

Varietal Trial of Mulberry Trees (*Morus Alba Koidz*) Under MSU Conditions

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Abstract

A total of 90 mulberry plants were used in the study composed of five varieties of Type B, Type F, Type C, Brazilian and Costa Rican, plus a control, all replicated three times in a Randomized Complete Block Design (RCBD) experiment to determine growth and adaptability in terms of height, number of leaves, size of leaves circumference, stem circumference, disease and pests resistance.

Results showed significantly ($P \leq .01$) Type B to be tallest in height at 933.33 mm, followed by Type F at 718.33 mm, Type C at 661.66 mm, Brazilian at 643.33 mm, and Costa Rican at 520 mm. The control had the shortest height at 400 mm.

More leaves of 131.66 pieces were obtained from Type B variety compared to 92, 75, 61 and 56 pieces for Brazilian, Type F, Type C and Costa Rican, respectively. No significant difference was noted between the control and Type C varieties. Broader leaves were significant ($P \leq .05$) in Type F variety at 146.66 mm followed by 141.33 mm, 140 mm, 125 mm and 74.33 mm from Type C, Costa Rican, Type B and Brazilian varieties, respectively. The control showed a small size of leaves at 61.83 mm. The size of the stem circumference revealed no significant differences between Type B and Type C varieties at 22.33 mm and 21.66 mm, respectively. No significant differences were observed between the control and the Brazilian varieties at 7.0 mm and 8.66 mm, respectively.

The type B and Type C varieties were the most resistant to Twig Blight, Powdery Mildew and Mosaic diseases of mulberry plants, followed by the Brazilian and Costa Rican varieties. The control showed the least resistance to disease. The same finding was observed in the occurrence of common pests such as the Mulberry Tiger Moth, Mulberry Scales and Mulberry Borer.

Mulberry (*Morus alba koidz*) is a plant belonging to the genus *Morus* and includes several species that have been introduced in the Philippines. Moriculture is the field of science dealing with mulberry

production mainly for the production of leaves as the most important raw material for feeds for the silkworm in order for the latter to produce raw silk. Sericulture is the production of silk, but the culture cannot proceed or survive without Moriculture.

Mulberry leaf is not only good as silkworm feed to produce raw silk but is also good as farm animals' feed because of its high protein content at about 40%. Mulberry fruit can be processed as jelly or jam for human consumption (*PCAARD News*, UPLB).

The different varieties of the mulberry are found in different sericulture and moriculture research centers in the Philippines, such as in the Philippine Textile Research Institute (PTRI) in La Trinidad, Benguet, Baguio City; Sericulture Research Training Center (SRTC) at Central Luzon State University (CLSU), Muñoz, Nueva Ecija; PTRI in Bicutan, Taguig, Rizal; BPI in Novaliches, Quezon City; UPLB in Los Baños, Laguna, and the SRTC in Kalingagan, Misamis Oriental. These centers have tested 35 species of the mulberry from different countries of the world.

There are only three popular species of the mulberry, name, the *Morus koidz*, *Morus lhou koidz* and *Morus alba koidz*, which came from Japan, Korea and China, respectively. These varieties grow well in several regions in the Philippines, but their growth potentials are not yet known in the hilly, cool but humid environs of Lanao del Sur.

The "right" mulberry variety for a location depends on this location's climatic condition. This study conducted at Mindanao State University, Marawi City, Lanao del Sur, should help in the initial steps to establish sericulture and moriculture in southern Philippines, particularly in Lanao del Sur. This research was conducted to ascertain the right varieties and varietal requirements for the area, in order to avoid the "hit or miss" procedure in securing the suitable mulberry variety.

General Objectives

This study was conducted to introduce silkworm rearing as

one of the cottage industries in southern Philippines, particularly in Marawi City and Lanao del Sur province with the view of meeting the demands of raw silk by local textile industries and adding income to Maranao families.

Specific Objectives

This study had the following specific objectives:

1. To introduce the right variety of mulberry tree or trees suited for the area;
2. To evaluate the adaptability of different mulberry varieties under Mindanao State University, Marawi City and Lanao del Sur province conditions; and
3. To enhance the development of silk production in the area.

Methodology and Procedure

The research was conducted to test and evaluate five varieties of the mulberry (Type B, Type F, Type C, Costa Rican and Brazilian) in the College of Agriculture, Mindanao State University, Marawi City. Mulberry saplings/cuttings were purchased from the Sericulture Research Training Center in Kalingagan, Misamis Oriental. The cuttings with the same sizes and ages of each variety, including the control, were planted in soil wrapped in polyethylene plastic bags after having been soaked for six hours in a low concentration of Alpha Naphthalene Acetic Acid and were raised in the nursery area.

