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Forest tree seedlings growth as influenced by plant growth regulators in nursery

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ABSTRACT

A study was conducted to see the effect of plant growth regulators on growth of different forest tree seedlings in nursery with the aim to produce good quality planting stock for plantation in the field. Pooled results of two years indicate that Vipul and Mixtalol applied @ 2 ppm as foliar spray on foliage at 45 and 90 days after sowing of seeds in polybags recorded maximum growth in terms of height and collar diameter of all tree species viz *Parkinsonia aculeata, Acacia senegal, A bivinosa, A salicina, A holosericea, A leucophloea, Prosopis cineraria* and *Leucaena leucocephala* which was significantly higher over control.

Keywords: Plant growth regulators; seedlings; height; collar diameter

INTRODUCTION

Presently the environmental factors at the planting sites are in general harsh with one or more adverse conditions present such as erratic rainfall, infertile soils, problematic soils and degraded, rocky conditions of the terrain etc. At such sites plantations by direct seed sowing are likely to be unsuccessful and under these circumstances nursery raised seedlings/ saplings of good quality to raise plantations are of prime importance. The establishment and survival of the planting stock in the field are mainly dependent on the production of good quality planting stock which is influenced by the size and vigour of the seedlings (Venkatesh 2000). For such purposes growth promoting substances or chemicals could be used successfully. At various occasions many growth regulators endogenous or synthetic have frequently been used with success to exploit genetic potential to enhance growth and vigour. In view of this a study has been made to evaluate the effect of plant growth regulators on growth of some tree seedlings under nursery conditions.

MATERIAL AND METHODS

The study was carried out at Soil and Water Conservation Research and Demonstration Centre, College of Technology and Agricultural Engineering, Udaipur, Rajasthan. The soils of experimental site used for filling of polythene bags was clay loam with pH 7.4, available nitrogen 295.2 hg/ha, phosphorus 21.5 kg/ha and potassium 355.4 kg/ha. Uniform and surface sterilized seeds of *Parkinsonia aculeata, Acacia senegal, A bivinosa, A salicina, A holosericea, A leucophloea, Prosopis cineraria* and *Leucaena leucocephala* were taken and after hot water treatment these seeds were sown in polythene bags (size 25 cm x 10 cm) duly filled with mixture of soil, sand and FYM in 3:1:1 ratio. Two seeds of each species were sown in polybags in the last week of March during both the years. Regular watering was done throughout growing period in the nursery beds as per requirement. After 3weeks thinning operation was performed to retain one healthy seedling in each polythene bag. Polythene bags with single seedling of each tree species were then divided and arranged in beds into 7 groups containing 40 seedlings of each tree species in each group in completely randomized block design. Group 2 to 7 were given scheduled treatment consisting of six growth regulators viz Vipul, Mixtalol, Miraculan and Tricontanol (2 ppm each), IAA (100 ppm) and NAA (25 ppm) applied through foliar application. Only water was applied in Group 1. Growth regulators were foliar sprayed on foliage at 45 and 90 days after sowing (DAS) of seeds in poly bags. Ten seedlings from each group/treatment and of each tree species were selected for recording height and collar diameter after 15 days of last spray.

RESULTS AND DISCUSSION

Perusal of data (Table 1) reveals that all the plant growth regulators except NAA @ 25 ppm and IAA @ 100 ppm significantly increased growth in terms of height and collar diameter of all the tree species under study over control. Further foliar application of Miraculan applied @ 2 ppm failed to influence growth of *Acacia salicina* over control. Amongst plant growth regulators foliar spray of Vipul @ 2 ppm recorded maximum growth of *Albizzia lebbeck, Acacia senegal, Prosopis cineraria* and *Leuceana leucocephala* which was significantly higher over control, IAA, NAA and Miraculan but at par with Mixtalol and Tricontanol @ 2 ppm. The magnitude of increases in height and collar diameter were to the tune of 71.7 and 48.2 per cent in *A lebbeck*, 73.9 and 54.8 per cent in *A senegel*, 52.8 and 50.0 per cent in *P cineraria* and 67.6 and 50.0 per cent in *L leucocephala* respectively over control. Likewise maximum growth of *A bivinosa, A salicina, A holosericea, A leucophloea* and *Parkinsonia aculeata* was observed when Mixtalol @ 2 ppm was sprayed

Table 1. Effect of plant growth regulators on seedlings growth of different tree species (pooled data)

Treatment	*A lebbeck*		*P aculeate*		*A senegal*		*A bivinosa*		*A salicina*		*A holosericea*		*A leucophloea*		*P cineraria*		*L leucocephala*	
	H	D	H	D	H	D	H	D	H	D	H	D	H	D	H	D	H	D
Control	26.2	0.27	34.7	0.25	36.5	0.31	21.7	0.20	27.0	0.23	23.5	0.18	25.0	0.22	30.3	0.24	54.1	0.46
Mixtalol (2 ppm)	42.2	0.38	60.3	0.42	60.0	0.45	32.7	0.32	39.0	0.33	34.0	0.27	47.2	0.33	43.0	0.33	85.4	0.67
Vipul (2 ppm)	45.0	0.40	58.5	0.40	63.5	0.48	31.7	0.31	36.5	0.32	33.0	0.26	46.0	0.31	46.3	0.36	90.7	0.69
IAA (100 ppm)	26.7	0.32	38.2	0.29	41.5	0.34	23.5	0.21	28.7	0.26	26.3	0.21	35.0	0.25	33.3	0.25	62.4	0.52
Tricontanol (2 ppm)	38.2	0.33	55.0	0.37	60.2	0.46	29.7	0.30	34.0	0.31	32.2	0.25	45.5	0.30	44.2	0.33	79.2	0.62
Tricontanol (2 ppm)	35.0	0.34	50.0	0.34	50.0	0.38	28.5	0.30	30.0	0.27	29.0	0.22	38.7	0.29	40.0	0.29	72.6	0.56
NAA (25 ppm)	29.5	0.30	40.7	0.29	40.8	0.33	24.7	0.23	29.0	0.26	27.8	0.21	34.5	0.25	33.0	0.26	69.6	0.52
$CD_{0.05}$	8.34	0.054	10.12	0.05	5.87	0.035	5.26	0.048	6.07	0.042	4.73	0.038	10.26	0.044	6.0	0.045	15.2	0.09

H: Shoot height (cm) D: Collar diameter (cm)

which was significantly higher over control, Miraculan, NAA and IAA except Miraculan in case of *A bivinosa*. However this treatment was closely followed by vipul and tricontanol. Thus when compared to water spray the foliar spray of Mixtalol significantly enhanced height and collar diameter of *A bivinosa* by 50.7 and 60.0, *A salicina* by 44.4 and 43.5, *A holosericea* by 44.7 and 50.0, *A leucophloea* by 88.8 and 50.0 and *P aculeata* by 73.8 and 68.0 per cent respectively. The results are in collaboration with the findings of Chaplot and Mahnot (2004) and Thakur and Thakur (1992). Result of present investigations clearly delineate growth promotery capabilities of these two chemical substances ie Vipul and Mixtalol. There are reports where increased photosynthesis, water uptake, nutrient uptake and reduced photorespiration have been influenced by plant growth regulator treatments thereby enhancing overall growth rates of all tree species under study (Gudi and Bohra 2005, Shivanna et al 2007).

CONCLUSION

The plant growth regulators like Vipul and Mixtalol could be successfully employed and hold good promise for forestry plantations to get better, healthy and quality seedlings from nurseries to be planted in the field for maximum survival and establishment.

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