www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(3): 566-568

www.thepharmajournal.com
Received: 17-01-2022
Accepted: 27-02-2022

Sakeena Gul Niazi
Forest Research Institute
Dehradun, Uttarakhand, India

Dinesh Kumar
Forest Research Institute
Dehradun, Uttarakhand, India

Ashok Kumar
Forest Research Institute
Dehradun, Uttarakhand, India

Corresponding Author:
Sakeena Gul Niazi
Forest Research Institute
Dehradun, Uttarakhand, India

Effect of cutting length and diameter on shoot cuttings in *Melia dubia*

Sakeena Gul Niazi, Dinesh Kumar and Ashok Kumar

Abstract
The present study was conducted to assess the effect of cutting length and diameter on shoot cuttings in *Melia dubia* in the nursery at Forest Research Institute, Dehradun. Hardwood stem cuttings from phenotypically superior and five years old *Melia dubia* trees were prepared to conducted the present experiment. Shoot cutting of four length classes i.e. 3-5 cm, 5-7.5 cm, 7.5-10 cm, 10-12 cm and four diameter classes i.e. 3-5mm, 5-7.5 mm, 7.5-10 mm, 10-12 mm were made. The experiment was laid out in mist chamber as randomised block design with three replications. Results revealed that the highest rooting percentage (76.66%) in shoot cutting was recorded in the length class 10 -12 cm and diameter class 10-12 mm where as it was least in length class 3-5 cm and diameter class 3-5 mm which may be indicating that thick and long hardwood cuttings are best for the propagation of *Melia dubia* under the nursery conditions.

Keywords: *Melia dubia,* cutting length and cutting diameter, RBD, growing parameters

1. Introduction

Melia composita Willd. (Syn. *Melia dubia* Cav.) is a multipurpose, fast growing, large deciduous tree belongs to family Meliaceae. It is commonly known as Malabar neem, Malabar dek, white cedar, gora neem or dreak (Swaminathan *et al.*, 2017). The tree is native to Indian subcontinent. Apart from India, it is also distributed in Sri Lanka, Myanmar, Malaysia, Java, China and Australia. In India, it occurs in Himalayas, North Bengal and upper Assam, Khasi hills, Western Ghats, Deccan and Hills of Orissa. It is an industrially important tree. It is commercially cultivated due to the fast growing nature, short rotation, low maintenance, stem straightness and non susceptibility to pest. *M. Dubia* has become extremely popular among the growers as plywood and pulp tree when harvested at an age of 6-8 years and a timber tree when grown more than 10-12 years (Kumar *et al.*, 2017) [5]. It is also valued for urban landscaping and afforestation. It is observed frequently along the roadside, farm boundary, pure plantation and in natural forests (Susheela *et al.*, 2008) [15]. *M. dubia* generally grows to the height of 25-30 m with a clear bole of 9 m in length and 1.5m in girth (Sarvanan and Sarumathi, 2013) [12]. Each and every part of the tree is used for medicinal purposes. Due to its multiuse, the trees growing naturally have been indiscriminately logged and resulted in significant decline in its population. Moreover, the tree has poor seed germination (14%-34.3%) due to hard stony seed coat (Anand *et al.,* 2012) [2]. Hence artificial propagation through stem cuttings can obviate the problems of slow and poor seed germination and subsequent survival of young seedlings. *M. dubia* is usually raised from seeds, however poor viability of seeds, irregular growth and variability in both quantity and quality of oil limit this method. Further, the plants propagated through seeds are highly heterozygous and take long gestation period to bear flowers, fruits and seeds. All these problems can be overcome by mass multiplying the superior genotypes/phenotypes *via* clonal techniques which help in producing healthy, uniform planting stock with shorter juvenile period consequently higher seeds. Pal (1995) [8] reported that the sprouting behaviours of cuttings depend on factors like the physiological age of the cutting, length and genotype of the mother plant material. Henning (2003) [4] also reported that longer cuttings were amenable for vegetative propagation than shorter cuttings. *M. dubia* is being widely introduced in all parts of the country. But, large-scale planting is hampered by poor seed germination (less than 10 %), despite producing abundant quantities of fruits every year (Nair *et al.*, 2005) [6]. As a result, planting stock is not available to the farmers and other planting agencies. Researchers state that poor germination rates are due to the hard stony coat (Anand *et al.*, 2012) [2]. Vegetative propagation option is also worth special attention. Theoretically, it can be used for mass "bulk" vegetative propagation of a restricted number of juvenile genotypes of presumably high genetic value derived for example from controlled pollinations, or for producing clones, either to establish clonal seed-orchards, or to develop clonal plantations, especially from genotypes selected from clonal tests of advanced generation families. The intricate relationships among the seasons, age of mother tree, auxin treatments and physiological conditions need to be thoroughly understood for developing a commercial protocol for clonal multiplication of *M. dubia*. Thus, the present study tries to understand reasons behind poor rooting, techniques to enhance the same, and the possibilities of using coppice cuttings for macro propagation.