Six hundred cuttings were cared for in sampling beds at 100 pieces per variety, plus the control, for three months. After that period, only the five best of the selected cuttings of each variety were planted in 1 m x 0.5 m (1 m between rows and 0.5 m between plants in a row), at the recommended distance in the field of 150 sq m experimental area.

A total of 90 experimental plants were used in six treatments, including the control at five plants per treatment replicated three times in Randomized Complete Block Design (RCBD).

When the mulberry plants reached three months in the experimental field, data on average height mm, average number of leaves, size of leaves circumference mm (average of 100 samples), stem circumference mm (15 cm above the ground level) and preliminary observations on disease and pest resistance of each variety were recorded, analyzed and evaluated in terms of the varieties suitable at Mindanao State University, or in Marawi City and Lanao del Sur province.

Results and Findings

The average height of each variety is presented in Table 1. Results show significantly ($P \leq .01$) Type B to be taller in height at 933.33 mm, followed by Type F at 718.33 mm, Type C at 661.66 mm, Brazilian at 643 mm, and Costa Rican at 520 mm. The shortest was the control at 400 mm.

The average number of leaves of each variety is shown in Table 2. Results indicated significantly ($P \leq .01$) Type B to have the most number at 131.66, followed by Brazilian at 92.33, Type F at 75, Type C at 61.33, the control at 56.66 and Costa Rican at 56.33.

The average circumference of stem of the different varieties show insignificant differences between Type F, Type C and Costa Rican at 146.16 mm, 141.33 mm and 140 mm, respectively, followed by 125 mm for the Type B variety. Furthermore, results show the Brazilian at 74.33 mm to be the least in size, compared to the control at 61.83 mm (Table 3).

The average stem circumference of each variety is shown in Table 4. Results show no significant differences was observable between Type B, Type C, Type F and Costa Rican varieties at 22.33 mm, 21.66 mm, 18.00 mm and 16.00 mm, respectively although Type B had a slightly bigger stem. Significantly ($P \leq .01$) smaller size of stem was observed in the control and Brazilian at 7.00 mm and 8.66 mm, respectively.

Table 1. Average Height of Mulberry Varieties (mm)

Mulberry Variety	Replication			Mean
	I	II	III	
Type B	900	1,050	850	933.33 ^a
Type F	750	805	600	718.33 ^{ab}
Type C	750	650	585	661.66 ^{bc}
Brazilian	580	600	750	643.33 ^{bcd}
Costa Rican	450	525	585	520.00 ^d
Control	350	450	400	400.00 ^e
Mean	650	680	628.33	646.1

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

Table 2. Average Number of Leaves of Mulberry Varieties (pieces)

Mulberry Variety	Replication			Mean
	I	II	III	
Type B	100	175	120	131.66 ^a
Type F	65	75	85	75.00 ^{abc}
Type C	60	70	54	92.33 ^{ab}
Brazilian	90	85	102	92.33 ^{ab}
Costa Rican	65	53	51	56.33 ^f
Control60	60	50	56.66 ^{abcde}	
Mean	73.33	86.33	77	78.88

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

The average stem circumference of each variety is shown in Table 4. Results show no significant difference is observable among Type B, Type C, Type F and Costa Rican varieties at 22.33 mm, 21.66 mm, 18.00 mm and 16.00 mm, respectively, although Type B had a slightly bigger stem. Significantly ($P \leq .01$) smaller size of stem was observed in the control and Brazilian varieties at 7.00 mm and 8.66 mm, respectively.

The percentage of disease occurrence in each variety is shown in Table 5. The most resistant varieties to common diseases was observed to be Type B and Type C at both zero per cent, followed

by 33, 66 and 66 per cent in Type F, Brazilian and Costa Rican, respectively. The Control came out the least resistant to the common diseases of mulberry plants. On the other hand, the common diseases that attacked mulberry plants were Powdery Mildew at 66 per cent, followed by Mosaic at 50%, and Twig Blight at 16 %.

