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Effect of different growth regulators on seedling performances of *Melia dubia* cuttings

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Abstract
The experiment was conducted to study the "Effect of different growth regulators on growth performances of *Melia dubia* cuttings" was conducted in the Forest Nursery and Research centre, College of Forestry of Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj. Five growth hormones used for stem cutting (IBA, IAA, NAA, GA_3 and 2, 4-D) in doses of 100ppm each along with control condition. It was found out that using of T_2- IBA 100ppm gave the most effective results in sprout percentage, sprout /cutting, survival percentage, diameter, leaf area, number of roots, fresh roots weight, dry roots weight, shoot length, fresh shoot weight, dry shoot weight compared to T_0 and other treatments. So it can be recommended T_2 (IBA 100 ppm) was the best and effective growth regulators for rasing *Melia dubia* cuttings.

Keywords: Growth regulators, survival, seedling, *Melia dubia*

Introduction
Melia dubia belongs to the family Meliaceae and is an indigenous tree species to India. About 550 species are known in the family under 50 genera (Pennington and Styles, 1975). It is an industrially and economically important fast growing multipurpose tree species, which can be harvested on a short rotation, but large scale planting is hampered due to poor seed germination (Tilakaratna, 1991). It is an important alternative timber species and has been realized for use in operational planting to fulfil the requirement for timber, pulp, biomass and source of plywood (Nasayao *et al*., 1993). The tree attains a height of about 20 m with a spreading crown and a cylindrical straight bole up to 9 m in length and 1.5 m in girth. It is a fast growing tree used for afforestation and land rehabilitation (Langenberger *et al*., 2005).
Melia dubia grows on a variety of soils; however, it grows well in deep, fertile and sandy loam soils.*Melia dubia* is a multipurpose tree of tropical and subtropical regions mainly cultivated for its medicinal and industrial importance. The species originated from southern Asia (India-Pakistan-Iran). It has been introduced and widely cultivated in South Africa, Middle East, America (Bermuda, Brazil and Argentina), Australia, SE Asia-Pacific islands, and southern Europe.

Materials and Methods
The present investigation was carried out in the Forest Nursery and Research centre, College of Forestry of Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj. Cuttings were collected from Forest Research Centre for Eco-Rehabilitation Prayagraj. Study was conducted for standardization of nursery techniques to observe the effect of auxin on rooting behaviour of the solution of auxins was made and cutting of *Melia dubia* were soaked in growth regulators for 24 hours before planting. The cuttings of *Melia dubia* were test compounds by dipping their basal 3.5 cm portions in various rooting regulators solution for 24 hours at room temperature (20 ± 1^0C).The solutions included Indole-3-Butylic Acid(IBA 100ppm), Indole-3-acetic acid (IAA 100ppm), 1-Naphthaleneacetic acid (NAA 100ppm), Gibberllic acid(GA_3 100ppm) and 2,4-Dichlorophenoxyacetic acid(2,4-D 100ppm). The cutting were planted in a Completely Randomized Block Design (CRD) with 5 treatment each replicated 3 times along with control condition, In each replication 10 cuttings were raised accordingly and data are recorded immediately after the cuttings emerged. Measurements were carried out after one growing season seedling growth parameter such as shoot length, root length, number of roots, survival per cent, fresh and dry weight of seedlings, Seedling biomass was recorded.

Results and Discussion

At the end of the study, the result implies that the cuttings with small buds must be used while producing *Melia dubia* with stem cuttings. Hormone applications in different doses affect the germinated percentages, as well as the characteristics of the germinated individuals, at different levels. The data acquired with the result of the study, the result of variance analysis applied on these data, and the Duncan test are given in table 1. The highest sprouting percentage (96.67%),) were acquired with 100mg/L IBA followed by (83.33%) in T_0 control condition.

It was also observed that the highest shoot length with 38.07cm was produced with the 100 mg/L IBA application. The seedlings produced in the control group have 28.98cm stem lengths.

Table 1: Mean values of characters, results of variance analyzed, and the Duncan test.

