Propagation and Phenological Studies of *Memecylon umbellatum* Burm.f, (Melastomataceae) as a Promising Landscape Plant

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ABSTRACT

Today, exotic plants are widely used in the landscape industry. However, there are potential native plants which can be introduced to the landscape industry. An experiment was conducted at Makandura to identify the best cutting type and time period required for the field establishment of *M. umbellatum* as a potential landscape plant. Three types of cuttings namely softwood, softwood with 3cm portion of hardwood and hardwood of 20cm in length were planted in sand medium. Cuttings were factorially arranged in a completely randomized design inside a propagator in a net house. Six weeks after planting, rooting percentage, number of roots and root dry weight were measured. This was repeated up to the 13th week. Softwood with a 3cm portion of hardwood recorded the significantly higher rooting percentage, root dry weight and number of roots. Further, 12 weeks after planting growth performances were satisfy enough for the field establishment. Therefore, softwood with a 3cm portion of hardwood grown in sand medium can be recommended as the potential propagule for the field establishment 12 weeks after planting.

Phenological observations reveal that this plant produces attractive blue violet flowers and fruits many times a year. This colour is rare in nature and can be used as cool colour in landscape designing. Further, it produces shorter internodes and tolerate pruning. Therefore can be used in hedges as well as to make topiary.

KEYWORDS: Landscape, *Mememecylon umbellatu*, Native, Phenology, Propagation

INTRODUCTION

Native plant species are those that occur in a region which they evolved. Therefore, they are well adapted to local conditions over thousands of years. As more gardens and landscapes are designed and installed true to their local conditions, opportunities will continue to expand for the use and development of new native plants for ornamental horticulture industry (O'Brien, 1996).

In contrary to native plants, exotic plants have a higher demand in the market as most of them produce attractive, colourful flowers and foliages. However, they have a higher water requirement, susceptible to pest and diseases, need regular maintenance and some tend to become invasive.

Compared to exotics, native plants are believed to be superior to them because of their better growth and reduced likelihood to become invasive (Kendle and Rose, 2000). Further, they maintain or improve soil fertility, reduce soil erosion, less or no fertilizer and pesticide requirement and it provides habitats for wild life (Anon, 2005a).

Though some native plants have an immense potential to be used as landscape plants, less awareness of people about suitable wild plants and unavailability of knowledge of suitable propagules are the main barriers in introducing these plants to the landscape industry in Sri Lanka (Konara and Yakandawala, 2005).

Memecylon umbellatum, a native plant locally known as Korakaha which is naturally distributed in dry, intermediate and wet zones in Sri Lanka (Bremer, 1987) is identified as a potential landscape plant by Senarathne and Yakandawala in 2005. Further, it has a potential to be used in landscaping as a specimen plant, to establish a hedge and to make topiary (Senarathne and Yakandawala, 2005). It produces attractive violet blue colour inflorescences along the branches.

In addition to its potential landscape use this plant is used in Ayurvedic medicine. The leaves as a cooling astringent; used in conjunctivitis as a lotion and given internally in Leucorrhoea and Gonorrhoea (Mhaskar *et al.*, 2000). According to Amalraj and Ignacimuthu (1998), oral administration of an alcoholic extract of the leaves led to a significant lowering of serum glucose levels. The leaves are also used for the treatments in snake bites (Anon, 2005b) and infusion of leaves used as astringent for Opthalmia (Jayaweera, 1982). The bark is used as a lep to bruises (Mhaskar *et al.*, 2000). A decoction of roots of this plant is given for irregular menstruation. (Jayaweera, 1982).

Leaves of this plant yield a yellow dye (Bremer, 1987) and used locally to colour traditional Dumbara mats and tapestries (Anon, 2006). In rural areas dried twigs are used to make brooms to collect paddy in threshing process and the hard stems are used to make supports in Beatle cultivation.

This research was conducted with the objective of identifying the best cutting type to be used as a propagule and time period required for the field establishment of *M. umbellatum* cuttings. Phenological observations and details of flowering and fruiting features were also recorded to gather information on lowering and fruiting in order to relate them to the potential landscape interests.

