BIBLIOGRAPHY

PAKIAS, ROSE LYN D. OCTOBER 2009. Growth and Flowering of Medinilla *(Medinilla magnifica)* as Affected by Different Potting Media Compositions. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

This study was conducted to determine the effect of the different potting media mixture on the growth and flowering of medinilla; to identify the potting media mixture best suited for the culture of potted medinilla plants; and to determine the economics of using the different potting media compositions for potted medinilla production.

The different potting media compositions used in growing medinilla plants were: 1:1 garden soil + alnus compost, 2:1:1 alnus compost + rice hull + cattle manure, 1:1:1:1alnus compost + lumber sawdust + rice hull + cattle manure, 1:1:1 lumber sawdust + alnus compost + cattle manure, and 1:1:1 garden soil + alnus compost + cattle manure.

Results show that using 1:1 garden soil + alnus compost as potting media for medinilla plants promoted the production of highest number of laterals at four months from transplanting and had the lowest cost of production.

Plants grown in 1:1:1:1 Alnus compost + lumber sawdust + rice hull + cattle manure as potting media had the lowest gross income had the highest cost of production; the lowest net income and the lowest return on investment (ROI) of only 46.53%.

1:1:1 lumber sawdust + alnus compost + lumber cattle manure as potting media promoted the production of the thickest stems, the tallest plants at flowering, the highest number of leaves per plant at flowering, the longest pendulous flower panicle, the highest net income of Php 5,350.00 and the highest ROI of 115.05%.

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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 terrestrial plant 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 (Arora, 1992).

Adriance and Brison (1955) stated that most species only grow outdoors in the tropics. They can be cultivated as greenhouse and houseplant, but it cannot tolerate winter minimums below 64^0F (18^0C). 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 and oval dark green leaves with light veining. Truly, it is an incredible house plant.

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 (Ingles, 1994).

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 foresana*, China, *Medinilla himalayana* China, *Medinilla magnifica*, Philippines, *Medinilla multiflora*, Philippines, *Medinilla venosa* Indonesia and Philippines (Arora, 1992).

Due to the economic potential and aesthetic value of potted plants, it is important to study the appropriate potting media for the growth and flowering of Medinilla grown in containers.

The study aimed to:

1. To determine the effect of different potting media mixtures on the growth and flowering of Medinilla.

2. To identify the potting media mixture, best suited for the culture of potted medinilla plants.

3. To determine the economics of using the different potting media compositions for potted Medinilla production.

The study was conducted at the Ornamental Horticulture Research Area, Benguet State University La Trinidad, Benguet, from January – June 2009.

REVIEW OF LITERATURE

Cuttings 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 (McDaniel, 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 soft wood cuttings generally root easier and quicker than hard wood 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.

Importance of Organic Matter in the Growing Media

Brady (1984) as cited by Allan (1999) mentioned that organic matter is composed of living or dead plants and animal residues which are very active and important portion of the soilage. They protect soil against erosion, supplies cementing substances for desirable aggregation formation and it loosens the soil to provide better aeration and water movement.

He further considered that farm manures are degraded plant materials and they tend to increase the yield of crops. The nutrient elements taken by animal manures are valuable sources of both macro element and micro element.

Organic matter in the soil, perform several functions such as prevention of the loss of nutrients by forming complexes with the nutrients elements, facilities absorption and perculation of water into through the soil. Thus, increasing water holding ability and

reducing erosion also source of nutrient elements, and improves the penetration of roots through the soil by good structure brought by its decomposition (Bautista, 1993).

Thompson and Troeh (1978) claimed that the nutrients released from a well-rooted compost is probably better balanced and regulated than that from fresh manure whereby gardeners can therefore apply larger amounts of compost than the use of fresh manures. Without danger of injuring plants they added the use of compost also results in humus formation and promotes good soil structure. Compost also supply nutrients such as nitrogen, phosphorus, and sulfur which are essential for plant growth.

Compost encourages the formation of vigorous roots, which in turn produce a healthy plant, one which is capable of taking in more food and water (Jankowiak, 1978).

