

(II)

**MASS PROPAGATION PROTOCOL FOR A *PODOCARPUS NERIIFOLIUS*
D. DON. THROUGH JUVENILE SHOOT CUTTINGS**

Vegetative propagation of forest trees is an old silvicultural technique. During the past few decades, much progress has been made with regard to mass clonal multiplication of forest trees using rooted cuttings for establishing industrial plantations. It has become a large-scale, operational programme in such countries as Brazil and Congo, and many more countries are following the same. Clonal forestry offers new opportunities to tree breeders and its judicious selection to complement traditional forestry plantation programme is likely to pay great dividends in the future.

The basic feature of cloning by contrast with sexual propagation through seeds consists, throughout mitosis and only mitosis, in duplicating the selected individual—the ortet—while preserving its whole genetic identity and structure. This means in term of plant improvement, capturing and transferring to the vegetatively obtained offspring the integral genetic value—both additive and non-additive components—of the ortet they derived from. This is of paramount importance as variations due to such non-additive gene effects can exceed 50% in forest tree species (Hasnain and Cheliak, 1986), affecting especially major traits such as form, vigour and wood characteristics, which are known to be under polygenic control and not so well inherited sexually.

Vegetative propagation is a good tool

for propagating the selective genotype. Cloning by rooting of cuttings has developed a lot because it became possible to use improved genetic material in the establishment of seed orchards, in nutrition trials, in increasing hybrids with more genetic accuracy for tests and establishment of large industrial plantation forests through mass propagation of clonal planting material.

Podocarpus neriifolius D. Don (Podocarpaceae) known as 'Halis' in India, is a tree found in the Eastern Himalayas, Assam and Andamans. The plant yields high-class timber used for making furniture, ladders, instruments and pencils besides one of the best ornamental trees. The tree height generally ranging from 30-45 m. with 10-100 cm diameter and clear bole up to 20 m. The crown is often dome-shaped.

The economic method of vegetative propagation is rooting of branch/stem cuttings and juvenile shoot cuttings; however, there are large numbers of endogenous factors affecting the production of rooted vegetative propagules. These include nature of species, genetic variation within the species, maturation state of propagules donor, position of cuttings on the crown, the type and size of the cutting, time of collection (season) etc. Generally rooting response varies with season (Nanda *et al.*, 1968, 1970). In general, rooting is more profuse during

summer months especially from April to July (Rana *et al.*, 1987) declines from August onwards and there is no rooting in winter (Nanda *et al.*, 1968).

Various auxins viz. IAA, IBA, IPA, and NAA, etc. promote rooting of stem as well as juvenile shoot cuttings but the effectiveness of the auxins varies with the season, concentration and chemical nature of auxins and the mode of treatment (Nanda, 1970; Nautiyal *et al.*, 1987). IAA is more effective in promoting rooting in summer (Nanda, 1970) while IBA and IPA were found more effective in winter (Pain and Roy, 1981).

Considering the importance of cloning of *Podocarpus neriifolius* for various specific uses, the different rooting hormones in two concentrations were tested to finally recommend the best treatment for rooting of the juvenile shoot cuttings to develop a mass multiplication technology of this species.

The juvenile shoot cuttings were collected from the already established plantation trees of *Podocarpus neriifolius* from Forest Research Institute Campus

Dehradun in the month of May 2005. The tender shoots 10 to 12 cm long were used for cuttings with 2 to 4 mm dia. The cuttings were treated with bavistine solution (1%) for 5 minutes, to avoid fungal infection. The two different concentration of rooting hormone that is 2000 and 4000 ppm. of IBA, IAA and NAA diluted in telcome powder (dry) were used as hormonal treatment. The freshly prepared dry mixture of rooting hormone with telecom powder was used. The basal portions of the cuttings were dipped in rooting mixture and then gently tapped to remove excessive mixture of auxin. After hormonal treatment the cuttings were planted in wet vermiculite rooting media filled in plastic trays and sifted in the mist chamber. A suitable control was maintained in which the cuttings were treated with talcum powder only. Fifty cuttings were taken for each treatment. The mist chamber used is having facility of electronically controlled intermittent misting and maintained a temperature 35°C and a relative humidity 80%. After thirty days the cuttings were carefully removed from the rooting medium and observation were recorded on the number of cuttings rooted, root number, main root

Table 1

Rooting response of juvenile shoot cuttings of Podocarpus neriifolius under different hormonal treatments.

Treatment	No. of cuttings/ treatment	Rooting % of cuttings	No. of roots/ cutting	Root length/ cutting (cm)	No. of sprouts/ cutting
Control	50	10	2	2.3	1
IAA 2000	50	30	6	4.5	2
IAA 4000	50	40	8	6.9	2
IBA 2000	50	60	10	7.0	2
IBA 4000	50	80	12	6.8	3
NAA 2000	50	35	5	8.0	1
NAA 4000	50	30	4	8.3	2

length and number of sprouts per cutting (Table 1).

The maximum 80% rooting was observed in the cuttings treated with IBA 4000 ppm followed by IBA 2000 ppm (60%) and IAA 4000 ppm (40%). However, the minimum rooting percentage was observed in case of Control (10%) without any hormonal treatment. It is interesting to note that the number of roots per cutting were higher in case of IBA and IAA treatments but root length was observed more in case of NAA treated cuttings. The

IBA was found to be the best rooting hormone in case of many other tree species also as reported by Nautiyal *et al.* (1991), Gurumurti and Bhandari (1988), Pal (1992), Chandra and Verma (1989), and Nautiyal *et al.* (2004).

Since, IBA 4000 ppm treatment is proven to be the best rooting hormone for rooting of juvenile shoot cutting of *Podocarpus neriifolius*, therefore, this treatment is recommended for treating the juvenile shoot cuttings for mass multiplication of this species.

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