Clonal Propagation of Lubeg (*Syzygium lineatum*) using Stem Cuttings in Different Rooting Media

Yolina T. Castañeto[1] and Elmer T. Castañeto[1]

[1] Department of Environmental Science, Nueva Vizcaya State University, 3700 Bayombong, Nueva Vizcaya, Philippines

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ABSTRACT

Nursery experiment on clonal propagation was conducted using indigenous species of Lubeg (Syzygium lineatum). This species has multiple uses and a potential crop for upland rehabilitation. Stem cuttings were collected from seedlings of Lubeg (Syzygium lineatum) and observed for the formation of adventitious roots. Rooting of stem cuttings was done using different rooting media such as sand and coir dust (T1), sand and charcoal (T2), sand and vermicompost (T3), and sand and rice hull in 2:1 ratio by volume. The following parameters were used: Percent survival, percent sprouting, percent rooting, length of sprouts, length of adventitious root and number of adventitious roots produced to assess the rooting of the two species in different rooting media.

Observation on the rooting of the species revealed that the different rooting media influenced the rooting of Lubeg. Lubeg macropropagation using stem cuttings was found feasible. Lubeg cuttings root formation was affected by the rooting media used except for the length of cutting sprouts. Among the four media, Lubeg cuttings grown in sand and coir dust gave higher percent survival, percent rooting, percent sprouting, length of roots and number of adventitious roots.

From the results, Lubeg cutting's best rooting was achieved using sand and coir dust and therefore, is recommended for use on rooting the said species using stem cuttings collected from seedlings.

INTRODUCTION

Propagation of forest tree species is generally using seeds through sexual reproduction. However, there are species which have irregular flowering characteristics; thus, fruit and seed availability are also affected. In the absence of viable and high quality seeds to mass produce the species, an alternative method needs to be tried. Asexual vegetative or clonal propagation is one of the alternative methods (Castañeto and Inhumang, 2004). However, each tree species is a unique organism; thus, gave different responses when propagated using stem cuttings. To date, there are only few researches conducted in the propagation of indigenous tree species using stem cuttings. The use of other plant parts except the seed for plant propagation is also called asexual propagation. Asexual propagation is an alternative means of plant propagation and at the same time for tree species conservation. One form of asexual propagation is vegetative propagation in which new individuals arise without production of seeds. In a broader sense, vegetative propagation method include the use of stem cuttings and other plant parts, air layering, budding and grafting.

Vegetative propagation ensures the capture of full genetic composition of the source of the planting materials. Among the advantages of this method are improved productivity in terms of increased uniformity of growth and improved stem straightness of the tree species. Moreover, it is also an effective technique in safeguarding the

species' genetic variation (Castañeto, 2003).

In using vegetative propagation, the use of stem cuttings is one of the most preferred. The pieces of the "parent" plant are removed and placed in a suitable environment so that it can grow into a whole new plant, known as the "clone", which is genetically identical to the parent. Cutting exploits the ability of plants to grow adventitious roots under certain conditions. Vegetative propagation is usually considered a cloning method. It is also a process whereby a new plant can be created from a twig or stem of the tree.

The study on rooting of stem cuttings was experimented using Lubeg (*Syzygium lineatum*) species which has multipurpose values and uses and most importantly a potential species for rehabilitation of denuded upland areas.

The asexual propagation of the species is a move toward their genetic conservation. Once two morphologically desirable species of these indigenous trees were successfully propagated using vegetative clonal propagation, it will give an alternative method of mass production of desirable species.

In general, the study aimed to propagate Lubeg using stem cuttings from seedlings in different rooting media. Specifically, the study aimed to:

1. Determine if there are significant differences in percent survival, sprouting, rooting, length of sprout and adventitious roots and number of adventitious roots of Lubeg; and
2. Determine the best rooting medium that will enhance better rooting of Lubeg.

METHODOLOGY

A nursery experiment was performed at the NVSU College of Forestry Greenhouse using Lubeg (*Syzygium lineatum*) following the methods:

Preparation of Cuttings

A two-node cuttings were obtained from the apical shoots of phenotypically superior seedlings of Lubeg using a sharp pruning shear. The cuttings were placed in a basin with water to avoid dessication and to wash off dusts. Leaves from the lower part of the cuttings were removed and the remaining leaves were trimmed into half. The cuttings were soaked in Manzate fungicide for one hour.

