



**INTERNATIONAL TROPICAL  
TIMBER ORGANIZATION (ITTO)**

**CRIMJ**

**RESEARCH INSTITUTE  
OF WOOD INDUSTRY**

**IDENTIFICATION, PROPERTIES AND USES  
OF  
SOME SOUTHEAST ASIAN WOODS**

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## Foreword

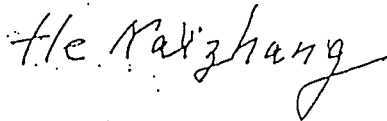
Southeast Asia is rich in tree species. It is reported that 4,000 species occur in Indonesia, 3,500 species in the Philippines and 3,000 species in Malaysia. Since the number of species of commercial timbers are increasing, better knowledge of the properties and uses of these timbers is indispensable to their rational utilization. The completion of ITTO project PD 41/88 (I) "The Identification, Properties and Uses of Tropical Timber Imported to China from Southeast Asia" will make contribution in providing these information.

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This study was undertaken by Liu Peng, Chen Fang and Yang Jiaju and whilst most attention was given by them to details in the preparation of this publication, some inaccuracies or errors may still be found for which the authors would greatly appreciate any reader's comments.



He Naizhang  
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## Explanatory Note

Trade Name The most common name used in the international trade. Sometimes, the same trade name may be used for different species.

Botanical name Scientific name presently adopted by botanists.

Local name Local or country name used in the international trade.

### Habit of Tree

Small tree: Diameter 3-30cm, Height 2-5m.

Medium tree: Diameter 30-40cm, Height 5-15m.

Large tree: Diameter over 40cm, Height over 15m.

Texture The wood constituents, particularly the tangential diameters of vessels are considered.

Very fine: Mean tangential diameter of vessels < 100um

Fine: Mean tangential diameter of vessels 100-200um

Medium: Mean tangential diameter of vessels 200-300um

Coarse: Mean tangential diameter of vessels > 300um

Weight It is estimated based on air density. (M.C. 15%)

Very light: < 0.35 g/cm<sup>3</sup>

Light: 0.36-0.55 g/cm<sup>3</sup>

Moderately heavy: 0.56-0.75 g/cm<sup>3</sup>

Heavy: 0.76-0.95 g/cm<sup>3</sup>

Very heavy: > 0.96 g/cm<sup>3</sup>

### Shrinkage

Tangential shrinkage (%)  
Green to M.C. 12%, Green to oven-dry

Very small	< 2.5	< 3.5
Small	2.6-4.0	3.6-5.0
Comparatively large	4.1-5.5	5.1-6.5
Large	5.6-7.0	6.6-8.0
Very large	> 7.1	> 8.1

Strength classes Based on compressive strength, timbers are divided into five strength classes:

Very weak	< 29 MPa	M.C. 15 %
Weak	30-44	
Medium	45-59	
Strong	60-74	
Very strong	> 74	

Air drying rates

Drying rate of 40 mm thick boards

Fast	Less than 3 months
Moderately fast	3-4
Moderately slow	4-6
Slow	6-8
Very slow	More than 8 months

Nature durability

Number of years

Non-durable	0-2
Moderately durable	2-5
Durable	5-10
Very durable	More than 10 years

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## Descriptions of species arranged by Families

Anacardiaceae	1	Hernandiaceae	67	Sonneratiaceae	177
Annonaceae	10	Icacinaceae	68	Sterculiaceae	180
Apocynaceae	12	Irvingiaceae	69	Theaceae	187
Aquifoliaceae	14	Juglandaceae	70	Tetrameristaceae	189
Barringtoniaceae	15	Lauraceae	71	Thymelaeaceae	190
Bombacaceae	16	Leguminosae	78	Tiliaceae	191
Boraginaceae	19	Loganiaceae	106	Ulmaceae	194
Burseraceae	20	Lythraceae	107	Verbenaceae	196
Casuarinaceae	21	Magnoliaceae	109	Xanthophyllaceae	201
Celastraceae	22	Melastomataceae	114		
Combretaceae	23	Meliaceae	116		
Compositae	28	Moraceae	129		
Cornaceae	29	Myrtaceae	135		
Crypteroniaceae	30	Nyssaceae	141		
Ctenolophonaceae	31	Olacaceae	142		
Datisceae	32	Proteaceae	145		
Dilleniaceae	34	Rhamnaceae	146		
Dipterocarpaceae	35	Rhizophoraceae	147		
Ebenaceae	54	Rosaceae	152		
Elaeocarpaceae	55	Rubiaceae	155		
Euphorbiaceae	56	Rutaceae	161		
Fagaceae	60	Samydaceae	163		
Guttiferae	62	Sapindaceae	165		
Hamamelidaceae	66	Sapotaceae	169		



TRADE NAME: Terentang      BOTANICAL NAME: Camptosperma auriculata Hook. f. (Anacardiaceae)  
 LOCAL NAME: Terentang daun besar (M.); Nang pron (Th.); karamati, Talantang, Talantang putih (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, yellow, brown, red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: light, - Shrinkage: small,

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: moderately fast, - Checking: no risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: easy,

USES: Veneer, Plywood, Wood based panel,

Food containers, Household appliance, Matches,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, scalariform, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 20-40/sq.mm, - Vessel element mean length: >800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, - Radial intercellular canals present,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density						
Malaysia	5	16.6	0.30	0.370	42	51	7.0	6.5	22.4	26.3
Stress at limit proportionality MPa		Hardness N. Side grain		Shear paralel to grain MPa		Resistance to splitting N/cm				
		end grain		R	T	R-Plane		T-plane		
2.21	2.37	1470	1541	7.5	9.0	38		39		

TRADE NAME: Dao BOTANICAL NAME: Dracontomelon dao Merr. et Rolf (Anacardiaceae)  
 LOCAL NAME: Sengkuang, Mati anak(M.); kaili laki, Dahu ketjil daun (In.); Lamino (Ph.); New Guinea Walnut (N. Z., Aust.); Dorea, Loup (P. N.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: yellow, brown, with streaks, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: light, moderately heavy, - Shrinkage: small, comparatively large,

STRENGTH CLASSES: medium, weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: easy,

USES: Interior finish, Furniture, Veneer, Plywood,  
 Packing boxes,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia, Papua New Guinea, China,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: vasicentric, aliform, confluent,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Philippines	2	72	0.53	0.659	101	92.6	12.5	11.6	49.6	45.8
Stress at limit proportionality		Hardness N. Side grain	Hardness N. end grain		Shear paralel to grain		Resistance to splitting			
MPa	MPa		R	T	MPa	MPa	N/cm R-Plane	N/cm T-plane	N/cm	N/cm
8.62	7.46	5030	5580	10.5	10.9					

TRADE NAME: Rengas      BOTANICAL NAME: Gluta renghas L. (Anacardiaceae)

LOCAL NAME: Rengas tembaga, Rengas hutan, rangai, Inghas (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: indistinct,  
- Grain: interlocked, - Texture: medium; - Weight: moderately heavy, heavy, - Shrinkage: very small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately slow, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately difficult,

USES: Interior finish, Furniture, Veneer, Plywood,

Household appliance, Tool handle, Novelties,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate,  
- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
- Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: terminal, - Paratracheal p.: scanty, vasicentric, - Banded: 1-3 cells, >3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate, - Radial intercellular canals present,

MINERAL INCLUSIONS - Silica: present in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa		MPa	
Indonesia		13.7		0.652	70.7	69.8	10.98	10.45	43.2	44.5
Stress at limit proportionality		Hardness N.		Shear paralel to grain		Resistance to splitting		N/cm		
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane			
				3.2	4.4	3.5	4.8	3.8	4.8	

TRADE NAME: Mugis      BOTANICAL NAME: Koordersiodendron pinnatum Merr. (Anacardiaceae)  
 LOCAL NAME: Amugis (Ph.); Bugis (In.); Runggu (Sab. Sar.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, indistinct, - Heartwood Color: brown, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, heavy, - Shrinkage: small,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture,

Turnery wood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia, Papua New Guinea,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,

- Perforation plates: simple, - Intervessel pits: alternate,

- Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200µm,

- Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: common, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty, vasicentric,

RAYs - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Radial intercellular canals present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Philippines	1	green	0.69	0.844	65.9	126	12.6	16.8	36.4	69.4
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane	T-plane			
8.82	8.9	5710	8232	4770	9356	10.0	15.5			

TRADE NAME: Jhintang      BOTANICAL NAME: *Lannea Coromandelica* (Houtl.) Merr. (Anacardiaceae)  
 LOCAL NAME: Coromandel lannea (China); Wodier (Ind.); Nabe (Bur.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, - Odour: indistinct,  
 - Grain: straight, - Texture: medium, - Weight: light, - Shrinkage: small;

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: durable, WORKING QUALITIES: easy,

USES: Interior finish, Textile timber, Furniture,

Agricultural implement wood, Packing boxes, Turnery wood, Carving, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Burma, Indonesia, China, India,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, - Paratracheal p.: scanty,

RAYS - interconnected (fused) rays, - Width: commonly 4-10 seriate, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type II,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
China			0.43	0.49	64.4	3.04	22.6
Stress at limit proportionality MPa		Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Machang BOTANICAL NAME: Mangifera indica L. (Anacardiaceae)  
 LOCAL NAME: Mangga(Ph. Th. M.); Thayet(Bur.); Membátjang(In.); Mango(Ind. Pak.); Malapaho, Pahutan(Ph.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, with streaks, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: easy,

USES: Interior finish, Furniture, Veneer, Plywood,

Wood mould, Turnery wood, Novelties,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand, Malaysia, Indonesia, Indo-china, Parkistan, India, Sri Lanka,

GROWTH RINGS: moderately distinct,

VESSLS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Septate fibres: present, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, terminal, - Paratracheal p.: vasicentric, aliform, - Banded: 1-3 cells, >3 cells,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, >12/mm, - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa		
			Basic density	Air-dry density	MPa	MPa	MPa	MPa	MPa	MPa	
Malaysia	1	17.4	0.59	0.705	57	65	7.5	7.6	32.1	39.1	
Stress at limit proportionality	MPa	Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm					
		Side grain	end grain	R	T	R-Plane	T-plane	MPa	MPa		
		5650	6057			12.2	14.9			54	57

TRADE NAME: Thitsi BOTANICAL NAME: Melanorrhoea usitata Wall. (Anacardiaceae)  
 LOCAL NAME: Burma Varnish tree(Bur.); Rak(Th.); Rengas(M. In.)

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red; purple, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: moderately heavy; - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DUARABILITY: WORKING QUALITIES: moderately easy,

USES: Interior finish, Ship and boat manufacturing, Furniture, Veneer, Plywood,  
 Turnery wood, Tool handle,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: terminal, - Paratracheal p.: scanty, vasicentric, - Banded: >3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate, - Radial intercellular canals present,

MINERAL INCLUSIONS - Silica: present in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa	Hardness N. Side grain	Hardness N. end grain	Shear paralel to grain MPa		Resistance to splitting N/cm		
			R	T	R-Plane	T-plane	

TRADE NAME: Pelaju      BOTANICAL NAME: Pentaspadon velutinus Hook. f. (Anacardiaceae)  
 LOCAL NAME: Pelajau(Sar.); Pelong(M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately slow, - Checking: - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: Interior finish, Plywood,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type II, - Radial intercellular canals present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	elasticity GPa	MPa		
Malaysia	4	47	0.46	0.560	53	80	8.6	10.5	31.8	43.5
Stress at limit proportionality	MPa	Hardness N. Side grain	Hardness N. end grain		Shear paralel to grain MPa		Resistance to splitting N/cm			
			Side grain	end grain	R	T	R-Plane		T-plane	
3.10	4.1	4000			7.9	10.4	49		46	



TRADE NAME: Merpauh      BOTANICAL NAME: Swintonia floribunda Griff. (Anacardiaceae)  
 LOCAL NAME: Merpauh pering(M.); Civit(Bur.); Moum(Cam. Viet.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: medium, - Weight: moderately heavy, heavy; - Shrinkage: small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: moderately easy,

USES: Interior finish, Plywood,  
 Matches,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand, Malaysia, Indonesia, Indo-china, Parkistan, India, Sri Lanka,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse-in-aggregates, terminal, - Paratracheal p.: vasicentric, aliform, - Banded: >3 cells,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary, chambered, - Silica: present in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Malaysia		15		0.874	101	105.2	16.2	15.7	50.1	54.5
Stress at limit proportionality		Hardness N.		Shear paralel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane			
6.9	7.7			10.0	15.5					

TRADE NAME: Bolon      BOTANICAL NAME: Alphonsea arborea Merr. (Annonaceae)  
 LOCAL NAME: Mempisang(M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: heavy, - Shrinkage: comparatively large, very large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: easy,

USES: Ship and boat manufacturing, Sporting goods,

Agricultural implement wood, Tool handle,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, China,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Banded: 1-3 cells,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES.

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Philippines	2	12	0.71	0.864	138	127	16.4	15.2	61.6	56.9
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane	T-plane	N/cm		
11.8	10.2	9370	8527	9540	8681	11.9	12.3			

TRADE NAME: Cananga      BOTANICAL NAME: Cananga odorata Hook. f. et Thoms (Annonaceae)  
 LOCAL NAME: Iliang-Iliang, Alangilan, Tangit, tangig (Ph.); Fereng (Th.); Kenanga (In. Sab. Sar. Br.); Langolian (In.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, - Odour: distinct,  
 - Grain: straight, - Texture: coarse, - Weight: light, - Shrinkage: comparatively large,

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: easy,

USES:

Packing boxes, Household appliance, Turnery wood, Buoys,

GEOGRAPHIC DISTRIBUTION: Burma, Malaysia, Philippines, Indonesia, China, India,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Banded: 1-3 cells,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength		
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa	
Philippines	5	12	0.30	0.364	45.6	45.6	7.36	6.33	23.3	21.5	
Stress at limit proportionality	MPa	Hardness N.				Shear parallel to grain		Resistance to splitting			
		Side grain	end grain	R	T	MPa	MPa	R-Plane	T-plane	N/cm	N/cm
2.41	2.08	1470	1338	2360	2148	4.94	5.11				

TRADE NAME: Pulai      BOTANICAL NAME: *Alstonia scholaris* R. Br. (Apocynaceae)  
 LOCAL NAME: Dita (Ph.); Shaitan (Bur.); Popel khe (Cam.); Pulai biasa (In.); White cheeswood, Milky pine (Aust.); Mocua (Viet); Shaitan wood, chatian(Ind.)

HABIT OF TREE: large tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: light, - Shrinkage: comparatively large,  
 STRENGTH CLASSES: weak,  
 SEASONING - Air drying rates: fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,  
 NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: moderately easy,  
 USES: Interior finish, Plywood, Culture,  
 Packing boxes, Food containers, Wood mould, Household appliance, Matches, Pencils, Battery separators,  
 GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Burma, Thailand, Malaysia, Philippines, Indonesia, Indo-china, China, Parkistan, India, Sri Lanka,  
 GROWTH RINGS: moderately distinct,  
 VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: >800µm, - Tyloses: present,  
 FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,  
 AXIAL PARENCHYMA - Banded: 1-3 cells,  
 RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type II, heterogeneous type III, - Latex or tanniferous tubes present,  
 MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary, chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	elasticity GPa	MPa		
Philippines	2	green	0.34	0.409	35.7	55	5.70	7.3	21.4	33.2
Stress at limit proportionality		Hardness N. Side grain	Hardness N. end grain		Shear paralel to grain MPa		Resistance to splitting N/cm			
MPa	MPa		R	T	MPa	MPa	R-Plane	T-plane	N/cm	N/cm
2.74	1.7	1900	2160	3.57	7.7					

TRADE NAME: Jelutung BOTANICAL NAME: Dyera costulata Hook. f. (Apocynaceae)

LOCAL NAME: Jelutung bukit (Sab.); Tinpeddaeng(Th.); Njalutung(In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, yellow; - Odour: indistinct,  
- Grain: straight, - Texture: medium, - Weight: light, - Shrinkage: very small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: fast, - Checking: slight risk of checking; - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: moderately easy,

USES: Plywood, Culture,

Wood mould, Carving, Pencils, Battery separators,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Philippines, Indonesia, Indo-china, Papua New Guinea,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal, and/or radial pattern,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vesselled pits present,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
- Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: >800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Banded: 1-3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II, - Latex or tanniferous tubes present,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa				
Malaysia	3	15.8	0.36	0.435	50	59	8.1	7.4	27.0	30.5
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane		T-plane		
2.65	2.75	1740	1782	5.8	6.7	36		41		

TRADE NAME: Mensira      BOTANICAL NAME: Ilex pleiobrachiata Loes (Aquifoliaceae)  
 LOCAL NAME: Mensira gunung (In.)