Materials and Method

The experiment was conducted during the spring season. *Melia dubia* stem cuttings were obtained from the superior phenotypes planted by Genetics and Tree Improvement division of Forest Research Institute (FRI), Dehradun at Seema Dwar, Dehradun. To avoid the chances of drying and decaying of material, cutting were prepared and planted in the same evening of collection. Shoot cutting of four length classes and four diameter classes are presented in table 1. the stem cuttings were planted with the application of hormone indole butyric acid (IBA) @2000 ppm at the basal portion in dry form mixed with talcum powder for early facilitation of rooting. The experiment was laid in Randomised Block Design (RBD) in the polybags containing a mixture of soil and sand in 2:1 in the mist chamber near central nursery of FRI, Dehradun.

Table 1: Cutting length and diameter class for planted stem cuttings

Sr. No.	Cutting length class (cm)	Cutting diameter class (mm)
1.	L1 (3-5)	D1 (3-5)
2.	L2 (5-7.5)	D2 (5-7.5)
3.	L3 (7.5-10)	D3 (7.5-10)
4.	L4 (10-12)	D4 (10-12)

Results and Discussion

Analysed data presented in table 2 showed variations in recorded parameters due to different length and diameter class were found significant. Rooting and sprouting parameters were greatly influenced by cutting length and diameter class. The success in the cuttings propagation of woody species is often related to the existence of reserve substances in the stem, mainly carbohydrates, which will supply the necessary energy to the rhizogenesis (Oliveira *et al.*, 2012) [7]. The photosynthates translocation takes place during the dormancy period and, therefore, autumn is the time that provides these reserves immediately available (Denaxa *et al.*, 2012), justifyingthe best rooting in this season. The application of plant regulators, mainly of the auxin group, has been cited as favorable to the adventitious rooting process in several species. Many factors influence the rooting process of cuttings; among them, the age of the mother tree (Wendling *et al.*, 2014b) [16], the collection season (Zen *et al.*, 2015) and the application of plant regulators (Stuepp *et al.*, 2014) [14]. Thus, more juvenile branches and in good nutritional condition tend to present a better rooting (Wendling *et al.*, 2014b) [16].

Number of cutting sprouted: The analysed data revealed that highest sprouting (56 out of 60) was recorded in the L4D4 whereas minimum (35 out of 60) was recorded in L1D1. Although highest sprouting (90%) was also recorded in the treatment L4D4 whereas minimum (58.33%) recorded in treatment L1D1. In general, the rooting percentage, number and length of roots had higher values in old age cuttings, a fact probably related to the greater vigor presented by these plants. Several authors recommend the use of juvenile materials for the propagation of woody species, justifying, above all, the improvements related to the rooting and vigor of clonal plants (Wendling *et al.*, 2014b) [16]. The decline in rooting capacity in woody species is often linked to the effects of maturation where cuttings from more juvenile plants or branches tend to have a better rooting (Stuepp *et al.*, 2014; Wendling *et al.*, 2014b) [14, 16]. Thus, cuttings collected from younger age plants have greater vigor and greater easiness to root, justifying the best results observed in the present work.

