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RESEARCH ARTICLE

EFFECT OF VARIOUS PLANT GROWTH REGULATORS ON GROWTH PARAMETERS OF AONLA (*EMBLICA OFFICINALIS* GAERTN.) SEEDLINGS AFTER SEED GERMINATION

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ABSTRACT

Indian gooseberry or Aonla (*Emblica officinalis* Gaertn.) is richest source of Vitmain C in dry land groups of India. These aonla is propagated by seed but because of its hard seed coat and dormancy period it is difficult to germinate all seeds. Hence the research is carried out to standardize proper plant growth regulators for seed treatments to study out plant growth characters like seedling height, diameter of stem, and number of leaves. Result showed that seed treatments with GA_3 200 ppm on seedling growth parameters like seedling height, diameter of stem and number of leaves after 30, 60, 90, 120, 150, 180 days of sowing gives highest result than Thiourea and Ethrel.

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INTRODUCTION

The Aonla (*Emblica officinalis* Gaertn.) is belonging to Euphorbiaceae family and known as Indian Goseberry. Basically it is native of India and rich source of Vitmain C (600-1000 mg/100 g) in aonla pulp and polyphenols, hence mostly used in chyavanprash as ayuervedic herbal medicine. It is one of the three constituents of the famous ayurvedic preparation, triphala, which is prescribed in many digestive disorders (Chopra *et al.* 1958). Because of these importance we carried out research on effect of various plant growth regulators on growth parameters of Aonla seedlings after seed germination. Aonla can be propagated by seed as well as by vegetative methods. Difficulties are commonly in seed propagation due to poor and delayed germination of seeds. Now a days use of growth regulators in propagation of fruit crops is an advanced technique.

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It is an established fact that growth regulators improve the germination and its subsequent growth in many fruit crops (Bose, 1990). Out of various growth regulators GA and ethylene have indicated beneficial effects on germination and seedling growth (Choudhari and Rane, 1978 and Iyer *et al*., 1970). Aonla being a minor fruit crop, no systemic research work has been undertaken for improving the yield as well as the quality of aonla fruits by plant growth regulators. Therefore keeping all these points in view, the present study was undertaken to find out suitability of plant growth regulators with various concentrations in respect of seed germination and seedling growth.

MATERIALS AND METHODS

The present investigation on Aonla (*Emblica officinalis* Gaertn.) was conducted at Department of Horticulture, Marathwada Agricultural University, Parbhani during 2007-08. Fully ripen seeds were soaked in different concentrations (ppm or percent) of plant growth regulators and water for 24 hrs. In laboratory we calculate germination percentages by placing

soaked seeds between the blotting paper in Petri dishes. These presoaked seeds are sown in polythene bags of 200 gauge and 5 x 7" size which filled with sterilized soil along with FYM. Simple randomized block design with 11 treatments and 3 replications are designed for this experiment these are Control (no soaking)- T0, Water soaking- T1, GA3 100 ppm- T2, GA3 150 ppm- T3, GA3 200 ppm- T4, Thiourea 1 per cent- T5, Thiourea 2 per cent- T6, Thiourea 3 per cent- T7, Ethrel 1000 ppm- T8, Ethrel 2000 ppm- T9, Ethrel 3000 ppm- T10. All cultural operations like regular irrigation , weeding etc. should be carried out time to time. Various observations of seedling growth on its growth parameters are recorded properly and analyzed statistically by using the method of Panse and Sukhatme (1985).

Table 1. Effect of plant growth regulators on height of aonla seedlings (cm)

Treatments	Days after sowing					
	30	60	90	120	150	180
Control (no soaking)	8.4	13.20	18.70	23.10	31.20	40.12
Water soaking	9.7	14.18	20.10	30.70	40.42	50.30
GA_3 100 ppm	10.40	20.94	30.50	45.50	65.14	85.70
GA_3 150 ppm	11.03	20.61	33.80	48.20	68.13	88.82
GA_3 200 ppm	11.59	20.52	35.45	50.32	70.21	90.16
Thiourea 1 per cent	10.54	15.54	25.37	35.62	45.52	55.30
Thiourea 2 per cent	11.52	18.06	28.65	38.15	48.17	58.62
Thiourea 3 per cent	10.61	20.59	30.15	40.17	50.31	60.14
Ethrel 1000 ppm	9.94	15.41	25.20	35.19	50.82	65.28
Ethrel 2000 ppm	10.18	20.70	30.10	40.22	50.19	60.42
Ethrel 3000 ppm	8.2	11.40	14.14	17.30	21.20	25.26
S.E.±	0.263	0.316	0.243	0.187	0.302	0.255
CD at 5 per cent	0.774	0.932	0.718	0.552	0.890	0.752

Table 2. Effect of plant growth regulators on stem diameter of aonla seedlings (mm)

Treatments	Days after sowing					
	30	60	90	120	150	180
Control (no soaking)	1.0	1.49	2.0	2.6	3.3	4.0
Water soaking	1.5	2.0	2.6	3.2	3.8	4.5
GA_3 100 ppm	1.6	2.16	3.8	5.0	6.2	7.5
GA_3 150 ppm	1.8	3.0	4.2	5.6	7.0	8.5
GA_3 200 ppm	1.9	3.40	4.9	6.6	8.3	10.0
Thiourea 1 per cent	1.3	2.30	3.50	4.7	5.9	7.2
Thiourea 2 per cent	1.4	2.40	3.59	4.8	6.0	7.3
Thiourea 3 per cent	1.5	2.50	3.7	4.9	5.1	7.4
Ethrel 1000 ppm	1.5	2.50	3.6	4.8	6.0	7.3
Ethrel 2000 ppm	1.6	2.60	3.7	4.9	6.1	7.2
Ethrel 3000 ppm	1.0	1.50	2.0	2.5	3.0	3.5
S.E.±	0.117	0.219	0.276	0.286	0.324	0.268
CD at 5 per cent	0.347	0.647	0.814	0.843	0.955	0.790