HABIT OF TREE: medium tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct,   - Heartwood Color: yellow,   - Odour: indistinct,  
                               - Grain: straight,   - Texture: fine,   - Weight: heavy,   - Shrinkage: large,  
 STRENGTH CLASSES: medium,  
 SEASONING - Air drying rates:   - Checking: slight risk of checking,   - Deformation: slight risk of deformation,  
 NATURE DURABILITY: non-durable,   WORKING QUALITIES: easy,  
 USES: House building, Interior finish,  
       Household appliance, Turnery wood, Carving, Tool handle, Matches, Pencils, Disposable chopsticks etc.,  
 GEOGRAPHIC DISTRIBUTION: Indonesia,  
 GROWTH RINGS: moderately distinct,  
 VESSELS/PORES - Porosity: wood diffuse-porous,   - Arrangement: in diagonal and/or radial pattern,  
                               - Perforation plates: scalariform,   - Intervessel pits: opposite,  
                               - Vessel-ray pitting: similar to intervessel pits,   - Mean T.D.: 100-200µm,  
                               - Vessel No.: 5-20/sq.mm,   - Vessel element mean length: >800µm,  
 FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered,   - Mean length: >1600µm,   - Wall thickness: thin to thick,  
 AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates,  
 RAYS - Width: commonly 4-10 seriate,   - Numbers: <4/mm,   - Ray tissues: heterogeneous type II,   - Sheath cells present,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

TRADE NAME: Putat      BOTANICAL NAME: Planchonia Valida Blume (Barringtoniaceae)  
 LOCAL NAME: Putat paya (In. Sab.); Selangan kan kong (sab.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: small,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: moderately slow, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: durable, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Ship and boat manufacturing, Vehicle, Furniture,  
 Agricultural implement wood,

GEOGRAPHIC DISTRIBUTION: Burma, Malaysia, Indonesia,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: present, - Mean length: >1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Banded: 1-3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: >12/mm,  
 - Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa		MPa	
Indonesia		64.9	0.68	0.831	78.6	123.6	12.16	16.48	39.5	68.3
	Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting			
	MPa	Side grain	end grain	R	T	R-Plane	T-plane			
				6.1	6.8	6.8	7.7			

TRADE NAME: Didu      BOTANICAL NAME: Bombax insigne Wall. (Bombacaceae)  
 LOCAL NAME:

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight, - Texture: coarse, - Weight: light, - Shrinkage: small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: fast, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: easy,

USES: Furniture, Veneer, Plywood, Musical instruments,

Food containers, Wood mould, Household appliance, Matches, Battery separators, Buoys,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Burma, China, India,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty, vasicentric, - Banded: 1-3 cells,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type III,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa		MPa	
India		8.9		0.395	52	44.7	7.000	6.17	30	22.7
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane		T-plane		



TRADE NAME: Durian      BOTANICAL NAME: Durio zibethinus Murr. (Bombacaceae)  
 LOCAL NAME: Durian daun, Durian kampong (M.) Durain puteh (Sab.); Durian benar, Laung, Loeria (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: coarse, - Weight: light, moderately heavy, - Shrinkage: large,

STRENGTH CLASSES: medium, weak,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: moderately, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: moderately easy,

USES: House building, Furniture, Plywood,

Household appliance,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: >800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: vasicentric, - Banded: 1-3 cells,

RAYS - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Tile cells: Durio type,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength		
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa	
Philippines	1	green	0.45	0.546	48.1	77	8.16	10.3	22.6	42.4	
Stress at limit proportionality	MPa	Hardness N.				Shear parallel to grain		Resistance to splitting			
		Side grain	end grain	R	T	R	T	R-Plane	T-plane	N/cm	N/cm
3.69	3.9	2350	3210	2970	3954	5.88	10.2				

TRADE NAME: Balsa - BOTANICAL NAME: Ochroma pyramidale Urban (Bombacaceae)

LOCAL NAME:

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, - Odour: indistinct,  
- Grain: straight, - Texture: coarse, - Weight: very light, - Shrinkage: large,

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: easy,

USES: Plywood,

Household appliance, Battery separators, Buoys,

GEOGRAPHIC DISTRIBUTION: Philippines, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate,  
- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
- Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: - Mean length: >1600um, - Wall thickness: very thin,

AXIAL PARENCHYMA - Paratracheal p.: vasicentric, - Banded: 1-3 cells,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Sheath cells present,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	R	T	R-Plane	T-plane		
Philippines	1	12	0.31	0.364	50.5	50.5	6.41	5.51	23.4	21.6
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane		T-plane		
4.93	4.26		2410	2193						

TRADE NAME: Balu BOTANICAL NAME: Cordia subcordata Lam. (Boraginaceae)

LOCAL NAME: Salimuli (In.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: yellow, brown, with streaks, - Odour: indistinct,  
- Grain: straight to fairly interlocked, - Texture: fine, - Weight: light, moderately heavy, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,

USES: Furniture, Plywood, Musical instruments,

Turnery wood, Gunstocks,

GEOGRAPHIC DISTRIBUTION: Philippines, Indonesia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood semi-ring-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
- Vessel No.: 5-20/sq.mm, - Vessel element mean length: <350um,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, terminal, - Paratracheal p.: vasicentric, aliform, confluent,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, - Sheath cells present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

TRADE NAME: Piling-liftan BOTANICAL NAME: Canarium luzonicum A. Gray (Burseraceae)  
 LOCAL NAME:

HABIT OF TREE: large tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, indistinct, - Heartwood Color: brown, red, - Odour: distinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: light, moderately heavy, - Shrinkage: small, comparatively large,  
 STRENGTH CLASSES: medium, weak,  
 SEASONING - Air drying rates: moderately slow, - Checking: no risk of checking, - Deformation: no risk of deformation,  
 NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,  
 USES: House building, Interior finish, Furniture, Veneer, Plywood, Wood based panel,  
 Agricultural implement wood, Packing boxes,  
 GEOGRAPHIC DISTRIBUTION: Philippines,  
 GROWTH RINGS: indistinct or absent,  
 VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm,  
 FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Septate fibres: common, - Mean length: 900-1600µm, - Wall thickness: thin to thick,  
 AXIAL PARENCHYMA - Paratracheal p.: scanty, vasicentric,  
 RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, - Radial intercellular canals present,  
 MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Philippines	1	12	0.48	0.568	84.8	77.7	7.95	7.37	40.9	37.8
Stress at limit proportionality MPa		Hardness N.	Shear parallel to grain MPa				Resistance to splitting N/cm			
			Side grain	end grain	R	T	R-Plane	T-plane		
9.32	8.06	3600	3276	5670	5160	13.3	13.8			

TRADE NAME: Agoho BOTANICAL NAME: Casuarina equisetifolia L. (Casuarinaceae)  
 LOCAL NAME: Ru (M.); Aru, Semipilau (Sab.); Tjemara Laut (In.); She oak (Aust. N. G)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: straight, oblique, - Texture: fine, - Weight: heavy, very heavy, - Shrinkage: large,

STRENGTH CLASSES: very strong, strong,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately difficult,

USES: House building, Durable timber, Ship and boat manufacturing, Vehicle,  
 Fuel, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Malaysia, Philippines, Indonesia, China, Parkistan, India,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, scalariform, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600um, - Wall thickness: very thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Banded: 1-3 cells,

RAYS - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, >12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary, chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Philippines	7	12	0.84	1.103	175	160	21.3	19.8	82.8	76.5
Stress at limit proportionality		Hardness N.		Shear paralel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane		T-plane		
21.3		18.4	15600	14196	14700	13377	18.3	18.9		

TRADE NAME: Mata ulat      BOTANICAL NAME: Kokoona reflexa (Laws.) Ding Hou (Celastraceae)  
 LOCAL NAME:

HABIT OF TREE: small tree, medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: very small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: House building, interior finish, Durable timber, Furniture,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: extremely rare or absent,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: 20-40/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Banded: >3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa		
Malaysia	15		1.121		102	106.3	16.3	15.8	53.1	57.7
Stress at limit proportionality: MPa		Hardness N.		Shear parallel to grain		Resistance to splitting		N/cm		
		Side grain	end grain	R	T	R-Plane	T-plane			
6.83										

TRADE NAME: Yon BOTANICAL NAME: Anogeissus acuminata Wall. (Combretaceae)

LOCAL NAME: Takiem-nu (Th.); Ram (Viet.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, indistinct, - Heartwood Color: yellow, purple, - Odour: indistinct,  
- Grain: straight, oblique, - Texture: fine, - Weight: heavy, - Shrinkage: very large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, WORKING QUALITIES: moderately difficult,

USES: Durable timber, Textile timber,

Turnery wood, Tool handle,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Philippines, Indonesia, Indo-china, Papua New Guinea, China,

GROWTH RINGS: distinct, moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
- Vessel grouping: radial multiple, - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
- Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Septate fibres: present, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, - Paratracheal p.: vasicentric, aliform,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm, >12/mm,

- Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - Crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
India		13.4		1.017	133	129.7	14.99	14.21	65	65.0
Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear parallel to grain MPa R   T		Resistance to splitting N/cm R-Plane   T-plane				
				15.8	17.1					

TRADE NAME: Ketapang      BOTANICAL NAME: Terminalia catappa L. (Combretaceae)  
 LOCAL NAME: Talisai(Ph.,Sab.); Indian almond(Ind.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: medium, weak,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: easy,

USES: House building, Interior finish, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Plywood,  
 Turnery wood, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia, China, India,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: <350um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: present, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty, vasicentric, aliform, confluent, - Banded: 1-3 cells, >3 cells,

RAYS - interconnected (fused) rays, - Width: commonly 4-10 seriate, - Numbers: 4-12/mm,  
 - Ray tissues: homogeneous uniseriate and multiseriate, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Druses or sand crystals present, in axial parenchyma cells, - crystalliferous cells: idioblast,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa				
Malaysia		15		0.71	73.5	76.6	10.95	10.6	40.3	43.8
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane		T-plane		
5.1	5.7			9.1	10.3					



TRADE NAME: Lanipau BOTANICAL NAME: Terminalia copelandii Elm. (Combretaceae)

LOCAL NAME: Ketapang(In.); Talisai(Sab.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES: - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, - Odour: indistinct,  
- Grain: straight, oblique, - Texture: medium, - Weight: light, - Shrinkage: small, comparatively large,

STRENGTH CLASSES: medium, weak,

SEASONING: Air drying rates: moderately fast, moderately slow, - Checking: - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: moderately easy,

USES: Furniture, Veneer, Plywood,

Packing boxes, Turnery wood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia, Papua New Guinea,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vested pits present,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
- Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: present, - Mean length: >1600um, - Wall thickness: very thin, thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: vasicentric, aliform, confluent,

RAYS - Width: 1-3 cells, - Numbers: <4/mm, 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Druses or sand crystals present, in axial parenchyma cells, - Crystalliferous cells: idioblast,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Philippines	5	12	0.44	0.546	89.8	82.3	12.0	11.1	45.8	42.3
Stress at limit proportionality MPa		Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm				
		Side-grain	end grain	R	T	R-Plane		T-plane		
165.5 5.91		3650	3322	5170	4705	9.54	9.87			

TRADE NAME: Sakat BOTANICAL NAME: Terminalia nitens Presl (Combretaceae)  
 LOCAL NAME: Mantalisal (Ph.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: - Texture: medium, - Weight: moderately heavy, heavy, - Shrinkage: comparatively large, very large,

STRENGTH CLASSES: strong, medium,

SEASONING - Air drying rates: slow, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DUARBILITY: non-durable, WORKING QUALITIES:

USES: House building, Durable timber, Ship and boat manufacturing, Vehicle, Furniture,  
 Agricultural implement wood, Tool handle, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - vested pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: present, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: vasicentric, aliform, confluent,

RAYs - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate, heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa
			Basic density	Air-dry density	MPa				
Philippines	12	12	0.56	0.705	87.0	79.8	12.1	11.2	
Stress at limit proportionality MPa		Hardness N. Side grain		Shear paralel to grain MPa R		Resistance to splittling N/cm R-Plane		T-plane	
13.2	11.4	5510	5014	8370	7617				

TRADE NAME: Rokfa BOTANICAL NAME: Terminalia tomentosa Wight & Arn (Combretaceae)  
 LOCAL NAME: Laurel(Bur.); Cam lien(Viet.); Chhilik(Cam.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: brown, purple, with streaks, - Odour: indistinct,  
 - Grain: straight, oblique, - Texture: medium, - Weight: heavy, - Shrinkage: large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: durable, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture,  
 Agricultural implement wood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Burma, Thailand, India,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: present, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, terminal, - Paratracheal p.: aliform, confluent, - Banded: 1-3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, Styloid crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
PHYSICAL PROPERTIES							
Stress at limit proportionality	Stress at limit, MPa	Hardness N.		Shear parallel to grain MPa	Resistance to splitting N/cm	Maximum crushing strength MPa	
		Side grain	end grain			R	T
USES: House building, etc.							

TRADE NAME: Malasambong-gubat     BOTANICAL NAME: Vernonia arborea Hem. (Compositae)  
 LOCAL NAME: Medang Lempong, Menggambang (M.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight, - Texture: medium, - Weight: light, - Shrinkage:

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: easy,

USES: Wood based panel,

Household appliance, Carving,

GEOGRAPHIC DISTRIBUTION:

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: vasicentric, aliform, confluent,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, - Sheath cells present,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa	Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa		MPa	MPa
Indonesia		12.5		0.353	36	36.8		22.8	21.7
Stress at limit proportionality		Hardness N. Side grain	Shear paralel to grain		Resistance to splitting				
MPa	MPa		end grain	R	T	R-Plane	T-plane	N/cm	N/cm

TRADE NAME: Apanit      BOTANICAL NAME: Mastixia philippinensis Wang (Cornaceae)

LOCAL NAME:

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
- Grain: straight, - Texture: fine, - Weight: light, - Shrinkage: large,

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: WORKING QUALITIES:

USES: Wood based panel,

Pulpwood, Disposable chopsticks etc.,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: scalariform, - Intervessel pits: opposite-scalariform, scalariform,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 50-100µm,  
- Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type I, heterogeneous type II,

MISCELLANEOUS: Axial intercellular canals in short tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Philippines	1	12	0.49	0.614	99.0	90.8	11.8	10.9	49.1	45.4
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane		T-plane		
5.87	5.08	4040	3676	5940	5405	9.80	10.1			

TRADE NAME: Tiaui      BOTANICAL NAME: Crypteronia paniculata Bl. (Crypteroniaceae)  
 LOCAL NAME: Bekoi, Tiliga badak (M.) Loi (Viet); Trap toum (Cam.)

HABIT OF TREE: large tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: moderately heavy, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: moderately durable, WORKING QUALITIES:

USES: House building, Interior finish,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Malaysia, Indonesia, China, India,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, terminal, - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYs - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: >12/mm,  
 - Ray tissues: heterogeneous type II,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa	Hardness N. Side grain	Hardness N. end grain		Shear parallel to grain MPa		Resistance to splitting N/cm	
				R	T	R-Plane	T-plane

TRADE NAME: Mertas      BOTANICAL NAME: Ctenolophon parvifolius Oliv. (Ctenolophonaceae)  
 LOCAL NAME: Besi-besi (Sab.); Lith (Sar); Adau (Br); Lasah, Madjuit, ukut (In.).

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: interlocked, wavy, - Texture: fine, - Weight: heavy, - Shrinkage: small,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: moderately durable, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Durable timber,

GEOGRAPHIC DISTRIBUTION: Brunei, Malaysia, Indonesia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: scalariform, - Intervessel pits: extremely rare or absent,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.:  
 - Vessel No.: - Vessel element mean length: Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse-in-aggregates, - Paratracheal p.: scanty,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, >12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary, chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Malaysia	3	16.3	0.76	0.945	122	133	18.1	18.0	61.6	71.3
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane		T-plane		
		9920	10307	14.9	17.6	53		58		

TRADE NAME: Binuang      BOTANICAL NAME: Octomeles sumatrana Miq. (Datiscaceae)  
 LOCAL NAME: Benuang (In.); Ilimo, Erima (N. G.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: oblique, interlocked, - Texture: medium, - Weight: very light, - Shrinkage: large,

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: easy,

USES: Veneer, Plywood,

Matches, Buoys,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Philippines, Indonesia, Indo-china, Papua New Guinea,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: very thin,

AXIAL PARENCHYMA - Paratracheal p.: vasicentric, aliform, confluent,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength		
			Basic density	Air-dry density	MPa		GPa		MPa		
Philippines	4	12	0.27	0.318	41.7	41.7	7.00	6.02	24.2	22.4	
Stress at limit proportionality	MPa	Hardness N.				Shear parallel to grain		Resistance to splitting			
		Side grain	end grain		R	T	R-Plane		T-plane		
2.17	1.88	1490	1356	2820	2566	3.84	3.97				



TRADE NAME: Mengkundor      BOTANICAL NAME: *Tetrameles nudiflora* R. Br. (Datiscaceae)  
 LOCAL NAME: Kundur, Binung(In.); Sompong(Cam. Th.); Tung(Viet); Baing(Bur.); Maina(Ind. Pak.); Kapong (Th.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: interlocked, - Texture: medium, - Weight: very light, light, - Shrinkage:

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,

USES: Veneer, Plywood,

Packing boxes, Food containers, Matches,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Thailand, Malaysia, Indonesia, Papua New Guinea, China, India, Sri Lanka,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: very thin,

AXIAL PARENCHYMA - Paratracheal p.: vasicentric, aliform,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MISCELLANEOUS: Axial parenchyma storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
		16.5			56.95	7.25	35.6
Stress at limit proportionality MPa	Hardness N.	Shear parallel to grain MPa		Resistance to splitting N/cm			
		Side grain	end grain	R	T	R-Plane	T-plane
				8.2	9.5		

TRADE NAME: Katmon      BOTANICAL NAME: Dillenia philippinensis Rolfe (Dilleniaceae)  
 LOCAL NAME:

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: red, purple, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, coarse, - Weight: moderately heavy, heavy, - Shrinkage: large,

STRENGTH CLASSES: strong, medium,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Durable timber, Furniture, Plywood,

Agricultural implement wood, Packing boxes, Wood mould, Matches, Fuel, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: scalariform, - Intervessel pits:  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: present, - Mean length: >1600um, - Wall thickness: thin to thick, very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty,

RAYS - rays of two distinct sizes, - Width: commonly 4-10 seriate, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Raphides crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa		
			Basic density	Air-dry density					
Philippines	1	12	0.65	0.750			41.2	38.1	
Stress at limit proportionality	MPa	Hardness N.				Shear parallel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane		
12.2	10.6	6530	5942	8830	8035	13.7	14.2		

TRADE NAME: Mersawa      BOTANICAL NAME: Anisoptera marginat Korth. (Dipterocarpaceae)  
 LOCAL NAME: Mersawa paya (P. M.); Pengiran kerangas (Sab.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: very slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Plywood,  
 Packing boxes,

GEOGRAPHIC DISTRIBUTION: Brunei, Malaysia, Indonesia,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: extremely rare or absent, - Vestured pits present,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: >1600um, - Wall thickness: very thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: vasicentric, aliform, - Banded: 1-3 cells,

RAYs - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Sheath cells present,

MINERAL INCLUSIONS - Silica: present in ray cells,

MISCELLANEOUS: Axial intercellular canals in short tangential lines,  
 Axial intercellular canals in diffuse,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Malaysia	2	97	0.55	0.675	54	98	12.6	13.0	28.9	53.6
Stress at limit proportionality		Hardness N.		Shear paralel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane			
5.52	6.0	4180	5302	7.1	12.4	51	66			

TRADE NAME: Kiam      BOTANICAL NAME: *Cotylelobium melanoxyton* (Hook. f.) Pierre (Dipterocarpaceae)  
 LOCAL NAME: Resak, Resak Tempurong (M. Sab.); Giam, Giam hitam, Giam tembaga (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight, oblique, - Texture: fine, - Weight: very heavy, - Shrinkage:

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: very durable, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Textile timber, Furniture, Culture,  
 Cooperage, Turnery wood, Bedding wood material;

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel.No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: very thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aportracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, vasicentric, - Banded: 1-3 cells,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Silica: present in ray cells,

MISCELLANEOUS: Axial intercellular canals in short tangential lines,  
 Axial intercellular canals in diffuse,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density						
Indonesia		13.7		1.099	134.8	133.1	18.63	17.73	68.2	69.3
Stress at limit proportionality	MPa	Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane	T-plane			
				6.7	7.4	7.3	8.1			

TRADE NAME: Keruing      BOTANICAL NAME: Dipterocarpus grandiflorus Blanco (Dipterocarpaceae)  
 LOCAL NAME: Apitong (Ph.); Keruing Belimbing (M. N.B.); Hieng (Th.) Gurjun (Ind.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, red, - Odour: distinct,  
 - Grain: straight, - Texture: medium, - Weight: moderately heavy, heavy, - Shrinkage: very large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Plywood, Wood based panel,  
 Cooperage, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Philippines, Indonesia, India,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600um, - Wall thickness: very thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aportracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, vasicentric,

RAYs - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Sheath cells present,

MISCELLANEOUS: Axial intercellular canals in short tangential lines,  
 Axial intercellular canals in diffuse,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Malaysia	1	18.1	0.66	0.800	98	115	17.6	17.9	51.8	65.0
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain		Resistance to splitting				
		Side grain	end grain	R	T	R-Plane	T-plane	N/cm	N/cm	
5.38	6.13	5160	5640	10.3	12.8	53	57			

TRADE NAME: Kapur - BOTANICAL NAME: Dryobalanops aromatica Gaerth. f. (Dipterocarpaceae)  
 LOCAL NAME: Kapur barus (sab.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: distinct,  
 - Grain: interlocked, - Texture: medium, - Weight: heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Plywood,  
 Packing boxes, Tool handle,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: alternate, - Vesselled pits present,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600um, - Wall thickness: very thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aporotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: vasicentric, aliform, - Banded: 1-3 cells,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Sheath cells present,

MINERAL INCLUSIONS - Silica: present in ray cells, present in axial parenchyma cells,

