

## GROWTH OF CLONED DAO (DRACONTOMELON DAO (L.) BLUME) AS AFFECTED BY DIFFERENT MIXTURES OF POTTING MEDIA AND LEVELS OF MYCORRHIZAL INOCULANT

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**ABSTRACT** This study was conducted inside the grown-out area of the Clonal Nursery Complex of the GSC Baterna Campus, San Lorenzo, Guimaras in January-February, 2019. This study aims to determine the growth of cloned dao seedlings as affected by different mixtures of potting media and evaluate the growth of cloned dao seedlings as affected by the different levels of mycorrhizal inoculant. A factorial experiment on a Completely Randomized Design (F-CRD) was used in this study. Factor A represented different mixtures of potting media: A1-Negative Control (Pure Garden Soil), A2- Positive Control (Pure Vermicompost), A3-50% garden soil + 50% vermin compost, and A4-75% garden soil + 25% vermicompost. Factor B represented the levels of mycorrhizal inoculant per pot: B1- Control, B2- 14 grams mycorrhiza/pot and B3-28 grams mycorrhizal/pot. There were twelve (12) treatment combinations replicated four (4) times, making a total of forty-eight (48) variates. Each variate had ten (10) cloned dao seedlings as experimental plants. The parameters used in this study were the following: plant height, number of leaves, length of leaves, width of leaves, number of branches, survival rate, and number of days to reach the plantable height (1 foot). Results show that the different mixtures of potting media and different levels of mycorrhizal inoculant have a highly significant effect on the growth of cloned dao seedlings in terms of plant height and number of days to reach the plantable height (1 foot). The researchers recommend using combination of 75% garden soil + 25% vermicompost with 28 grams mycorrhizal/pot which can hasten the number of days to reach the plantable height (1 foot) of dao seedlings.

**Keywords:** *dao, growth evaluation, mycorrhizal, soil media mixtures*

### INTRODUCTION

In the Philippines, the municipality of Dao, Capiz and barangay of Dau in Mabalacat, Pampanga are named after the dao tree. Revered and called "Five Buddhas" in Thailand and Laos because of the intricate pattern of approximate five-fold symmetry on the seed surface and its rhombic protrusions that reminds of the primitive Buddha image. Dao is a large tree, growing 30 meters or taller, with the trunk 1 meter or more in diameter. Leaves are alternate and pinnately compound. Leaflets are smooth, oblong, 5 to 7 pairs, up to 15 centimeters long, and 4 centimeters wide, pointed at the apex, and abruptly tapered at the base. Flowers are small, white, and fragrant, hanging in lax panicles. Fruit is globose, green turning yellow when ripe with oval markings on the upper side of the fruit, about 2 to 3 centimeters in diameter (Stuart, 2016).

Vermicompost improves soil texture and enhances the water-holding capacity of the soil. It may be low in NPK but contains essential nutrients (e.g. calcium, magnesium, manganese, copper, iron, and zinc) not found in inorganic fertilizers. Moreover, it has microbial activities that promote plant health and pest/disease resistance (Department of Agriculture, 2016).

Mycorrhizal not only enhances a plant's uptake of water even in arid or acidic soils but also releases powerful enzymes into the soil that dissolve hard-to-capture nutrients such as organic nitrogen, phosphorus, iron, and other "tightly bound" soil nutrients. Mycorrhizal fungus possesses symbiotic ties with plants. It attaches itself either on or inside the plant roots to tap into the sugars and carbohydrates present in the leaves for its sustenance. In turn, the fungal hyphae (filaments) grow out from the roots and bring water and soil nutrients back into the plant host (Que, 2016).

The nutrient problem is one of the reasons for the lower survivability of the newly potted clones. There should be readily available nutrients in the media for the young roots to absorb to boost their growth and to have a short recovery period.

## Objectives of the Study

This study was conducted to (1) determine the growth of cloned dao seedlings as affected by different mixtures of potting media as to their: plant height, number of leaves, length of leaves, width of leaves, number of branches, survival rate, and number of days to reach the plantable height (1 foot), (2) evaluate the growth of cloned dao seedlings as affected with different levels of mycorrhizal inoculant as to their: plant height, number of leaves, length of leaves, width of leaves, number of branches, survival rate and number of days to reach the plantable height (1 foot), (3) know the significant difference of different mixtures of potting media to the growth of cloned dao seedlings, (4) determine the significant difference of different levels of mycorrhizal inoculant to the growth of cloned dao seedlings, and (5) to know the interaction effect of different mixtures of potting media and different levels of mycorrhizal inoculant to the growth of cloned dao seedlings.

