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New Clone of Sesenduk (FRIMsrp001)

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Abstract

The clone was produced from a breeding attempt on pioneer indigenous species of *Endospermum diadenum*. Seeds from the tree were collected and then were propagate and germinated in FRIM's nursery. The selection process continued for the progeny which has possessed vigorous growth among others. A bud from the plant was successfully tissue-cultured, which multiplied and developed roots in glass container. The clone was planted in year 1996 at Kepong Botanical Garden (FRIM's KBG) and Kampung Jawa plantation plots in FRIM. The seedlings of the clone were able to grow and survive at open site. Several trees of the planted clone from these areas have been cut for timber testing for its basic properties as well as for product development. The wood of the clone trees possessed good physical and mechanical properties and acceptable wood colour (yellow to white colour). The trees were able to achieve 30cm in diameter and 24m in height of straight bole in 10 years after planting provided that the soil at the plantation site is well-nurtured. Short rotation of planting, practiced for the clone is suitable for forest plantation and sustainable supply of raw material either for solid furniture industry or wood-based industry.

1. Introduction

Sesenduk came from a family of *Euphorbiaceae* and it is common throughout Malaysia, Thailand, Sumatera and Borneo [1]. It is widely distributed in the lowland secondary forest up to 1000m altitude in Peninsular Malaysia and is usually occurred in the logged over forest [2,3]. Sesenduk also can be found in India, Pakistan, Sri Lanka, or Thailand, Laos, Vietnam and Cambodia [4]. It also came with various traditional and trade names: sesendok (Peninsular Malaysia), sendok-sendok (Indonesia, Peninsular Malaysia), gubas (Philippines), New Guinea basswood (Papua New Guinea), endospermum-sasa and Hongopo (Solomon Islands), terbulan (Malaysia), bakota (India) [4,5].

The timber is also suitable for pattern making manufacture of drawing boards, trays, plywood, crates, toys, wooden clogs, disposable chopsticks, furniture components, interior joinery, interior paneling, moulding, light carpentry, glued laminated and blockboard [6,7,5]. This species has low durability and can easily be treated with preservatives to expand it usage [3].

The research started when they committed in conducting research outputs for plantation forestry and accepting the aspiration of the government of Malaysia in achieving sustainable production of future timber and non-timber forestry products for the future. Subsequent to that, they undertake research on alternative sources of general utility timber in order to assist the country wood industries in facing the dwindling supply of timber from natural forests and Rubberwood plantation. The clone was introduced by researchers from Plantation Programme, Biotechnology Division, FRIM. The seeds were collected from mother tree and raised in FRIM's nursery. The progenies were then subjected to an evaluation based on growth vigor at nursery stage which was then followed by selection process. A single progeny was then selected and planted in the FRIM nursery ground and posed to cloning study i.e. macro

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and micro propagation techniques. A bud from this progeny was successfully cultured into clean culture through tissue culture technique which was then later on multiplied and rooted in-vitro. The plantlets of the clone produced were acclimatized, hardened and raised into seedlings in the nursery. In year 1996, the clone has been planted in FRIM at Kg. Jawa and Kepong Botanical Garden (KBG) plantation plot.

2. Materials and Methods

The raw material used was 17 years old Sesenduk clone obtained from the Kepong Botanical Garden (KBG) plantation plots in FRIM. The study was divided into two different parameters i.e. solid and veneer study. Three (3) trees each were used for solid and veneer study.

2.1. Solid Study (17 years old)

Solid study included determination of timber recovery, physical and mechanical properties and product development. Samples for physical and mechanical properties test were cut in accordance with American Standard Testing Method (ASTM D5536-97).The physical and mechanical properties were tested under green and air-dry conditions based on the BS 373:1957 (reconfirmed 2008); method of testing small clear specimen for timber. Samples were tested for specific gravity (SG), basic density, shrinkage, moisture content (MC), modulus of rupture (MOR), modulus of elasticity (MOE), shear strength, compression parallel to grain test and hardness test. Solid furniture was successfully done by Furniture Industry Technology Center (FITEC), with some modification of its thickness and design.

2.2. Veneer Study (12 years old)

Veneer study comprises recovery rate study, veneer quality also physical and mechanical properties of flat plywood. Physical and mechanical properties tests were conducted based on the JAS 233:2003, EN 314-2:1993 and BS 5669: Part 1:1989 standards.

