

PERFORMANCE OF POPLAR CUTTINGS WITH DIFFERENT GROWTH REGULATORS AND POTTING MEDIA

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ABSTRACT : The study was conducted on performance of poplar cuttings with different growth regulators and potting media in the Forest Nursery and Research Centre of SHIATS, Allahabad. The experiment was laid out in RBD with four replications. There were six treatments of growth regulators, viz. T₁-Control (distilled water), T₂- IBA(100 ppm), T₃- IAA (100 ppm), T₄- NAA (100 ppm), T₅-GA₃ (100 ppm), T₆-2,4-D (100 ppm), and seven treatments of potting media, viz. M₁-Soil only, M₂-Soil + Sand + FYM (1:1:1), M₃- Soil + FYM + Neem cake (1:1:1), M₄- Soil + FYM + VC (1:1:1), M₅- Neem cake + sand + VC (1:1:1), M₆- Neem Cake + Soil + VC (1:1:1) and M₇- Neem cake + FYM + VC (1:1:1). Ten cuttings per replication were used for each treatment. Among different growth regulators used, IAA @100 ppm showed maximum survival percentage (80.00%), shoot and root length ((35.30cm and 32.55cm, respectively), fresh shoot weight (20.00g), and fresh and dry weight of roots (13.00g and 6.47g, respectively), as well as total biomass (12.82g) compared to control and other treatments. Number of sprouts and no. of roots/cutting (2.25 and 27.00, respectively) and dry weight of shoot (6.70g) were found maximum with 100ppm IBA, while maximum root: shoot ratio of 1.15 was produced by 100 GA₃. Among potting media combinations, most effective treatment was M₂ (Soil + Sand+ FYM, 1:1:1) which resulted in maximum number of sprouts/cutting (2.55), survival percentage (63.33%), shoot length (24.45 cm), dry weight of shoot (5.17g) and fresh weight of root (10.17g) over other treatments. Length of root (22.0cm), dry weight of roots (6.22g), root: shoot ratio (1.71) and total biomass (11.02g) were maximum in M₇ (Neem cake + FYM + VC, 1:1:1).

Keywords : Vermicompost, potting media, growth regulators, clone, poplar.

Poplar (*Populus deltoides*), belongs to the family Salicaceae, is a very important group of tree species in plantation forestry because it is a deciduous fast growing multipurpose tree species and can be harvested at a short rotation of 7-8 years (Chaturvedi, 4). The tree is deciduous which remains leafless from 3 - 4 months during winter and produces straight and clean bole in very short duration (Singh, 12) The best time of planting poplar cuttings is January to February (Lal, 6), February to March (Mishra and Gupta, 9) and middle of February to middle of March (Chandra, 3).

Populus deltoides is the most widely planted species of poplar in India. It is planted in the plains of North West India i.e., Western Uttar Pradesh, Punjab and Haryana and to some extent in outer plains/valleys of Uttarakhand, Himachal Pradesh and J & K. It has been successfully cultivated as a forest crop and/or agro-forestry crop in Punjab plains and in Tarai region of U.P. Poplars have been raised at slightly lower latitudes also, but it is only above 29°N that they had fair success in experimental plantations and on farms timber is used principally for lumber, veneer, pulpwood, excelsior and fuel (Laver, 7). Widely used for shelter

belt, windbreak and amenity plantings. Recently, it has been championed as one of the leading potential species for silviculture biomass production. Salicylic acid, derivable from this species, is used as a coupling agent in dye intermediates (Behan, 2).

Vegetative propagation of trees is a tool and its domestication has a long history. The rate of multiplication through cuttings is higher than for any other vegetative propagation technique, with the exception of micro-propagation. Propagation of poplars by stem cuttings is the easiest way for selection of new clones (Singh, 12). The nursery plants raised from cuttings are taken from one year old nursery growth. The ability of cuttings to root and their subsequent growth in nursery is determined by number of factors viz; time at which cuttings are taken, age of the donor tree, position within the crown from where cuttings are taken, treatment and status of rooting/growth hormones and conditions under which cuttings are rooted (Puri, 10). The time of the year in which cuttings are taken can have a dramatic influence on rooting of cuttings and may provide the key to highly successful rooting (Hartmann and Kester, 5).

MATERIALS AND METHODS

The study was conducted in the Forest Nursery of Allahabad Agricultural Institute (SHIATS) situated at 25.28°N latitude and 81.55°E longitude. The area is situated at an altitude of 98 m above average mean sea level and enjoys sub-tropical type of climate.

(A) Method of solution and treatments

The size of cuttings was 5 to 6 inches long, having 2 to 3 buds with the slanting basal cut. Cuttings of *Populus deltoides* were soaked in growth regulators for 24 hours before planting. The prepared cuttings were treated by dipping their basal 3.5 cm portions in solutions of IBA, IAA, NAA, GA₃ and 2,4-D@100ppm each and distilled water (control) for 24 hours at room temperature (20±1°C). Treated cuttings were planted in beds made by mixing soil and sand. The experiment was laid out in Randomized Block Design with 6 treatments each replicated 4 times. In each replication, 10 cuttings were raised accordingly.

(b) Preparation of propagating media

The cuttings were planted in plastic bags having propagation media viz., M₁-Soil only, M₂-Soil + Sand + FYM (1 : 1 : 1), M₃- Soil + FYM + Neem cake (1 : 1 : 1), M₄- Soil + FYM + VC (1 : 1 : 1), M₅- Neem cake+ sand+ VC (1 : 1 : 1), M₆- Neem Cake+Soil+VC (1:1:1) and M₇- Neem cake+FYM+VC (1:1:1). After planting in plastic bags, full irrigation was given with a sprinkler to protect them from desiccation. The experiment was laid out in Randomized Block Design with 7 treatments

each replicated 4 times. In each replication, 10 cuttings were raised accordingly.