Whole ricehull are moderately resistant to decomposition. They hold little water and improve aeration. They are useful light weight component of mixes for orchids and are also to increase the porosity of bending mixture based on peat. Ricehull provides a light to medium texture with good aeration and also does not affect soil PH. Ricehull are good as soil amendments especially in heavy clay soils. He further stated that maximum effectiveness is obtained when ricehull is more than 20 percent by volume of potting mixtures (Einert, 1972).

Sawdust is a good bedding soil mixture material since it absorbs liquid and a good soil conditioner. He further stated that sawdust is composed of 4lbs. of nitrogen, 21lbs phosphorus and 4 lbs of potassium per ton of materials on an oven dry weight bases (Donahue, 1971).

In the 1994, Oryan found that 1:1:1:1 part weight of garden soil, horse manure, sand and compost greatly improved the vegetative growth and flowering of African

violets grown in pots under partial shade. The media mixture of 1:1:1 part of horse manure, garden soil and compost produced the tallest plants and had the higher leaf count at anthesis and initiated flower bud earlier in Chrysanthemum (Acop, 1987).

Micklay (1990) found that 1:1:1:1 part by weight of garden soil, horse manure, sand and compost had greatly improved the vegetative growth and reproductive ability of geranium plants.

He also found that a media of 1:1:1 alnus, compost and garden soil, significantly improved the vegetative growth of impatients and produced taller plants (Gawaban, 1999).

Cabalo (2001) recommended that a mixture of 1:1:1:1 sand + sawdust + ricehull + cow manure will promote thicker stems, bigger cyme diameter, longer aesthetic duration and high return on investments in Milflores.

Media composition 1:1:1:1 garden soil + coco fiber + coco soil + horse manure as a growing media for white Calla recommended for improved growth, earlier flowering and higher quality cutflowers and big sized corms with a return on investment of 213.11% (Sumakey, 2004).

MATERIALS AND METHODS

Materials

The materials used in this study were one year old established plants of Medinilla without flowers at transplanting; about 25 – 30 cm in length, polyethylene bags 7 x 11 inch, ricehull, lumber saw dust, alnus compost, fully decomposed cattle manure, Osmocote 14-14-14 fertilizer, and labeling materials.

Methods

The study was laid out following the simple completely randomized design (CRD). There were 3 sample plants per treatment, replicated three times.

The plants were grown under open field conditions in black plastic bags. Routine management operations such as weeding, fertilizer application, and irrigation were applied uniformly to all test plants.

The different potting media compositions which served as treatments were as follows:

T_0 – 1:1 garden soil + alnus compost (farmers practice)

T_1 – 2:1:1 alnus compost + ricehull + cattle manure

T_2 – 1:1:1:1 alnus compost + lumber saw dust + ricehull + cattle manure

T_3 – 1:1:1 lumber sawdust + alnus compost + cattle manure

T_4 – 1:1:1 garden soil (sandy loam) + alnus compost + cattle manure

The data gathered were the following:

A. Vegetative Growth

1. Plant height at flowering (50% anthesis). This was taken by measuring the height of the plant from the base to the tip of the flower in cm. at flowering.

2. Stem thickness (cm). This was taken by measuring the thickness of the main stem 6 cm. from the base of the plant with the use of a vernier calipher.

3. Leaf number at flowering (50% anthesis). This was obtained by counting the number of leaves per plant at flowering.

4. Number of laterals after 4 months from transplanting. This was obtained by counting the number of laterals after 4 months from transplanting.

B. Reproductive Growth

1. Number of days from visible flower bud initiation to 50% anthesis. This was obtained by counting the number of days from visible flower bud initiation to 50% anthesis of the flower panicle.

C. Flower quality

1. Length of the pendulous flower panicle at 50% anthesis. This was taken by measuring the length of the whole flower panicle at 50% anthesis.

2. Aesthetic duration of the flowers from 25% anthesis to the onset of senescence. This was obtained by counting the number of days from 25% anthesis to the onset of senescence.

