BIBLIOGRAPHY

DELA ROSA, JEANIFRE P. APRIL 2007. Rooting Characteristics of Medinilla (*Medinilla magnifica* Lindi) as Affected by Different Concentrations of ANAA. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted to determine the effect of different concentrations of ANAA on the rooting characteristic and shoot growth of Medinilla shoot tip cutting, and to evaluate the best concentration of ANAA suited for faster and uniform rooting of cuttings.

Results showed that cuttings treated with 750 and 1000 ppm ANAA formed roots and initiated shoot earlier; had the highest percentage of rooted cuttings, had the longest shoot length and root length two months after sticking of shoot tip cuttings in 1:1 alnus leaves compost and sandy loam soil.

Findings showed that the untreated or control had significantly delayed root formation compared to the treated cuttings.

These findings showed that dipping shoot tip cuttings of Medinilla for 30 minutes in 750 ppm to 1000 ppm ANAA prior to rooting is recommended since it hastened earlier root initiation, promoted the production more number of longer roots and shoots per cuttings two months from sticking in the rooting media.

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INTRODUCTION

Medinilla (*Medinilla magnifica. Lindi)* belongs to the family Melastomataceae Juss. This erect shrub stands 6 ft (1.8m) tall is usually found as an epiphyte in its Philippine homeland. Its stems may be ribbed or even winged and its rich glossy green leaves grow to about 12 inches (30 cm) long and have obvious paler veins. Its small pink flowers are produced throughout spring and summer in long pendulous panicles to 18 inches (45 cm); these are made even more obvious because of the large pink bracts attached to the flower clusters.

Most species only grow outdoors in the tropics. They can be cultivated as greenhouse and houseplants, but it cannot tolerate winter minimums below 64ºF (18ºC). The plants are usually grown in rich, moist, well-drained, humus-rich soil in partial shade. They need regular watering and feeding during the growing season. It can be propagated from seeds or cuttings. The exotic pink flower heads can reach up to 50 cm in length hanging down from the main plant. In addition, the plant has large oval dark green leaves with light veining. Truly, it is an incredible houseplant.

Medinilla is a genus of about 150 species of flowering plants, native to tropical regions of the Old World from Africa (two species) east through Madagascar (about 70 species) and Southern Asia to the western Pacific Ocean Islands. The genus was named after Ide Medinilla, governor of the Mariana Islands in 1820.

They are evergreen shrubs on lianas with leaves that are opposite or whorled or alternate in some species. The flowers are white or pink which are produced in large panicles. The following are some selected species of medinilla: *Medinilla arboricola*

China, *Medinilla assomica* China, *Medinilla cumigii*, Philippines. *Medinilla erthrophylla* China, Nepal, *Medinilla fengii* China, *Medinilla fengii* China, *Medinilla foresana* China, *Medinilla himalayana* China, Medinilla magnifica, Philippines, *Medinilla multiflora*, Philippines, *Medinilla venosa* Indonesia, and Philippines.

Auxins are commonly used and recommended by scientists to improve in root development of cuttings. However, farmers are usually not properly informed on the kind of auxins and concentrations to use. Besides, before the use of auxins as synthetic root promoting growth regulators in rooting stem cuttings, many chemicals were tried with limited success. The cuttings of some difficult-to-root species still root poorly after treatment with auxins. Hence, auxins are not always the limiting chemical component in rooting.

Therefore, problems on the quality and rate of rooting maybe solved by using appropriate growth regulators, concentrations, formulations and application.

The study was conducted to: determine the effect of different concentrations of (ANAA) on the rooting characteristics and shoot growth of medinilla shoot tip cuttings, and to evaluate the best concentration/s of ANAA for faster and uniform rooting of medinilla shoot tip cuttings.

This study was conducted at the Ornamental Horticulture Division, HORTI Research Area, Benguet State University, La Trinidad, Benguet from November 2006 to January, 2007.