Table 3. Average Leaves Circumference of Mulberry Varieties (mm)

Mulberry Variety	Replication			Mean
	I	II	III	
Type B	130	125	120	125.00 ^{abcd}
Type F	175	130.30	133.20	146.16 ^a
Type C	160	129	135	141.33 ^{abc}
Brazilian	80	75	70	74.33 ^{ef}
Costa Rican	150	140	130	140.00 ^{abcd}
Control	60	50	75.50	61.83 ^f
Mean	125.83	108.16	110.61	114.77

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

Table 4. Average Stem Circumference of Mulberry Varieties (mm)

Mulberry Variety	Replication			Mean
	I	II	III	
Type B	25	20	22	22.33 ^a
Type F	19	15	20	18.00 ^{abc}
Type C	26	20	19	21.66 ^{ab}
Brazilian	10	9	7	8.6 ^{abcde}
Costa Rican	18	17	13	16.00 ^{abcd}
Control	10	5	6	7.00 ^f
Mean	18	14.33	14.50	15.60

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

The percentage of common pests' occurrence in each variety of mulberry is shown in Table 6. The most resistant varieties to mulberry pests were Type B and Type C, at 0.00% occurrence of pests. No significant difference was observed among the Type F, Brazilian, Costa Rican and the Control, with the same 66% occurrence of pests.

Results further indicated that the common pests that attacked mulberry trees were the Mulberry Tiger Moth and Mulberry Scales, with the same 66% occurrence, while the Mulberry Borer showed no occurrence among the mulberry varieties.

Table 5. Percentage of Disease Occurrence in Mulberry Varieties (%)

Mulberry Variety	COMMON MULBERRY DISEASES			%
	Twig Blight	Powdery Mildew	Mosaic	
Type B	0	0	0	0.00 ^a
Type F	0	1	0	33 ^{ab}
Type C	0	0	0	0.00 ^a
Brazilian	0	1	1	66 ^{abc}
Costa Rican	0	1	1	66 ^{abc}
Control	1	1	1	100 ^d
Percent	16 ^a	66 ^c	50 ^b	

Percentages with the same superscripts are not significantly different at 5% level by DMRT.

Table 6. Percentage of Pests Occurrence in the Mulberry Varieties (%)

Mulberry Variety	COMMON MULBERRY PESTS			%
	Tiger Moth	Scales	Borer	
Type B	0	0	0	0.00
Type F	1	1	0	66.00 ^{ab}
Type C	0	0	0	0.00 ^a
Brazilian	1	1	0	66.00 ^{ab}
Costa Rican	1	1	0	66.00 ^{ab}
Control	1	1	0	66.00 ^{ab}
Percent	66.00 ^b	66.00 ^b	0.00 ^a	

Percentages with the same superscripts are not significantly different at 5% level by DMRT.

Summary, Conclusion and Recommendation

A total of 90 mulberry trees were used in the study composed of five varieties: Type B, Type F, Type C, Brazilian and Costa Rican, plus a Control, replicated three times in a Randomized Complete Block

Design (RCBD) experiment to determine the growth performance and the adaptability in terms of height, number of leaves, size of leaves, stem circumference, and disease and pest resistance.

Results showed significantly ($P \leq .01$) Type B to be tallest in height in 933.33 cm, followed by Type F at 718.33 cm, Type C at 661.66 cm, Brazilian at 643.33 cm and Costa Rican at 520 cm. The Control was the shortest at 400 cm.

More leaves at 131.66 pieces were obtained from the Type B variety, compared to 92, 75, 61 and 56 pieces of the Brazilian, Type F and Type C, respectively. No significant differences were noted between the Control and Type C varieties.

Broader leaves were significantly ($P \leq .01$) shown in the Type F variety at 146.66 mm, followed by Type C at 241.33 mm, Costa Rican at 140 mm, Type B at 125 mm and Brazilian at 74.33 mm. The Control showed smaller leaves at 61.83 mm. The size of the stem revealed no significant differences between the Type B and Type C varieties at 22.33 mm and 21.66 mm circumference, respectively. No significant difference was observed between the Control and Brazilian varieties at 7.00 mm and 8.66 mm, respectively.

Type B and Type C varieties were the most resistant to Twig Blight, Powdery Mildew and Mosaic diseases. The same finding was observed with regard to the occurrence of common pests, such as the Mulberry Tiger Moth, Mulberry Scales and Mulberry Borer.

Under Mindanao State University, Marawi City and Lanao del Sur province conditions, it has been found to be feasible to grow the mulberry as an initial step in the development of raw silk production, a possible major cottage industry in Lanao del Sur.

The best varieties for this area are the Type B, Type F and Type C. It is further recommended that other varieties of mulberry that grow in other parts of the country be studied similarly for purposes of cross-checking in order to obtain maximum mulberry production in this locality.

Rogelio L. Pagarigan has earned his doctoral in agriculture and is a professor at the MSU-College of Agriculture, where he also heads the Dairy Department. **Naty D. Cortez**, also a professor at the same college, has recently retired.

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