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ROOTING AND SHOOTING BEHAVIOUR OF *TERMINALIA BELLERICA* ROXB. UNDER CONTROLLED CONDITION

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ABSTRACT:

The effect of different growing media and various concentrations of IAA, IBA and NAA on the rooting and shooting of softwood cutting of *Terminalia bellerica* were investigated in the Research field of Chauras Campus of H.N.B. Garhwal Central University (Uttarakhand), India. For preparing the rooting media Vermiculite, Vermiculite + Sand (1:1) and Garden Soil were mixed thoroughly. Properly prepared cuttings of about 9-10 cm length in the month of May were treated with different concentrations of IAA, IBA and NAA viz., 100, 500, 1000 ppm and control in liquid hormonal solution and powdery hormonal treatment. The cuttings treated with IBA 500 ppm and IBA 1000 ppm, performed the best in all aspects, as rooting percentage and shooting percentage and also the overall growth rate of rooting and sprouting was found good in liquid hormonal solution as compared to powdery hormonal treatment.

KEY WORD: *Vermiculite, Garden Soil, Growth hormones, Controlled condition.*

INTRODUCTION:

Trees are major sources of food, fodder, oils, medicines, fuel wood, fibers, and timber. In many developing countries like India, consumption of wood products is continuously increasing with population growth (Phulwaria *et al*., 2012). In recent years, vegetative propagation approaches have been used as an efficient tool for propagation of trees and proved suitable for large-scale production of seedling in short time as comparison to seed method. Clonal propagation by cutting method is widely used to multiply

elite trees obtained from the natural population. Rooting ability of cuttings depends upon the size of cutting, age, time, hard, moderately hard, soft or herbaceous and environmental conditions (Hartmann *et al*., 1997; Husen and Pal, 2003a**)** Propagators usually select healthy, vigorous, well-matured, shoots with viable buds as the source of cuttings for propagation. Maturity of stem cuttings plays an important role in rooting and the cuttings obtained from young soft stem generally root more profusely (Hartmann *et al*., 1997; Husen 2012). Rooting performance depends on the type of medium used in the propagating structure because these materials provide physical support, oxygen, water and rooting hormones (Kester *et al*., 1990). *Terminalia bellerica* is one of the important trees of arid region and fruit of this plant is used in many ayurvedic preparations as well as for other purpose like making ink, dying and tanning material (Troup, 1921). The tree is generally propagated through the seeds. However, seeds have low viability as well as hard seed coat exhibit poor germination (Phulwaria *et al*., 2012). Therefore, best and alternative option is vegetative mass multiplication for large scale plantation. With this view the present study was conducted to standardize the hormones and growing media for mass multiplication of *T. bellerica*.

MATERIALS AND METHODS:

The experiment was conducted at the research field of Chauras campus of H.N.B Garhwal Central University, Srinagar (Uttarakhand). The experimental site is located between latitude 30^0, 12’ 0″ to $30^0$13'4″ N and longitude $78^0$0'45″ to $78^0$0'50″ E at an elevation 540 m above MSL. The region shows a semiarid and sub-tropical climate. Except during rainy season rest of months are usually dry with exception occasional showers during winter or early spring. The average minimum and maximum temperature, relative humidity and rainfall vary from 7.42^{0}C to 35.3^{0}C, 42.24% and 2.50 to 235.24 mm respectively.

The phenotypically superior trees were selected for juvenile shoots cuttings and cuttings were collected during the 3rd week of May 2011. Collected cutting were 9-10 cm in length and each cutting were having 1 or 2 leaves. The cuttings were washed in tap water and then treated with 2 % indophyl fungicide for 5 min to avoid fungal infection and then again washed with distilled water. Three plant growing medium viz. vermiculite, vermiculite + sand and garden soil were selected along with three growth regulators like Indole-3-Acetic Acid (IAA), Naphthalene Acetic Acid (NAA) and Indole-3-Butyric acid (IBA) were used as exogenous hormones. Liquid hormonal solution and powdery formulations were prepared by mixing the growth hormones in required quantities with distilled water and inert talc powder and adjusted to a concentration of 100 ppm, 500 ppm and 1000 ppm following the procedure of Hartmann et al., (1983). Cuttings dipped in distilled water (water dipping) were treated as control. After hormonal treatment the cuttings were planted in root trainers filled with garden soil, vermiculite and vermiculite with sand in the ratio of 1:1 and shifted to the mist chamber.