D. Cost and return analysis. The cost and return analysis of the different media treatments was obtained by using the formula:

$$ROI = \frac{\text{Gross Income} - \text{Total Expenses}}{\text{Total Expenses}} \times 100$$

E. Photo documentation of the study. Pictures were taken from the experimental area at visible flower bud formation, and 4 months from transplanting.

Fig.1. Documentation of the study at flower bud formation

Fig.2. Documentation of the study after four months from transplanting

RESULTS AND DISCUSSION

Vegetative Growth

Plant Height at Flowering (50% Anthesis)

Highly significant differences were noted on the plant height of medinilla at flowering as affected by the different potting media compositions. Plants grown in 1:1 garden soil + alnus compost and in 1:1:1 lumber sawdust + alnus compost + cattle manure produced the tallest among the other potting media treatments with 42.72 cm and 40.78 cm, respectively. While plants grown in potting media with 1:1:1:1 alnus compost + lumber sawdust + rice hull + cattle manure produced the smallest medinilla plants with 27.11 cm.

These findings show that the use of 1:1 garden soil + alnus compost and 1:1:1 sawdust + alnus compost + cattle manure as potting media compositions can produce taller medinilla plants at flowering.

Stem Thickness

Table 2 shows highly significant differences on the stem thickness of medinilla plants as affected by the different potting media compositions. Medinilla plants grown in 1:1:1 lumber sawdust + alnus compost + cattle manure produced the thickest stem with 1.07 cm while medinilla plants grown in 2:1:1 alnus compost + rice hull + cattle manure and 1:1:1:1 alnus compost + lumber sawdust + rice hull + cattle manure produced the thinnest stems with 0.70 cm and 0.72 cm, respectively.

These findings show that the use of 1:1:1 lumber sawdust + alnus compost + cattle manure as potting media can promote the production of thicker medinilla stems

compared to the other potting media compositions used.

Number of Leaves at Flowering (50% anthesis)

Table 3 shows significant differences on the number of leaves at flowering of medinilla as affected by the different potting media compositions. It was noted that plants grown in potting media with 1:1:1 lumber sawdust + alnus compost + cattle manure and in 1:1 garden soil + alnus compost had the highest number of leaves at flowering (50% anthesis) with 54 and 49 leaves.

These findings show that the effect of potting media with 1:1:1 lumber sawdust + alnus compost + cattle manure on medinilla plants in terms on the number of leaves at flowering was better as compared to the other potting media compositions used.

Number of Laterals After Four (4) Months from Transplanting

Table 4 shows highly significant differences on the number of laterals of

Table 1. Plant height at flowering (50% anthesis) of Medinilla as affected by different potting media

TREATMENT	HEIGHT (cm)
1:1 (Garden Soil + Alnus Compost)	42.72[a]
2:1:1 (Alnus Compost + Rice Hull + Cattle Manure)	29.11[c]
1:1:1:1 (Alnus Compost + Lumber Sawdust + Rice Hull + Cattle Manure)	27.11[c]
1:1:1 (Lumber Sawdust + Alnus Compost + Cattle Manure)	40.78[a]
1:1:1 (Garden Soil + Alnus Compost + Cattle Manure)	35.17[b]
CV (%)	13.92

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

Table 2. Stem thickness of Medinilla as affected by different potting media

TREATMENT	STEM THICKNESS (cm)
1:1 (Garden Soil + Alnus Compost)	0.97[b]
2:1:1 (Alnus Compost + Rice Hull + Cattle Manure)	0.70[c]
1:1:1:1 (Alnus Compost + Lumber Sawdust + Rice Hull + Cattle Manure)	0.72[c]
1:1:1 (Lumber Sawdust + Alnus Compost + Cattle Manure)	1.07[a]
1:1:1 (Garden Soil + Alnus Compost + Cattle Manure)	0.93[b]
CV (%)	10.28

Means with the same letters are not significantly different at 5% level by DMRT

Table 3. Leaf number at flowering (50% anthesis) of Medinilla as affected by different potting media