Preparation of the Rooting Media

The different rooting media (sand, coir dust, charcoal, vermicompost and rice hull) were collected and mixed based on 2:1 ratio by volume as follows:

T1 - sand and coir dust
T2 - sand and powdered charcoal
T3 - sand and vermicompost
T4 - sand and rice hull

The mixed rooting media were placed in labeled Hiko trays. Treated stem cuttings of Lubeg and Tuai were planted in the Hiko trays and were kept in transparent chambers. The planted cuttings were watered using hand sprayer as the need arises. These Hiko trays with cuttings were maintained in the nursery for thirty days after planting the stem cuttings.

Data on percent survival, sprouting, rooting, length of sprout and adventitious root, and number of adventitious roots were collected to evaluate the response of the different species to different rooting media.

The experiment was set-up in a Completely Randomized Design (CRD) replicated four times. Randomization was done to assign the different treatments. Twenty-four cuttings were used in each treatment. The different parameters were subjected to Analysis of the Variance (ANOVA) to determine the effect of treatments using SPSS 3.1 for Windows.

RESULTS AND DISCUSSION

Propagation of Lubeg (*Syzygium lineatum*) using stem cuttings in different rooting media after thirty days revealed the following results as shown in the Analysis of the Variance (ANOVA) on Table 1.

Rooting of stem cuttings of Lubeg from seedlings in different rooting media gave significant differences in percent survival, percent sprouting, percent rooting, length of adventitious roots and number of adventitious roots.

Percent Survival

Survival of stem cuttings of Lubeg was affected by the rooting media. Lubeg had 66.67 to 100% survival. Lubeg cuttings had 100% survival in coir dust and rice hull while 66.67% in vermicompost. It was noted Lubeg stem cuttings survival is higher in sand and coir dust and sand and rice hull and lowest in sand and vermicompost (Table 2). On the contrary, study on Yacon using stem cuttings grown in different rooting media did not show significant differences in percent survival (Angayon *et al.,* 2008).

Percent Sprouting

The ability of the cuttings to produce shoots or sprouts is very necessary for its growth and development because it helps the cuttings to synthesize food and sustain the different physiological processes for growth and survival. Rooting media affected the sprouting of stem cuttings of Lubeg. Lubeg had high sprouting (95.83 to 100%) in all the rooting media used except for those cuttings in sand and vermicompost with 70.84% (Table 3).

Percent rooting

The ability of the cuttings to produce adventitious root is very essential in their survival. The roots are very important in the absorption of nutrients and minerals needed by the plant. Rooting of Lubeg stem cuttings was affected by the rooting media. Better rooting of Lubeg cuttings was achieved using sand and coir dust, sand and rice hull, sand and charcoal, and lowest in sand and vermicompost (Table 4).

In a study using Yacon stem cuttings formation of adventitious roots was not affected by the rooting media (Angayon *et al.,* 2008). This corroborated with the

Table 1. Summary of the Analysis of the Variance on Different Parameters of Lubeg

Parameters	Fc
Percent Survival	0.044*
Percent Sprouting	0.009**
Percent Rooting	0.044*
Length of Sprouts	0.604ns
Length of Adventitious Roots	0.044*
Number of Adventitious roots	0.034*

ns - Not significant ** - Significant*
*** - Highly significant*

Table 2. Percent survival of Lubeg stem cuttings in different rooting media

Rooting media	Percent Survival (%)
T1 (sand + coir dust)	100.00b
T2 (sand + charcoal)	83.34ab
T3 (sand + vermicompost)	66.67a
T4 (sand + rice hull)	100.00b
Fc	0.044*

Table 3. Percent sprouting of Lubeg in different rooting media

Rooting media	% Sprouting
T1 (sand + coir dust)	95.83b
T2 (sand + charcoal)	100.00b
T3 (sand + vermicompost)	70.84a
T4 (sand + rice hull)	100.00b
Fc	0.009**

findings in Lubeg cuttings. Moreover, cuttings of carnation improve the percentage of adventitious root using three parts of sand and one part of soil (Thomas, 2003).

Length of Sprout

Production of sprouts is very essential for the cuttings to survive because of its role in photosynthesis. The study showed that length of sprout of Lubeg was not affected by the different rooting media. The length of Lubeg sprout measured 1.85 to 3.20 cm (Table 5). Same findings were obtained on the length of sprout of Yacon (Angayon *et al.,* 2008). However, a contrasting result was obtained on Baleteng liitan (Ficus binendijkii) cuttings (Shah, 2003).

