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Vegetative Propagation of Neem (*Azadirachta indica)* through Mature Stem Cuttings

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ABSTRACT

Neem (*Azadirachta indica*) is a multipurpose tree that produce high quality timber with high demand. However, it is difficult to find trees with good form such as tall, straight and less branches. Therefore, it is necessary to develop suitable vegetative propagation techniques to obtain clones from superior elite trees since sexual propagation (seeds) does not always yield similar progeny to mother plant. This experiment was carried out to investigate suitable conditions to obtain clones from rooted mature stem cuttings. In the present study three different media, three levels of Indol Butric Acid hormone and two different environments were tested. Shoot initiation was observed two weeks after planting and number of rooted cuttings were recorded in each condition nine weeks after planting. The results showed significant difference in rooting percentage between medium, hormone level and environment. A higher rooting percentage was observed inside the propagator (25.56%) than in open environment (12.22%). Among different media highest rooting percentage was observed in sand (30%) followed by (sand: coir dust) and (sand: top soil). IBA 400ppm (30%) hormone level was the best.

KEYWORDS: Hormone level, Media, Neem, Vegetative propagation

INTRODUCTION

Neem, (*Azadirachta indica*) popularly known as "kohomba" in Sri Lanka, grows wild in most parts of the dry and intermediate zones of the country. It is also a forest plantation species in dry North and Eastern Regions, but found mostly in home gardens, tank bunds and roadsides to form shady avenues (Gunasena and Marambe, 1998).

Neem is a medium to fairly large-sized tree reaching 15-25 m height and 60-80 cm diameter of breast height (DBH), usually evergreen except in dry localities and periods of extreme drought, when it becomes leafless for a short period. Bark is thick, brown to dark grey with deep longitudinal furrows and; bitter to taste (Hocking, 1993).

There are so many uses in neem tree. The wood, durable and resistant to insect attacks, has been used for everything from furniture to boat oars, from agricultural implements to drums and carved images. Like its relative mahogany, it takes on a good polish. The young, tender branches have been widely used in India and other countries as "chewing sticks" to keep the teeth and gums clean and healthy. Commercial toothpastes containing neem extracts are now available in India, Europe, and United States. The bitter leaves and flowers are eaten as a potherb, and the fruit is also edible. In Indian folk medicine, the leaves are prescribed for many ailments, including intestinal parasites, swollen glands, bruises, sprains, and malaria. Leaf extracts have been shown to have antiviral activity and delay blood clotting (confirming their efficacy as traditional snakebite treatments), and the leaf essential oil has strong antibacterial and antifungal activity. The bark of the neem tree yields a red dye which, however, is seldom used. The bark and root bark have been used to treat malaria, jaundice, and intestinal parasites, and to tan goatskins. The fruit has been used to treat urinary disorders and haemorrhoids (Foster, 1993).

Neem is easily raised by sexual or vegetative propagation. The tree can be planted using seeds, seedlings, saplings, root suckers, or tissue culture. (Gunasena and Marambe, 1998).

Vegetative propagation has some added advantages than seeds propagation. Foremost is the genetically identical off springs by which valuable traits can be preserved. Secondly only one parent is required which eliminates the need of special mechanisms. Vegetative propagation is especially beneficial to the agriculturists and horticulturists. They can raise crops like bananas, sugarcane, potato, etc that do not produce viable seeds. The seedless varieties of fruits are also a result of vegetative propagation (Anon, 2012).

Neem seeds are viable for short durations and trees produced through seed germination exhibit considerable variations. Production of nursery stock through vegetative propagation is desirable for raising plantations of high productivity (Board, 2004).

One method of vegetative propagation is acquiring roots from stem cuttings. So many factors affect the rooting percentage .Such as, temperature, day light, photosynthesis rate, RH, hormone level, potting media and etc.

This research was conducted to determine suitable environment, media and hormone level to obtain the higher number of rooted stem cuttings of neem.

MATERIALS AND METHODS

The experiment was done in Forest Research Centre, Kurunegala, from January to April 2013.

Collection of Cuttings

Cuttings were taken from good healthy mother plants of high vigour. Plants were selected from the nursery site within the Forest Research centre. Tree heights were 10-15 m. 0.5 m to 1.2 m long branches were collected randomly from the mother plant and leaves were removed from each branch. Then about 20 cm long and 0.5 cm-1.5 cm diameter mature cuttings were obtained from each branch. All the cuttings were put into a water bucket immediately to reduce the transpiration rate. Slant cut was given to each cutting to increase the surface area to enhance absorption of hormone and rooting.

Treatment and Planting

Three IBA hormone levels such as 0 ppm, 200 ppm and 400 ppm were used in this research. These cuttings were dipped in each hormone (aqueous IBA hormone) level for 30 min.

Three types of potting media used these were sand and top soil (1:1), sand and coir dust (1:1) and sand. Top soil was collected from the forest close to the Forest Research Centre. Sand was collected from the river close to the forest research centre. Then cuttings were planted in each potting media 2 to 3 cm in depth. Those cuttings were planted inside the propagator and open space environment (natural environment). Both environments were supplied with water, using the sprinkler irrigation system, 5 min daily. Maxicrop liquid fertilizer solution was sprayed time to time to provide the nutrients to the cuttings.

Data Recording

Total numbers of rooted and non rooted cuttings were taken separately nine week after planting.

Statistical Analysis

All data were statistically analyzed using CATMOD procedure by using (SAS 9.2 software, SAS Inc.,Cary, USA). Data were in categorical form and non-parametric analytical tool was used as the method ($P < 0.05$).