## METHODOLOGY

This study was conducted inside the grown-out area of the Clonal Nursery Complex of the GSC Baterna campus, San Lorenzo, Guimaras in January-February, 2019. Experimental design, treatments, and replication were utilized in the study. A factorial experiment on a Completely Randomized Design (F-CRD) was used in this study. Factor A represented different mixtures of potting media: A1- Negative Control (Pure Garden Soil), A2- Positive Control (Pure Vermicompost), A3- 50% garden soil + 50% vermin compost, and A4-75% garden soil + 25% vermicompost. Factor B represented the levels of mycorrhizal inoculant per pot: B1- Control, B2- 14 grams mycorrhizal/pot, and B3-28 grams mycorrhizal/pot. There were twelve (12) treatment combinations replicated four (4) times making a total of forty-eight (48) variates. Each variate had ten (10) cloned dao seedlings as experimental plants.

Table 1. Treatment combinations

Factor A (Mixtures of Potting Media)	Factor B (levels of mycorrhizal)		
	B1	B2	B3
A1	A1B1	A1B2	A1B3
A2	A2B1	A2B2	A2B3
A3	A3B1	A3B2	A3B3
A4	A4B1	A4B2	A4B3

Table 2. Experimental Layout

A2B1	A1B2	A1B3	A1B1
A3B1	A2B1	A2B1	A1B2
A4B2	A3B3	A4B3	A2B1
A1B1	A4B2	A4B3	A2B3
A4B1	A4B3	A1B1	A1B3
A3B2	A1B2	A1B3	A4B1
A2B2	A3B2	A3B3	A3B2
A4B2	A3B3	A2B3	A4B1
A3B1	A2B2	A2B3	A2B2
A3B2	A3B3	A4B2	A2B3
A1B1	A2B3	A3B1	A4B1
A2B2	A1B2	A4B2	A3B1

Legend: Factor A (Mixtures of the Potting Media)  
A1- Negative Control (Pure Garden Soil)  
A2- Positive Control ( Pure Vermicompost)  
A3- 50% garden soil + 50% Vermicompost  
A4- 75% garden soil + 25% Vermicompost

Factor B (Levels of Mycorrhizal)  
B1- Control  
B2- 14 grams Mycorrhizal/pot  
B3-28 grams Mycorrhizal/pot

Collection of Potting Media. The potting media was a combination of garden soil and vermicompost that were collected in the production area of the GSC Baterna Campus.

Source and collection of Planting Materials. Newly rooted ramets was collected from the rooting chambers of the nursery. Ramets with good root development and shoots were selected for the study. Seedlings were carefully uprooted to avoid root damage. They were directly placed inside a plastic pale with water to avoid transplant shock and were brought to the potting area.

Potting and Planting. Potting media was a combination of garden soil and vermicompost. After the collection, potting media was sieved to have a finer particle and to take away the debris and other biological remains. Before mixing and potting, it was disinfected by placing the media inside a wok over the fire to eliminate the fungi and other pathogens that may cause infection to the clones.

Disinfected media was mixed and was placed inside a plastic pot (polyethylene). The plastic was filled with potting media before applying the mycorrhizal. The rooted cuttings were placed at the top of inoculants and it was filled again with potting media. They were arranged according to experimental layouts in the elevated beds.

Water Management. Cloned seedlings were watered twice daily with installed overhead sprinklers inside a screen house.

Pest Management. To prevent pest infestation, the screen house was closed for the entire period of the study. The biosecurity procedure was strictly observed.

The following data were gathered to evaluate the growth of cloned dao as affected by different mixtures of potting media and levels of mycorrhizal inoculant: plant height, number of leaves, length of leaves, width of leaves, number of branches, survival rate, and number of days to reach the plantable height (1 foot). Data gathering was conducted every seven (7) days. All the data were analyzed using two (2) ways Analysis of variance (ANOVA). Significant means were tested using Duncan's Multiple Range Test (DMRT).

## **RESULTS AND DISCUSSION**

### **Plant height**

Table 3 presents the summary of means of plant height, number of leaves, length of leaves, width of leaves, number of branches, survival rate, and number of days to reach the plantable height (1 foot). The second column of Table 3 shows the plant height of dao. For factor 1 (mixtures of potting media), the highest mean was obtained by treatment A3 (50% garden soil + 50% vermicompost), which is 37.3 cm. Analysis of variance shows a highly significant effect among treatment means of factor 1. It shows that the use of different mixtures of potting media has a highly significant effect compared to pure garden soil. This implies that the use of 50% garden soil + 50% vermicompost can increase the height of dao seedlings.