REVIEW OF LITERATURE

Cutting as Propagules

The use of terminal shoot tip cuttings is from 3-5 inches in length and should have 6-8 leaves on the terminal shoot (Mc Daniel, 1982). Stem cuttings used are with lateral or terminal buds (Bautista *et al*, 1983) which are capable of developing adventitious roots as its basal portion eventually producing a plant.

Hartman and Kester (1968 and 1975), stated that softwood cuttings generally root easier and quicker than hardwood cuttings because they readily respond to treatments with root promoting substances. They stated further that stem cuttings in the most practical and economical method of propagating ornamental shrubs.

According to Apnoyan (1981) propagation by cutting has the advantages of making possible to produce genetically identical rootstock of trees, in contrast to the wide genetic variation found in seedlings. Thus, cuttings would provide a mean of multiplying superior rootstocks, if such rootstocks are developed.

Rooting Hormones

Rooting hormones help in the stimulation of root initiation with a larger percentage of roots formed in cuttings and a faster rooting time. Growth regulators may alter the type of roots formed as well as the number of roots produced (Brown, 1996). Rieley and Shry (1999) reported that the development of rooting hormones made the possibility of rooting certain plat cuttings that were considered impossible to root before. This chemical also shortened the length of time required to root cuttings.

In 1982, Fletcher and Kirlwood stated that plant growth regulators have found a wide application in horticulture, particularly for the stimulation of rooting, fruit set and fruit thinning. Furthermore, Hartmann and Kester (1968) reported that application of growth regulators to cuttings is important for the improvement of the quality of roots formed, stimulation of root initiation and for the acceleration of rooting of cuttings.

Janick (1972) mentioned that the rooting of cuttings positively influenced by auxins. The auxins level is closely related with adventitious rooting of stem cuttings. It was also noted that in a variety of such compounds, the greatest degree of success has been achieved with IBA.

Rooting hormones are generally used to aid in root formation. Some plants more easily than others because they produce higher level of natural hormones. These plants need less synthetic rooting hormones to root satisfactorily (Ingles, 1994).

Hormone Concentrations

Bleasedale (1973) stated that hormones maybe used to overcome the inherent difficulties encountered in rooting cuttings but can also inhibit the growth of the cuttings if applied at the wrong concentrations. This so because high concentrations maybe in effective (Halface and Barden, 1979). Root formation is more stimulated at lower concentrations than shoot formation (Bedwell, 1979).

Adriance and Brison (1955) reported the growth regulators are more effective if the concentrations is just below toxic level. Weaver (1972) added that high concentrations of growth regulators do not produce abnormalities in root formation and necrosis on tissues.

Macli-ing (2004) stated that dipping of milflores shoot tip cuttings in 500 ppm ANAA is the best concentration since it hastened early root initiation, promoted the production of longer roots and more produced per cuttings.

Calixto (2004), reported that application of 500 to 750 ppm concentrations of ANAA and Hormex can improve rooting of azalea cuttings because they promoted earlier callus formation, initiated earlier opening of buds, produced the highest number of roots, longer roots, and longest shoots in the cuttings.

Misting

Cuttings can absorb small amounts of water through its cut ends. The amount absorbed is not enough to replace the amount normally lost through the process of transpiration. Thus, transpiration has to be slowed down by keeping the relative humidity high in the vicinity of the cuttings and keeping the temperature relatively lower. Misting or sprinkling water can increase relative humidity.

METHODOLOGY

Materials

The materials used in the study were shoot tip cuttings of medinilla about 6 inches long, rooting hormones (ANAA), pruning shear, 6 x6 inches polyethylene bags, graduated cylinder, labeling materials, compost and sandy loam soil (:1).

Methods

Experimental design and treatments. The experiment was laid out in Completely Randomized Design (CRD) with 5 samples per treatment replicated 3 times.