TREATMENT	LEAF NUMBER
1:1 (Garden Soil + Alnus Compost)	49[a]
2:1:1 (Alnus Compost + Rice Hull + Cattle Manure)	39[b]
1:1:1:1 (Alnus Compost + Lumber Sawdust + Rice Hull + Cattle Manure)	34[b]
1:1:1 (Lumber Sawdust + Alnus Compost + Cattle Manure)	54[a]
1:1:1 (Garden Soil + Alnus Compost + Cattle Manure)	40[b]
CV (%)	16.19

Means with the same letters are not significantly different at 5% level of by DMRT

medinilla plants four months from transplanting as affected by the different potting media compositions. Medinilla plants grown in 1:1 garden soil + alnus compost produced the highest number of laterals after four months from transplanting among the different potting media compositions with 21 laterals, while plants grown in 1:1:1:1 alnus compost

+ lumber sawdust + rice hull + cattle manure produced the lowest number of laterals with only 9 laterals.

The findings show that 1:1 garden soil + alnus compost is the best potting media for growing medinilla plants in terms of the number of laterals produced per plant after four months from transplanting.

Reproductive Growth

Number of Days from Visible Flower Bud Initiation to 50% Anthesis

There were no significant differences noted on the number of days from visible flower bud initiation to 50% anthesis in medinilla plants as affected by the different potting media compositions (Table 5). Flower development in medinilla plants from flower panicle initiation to 50% anthesis was from 25 days to 36 days. Plants grown in 1:1 garden soil + alnus compost developed their flower buds to 50% anthesis significantly later; while plants grown in 2:1:1 alnus compost + rice hull + cattle manure developed their flower buds to 50% anthesis the earliest.

Flower Quality

Length of the Pendulous Flower Panicle at 50% Anthesis

Table 6 shows significant differences on the length of the pendulous flower panicle at 50 % anthesis of medinilla plants as affected by the different potting media compositions. Plants grown in 1:1:1 lumber sawdust + alnus compost + cattle manure as potting media produced the longest pendulous flower panicles at 50% anthesis with a mean of 23.67 cm long; while those grown in 2:1:1 alnus compost + rice hull + cattle

Table 4. Number of laterals after four months from transplanting of Medinilla as affected by different potting media

TREATMENT	NUMBER OF LATERALS
1:1 (Garden Soil + Alnus Compost)	21[a]
2:1:1(Alnus Compost + Rice Hull + Cattle Manure)	13[c]
1:1:1:1 (Alnus Compost + Lumber Sawdust + Rice Hull + Cattle Manure)	9[d]
1:1:1 (Lumber Sawdust + Alnus Compost + Cattle Manure)	18[b]
1:1:1 (Garden Soil + Alnus Compost + Cattle Manure)	14[c]
CV (%)	20.14

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

Table 5. Number of days from visible flower bud initiation to 50 % anthesis of Medinilla as affected by different potting media

TREATMENT	FLOWER BUD INITIATION (Days)
1:1 (Garden Soil + Alnus Compost)	36[a]
2:1:1 (Alnus Compost + Rice Hull + Cattle Manure)	25[a]
1:1:1:1 (Alnus Compost + Lumber Sawdust + Rice Hull + Cattle Manure)	28[a]
1:1:1 (Lumber Sawdust + Alnus Compost + Cattle Manure)	31[a]
1:1:1 (Garden Soil + Alnus Compost + Cattle Manure)	31[a]
CV (%)	17.06

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

manure and in 1:1:1:1 alnus compost + lumber sawdust + rice hull + cattle manure as potting media had the shortest pendulous flower panicle at 50% anthesis with 12.94 cm.

Aesthetic Duration of the Flowers from 25% Anthesis to the Onset of Senescence

There were no significant differences noted on the aesthetic duration of the flowers from 25% anthesis to the onset of senescence of medinilla plants as affected by the different potting media compositions (Table 7). It was noted that the aesthetic durations of the flowers ranged from 24 to 43 days.