MISCELLANEOUS: Axial intercellular canals in long tangential lines, Axial intercellular canals in short tangential lines,  
 Axial intercellular canals in diffuse,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Malaysia	5	15.9	0.65	0.800	114	123	18.7	18.4	61.7	70.1
Stress at limit proportionality	# MPa	Hardness N.		Shear parallel to grain		Resistance to splitting				
		Side grain	end grain	R	T	R-Plane	T-plane	W/cm		
5.52	5.74	5560	5710	10.5	12.3	56	56			

TRADE NAME: Giam BOTANICAL NAME: Hopea nutens Ridl. (Dipterocarpaceae)

LOCAL NAME: Chengal batu (P. M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, brown, green, - Odour: indistinct,  
- Grain: interlocked, - Texture: medium, - Weight: very heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: very slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DUARABILITY: very duarble, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle,

Cooperage; Oil press, Friction blocks, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Brunei, Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
- Vessel-ray pitting: - Mean T.D.: >200,  
- Vessel No.: 5-20/sq.mm, - Vessel element mean length: - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: - Wall thickness: very thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: vasicentric, aliform, confluent, - Banded: 1-3 cells,

RAYs - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Tile cells: Durio-Pterospermum type,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: ordinary, chambered,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Axial intercellular canals in long tangential lines, Axial intercellular canals in short tangential lines,  
Axial intercellular canals in diffuse,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	R	T	R-Plane	T-plane		
Malaysia	5	42	0.84	1.025	109	156	17.9	20.8	66.9	86.3
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane	T-plane			
13.45	12.0	9660	11370	13.4	18.8	98	116			

TRADE NAME: Merawan BOTANICAL NAME: Hopea odorata Roxb. (Dipterocarpaceae)  
 LOCAL NAME: Merawan siput jantan, Chengal pasir, Chengal kampong, Chengal pulau, Chengal mas(M.); Takhiantong(Th.); White thingan, Safed thingan(Ind.); Sauchi, Sawkwai, Thi  
 nsingan, Thingan Net(Bur.); Sao(Viet); Koki(Cam.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, indistinct, - Heartwood Color: yellow, brown, - Odour:  
 - Grain: - Texture: fine, - Weight: moderately heavy, heavy, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,  
 NATURE DURABILITY: durable, RESISTANCE TO TERMITES: moderately, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: House building, Interior finish, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Plywood,  
 Cooperage, Household appliance,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Cambodia, Burma, Thailand, Malaysia, China, Bangladesh,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick, very thick,  
 TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: vasicentric, aliform, confluent,

RAYs - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Sheath cells present, - Tile cells: Durio type,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - Crystalliferous cells: ordinary,

MISCELLANEOUS: Axial parenchyma storied, Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
India					94.51	11.47	46.27
Stress at limit proportionality MPa	Hardness N. Side grain	Hardness N. end grain	Shear parallel to grain MPa		Resistance to splitting N/cm		
			R	T	R-Plane	T-plane	



TRADE NAME: Chengal      BOTANICAL NAME: Neobalanocarpus heimii Ashton (Dipterocarpaceae)  
 LOCAL NAME: Takien chan (Th.), Penak (M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: brown, purple, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: heavy, very heavy, - Shrinkage: small,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: very durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately easy,

USES: House building, Durable timber, Ship and boat manufacturing, Vehicle,  
 Cooperage, Tool handle,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, terminal, - Paratracheal p.: scanty, vasicentric, aliform, confluent,

RAYS - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type III, - Sheath cells present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - Crystalliferous cells: ordinary, - Silica: present in ray cells,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied, Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Malaysia	5	15.6	0.78	0.945	149	159	19.6	19.2	75.2	84.2
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain		Resistance to splitting				
		Side grain	end grain	R	T	R-Plane	T-plane	N/cm		
12.0	12.3	9480	9651	13.9	16.1	55	49			

TRADE NAME: White seraya      BOTANICAL NAME: Parashorea malaanonan Merr. (Dipterocarpaceae)  
 LOCAL NAME: Bagtikan, Southern batikan, White lauan, Tiaong, Danlig (Ph.); Urat mata (Sab. Sar.); Urat mata daun Lichin (Sab.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: medium, - Weight: light, moderately heavy, - Shrinkage: comparatively large, large,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately easy,

USES: Interior finish, Ship and boat manufacturing, Plywood,  
 Wood mould,

GEOGRAPHIC DISTRIBUTION: Brunei, Malaysia, Philippines, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: very thin,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Apotracheal p.: diffuse, - Paratracheal p.: vasicentric, aliform,

RAYs - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - Crystalliferous cells: ordinary, chambered,

MISCELLANEOUS: Axial parenchyma storied, Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Philippines	22	12	0.49	0.591	92.4	84.7	12.9	12.0	48.1	44.4
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane			
6.36	5.50	3720	3385 3840 3494	9.46	9.78					

TRADE NAME: Thingadu BOTANICAL NAME: Parashorea stellata kurz. (Dipterocarpaceae)  
 LOCAL NAME: Gerutu, Gertu-gerutu, Meranti Gerutu (M.) Cho-chi (Viet); Tavoy Wood (Bur. Ind.); May cho chi (Laos)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: oblique, - Texture: coarse, - Weight: moderately heavy, - Shrinkage: large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Ship and boat manufacturing, Furniture, Plywood,

Packing boxes,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Cambodia, Burma, Thailand, Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: vasicentric, aliform, confluent,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - Crystalliferous cells: ordinary, chambered,

MISCELLANEOUS: Axial parenchyma storied, Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
India					101.0	15.39	57.94
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: White lauan      BOTANICAL NAME: Shorea contorta Vidal (Dipterocarpaceae)  
 LOCAL NAME: Dangog, Danlig, Hapnit, Miadanao White Lauan (Ph.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: coarse, - Weight: light, - Shrinkage: comparatively large,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately easy,

USES: Interior finish, Ship and boat manufacturing, Furniture, Veneer, Plywood,  
 Wood mould, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: >1600µm, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aportracheal p.: diffuse, - Paratracheal p.: vasicentric, aliform, confluent,

RAYs - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type III, - Sheath cells present,

MISCELLANEOUS: Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Philippines	19	12	0.43	0.512	80.6	80.6	11.7	10.1	41.8	38.6
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	N/cm		R-Plane	T-plane	
5.23	4.52	3140	2857	3530	3212	8.26	8.54			

TRADE NAME: Yellow merianti BOTANICAL NAME: Shorea faguettiana Heim (Dipterocarpaceae)

LOCAL NAME: Damar hitam siput, Seraya kuning siput (M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
- Grain: interlocked, - Texture: medium, - Weight: light, moderately heavy, - Shrinkage: large,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately slow, - Checking: - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: House building, Interior finish, Ship and boat manufacturing, Furniture, Veneer, Plywood,

GEOGRAPHIC DISTRIBUTION: Brunei, Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vested pits present,

- Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200µm,

- Vessel No.: 5-20/sq.mm, - Vessel element mean length: - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: - Mean length: - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aporacheal p.: diffuse-in-aggregates, - Paratracheal p.: vasicentric, aliform,

RAYS - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Sheath cells present,

- Radial intercellular canals present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - Crystalliferous cells: ordinary, chambered, idioblast,

MISCELLANEOUS: Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa				
Malaysia	2	102	0.44	0.530	60	75	10.7	10.0	32.8	41.2
Stress at limit proportionality		Hardness N. Side grain	Shear parallel to grain		Resistance to splitting					
MPa	MPa		end grain	R	T	R-Plane	T-plane			
3.86	3.7	3110	6.4	9.9	49	62				

TRADE NAME: Red Balau BOTANICAL NAME: Shorea guiso Bl. (Dipterocarpaceae)

LOCAL NAME: Membatu, Chengal pasir(M.); Selangan Batu merah(Br. Sab. Sar.); Salanga batu(Sab.); Red selangan(Sar.) Guijo(ph.); Chai(Viet.); Chor chong(Cam.); Giso, Balau merah, Bangkirai(In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, distinct, - Heartwood Color: red, - Odour: indistinct,  
- Grain: interlocked, - Texture: medium, - Weight: moderately heavy, heavy, - Shrinkage: large,

STRENGTH CLASSES: very strong, strong,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber, Furniture,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Cambodia, Thailand, Malaysia, Philippines, Indonesia,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
- Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200um,  
- Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: aliform, confluent,

RAYS - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Sheath cells present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - Crystalliferous cells: chambered,

MISCELLANEOUS: Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	elasticity GPa	MPa		
Malaysia	6	16.9	0.60	0.755	100	113	14.8	14.8	52.2	62.2
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane			
5.52	5.99	5920	6257	12.0	14.4	65	77			

TRADE NAME: White meranti . BOTANICAL NAME: Shorea hypochra Hance (Dipterocarpaceae)

LOCAL NAME: Meranti Temak, Meranti Terbak, Temak (M.) Bo-bo (Viet.); Komnhan(Cam.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,

- Grain: - Texture: medium, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Ship and boat manufacturing, Furniture, Plywood,

GEOGRAPHIC DISTRIBUTION: Laos, Cambodia, Thailand, Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,

- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,

- Vessel-ray pitting: large, rounded, - Mean T.D.: >200,

- Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aportracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: aliform, confluent,

RAYS - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Silica: present in ray cells,

MISCELLANEOUS: Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Malaysia	5	15.7	0.58	0.690	97	104	15.7	15.4	51.7	58.2
Stress at limit proportionality		Hardness N.		Shear paralel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane		T-plane		
5.93	6.12	5250	5360	10.0	11.6	41		44		

TRADE NAME: Balau      BOTANICAL NAME: Shorea laevis Ridl. (Dipterocarpaceae)  
 LOCAL NAME: Balau kumus (P. M.), Salangan Batu (Sar.); Salanga Batu kumus (Sab.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: heavy, very heavy, - Shrinkage: small,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: very slow, - Checking: high risk of checking, - Deformation: high risk of deformation,

NATURE DURABILITY: very durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Furniture,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Indonesia, India,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vested pits present,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick, very thick,

TRACHEIDS: vasicentric; AXIAL PARENCHYMA - Aportracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, aliform, confluent,

RAYs - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Sheath cells present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - Crystalliferous cells: chambered, idioblast,

MISCELLANEOUS: Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	MPa	MPa	MPa	MPa
Malaysia	5	15.6	0.80	0.960	142	151	20.1	19.7	76.0	85.1
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane		T-plane		
9.79	10.05	10010	10190	15.0	17.4	65		72		



TRADE NAME: Dark red meranti      BOTANICAL NAME: Shorea pauciflora King (Dipterocarpaceae)  
 LOCAL NAME: Nemusu (M.) Obar suluk (Sab.); Meranti merah, Meranti Ketuko (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct; indistinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: medium, - Weight: light, moderately heavy, - Shrinkage: small, comparatively large, large,

STRENGTH CLASSES: medium, weak,

SEASONING - Air-drying rates: moderately fast, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: Interior finish, Furniture, Veneer, Plywood,  
 Wood mould,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vesselled pits present,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aporotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: vasicentric, aliform, confluent, - Banded: 1-3 cells,

RAYs - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: chambered, idioblast,

MISCELLANEOUS: Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength		
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa	
Philippines	2	12	0.32	0.398	67.9	67.9	11.0	9.46	34.3	31.7	
Stress at limit proportionality	MPa	Hardness N.				Shear parallel to grain		Resistance to splitting			
		Side grain	end grain	R	T	MPa	MPa	N/cm	N/cm	R-Plane	T-plane
3.54	3.06	1650	1502	2830	2575	5.59	5.78				

TRADE NAME: Yellow lauan BOTANICAL NAME: Shorea polita Vidal (Dipterocarpaceae)

LOCAL NAME: Malaanonang; Lauan-puti (Ph.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
- Grain: interlocked, - Texture: medium, - Weight: light, - Shrinkage: small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Veneer, Plywood,  
Packing boxes,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
- Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200um,  
- Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Paratracheal p.: vasicentric, aliform, confluent,

RAYS - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Sheath cells present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - Crystalliferous cells: ordinary,

MISCELLANEOUS: Axial parenchyma storied, Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Philippines	4	12	0.47	0.603	89.1	81.7	11.1	10.3	41.8	38.6
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane		T-plane		
6.88	5.95	3830	3485	5120	4659	9.59	9.92			

TRADE NAME: Light red meranti      BOTANICAL NAME: Shorea teysmanniana Dyer ex Brandis (Dipterocarpaceae)  
 LOCAL NAME: Meranti bunga (M.); Serraya bunga (Sab.); Tiaong (Ph.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: coarse, - Weight: light, moderately heavy, - Shrinkage: large,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: House building, interior finish, Furniture, Plywood,

Packing boxes, Wood mould,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vesselled pits present,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: >200,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: >1600um, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Apotracheal p.: diffuse-in-aggregates, - Paratracheal p.: vasicentric, aliform, confluent,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Radial intercellular canals present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - Crystalliferous cells: chambered, idioblast,

MISCELLANEOUS: Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Malaysia	2	83	0.42	0.510	46	71	10.6	9.5	23.6	39.0
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain MPa			Resistance to splitting N/cm			
		Side grain	end grain	R	T		R-Plane	T-plane		
2.33	3.3	2580		5.3	9.5		31		36	

TRADE NAME: Resak      BOTANICAL NAME: Vatica mangachapoi Blanco (Dipterocarpaceae)  
 LOCAL NAME: Resak julong (Sar. Br.); Resak bajau (Sab.) Narig (Ph.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, - Odour: indistinct,  
 - Grain: straight, oblique, - Texture: very fine, - Weight: heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: moderately slow, - Checking: - Deformation:

NATURE DURABILITY: very durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: very difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Textile timber, Culture,  
 Cooperage, Turnery wood, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Philippines, China,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered; - Mean length: 900-1600µm, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty,

RAYS - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II,

MISCELLANEOUS: Axial intercellular canals in short tangential lines,  
 Axial intercellular canals in diffuse,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Philippines	9	12	0.66	0.875	134	123	17.4	16.1	65.2	60.2
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane	T-plane	N/cm		
11.5	9.95	7580	6898	8990	8181	13.1	13.6			

TRADE NAME: Penyau BOTANICAL NAME: Upuna borneensis Sy (Dipterocarpaceae)

LOCAL NAME: Upun batu(Kal.); Upun(Sab.); Balau penjau(In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
- Grain: straight to fairly interlocked, - Texture: medium, - Weight: very heavy, - Shrinkage: small,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: moderately fast, - Checking: - Deformation:

NATURE DURABILITY: durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: difficult,

USES: House building, Durable timber, Furniture,

Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Brunei, Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: extremely rare or absent, - Vestured pits present,  
- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
- Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: - Wall thickness: very thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aportracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: vasicentric,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, - Sheath cells present,

MISCELLANEOUS:

Axial intercellular canals in diffuse,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Malaysia		15		1.14	156	162.5	17.8	17.28	87.0	94.6
	Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting		N/cm	
	MPa		Side grain	end grain	R	T	R-Plane	T-plane		
					18.0	20.5				

TRADE NAME: Ebony BOTANICAL NAME: Diospyros celebica Bakh (Ebenaceae)  
 LOCAL NAME: Macassar ebony (USA.); Amara, Ayu maitong, Kayu itam, Maeta, Sora, Toetandu (In.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: black, with streaks, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: very heavy, - Shrinkage: very large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately difficult,

USES: Furniture, Veneer, Musical instruments,

Turnery wood, Carving, Novelties,

GEOGRAPHIC DISTRIBUTION: Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick, very thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYs - Width: exclusively uniseriate, - Numbers: >12/mm, - Ray tissues: heterogeneous uniseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa				
Indonesia		15		1.09	110.7	115.3	14.71	14.28	60.2	65.4
Stress at limit proportionality		Hardness N. Side grain	Shear paralel to grain		Resistance to splitting					
MPa			end grain	R	T	R-Plane	T-plane			

TRADE NAME: Jenitri BOTANICAL NAME: *Elaeocarpus sphaericus* K. schum. (Elaeocarpaceae)  
 LOCAL NAME: Sengkurat (M.); Sanga burong (P. M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: light, - Shrinkage: very small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: Interior finish, Veneer, Plywood,

Packing boxes, Matches,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia, Papua New Guinea, India, Sri Lanka,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: terminal, - Paratracheal p.: scanty,

RAYS - interconnected (fused) rays, - Width: commonly 4-10 seriate, - Numbers: >12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary, chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density						
Malaysia	1	17.3	0.43	0.515	61	76	10.3	9.6	34.1	41.3
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane		T-plane		
		2670	2854	7.2	8.8	35		48		

TRADE NAME: Kemiri      BOTANICAL NAME: Aleurites moluccana Willd. (Euphorbiaceae)  
 LOCAL NAME: Lumbang, Candlenut tree (Ph.); Beraoe (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, yellow, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: very light, - Shrinkage:

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,

USES: Interior finish, Sporting goods,

Food containers, Wood mould, Household appliance, Battery separators, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Philippines, Indonesia, China,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: >800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: very thin,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, terminal, - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYs - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	elasticity GPa	MPa		
Philippines	1	green	0.29	0.347	22.1	45	4.12	5.9	9.67	24.4
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane			
1.45	0.63	1200	1420	3.66	6.6					



TRADE NAME: Tuai      BOTANICAL NAME: Bischofia javanica Bl. (Euphorbiaceae)  
 LOCAL NAME: Godog (In.); Gintungan (Java); Nhoi (Viet); Term (Th.); Bisshopwood (Ind. Bur.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: red, purple, with streaks, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage: large, very large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Furniture,

Packing boxes,

GEOGRAPHIC DISTRIBUTION: Vietnam, Thailand, Malaysia, Philippines, Indonesia, China, Bangladesh, India,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: present, - Mean length: >1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - absent or extremely rare,

RAYs - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Philippines	1	12	0.56	0.728	111	102	11.3	10.5	49.2	45.5
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane	T-plane			
9.80	8.48	8180	7444	10600	9646	16.6	17.2			

TRADE NAME: Sesendok      BOTANICAL NAME: Endospermum diadenum (Miq.) Airy-Shaw. (Euphorbiaceae)  
 LOCAL NAME: Sendok-sendok (Sab. Br. M.); Ekur belangkas, Terbulan (Sar.); Membulan (P. M.); Merbulan; Lempaung; Labu (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: light, - Shrinkage: very small;

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: easy,

USES: Furniture, Plywood,

Packing boxes, Wood mould, Household appliance, Matches, Disposable chopsticks etc.,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: radial multiple, - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: >800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600um, - Wall thickness: very thin,

AXIAL PARENCHYMA - Banded: 1-3 cells,

RAYs - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Malaysia	1	76	0.33	0.400	39	53	8.5	7.0	20.8	28.9
Stress at limit proportionality		Hardness N. Side grain	Shear paralel to grain		Resistance to splitting					
MPa			end grain	R	T	MPa	N/cm	R-Plane	T-plane	
1.75	1.5	1560		5.4	7.5		32		32	

TRADE NAME: Rubberwood · BOTANICAL NAME: Hevea brasiliensis Muell.-Arg (Euphorbiaceae)  
 LOCAL NAME: Getah(Sab.); Kayu getah(M.); Para rubber(Ph., M.); Karet(In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight, oblique, - Texture: fine, medium, - Weight: moderately heavy, - Shrinkage: very small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: easy,

USES: Interior finish, Furniture,

Packing boxes, Household appliance, Turnery wood, Carving, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia, China,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,

- Perforation plates: simple, - Intervessel pits: alternate,

- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,

- Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: >1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse-in-aggregates, - Paratracheal p.: scanty, vasicentric, - Banded: 1-3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, commonly 4-10 seriate, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in vessels,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Malaysia	3	17.2	0.53	0.640	66	75	9.2	9.2	32.3	39.0
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain		Resistance to splitting		N/cm		
		Side grain	end grain	R	T	R-Plane	T-plane	R-Plane	T-plane	
4.69	5.15	4320	4605	11.0	13.3	54	72			

TRADE NAME: Saninten      BOTANICAL NAME: Castanopsis argentea A.Dc. (Fagaceae)  
 LOCAL NAME: Berangan, tunggeureuk(In.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight, - Texture: medium, - Weight: moderately heavy, - Shrinkage: very large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: durable, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber,

Agricultural implement wood, Packing boxes, Tool handle, Fuel,

GEOGRAPHIC DISTRIBUTION: Indonesia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: extremely rare or absent,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: 4-12/mm, >12/mm, - Ray tissues: homogeneous uniseriate,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength	
			Basic density	Air-dry density	MPa		MPa		MPa	
Indonesia		14.2		0.860	95.9	96.4	11.86	11.4	53.4	55.7
	Stress at limit proportionality		Hardness N.		Shear paralel to grain		Resistance to splittiing		N/cm	
	MPa		Side grain	end grain	R	T	R-Plane	T-plane		
					7.2	8.0	8.0	8.9		

TRADE NAME: Manaring BOTANICAL NAME: Lithocarpus soleriana Rehd. (Fagaceae)  
 LOCAL NAME: Ulian, masaring, Ihip, bayukan(Ph.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: coarse, - Weight: heavy, - Shrinkage:

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: moderately durable, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Furniture,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: extremely rare or absent,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: >800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: very thick,

TRACHEIDS: vascentric, AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYS - aggregate rays common, - Width: commonly 4-10 seriate, - Numbers: 4-12/mm,

- Ray tissues: homogeneous uniseriate and multiseriate, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
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Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear parallel to grain MPa R   T		Resistance to splitting N/cm R-Plane   T-plane	
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TRADE NAME: Bintangor      BOTANICAL NAME: Calophyllum inophyllum L. (Guttiferae)  
 LOCAL NAME: Bintangor laut (M.) Bintanghol, Bitag (Ph.); Mu-u (Viet.); Njamlung In.); Pongnet (Bur.); Poon (Bur. Ind.); Tanghon, kathing (Th.)