For factor 2 (Levels of Mycorrhizal), the highest mean was obtained by treatment B3 (28 grams mycorrhizal/pot), which has 35.4 cm. Analysis of variance shows a highly significant effect among treatment means of factor 2. It shows that the levels of mycorrhizal have a highly significant effect on the growth of dao seedlings, specifically on its height. This implies that the use of 28 grams of mycorrhizal/pot can increase the height of dao seedlings.

Table 3. Summary of means on plant height, number of leaves, length of leaves, width of leaves, number of branches, survival rate, and number of days to reach the plantable height (1 foot).

Treatment	Plant height	Number of leaves	Length of leaves	Width of leaves	Number of branches	Survival rate	Number of days to reach the plantable height (1 foot)
Factor 1							
A1	32.7c	9	11.25	6.58	4	1.00	39.0a
A2	35.8b	9	12.17	6.92	3	1.00	32.8c
A3	37.3a	9	12.80	7.17	4	1.00	35.4b
A4	34.0b	10	12.08	7.08	4	1.00	37.7b
f-test	**	ns	ns	ns	ns	ns	**
Factor 2							
B1	34.4b	9	11.75	7.00	4	1.00	36.9a
B2	35.0ab	10	12.06	6.75	4	1.00	36.3ab
B3	35.4a	10	11.94	7.06	4	1.00	35.4b
f-test	**	ns	ns	ns	ns	ns	**
cv%	1%	19%	8%	11%	12%	N/A	1%

For the combination of treatments (Table 3.1), analysis of variance showed a highly significant effect on the plant height of dao. This implies that the use of 50% garden soil + 50% vermicompost with a higher amount of mycorrhizal has a highly significant effect on the plant height of dao seedlings. The coefficient of variance is 1%.

Table 3.1. Two-way table on plant height of dao at different mixtures of potting media and levels of mycorrhizal.

Levels of Mycorrhizal					
Mixtures of the Potting Media	B1	B2	B3	Total	Mean
A1	32.0	33.0	33.0	98	32.66
A2	35.0	36.0	36.5	107.5	35.83
A3	37.0	37.0	37.8	111.8	37.26
A4	33.8	34.0	34.3	102.1	34.03
A4	137.8	140	141.6	419.4	34.03
Total					139.78
Mean	**				
f-test	1%				
cv%					

### Number of leaves

The third column of Table 3.2 shows the number of leaves of dao seedlings. For factor 1 (mixtures of potting media), the highest mean which is 10 was obtained by treatment A4 (75% garden soil + 25% vermicompost). Analysis of variance showed no significant effect among treatment means of factor 1. It shows that the use of different mixtures of potting media has the same effect on the number of leavesW

For factor 2 (Levels of Mycorrhizal), the highest mean which is 10 was obtained by treatments B2 (14 grams mycorrhizal/pot) and B3 (28 grams mycorrhizal/pot). Analysis of variance showed no significant effect among treatment means of factor 2. It shows that the levels of mycorrhizal has the same effect on the growth of dao seedlings, specifically on the number of leaves.

For the combination of treatments (Table 3.2), analysis of variance shows no significant effect on the number of leaves of dao. This implies that different mixtures of potting media and levels of mycorrhizal have the same effect on the growth of dao seedlings, specifically on the number of leaves. The coefficient of variance is 19

Table 3.2. Two-way table on the number of leaves of dao at different mixtures of potting media and levels of mycorrhizal.

Levels of Mycorrhizal					
Mixtures of the Potting Media	B1	B2	B3	Total	Mean
A1	10.5	8.5	10.0	29.0	
A2	9.0	9.3	11.0	29.3	9.66
A3	9.3	8.3	9.0	26.6	9.76
A4	37.6	34.4	38.5	110.5	8.86
Total			v		
Mean	NS				36.81
f-test	19%				
cv%					

### Length of leaves

The fourth column of Table 3.3 shows the length of leaves of dao seedlings. For factor 1 (mixtures of potting media), the highest mean which is 12.80 cm was obtained by treatment A3 (50% garden soil + 50% vermicompost) and treatment A1- Negative Control (Pure Garden Soil) got the lowest mean of 11.25 cm. Analysis of variance showed no significant effect among treatment means of factor 1. It shows that the use of different mixtures of potting media have the same effect on the length of leaves.

For factor 2 (Levels of Mycorrhizal), the highest mean which is 12.06 cm was obtained by treatment B2 (14 grams mycorrhizal/pot). Analysis of variance showed no significant effect among treatment means of factor 2. It shows that the levels of mycorrhizal have the same effect on the growth of dao seedlings specifically on the length of leaves.