Cost and Return Analysis

Table 8 shows the gross income, net income, expenses, and ROI (%) of medinilla plants as affected by the different potting media compositions. Medinilla plants

Table 6. Length of the pendulous flower panicle at 50% anthesis as affected by different potting media

TREATMENT	LENGTH (cm)
1:1 (Garden Soil + Alnus Compost)	22.17[b]
2:1:1 (Alnus Compost + Rice Hull + Cattle Manure)	12.94[c]
1:1:1:1 (Alnus Compost + Lumber Sawdust + Rice Hull + Cattle Manure)	13.67[c]
1:1:1 (Lumber Sawdust + Alnus Compost + Cattle Manure)	23.67[a]
1:1:1 (Garden Soil + Alnus Compost + Cattle Manure)	22.56[b]
CV (%)	24.18

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

Table 7. Aesthetic duration of the flowers from 25% anthesis to the onset of senescence of Medinilla as affected by different potting media

TREATMENT	DURATION (Days)
1:1 (Garden Soil + Alnus Compost)	39[a]
2:1:1 (Alnus Compost + Rice Hull + Cattle Manure)	43[a]
1:1:1:1 (Alnus Compost + Lumber Sawdust + Rice Hull + Cattle Manure)	34[a]
1:1:1 (Lumber Sawdust + Alnus Compost + Cattle Manure)	24[a]
1:1:1 (Garden Soil + Alnus Compost + Cattle Manure)	35[a]
CV (%)	21.83

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

Table 8. Cost and return analysis for 100 potted medinilla plants

TREATMENT	GROSS INCOME (Php)	EXPENSES (Php)	NET INCOME (Php)	ROI (%)	RANK
1:1Garden Soil + Alnus Compost	9,400.00	4,450.00	4,950.00	111.24	2
2:1:1Alnus Compost + Rice Hull + Cattle Manure	8,100.00	4,850.00	3,250.00	67.10	4
1:1:1:1 Alnus Compost + Lumber Sawdust + Rice Hull + Cattle Manure	7,400.00	5,050.00	2,350.00	46.53	5
1:1:1 Lumber sawdust + Alnus Compost + Cattle Manure	10,000.00	4,650.00	5,350.00	115.05	1
1:1:1 Garden soil + Alnus Compost + Cattle Manure	9,400.00	4,850.00	4,550.00	93.81	3

grown in 1:1:1 lumber sawdust + alnus compost + cattle manure had the highest gross income of php10, 000.00 while plants grown in 1:1:1:1 alnus compost + lumber sawdust + rice hull + cattle manure had the lowest gross income of php7,400. On the other hand, plants grown in 1:1 garden soil + alnus compost had the lowest expenses of only Php 4,450 while plants grown in 1:1:1:1 alnus compost + lumber sawdust + rice hull + cattle manure had the highest expenses of php 5,050.00 for 100 potted medinilla plants.

Medinilla plants grown in 1:1:1 lumber sawdust + alnus compost + cattle manure gained the highest net income of Php 5,350.00 while; those grown in 1:1:1:1 alnus compost + lumber sawdust + rice hull + cattle manure had the lowest net income of Php 2,350.00. Results show that plants grown in 1:1:1 lumber sawdust + alnus compost + cattle manure as potting media had the highest ROI of 115.05%; while medinilla plants grown in 1:1:1:1 alnus compost + lumber sawdust + rice hull + cattle manure had the lowest ROI of 46.53%.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The study was conducted to determine the effect of the different potting media mixtures on the growth and flowering of medinilla; to identify the potting media mixture best suited for the culture of potted medinilla plants; and to determine the economics of using the different potting media compositions for the potted medinilla plants.

The different potting media compositions used in medinilla plants were 1:1 garden soil + alnus compost, 2:1:1 alnus compost + rice hull + cattle manure, 1:1:1:1 alnus compost + lumber sawdust + rice hull + cattle manure, 1:1:1 lumber sawdust + alnus compost + cattle manure, and 1:1:1 garden soil + alnus compost + cattle manure.