RESULTS AND DISCUSSION

Statistical analysis show that all three factors (variables) namely media, hormone levels and environment tested in this experiment significantly influence the rooting of neem cuttings (Table 1). Whereas, this analysis further shows that there were no significant effect from the interaction between media and hormone level, between media and environment and between hormone level and environment on rooting percentage of the neem cuttings.

Table 1. Effect of hormone level, media and type of environment to the rooting of neem cuttings

Source	Probability
Media	0.0442
Hormone	0.0041
Environment	0.0205
Media* Hormone	0.9002
Media* Environment	0.7681
Hormone* Environment	0.6828
Chi-Square	0.9197

Note: Probability value< 0.05-significantly different

Table 2. Percentage value of rooted cuttings of the both environments

Environment type	Rooted %	Non rooted %
Inside propagator	25.56	74.44
Open space	12.22	87.78

As far as environment is concerned Rooting percentage inside the propagator is higher than the rooting percentage of the open space (Table 2). This result suggests that use of propagator increases the percentage of rooting of neem cuttings.

Table 3. Percentage value of rooted cuttings of different type of media

Type of media	Rooted %	Non rooted %
Inside propagator		
Sand + top soil	20	80
Sand + coir dust	20	80
Sand	36.67	63.33
Open space		
Sand + top soil	6.67	93.33
Sand + coir dust	6.67	93.33
Sand	23.33	76.67
Both environments		
Sand + top soil	13.33	86.67
Sand + coir dust	13.33	86.67
Sand	30	70

According to Table 3, sand media has higher rooting percentage (36.67% inside the propagator and 23.33% in open space) in both media than the other two types (sand: top soil, sand: coir dust) of media. Therefore, to obtain a higher number of rooted neem cuttings, sand medium is preferred over other two media tested.

Table 4. Percentage value of rooted cuttings of different type of hormone level

Hormone level	Rooted %	Non rooted %
Inside propagator		
0 ppm	10	90
200 ppm	26.67	73.33
400 ppm	40	60
Open space		
0 ppm	3.33	96.67
200 ppm	13.33	86.67
400 ppm	20	80
Both environments		
0 ppm	6.67	93.33
200 ppm	20	80
400 ppm	30	70

Above results (Table 4), indicate that 400 ppm hormone level had a higher rooting percentage (40% inside the propagator, 20% in the open area) in both environments than the other two hormone levels in both environments. This shows that 400 ppm IBA is the best among all three levels of IBA for rooting.

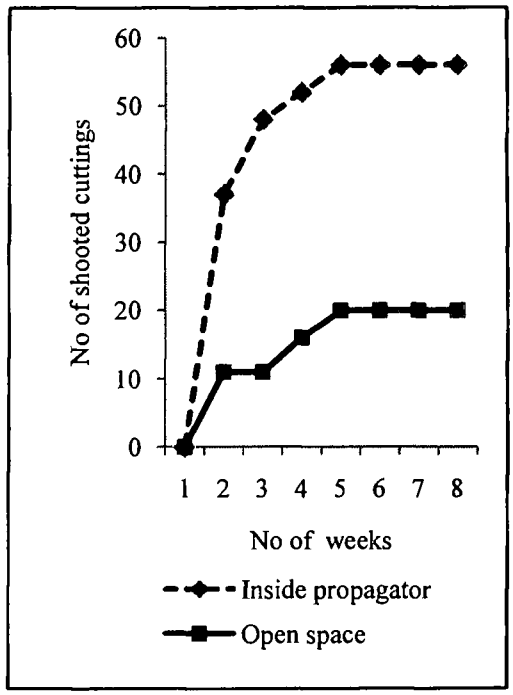

Figure 1. Number of shoot cuttings of inside Propagator and open space environment

Therefore, using cuttings treated with 400 ppm IBA in sand media kept inside the propagator produced the highest number of rooted cuttings than any other combination used in this experiment.

Further, some problems were encountered during this research. One of them is fungus attack in newly emerged shoots. This attack is higher inside the propagator than the open space environment. This may be due to high moisture and temperature condition inside the propagator. It could be prevented or reduced if cuttings were treated with fungicide before planting.

At the very beginning of the experiment sprouting of young shoots from the cuttings which are in the propagator is higher than that of the open space environment (Figure 1). However, with the time many tender shoots inside the propagator begun to die. This may be due to fungal attack.

Therefore, by removing the cover of the propagator just after peak sprouting (4 to 5 weeks after planting), it is possible to test whether the death young shoot followed by death of cuttings can be reduced and thereby dead percentage of the shoot cuttings can be reduced.

CONCLUSIONS

All three factors (variables) namely, media, hormone levels and the environment tested in this experiment significantly influence the rooting of neem cuttings. There were no significant effect from the interaction

between media and hormone level, between media and environment and between hormone level and environment on rooting percentage of the neem cuttings. Sand medium has higher rooting percentage (36.67% inside the propagator and 23.33% in open space) in both media than the other two types (sand: top soil, sand: coir dust) of medium. Rooting percentage inside the propagator is higher than the rooting percentage of the open space. 400 ppm IBA is the best among all three levels of IBA for rooting. Highest number of rooted cuttings was obtained by using cuttings treated with 400 ppm IBA in sand media and inside propagator, than any other combination used in this experiment. Treatment of cuttings with systemic fungicide is essential to reduce the fungal infestation, especially inside the propagator.

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