After 55 days these cuttings were uprooted and observation on rooting % and sprouting % of cuttings were recorded daily till the compilation of rooting and sprouting.

RESULTS AND DISCUSSION:

Sprouting and rooting was significantly influence by liquid hormone solution and growing media (Table 1). Cuttings treated with IBA 500 ppm gave maximum sprouting and rooting (80 %) whereas cuttings treated in IAA 1000 ppm and NBA 1000 ppm in terms of sprouting and NBA 500 ppm and NBA 1000 ppm in terms of rooting gives no result. The lowest sprouting was recorded in IAA 100 ppm and NBA 100 ppm (20%), whereas lowest rooting was recorded in NBA 500 ppm and NBA 1000 ppm (20%) in vermiculite medium. However, sprouting and rooting was influenced well when cuttings were treated with IBA 100 ppm, NBA 500 ppm (60%) and IBA 100 ppm, control (60%) when vermiculite was used as a growing media for cutting. Whereas, vermiculite with sand medium gave highest (40%) sprouting when IAA 1000 ppm treated cutting was used. Lowest 20% sprouting and rooting was found in control, while other set of solution showed negative responses in sprouting. In case of garden soil, maximum sprouting and rooting was recorded in cutting those were treated with IAA 100 ppm solution and IBA 1000 ppm respectively. Rest of treatments could not response and gave no results except IBA 100 ppm, IBA 500 ppm initiate the sprouting with very low per centage i.e. 20 % in each. However, control responded well for both sprouting and rooting gave good success. When growth promoting hormone were used in medium concentration proved to be good for enhancing the sprouting and rooting response in *T. bellerica* because IBA enhance the circulation of food material. Similar results were reported by Tewary *et al*. (2004) in *Vitex negundo* and Luna *et.al*. (2006) in *Melia composite.* As per Luna, (2006) IBA treatment gave better rooting (54.76%) than IAA and NAA in *Melia composite*. Tchendjeu *et al*. (2004) reported good sprouting and rooting in juvenile shoot cutting of *Pausinystalia johimbe*. According to Kumar, (2004) all the three species of *Terminalia* are difficult to root comparatively *T. arjuna* and *T. chebula* responded to rooting of hardwood cuttings, however, *T. bellerica* did not root at all. Role of auxins is enhancing callusing and rooting has been reported by Nanda *et al*. (1974) and Loach, (1988). Jones *et al*. (1976); Zimmerman, (1984) and Routt, (2006) advocated that accumulation of auxin in shoot was responsible for successive vegetative propagation of cuttings.

Effect of powdery hormonal treatment and growing on cutting of *T. bellerica* were presented in Table 2. It was observed that the out of the above mentioned mediums, the vermiculite medium with different treatments significantly influenced the sprouting and rooting behavior of *T. bellerica* while other mediums show less or no response. IBA 1000 ppm treated cutting were placed in vermiculite gave maximum sprouting (70%) followed by IBA 100 ppm, NBA 1000 ppm and control with 40 % each. While highest rooting (70%) was responded by IBA 500 ppm followed by IBA 100 ppm, IBA

1000 ppm and NBA 100 ppm gave 60 % rooting with each treatments and no response were found in NAA 100 ppm treatment. All treatments gave no response for sprouting and rooting when growing media was used as vermiculite+sand and garden soil alone. However, NAA 100 ppm, IBA 100 ppm IBA 1000 ppm and control gave only 20 % success in sprouting and rooting when it is treated with vermiculite+ sand and in case of garden soil 20 % sprouting was recorded with IAA 1000

CONCLUSION:

It was concluded from the present study that vermiculite medium with IBA treatment gives good results in sprouting and rooting of cutting while others gives no response. Also liquid hormonal solution gives better result as compare to powdery hormonal treatment in rooting and sprouting of cuttings. Vegetative techniques to propagate clones from genetically superior individual tree is very important in tree improvement and selection programmes, since cuttings can be taken on the same tree is identified by progeny test as the most desirable genotypes.

REFERENCES:

Hartmann, H.T and Kester, D.E. 1983. Plant propagation principles and practices (4th ed.), Prentice Hall, Inc. England Cliffs, New Jersey. 321p.

Hartmann, H.T., Kester, D.E., Davies, F.T and Geneve, R.L. 1997. Plant Propagation Principle and Practices. 6th Ed. Prentice-Hall of India Private Limited, New Delhi., 276-328.