Data on growth, sprouting and survival of poplar cuttings were recorded periodically (Table 1 and 2) and analyzed statistically.

RESULTS AND DISCUSSION

Effect of different growth regulators

A perusal of Table 1 revealed that cuttings treated with 100ppm IBA (T₂) performed best for maximum number of sprouts/cutting (2.25), number of roots (27.00) and dry weight of shoot (6.70 g) followed by 100ppm IAA as compared to other treatments. Survival per cent (80%), shoot and root length (35.30 and 32.55 cm, respectively) fresh weight of shoot and roots (20g and 13 g, respectively), dry weight of roots (6.47g) and total biomass (12.82g) were found maximum in cuttings treated with 100ppm IAA as compared to other treatments. The root: shoot ratio was maximum (1.15) in 100ppm GA₃ treated ones followed by 100 ppm NAA (1.11).

Efficacy of different potting media

The maximum sprouts/cutting (2.55), survival per cent (63.33%), dry weight of shoot (5.17g) as well as fresh weight of roots (10.17g) were significantly maximum in cuttings planted in mixture of soil + sand + FYM in ratio of 1 : 1 : 1 (M₂). Number of roots/cutting was observed maximum (15.57) in cuttings planted in M₆ (Soil + Vermicompost + Neem cake, 1 : 1 : 1) followed by M₂ (13.67 roots). It might be due to that

Table 1: Effect of different growth regulator on poplar cuttings.

Treatments Parameters	T ₁ (Control)	T ₂ (100ppmIBA)	T ₃ (100ppmIAA)	T ₄ (100ppmNAA)	T ₅ (100ppmGA ₃)	T ₆ (100ppm 2,4-D)
Survival %	30.00	67.50	80.00	55.00	77.50	65.00
No. of sprouts/cutting	1.81	2.25	2.06	2.00	1.93	2.00
Shoot length (cm)	20.10	32.82	35.30	31.52	30.92	26.33
No. of roots/cutting	8.81	27.00	21.39	19.56	19.35	17.96
Root length (cm)	15.78	29.45	32.55	22.60	23.69	21.18
Fresh wt. of shoot (g)	8.25	16.50	20.00	13.50	9.31	12.42
Dry wt. of shoot (g)	3.39	6.70	6.60	5.05	3.76	4.72
Fresh wt. of root (g)	5.31	12.58	13.00	9.69	7.75	7.25
Dry wt. of root (g)	3.44	5.88	6.47	3.75	4.23	3.80
Root : shoot ratio	0.84	0.87	0.96	1.11	1.15	0.98
Total biomass (g)	7.14	12.63	12.82	9.28	7.21	8.51

Table 2: Evaluation of efficacy of different potting media on poplar cuttings.

Treatments	M ₁	M ₂	M ₃	M ₄	M ₅	M ₆	M ₇
Survival %	13.33	63.33	16.67	33.33	20.00	53.33	23.33
No. of sprouts/cutting	1.77	2.55	2.22	2.33	1.89	1.89	2.44
Shoot length (cm)	18.33	24.45	22.35	23.20	17.53	21.85	19.80
No. of roots/cutting	6.85	13.67	12.73	9.14	10.23	15.57	7.83
Root length (cm)	16.72	17.15	18.52	21.44	19.90	17.17	22.00
Fresh wt. of shoot (g)	8.53	13.08	14.12	10.83	10.50	11.55	10.83
Dry wt. of shoot (g)	4.32	5.17	4.40	4.40	4.98	4.34	4.63
Fresh wt. of root (g)	7.58	10.17	10.08	8.94	9.55	9.07	8.42
Dry wt. of root (g)	4.17	4.57	5.33	4.57	4.66	5.18	6.22
Root : shoot ratio	0.94	1.47	0.96	1.05	0.99	1.56	1.71
Total biomass (g)	8.80	9.73	9.50	8.97	9.64	9.50	11.02

*M₁–Soil only, M₂–Soil + Sand + FYM, M₃–Soil + FYM + Neemcake, M₄–Soil + FYM + vermicompost, M₅–Neem cake + Sand + VC, M₆–Neem cake + Soil + VC, M₇–Neem cake + FYM + VC.

decomposed organic material improves soil fertility by increasing soil aeration, water holding capacity and water infiltration at lower surface (Mathad and Nalwadi, 8). Similarly, the poorest performance of rooted cuttings in control may be due to nutritionally poor medium, lacking in organic material that resulted in minimum survival, thereby reducing the plant survival and growth.

After 120 days of planting, the maximum root length of 22.0 cm, dry weight of roots (6.22g) and maximum root: shoot ratio (1.71) and biomass (11.02g) were observed in cuttings planted in Vermicompost + FYM + Neem cake (M₇). Ahmad and Qasim (1) and Rahman and Ishtiaq (11) had also found that potting media containing FYM, poultry manure as main source of organic matter with sand, silt and saw dust were better than sole factor of soil itself, as these combinations presented more growth and vigour of the plants improving total available nitrogen and phosphorus.

In the view of above findings, the most effective growth regulator was IAA @100ppm) which gave better results with survival percentage, number of roots, shoot and root length, shoot and root fresh weight, root dry weight and total biomass compared to control and other treatments.

Among all potting media combinations, the most effective medium was Soil + Sand + FYM (1 : 1 : 1)

which showed better results in number of sprouts/cutting, survival percentage, shoot length, shoot dry weight and root fresh weight as compared to control or other treatments.

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