Growth Performance of Selected Dipterocarp Species at the WMSU Experimental Forest

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Abstract

The growth performance of five dipterocarp species growing in the Western Mindanao State University experimental forest was assessed. Twelve wildlings of each dipterocarp species were collected in the área and were subjected to hardening-off process in the forest nursery. They were planted in two sites, one facing East while the other is facing West. Randomized Complete Block Design was used, with three (3) blocks, measuring 3m x 6m, laid out in each site. Ten wildlings, two samples for each dipterocarp species, were planted in each block, following a spacing distance of 1m x 1m. The apical and lateral growth of the dipterocarp species were measured and recorded. Results showed that the average height and basal diameter in Site I were 47.43cm and 6.08mm respectively, while 48.47cm and 5.73mm respectively in Site II. In Site I, Tiaong exhibited the highest apical growth at 52.27cm while Bagtikan had the lowest at 40.95cm. While Lauan showed the highest lateral growth at 6.39mm while Tanguile had the lowest at 5.91mm. In Site II, Tanguile exhibited the highest apical growth at 56.73cm while Almon had the lowest at 40.22cm. While Lauan showed the highest lateral growth at 7.19mm while Tiaong had the lowest at 5.10mm. Growth performance was significantly different as regards the species level but no significant difference occurred within sites. All the dipterocarp wildings planted in the field survived during the study. Further study can be conducted by using other indigenous wildings planted on open areas dominated by cogon grasses (Imperata cylindrica).

Keywords: Dipterocarp Species, Orientation, Apical Growth, Lateral Growth

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Introduction

Today, most of our forest land is considered to be marginalized and unproductive because of unsustainable harvesting methods conducted in the area, leading to the denudation of most of our forests. Dipterocarp trees were harvested for commercial purposes hence very few dipterocarp trees were left in the forest. Dipterocarp tree species were usually the source for commercial lumber in the market.

Dipterocarp species can be used successfully in reforestation and can be planted in grasslands according to the study of Schneider, Ashton, Montagnini and Milan (2012). Among the good performing dipterocarp species that can be considered are Shorea guiso, Shorea contorta, and Parashorea malaanonan.

In another study, dipterocarp seedlings can be planted on highly degraded land such as grassland, although high light intensity limits their survival. However, planting under nurse trees such as regenerated pioneer trees could be considered as an effective method to enhance seedling survival under open conditions such as grassland (Daisuke, Tanaka, Jawa, Ikuo, & Katsutoshi, 2013).

In Zamboanga Peninsula, the total forest cover is 176, 918 hectares with closed forest cover of 29, 906, open forest 120, 488 and mangrove forest of 26, 523. (SEPO 2015).

The Western Mindanao State University experimental forest area, located at Upper La Paz, Zamboanga City, albeit already a logged-over area, dipterocarp trees still exist, but they grow in patches. Among the Dipterocarp species, white lauan species were the most numerous in the area (Lukman, Barre, San Juan, Sabellina, & Domingo, 2001). Such trees can be considered as mother trees or plus trees which could

be used as source of seeds for the propagation of dipterocarp seedlings. There is a need to propagate more seedlings of dipterocarp species for future reforestation activities and maintain the ecological balance in the area.

Moreover, in the study concluded that the experimental forest is inadequately covered by forest tree-species in most of the parts of the area. In fact, the area occupied by forest trees is only 16.2% or a total of 128.12 hectares with 7.82% or 97.23 hectares are occupied by non-timber plant species (Lukman, et al., 2001).

Furthermore, the study of Diamante and Barre (2011) Bagtikan (Parashorea malaanonan) (Blanco, Merr) perform well in terms of apical growth and basal diameter using different substrates in the forest nursery.

These dipterocarp trees are scattered in the experimental forest, ranging from easy terrain to very steep slopes. This study was conducted with a view in mind of the possible construction and establishment of an arboretum in the area where stakeholders can visit one particular place to see and observe the growth of dipterocarp species.

The study tried to determine the growth performance of selected dipterocarp species at the WMSU experimental forest. Specifically, it tried to measure the apical and lateral growth of these dipterocarp species planted on sites established on different cardinal orientation, i.e., one facing the East direction while the other is facing the West direction. The study also tried to compare the growth among species as well as their performance in the different cardinal orientation.

Methodology

The study was conducted at km 14 of the experimental forest of Western Mindanao State University. The closed canopy area is presently dominated by dipterocarp species such as Almon, Bagtikan, Mayapis, White lauan, Tanguile and Tiaong and other indigenous tree species (Barre, 1995).