Number of cuttings rooted and rooting percentage: The analysed data revealed that highest routing (46 out of 60) was recorded in the L4D4 whereas minimum (28 out of 60) was recorded in L1D1. Although highest rooting (76.7%) was also recorded in the treatment L4D4 whereas minimum (46.7%) recorded in treatment L1D1. The maximum root length (7.5 cm) was recorded in the L4D4 whereas minimum (3.5 cm) was recorded in L1D1. The use of plant regulators, specifically IBA, has been recommended for stimulating and accelerating the process of adventitious root formation (Guo *et al.*, 2009; Pop *et al.*, 2011) [3, 11], increasing the rooting index, the speed of formation, quality and uniformity of the root system. The addition of auxins has been verified in many studies and the concentrations required vary from species to species (Abu-Zahra *et al.*, 2013) [1]. The plants respond progressively to the stimulus to an optimal level of auxin, from which, the increase in concentration becomes inhibitory or even phytotoxic (Pop *et al.*, 2011) [11].

Number of shoot per cutting: The analysed data revealed that higher number of shoot per cutting (6.1) was recorded in the L4D4 whereas minimum (2.8) was recorded in L1D1. Similarly, highest number of root apices per (6.6) was recorded in the L4D4 whereas minimum (3.1) was recorded in L1D1. The high mortality seems to be related mainly to the harvesting season, since in the autumn the mortality was low for the two plants ages, as well as for all the concentrations of IBA used. This result may be a consequence of the branches physiological condition at the time of collection, because it is during this period that plants begin to store reserves in the stem, being readily available to the cuttings during the periods of greatest growth, decreasing, consequently the mortality (Oliveira *et al.*, 2012) [7].

Survival (%): The analysed data revealed that higher survival (71.7%) was recorded in the L4D4 whereas lower (33.3%) was recorded in L1D1. The overall recorded results in the present nursery experiment revealed that different cutting length/diameter and IBA greatly have effect on *Melia dubia* cuttings on the morphological characteristic. It is generally accepted that IBA have a certain role in the rooting initiation (Stefancic *et al.*, 2005). 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. There was significant variation in rooting percentage during different seasons in coppice shoot cuttings of *Melia dubia* indicating that season has a major effect on rooting in the species, which is similar to the earlier findings (Palanisamy *et al.*, 1995) [10]. Palanisamy and Pramod Kumar (1996) [9] reported that in Neem significant adventitious formation occurs only in leaf fall season, whereas in other season the rooting was very poor. Similar results have been obtained in our experiments also indicating similar responses between species of the same family.

Table 2: Evaluation of planted cuttings for different parameters.

Treatments	No. of cutting sprouted	Sprouting (%)	No. of cuttings rooted	Rooting (%)	Number of shoot/ cutting	Number of root apices	Root length (cm)	Survival (%)
L1D1	35	58.3	28	46.7	2.8	3.1	3.5	33.3
L1D2	38	63.3	30	50.0	2.9	3.3	4.2	33.3
L1D3	40	66.7	30	50.0	3.0	3.6	4.3	40.0
L1D4	42	70.0	34	56.7	3.1	4.1	4.6	41.6
L2D1	43	71.7	35	58.3	3.4	4.1	4.8	46.6
L2D2	43	71.7	40	66.7	4.0	4.3	5.1	50.0
L2D3	44	73.3	40	66.7	4.1	4.5	5.5	50.0
L2D4	44	73.3	41	68.3	4.0	5.1	5.7	60.0
L3D1	38	63.3	34	56.7	4.3	5.1	5.8	61.7
L3D2	44	73.3	40	66.7	4.5	5.2	5.8	65.0
L3D3	48	80.0	41	68.3	4.8	5.3	6.0	65.0
L3D4	50	83.3	42	70.0	4.9	5.3	6.2	66.7
L4D1	52	86.7	43	71.6	5.1	5.4	6.5	68.3
L4D2	52	86.7	44	73.3	5.5	6.1	6.5	68.3
L4D3	54	90.0	45	75.0	5.8	6.4	6.8	70.0
L4D4	56	93.3	46	76.7	6.1	6.6	7.5	71.7

Conclusion

Cuttings from younger stock plants are more responsive for adventitious roots formation, as well as result in the formation of a more vigorous root system. The highest rooting percentage (76.66%) in shoot cutting was recorded in the length class 10 -12 cm and diameter class 10-12 mm. So it can be recommended that thick and long hardwood cuttings are best for the propagation of *Melia dubia*.