HABIT OF TREE: large tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: medium, - Weight: moderately heavy, - Shrinkage: large,  
 STRENGTH CLASSES: medium,  
 SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking; - Deformation: slight risk of deformation,  
 NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately easy,  
 USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Furniture, Veneer, Plywood, Wood based panel, Sporting goods, Musical instruments,  
 Agricultural implement wood, Packing boxes, Gunstocks, Bent wood,  
 GEOGRAPHIC DISTRIBUTION: Vietnam, Burma, Malaysia, Philippines, Indonesia, Papua New Guinea, China, India, Fiji,  
 GROWTH RINGS: indistinct or absent,  
 VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: extremely rare or absent,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,  
 FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: present, - Mean length: 900-1600um, - Wall thickness: thin to thick,  
 TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Banded: 1-3 cells,  
 RAYS - Width: exclusively uniseriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous uniseriate, heterogeneous type II, heterogeneous type III,  
 MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Philippines	1	12	0.56	0.671	106	97.2	8.56	7.94	38.8	35.9
Stress at limit proportionality	MPa	Hardness N.				Shear paralel to grain		Resistance to splitting		
		Side grain	end grain	R	T	R-Plane	T-plane			
12.1	10.5	6470	5888	7890	7180	15.0	15.5			

TRADE NAME: Geronggang      BOTANICAL NAME: *Cratoxylum arborescens* Bl. (Guttiferae)  
 LOCAL NAME: Serugan (Sab.); Geronggang (M. In. Sab.); Adat (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: straight, - Texture: very fine, - Weight: light, - Shrinkage: comparatively large,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: fast, - Checking: slight risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Veneer, Plywood, Wood based panel, Culture,

Packing boxes, Food containers, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Thailand, Malaysia, Philippines, Indonesia, Papua New Guinea, Fiji,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: very thin,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aporacheal p.: diffuse, - Paratracheal p.: scanty, vasicentric,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Silica: present in ray cells, present in axial parenchyma cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Malaysia	5	106	0.37	0.450	40	61	8.0	8.1	18.3	33.4
Stress at limit proportionality		Hardness N. Side grain	Shear parallel to grain		Resistance to splitting					
MPa	MPa		end grain	R	T	R-Plane	T-plane	N/cm		
1.93	2.3	1870	5.1	8.4	32	40				

TRADE NAME: Trai-ly      BOTANICAL NAME: *Garcinia fragraeoides* A. Chev. (Guttiferae)

LOCAL NAME:

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, - Odour: indistinct,  
- Grain: straight, oblique, - Texture: fine, - Weight: very heavy, - Shrinkage:

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: very slow, - Checking: - Deformation:

NATURE DURABILITY: very durable, WORKING QUALITIES: difficult,

USES: House building, Durable timber, Ship and boat manufacturing, Furniture, Musical instruments,  
Novelties, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
- Vessel grouping: exclusively solitary, radial multiple, - Perforation plates: simple, - Intervessel pits: alternate,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 50-100µm,  
- Vessel No.: 20-40/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, - Paratracheal p.: aliform, confluent, - Banded: 1-3 cells, >3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm,  
- Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: chambered, - Silica: present in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality	MPa	Hardness N. Side grain	end grain	Shear parallel to grain R	MPa T	Resistance to splitting R-Plane	N/cm T-plane



TRADE NAME: Penaga      BOTANICAL NAME: Mesua ferrea L. (Guttiferae)  
 LOCAL NAME: Bosneak (Cam.); Boonnark, Bunnark (Th.); Vap (Viet.); Lenggapus (P.M.); Mergasing (Sar.); Nagasari (In.); Mesua (Ind.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, with streaks, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: heavy, very heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: difficult,

USES: House building, Durable timber, Ship and boat manufacturing, Furniture,

Tool handle, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Cambodia, Thailand, Malaysia, Indonesia, China, India,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: extremely rare or absent,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600µm, - Wall thickness: very thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Banded: 1-3 cells, >3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: >12/mm, - Ray tissues: heterogeneous uniseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Malaysia	3	16.5	0.97	1.120	155	171	19.5	19.3	79.5	92.9
	Stress at limit proportionality MPa		Hardness N.		Shear paralel to grain MPa		Resistance to splittiing N/cm			
			Side grain	end grain	R	T	R-Plane	T-plane		
	16.07	17.15	14860	15529		19.3	23.0	63	75	

TRADE NAME: Rasamala      BOTANICAL NAME: Altingia excelsa Noronha (Hamamelidaceae)

LOCAL NAME: Nantayok (Bur.); Jutili (Ind.); Sob (Th.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
- Grain: straight to fairly interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURAL DURABILITY: moderately durable, WORKING QUALITIES: moderately difficult,

USES: House building, Durable timber, Ship and boat manufacturing, Vehicle,

Pulpwood,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand, Malaysia, Indonesia, China, India,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,

- Vessel grouping: exclusively solitary, solitary vessel outline angular, - Perforation plates: scalariform, - Intervessel pits: extremely rare or absent,

- Vessel-ray pitting: large, rounded, large, gash-like, - Vessel with helical thickenings, - Mean T.D.: 50-100µm,

- Vessel No.: 40-100/sq.mm, - Vessel element mean length: >800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Fibres with helical thickening, - Mean length: >1600µm, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

TRADE NAME: Buah keras Laut      BOTANICAL NAME: Hernandia nymphaefolia Kuntz. (Hernandiaceae)  
LOCAL NAME: Baru Laut (P. M.)

HABIT OF TREE: small tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, - Odour: indistinct,  
- Grain: straight, - Texture: fine, - Weight: light, - Shrinkage: small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,

USES: Furniture, Culture,

Household appliance, Buoys, Disposable chopsticks etc.,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate,  
- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
- Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600µm, - Wall thickness: very thin,

AXIAL PARENCHYMA - Paratracheal p.: aliform, confluent, - Banded: 1-3 cells, >3 cells,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

TRADE NAME: Dedaru      BOTANICAL NAME: *Cantleya corniculata* Howord (Icacinaceae)  
 LOCAL NAME: Bedaru (Sar. In.); Samala (Sab.); Seranai (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, - Odour: distinct,  
 - Grain: interlocked, - Texture: fine, - Weight: heavy, - Shrinkage:

STRENGTH CLASSES: very strong, strong,

SEASONING - Air drying rates: moderately slow, - Checking: - Deformation:

NATURE DURABILITY: durable, WORKING QUALITIES: moderately easy,

USES: House building, Durable timber, Vehicle,

Tool handle, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: extremely rare or absent,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: >800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600µm, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, - Paratracheal p.: scanty, aliform,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Malaysia	1	16.7	0.80	0.930	128	143	18.3	18.3	62.8	74.0
Stress at limit proportionality MPa		Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane		T-plane		
		10280	10804		13.1	15.7	53		72	

TRADE NAME: Kabok      BOTANICAL NAME: Irvingia malayana Oliv. ex Benn. (Irvingiaceae)  
 LOCAL NAME: Pauh kijang (M.); Bongin, Pauh kidjang (In.); Kaju tulang (Br.); Cay, Chambak(Cam.) )

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, with streaks, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: very heavy, - Shrankage: comparatively large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DUARBILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: difficult,

USES: House building, Interior finish, Durable timber, Furniture,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Cambodia, Burma, Thailand, Malaysia, Indonesia, India,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse, - Banded: 1-3 cells, >3 cells,

RAYs - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered, - Silica: present in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa	
			Basic density	Air-dry density				
Malaysia	3	16.8	0.83	1.090			70.5	83.5
Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear paralel to grain MPa R   T		Resistance to splitting N/cm R-Plane   T-plane		
12.62	13.64	13130	13839	17.0	20.3			

TRADE NAME: Kayuhujan      BOTANICAL NAME: Engelhardtia roxburghiana Wall. (Juglandaceae)  
 LOCAL NAME: Cheo, Cheo Tia (Viet.); Dungun paya, Paar, Teraling (M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, - Odour: indistinct,  
 - Grain: straight, oblique, - Texture: fine, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, WORKING QUALITIES: moderately easy,

USES: House building, Durable timber, Vehicle, Furniture, Plywood,

Agricultural implement wood, Wood mould, Turnery wood, Gunstocks,

GEOGRAPHIC DISTRIBUTION: Vietnam, Burma, Thailand, Malaysia, Indonesia, China,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood semi-ring-porous, wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Perforation plates: simple, scalariform, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, vasicentric, - Banded: 1-3 cells,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
China			0.46	0.57	91.1	10.10	44.2
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane
				9.1	9.8		

TRADE NAME: Medang      BOTANICAL NAME: *Alseodaphne insignis* Gamb. (Lauraceae)  
 LOCAL NAME: Mecang tanah (P. M.); Medang payong (M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, - Odour: indistinct,  
 - Grain: straight, oblique, - Texture: fine, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Furniture, Veneer, Plywood,  
 Agricultural implement wood,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, scalariform, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Septate fibres: common, - Mean length: >1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty, vasicentric, aliform,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MISCELLANEOUS: Oil and/or mucilage cells associated with ray parenchyma, Oil and/or mucilage cells associated with axial parenchyma,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa	
			Basic density	Air-dry density			R-Plane	T-plane
Malaysia	3	45	0.57	0.705			39.9	55.9
Stress at limit proportionality MPa		Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm		
		Side grain	end grain	R	T	R-Plane	T-plane	
4.00	6.4	3340	5721	8.3	12.8			

TRADE NAME: Medang      BOTANICAL NAME: Cinnanomum porrectum Kostern (Lauraceae)  
 LOCAL NAME: Medang Lesah (In.); Medang (In. M.); Medang kemangi (M.) Medang rawali (Bor.); Keplan wangi (Sar.); Ki-serah (Bur. In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: distinct,  
 - Grain: interlocked, - Texture: fine, - Weight: light, moderately heavy, - Shrinkage: very small,

STRENGTH CLASSES: strong, medium,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: durable, WORKING QUALITIES: easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Furniture, Veneer, Plywood,  
 Wood mould,

GEOGRAPHIC DISTRIBUTION: Burma, Malaysia, Indonesia, China, Parkistan, India,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, scalariform, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, terminal, - Paratracheal p.: scanty, vasicentric, aliform, confluent,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type II, heterogeneous type III,

MISCELLANEOUS: Oil and/or mucilage cells associated with ray parenchyma, Oil and/or mucilage cells associated with axial parenchyma,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa				
Indonesia			0.63		55.2	57.5	8.333	8.090	56.6	61.5
Stress at limit proportionality	MPa	Hardness N.		Shear paralel to grain MPa				Resistance to splitting N/cm		
		Side grain	end grain	R	T	R-Plane	T-plane			
				6.4	7.0	7.3	7.9			



TRADE NAME: Medang BOTANICAL NAME: Cryptocarya griffithii Wight. (Lauraceae)  
 LOCAL NAME: Medang dering (Sab.); Medang (M. Br. In.); Medang, Medang payong (M.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: moderately heavy, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Veneer, Plywood,  
 Agricultural implement wood,

GEOGRAPHIC DISTRIBUTION: Brunei, Malaysia, Indonesia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: terminal, - Paratracheal p.: scanty,

RAY S - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Tile cells: Pterospermum type,

MISCELLANEOUS: Oil and/or mucilage cells associated with ray parenchyma, Oil and/or mucilage cells associated with axial parenchyma,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa		Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Medang      BOTANICAL NAME: Dehaasia cuneata Bl. (Lauraceae)  
 LOCAL NAME: Medang tanehan (In.); Medang payong (M.)

HABIT OF TREE: medium tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: yellow, - Odour: indistinct,  
                             - Grain: oblique, - Texture: fine, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Veneer, Plywood,  
 Turnery wood, Carving,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
                             - Perforation plates: simple, - Intervessel pits: alternate,  
                             - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
                             - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, - Paratracheal p.: scanty,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MISCELLANEOUS: Oil and/or mucilage cells associated with ray parenchyma, Oil and/or mucilage cells associated with axial parenchyma,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa	Hardness N. Side grain	Hardness N. end grain	Shear paralel to grain MPa		Resistance to splitting N/cm		
			R	T	R-Plane	T-plane	

TRADE NAME: Belian BOTANICAL NAME: Eusideroxylon zwageri Teijsm. & Binnend. (Lauraceae)  
 LOCAL NAME: Borneo ironwood (Uk.); Tambulian (Ph.); Badjudjang, Bulian, Oelian, Onglen, Tabulin, Tihin, Ulin, Uling (In.)

HABIT OF TREE: large tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: distinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, medium, - Weight: very heavy, - Shrinkage: comparatively large,  
 STRENGTH CLASSES: very strong,  
 SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,  
 NATURE DUARABILITY: very durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: difficult,  
 USES: House building, Durable timber, Ship and boat manufacturing, Vehicle,  
 Bedding wood material,  
 GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia,  
 GROWTH RINGS: indistinct or absent,  
 VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,  
 FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: very thick,  
 AXIAL PARENCHYMA - Apotracheal p.: terminal, - Paratracheal p.: scanty, aliform, confluent, - Banded: 1-3 cells, >3 cells,  
 RAYS - interconnected (fused) rays, - Width: 1-3 cells, commonly 4-10 seriate, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type III,  
 MISCELLANEOUS: Oil and/or mucilage cells associated with axial parenchyma,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	GPa	MPa	MPa
Indonesia		15.5		1.198	140.3	149.1	18.39	18.0	71.9	80.1
	Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting			
	MPa		Side grain	end grain	R	T	R-Plane		T-plane	
					11.4	11.5	13.1	13.3		

TRADE NAME: Medang      BOTANICAL NAME: Litsea oderifera Val. (Lauraceae)  
 LOCAL NAME: Medang Perawas (In.); Lisang (Sab.); Batikulung surutan (Ph.); Lelamit, Perawas (In.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: light, moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: medium, weak,

SEASONING - Air drying rates: moderately slow, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Veneer, Plywood, Culture,  
 Packing boxes, Wood mould, Carving,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, scalariform, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty, vasicentric, aliform,

RAYS - Width: 1-3 cells, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MISCELLANEOUS: Oil and/or mucilage cells associated with axial parenchyma,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa		Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Medang      BOTANICAL NAME: *Nothaphoebe panduriformis* Gamb. (Lauraceae)  
 LOCAL NAME: Medang pisang (M.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: green, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: light, - Shrinkage: small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: WORKING QUALITIES: easy,

USES: Interior finish, Furniture, Veneer, Plywood,  
 Packing boxes,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Perforation plates: simple, scalariform, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty, vasicentric,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MISCELLANEOUS: Oil and/or mucilage cells associated with ray parenchyma, Oil and/or mucilage cells associated with axial parenchyma,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

TRADE NAME: Pilang      BOTANICAL NAME: Acacia leucophloea Willd. (Leguminosae)  
 LOCAL NAME: Tanaung (Bür.); Reru, Panharya (In.); Chalaep daeng (Th.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: red, with streaks, - Odour: indistinct,  
 - Grain: interlocked, - Texture: medium, - Weight: moderately heavy, - Shrinkage: large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, WORKING QUALITIES: moderately difficult,

USES: House building, Vehicle,

Agricultural implement wood, Turnery wood, Tool handle, Fuel,

GEOGRAPHIC DISTRIBUTION: Burma, Indonesia, India,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: <350µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, terminal, - Paratracheal p.: aliform, confluent,

RAYs - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: homogeneous multiseriate, homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Indonesia		14.2		0.871	85.1	85.8	10.78	10.34	51.5	53.7
	Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm			
			Side grain	end grain	R	T		R-Plane	T-plane	
					7.9	9.3	8.8	10.3		

TRADE NAME: Makharmong      BOTANICAL NAME: Afzelia xylocarpa Craib (Leguminosae)  
 LOCAL NAME: Makha hua kham, Makha Luang, Marka-mong (Th.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, with streaks, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: heavy, - Shrinkage:

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: durable, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture,  
 Agricultural implement wood, Tool handle, Bent wood,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: terminal, - Paratracheal p.: aliform, confluent,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear parallel to grain MPa R   T		Resistance to splitting N/cm R-Plane   T-plane	

TRADE NAME: OBatai      BOTANICAL NAME: Albizia falcataria Fosberg (Leguminosae)  
 LOCAL NAME: Sengon, sengon laut (In.); Moluccan sau (Ph.); Sengon Batai (In. M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: light, - Shrinkage: small,

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: fast, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: Interior finish, Plywood, Wood based panel,

Packing boxes, Turnery wood, Matches, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia, China,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: very thin,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: vasicentric,

RAYS - Width: exclusively uniseriate, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate, homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	MPa	MPa		
Malaysia	3	72	0.32	0.385	38	51	6.8	6.8	19.2	27.7
Stress at limit proportionality		Hardness N.	Shear parallel to grain		Resistance to splitting					
MPa	MPa		Side grain	end grain	R	T	R-Plane	T-plane	N/cm	N/cm
1.68	1.2	2360		5.0	7.3			13	29	



TRADE NAME: White siris      BOTANICAL NAME: Albizia procera Benth. (Leguminosae)

LOCAL NAME: Akle (Ph.); Sitpen, Sibok (Bur.); Sada (Pak.); Then, Pluk (Th.); Akleng parang (Ph.); Wangkol, Weru, Saoentiri (In.); Safed siris (Ind. Pak.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: black, with streaks, - Odour: indistinct,  
- Grain: straight to fairly interlocked, - Texture: medium, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: very durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Plywood,  
Agricultural implement wood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Burma, Malaysia, Philippines, China, Pakistan, Bangladesh,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vesselled pits present,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
- Vessel No.: <5/sq.mm, - Vessel element mean length: <350µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, terminal, - Paratracheal p.: vasicentric, aliform, confluent,

RAYs - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered, idioblast,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
China		15	0.57	0.68	103.0	10.49	54.7
Stress at limit proportionality	MPa		Side grain	end grain	Shear paralel to grain MPa R		Resistance to splitting N/cm R-Plane   T-plane
					10.5	12.1	

TRADE NAME: Johar      BOTANICAL NAME: Cassia siamea Lam. (Leguminosae)  
 LOCAL NAME: Djohar (In.) Jahar (M.) Muong, Muong den, Perdrik wood (Viet.); Angkanh (Cam.) Mezali (Bur.) Kilet, Khi lekban (Th.) Beati (Ind.)