MATERIALS AND METHODS

1) Field trial

Healthy, vigorous cuttings were obtained from well grown *M. umbellatum* plants at Liniyakanda, Giriulla. The exact location and the elevation of the site were recorded using a Geographical Positioning System (Garmin etrex summit). A soil sample was collected at a depth of 30cm to determine the soil pH.

The field trial was carried out at the faculty of Agriculture and plantation Management, Wayamba University, Makandura from February to July 2006.

Cuttings of 20cm in length to represent three maturity stages viz Softwood (SW), Softwood with 3 cm portion of Hardwood (SW + HW) and Hard wood (HW) were used in the experiment

Pre-moistened sand was used as the common media. The cuttings were planted in black polythene bags (6cm × 8cm, gauge 150) after treated with rooting hormone (Keradix). Three treatments were factorially combined in a completely randomized design and each treatment consists of 56 plants. These were placed inside propagators covered with milk white polythene, (gauge 500, relative humidity 90% and temperature 30^{0}C) under a net house (shade level 1800 lux). Captan was applied (20g/10l) as required to overcome fungal infections to the media.

Six weeks after planting eight plants were randomly selected from each treatment and presence and absence of roots, number of roots and root dry weight (Oven dried at 80^{0}C for 48 hours) were measured. This was repeated up to the 13th week. SAS programme was used to analyze the data (Anon, 1999).

2) *Phenology and details of flowering and fruiting features:*

Ten individuals of *M. umbellatum* which are likely to flower, located at the university premises were selected for the phenological observations and to study the details of flowering and fruiting. Each plant was observed from November 2005 to July 2006 at one week interval. When flower buds were present, two buds from each plant were tagged and observations were made daily throughout the flowering season to determine the time, duration and frequency of flowering and fruiting.

Further, the number of inflorescences per node, number of flowers per inflorescences, fruiting percentage of an inflorescence, duration of fruit development and falling were also recorded.

In addition, the colour of the flowers and fruits were recorded using RHS (Royal Horticultural Society, 2001) colour chart.

RESULTS AND DISCUSSION

1) Field trial

A natural population of *M. umbellatum* was found at Liniyakanda, Giriulla area. The exact location of the site is N 07^{0}22.142 latitude and 80^{0}06.189 longitude and the elevation is 96m. It is a sloppy site and the soil is slightly acidic pH 5.7).

Among the various propagation methods, cuttings are most commonly used, since it is the easiest and most convenient method of vegetative propagation (Chadha and Bhattacharjee 1994). In *M. umbellatum*, seeds are not available throughout the year. Therefore, cuttings were tested as potential propagules by Senarathene and Yakandawala, (2004).

According to Senarathne and Yakandawala (2004), for *M. umbellatum* sand was the best medium to propagate cuttings. Therefore, sand was used as the medium in this experiment.

1.1 - Root dry weight

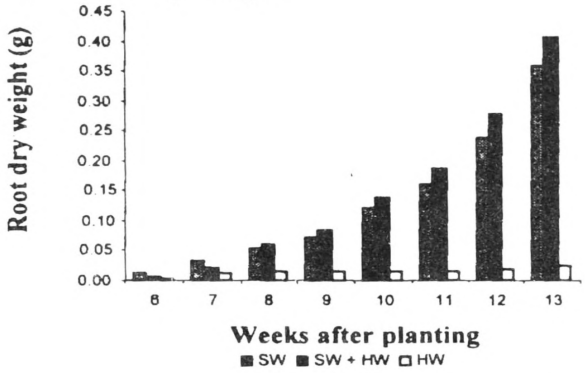

Figure 1- Root dry weight of cuttings at different weeks after planting:

The root dry weight of *M. umbellatum* was highly significant with weeks (<0.0001) and cutting type (<0.0001). However, interaction between weeks and cutting type was not significant.

