Cuttings Propagation of *Labisia pumila* (KACIP FATIMAH)

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Abstract

Cutting propagation trial on *Labisia pumila* was conducted in this study. Since the raw material supply of this herb are limited, this study aimed to identify feasible propagation methods for future planting production of this herb. Two part of cuttings were used i.e. shoot and stem. These cuttings were propagated in sand beds (0.3m depth) containing 100% medium of fine sand and covered with plain white UV plastic sheet using closed capillary propagation system. For each shoot and stem cuttings, cuttings were divided into different cutting's diameter i.e A (> 0.7 cm), B (< 0.7 cm) and length i.e. 10 cm, 15 cm, 20 cm. All of the cuttings were treated with commercial hormone, IBA. Each treatment consisted of 50 cuttings and replicated into 4 replicates. All types of cuttings used in this experiment begin establish root systems in first 3 weeks after propagated. Based on the result the highest percentage of rooting was achieved by using shoot cutting that less than 7 cm diameter and 10 cm long (91.5 ± 1.9%). Stem cutting that more than 7 cm diameter and 10 cm long gave the lowest percentage of 57.0 ± 10.4%. On average, cuttings using shoot parts give better results than stem parts on success of rooting.

Key words: *Labisia pumila*; cuttings propagation; stem cuttings; shoot cuttings.

1. Introduction

Labisia pumila, commonly known as Kacip Fatimah or Akar Fatimah, Remoyan Batu (Jah Hut) and Sangkoh (Iban) is a plant from family Myrsinaceae. *L. pumila* is native to Southeast Asia and naturally found in the damp forest floor at elevations of between 80-100 m (Stone, 1988). In Malaysia, *L. pumila* is a well known herb for women. Traditionally, the plant have been used to induce and ease childbirth and as post-partum medication to contract the womb, delay conception, regain body strength, firm up breasts and abdominal muscles, and also regulate and ease painful menstrual cycle among young women (Wan Ezumi *et al.*, 2007). It is also being used to treat dysentery, rheumatism and gonorrhea (Burkill, 1966). The antioxidative properties and capacities of *L. pumila* also have been reported that are believed to play a role in protection against a variety of diseases and delaying ageing processes (Norhaiza *et al.*, 2009).

This plant is usually obtained from its natural habitat. Its availability in the forest is becoming scarce due to the increase in demand by the users (Mohd Satefarzi, 2001). In addition, the plant have slow growth rate and take a long time to grow (Mohd Noh *et al.*, 2002). Logging activities and encroachment of the forest have also contributed to the problem. It is anticipated that this plant species will face extinction and severe genetic loss if necessary steps are not taken to replant and conserve it. To avoid further depletion of this species, there is a need to domesticate and cultivate it. The plant can be propagated by seeds, leaves and stem cuttings. The planting stocks are usually raised from seeds. However, the dependence on seeds as the source of planting materials is inadequate as seeds are difficult to obtain due to the depletion of mother plants. Therefore, leaf and stem cutting method was chosen to propagate the plant to reduce reliability on planting material from natural habitat.

The importance and potential of *L. pumila* in medical plant and pharmaceutical industry is known, but more research is desirable especially in commercialize planting and nursery aspect as well. Easy propagation and rapid production of the plant can add to the prospects as a medical plant of wider use and can reduce reliability of material from wild. This study was aimed to determine and investigate the factors (different plant parts and sizes) affecting the rooting ability of *L. pumila*'s cutting. Although propagation by cuttings has been successfully carried out in *L. pumila*, there are still refine techniques need to be reinvestigated to enhance a more successful and precise mass propagation of this species. The technique expressed in the earlier researches are more general (Rozihawati *et al*, 2005; Nurul Nahar, 2009) by which more focused on rooting ability of stem cuttings. Meanwhile this paper focuses on the various types and sizes of planting material used for production of *L. pumila*. The findings of this study could refine and contribute to the development of more suitable propagation techniques which lead to increase propagation rate of the species.

2. Materials and Methods

2.1 Plant materials

L. pumila variety of alata was used in this study. The stock plants of *L. pumila* var. alata were sampled from matured plants collected from Sg. Siput, Perak. Only healthy and disease-free plants were used for cuttings propagation in this experiment.