The Randomized Complete Block design was used in the study.

Two sites were established, one site facing East while the other site faces West. Three blocks measuring 3 meters by 6 meters were established in each site.

Five dipterocarp species were used in the study, namely Mayapis (Shorea palosapis (Blanco Merr.), Almon, (Shorea almon Foxw.), Bagtikan, (Parashorea malaanonan (Blanco) Merr.), White lauan (Shorea contorta Vidal) and Tiaong (Shorea agsaboensis).

Sixty (60) dipterocarp wildlings were collected within the experimental forest. Twelve (12) wildlings for each dipterocarp species were collected. The wildlings were potted individually in 3"x 6" polyethylene bags. They were placed in a partially shaded area of the forest nursery for the hardened-off process for six months.

After the hardening-off process, the dipterocarp seedlings were planted in two different sites. In each site, three (3) blocks were laid out to accommodate 10 seedlings with a spacing distance of 1m x 1m.

Bush cutting and brushing were conducted to establish the blocks. Staking was done to establish the spacing distance of 1m x 1m within the blocks. Holes were dug prior to the planting of the wildlings.

The height and basal diameter of the wildlings were measured and recorded to establish the apical and lateral growth. Ring weeding was conducted once a month to minimize competition from other plants and grasses in the experimental sites.

Results and Discussion

In Site I, the height of the dipterocarp wildlings ranged from 34.4cm to 75.1cm, with an average of 47.33cm. Bagtikan exhibited the lowest height while Tiaong emerged as the highest wildling. Basal diameter ranged from 4.1mm to 9.07mm, with an average of 6.079mm. Tiaong exhibited the lowest and highest lateral growth.

Table 1.
Growth of the Dipterocarp Wildlings in Site I

Seedling No	Block 1			Block 2			Block 3		
	Species	Height (cm)	Diameter (mm)	Species	Height (cm)	Diameter (mm)	Species	Height (cm)	Diameter (mm)
1	W. lauan	43.4	6.01	W. lauan	38.8	4.18	Almon	41.2	6.38
2	Tanguile	57.3	5.99	W. lauan	46.2	7.70	Tanguile	50.0	5.47
3	Bagtikan	37.8	4.44	Tiaong	47.8	5.05	Tiaong	46.3	4.10
4	Almon	42.8	5.69	Tiaong	75.1	9.07	Bagtikan	35.6	5.23
5	Tiaong	48.4	5.63	Tanguile	41.3	4.92	W. lauan	38.3	4.88
6	Tanguile	54.3	5.22	Tanguile	40.9	7.34	Tanguile	61.7	6.54
7	Almon	49.2	6.15	Bagtikan	38.5	6.58	Tiaong	48.5	6.48
8	Bagtikan	52.1	7.57	Bagtikan	34.4	5.07	Bagtikan	47.3	6.66
9	W. lauan	51.9	7.73	Almon	40.7	4.82	W. lauan	54.9	7.81
10	Tiaong	47.5	5.66	Almon	57.8	7.60	Almon	50.0	6.40
Average		48.77	6.01		46.15	6.23		47.38	6.00

In Site II, the height ranged from 29.6cm to 81.8cm with an average of 48.49cm. Basal diameter ranged from 3.83mm to 8.15mm with an average of 5.729mm. Bagtikan exhibited the lowest apical growth while Tiaong emerged as the highest wildling in Site II. Tiaong had the lowest basal diameter while White Lauan attained the biggest basal diameter.

Table 2. Growth of the Dipterocarp Wildlings in Site II.

Seedling No	Block 1			Block 2			Block 3		
	Species	Height (cm)	Diameter (mm)	Species	Height (cm)	Diameter (mm)	Species	Height (cm)	Diameter (mm)
1	Almon	38	5.4	Almon	32.3	4.71	Almon	**56.8**	6.64
2	Almon	38.8	4.6	Tiaong	**81.8**	7.26	Bagtikan	41	5.65
3	Tiaong	31.5	3.83	W. lauan	47.5	5.72	Tiaong	**50.7**	5.97
4	Bagtikan	**58.5**	7.23	Bagtikan	29.6	4.16	Tanguile	46.5	5.6
5	W. lauan	**59.6**	7.65	Tanguile	57	6.06	W. lauan	**50.3**	7.73
6	Tanguile	**75.9**	6.37	Tanguile	38.9	4.64	Tanguile	**78.9**	6.73
7	W. lauan	45.7	5.94	W. lauan	**52.8**	8.15	Almon	44	5.99
8	Bagtikan	**50.6**	5.01	Bagtikan	34.1	5.17	Bagtikan	34.2	4.77
9	Tiaong	**57.6**	3.99	Tiaong	40.8	4.51	Tiaong	46.2	5.02
10	Tanguile	43.2	4.81	Almon	31.4	4.63	W. lauan	**60.5**	7.94
Average		**49.94**	**5.48**		**44.57**	**5.5**		**50.91**	**6.2**