For the treatment combinations (Table 3.3), analysis of variance shows no significant effect on the length of leaves of dao. This implies that different mixtures of potting media and levels of mycorrhizal have the same effect on the length of leaves. The coefficient of variance is 8 %.

Table 3.3. Two-way table on the length of leaves of dao at different mixtures of potting media and levels of my-

Levels of Mycorrhizal					
Mixtures of the Potting Media	B1	B2	B3	Total	
A1	12.5	11.8	12.3	36.6	
A2	11.0	11.5	11.3	33.8	
A3	11.8	12.5	12.3	36.6	
A4				143.3	
Total					
Mean					
f-test	NS				
cv%	8%				

### Width of Leaves

The fifth column of Table 3.4 shows the width of the leaves of dao seedlings. For factor 1 (mixtures of potting media), the highest mean which is 7.17 cm was obtained by treatment A3 (50% garden soil + 50% vermicompost) and treatment A1 (Negative Control-Pure Garden Soil) got the lowest mean of 6.58 cm. Analysis of variance showed no significant effect among treatment means of factor 1. It shows that the use of different mixtures of potting media has the same effect on the length of leaves.

For factor 2 (Levels of Mycorrhizal), the highest mean which is 7.06 cm was obtained by treatment B3 (28 grams mycorrhizal/pot) and treatment B2 (14 grams mycorrhizal/pot) got the lowest mean of 6.75 cm. Analysis of variance shows no significant effect among treatment means of factor 2. It shows that the levels of mycorrhizal have the same effect on the growth of dao seedlings specifically on the width of leaves.

For the treatment combinations (Table 3.4), analysis of variance shows no significant effect on the width of leaves of dao. This implies that different mixtures of potting media and levels of mycorrhizal have the same effect on the growth of dao seedlings, specifically on the width of leaves. The coefficient of variance is 11 %.

Table 3.4. Two-way table on the width of leaves of dao at different mixtures of potting media and levels of mycorrhizal.

Levels of Mycorrhizal					
Mixtures of the Potting Media	B1	B2	B3	Total	Mean
A1	6.5	7.3	7.5	21.3	7.1
A2	7.0	7.0	7.3	21.3	7.1
A3	7.3	6.5	7.0	20.8	6.93
A4				83.5	
Total					27.83
Mean	NS				
f-test	11%				
cv%					

### Number of branches

The sixth column of Table 3.5 shows the number of leaves of dao seedlings. For factor 1 (mixtures of potting media), the highest mean which is 4 was obtained by treatment A1 (Negative Control-Pure Garden Soil), treatment A3 (50% garden soil + 50% vermicompost), and treatment A4 (75% garden soil + 25% vermicompost). Treatment A2 (Positive Control-Pure Vermicompost) got the lowest mean which is 3. Analysis of variance showed no significant effect among treatment means of factor 1. It shows that the use of different mixtures of potting media has the same effect on the number of branches.

For factor 2 (Levels of Mycorrhizal), all treatments got the same mean which is 4 in terms of the number of branches. Analysis of variance shows no significant effect among treatment means of factor 2. It shows that the levels of mycorrhizal have the same effect on the growth of dao seedlings specifically on the number of branches.

For the treatment combinations (Table 3.5), analysis of variance shows no significant effect on the number of branches of dao. This implies that different mixtures of potting media and levels of mycorrhizal have the same effect on the growth of dao seedlings specifically on the width of leaves. The coefficient of variance is 12 %.

Table 3.5. Two-way table on the number of branches of dao at different mixtures of potting media and levels of mycorrhizal.

Levels of Mycorrhizal					
Mixtures of the Potting Media	B1	B2	B3	Total	Mean
A1	3.5	4.0	3.8	11.3	3.76
A2	4.0	3.5	3.3	10.8	3.6
A3	3.3	3.8	4.0	11.1	3.7
A4	3.8	3.3	3.8	10.9	3.63
Total				44.1	
Mean	NS				11.02
f-test	12%				
cv%					

### Survival rate

The seventh column of Table 3.6 shows the survival rate of dao seedlings. For factor 1 (mixtures of potting media), results show that all seedlings have a 100% survival rate. Analysis of variance showed no significant effect among treatment means of factor 1. It shows that the use of different mixtures of potting media has the same effect on the survival rate of dao seedlings.

For factor 2 (Levels of Mycorrhizal), all treatments show a 100% survival rate. Analysis of variance shows no significant effect among treatment means of factor 2. It shows that the levels of mycorrhizal have the same effect on the survival rate of dao seedlings.

For the treatment combinations (Table 3.6), analysis of variance shows no significant effect on the number of branches of dao. This implies that different mixtures of potting media and levels of mycorrhizal have the same effect on the growth of dao seedlings, specifically on the width of leaves.