2.2 Cuttings preparation and propagation

Two types of cuttings were used i.e. shoot andstem. These cuttings were propagated in sand beds containing 100% medium of fine sand and covered with plain white UV plastic sheet using closed capillary propagation system to keep and maintain high humidity surrounding the cuttings and medium (Mohd Afendi *et al.*, 1996). The system was reported potentially can increase rooting of cuttings (Ab. Kahar *et al.*, 2009) and used in other propagation study of the species (Nurul Nahar, 2009). For each shoot and stem cuttings, cuttings were divided into different cutting's diameter i.e A (> 0.7 cm), B (< 0.7 cm) and length i.e. 10 cm, 15 cm, 20 cm (refer Table 1).

Table 1. Cuttings preparation and experimental design

Plant Part	Diameter (cm)	Length (cm)	Treatment	Total	Replicate
Shoot	A (> 0.7 cm)	10	A10-Shoot	50	4
		15	A15-Shoot	50	4
		20	A20-Shoot	50	4
	B (< 0.7 cm)	10	B10-Shoot	50	4
		15	B15-Shoot	50	4
		20	B20-Shoot	50	4
Stem	A (> 0.7 cm)	10	A10-Stem	50	4
		15	A15-Stem	50	4
		20	A20-Stem	50	4
	B (< 0.7 cm)	10	B10-Stem	50	4
		15	B15-Stem	50	4
		20	B20-Stem	50	4

All of the cuttings were treated with commercial hormone, IBA Rootmone. IBA was applied at the base of cuttings before planting. Each treatment consisted of 50 cuttings and replicated into 4 replicates (Table 1). The cuttings were maintained and raised in the nursery for up to 4 months and rooting and post-rooting activities was then recorded for each treatment.

2.3 Statistical analysis

Data collected in all experiments were analyzed by SPSS and subjected to analysis of variance (ANOVA). The mean differences were tested using Tukey's honestly significant difference test (Tukey HSD) with significant value of $P = 0.05$.

3.0 Results and Discussions

3.1 Rooting ability of *L. pumila*'s cuttings

All types of cuttings used in this experiment begin establish root systems in first 3 weeks after propagated. Based on the result summarized in Table 2, the highest percentage of rooting was achieved by using cutting class of B10-Shoot (91.5 ± 1.9%) and followed by cutting class of B20-Shoot (90.5 ± 4.4%). There are significance difference between the two class at $P = 1.000$. Cutting class of A10-Stem gives the lowest percentage of only 57.0 ± 10.4%. On average, cuttings using shoot parts give better results than stem parts on success of rooting. This finding of higher rooting percentage on shoot part (upper part) than stem part (below part) of this species was in agreement with Rozihawati *et al.* (2005). In addition, leaf cuttings were reported have higher percentage of rooting compared

Table 2. Percentage of rooting and shoot production of *L. pumila* cuttings

Treatment	Mean percentage of rooted ± S.D.* (%)	Mean percentage of shoot produced ± S.D.* (%)
A10-Shoot	82.5 ± 5.3[abcd]	81.0 ± 3.5[a]
A15-Shoot	81.5 ± 3.4[abcde]	70.0 ± 11.4[ab]
A20-Shoot	81.0 ± 9.0[abcde]	75.0 ± 9.5[ab]
B10-Shoot	91.5 ± 1.9[a]	88.5 ± 1.9[a]
B15-Shoot	82.5 ± 12.8[abcd]	69.5 ± 26.0[ab]
B20-Shoot	90.5 ± 4.4[ab]	88.5 ± 6.0[a]
A10-Stem	57.0 ± 10.4[f]	23.0 ± 2.6[cd]
A15-Stem	59.5 ± 9.6[def]	23.5 ± 6.6[d]
A20-Stem	59.0 ± 15.4[ef]	25.0 ± 8.9[d]
B10-Stem	67.5 ± 13.8[bcdef]	33.0 ± 12.4[cd]
B15-Stem	70.0 ± 3.7[abcdef]	44.0 ± 6.3[bcd]
B20-Stem	67.0 ± 12.1[cdef]	44.0 ± 16.6[bcd]

* Values represent mean ± standard deviation of 4 replicates. Means followed by the same letter did not differ significantly at $p < 0.05$

to other plant parts of the species (Rozihawati *et al.*, 2004), even though Nurul Nahar (2009) reported stem cuttings gives preferable survival percentage (>80%) than leaf cuttings (<15%).