The treatments were as follows:

	ANAA concentration (ppm)
C1	Control (tap water only)
C2	250
C3	500
C4	750
C5	1000

Shoot tip cuttings preparation. The cuttings were cleaned/trimmed and 2-3 nodes retained on the shoot tip cuttings. The stem ends of the samples were cut into a slanting manner before dipping for 30 minutes in different ANAA concentrations and then rooted under partial shade in 1:1 compost and sandy loam soil under greenhouse conditions.

Care and maintenance. This was done to all cuttings throughout the duration of the study.

Data to be Gathered

The following data were gathered and subjected to analysis of variance and mean separation test by Duncan's Multiple Range Test (DMRT) were as follows:

1. Days from Sticking to Visible Root Formation. (0.5 cm). This was gathered by counting the number of days from treatment to visible root formation through destructive sampling method. There were 2 samples per treatment using white plastic.
2. Percentage of rooted cuttings(%). This was obtained one month after sticking of the cuttings in the rooting media using the formula;

$$\% \text{ of rooted cuttings} = \frac{\text{Number of rooted cuttings}}{\text{Total number of cuttings}} \times 100$$

3. Average root length (cm). The length of roots for every cutting was measured one month after planting and the average root length was computed as follows:

$$\text{Average root length} = \frac{\text{Length of roots}}{\text{Number of roots produced per plant}}$$

4. Average number of root produced /cuttings. All formed roots of every cuttings were counted from sticking of cuttings in the rooting media and were computed as follows:

$$\text{Average} = \frac{\text{Total number of roots produced}}{\text{Number of samples planted}}$$

5. Shoot length (cm). This was gathered two months from rooting.

6. Documentation. Documentation of the study was done through print pictures as shown in figure 1 and 2. Figure 1 shows the I=overview of the experiment at the start or set-up of the trails and figure 2 shows the experiment at termination stage. It also shows the effect of the different concentrations of ANAA on the shoot growth of medinilla shoot tip cuttings.

Figure 1. Overview of the experiment at the start

Figure 2. Experiment at termination

RESULTS AND DISCUSSION

Days from Sticking to Visible Root Formation

Table 1 shows that there were no significant difference among the treated and untreated cuttings as far as the number of days to root initiation is concerned. However, the untreated cuttings had delayed root formation compared with the treated cuttings. Stem cuttings treated with 1000 ppm and 750 ppm ANAA rooted earlier, however, they were statistically comparable with the other treatments that showed means of 29.33 to 29.67 days from treatment of cuttings. Cutting treated with 500 ppm ANAA initiated earlier root with root visible after 33 days from the treatment. Longest durations of root initiations were obtained from cuttings treated with 250ppm and the control with means of 35.33 and 36 days from treatment respectively.

These results agree with the statement of Bleasedale (1973) that although hormones were known to promote earlier rooting various kinds of cuttings, it is important to take into consideration that individual plant species and cultivars need a specific concentration to be used.

Table 1. Days from sticking to visible root formation

ANAA CONCENTRATION	MEAN (DAYS)
0 ppm	36.00 a
250 ppm	35.33 a
500	33.00 a
750 ppm	29.67 a
1000 ppm	25.33 a

* Means with the same letter are not significantly different at 5% level of DMRT

Percentage of Rooted Cuttings

Table 2 shows that there were no significant differences observed on the effect of the different ANAA concentrations applied before planting on the percentage of rooted cuttings two months from sticking of cutting in 1:1 part by volume of alnus leaves compost and sandy soil.

However, it was observed that the highest percentage of rooted cuttings was obtained from 1000 ppm and 750 ppm of ANAA which had the same means of 93.33%. Lowest percentage of rooted cuttings was obtained from 500 ppm of ANAA with a mean of 66.67%.

Table 2. Percentage of rooted cuttings

ANAA CONCENTRATION	MEAN (%)
0 ppm	80.00 a
250 ppm	73.33 a
500 ppm	66.67 a
750 ppm	93.33 a
1000 ppm	93.33 a

* Means with the same letter are not significantly different at 5% level of DMRT.

