Node number of first male flower was significantly reduced by PGR and the lowest was in Ethrel 200 ppm (8.20). Similarly,Ethrel 200 ppm significantly decreased the node number of first female flower (11.02).

The increased vine length, Number of primary branches and Days to first female and male flower by MH and ethrel might be due to the mechanism of MH in the apex, protein synthesis, cell division, auxins production, cell expansion and elongation of vine of the bottle gourd. Mishra *et al*. (1972) showed that MH was most effective in increasing the length of vine which was also supported by Arora *et al*. (1985). Ethrel reduced the growth which might be due to decrease in level of gibberellins as also reported by Rudich *et al*. (1970). Application of ethrel caused reduction of vine length and induction of dwarfism had resulted in the increased number of branches. This result was in accordance with the finding of Arora and Pratap (1989) with ethrel in Pumpkin. Application of ethrel caused reduction of days for first male flower appearance. The results obtained are in agreement with those Baruas and Das (1997) in Bottle gourd, respectively. Application of ethrel caused reduction of days for first female flower appearance. The results obtained are in agreement with Verma *et al*. (1984) in bitter gourd.

Application of ethrel caused reduction of Node number of first male flower (Similar results also reported by Sidhu *et al.* (1982) in Muskmelon) and Node number of first female flower (Similar results also reported by Heslop-Harrison (1957)).

Fruit Character : With respect to fruit characters, PGR showed significant effect (Table 2). Ethrel -200ppm significantly reduced days to first harvesting (54.00 days) which was statistically at par with the treatment T_6 NAA -150 ppm (58.00 days), T_5 NAA 100 ppm (57.66 days), T_4 NAA- 50ppm (56.78 days), T_3 Ethrel 300ppm (55.33 days) and T_1 Ethrel 100ppm (54.58 days).

Length of fruit increased significantly with PGR maximum (37.86 cm) long fruits with the application of distilled water (control) (Table 2). The maximum diameter of fruit (29.22 cm) was recorded by application of distilled water which showed significant effect.

Average maximum fruit weight (1.48kg) was increased significantly by the application of distilled water which was statistically at par with T_2 Ethrel 200 ppm (1.45 kg) and T_3 Ethrel 300 ppm (1.40 kg). PGR significantly increased number of fruits per vine and Ethrel 200 ppm gave maximum (10.36 fruit/vine). The highest Fruit yield (kg/ vine) was recorded in treatment T_2 Ethrel 200 ppm (15.02 kg) which was statistically at par with treatment T_3 Ethrel 300 ppm (13.79 kg). The data revealed that fruit yield of bottle gourd per plot was significantly increased by various treatments. The maximum fruit yield per plot was recorded in treatment T_2 Ethrel 200 ppm (70.28 kg) which was statistically at par with treatment T_3 Ethrel 300 ppm (65.39 kg).

The increased number of fruits per vine (Mandai*et al.* (1990) and Kumar et al. (2006) in bottle gourd), Fruit yield (kg/ vine) (Parmar (2003) in sponge gourd), days to first harvesting and yield of bottle gourd per plot (These findings are also in consonance with those of Arora et al. (1988) in sponge gourd; Das and Maurya (1993) in pumpkin)by application of Ethrel 200 ppm.

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