Table 2 also showed that shoot and stem cuttings with smaller sizes in diameter (< 0.7 cm) give better percentage of rooting. Lengths sizes of cuttings seem not significantly affecting the rooting ability of shoot and stem cuttings. However Rozihawati *et al.* (2005) reported rooting percentage for up to 75% for stem cuttings with length of only 6 cm, compared to an average of 63% in this experiment with cutting above 10 cm in length.

From ANOVA using SPSS software, there is a statistically significant difference in the mean percentage of rooted cuttings between all groups of treatments ($F_{14,45}$ = 7.315, P = 0.000). However, there were no significant difference within groups of shoot ($F_{5,18}$ = 1.766, P = 0.171) and stem ($F_{5,18}$ = 0.910, P = 0.496) as determined by one-way ANOVA.

3.2 Shoot formation ability of *L. pumila*'s cuttings

The shoot production process started after 6 weeks of propagation. Shoots were then elongated along with expanded leaves. Based on result in Table 2, even smaller cuttings in diameter (Class B or diameter < 1.0 cm) have better percentage to root and produced shoot, leaves produced were smaller compared to leaves produced from larger diameter cuttings (Class A or diameter >1.0 cm) which bigger and larger. This could be due to high food storage in bigger cuttings that will effect cuttings growth.

Based on result in Table 2, cutting classes of B10-Shoot and B20-Shoot share the highest percentage (88.5 ± 1.9% and 88.5 ± 6.0%) to produce new shoot from rooted cuttings. All groups from shoot cuttings have percentage to produce new shoot above 70% (except class B15-Shoot) whereas groups from stem cuttings only have percentage below 45%. This is an expected phenomenon as shoot parts (apex) have succulent cambium cells which could stimulate meristem cells to actively divide and produce new shoots (Meyer *et al.*, 1977), even only stem parts reported have leaf trace cells which could encourage new shoot production (Nurul Nahar *et al.*, 2009). There was a statistically significant difference in ability to produce and initiate new shoot between all type of cuttings as determined by one-way ANOVA ($F_{14,45}$ = 13.220, P = 0.000).

4.0 Conclusion

The species is known it can be propagated by using seeds or cuttings. The germination using seeds is a natural process of the species in its natural environment. However, it's not efficient for commercial purposes as the percentage of germination using seeds was only 15% after germinated. Results of this study showed that the vegetative propagation using other parts of the species as cuttings can give higher percentage and success for mass production of the species for commercial planting. Cuttings using shoot parts can give percentage up to 88.5% and take shortest period (2 months) to establish as a new plant. However, cuttings using shoot parts of the plants have some disadvantages as most matured plant found from this species can only produce one shoot per plant, even a few plants found have more than 2 shoots. Whereas, matured plants of the species which have average height of 30 cm can produce 2 or more stem cuttings, even showed lower percentage (up to 44%) and take longer time (4 months) to establish as a new plant. Leaf cuttings of the species could be new a dimension for mass production of the species as discussed in other paper by the author. Even taking an extensive period to initiate shoot formation (up to 12 months), leaf cuttings have the ability to produce multiple shoots (up to 4 in this study), thus can produce more new plants. In addition, matured plants of the species have an average of 8 leaves and each leaf can be divided into 3 or 4 sections.

In conclusions, this study indicates that *L. pumila* could be propagated using different plant parts and sizes with optional and preferable results showed that shoot parts of the species gives promising result. The used of the shoot and stem parts as the planting material for propagation method is an effective way by reduced waste of planting materials and in addition, it can be mass propagated in smaller area even from limited planting materials. Thus, further observation and study should be carried out to refine and enhance the cuttings techniques for this species to rapidly and improve the propagation rate. The whole results of this study also can be exploited to utilized planting materials more efficiently and reduce the reliability of planting materials from the wild.

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