Average Root Length

Result shows that there were no significant differences noted on the effect of the different ANAA concentrations on the average length of roots produced by the medinilla cuttings two months from sticking in the rooting media.

However, the application of 1000 ppm ANAA promoted the production of the longest roots produced with 0.97 cm followed by those treated with 750 ppm, 250 ppm, control and 500 ppm with means of 0.95, 0.83, 0.64 and 0.39 cm, respectively.

Average Number of Root Produced per Cuttings

Highly significant differences were obtained on the average number of roots after sticking on the rooting media as affected by the different concentrations of ANAA used on Medinilla shoot tip cuttings.

Table 3. Average root length

ANAA CONCENTRATION	MEAN (cm)
0 ppm	0.64 a
250 ppm	0.83a
500 ppm	0.39a
750 ppm	0.95a
1000 ppm	0.97a

* Means with the same letter are not significantly different at 5% level by DMRT.

Shoot tip cuttings of Medinilla treated with 1000 ppm ANAA produced highest number of roots with a mean of 2.53 roots per cuttings two months from sticking in the rooting media, followed by those treated with 750 ppm ANAA with the mean of 1.87 roots per cuttings, while shoot tip cuttings of Medinilla treated with 500 ppm ANAA produced significantly fewer roots with a mean of 1,00 root per cuttings. The lowest number of roots were obtained from cuttings treated with 250 ppm ANAA and the untreated cuttings or control (0 ppm) which had the same mean of 0.80 root per cutting.

These findings corroborate with the statement of Delvin (1977), as cited by Rillorta (1982), that auxins are very effective for initiating root formation in many plant species. Hormones may be used to overcome the inherent difficulties encountered in rooting of cuttings but many also inhibit the growth of the cuttings if applied at the wrong concentrations (Bleasedale, 1973).

Table 4. Average number of roots produced per cuttings

ANAA CONCENTRATION	MEAN
0 ppm	0.80c
250 ppm	0.80c
500 ppm	1.00b
750 ppm	1.87ab
1000 ppm	2.53a

* Means of the same letter are not significantly different at 5% level of DMRT.

<u>Average Shoot Length</u>

Results show that there were no significant differences on the length of shoots produced as affected by different ANAA concentrations measured 60 days from treatment. Nevertheless, dipping cuttings in 1000 ppm ANAA prior to rooting produced the longest shoots with a mean of 34.33 cm, while the untreated cuttings or control (0 ppm) had the shortest shoots at 12.67 cm.

These findings conform with the earlier study by Amlos (1998) that application of ANAA at lower rates effected no significant differences on the number of days from sticking of cuttings to opening of lateral buds, final length of shoots, leaf number, and percentage of rooted cuttings.

Table 5. Average shoot length

ANAA CONCENTRATION	MEAN (cm)
0 ppm	12.67a
250 ppm	13.40a
500 ppm	14.00a
750 ppm	17.67a
1000 ppm	34.33a

*Means of the same letters are not significantly different at 5% level of DMRT.

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted at the Ornamental Horticulture Division, HORTI Research Area, Benguet State University , La Trinidad, Benguet from November 2006 to January 2007 to determine the effect of different concentrations of ANAA on the rooting characteristics and shoot growth of Medinilla shoot tip cuttings, and to evaluate the best concentrations of ANAA for faster and uniform rooting of Medinilla shoot tip cuttings.

Results showed that treated cuttings with ANAA initiated shoots earlier, had the highest percentage of rooted cuttings and the longest shoots.

Among the treated cuttings, earlier root formation was observed in those treated with 1000 ppm ANAA, developed he highest number of roots and the longest shoots two months from sticking in the rooting media. Medinilla cuttings treated with 750 ppm and 1000 ppm produced the same percentage of rooted cuttings.