HABIT OF TREE: large tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: purple, with streaks, - Odour: indistinct,  
 - Grain: oblique, interlocked, - Texture: medium, - Weight: heavy, very heavy, - Shrinkage: large,  
 STRENGTH CLASSES: strong,  
 SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,  
 NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: moderately difficult,  
 USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture,  
 Agricultural implement wood, Turnery wood, Carving, Tool handle, Novelties, Fuel,  
 GEOGRAPHIC DISTRIBUTION: Vietnam, Burma, Thailand, Malaysia, Indonesia, India,  
 GROWTH RINGS: indistinct or absent,  
 VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: <350µm, Gums and other deposits,  
 FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: very thick,  
 AXIAL PARENCHYMA - Apotracheal p.: diffuse, terminal, - Paratracheal p.: confluent, - Banded: >3 cells,  
 RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,  
 MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa		
			Basic density	Air-dry density	MPa						
Indonesia		14.8		1.011	120.5	124.5	12.06	11.67	58.4	62.8	
Stress at limit proportionality		Hardness N.	Shear parallel to grain		Resistance to splitting						
MPa			Side grain	end grain	R	T	R-Plane	T-plane			
				9.5	10.1	10.7	11.4				

TRADE NAME: Merbau kera      BOTANICAL NAME: *Crudia curtisii* Prain (Leguminosae)

LOCAL NAME: Angar-angar (Sab.); Babi kurus, jering tupai (P. M.)

HABIT OF TREE: small tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: purple, with streaks, - Odour: indistinct,  
 - Grain: interlocked, wavy, - Texture: fine, - Weight: heavy, very heavy, - Shrinkage:

STRENGTH CLASSES: very strong, strong,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, WORKING QUALITIES: difficult,

USES: Interior finish,

Tool handle,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,

- Vessel grouping: exclusively solitary, radial multiple, - Perforation plates: simple, - Intervessel pits: alternate, - vestured pits present,

- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,

- Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aportracheal p.: terminal, - Banded: 1-3 cells, >3 cells,

RAYs - Width: 1-3 cells, - Numbers: >12/mm, - Ray tissues: homogeneous uniseriate and multiseriate, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Malaysia		17.8		1.13	138.3	146.1	17.10	16.8	70	77.2
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane			

TRADE NAME: Kekatong      BOTANICAL NAME: *Cynometra malaccensis* Meeuwan (Leguminosae)  
 LOCAL NAME: Kekatong laut, belangan, (M.P.); Katong-katong (Sab.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: red, purple, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: heavy, - Shrinkage: small,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: difficult,

USES: House building, Durable timber,

Agricultural implement wood, Tool handle, Novelties,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vesselled pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: thin to thick, very thick,

AXIAL PARENCHYMA - Paratracheal p.: aliform, confluent, - Banded: >3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,  
 - Ray tissues: homogeneous uniseriate and multiseriate, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Malaysia	5	18.9	0.84	1.010	135	163	18.4	18.9	67.0	87.1
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
11.4	13.4	12370	13817	R	T	R-Plane		T-plane		
				15.6	19.8	61		74		

TRADE NAME: Payung      BOTANICAL NAME: Dalbergia cochinchinensis Pierre (Leguminosae)  
 LOCAL NAME: Kranghung (Cam.); Siam rosewood, Trac (Viet. Cam.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: purple, with streaks, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: very heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: very durable, WORKING QUALITIES: moderately difficult,

USES: Furniture, Veneer, Musical instruments, Culture,

Carving, Tool handle, Novelties,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Thailand,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,

- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,

- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,

- Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: <350µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: aliform, - Banded: 1-3 cells, >3 cells,

RAYs - Width: 1-3 cells, - Numbers: 4-12/mm, >12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Vietnam		12		1.09	202.8		107.8
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Sonkeling      BOTANICAL NAME: Dalbergia latifolia Roxb. (Leguminosae)  
 LOCAL NAME: Angsana keling, Java-palisandre (In.); Sonobrits (Java); Bombay black wood (Ind.); Rosewood (Ind. Bur.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: yellow, purple, with streaks, - Odour:  
 - Grain: interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DUARABILITY: very durable, RESISTANCE TO TERMITES: moderately, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: difficult,

USES: Interior finish, Durable timber, Vehicle, Furniture, Veneer, Musical instruments,

Novelties,

GEOGRAPHIC DISTRIBUTION: Indonesia, India,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: <350µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse-in-aggregates, terminal, - Paratracheal p.: aliform, - Banded: 1-3 cells,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
		11.8		0.75	116.1	11.28	63.2
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane
				14.3			

TRADE NAME: Chingchan      BOTANICAL NAME: Dalbergia oliveri Gamble (Leguminosae)  
LOCAL NAME: Burma Tulipwood, Tamalan (Bur.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: distinct,  
- Grain: interlocked, - Texture: fine, - Weight: very heavy, - Shrinkage:

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: very durable, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: difficult,

USES: Interior finish, Vehicle, Furniture, Veneer, Sporting goods,

Agricultural implement wood, Packing boxes, Turnery wood, Carving, Tool handle, Bent wood, Fuel,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Thailand,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood semi-ring-porous, wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
- Vessel No.: <5/sq.mm, - Vessel element mean length: <350µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse-in-aggregates, - Paratracheal p.: confluent, - Banded: 1-3 cells, >3 cells,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa	Hardness N.	Shear parallel to grain MPa		Resistance to splitting N/cm			
		Side grain	End grain	R	T	R-Plane	T-plane

TRADE NAME: Xoay      BOTANICAL NAME: *Dialium cochinchinensis* Pierre (Leguminosae)  
 LOCAL NAME: Kralanh (Cam.); Kh Leng (Th.); Keranji (Br.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: purple, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: very heavy, - Shrinkage: very large,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: difficult,

USES: House building, Durable timber, Ship and boat manufacturing, Vehicle,

Agricultural implement wood, Tool handle, Oil press, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Thailand, Brunei,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,

- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,

- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,

- Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: <350um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse-in-aggregates, - Banded: 1-3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,

- Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered, idioblast,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Thailand		13		1.10	165.9	19.41	90.7
				23.0			

Stress at limit proportionality MPa	Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm	
	Side grain	end grain	R	T	R-Plane	T-plane



TRADE NAME: Keranji      BOTANICAL NAME: Dialium platysepalum Baker (Leguminosae)  
 LOCAL NAME: Keranji kuning besar(M.); Kerandji asap(In.); Yi thong bueng(Th.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: medium, - Weight: heavy, very heavy, - Shrinkage: small,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: durable, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Ship and boat manufacturing, Furniture, Veneer, Plywood,  
 Tool handle,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vessel pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: present, - Mean length: 900-1600um, - Wall thickness: thin to thick, very thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty, - Banded: 1-3 cells, >3 cells,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Malaysia	3	17.1	0.79	0.915	134	151	20.1	20.1	72.0	86.5
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa			Resistance to splitting N/cm			
		Side grain	end grain	R	T		R-Plane	T-plane		
		10640	11310		16.0	19.3		56	67	

TRADE NAME: Rarang      BOTANICAL NAME: Erythrina subumbrans Merr. (Leguminosae)  
 LOCAL NAME:

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight, - Texture: medium, - Weight: very light, - Shrinkage: small,

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES:

USES: Interior finish, Plywood,

Food containers, Battery separators, Buoys, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: <350um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: very thin,

AXIAL PARENCHYMA - Banded: >3 cells,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Sheath cells present,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa				
Philippines		12	0.23	0.307	40.6	37.2	4.608	4.0	16.3	15.1
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane		T-plane		
		1060	965	1600	1456	11.0	11.4			

TRADE NAME: Lim      BOTANICAL NAME: Erythrophloeum fordii Oliv. (Leguminosae)  
 LOCAL NAME: Lin, Lim xank (Viet.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: heavy, Very heavy, - Shrinkage: large,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: - Checking: - Deformation: slight risk of deformation,

NATURE DURABILITY: very durable, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture,  
 Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Vietnam, China,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, - Paratracheal p.: aliform, confluent,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Vietnam		12		0.950	152.1		87
Stress at limit proportionality MPa	Hardness N.	Shear parallel to grain MPa		Resistance to splitting N/cm			
		Side grain	end grain		R-Plane	T-plane	

TRADE NAME: Merbau      BOTANICAL NAME: Intsia palembanica Miq. (Leguminosae)  
 LOCAL NAME: Mirabow, Merbau darat, Ipil, Djumelai (In.); Salumpho (Th.); Kwila (N. G.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, with streaks, - Odour: indistinct,  
 - Grain: interlocked, - Texture: medium, - Weight: moderately heavy, heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: very strong, strong,

SEASONING - Air drying rates: slow, - Checking: - Deformation:

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Musical instruments,  
 Packing boxes, Carving, Tool handle, Novelties,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand, Malaysia, Philippines, Indonesia, Fiji,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: terminal, - Paratracheal p.: aliform, confluent,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa		MPa	
Malaysia	5	15.0	0.68	0.800	116	121	15.4	15.0	58.2	63.3
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain		Resistance to splitting		N/cm		
		Side grain	end grain	R	T	R-Plane	T-plane			
9:17	9.17	6679	6679	12.5	14.2	75	82			

TRADE NAME: Batete BOTANICAL NAME: Kingiodendron alternifolium Merr. et Rolfe (Leguminosae)

LOCAL NAME: Apiitan, magbalago, danggai, tabalangon (Ph.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
- Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage: large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: moderately, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
- Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: terminal, - Paratracheal p.: vasicentric, aliform, - Banded: 1-3 cells, >3 cells,

RAYs - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - Crystalliferous cells: ordinary, chambered,

MISCELLANEOUS: Axial intercellular canals in long tangential lines,

Axial intercellular canals in diffuse,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Manggis      BOTANICAL NAME: Koompassia excelsa Taubert (Leguminosae)  
 LOCAL NAME: Bengaris, Wehis, Menggeris (In.); Ginoo (Ph.); Kayu raja, Tapang (Sar.) Mengaris (Sab. Sar.); Tualang (M. In.); Yuan (Th.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: interlocked, wavy, - Texture: coarse, - Weight: heavy, - Shrinkage: very small,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Plywood,

Agricultural implement wood, Household appliance, Fuel,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Philippines, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vested pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: terminal, - Paratracheal p.: confluent, - Banded: >3 cells,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - Crystalliferous cells: ordinary, chambered,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

Included phloem concentric,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Philippines	1	12	0.70	0.864	146	134	18.1	16.8	76.2	70.4
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting		N/cm		
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane			
12.4	10.7	9410	8563	10400	9464	12.6	13.0			

TRADE NAME: Kempas      BOTANICAL NAME: *Koompassia malaccensis* Maing (Leguminosae)  
 LOCAL NAME: Empas (Sab.); Impas (Bor. In. Sab.); Mengeris, Pah, upil (In.); Thong, bueng (Th.)

HABIT OF TREE: large tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, with streaks, - Odour: indistinct,  
 - Grain: interlocked, - Texture: coarse, - Weight: heavy, very heavy, - Shrinkage: small,  
 STRENGTH CLASSES: very strong, strong,  
 SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,  
 NATURE DUARBILITY: moderately durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: moderately difficult,  
 USES: House building, Interior finish, Durable timber, Vehicle, Furniture,  
 Cooperage, Tool handle, Fuel,  
 GEOGRAPHIC DISTRIBUTION: Brunei, Malaysia, Indonesia,  
 GROWTH RINGS: moderately distinct, indistinct or absent;  
 VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,  
 FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: very thick,  
 AXIAL PARENCHYMA - Aporacheal p.: diffuse, terminal, - Paratracheal p.: aliform, confluent,  
 RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,  
 MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,  
 MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,  
 Included phloem concentric,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa				
malaysia	5	15.1	0.71	0.850	122	127	18.6	18.1	65.6	71.6
Stress at limit proportionality	MPa	Hardness N. Side grain	Hardness N. end grain		Shear parallel to grain MPa		Resistance to splitting N/cm			
					R	T	R-Plane		T-plane	
7.52	7.55	7610	7633			12.4	14.1	60		67

TRADE NAME: Thinwin      BOTANICAL NAME: *Milletia lencantha* Kurz (Leguminosae)  
 LOCAL NAME: Theng-weng (Bur); Sa-thon(Th.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct,   - Heartwood Color: purple, with streaks,   - Odour: indistinct,  
                               - Grain: straight to fairly interlocked,   - Texture: medium,   - Weight: very heavy,   - Shrinkage:

STRENGTH CLASSES: strong,

SEASONING - Air drying rates:   - Checking: slight risk of checking,   - Deformation:

NATURE DURABILITY: very durable,   WORKING QUALITIES: difficult,

USES: House building, Interior finish, Durable timber, Furniture, Veneer,  
 Agricultural implement wood, Household appliance, Novelties,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous,   - Arrangement: in diffuse,  
                               - Perforation plates: simple,   - Intervessel pits: alternate,   - Vested pits present,  
                               - Vessel-ray pitting: similar to intervessel pits,   - Mean T.D.: 100-200µm,  
                               - Vessel No.: <5/sq.mm,   - Vessel element mean length: <350µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits,   - Mean length: 900-1600µm,   - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: terminal,   - Paratracheal p.: scanty, aliform,   - Banded: >3 cells,

RAYS - Width: commonly 4-10 seriate,   - Numbers: 4-12/mm,   - Ray tissues: homogeneous multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells,   - Crystalliferous cells: chambered,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa	Hardness N.	Shear parallel to grain MPa		Resistance to splitting N/cm			
		Side grain	end grain	R	T	R-Plane	T-plane



TRADE NAME: Petai BOTANICAL NAME: Parkia singularis Miq. (Leguminosae)

LOCAL NAME: Petai meranti (M.); Kupang (Sab.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: coarse, - Weight: moderately heavy, - Shrinkage: very small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: easy,

USES: Interior finish, Plywood,

Packing boxes, Disposable chopsticks etc.,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: <350µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: terminal, - Paratracheal p.: aliform, confluent,

RAYS - interconnected (fused) rays, - Width: commonly 4-10 seriate, - Numbers: 4-12/mm,

- Ray tissues: homogeneous multiseriate, homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Malaysia		15		0.70	55	57.3	10.7	10.4	30.8	33.5
Stress at limit proportionality			Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm			
	MPa		Side grain	end grain	R	T	R-Plane		T-plane	
					7.4	8.4				

TRADE NAME: Jemerelang BOTANICAL NAME: Peltophorum dasyrachis Kurz ex Baker (Leguminosae)  
 LOCAL NAME: Hoang Linh (Viet. Cam.); Cha kham, Nontri (Th.); Treas (Cam.); Trasec (Cam. Viet)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, with streaks, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: light, moderately heavy, - Shrinkage: very small,

STRENGTH CLASSES: medium, weak,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: RESISTANCE TO TERMITES: no, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Veneer, Plywood,  
 Packing boxes, Turnery wood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Cambodia, Thailand, Malaysia, Indonesia,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vessels with pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, - Paratracheal p.: aliform, confluent,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa	
			Basic density	Air-dry density				
Thailand		16		0.82	106.1	10.29	39.6	
	Stress at limit proportionality MPa		Hardness N. Side grain	end grain	Shear parallel to grain MPa R	T	Resistance to splitting N/cm R-plane	T-plane
					6.6	15.5		

TRADE NAME: Kungkur BOTANICAL NAME: Pithecellobium splendens (Miq.) Corner (Leguminosae)

LOCAL NAME:

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
- Grain: straight to fairly interlocked, - Texture: coarse, - Weight: moderately heavy, - Shrinkage: very small,

STRENGTH CLASSES: medium, weak,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: moderately, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Veneer, Plywood,

Carving,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
- Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: vasicentric, aliform, confluent,

RAYs - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	R	T	R-Plane	T-plane		
Malaysia		15	0.75		89	92.7	10.7	10.4	44.1	47.9
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
6.62	7.4	Side grain	end grain	R	T	R-Plane		T-plane		
				12.8	14.5					

TRADE NAME: Amboyna      BOTANICAL NAME: Pterocarpus indicus Willd. (Leguminosae)  
 LOCAL NAME: Angsana (Sar.); Padauk (Bur.); Narra (Ph.); N. G. rosewood, Padauk (P. N.); Sena (M.); Pradoo (Th.); Linggoa, sandana, Oele, Tjempaga, Sonokembang (In  
 .)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: brown, red, with streaks, - Odour: distinct,  
 - Grain: oblique, straight to fairly interlocked, - Texture: medium, - Weight: moderately heavy, - Shrinkage: very small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately slow, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: very durable, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: easy,

USES: Interior finish, Ship and boat manufacturing, Vehicle, Furniture,  
 Turnery wood, Novelties,

GEOGRAPHIC DISTRIBUTION: Burma, Malaysia, Philippines, Indonesia, India,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood semi-ring-porous, wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vested pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: <350µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: terminal; - Paratracheal p.: scanty, aliform, confluent, - Banded: 1-3 cells, >3 cells,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, >12/mm, - Ray tissues: homogeneous uniseriate, homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Philippines	8	12	0.52	0.614	93.4	85.6	11.7	10.9	53.8	49.7
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane			
9.76	8.44	4530	4122	5550	5051	10.9	11.3			

TRADE NAME: burma padau BOTANICAL NAME: Pterocarpus macrocarpus Kurz (Leguminosae)  
 LOCAL NAME: Pradoo, Pradu, mai Pradoo (Th.); May-dou (L.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: medium, - Weight: heavy, - Shrinkage:

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: very durable, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: difficult,

USES: Interior finish, Durable timber, Vehicle, Furniture, Veneer, Musical instruments,

Agricultural implement wood, Carving, Tool handle, Novelties, Oil press,

GEOGRAPHIC DISTRIBUTION: Laos, Burma, Thailand,

GROWTH RINGS: distinct, moderately distinct,

VESSELS/PORES - Porosity: wood semi-ring-porous, wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: <350µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: terminal, - Paratracheal p.: aliform, confluent, - Banded: 1-3 cells, >3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: 4-12/mm, >12/mm, - Ray tissues: homogeneous uniseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength	Modulus of	Maximum crushing strength
			Basic density	Air-dry density	MPa	elasticity GPa	MPa
Thailand		11	0.83		128.4	12.45	63.8
	Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear parallel to grain MPa R   T		Resistance to splitting N/cm R-Plane   T-plane
					15.9   21.9		