Table 1 - Root dry weight comparison in different treatments:

Cutting type	Difference between means	95% confidence limit	
		High	Low
SW Vs. SW + HW	0.2658	-0.3880	0.9197
SW Vs. HW	2.2551	1.6013	2.9090*
SW + HW Vs. HW	1.9893	1.3424	2.6361*
CV	33.0091		
LSD	1.8295		

Comparisons significant at 0.05 levels are indicated by *

According to t-test for root dry weight log values; there was no significant difference between softwood (SW) and softwood with a portion of hardwood (SW + HW).

However, it is significantly different between softwood and hardwood (HW) as well as softwood with a portion of hardwood and hard wood (Table 1).

If only root dry weight is considered softwood and softwood with a portion of hardwood can be used as the best propagule.

Table 2 - Root dry weight of cuttings at different weeks:

Week comparison	Difference between mean	95% confidence interval	
		Low	High
13-12	0.3072	-0.7491	1.3635
13-11	0.6191	-0.4372	1.6753
13-10	0.8554	-0.2009	1.9117
13-9	1.2248	0.1685	2.2811*
CV		33.0091	
LSD		1.1295	

Comparisons significant at 0.05 levels are indicated by*

According to Table 2, the mean root dry weight from 10th week onward was not significantly different.

Root dry weight log values for different weeks indicate that rooted cuttings can be established in the field from 10th week after planting.

1.2 - Rooting percentage:

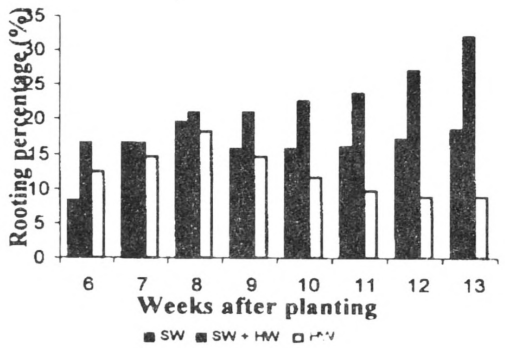

Figure 2 - Rooting percentages of cuttings in different treatments:

Rooting percentage of *M. umbellatum* was highly significant among cutting type (<0.0001). However, it was not significant at different weeks (0.3114).

Table 3 - Mean rooting percentages in different treatments:

Cutting Type	Mean rooting percentage (%)
SW	29.17_a
SW + HW	66.67_b
HW	8.33_a
CV	36.4912
LSD	28.837

Treatment means having common letters are not significantly different at p=0.05

Significantly higher percentage of roots were recorded by SW + HW (66.67) followed by SW (29.17). Lower number of roots was observed in HW. (8.33). However, there was no significant difference between SW and HW (Table 3).

According to mean rooting percentages softwood with a portion of hardwood (SW + HW) was the best cutting type to be used as a propagule.

1.3 - Number of roots:

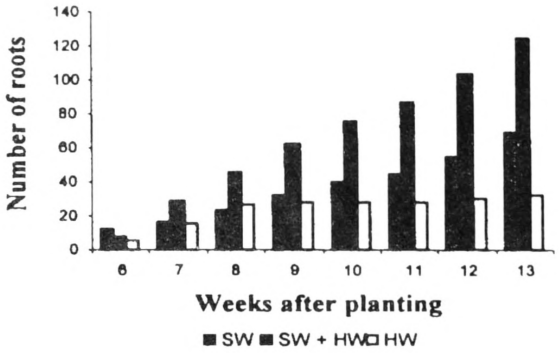

Figure 3 - Number of roots of cuttings at different weeks:

The number of roots is highly significant with both weeks (<0.0001) and type of cutting (<0.0001). Interaction between weeks and type of cutting also has a significant effect.

According to Figure 3, the different mean number of roots presented at different weeks. Although at 6th week SW has the highest mean number of roots, in all the other weeks SW + HW has the highest mean number of roots. Therefore, softwood with portion of hardwood (SW + HW) can be considered as the best cutting type.

Table 4 - Mean number of roots in different treatments:

Treatment	Mean number of roots (for 64 cuttings)
SW	36.375_b
SW + HW	66.917_a
HW	24.375_c
CV	44.7238
LSD	11.047

Treatment means having common letters are not significantly different at p=0.05

Significantly higher mean number of roots were observed in SW + HW (66.917) followed by SW (36.375). In HW significantly lower numbers of roots were observed.