3. Result and Discussion

3.1. Solid Study – Timber Recovery, Physical and Mechanical Properties

Timber recovery of Sesenduk clone FRIMsrp001 was evaluated and it shows that timber recovery for Sesenduk clone was higher than Rubberwood and *Acacia mangium* (plantation species). Timber recovery for Sesenduk clone was 46-52% while for rubberwood and *Acacia mangium* were 15-35% [8] and 35-41% [9] respectively. *Acacia mangium* was chosen as a comparative species for this study because Acacia species (mangium/hybrid) is one of the species that listed by MTIB as a forest plantation and well-known as fast-growing species like Sesenduk. On the other hand, Rubberwood is popular and widely used in furniture industry for a decade.

Table 1: Physical and mechanical properties of Sesenduk clone 17 years old compared to Sesenduk clone 12 years old, *Acacia mangium* 20 years old and Rubberwood.

Properties	Sesenduk Clone (17 Years Old)		Sesenduk Clone (12 Years Old)[1]		*Acacia mangium* (20 Years Old) [2]		Rubber Wood[3]
	Green	Air Dried	Green	Air Dried	Green	Air Dried	Air Dried
Moisture Content (%)	117.9	18.9	102.8	16.6	94.5	15.8	17
Density (Kg/M^3)	358.4	365.6	311.1	323.4	1083.1	673.1	640
Mor (N/Mm^2)	44.9	56.4	38.1	48.2	102.5	111.2	66
Moe (N/Mm^2)	5159.5	6515.5	4471.8	5618.2	10838	10764	9240
Hardness (Kn)	1.4	1.5	1.2	1.3	3.4	2.1	4.3
Shear (N/Mm^2)	5.4	6.9	4.7	6.1	11.3	16.0	11.0
*Compression Parallel To Grain (N/Mm^2)	21.1	28.1	18.4	24.2	43.4	52.9	32.3
Specific Gravity (Sg)	0.4	0.4	0.3	0.3	0.6	0.6	0.55
Tangential Shrinkage (%)	2.1 (AD)	3.4 (OD)	1.8 (AD)	3.0 (OD)	n.a	n.a	n.a
Radial Shrinkage (%)	2.9 (AD)	4.9 (OD)	2.5 (AD)	4.2 (OD)	n.a	n.a	n.a

[1]Khairul Masseat *et al*., 2010 – Solid wood and veneer study of 12-year old Sesenduk clone.
[2]M Omar M.K and M Jamil A.W, 2011 – Properties of *Acacia mangium* planted in Pen. Malaysia.
[3]The Strength Properties of Some Malaysian Timbers, 1979.
AD – air-dry; OD – oven-dry, n.a – not available

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Sesenduk clone 17 years old was also compared with same clone 12 years old and others plantation species i.e. *Acacia mangium* 20 years old and Rubberwood as stated in table 1. It was found that all properties of *Acacia mangium* and Rubberwood better than Sesenduk clone because the densities for both species are higher than Sesenduk clone. Normally, physical and mechanical properties are much depends on the density of the wood. Generally the results from this testing showed that the properties for this clone were almost similar to the mature Sesenduk timber logged from the natural forest [7]. Although properties of Sesenduk clone are lower than *Acacia mangium* and Rubberwood, it can still use to produce solid furniture but the worker/manufacturer need more cautious when dealing with this timber because it easy to dent although machining properties very good.

Table 2: Physical and mechanical properties of flat plywood made from Sesenduk clone.

Boards	Density (Kg/m^3)	Bending Strength (Mpa)				Tensile Shear (Mpa)		FPTT (Mpa)	Screw Withdrawal (N)		
		Length Wise		Width Wise		DRY	24 hrs		Face	Edge Radial	Edge Tangential
		MOR	MOE	MOR	MOE						
UF 1510	537	50.14	6387	35.29	3644	2.25	2.01	2.04	854.4	734.8	686.9
UF 1520	574.21	53.12	6769	35.27	3840	1.91	1.72	2	903.8	722.3	720
UF 2510	554.91	53.78	6828	29.84	3292	1.51	1	1.65	749.1	521.2	534.5
UF 2520	579.45	50.61	6313	37.65	4044	2.31	1.8	1.94	962.1	784.4	814.3
FG+PE 2510	668.7	50.05	6493	31	2999	2.02	2.26	2.23	1252.7	1369	1166.8
FG+PE 2520	726.03	53.38	6947	45.04	4025	3.45	3.16	1.67	1267.5	1360.4	1424.7
STD.	-	26[1]	-	16[1]	-	0.2 - 1.0[2]		0.4[1]	470[3]	360[3]	420[3]