TRADE NAME: Raintree      BOTANICAL NAME: Samanea samana (Jacq.) Merr. (Leguminosae)  
 LOCAL NAME: Kampoo (Th.); Kihudjau, Trembesi (In.); Monkepod Tree (Ph.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: brown, with streaks, - Odour: indistinct,  
 - Grain: oblique, - Texture: fine, - Weight: light, - Shrinkage: very small,

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,

USES: Interior finish, Furniture, Plywood,  
 Carving,

GEOGRAPHIC DISTRIBUTION: Philippines, Indonesia, China,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: <350µm,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: vasicentric, aliform, confluent,

RAYS - Width: 1-3 cells; commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: homogeneous multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Philippines	6	12	0.48	0.557	57.5	52.7	5.47	5.07	32.7	30.2
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane	N/cm		
8.24	7.13	5030	4577	5200	4732	10.3	10.7			

TRADE NAME: Sepetir BOTANICAL NAME: Sindora beccariana Baill. (Leguminosae)

LOCAL NAME: Sampit, separantu, sindur (In.); Sepetir, berduri (Br.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: yellow, - Odour: distinct,

- Grain: straight, - Texture: fine, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Ship and boat manufacturing, Vehicle, Furniture, Plywood, Sporting goods,

Packing boxes, Novelties,

GEOGRAPHIC DISTRIBUTION: Brunei, Malaysia, Indonesia,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,

- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,

- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,

- Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, terminal, - Paratracheal p.: vasicentric,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

MISCELLANEOUS: Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear parallel to grain MPa R   T		Resistance to splitting N/cm R-Plane   T-plane	

TRADE NAME: Sindoer     BOTANICAL NAME: *Sindora cochinchinensis* Baill. (Leguminosae)  
 LOCAL NAME: Go, Gomat, Gu (Viet.); Krakas, Krakas sbek, Krakas meng (Cam.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: purple, with streaks, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: small, comparatively large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: slow, - Checking: - Deformation:

NATURE DURABILITY: durable,     WORKING QUALITIES: difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Sporting goods,  
 Novelties,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Thailand,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: <350µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse, terminal, - Paratracheal p.: scanty, vasicentric, aliform,

RAYs - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

MISCELLANEOUS: Axial intercellular canals in long tangential lines,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Vietnam		12		0.88	123.5		69.0
Stress at limit proportionality		Hardness N. Side grain	Shear parallel to grain		Resistance to splitting	N/cm	
MPa	end grain		R	T		R-Plane	T-plane



TRADE NAME: Pyinkado      BOTANICAL NAME: Xylia xylocarpa (Roxb.) Taub. (Leguminosae)  
 LOCAL NAME: Cam xe (Cam. Th. Viet.); Sokram (Cam.); Deng (Th.) Irul (Ind.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, with streaks, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: very heavy, - Shrinkage: very large,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: very slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DUARABILITY: very durable, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: very difficult,

USES: Durable timber, Ship and boat manufacturing, Vehicle,

Agricultural implement wood, Bent wood,

GEOGRAPHIC DISTRIBUTION: Laos, Cambodia, Burma, Thailand, China, India,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aporotracheal p.: diffuse, terminal, - Paratracheal p.: vasicentric, aliform, confluent,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, >12/mm, - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Vietnam		12		1.14	134.6		76.3
Stress at limit proportionality MPa	Hardness N.	Shear parallel to grain MPa		Resistance to splitting N/cm			
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Burma yellow heart      BOTANICAL NAME: *Fagraea fragrans* Roxb. (Loganiaceae)  
 LOCAL NAME: Anan (Bur.); Tatrau (Cam.); Kan krao (Th.); Trai (Viet. Cam.); Tam sao (Viet.); Tembusu padang (M.); Temasuk (Sab.); Tembesu talang (In.); Urung (Ph.)

HABIT OF TREE: large tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: distinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: very small,  
 STRENGTH CLASSES: strong, medium,  
 SEASONING - Air drying rates: very slow, - Checking: slight risk of checking, - Deformation:  
 NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately easy,  
 USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Culture,  
 Household appliance, Carving,  
 GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Burma, Thailand, Malaysia, Indonesia,  
 GROWTH RINGS: indistinct or absent,  
 VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,  
 FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: very thick,  
 AXIAL PARENCHYMA - Aportracheal p.: diffuse, - Banded: 1-3 cells, >3 cells,  
 RAYS - Width: exclusively uniseriate, - Numbers: >12/mm, - Ray tissues: heterogeneous uniseriate,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	R	T	R-Plane	T-plane		
Malaysia	2	17.2	0.72	0.865	95	107	14.0	14.1	52.0	62.7
			Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm			
			Side grain	end grain	R	T	R-Plane		T-plane	
			6540	6972			37		40	

TRADE NAME: Leza byu BOTANICAL NAME: Lagerstroemia calyculata Kurz. (Lythraceae)

LOCAL NAME: Tabaek, Intanin, Bang lang (Th.); Pyimma-hpyoo (Bur.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, - Odour: indistinct,  
- Grain: straight, oblique, - Texture: fine, - Weight: heavy, - Shrinkage:

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: high risk of checking, - Deformation: high risk of deformation,

NATURE DURABILITY: non-durable, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Furniture,

Agricultural implement wood, Tool handle, Gunstocks,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
- Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: terminal, - Paratracheal p.: scanty, - Banded: 1-3 cells, >3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: >12/mm, - Ray tissues: homogeneous uniseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Thailand		14		0.72	114.5	11.08	50.0
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane
				18	19.6		

TRADE NAME: Bungor      BOTANICAL NAME: Lagerstroemia speciosa Pers. (Lythraceae)  
 LOCAL NAME: Pyinma (Bur.); Intanin, Tabeck (Th.); Banglang (Viet.); Banaba (Ph.); Bungur (In.); Jarul (Ind. Ba.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, medium, - Weight: moderately heavy, - Shrinkage: very large,

STRENGTH CLASSES: strong, medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: easy,

USES: House building, Interior finish, Ship and boat manufacturing, Veneer, Plywood,  
 Agricultural implement wood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Burma, Thailand, Philippines, Indonesia, China,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood semi-ring-porous, wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: terminal, - Paratracheal p.: confluent, - Banded: 1-3 cells, >3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm, >12/mm,  
 - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa		MPa	
Philippines	2	12	0.53	0.671	96.6	88.6	10.6	9.83	50.0	46.2
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane	T-plane			
9.34	8.08	6300	5733	7290	6634	10.7	11.1			

TRADE NAME: Chempaka      BOTANICAL NAME: Aromadendron elegans Bl. (Magnoliaceae)  
 LOCAL NAME: Chempaka hutan (M.); Djalaprang, Maleoewei, Malaban, Utep, Utap-utap (In.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, green, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: moderately heavy, - Shrinkage: very small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately fast, - Checking: - Deformation:

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Veneer, Plywood, Culture,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Indonesia,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: scalariform, - Intervessel pits: scalariform,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800um,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: terminal,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa				
Indonesia		14	0.791		70.9	70.9	10.59	10.13	39.6	40.89
Stress at limit proportionality		Hardness N.		Shear paralel to grain				Resistance to splitting		
MPa		Side grain	end grain	R	T			R-Plane	T-plane	
				3.6	4.0	3.97	4.41			

TRADE NAME: Wau beech      BOTANICAL NAME: Elmerrillia papuana Dandy (Magnoliaceae)  
 LOCAL NAME:

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: light, - Shrinkage:

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,

USES: Interior finish, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Plywood, Culture,  
 Packing boxes, Turnery wood,

GEOGRAPHIC DISTRIBUTION: Papua New Guinea,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: scalariform, - Intervessel pits: opposite-scalariform, scalariform,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: terminal,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II,

MISCELLANEOUS: Oil and/or mucilage cells associated with ray parenchyma, Oil and/or mucilage cells associated with axial parenchyma,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
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Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear paralel to grain MPa R   T		Resistance to splitting N/cm R-Plane   T-plane	
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TRADE NAME: Mo-vang-tam      BOTANICAL NAME: Manglietia fordiana (Hemsl.) Oliv. (Magnoliaceae)

LOCAL NAME: Vang-tam (Viet.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: yellow, green, - Odour: indistinct,  
- Grain: straight, - Texture: very fine, - Weight: light, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: moderately, WORKING QUALITIES: easy,

USES: Interior finish, Furniture, Plywood,

Packing boxes, Carving, Pencils,

GEOGRAPHIC DISTRIBUTION: Vietnam, China,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: scalariform, - Intervessel pits: opposite-scalariform, scalariform,  
- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 50-100µm,  
- Vessel No.: 20-40/sq.mm, - Vessel element mean length: >800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: present, - Mean length: >1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: terminal,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II, heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Vietnam		12		0.45	81.2		47.7
Stress at limit proportionality MPa		Hardness N.	Shear parallel to grain MPa		Resistance to splitting N/cm		
			Side grain	end grain		R	T

TRADE NAME: Chempaka      BOTANICAL NAME: *Michelia champaca* L. (Magnoliaceae)  
 LOCAL NAME: Champa (Th.); Su (Viet.); Chempaka merch (M.); Champaka (Ph. M.); Sagah, safan (Bur.); Tjempaka (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: light, moderately heavy, - Shrinkage: very small,

STRENGTH CLASSES: medium, weak,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Veneer, Plywood,

Packing boxes, Battery separators,

GEOGRAPHIC DISTRIBUTION: Vietnam, Burma, Thailand, China, India, Nepal,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: scalariform, - Intervessel pits: opposite-scalariform, scalariform,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: terminal, - Banded: 1-3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II, heterogeneous type III,

MISCELLANEOUS: Oil and/or mucilage cells associated with ray parenchyma,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Indonesia		14.1		0.699	70.6	70.9	8.333	7.98	42.6	44.2
	Stress at limit proportionality		Hardness N.		Shear paralel to grain				Resistance to splitting	
	MPa		Side grain   end grain		R	T			R-Plane	T-plane
					10.6	11.6	11.7	12.8		



TRADE NAME: Gioi      BOTANICAL NAME: Talauma gioi A. Chev. (Magnoliaceae)

LOCAL NAME: Champak (Bur.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: yellow, - Odour: distinct,

- Grain: straight, - Texture: fine, - Weight: moderately heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately slow, - Checking: - Deformation:

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: easy,

USES: House building, Interior finish, Ship and boat manufacturing, Furniture, Plywood,

Packing boxes, Carving,

GEOGRAPHIC DISTRIBUTION: Vietnam, Burma,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,

- Perforation plates: scalariform, - Intervessel pits: opposite-scalariform, scalariform,

- Vessel-ray pitting: large, rounded, large, gash-like, - Vessel with helical thickenings, - Mean T.D.: 100-200µm,

- Vessel No.: 5-20/sq.mm, 20-40/sq.mm, - Vessel element mean length: 350-800µm, >800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: terminal,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II, heterogeneous type III,

MISCELLANEOUS: Oil and/or mucilage cells associated with ray parenchyma,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Vietnam		12		0.58	105.5		59.3
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Jongkong BOTANICAL NAME: Dactylocladus stenostachys Olive. (Melastomataceae)

LOCAL NAME: Medang jongkong, Merebong(Sar.); Medang tabak(Sab.); Sampinur(In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,

- Grain: straight to fairly interlocked, - Texture: - Weight: light, moderately heavy, - Shrinkage: small, comparatively large,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Plywood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,

- Perforation plates: - Intervessel pits: alternate, - Vestured pits present,

- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.:

- Vessel No.: - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, - Paratracheal p.: scanty, aliform, confluent,

RAYS - Width: exclusively uniseriate, - Numbers: >12/mm, - Ray tissues: heterogeneous uniseriate,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa		MPa	
Malaysia		15		0.633	72.5	75.5	11.2	10.9	38.3	41.6
	Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting		N/cm	
	MPa		Side grain	end grain	R	T	R-Plane	T-plane		
					9.3	10.6				

TRADE NAME: Nipis kulit      BOTANICAL NAME: Memecylon pubescens King. (Melastomataceae)

LOCAL NAME: Delek tembaga (P. M.)

HABIT OF TREE: small tree, medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, - Odour: indistinct,  
- Grain: interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: small, comparatively large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: difficult,

USES: Ship and boat manufacturing,

Tool handle, Fuel,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
- Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: <900um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, - Paratracheal p.: vasicentric, aliform, confluent,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: >12/mm, - Ray tissues: heterogeneous type I, heterogeneous type II,

MISCELLANEOUS:

Included phloem diffuse,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa	
			Basic density	Air-dry density				
Malaysia	3	15.8	0.77	0.945			67.0	75.8
Stress at limit proportionality	MPa	Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm		
		Side grain	end grain	R	T	R-Plane	T-plane	
10.90	11.29	8770	8980	11.8	13.8			

TRADE NAME: Goi tia BOTANICAL NAME: *Aglaia gigantea* Pellegin. (Meliaceae)

LOCAL NAME: Beng kheoa (Cam.)

HABIT OF TREE: Large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: House building, Interior finish, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Plywood,  
 Gunstocks,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Burma, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse, - Paratracheal p.: scanty, vasicentric, aliform,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Vietnam		12		0.56	80.8		54.9
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Tasua . BOTANICAL NAME: Amoora cucullata Roxb. (Meliaceae)  
 LOCAL NAME: Amoora (Pak., P. N., In.); Goi (Viet.); Thit nee (Bur.); Keramu, Jambangan (Br.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: medium, - Weight: light, moderately heavy, - Shrinkage:

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Plywood,  
 Wood mould, Turnery wood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Burma, Thailand, Brunei, Indonesia, Papua New Guinea,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Septate fibres: common, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporotracheal p.: diffuse, - Paratracheal p.: scanty, vasicentric, aliform, - Banded: 1-3 cells,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Papua New Guinea		15	0.4	0.53	74.9	9.441	
Stress at limit proportionality	MPa	Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Kangko      BOTANICAL NAME: Aphanamixis perrotteiana A. Juss. (Meliaceae)  
 LOCAL NAME:

HABIT OF TREE: small tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: WORKING QUALITIES: easy,

USES: House building, Interior finish, Vehicle, Furniture, Veneer, Plywood,  
 Agricultural implement wood,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty, vasicentric, - Banded: 1-3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm, >12/mm,  
 - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Silica: present in ray cells, present in axial parenchma cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

TRADE NAME: Sentang BOTANICAL NAME: Azadirachta excelsa (Jack.) Jacobs.(Meliaceae)  
 LOCAL NAME: Limpaga (Sab.); Rang-gu (Sar.); Maranggo, Bird's-eye-kalantas (Ph.); Kaju bewang, Surian bawang (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, heavy, - Shrinkage: small, comparatively large,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Veneer, Plywood, Musical instruments,  
 Packing boxes,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, terminal, - Paratracheal p.: scanty,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No.of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Malaysia		15		0.8			
	Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear paralel to grain MPa R   T		Resistance to splitting N/cm R-Plane   T-plane

TRADE NAME: Pussur wood      BOTANICAL NAME: *Carapa moluccensis* Lamk. (Meliaceae)  
 LOCAL NAME: Indian crabwood, Poshur, dhundul (Ind.); Kyana, Kyathan, Pinle-on, Peng-lay-oang (Bur.); Piagau (Ph.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES: - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, with streaks, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: heavy, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: easy,

USES: House building, Ship and boat manufacturing, Vehicle, Furniture,  
 Wood mould, Tool handle, Novelties,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand, Philippines, Indonesia, Bangladesh, India,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 50-100um, 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: terminal, - Paratracheal p.: scanty, vasicentric,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			



TRADE NAME: Central American Cedar      BOTANICAL NAME: Cedrela odorata L. (Meliaceae)  
 LOCAL NAME: Cigarbox cedar, South American cedar, West Indian cedar; Spanish cedar (Ph.); Cederwood (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: distinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: light, - Shrinkage: comparatively large,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: moderately, WORKING QUALITIES: easy,

USES: House building, Interior finish, Ship and boat manufacturing, Furniture, Veneer, Plywood, Musical instruments,  
 Packing boxes,

GEOGRAPHIC DISTRIBUTION: Philippines, Indonesia,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: present, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, terminal, - Paratracheal p.: vasicentric,

RAYs - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, Druses or sand crystals present, in axial parenchyma cells, in ray cells,  
 - crystalliferous cells: ordinary, chambered, idioblast,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Philippines	1	12	0.37	0.523	63.6	63.6	6.91	5.95	29.8	27.5
Stress at limit proportionality	MPa	Hardness N.				Shear parallel to grain		Resistance to splitting		
		Side grain	end grain			R	T	R-Plane	T-plane	N/cm
4.01	3.47	1940	1765	2740	2493	6.54	6.76			

TRADE NAME: Katong-Matsin      BOTANICAL NAME: Chisocheten pentandrus (Blanco) Merr. (Meliaceae)  
 LOCAL NAME: Katong-maching(Ph.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage: large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Furniture, Veneer, Plywood,  
 Turnery wood,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse, - Paratracheal p.: scanty, aliform, - Banded: 1-3 cells, >3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength		
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa	
Philippines	1	12	0.52	0.648	94.0	86.2	10.5	9.74	48.1	44.4	
Stress at limit proportionality	MPa	Hardness N.				Shear parallel to grain		Resistance to splitting			
		Side grain	end grain	R	T	MPa	MPa	N/cm R-Plane	N/cm T-plane		
8.41	7.27	4790	4359	6070	5524	7.39	7.64				

TRADE NAME: Chittagong wood      BOTANICAL NAME: Chukrasia tabularis A. Juss. (Meliaceae)  
 LOCAL NAME: Surian Batu, Cherana puteh, Repoh, Suntang, Suntang puteh(M.); Lat hoa(Viet); Yeng-ma, taw-yengma, Yinma(Bur.); Yom him(Th.); Chickrassy(Ind. Bur. Ba.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: brown, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage: very small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: fast, - Checking: slight risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Musical instruments,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Burma, Thailand, Malaysia, Parkistan, India,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: present, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, terminal, - Paratracheal p.: scanty, vasicentric,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	MPa	MPa		
Malaysia	1	15.9	0.75	0.880	94	101	14.3	14.1	56.1	63.7
Stress at limit proportionality		Hardness N.		Shear paralel to grain		Resistance to splitting		N/cm		
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane			
11.2	11.7	8990	9233	15.3	17.8	60	71			

TRADE NAME: Miao      BOTANICAL NAME: Dysoxylum euphlebium Merr (Meliaceae)  
 LOCAL NAME:

HABIT OF TREE: small tree, medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: moderately heavy, heavy, - Shrinkage: small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately easy,

USES: House building, Durable timber, Ship and boat manufacturing, Vehicle, Furniture,

Agricultural implement wood, Turnery wood, Carving,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: indistinct or absent,

VESELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm,

- Ray tissues: homogeneous uniseriate and multiseriate, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered, - Silica: present in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Philippines	2	12	0.60	0.784	110	101	15.7	14.6	58.2	53.8
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane	T-plane			
10.9	9.43	5950	5415	5990	5451	12.1	12.5			

TRADE NAME: Persian Lilac      BOTANICAL NAME: Melia azedarach L. (Meliaceae)  
 LOCAL NAME: China berry tree (USA.); Mindi (Sab.); Tamaga, Tha-ma-kha (Bur.); Xondi (In.); Paraiso(Ph.); Xoan (Viêt)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: straight, oblique, - Texture: medium, - Weight: light, - Shrinkage: small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Plywood, Sporting goods,

Packing boxes, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Burma, Thailand, Malaysia, Indonesia, China, Parkistan, India,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood ring-porous, wood semi-ring-porous, - Arrangement: in tangential, in diffuse,  
 - Vessel grouping: clusters common, - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Vessel with helical thickenings, - Mean T.D.:  
 - Vessel No.: - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: present, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse, terminal, - Paratracheal p.: scanty, vasicentric,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: homogeneous multiseriate, homogeneous uniseriate and multiseriate, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Indonesia		37.5			45.1	7.451	21.3
Stress at limit proportionality	MPa	Hardness N.		Shear paralel to grain		Resistance to splitting	
		Side grain	end grain	R	T	R-Plane	T-plane
				2.4	4.3		

TRADE NAME: Sentul      BOTANICAL NAME: Sandoricum koetjape (Burm. f.) Merr. (Meliaceae)  
LOCAL NAME: Kra-thon(Th.); Thitto (Bur.); Klampu (Sar.); Katon (Bur, Th. In.); Sau-dau (Viet.); Kompeng reach (Cam.); Ketjapi (In.); Santol (Ph.)