Husen, A and Pal, M. 2003a. Effect of serial bud grafting and etiolation on rejuvenation and rooting cuttings of mature trees of *Tectona grandis* Linn. F. *Silvae Genetica.*, 52:84-87.

Husen, A and Khatoon, S. 2012. Role of anthraquinones as a marker and maturity in response to adventitious rooting of *Tectona grandis*. *American Journal of Plant Physiology*., 7(6): 220-231.

Jones, O.P and Hatfield, S.G.S. 1976. Root initiation in apple shoots cultured in vitro with auxins and phenolic compounds. *J. Hort. Sci.*, 51: 495-499.

Kester, D.E., Hartmann, T.H and Davier, F.T. 1990. Plant propagation: Principles and Practices. 5th edition. Prentice Hall, Singapore. 647p.

Loach, K. 1988. Influence of growth regulators on rooting success. *Acta. Hort.*, 226: 126-132.

Luna, R.K and Kumar, S. 2006. Vegetative Propagation through juvenile shoot cutting of *Melia Composita* Willd. Indian Forester., 1561-1569.

Nanda, K.K., Kumar, P and Kochar, B.K. 1974. Role of auxins in influencing rooting of cutting *N.Z.J. For. Sci.*, 4: 338-346.

Phulwaria, M., Rai, M.K., Harish, G.A.K and Khetaram, S.N.S. 2012. An improved micropropagation of *Terminalia bellirica* from nodal explants of mature tree. *Acta Physiol Plant.*, 34:299–305.

Routt, G.R. 2006. Effect of auxins on adventitious root development from single node cuttings of *Camellia sinensis* (L.) Kuntze and associated biochemical changes. *Plant Growth Regul*., 48: 111-117.

Tchoundkeu, Z., Asaah, E and Amougou, A. 2004. The role of vegetative propagation in the domestication of *Pausinystalia johimbe*. (K.Schum), a highly threatened medicinal species of West and Central Africa. For. *Ecol. Manage.*, 188:175-183.

Tewary, D.K., Vasudevan, P.K and Santosh. 2004. Effect of plant growth regulators on vegetative propagation of *Vitex negundo* L. (Verbenaceae). *Indian Forester.*, 130(1): 45-52.

Troup, R.S. 1921. Silviculture of Indian Tree. Clarendon Press, Oxford., 2:337-773

Zimmerman, R.H. 1984. Rooting apple cultivars in vitro: Interaction among light, temperature, phloroglucinol and auxin. *Plant Cell Tiss. Cult.*,301-311.

Table. 1. Effect of liquid hormonal solution and growing media on sprouting and rooting in *T. bellerica* (after 55 days of plantation)

	Vermiculite		Vermiculite + Sand		Garden Soil	
Treatment	Sprouting %	Rooting %	Sprouting %	Rooting %	Sprouting %	Rooting %
IAA100	20	80	0	0	40	40
1AA500	20	40	0	0	0	0
1AA1000	0	20	40	0	0	0
1BA100	60	60	0	0	20	0
1BA500	80	80	0	0	20	0
1BA1000	40	40	0	0	0	60
NAA100	40	20	0	0	0	0
NBA500	60	0	0	0	0	0
NBA1000	0	0	0	0	0	0
Control	40	60	20	20	40	40
S.D	28.36	28.60	13.50	6.32	16.87	23.19
S.E	8.98	9.10	4.27	2.00	5.34	7.34

Table 2. Effect of powdery hormonal treatment and growing media on sprouting and rooting response in T. bellerica (after 55 days of plantation)

	Vermiculite		Vermiculite + Sand		Garden Soil	
Treatment	Sprouting %	Rooting %	Sprouting %	Rooting %	Sprouting %	Rooting %
IAA100	20	40	0	0	0	0
1AA500	20	20	0	0	0	0
1AA1000	20	20	0	0	20	0
1BA100	40	60	0	20	0	0
1BA500	20	70	0	0	0	0
1BA1000	70	60	0	20	0	0
NAA100	0	0	20	0	0	0
NBA500	20	20	0	0	0	0
NBA1000	40	60	0	0	0	0
Control	40	50	0	20	0	0
S.D	23.47	23.57	6.32	9.66	6.32	0
S.E	7.42	7.45	2.00	3.06	2.00	0