Medinilla plants grown in 1:1 garden soil + alnus compost as potting media had the highest number of laterals four months from transplanting and had the lowest cost of production.

Growing medinilla in a media mixture of 1:1:1:1 alnus compost + lumber sawdust + rice hull + cattle manure had produced the lowest gross income, had the highest cost of production, lowest income and the lowest ROI of only 46.53%.

Growing medinilla in 1:1:1 lumber sawdust + alnus compost + cattle manure as potting media produced the thickest stems, tallest plants at flowering, the highest number of leaves at flowering, the longest pendulous flower panicle, the highest net income and the highest ROI.

Conclusions

Based on the results, the following conclusions were drawn:

1. 1:1 garden soil + alnus compost as potting media of medinilla plants promoted the production of the higher number of laterals four months from transplanting and had the lowest expenses. In terms of gross income, plants grown in 1:1:1:1 alnus compost + lumber sawdust + rice hull + cattle manure had the lowest gross income, the highest cost of production, lowest net income and lowest ROI. Growing medinilla in 1:1:1 lumber sawdust + alnus compost + cattle manure had the thickest stems, the tallest plants at flowering, the highest number of leaves at flowering, the longest pendulous flower panicle had the highest net income and the highest ROI of 115.05%.

2. The best potting media mixture suited for the culture of medinilla plants was: 1:1:1 lumber sawdust + alnus compost + cattle manure.

3. Growing medinilla plants in 1:1 garden soil + alnus compost as potting media had the lowest expenses, growing plants in 1:1:1:1 alnus compost + lumber sawdust + rice hull + cattle manure had the lowest gross income, and the highest expenses; the lowest income and the lowest ROI; while plants grown in 1:1:1 lumber sawdust + alnus compost + cattle manure had the highest net income and the highest ROI.

Recommendations

Based on the findings, it is best to grow medinilla in 1:1:1 lumber sawdust + alnus compost + cattle manure since it has the highest net income of Php 5,350.00 and ROI of 115.05 % compared to the other media mixtures.

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APPENDICES

Appendix Table 1. Plant height at flowering (50% anthesis)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
1:1 GS + AC	47.5	35.33	45.33	128.16	42.72
2:1:1 AC + RH + CM	34.33	23.50	29.50	87.33	29.11
1:1:1:1 AC + S + RH + CM	31.00	23.00	27.33	81.33	27.11
1:1:1 S + AC + CM	35.00	41.33	46.00	122.33	40.78
1:1:1 GS + AC + CM	35.50	34.33	35.67	105.50	35.17
TOTAL	183.33	157.49	183.83	524.65	
MEAN	36.67	31.50	36.77		34.98

GS – Garden soil RH – Rice hull S – Sawdust (lumber)

AC – Alnus compost CM – Cattle manure

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Treatment	4	569.813	142.453	6.01**	3.48	5.99
Experimental Error	10	237.242	23.724			
TOTAL	14	807.054				

** - highly significant Coefficient of variation (%) = 13.92

Appendix Table 2. Stem thickness (cm)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
1:1 GS + AC	1.00	0.97	0.93	2.90	0.97
2:1:1 AC + RH + CM	0.60	0.77	0.73	2.10	0.70
1:1:1:1 AC + S + RH + CM	0.83	0.60	0.73	2.16	0.72
1:1:1 S + AC + CM	1.03	1.10	1.07	3.20	1.07
1:1:1 GS + AC + CM	1.07	0.93	0.80	2.80	0.93
TOTAL	4.53	4.37	4.26	13.16	
MEAN	0.91	0.87	0.85		0.87

GS – Garden soil RH – Rice hull S – Sawdust (lumber)

AC – Alnus compost CM – Cattle manure

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Treatment	4	0.309	0.077	9.23**	3.48	5.99
Experimental Error	10	0.084	0.008			
TOTAL	14	0.393				