When consider the numbers of roots in softwood with a portion of hard wood (SW + HW) at different weeks, following results were observed.

Table 5 - Mean number of roots at different weeks after planting:

Weeks after planting	Mean number of roots
13	75.222_a
12	62.444_{ab}
11	53.222_b
CV	44.7238
LSD	18.039

Treatment means having common letters are not significantly different at p=0.05

Highest mean number of roots was observed at 13 weeks after planting (75.222). However, it was not significantly different from 12 weeks after planting (62.444). Number of roots in 12 weeks after planting was not significantly different from 11 weeks after planting (53.222). However, with compare to the number of roots at 13 weeks after planting with 11 weeks after planting there was a significant difference (Table 5).

Therefore, according to the mean number of roots, cuttings can be uprooted for field establishment from 12th week after planting.

By considering above results, soft wood with a portion of hardwood (SW +HW) can be considered as the best propagule and cuttings can be planted in the field 12 weeks after planting.

2) *Phenological observations and details of flowering*

M. umbellatum produced attractive younger shoots, flowers and fruits. Younger shoots are brown (Brown group 200A, RHS colour chart, 2001) in colour. Leaves are small, obtuse to round in shape and often notched at the apex. The average internodal distance of *M. umbellatem* is about 2.5cm.The shorter internodal distances and as stated by Senarathne and Yakandawala (2004), tolerance to severe pruning enable this plant to be used in hedges as well as in topiary.

2.1) Flowering

M. umbellatum produces attractive violet blue inflorescences (violet blue group 96A, RHS colour chart, 2001) along the branches. During the study period, flower buds initiated in February 2006 and continued until June 2006 with four flowering peaks in March, April, May and June. During peak flowering flowers cover about 80% of the canopy. Therefore, during that period the plant gives an attractive brilliant violet blue appearance. According to Genve (2000), violet blue colour is rare in nature and is useful in landscaping as a cool colour to provide harmony to a design specially to setup focal points and to develop pleasant colour schemes for the garden.

On average, a single bud takes 45 days to develop into a flower. Flowers ranging from 10 – 30 present in an inflorescence and they do not open at once. It takes about three to four days for all the flowers in an inflorescence to bloom. During first, second, third and fourth days, 16%, 61%, 21% and 2% flowers of the inflorescence open respectively.

In *M. umbellatum* one to four inflorescences present per node and these inflorescences cover the entire node with flowers. Therefore, it gives a dramatic effect during flowering period. The florets of an inflorescence open for only one day. However, all the florets of an inflorescence last for maximum of four days. Though the duration of flowers of an inflorescence is short, it does not affect the beauty of the plant as the bracts and the style are prominent and violet in colour. They remain in the inflorescence for five more days.

2.2) Fruiting

Fruits were globose in shape and initially yellowish green colour and mature fruits become bluish violet (violet blue group N62C, RHS colour chart, 2001).

Only about 46% of flowers in an inflorescence produce fruits. Fruits were initiated 12 days after flowering. A single fruit takes 20 days for ripening and fallen in three days. They were bitter in taste.

Although the flowering period of this plant last for about ten days, in between flowering, yellowish green immature fruits, and bluish violet mature fruits remain in the plant which further enhance the fascination of the plant. Due to the slow growth rate of the plant, it has a potential to be used as a potted plant as well.

CONCLUSIONS

Softwood of 20 cm in length with a 3 cm portion of hardwood can be recommended as the best cutting type to be used as the propagule. These cuttings can be introduced to the field 12 weeks after planting. Further *M. umbellatum* can be introduced to the landscape industry in all the three major climatic zones in Sri Lanka. It produces attractive clusters of violet blue flowers along the branches. This colour is rare in nature and can be used as a cool colour in landscape designing.

In addition fruits are also attractive. This plant tolerate pruning and it has shorter internodes therefore can be used in hedge and in topiary.

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