Note:

FPTT: Flat Plane Tensile Test
STD.: Standard
UF: Urea Formaldehyde
PE: Polyethylene
FG: Fiber glass
[1]STD.: JAS 233:2003
[2]STD.: EN 314-2:1993
[3]STD.: BS 5669: Part 1:1989
1510: 1500psi, 10min.
1520: 1500psi, 20min.
2510: 2500psi, 10min.
2520: 2500psi, 20min.

3.2. Veneer Study

While for veneer study, the Sesenduk veneer was compared with *Acacia mangium* veneer. The Sesenduk veneer properties were greater than that of *Acacia mangium*. The properties were evaluated through recovery rate and shrinkage (thickness, parallel and perpendicular). Higher recovery and lower shrinkage values indicate good properties. The recovery rate for Sesenduk clone and *Acacia mangium* were 76% and 46% respectively, whereas the shrinkage rates were 3.9% (thickness), 3.75% (parallel) and 0.25% (perpendicular) for Sesenduk clone and 2.8% (thickness), 4.22% (parallel) and 2.75% (perpendicular) for *Acacia mangium*. The Sesenduk clone veneer also was found resistance to defects such as pin holes, worm tracks and open slits. The physical and mechanical properties of the plywood from Sesenduk were decreasing as the resin loading and pressing time was increased.

4. Conclusions

Generally the result from the studies indicate that the potential of this clone to be used as forest plantation species for timber production to aid furniture industry thus could become a supplement or an alternative timber for Rubberwood and other species in furniture industry.

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References

[1] Siti Salwana, H., Norwati, M., Mahani, M.C., Ab Rasip, A.G & Mohd Rosli, H. 2006. Evaluation Of The Relatedness between The Two Entities of Endospermum Diadenum (Miq) Airy Shaw Using Wood Properties. Highlight of IRPA Project 2006. FRIM, Kepong, Malaysia

[2] Whitemore, T.C. 1972. Tree Flora of Malaya. Volume 2. Longman, Malaysia. Pp. 93-94.

[3] Gan, K.S., Choo,K.T and Lim, S.C. Timber Notes – Light Hardwoods VII (Sentang, Sepetir, Sesendok, Terap, Terentang, Timber Technology Bulletin No. 17-1999, Timber Technology Centre, Forest Research Institute Malaysia, Kepong, Selangor, Malaysia.

[4] Richter, H.G. and Dallwitz, M.J. 2000 onwards. Commercial timbers: descriptions, illustrations, identification, and information retrieval. In English, French, German, Portuguese, and Spanish. Version: 16th April 2006. http://delta-intkey.com'.

[5] Anon. 2009. Sesendok. http://tropix.cirad.fr/asia/sesendok.pdf, Accessed on 26th April 2009.

[6] Mohd Shukari, M. 1982. Malaysia timber-Sesenduk. Malayan Forest Service Trade Leaflets No. 66. 8 pp.

[7] Cheah, L. C. 1995. Pioneer Species for Fast Growing Tree Plantations in Malaysia – An Evaluation. FRIM Technical Information 53. 27 pp.

[8] Zhou, Y., Jiang, M., Gao, R. and Li, X. (2007). Rubberwood processing manual, CFC/ITTO/72 PD103/01 Rev.4 (I) "Demonstration of Rubberwood Processing Technology and Promotion of Sustainable Development in China and Other Asian Countries".

[9] M. Khairul, A.Khairul, X.Y. Teng, T.C. Wong, C.S. Chan, K. Izran & Y.E. Tan. 2011. Sawing and machining properties. Properties of *Acacia mangium* planted in Peninsular Malaysia: ITTO project on improving utilization and value adding of plantation timbers from sustainable sources in Malaysia (project no. PD 306/04(1)). 2011: 46-55. ISBN 978-967-5221-52-1.

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