References

1. Abu-Zahra TR, Al-Shadaideh AN, Abubaker SM, Qrunileh IM. Inûuence of auxin concentrations ondifferent ornamental plants rooting. International Journal of Botany. 2013;9:96-9.
2. Anand B, Devagiri GM, Maruti G, Vasudev HS, Khaple AK. Effects of Pre-sowing Seed Treatments on Germination and Seedling Growth Performance of Melia dubia CAV: An Important Multipurpose Tree. International Journal of Life Sciences. 2012;1:59-63.
3. Guo XF, Fu X, Zang D, Ma Y. Effect of auxin treatments, cuttings collection date and initial characteristics on Paeonia ‘Yang Fei Chu Yu’ cutting propagation. Scientia Horticulturae, 2009;119:177-81.
4. Henning R. The Jatropha Booklet. A guide to Jatropha System and Dissemination in Zambia, GTZ – Assp Project Zambia, 13, Mazabuka. 2003.
5. Kumar A, Savita Shrivastava P, Sharma S, Dobhal S, Rana A and Kumar R. Development of high yielding varieties of Melia dubia Cav. (Syn. M. Composita Benth.). Indian Forester. 2017;143(11):1203-1206.
6. Nair KKN, Mohanan C, Mathew G. Plantation technology for selected indigenous trees in the Indian peninsula. Bios et Forets Tropique. 2005;285:17-23.
7. Oliveira RJP, Bianchi VJ, Aires RF, Campos AD. Teores de carboidratos em estacas lenhosas de mirtileiro. Revista Brasileira de Fruticultura. 2012;34:1199-207.
8. Pal M. Rooting stem cuttings of woody plants. In: Forestry Improvement. Bawa, R., Khosla, P.K. and Kohli, R.K. (eds.) Dehra Dun, India. 1995, 37-58.
9. Palanisamy K and Pramod Kumar. Seasonal effect on induction of adventitious rooting in stem cuttings of neem (Azadiracta indica A. Juss). Indian Journal of Forestry. 1996;19:183-186.
10. Palanisamy K, Ansari SA and Mandal AK. Standardization of vegetative propagation technology of teak, sissoo, neem, karanj and bamboos. In: Proc. International Workshop on Forestry Research Methods, Vani Printers, Dehra Dun. 1995, 18-19.
11. Pop TI, Pamfil D, Bellini C. Auxin control in theformation of adventitious roots. Notulae Botanicae Horti Agrobotanici, 2011;39(1):307-16.
12. Sarvanan N and Sarumathi A. Beneficial effect of centella-asiatic and Asiatic acid in immobilization induced stress in rats: A FTIR Study. Journal of Global Trends in Pharmaceutical Sciences. 2013;4(4):1279-1284.
13. Stefanic M, Stamper F, Veberic R, Oster G. The level of IAA, IAAsp and some phenolics in cherry rootstock, Gisela5, leafy cutting pretreated with IAA and IBA. Scientia Hort. 2007;112:399-405.
14. Stuepp CA, Zuffellato-Ribas KC, Wendling I, Koehler HS, Bona C. Vegetative propagation of mature dragon trees through epicormic shoots. Revista Bosque. 2014; 35(3):333-41.
15. Susheela T, Balaravi P, Theophilus J, Reddy TN, Reddy PUM. Evaluation of hypoglycaemic and antidiabetic effect of M. dubia CAV fruits in mice. Current Science. 2008;94:1191–1195.
16. Wendling I, Trueman SJ, Xavier A. Maturation and related aspects in clonal forestry-part II: reinvigoration, rejuvenation and juvenility maintenance. New Forests. 2014b; 1:1-14.