HABIT OF TREE: large tree,  
PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
- Grain: straight to fairly interlocked, - Texture: - Weight: light, moderately heavy, - Shrinkage: large,  
STRENGTH CLASSES: medium, weak,  
SEASONING - Air drying rates: - Checking: no risk of checking, - Deformation: no risk of deformation,  
NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,  
USES: House building, Interior finish, Furniture, Veneer, Plywood,  
Agricultural implement wood, Household appliance, Turnery wood, Carving,  
GEOGRAPHIC DISTRIBUTION: Vietnam, Burma, Thailand, Malaysia, Philippines, Indonesia, India,  
GROWTH RINGS: indistinct or absent,  
VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
- Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um,  
FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick,  
AXIAL PARENCHYMA - Paratracheal p.: aliform, confluent,  
RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,  
- Ray tissues: heterogeneous type II, heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			



TRADE NAME: Yom hom      BOTANICAL NAME: *Toona ciliata* Roem (Meliaceae)  
 LOCAL NAME: Red cedar (      ); Limpaga (M.); Suren, Suren Sabrang, surian biasa, Mapala, Koemea (In.); Chomcha (Cam.); Tuni (Nep.); Toon (Ind.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, - Odour: distinct,  
 - Grain: straight, - Texture: coarse, - Weight: very light; light, - Shrinkage: small,

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: Interior finish, Ship and boat manufacturing, Furniture, Veneer, Plywood, Musical instruments,

Wood mould, Household appliance, Turnery wood, Carving,

GEOGRAPHIC DISTRIBUTION: Burma, Malaysia, Indonesia, China, India, Nepal,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood semi-ring-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: present, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse, terminal, - Paratracheal p.: scanty, vasicentric,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Malaysia		95	0.28	0.33	29	43	6.600	5.700	14.6	23.2
	Stress at limit proportionality MPa		Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm			
			Side grain	end grain	R	T	R-Plane		T-plane	
					4.4	6.4				



TRADE NAME: Terap      BOTANICAL NAME: Artocarpus elasticus Reinw (Moraceae)  
 LOCAL NAME: Malagumihan (Ph.); Koemboe, Kumut, Teo mongkoeni, Teureup, Tipoeloe (In.); Terap Ikal (Br.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, medium, - Weight: light, - Shrinkage: small,

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: easy,

USES: Interior finish, Furniture, Veneer, Plywood,

Household appliance, Turnery wood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,

- Perforation plates: simple, - Intervessel pits: alternate,

- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,

- Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: present, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: aliform, confluent,

RAYS - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, - Sheath cells present, - Latex or tanniferous tubes present,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Indonesia		12.6		0.490	48.82	50.2	8.53	7.41	27.84	26.6
Stress at limit proportionality	MPa	Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane	T-plane			
				4.9	5.29	5.2	5.6			

TRADE NAME: Ainee      BOTANICAL NAME: Artocarpus hirsutus Lamk. (Moraceae)  
 LOCAL NAME: Mit nai (Viet); Khnor prey (Cam.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, medium, - Weight: moderately heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DUARBILITY: very durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: good, low, WORKING QUALITIES: easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Plywood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, India,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Septate fibres: present, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: aliform, confluent, - Banded: >3 cells,

RAYS - interconnected (fused) rays, - Width: commonly 4-10 seriate, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type II, - Sheath cells present,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	R	T	R-Plane	T-plane		
India		12.9		0.695	91.47	87.3	11.67	11.0	56.67	55.1

TRADE NAME: Keledang BOTANICAL NAME: Artocarpus lakoocha Roxb. (Moraceae)  
 LOCAL NAME: Chaplash (Bur.); Manao, Mahat (Th.); Mit-nai (Viet.); Lokooch (M.); Lakuch (Ind.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage:

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: moderately, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately easy,

USES: House building, Ship and boat manufacturing, Furniture,  
 Packing boxes,

GEOGRAPHIC DISTRIBUTION: Vietnam, Burma, Thailand, Malaysia, India,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Septate fibres: present, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: aliform, confluent,

RAYS - Width: commonly 4-10 seriate, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II, - Sheath cells present,

#### TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa	
			Basic density	Air-dry density				
Stress at limit proportionality MPa			Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm	
			Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Ara BOTANICAL NAME: Ficus variegata Bl. (Moraceae)  
 LOCAL NAME: Arah, Kayu ara (Sab.); Tangisang Bayauak (Ph.); Fig (P. N.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, yellow, - Odour: indistinct,  
 - Grain: straight, - Texture: medium, - Weight: light, - Shrinkage:

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: moderately easy,

USES: Plywood,

Packing boxes, Household appliance, Buoys,

GEOGRAPHIC DISTRIBUTION:

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty, vasicentric, - Banded: >3 cells,

RAYS - interconnected (fused) rays, - Width: commonly 4-10 seriate, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type I, heterogeneous type II, - Sheath cells present, - Latex or tanniferous tubes present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

TRADE NAME: Ara berteh      BOTANICAL NAME: Parartocarpus venenosus Becc (Moraceae)  
 LOCAL NAME: Terap (M.); Terap hutan (Sab.); Ara berteh paya (P. M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, yellow, - Odour: indistinct,  
 - Grain: straight, oblique, - Texture: medium, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: moderately easy,

USES: Plywood,

Packing boxes, Household appliance,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia, Papua New Guinea,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: aliform, confluent,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate and multiseriate, - Latex or tanniferous tubes present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	MPa	MPa	MPa	MPa
Malaysia	3	17.0	0.47	0.595	68	76	12.0	12.0	34.8	41.6
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane		T-plane		
3.17	3.46	3290	3487	9.2	11.1	46		50		

TRADE NAME: Tempinis      BOTANICAL NAME: Streblus elongatus (Miq.) Cornor (Moraceae)  
 LOCAL NAME:

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: very heavy, - Shrinkage: very small,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: moderately fast, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DUARABILITY: very duarble, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: <350um, - Tyloses: present, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: present, - Mean length: 900-1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Paratracheal p.: aliform, confluent,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa	
			Basic density	Air-dry density				
Malaysia	3	13.7	0.81	0.975			89.6	91.1
Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear paralel to grain MPa R   T		Resistance to splitting N/cm <sup>2</sup> R-Plane   T-plane		
15.45	14.55	12500	12013	18.7	20.5			

TRADE NAME: Ampupu BOTANICAL NAME: Eucalyptus alba Reinw ex Blume (Myrtaceae)  
 LOCAL NAME: Gum (P. N.); Poplar gum (Aust.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: comparatively large, large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: very durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Sporting goods,

Agricultural implement wood, Turnery wood, Carving, Tool handle,

GEOGRAPHIC DISTRIBUTION: Indonesia, Papua New Guinea,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: alternate, - Vesselled pits present,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm, >12/mm,

- Ray tissues: homogeneous uniseriate and multiseriate,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa		MPa	
Indonesia		61.3	0.63	0.769	78.6	113.6	10.69	15.13	53.9	62.6
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain		Resistance to splitting				
		Side grain	End grain	R	T	R-Plane		T-plane		
				5.8	6.3	14.1				

TRADE NAME: Leda      BOTANICAL NAME: Eucalyptus deglupta Bl. (Myrtaceae)  
 LOCAL NAME: Bagras, Banikag (Ph.); Eucalyptus (M.); Mindanao gum (Aust.); Komo, Kamarere (P. N.); Deglupta (Fi.)

HABIT OF TREE: large tree;

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: light, moderately heavy, - Shrinkage: large,

STRENGTH-CLASSES: medium, weak,

SEASONING - Air drying rates: - Checking: - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: easy,

USES: House building, Interior finish, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Plywood, Wood based panel,

Agricultural implement wood, Packing boxes, Wood mould, Cooperage, Turnery wood, Tool handle, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia, Papua New Guinea, Fiji,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,

- Perforation plates: simple, - Intervessel pits: alternate, - Vested pits present,

- Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200µm,

- Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present;

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, vasicentric,

RAYs - Width: 1-3 cells, - Numbers: >12/mm, - Ray tissues: homogeneous uniseriate, homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - Crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Malaysia	1	98	0.40	0.465	50	67	7.5	8.9	24.7	36.7
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting		N/cm		
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane			
2.87	2.9	2710		7.3	9.0		49	48		



TRADE NAME: Kelat BOTANICAL NAME: Eugenia polyantha Wight (Myrtaceae)

LOCAL NAME: Obah (Sab.); Ubah (Sar.); Salam (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
- Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage:

STRENGTH CLASSES: medium, weak,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation:

NATURAL DURABILITY: moderately durable, WORKING QUALITIES: easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle,  
Agricultural implement wood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
- Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse, - Paratracheal p.: aliform, confluent,

RAYs - interconnected (fused) rays, - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: >12/mm,  
- Ray tissues: heterogeneous type II,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Indonesia		14.2		0.768	94.4	95.2	11.37	10.91	42.0	43.8
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain				Resistance to splitting		
		Side grain	end grain	R	T	T	R-Plane	T-plane		
				5.7	6.5	6.3	7.2			

TRADE NAME: Gelam      BOTANICAL NAME: Melaleuca leucadendron L. (Myrtaceae)  
 LOCAL NAME: Broad-Leaved-Tea-tree (P.N); Kayu puteh (In.); Niaouli(N.C.); Brown tra-tree, Paper bark(Aust.); Cajeput(U. S.); Smach chanlus(Cam.); Tea tree(P. N.);  
 Tram (Viet.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: oblique, - Texture: very fine, - Weight: moderately heavy, heavy, - Shrinkage: small,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, WORKING QUALITIES: moderately difficult,

USES: House building, Durable timber, Furniture,

Food containers,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Burma, Malaysia, Indonesia, Papua New Guinea, China,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: alternate, - Vested pits present,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, 20-40/sq.mm, - Vessel element mean length: 350-800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aportracheal p.: diffuse, - Paratracheal p.: scanty, vasicentric, - Banded: 1-3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: >12/mm, - Ray tissues: heterogeneous uniseriate, heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees   tested	Moisture   content %	Density g/cm <sup>3</sup>		Bending strength   MPa	Modulus of   elasticity GPa	Maximum crushing strength   MPa
			Basic density	Air-dry density			
China		15	0.64				
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain		Resistance to splitting	
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Lara BOTANICAL NAME: *Metrosideros Petiolata* K. et V. (Myrtaceae)

LOCAL NAME: Kaju Lara (In.)

- HABIT OF TREE: large tree,
- PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: purple, - Odour: indistinct,
  - Grain: interlocked, - Texture: very fine, - Weight: very heavy, - Shrinkage:
- STRENGTH CLASSES: very strong,
- SEASONING - Air drying rates: - Checking: - Deformation:
- NATURE DURABILITY: very durable, WORKING QUALITIES: difficult,
- USES: House building, Durable timber, Ship and boat manufacturing, Bedding wood material,
- GEOGRAPHIC DISTRIBUTION: Indonesia,
- GROWTH RINGS: indistinct or absent,
- VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,
  - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: alternate, extremely rare or absent, - Vested pits present,
  - Vessel-ray pitting: large, rounded, large, gash-like, - Vessel with helical thickenings, - Mean T.D.: 100-200µm,
  - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present, Gums and other deposits,
- FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: very thick,
- TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, - Banded: 1-3 cells,
- RAYS - Width: exclusively uniseriate, 1-3 cells, - Numbers: 4-12/mm, >12/mm, - Ray tissues: heterogeneous uniseriate, heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Indonesia		16.9		1.355	138.1	154.8	17.06	17.04	79.22	94.3
	Stress at limit proportionality MPa		Hardness N. Side grain	end grain	Shear paralel to grain MPa		Resistance to splitting N/cm			
					R	T	R-Plane	T-plane		
				11.96	12.65	14.4	15.2			

TRADE NAME: Pelawan . BOTANICAL NAME: *Tristania conferta* R.Br. (Myrtaceae)  
 LOCAL NAME: Selunsur (Sar.); Brush box (Aust.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: very large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: - Deformation: slight risk of deformation,

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: difficult,

USES: House building, Durable timber, Ship and boat manufacturing, Vehicle, Sporting goods,

Agricultural implement wood,

GEOGRAPHIC DISTRIBUTION: Indonesia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,

- Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: alternate, - Vested pits present,

- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 50-100µm,

- Vessel No.: 5-20/sq.mm, 20-40/sq.mm, - Vessel element mean length: 350-800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Aportracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty,

RAYS - Width: exclusively uniseriate, - Numbers: >12/mm, - Ray tissues: homogeneous uniseriate,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	Mpa	Mpa	elasticity GPa	MPa		
Indonesia		67.6	0.69	0.844	72.2	125.6	12.16	16.75	35.5	69.4
Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear paralel to grain MPa R		Resistance to splitting N/cm R-Plane   T-plane				
				5.6	7.6	15.5				

TRADE NAME: Kirung BOTANICAL NAME: *Nyssa javanica* (Bl.) Wang (Nyssaceae)  
 LOCAL NAME: Khueng khak, Khang khok (Th.); Kalay, Chilauni(Ind.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Veneer, Plywood,  
 Packing boxes, Food containers,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Burma, Thailand, Malaysia, China, India,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: scalariform, - Intervessel pits: opposite,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, - absent or extremely rare,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm, >12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	elasticity GPa	MPa		
Indonesia		13.9		0.722	71.18	70.9	11.57	11.05	48.92	50.2
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain MPa				Resistance to splitting N/cm		
		Side grain	end grain	R	T	R-Plane	T-plane			
				6.76	7.25	7.4	8.0			

TRADE NAME: Petaling BOTANICAL NAME: Ochanostachys amentacea Mast. (Olacaceae)  
 LOCAL NAME: Tanggal (Sab.); Petikal(Sar.); Tumbung asu(In.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: small, comparatively large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: very slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: durable, AMENABILITY TO PRESERVATIVE TREATMENT: medium, low, WORKING QUALITIES: moderately easy,

USES: House building, Durable timber, Furniture,

Packing boxes, Household appliance,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,

- Perforation plates: scalariform, - Intervessel pits: alternate,

- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,

- Vessel No.: 20-40/sq.mm, - Vessel element mean length: >800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse-in-aggregates, - Banded: 1-3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: >12/mm,

- Ray tissues: heterogeneous type I,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa	
			Basic density	Air-dry density				
Malaysia	3	16.4	0.73	0.915			56.1	65.2
Stress at limit proportionality		Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm		
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane	
6.28	6.68	6360	6627	9.8	11.6			

TRADE NAME: Tamayuan      BOTANICAL NAME: Strombosia philippinensis (Baill.) Rolfe (Olacaceae)

LOCAL NAME: Larag., Larak, tamanhuyan (Ph.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: purple, - Odour: indistinct,  
- Grain: straight to fairly interlocked, - Texture: very fine, - Weight: heavy, - Shrinkage:

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: durable, WORKING QUALITIES: moderately difficult,

USES: House building, Durable timber, Textile timber;

Household appliance, Turnery wood,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
- Perforation plates: scalariform, - Intervessel pits: opposite-scalariform,  
- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 50-100um,  
- Vessel No.: 40-100/sq.mm, - Vessel element mean length: >800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates,

RAYS - Width: commonly 4-10 seriate, - Numbers: >12/mm, - Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary, chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Philippines	1	12	0.74	0.887	121	111	13.6	12.6	65.8	60.8
Stress at limit proportionality		Hardness N.		Shear paralel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane	T-plane			
16.8	14.5	1160	1056	1350	1229	15.2	15.7			

TRADE NAME: Kulim BOTANICAL NAME: Scorodocarpus borneensis Becc. (Olacaceae)  
 LOCAL NAME: Bawang hutan (Br, M., Sab., Sar.); ungsunah (Sar.); Bawan, Kasino, madudu, Sinduk (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: red, purple, with streaks, - Odour: distinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: small,

STRENGTH CLASSES: strong, medium,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: moderately, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing,

GEOGRAPHIC DISTRIBUTION: Brunei, Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, scalariform, - Intervessel pits: opposite, opposite-scalariform,  
 - Vessel-ray pitting: large, rounded, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Fibres with helical thickening, - Mean length: >1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: >12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	R	T	R-Plane	T-plane		
Malaysia	4	15.8	0.66	0.815	107	115	14.9	14.7	57.0	64.5
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side-grain	end grain	R	T	R-Plane	T-plane			
5:10	5.28	6100	6246	10.3	11.9	46	67			



TRADE NAME: Sawa luka BOTANICAL NAME: Heliciopsis montana Sleum (Proteaceae)

LOCAL NAME:

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
- Grain: straight, oblique, - Texture: coarse, - Weight: light, - Shrinkage:

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation:

NATURE DUARABILITY: non-durable, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Veneer,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in tangential,  
- Perforation plates: simple, scalariform, - Intervessel pits: alternate,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
- Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Banded: 1-3 cells, >3 cells,

RAYS - rays of two distinct sizes, - Width: commonly >10 seriate, - Numbers: <4/mm,  
- Ray tissues: heterogenous type III, - Sheath cells present,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

TRADE NAME: Blakat      BOTANICAL NAME: Ziziphus talanai (Blornco) Merr.(Rhamnaceae)  
 LOCAL NAME:

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: moderately heavy, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,

USES: House building, Furniture, Veneer, Plywood, Sporting goods,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: aliform, confluent, - Banded: 1-3 cells, >3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: >12/mm, - Ray tissues: heterogeneous uniseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Philippines	1	12	0.56	0.659	104	95.3	11.8	10.9	49.5	45.7
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane	T-plane			
8.89	7.69	5610	5105	7660	6971	12.9	13.3			

TRADE NAME: Delek BOTANICAL NAME: Anisophyllea griffithii Oliv. (Rhizophoraceae)

LOCAL NAME: delek tembaga, Hampas kadah (M.); Mertama (Sar.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
- Grain: straight, - Texture: medium, coarse, - Weight: heavy, - Shrinkage: very large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately difficult,

USES: Interior finish, Furniture, Veneer,

Household appliance, Tool handle,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: simple, - Intervessel pits: extremely rare or absent,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
- Vessel No.: <5/sq.mm, - Vessel element mean length: >800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, - Paratracheal p.: aliform, - Banded: >3 cells,

RAYS - rays of two distinct sizes, - Width: commonly 4-10, seriate, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density						
Malaysia		58	0.75	0.895	79	82.3	16.90	16.45	42.8	46.5
Stress at limit proportionality MPa		Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane		T-plane		
				8.9	10.1					

TRADE NAME: Bakau      BOTANICAL NAME: Bruguiera gymnorhiza Lam. (Rhizophoraceae)  
 LOCAL NAME: Burma mangrove (Bur.); Tumu merah (M.); Busaing, Pototan (Ph.); Pasak, Pang kahua sum (Th.); Mangrov (P.N.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: straight, oblique, - Texture: medium, coarse, - Weight: heavy, - Shrinkage: very large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: moderately slow, - Checking: - Deformation:

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: moderately difficult,

USES: House building, Durable timber,  
 Household appliance, Tool handle, Fuel, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: scalariform, - Intervessel pits: scalariform,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 50-100um,  
 - Vessel No.: 20-40/sq.mm, - Vessel element mean length: >800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: present, - Mean length: >1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty,

RAYs - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Meransi BOTANICAL NAME: Carallia brachiata (Lour.) Merr. (Rhizophoraceae)  
 LOCAL NAME: Putat hutan(Sab.); Ringgit darach, Bara(In.); Kerakas, Payau(Br.); Bakauan gubat(Ph.); Chiangprar(Th.); Rabong(Sar.); Carallia wood(Ind.)