Length of Adventitious Roots

Length of adventitious roots of stem cuttings of Lubeg was affected by the rooting media. Lubeg had longest adventitious roots in sand and coir dust (Table 6). On the other hand the shortest length was observed for stem cuttings of Lubeg grown in sand and vermicompost but were comparable with sand and charcoal and sand and rice hull.

Number of adventitious roots

Lubeg cuttings number of adventitious roots were significantly affected by the different rooting media used in the study. Lubeg cuttings had the most number of adventitious roots on cuttings planted in sand and coir dust (5.16).

The above findings are in contrast with the study of Patricio *et al.* (2006) where number of adventitious roots of Shorea guiso did not show significant differences using river sand, rice hull and combination of river sand and rice hull. Same with the findings of Ayan *et al.* (2006) as cited by Abrias 2008 showed insignificant effect to Black Alder (*Alnus glutinosa*).

Table 4. Percent rooting of Lubeg in different rooting media

Rooting media	Percent rooting (%)
T1 (sand + coir dust)	100.00b
T2 (sand + charcoal)	83.34ab
T3 (sand + vermicompost)	66.67a
T4 (sand + rice hull)	100.00b
Fc	0.044*

Table 5. Length of sprouts (cm) of Lubeg and Tuai in different rooting media

Rooting media	Length of sprout (cm)
T1 (sand + coir dust)	2.77
T2 (sand + charcoal)	2.27
T3 (sand + vermicompost)	3.20
T4 (sand + rice hull)	1.85
Fc	0.064ns

Table 6 . Length of adventitious roots (cm) of Lubeg in different rooting media

Rooting media	Mean Length of Adventitious Roots (cm)
T1 (sand + coir dust)	4.45b
T2 (sand + charcoal)	2.33a
T3 (sand + vermicompost)	2.02a
T4 (sand + rice hull)	2.12a
Fc	0.044*

Table 7. Number of adventitious roots of Lubeg in different rooting media.

Rooting media	Number of adventitious roots
T1 (sand + coir dust)	5.16b
T2 (sand + charcoal)	2.25a
T3 (sand + using vermicompost)	2.33a
T4 (sand + rice hull)	2.08a
Fc	0.034*

CONCLUSION AND RECOMMENDATIONS

The indigenous species Lubeg (*Syzygium lineatum*) can be propagated using stem cuttings in different rooting media. Propagation of Lubeg using stem cuttings was found feasible. Except for cuttings length of sprouts, all the parameters were significantly affected by the rooting media used in the study. Lubeg cuttings grown in sand and coir dust gave higher percent survival, rooting, sprouting, length of roots and number of adventitious roots. Hence, in the macropropagation of Lubeg using stem cuttings, the best rooting media is sand and coir dust. However, it is recommended that verification trials be conducted to verify results before sharing the knowledge or study to the farmers or stakeholders.

LITERATURE CITED

Abrias, J. 2008. Rooting of Yacon (*Smallanthus sonchifolius*) Cuttings from Lateral Stem using Different Rooting Media. Undergraduate Thesis. NVSU Bayombong, Nueva Vizcaya.

Angayon, J.D., Y.T. Castañeto and E.T. Castañeto. 2008. Rooting of Yacon (*Smallanthus sonchifolius*) Using Main Stem in Different Rooting Media. NVSU Research Journal. Vol. XV (1-2):17-21.

Castañeto, Y. T. 2003. Growth of Mahogany (*Swietenia macrophylla* King.) Cuttings to Applied Mykovam and Biocore. NVSIT Graduate Research Journal. Vol. V (1-4):1-9.

Castañeto, Y.T. and I.A. Inhumang. 2003. Rooting of Ipil (*Intsia bijuga* Colebr.) Cuttings from Seedlings using Indolebutyric acid (IBA). Meristem. Vol 4:9-12.

Patricio, H.P., Y.T. Castaneto, A.P. Vallesteros and E.T. Castaneto. 2006. Macropropagation of Shorea guiso Using Stem Cuttings. Journal of Tropical Forest Science. 18(3):198-201.

Shah, M. 2003. Effect of Different Growing Media on the Growth of *Ficus binnendijkii*, Amstel Queen Cuttings. On-line: htpp://www.arpjournals.com/jabs/Researchpapers/jabs0906_22.pdf. Accessed: March 2008.

Thomas, L.M. 2003. Effect of different media on rooting cuttings of carnation cv. Mixed Super Chauband. Journal of Interacademicia. Vol VII:262-264.