Table 3.6. Two-way table on the survival rate of dao at different mixtures of potting media and levels of mycorrhizal

Levels of Mycorrhizal					
Mixtures of the Potting Media	B1	B2	B3	Total	Mean
A1	1.0	1.0	1.0	3	1
A2	1.0	1.0	1.0	3	1
A3	1.0	1.0	1.0	3	1
A4	1.0	1.0	1.0	3	1
Total				12	
Mean	NS				1
f-test	N/A				
cv%					

### Number of days to reach the plantable height (1 foot)

The seventh column of Table 3.7 shows the number of days to reach the plantable height (1 foot). For factor 1 (mixtures of potting media), the highest mean which is 39 was obtained by treatment A1 (Negative Control-Pure Garden Soil) and treatment A2 (Positive Control-Pure Vermicompost) got the lowest mean which is 32.8. Analysis of variance shows a highly significant effect among treatment means of factor 1. It shows that treatment A1 (Negative Control- Pure Garden Soil) got the longest days to reach plantable height (1 foot), while treatment A3 (50% garden soil + 50% vermicompost) and treatment A4 (75% garden soil + 25% vermicompost) have the same performance in the number of days to reach the plantable height. Treatment A2 (Positive Control-Pure Vermi compost) got the lowest days to reach the plantable height (1 foot). This implies that the use of pure vermicompost as potting media for dao seedlings can hasten the number of days to reach the plantable height (1 foot).

For factor 2 (Levels of Mycorrhizal), treatment B1- Control got the highest mean which is 36.9 while treatment B3-28 grams mycorrhizal/pot got the lowest mean of 35.4. Analysis of variance shows highly significant effect among treatment means of factor 2. It shows that B1- Control got the weak performance in terms of the number of days to reach the plantable height (1 foot), while B2 (14 grams mycorrhizal/pot) may have the same performance in either treatment B1 or B3. Treatment B3 (28 grams mycorrhizal/pot) got the lowest number of days to reach the plantable height of dao seedlings (1 foot). This implies that the use of a higher amount of mycorrhizal which is 28 grams may hasten the number of days to reach the plantable height of dao seedlings (1 foot). For the treatment combinations (Table 3.7), analysis of variance shows a highly significant effect in the number of days to reach the plantable height (1 foot). This implies that 75% garden soil + 25% vermicompost with 28 grams mycorrhizal/pot may hasten the number of days to reach the plantable height (1 foot) of dao seedlings. The coefficient of variance is 1 %.

Table 3.7. Two-way table on the number of days to reach the plantable height (1 foot) of dao at different mixtures of potting media and levels of mycorrhizal.

Levels of Mycorrhizal					
Mixtures of the Potting Media	B1	B2	B3	Total	Mean
A1	40.0	39.0	38.0	117	39
A2	38.0	38.0	37.0	113	37
A3	36.0	35.5	34.8	106.3	35.43
A4	33.8	32.5	32.0	98.3	32.76
Total	147.8	145	141.8	434.6	144.19
Mean					
f-test	**				
cv%	1%				

### CONCLUSION

The different mixtures of potting media did not affect the growth of dao seedlings in terms of number of leaves, length of leaves, width of leaves, number of branches, and survival rate, however, plant height and the number of days to reach the plantable height (1 foot) were highly affected. It implies that the use of 50% garden soil + 50% vermicompost can increase the height of dao seedlings and the use of pure vermicompost as potting media for dao seedlings can hasten the number of days to reach the plantable height (1 foot). The different levels of mycorrhizal inoculant did not affect the growth of dao seedlings in terms of number of leaves, length of leaves, width of leaves, number of branches, and survival rate, however, plant height and the number of days to reach the plantable height (1 foot) were highly affected. It implies that the use of 28 grams of mycorrhizal/pot can increase the height and hasten the number of days to reach the plantable height (1 foot) of dao seedlings. The different mixtures of potting media have a highly significant difference in the growth of cloned dao seedlings in terms of plant height and the number of days to reach the plantable height (1 foot). The different levels of mycorrhizal inoculant have a highly significant difference in the growth of cloned dao seedlings in terms of plant height and the number of days to reach the plantable height (1 foot). The different mixtures of potting media and different levels of mycorrhizal inoculant have a highly significant effect on the growth of cloned dao seedlings in terms of plant height and the number of days to reach the plantable height (1 foot). Plant height was highly affected using 50% garden soil + 50% vermicompost with 28 grams of mycorrhizal, and number of days to reach the plantable height (1 foot) was hastened using 75% garden soil + 25% vermicompost with 28 grams of mycorrhizal/pot.

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