Table 3. Effect of plant growth regulators on number of leaves of aonla seedlings

Treatments	Days after sowing					
	30	60	90	120	150	180
Control (no soaking)	4.5	7.3	10.1	13.0	16.0	20.0
Water soaking	4.4	9.3	14.1	19.0	24.0	30.0
GA_3 100 ppm	4.2	15.1	30.0	50.0	70.0	89.0
GA_3 150 ppm	4.5	19.3	35.1	58.33	75.0	95.0
GA_3 200 ppm	6.6	20.3	40.1	60.0	80.0	100.0
Thiourea 1 per cent	4.6	9.3	14.1	22.0	28.0	35.0
Thiourea 2 per cent	4.3	9.1	15.0	21.0	29.0	40.0
Thiourea 3 per cent	4.1	10.0	20.0	30.0	40.0	50.0
Ethrel 1000 ppm	4.2	10.1	20.0	30.0	45.0	60.0
Ethrel 2000 ppm	4.4	9.2	15.0	25.0	35.0	45.0
Ethrel 3000 ppm	2.43	4.2	6.0	8.0	10.0	15.0
S.E.±	0.421	0.762	0.253	1.070	0.194	0.282
CD at 5 per cent	1.241	2.244	0.744	3.154	0.572	0.833

RESULTS AND DISCUSSION

The growth contributing characters of aonla seedlings are height, diameter of stem, number of leaves, which were critically studied at interval of 30 to 180 days of sowing. These criteria are responsible for vigour and fruitfulness of the plant. The results described earlier indicate striking effects of the GA_3, thiourea, ethrel, distilled water soaking and control on a various growth parameters of growth of aonla.

Height of seedling

The data in Table-4 shown that significantly maximum height (11.59 to 90.16 cm) was observed in 200 ppm GA_3 treatment after 30 to 180 days of sowing. As the concentration of GA_3 increased from 100 to 200 ppm there was consistent and progressive increase in the production of height. All the concentrations of GA_3 significantly increased the height of seedling over control. Application of higher concentrated GA3 reveals that uptake of GA3 hormone is responsible for cell elongation which increase the seedling height. These results were in close agreement with the results obtained by Randhawa and Singh (1959) by using GA_3 100 ppm in Jullunduri khatti rootstock, Tendulkar (1978) by using GA_3 200 or 250 ppm in sapota and rayan. As concentration of thiourea increased from 1 per cent to 3 per cent, height also observed to increase from 55.30cm to 60.14cm in aonla. Similar results were reported by Nikam (1985) in ber and wood apple, Gholap *et al* (2000) by using thiourea 200 ppm in aonla, In the experiment as ethrel concentration increased it was found that higher concentration have toxic effect on seedling growth in respect of height,. Though ethrel 1000 ppm and 2000 ppm found to be just better (65.28cm to 60.42 cm) over control (40.12cm) but 3000 ppm found to be exclusively harmful (25.26cm) for seedling growth as it stunted the growth of seedling in most of the seedlings. Similar results were reported by Nikam (1985) that all treatments of ethrel was ineffective for increasing the length as well as diameter of stem at higher concentration, the length of main root was significantly decrease over control.

Diameter of stem (mm)

The data showed in Table no 02 observed that application of 200 ppm concentrated GA_3 in aonla given maximum stem diameter (10mm) also GA_3 treatment from 100 ppm to 200 ppm concentration consistently increased stem diameter. The findings were confirmed to be in close consideration with Prasad and Singh (1980) with 150 ppm in acid lime, Agha *et al.* (1990) by using GA_3 50-200 ppm in sour orange and citrage, Thiourea resulted in increased rate of stem diameter as concentration increased. It was found to increase stem diameter 7.2 mm to 7.4 mm from 1 to 3 per cent. These findings were supported by Nikam (1985) that stem diameter increased with increased concentration of thiourea in ber, Gholap *et al.* (2000) by using thiourea 200 ppm in aonla, As ethrel at higher concentrations found to produce toxic effect, it was seem to decrease stem diameter 7.3 mm to 3.5 mm with increase in concentration 1000 to 3000 ppm. These findings were supported by Nikam (1985) reported that ethrel was ineffective for increasing the stem diameter at higher concentrations.

Number of leaves

The data in Table 3 reveals that all GA_3 concentrations 100 to200 ppm were found to be significantly superior 89 to 100 over control (20). But It is very clear that GA_3 200 ppm produced showed highest number of leaves (100) on aonla seedlings throughout the experimental period. Ethrel 3000 ppm was found to produce minimum number of the leaves (15) throughout the experimental period. Toxic effect observed if ethrel concentration is high which reduced number of leaves per seedlings. These findings were supported by Brown *et al.* (1984) and Singh *et al.* (1989) by using 400, 450, 500 and 550 ppm GA_3 in sweet orange, Wagh *et al.* (1998) by using GA_3 400 ppm in aonla, Thiourea also seen to increase more number of leaves over control. As concentration increased from 1 per cent to 3 per cent number of leaves also got increased from 35 to 50 same findings by Choudhari and Chakrawar (1981) on Rangpur lime. The results obtained in the present study are concluded that GA_3 200 ppm recorded maximum height of seedlings, stem diameter, number of leaves same and lowest findings with higher ethrel concentration, i.e. 3000 ppm due to toxic effects on seedling growth parameter.

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