Conclusion

Based on the results of the study, it can be concluded that the application of 750 and 1000 ppm ANAA IMPROVED ROOTING OF Medinilla shoot tip cuttings. It is further concluded that Medinilla shoot tip cuttings can be induced to produce roots significantly earlier with dipping the basal ends of cuttings in 750 and 1000 ppm ANAA concentration for 30 minutes prior to sticking in rooting media of 1:1 alnus leaves compost and sandy loam soil.

<u>Recommendation</u>

In the propagation of Medinilla dipping shoot tip cuttings for 30 minutes in 750 and 1000 ppm ANAA prior to sticking them in the rooting media is recommended since it hastened earlier root initiation, promoted the production of more number of longer roots produced longer shoots per cuttings. It is further recommended that another study using varying concentrations of other rooting hormones in other horticultural crops propagated through shoot tip cuttings should be conducted to avoid using these hormones indiscriminately and as guide to growers on the best technique to use to produce faster and uniform rooting.

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APPENDICES

Appendix Table 1. Days from sticking to root formation (0.5 cm)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	42	30	36	108	36.00
C2	39	30	37	106	35.33
C3	31	34	34	99	33.00
C4	29	25	35	89	29.67
C5	25	24	27	76	25.33

ANALYSIS OF VARIANCE

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	Computed F	Tabular F	
					0.05	0.01
Treatment	4	233.733	58.433	3.28 ns	3.48	5.99
Error	10	176.000	17.800			
Total	14	411.733				

ns = not significant   Coefficient of variation = 13.24%

Appendix Table 2. Percentage of rooted cuttings (%)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	60.0	100.0	80.0	240.0	80.0
C2	80.0	60.0	80.0	220.0	73.3
C3	60.0	80.0	60.0	200.0	66.7
C4	80.0	100.0	100.0	280.0	93.3
C5	80.0	100.0	100.0	280.0	93.3

ANALYSIS OF VARIANCE

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	Computed F	Tabular F	
					0.05	0.01
Treatment	4	1706.667	426.667	2.29ns	3.48	5.99
Error	10	1866.667	186.667			
Total	14	3573.333				

ns = not significant

Coefficient of variation = 16.80%

Appendix Table 3. Average root length (cm)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	0.6	1.0	0.8	2.4	0.8
C2	1.00	0.60	0.8	2.4	0.8
C3	1.0	1.0	1.0	3.0	1.0
C4	1.8	2.2	1.6	5.6	1.87
C5	1.6	3.6	2.4	7.6	2.53

ANALYSIS OF VARIANCE

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	Computed F	Tabular F	
					0.05	0.01
Treatment	4	7.373	1.787	7.55**	3.48	5.99
Error	10	2.37367	0.237			
Total	14	9.520				

** = Highly significant Coefficient of variation = 34.80%

Appendix Table 4. Average number of root produced per cuttings.

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	0.6	1.0	0.8	2.4	0.8
C2	1.00	0.60	0.8	2.4	0.8
C3	1.0	1.0	1.0	3.0	1.0
C4	1.8	2.2	1.6	5.6	1.87
C5	1.6	3.6	2.4	7.6	2.53

ANALYSIS OF VARIANCE

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	Computed F	Tabular F	
					0.05	0.01
Treatment	4	7.373	1.787	7.55**	3.48	5.99
Error	10	2.37367	0.237			
Total	14	9.520				

** = Highly significant Coefficient of variation = 34.80%

Appendix Table 5. Shoot length (cm)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
C1	15.0	11.5	11.5	38.0	12.67
C2	6.0	27.2	7.0	40.2	13.4
C3	8.0	27.0	7.0	42.0	14.0
C4	10.5	32.0	10.5	53.0	17.67
C5	33.0	35.0	33.0	101.0	33.67

ANALYSIS OF VARIANCE

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	Computed F	Tabular F	
					0.05	0.01
Treatment	4	994.917	248.729	2.90 ns	3.48	5.99
Error	10	859.160	85.916			
Total	14	1854.077				

ns = not significant Coefficient of variation = 50.34%