** - highly significant Coefficient of variation (%) = 10.28

Appendix Table 3. Leaf number at flowering (50% anthesis)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
1:1 GS + AC	43	60	44	147	49
2:1:1 AC + RH + CM	34	43	40	117	39
1:1:1:1 AC + S + RH + CM	41	35	26	102	34
1:1:1 S + AC + CM	56	46	60	162	54
1:1:1 GS + AC + CM	40	35	45	120	40
TOTAL	214	219	215	648	
MEAN	43	44	43		43.33

GS – Garden soil RH – Rice hull S – Sawdust (lumber)

AC – Alnus compost CM – Cattle manure

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Treatment	4	788.400	197.100	4.006*	3.48	5.99
Experimental Error	10	492.000	49.200			
TOTAL	14	1280.400				

* - significant Coefficient of variation (%) = 16.19

Appendix Table 4. Number of laterals after four months from transplanting

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
1:1 GS + AC	17	25	20	63	21
2:1:1 AC + RH + CM	8	13	17	38	13
1:1:1:1 AC + S + RH + CM	9	8	11	28	9
1:1:1 S + AC + CM	19	19	16	55	18
1:1:1 GS + AC + CM	15	12	16	43	14
TOTAL	69	77	80	226	
MEAN	14	15	16		15

GS – Garden soil RH – Rice hull S – Sawdust (lumber)

AC – Alnus compost CM – Cattle manure

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Treatment	4	237.333	59.333	6.40**	3.48	5.99
Experimental Error	10	92.667	9.267			
TOTAL	14	330.000				

** - highly significant Coefficient of variation (%) = 20.14

Appendix Table 5. Number of days from visible flower bud initiation to 50 % anthesis

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
1:1 GS + AC	39	37	33	109	36
2:1:1 AC + RH + CM	26	28	21	74	25
1:1:1:1 AC + S + RH + CM	25	30	28	83	28
1:1:1 S + AC + CM	38	28	27	93	31
1:1:1 GS + AC + CM	22	32	38	92	31
TOTAL	150	155	147	450	
MEAN	30	31	29		30

GS – Garden soil RH – Rice hull S – Sawdust (lumber)

AC – Alnus compost CM – Cattle manure

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Treatment	4	215.733	53.933	2.059^{ns}	3.48	5.99
Experimental Error	10	262.000	26.200			
TOTAL	14	477.733				

ns - not significant Coefficient of variation (%) = 17.06

Appendix Table 6. Length of the pendulous flower panicle at 50% anthesis

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
1;1 GS + AC	18.50	26.00	22.00	66.50	22.17
2:1:1 AC + RH + CM	14.33	13.50	11.00	38.83	12.94
1:1:1:1 AC + S + RH + CM	14.50	10.50	16.00	41.00	13.67
1:1:1 S + AC + CM	25.67	29.33	16.00	71.00	23.67
1:1:1 GS + AC + CM	16.00	25.00	26.67	67.67	22.56
TOTAL	89	104.33	91.67	285.00	
MEAN	17.80	20.87	18.33		19.00

GS – Garden soil RH - Rice hull S – Sawdust (lumber)

AC – Alnus compost CM – Cattle manure

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Treatment	4	328.749	82.187	3.894*	3.48	5.99
Experimental Error	10	211.086	21.109			
TOTAL	14	539.836				

* - significant Coefficient of variation (%) = 24.18

Appendix Table 7. Aesthetic duration of the flowers from 25% anthesis to the onset of senescence

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
1:1 GS + AC	41	42	34	117	39
2:1:1 AC + RH + CM	45	39	47	130	43
1:1:1:1 AC + S + RH + CM	30	37	35	102	34
1:1:1 S + AC + CM	26	23	24	73	24
1:1:1 GS + AC + CM	20	35	51	106	35
TOTAL	162	176	191	527	
MEAN	32	35	38		35

GS – Garden soil RH – Rice hull S – Sawdust (lumber)

AC – Alnus compost CM – Cattle manure

ANOVA TABLE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Treatment	4	616.933	154.233	2.641^{ns}	3.48	5.99
Experimental Error	10	584.000	58.400			
TOTAL	14	1200.933				

ns - not significant Coefficient of variation (%) = 21.83