Treatments	Dose (ppm)	S.P	S.L	N.R	R.L	F.R.W	D.R.W	F.S.W	D.S.W
Control	0	83.33	28.98	16.60	6.56	2.83	1.41	33.03	11.15
IAA	100	80.00	34.57	18.80	9.48	3.93	1.80	32.13	10.17
IBA	100	96.67	38.07	21.33	11.24	5.44	2.03	36.17	12.27
NAA	100	70.00	34.82	20.80	11.67	4.43	1.73	25.97	8.17
GA_3	100	73.33	32.04	12.07	8.49	2.39	1.52	19.17	6.07
2,4-D	100	73.33	29.00	10.55	12.25	2.62	1.49	24.48	8.17
F-test		S	S	S	S	S	S	S	S
S.Em(±)		0.43	1.28	1.402	0.81	0.48	0.13	1.76	0.76
C.D at 5%		1.33	3.93	3.32	2.48	1.47	0.40	5.42	2.35

SP: Sprout Percent S.L: Shoot Length N.R: Number of Roots: R.L: Roots length F.R.W: Fresh Root Weight D.R.W: Dry Root Weight F.S.W: Fresh Shoot Weight D.S.W: Dry Shoot Weight

Even though the stem length is an important indicator of the sapling quality, root generation is also very important for a healthy sapling. Accordingly, roots generation in one of the most important sapling quality indicators. According to the results of the study, the saplings in the control developed 16.60 roots with an average length of 6.56 cm. The saplings that received the 100 mg/L IAA application developed 18.80 roots with an average length of 9.48cm while the saplings receiving the 100 mg/L IBA application developed 21.33 roots with an average length of 11.24 cm. The saplings that received the 100mg/L NAA application developed 20.80 roots with an average length of 11.67 cm. The saplings that received the 100 mg/L GA3 application developed 12.07 roots with an average length of 8.49 cm and the saplings that received the 100 mg/L 2, 4-D application developed 10.55 roots with an average length of 12.25 cm. The roots of the saplings developed with the 100 mg/L IBA application were twice longer than those of the control group indicates that the hormone application have a great effect on root development. When the effect of hormone application on Dry root weight and Fresh root weight is analyzed, it is observed that the IBA application have a high effect on both the Dry and Fresh root weight. It was observed that the root exposed to 100 mg/L IBA has the most Dry and Fresh root weight of 5.44g and 2.03g respectively. Whereas the Dry and Fresh root weigh in the control group was observed to be 2.83g and 1.41g. The highest value of Fresh shoot weight i.e. 36.17g and Dry shoot weight i.e.12.27g were acquired with the 100 mg/L IBA application, whereas in the control group the Fresh shoot weight was 33.03g and Dry shoot weight was 11.15g. As a result the hormone application has more effect then the control group.

The overall results in the present study showed that different growth regulators (IAA, IBA, NAA, GA3 and 2, 4-D) greatly have effect on *Melia dubia* cuttings on the morphological characteristic. It is generally accepted that auxins have a certain role in the rooting initiation (Štefančič, Štampar, and Osterc, 2005). Auxins control growth and development in plants, including lateral root initiation and root gravity response. Many studies have shown that exogenous application of auxins results in increase initiation of lateral roots and that lateral root development is highly dependent on auxin and auxin transport (Chhun, *et al.,* 2003, Wani *et al.,* 2018) [5, 10]. The use of vegetative propagation of trees as tools in their domestication has a long history. In order to meet the huge annual targets there is need to raise a large amount of seedlings in the nurseries and plant growth regulators have been exploited profitably to alter plant archetype to achieve higher yield and quality in intended species. Such positive results have been reported in many forest species. For instance Farooqi *et al.,* (1994) conducted an experiment on *Rosa damascene.* Mill and found increasing trend of rooting percentage, number of roots per cutting, length of the longest root(cm), thickness of root(cm), fresh weight of root and dry weight of root with increasing concentration of IBA from 100ppm to 300ppm. Carvalho *et al.,* (1995) reported that treating stem cutting of *Stevia rebaudiana* with IAA and IBA promoted rooting and increase the no of roots. Such kind of positive role of different growth regulators on seedling growth in different species was observed in viz., Sivakumar and Wani. (2014) [7] *Dendrocalamus strictus,* Ansari *et al.,* (1995), in *Dalbergia sissoo* Shekhawat *et al.,* (2000) in *Anogiuses latifola*; *Excoecaria agallocha* Dongare (2000).

Conclusion

Study revealed that the potential production of *Melia dubia* Using stem cuttings with the five different Hormones (IAA, IBA, NAA, GA3 and 2,4-D) concentration along with control condition were applied to the cuttings, with and without buds, in doses of 100 mg/L each and after one growing season, eight morphological characteristics of newly generated plants were detected, and a statistical analysis was carried out. On the above finding it can be concluded that T_2 (IBA 100 ppm) was found to be the most effective growth regulators which gave better result as compare to Control T_0 (Forest soil) and other treatments. So it can be recommended T_2 (IBA 100 ppm) was the best and effective growth regulators for *Melia dubia* cuttings among all the treatments.

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