On the average, Tiaong displayed the highest apical growth at 52.267cm while Bagtikan had the lowest apical growth at 40.95cm in Site I. On the other site, Tanguile demonstrated the highest apical growth at 56.73cm while Almon had the lowest at 40.217cm. As

for the growth in the basal diameter, White Lauan wildlings emerged with the biggest growth of 6.385mm and 7.188mm at Site I and Site II respectively. Tanguile had the lowest basal diameter growth in Site I while Tiaong had a basal diameter growth of only 5.097mm in Site II.

Table 3.
Average Growth of the Dipterocarp Wildlings in the Experimental Sites

Site I				SITE II			
AVERAGE HEIGHT		AVERAGE DIAMETER		AVERAGE HEIGHT		AVERAGE DIAMETER	
Tiaong	52.267	W. lauan	6.385	Tanguile	56.733	W. lauan	7.188
Tanguile	50.917	Almon	6.173	W. lauan	52.733	Tanguile	5.702
Almon	46.950	Tiaong	5.998	Tiaong	51.433	Bagtikan	5.332
W. lauan	45.583	Bagtikan	5.925	Bagtikan	41.333	Almon	5.328
Bagtikan	40.950	Tanguile	5.913	Almon	40.217	Tiaong	5.097

When the differences in the growth performance of the dipterocarp wildlings in the experimental sites were analyzed, it was revealed that the difference in the average growth as regards the performance of the wildlings in the sites was not significant. There is a significant difference, however, in the growth performance of the wildlings when analyzed as to species.

Table 4
Analysis of Variance in Terms of Growth in Height

Source of Variation	SS	df	MS	F	P-value	F crit
Sample	699.5972	4	174.8993	3.256399	0.0328	2.866081
Columns	10.03408	1	10.03408	0.186822	0.6702	4.351244
Interaction	186.6688	4	46.66721	0.868883	0.49967	2.866081
Within	1074.188	20	53.70942			
Total	1970.488	29				

Table 5
Analysis of Variance in Terms of Growth in Basal Diameter

Source of Variation	SS	df	MS	F	P-value	F crit
Sample	6.089742	4	1.522435	3.695284	0.020749	2.866081
Columns	0.917001	1	0.917001	2.225762	0.151332	4.351244

Table 5. [continued]

Interaction	2.936828	4	0.734207	1.782081	0.172065	2.866081
Within	8.239883	20	0.411994			
Total	18.18345	29				

The study revealed that the orientation of the site does not affect the growth performance of the wildlings. Regardless of the position, i.e., whether the wildlings were planted on sites facing East, or the rising sun, or on sites facing West, or the setting sun, the apical and lateral growth will not be significantly affected. However, the growth performance among the wildlings was significantly affected by the kind of species used in the study. Based on the results of the study, Tanguile and White Lauan may be recommended for reforestation activities in the area.

Conclusion and Recommendations

The study was conducted at the WMSU experimental forest, Upper La Paz, this City, from November 2012 to November 2014. It tried to compare the growth of five dipterocarp species planted on sites oriented on different cardinal directions.

Five dipterocarp species were used for the study, namely Mayapis (Shorea palosapis (Blanco) Merr.), Almon, (Shorea almon Foxw.), Bagtikan, (Parashorea malaanonan (Blanco) Merr.) White Lauan (Shorea contorta Vidal) and Tiaong (Shorea agsaboensis). A total of sixty (60) wildings of dipterocarp species were planted in two different sites, replicated three times.

Based on the result of the study, it showed that all the dipterocarp wildings survived in the field. In Site I, Tiaong and Tanguile species dominated in the height (apical growth) category while the White Lauan and Bagtikan species dominated the basal diameter (lateral growth) category. In Site II, Tiaong and Tanguile also dominated in height category while White Lauan dominated the diameter growth category.

Based on the findings of the study, the diptercarp species planted for this study can be considered for reforestation activities in the area. The following are hereby recommended: 1) Establishment of arboretum using the same dipterocarp species, 2) Extension of the study for better observation and data gathering, and 3) A similar study using indigenous species on grassland areas.

Future studies for the abovementioned dipterocarp species can be given priority. For survival studies, all the species can be considered in the future.

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