HABIT OF TREE: large tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight, oblique, - Texture: coarse, - Weight: heavy, - Shrinkage: very large,

STRENGTH CLASSES: strong, medium,  
 SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, WORKING QUALITIES: moderately easy,  
 USES: House building, Interior finish, Durable timber, Furniture, Veneer,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Philippines, Indonesia, China, India, Sri Lanka,  
 GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: >800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600um, - Wall thickness: very thick,  
 AXIAL PARENCHYMA - Aporacheal p.: diffuse, - Paratracheal p.: aliform, confluent, - Banded: 1-3 cells,

RAYS - rays of two distinct sizes, - Width: commonly >10 seriate, - Numbers: 4-12/mm, >12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II, - Sheath cells present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary, chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
China			0.74	0.87	124.5	16.82	65.6
Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear paralel to grain MPa R   T		Resistance to splitting N/cm R-Plane   T-plane	

TRADE NAME: Keruntum      BOTANICAL NAME: Combretocarpus rotundatus Dans. (Rhizophoraceae)  
 LOCAL NAME: Perepat paya (Sab.); Perepat darat (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, indistinct, - Heartwood Color: brown, red, - Odour:  
 - Grain: straight, oblique, - Texture: medium, coarse, - Weight: moderately heavy, heavy, - Shrinkage: small, comparatively large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: durable, moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Plywood,

Agricultural implement wood, Fuel,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: extremely rare or absent,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Banded: 1-3 cells, >3 cells,

RAYS - aggregate rays common, rays of two distinct sizes, - Width: commonly 4-10 seriate, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II, - Sheath cells present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density						
Malaysia		15	0.81		103	107.3	14.1	13.69	50	54.3
Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear paralel to grain MPa R   T		Resistance to splitting N/cm R-Plane   T-plane				
					9.0	10.2				

TRADE NAME: Bakau BOTANICAL NAME: Rhizophora mucronata Poir. (Rhizophoraceae)

LOCAL NAME: Bakau kurap (Sab. Br. Sar.); Dang (Viet.); Kong kang (Cam.); Opejo (In.); Bakauan babae (Ph.); Lenggayong (Sar.); Mangrove (P. N.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
- Grain: straight, - Texture: fine, - Weight: Very heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, WORKING QUALITIES: moderately difficult,

USES: House building, Durable timber,

Household appliance, Tool handle, Fuel, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Malaysia, Philippines, Indonesia, Papua New Guinea,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
- Perforation plates: scalariform, - Intervessel pits: scalariform,  
- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 50-100um,  
- Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty,

RAYS - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous multiseriate, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

TRADE NAME: Malas      BOTANICAL NAME: Parastemon urophyllus A. Dc. (Rosaceae)  
 LOCAL NAME: Ngilas (M.); Tampiluan, Mendailas (Sab.); Bebuan, mangilas, Kaju malas (In.); Sempalawan (Br.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, purple, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: very heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: moderately slow, - Checking: - Deformation: slight risk of deformation,

NATURE DURABILITY: durable, WORKING QUALITIES: very difficult,

USES: House building, Durable timber, Ship and boat manufacturing, Sporting goods,

Agricultural implement wood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: >800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600µm, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse-in-aggregates, - Banded: 1-3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type III,

MINERAL INCLUSIONS - Silica: present in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Malaysia	3	18.2	0.84	1.075	130	153	21.1	21.5	67.0	84.5
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain		Resistance to splitting		N/cm		
		Side grain	end grain	R	T	R-Plane	T-plane			
		12240	13415	16.1	20.0	44	66			



TRADE NAME: Merbatu BOTANICAL NAME: Parinari corymbosum Miq. (Rosaceae)  
 LOCAL NAME: Bankawang (Sab.); Liusin (Ph.); Bone, Donge, Joesoekadoja, Kalake, Kolasa (In.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: straight, oblique, - Texture: medium, - Weight: very heavy, - Shrinkage: very large,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: difficult,

USES: House building, Durable timber,  
 Fuel,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: >800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, - Banded: 1-3 cells,

RAYS - Width: exclusively uniseriate, 1-3 cells, - Numbers: >12/mm, - Ray tissues: heterogeneous uniseriate, heterogeneous type III,

MINERAL INCLUSIONS - Silica: present in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	R	T	R-Plane	T-plane		
Philippines	3	12	0.79	1.000	155	142	20.8	19.3	80.0	73.9
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
15.7	13.6	Side grain	end grain	R	T	R-Plane	T-plane			
		11900	10829	13000	11830	14.2	14.7			

TRADE NAME: Xoan-dao      BOTANICAL NAME: *Pygeum arboreum* Engl. (Rosaceae)  
 LOCAL NAME: Xuan-dao (Viet.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: oblique, straight to fairly interlocked, - Texture: fine, - Weight: light, moderately heavy, - Shrinkage: large,

STRENGTH CLASSES: medium, weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Plywood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, vasicentric,

RAYs - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa	Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa		MPa	MPa
Indo-china		12		0.435	63.9	63.9		43.1	39.8

TRADE NAME: Kwao . BOTANICAL NAME: Adina cordifolia Hook. f. (Rubiaceae)  
 LOCAL NAME: Gao yang (Viet.); Haldu (In. Th.); Hnaw (Bur.); Kvae (Cam.); kolon (S.l.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: very fine, - Weight: moderately heavy, heavy, - Shrinkage: large,

STRENGTH CLASSES: strong, medium,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately easy,

USES: House building, Ship and boat manufacturing, Furniture, Veneer, Plywood, Sporting goods, Musical instruments,  
 Food containers, Turnery wood, Carving,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Cambodia, Burma, Thailand,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 50-100um,  
 - Vessel No.: 40-100/sq.mm, - Vessel element mean length: >800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: >12/mm,  
 - Ray tissues: heterogeneous type I,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	R	T	R-Plane	T-plane		
Malaysia		14.6	0.758		83.9	86.0	9.215	8.9	41.47	44.2
Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear paralel to grain MPa R   T		Resistance to splittiing N/cm R-Plane   T-plane				
				8.5   9.5						

TRADE NAME: Kadam      BOTANICAL NAME: Anthocephalus chinensis Rich of Walp (Rubiaceae)  
 LOCAL NAME: Laran(M.); Gao(Viet.); Kelampajan(In.); Kaatoan bankal(Ph.); Sempayang(Sar.); Ludai(Sab.); Mao-Lettanshe(Bur.); Entipong(Br.) Thkeou(Cam.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, yellow, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: light, - Shrinkage: very small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately fast, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: easy,

USES: Interior finish, Furniture, Veneer, Plywood,

Food containers; Wood mould, Household appliance, Pencils, Pulpwood, Disposable chopsticks etc.,

GEOGRAPHIC DISTRIBUTION: Vietnam, Laos, Cambodia, Burma, Thailand, Malaysia, Philippines, Indonesia, China, India, Sri Lanka, Nepal,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: >800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: >12/mm,  
 - Ray tissues: heterogeneous type 1,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength		
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa	
Philippines	3	12	0.34	0.398	53.6	53.6	5.86	5.04	24.5	22.6	
Stress at limit proportionality	MPa	Hardness N.				Shear parallel to grain		Resistance to splitting			
		Side grain	end grain	R	T	MPa	MPa	N/cm R-Plane	N/cm T-plane		
3.96	3.43	2140	1947	3330	3030	6.24	6.45				

TRADE NAME: Kuthan      BOTANICAL NAME: Hymenodictyon excelsum Wall. (Rubiaceae)  
 LOCAL NAME: Ooloke, Ulok (Th.); Tai-nghe (Viet.); Aligango (Ph.); medang keladi (M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: white to grey, yellow, - Odour: indistinct,  
 - Grain: straight, - Texture: medium, - Weight: light, - Shrinkage:

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: easy,

USES: Furniture, Wood based panel,  
 Cooperage, Matches,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand, Malaysia, Philippines, China, India,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vessels with bordered pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: present, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYS - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: >12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear paralel to grain MPa R   T		Resistance to splitting N/cm R-Plane   T-plane	

TRADE NAME: Binga BOTANICAL NAME: *Mitragyna rotundifolia* (Roxb.) O. Kuntze (Rubiaceae)  
 LOCAL NAME: Mimbog (Ph.); Kutum (M.)

HABIT OF TREE: medium tree;

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: white to grey, yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage: very large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: WORKING QUALITIES: easy,

USES: House building, Interior finish, Textile timber,  
 Household appliance,

GEOGRAPHIC DISTRIBUTION: Burma, Philippines, India,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vested pits present,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, 20-40/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYs - interconnected (fused) rays, - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, >12/mm,  
 - Ray tissues: heterogeneous type II,

- TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength		
			Basic density	Air-dry density	MPa		GPa		MPa		
India	12	12.8		0.753	96.8	92.0	11.06	10.38	51.9	50.2	
Stress at limit proportionality		Hardness N.		Shear paralel to grain				Resistance to splitting			
MPa		Side grain	end grain	R		T		R-Plane		T-plane	
				10.0		10.6					

TRADE NAME: Malabira bukit BOTANICAL NAME: Mussaendopsis becariana Baill. (Rubiaceae)

LOCAL NAME: Mempelal babi (M.); Kaju patin, Selumar (In.).

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: yellow, - Odour:

- Grain: straight, oblique, - Texture: fine, - Weight: heavy, very heavy, - Shrinkage: very large,

STRENGTH CLASSES: very strong, strong,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: moderately difficult,

USES: House building, Durable timber,

Agricultural implement wood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,

- Perforation plates: simple, - Intervessel pits: alternate, - Vessel pits present,

- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,

- Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Septate fibres: present, - Mean length: >1600µm, - Wall thickness: thin to thick, very thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty,

RAYS - interconnected (fused) rays, - Width: - Numbers: 4-12/mm, >12/mm,

- Ray tissues: heterogeneous type I, heterogeneous type II,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density						
Indonesia		16.1		1.093	127.9	139.1	17.26	17.03	70.7	81.1
	Stress at limit proportionality MPa		Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm			
			Side grain	end grain	R	T	R-Plane		T-plane	

TRADE NAME: Bangkal BOTANICAL NAME: Nauclea orientalis L. (Rubiaceae)

LOCAL NAME: Bengkal, Gempol (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
- Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: no risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, WORKING QUALITIES: easy,

USES: House building, Furniture,  
Carving,

GEOGRAPHIC DISTRIBUTION: Philippines, Indonesia, China,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
- Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
- Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: >12/mm,  
- Ray tissues: heterogeneous type I,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa	Hardness N. Side grain	Shear parallel to grain MPa		Resistance to splitting N/cm			
		end grain	R	T	R-Plane	T-plane	



TRADE NAME: Sampang      BOTANICAL NAME: *Euodia glabra* Bl. (Rutaceae)  
 LOCAL NAME: Pepauh (M.)

HABIT OF TREE: small tree, medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: very light, - Shrinkage: small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: moderately fast, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,

USES: Interior finish, Plywood,

Packing boxes, Wood mould, Carvinge,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: very thin,

AXIAL PARENCHYMA - Paratracheal p.: aliform, confluent, - Banded: 1-3 cells, >3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,

- Ray tissues: homogeneous uniseriate and multiseriate, heterogeneous type III,

MINERAL INCLUSIONS - Silica: present in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa	Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm		
	Side grain	end grain	R	T	R-Plane	T-plane	

TRADE NAME: Kantu Duri      BOTANICAL NAME: Zanthoxylum rhetsa Dc. (Rutaceae)  
 LOCAL NAME: Chenkring (M.); Kaju tanah (In.); Kaitana (Ph.); Juminina, Rhetsa (Ind.)

HABIT OF TREE: small tree; medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight, wavy, - Texture: fine, - Weight: very light, - Shrinkage: comparatively large,

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: durable, WORKING QUALITIES: easy,

USES: Furniture,

Packing boxes, Novelties,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia, India,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length:

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: - Wall thickness: very thin,

AXIAL PARENCHYMA - Apotracheal p.: terminal, - Paratracheal p.: scanty,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, - Ray tissues: homogeneous uniseriate and multiseriate, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Philippines	1	12	0.33	0.387	58.2	58.2	8.05	6.93	28.7	26.5
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane	T-plane			
3.15	2.72	1680	1529	2670	2430	5.43	5.62			

TRADE NAME: Delinsem BOTANICAL NAME: Homalium foetidum Benth. (Samydaceae)

LOCAL NAME: Aranga (Ph.); Hia, Hija, Gia (In.); Malas (P. N.); Telor Buaya(M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
- Grain: straight to fairly interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: very small,

STRENGTH CLASSES: strong, medium,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: moderately, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Sporting goods,

Agricultural implement wood, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Burma, Malaysia, Philippines, Indonesia, Papua New Guinea,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
- Vessel grouping: radial multiple, - Perforation plates: simple, scalariform, - Intervessel pits: alternate,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
- Vessel No.: 5-20/sq.mm, 20-40/sq.mm, - Vessel element mean length: >800µm, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: common, - Mean length: >1600µm, - Wall thickness: very thick,

AXIAL PARENCHYMA - absent or extremely rare,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: >12/mm,  
- Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa	Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa		MPa	MPa
Indo-china		14.6		0.942	118.6	121,6		56.1	59.8
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain		Resistance to splitting		N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane		
				7.7	8.5	8.6	9.5		

TRADE NAME: Burma lancewood      BOTANICAL NAME: Homalium tomentosum Benth. (Samydaceae)  
 LOCAL NAME: Lance wood, Myaukchaw (Bur.); Delingsem (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: very fine, - Weight: very heavy, - Shrinkage:

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: moderately, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Sporting goods,  
 Agricultural implement wood, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: radial multiple, - Perforation plates: simple, scalariform, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 50-100µm,  
 - Vessel No.: 20-40/sq.mm, - Vessel element mean length: - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: - Wall thickness: very thick,

AXIAL PARENCHYMA - absent or extremely rare,

RAYS - interconnected (fused) rays, - Width: commonly 4-10 seriate, - multiseriate portion(s) as wide as uniseriate, - Numbers: >12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	R	T	R-Plane	T-Plane		
Indonesia		13.7		1.099	129.7	128.1	14.31	13.6	67.5	68.6
	Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear parallel to grain MPa R	T		Resistance to splitting N/cm R-Plane   T-plane		
				9.8	10.5	10.7	11.5			

TRADE NAME: Mangir BOTANICAL NAME: Ganophyllum obliquum (Blanco) Merr.(Sapindaceae)  
 LOCAL NAME: Anamea, Konawe, Marasoelo (In.); Arangen (Ph.); Scaly ash (P. N.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: heavy, - Shrinkage: large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately difficult,

USES: House building, Durable timber, Ship and boat manufacturing, Vehicle, Sporting goods,  
 Agricultural implement wood, Turnery wood,

GEOGRAPHIC DISTRIBUTION: Philippines, Indonesia, Papua New Guinea,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: 5-20/sq.mm, 20-40/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, - Paratracheal p.: scanty, vasicentric, aliform, confluent,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: >12/mm,  
 - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

MISCELLANEOUS: Rays storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	MPa	MPa	MPa	MPa
Indonesia		12.6	0.923		88.4	83.2	12.55	11.74	57.8	55.3
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane	T-plane			
					11.9	12.5	12.5	13.2		

TRADE NAME: Uas      BOTANICAL NAME: Harpullia arborea (Blanco) Radlk (Sapindaceae)  
 LOCAL NAME:

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight, wavy, - Texture: fine, - Weight: moderately heavy, - Shrinkage: small;

STRENGTH CLASSES: medium, weak,

SEASONING: - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: WORKING QUALITIES: easy,

USES: House building, Furniture, Plywood,  
 Packing boxes,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia, India,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: <900um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, terminal, - Paratracheal p.: scanty, vasicentric, aliform, confluent,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, >12/mm, - Ray tissues: heterogeneous type II, heterogeneous-type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered;

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa				
Philippines	1	12	0.60	0.693	98.0	89.8	10.6	9.83	46.2	42.7
Stress at limit proportionality	MPa	Hardness N.				Shear parallel to grain MPa		Resistance to splitting N/cm		
		Side grain	end grain	R	T	R-Plane	T-plane			
10.0	8.65	5870	5342	8480	7717	13.4	13.9			

TRADE NAME: Kasai      BOTANICAL NAME: Pometia pinnata Forst. (Sapindaceae)  
 LOCAL NAME: Truong (Viet); Matoa(In.); Taun (P.N.); Malugai (Ph.); Toun, Kasai besar daun, Lan doeng (In.); Sibul (Sar.)

HABIT OF TREE: large tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage: large,  
 STRENGTH CLASSES: medium,  
 SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,  
 NATURE DURABILITY: durable, moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately easy,  
 USES: House building, Interior finish, Ship and boat manufacturing, Vehicle, Textile timber, Furniture, Sporting goods, Culture,  
 Agricultural implement wood, Packing boxes, Turnery wood, Tool handle, Bent wood, Pulpwood,  
 GEOGRAPHIC DISTRIBUTION: Vietnam, Malaysia, Philippines, Indonesia, Indo-china, Papua New Guinea, China, India, Sri Lanka,  
 GROWTH RINGS: moderately distinct,  
 VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,  
 FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,  
 AXIAL PARENCHYMA - Aportracheal p.: terminal, - Paratracheal p.: vasicentric, aliform,  
 RAYS - Width: exclusively uniseriate, - Numbers: 4-12/mm, >12/mm, - Ray tissues: heterogeneous uniseriate,  
 MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary, chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa					
Philippines	5	12	0.56	0.682	104	95.3	12.8	11.9	52.4	48.4
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane		T-plane		
8.67	7.50	5380	4896	7040	6406	12.6	13.0			

TRADE NAME: Kusambi      BOTANICAL NAME: *Schleichera trijuga* Willd. (Sapindaceae)  
 LOCAL NAME: Kesambi (In.); Celon-oak (S. L.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: fine, - Weight: heavy, - Shrinkage:

STRENGTH CLASSES: very strong, strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: moderately, WORKING QUALITIES: difficult,

USES: House building, Ship and boat manufacturing, Vehicle, Musical instruments,  
 Agricultural implement wood, Tool handle, Oil press, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Burma, Malaysia, Philippines, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, - Paratracheal p.: scanty,

RAYs - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: >12/mm,  
 - Ray tissues: homogeneous uniseriate and multiseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa		Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane



TRADE NAME: Sulewe      BOTANICAL NAME: Madhuca philippinensis Merr. (Sapotaceae)  
 LOCAL NAME: Manilig (Ph.); Palapi (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: red, - Odour: indistinct,  
 - Grain: oblique, - Texture: fine, - Weight: heavy, very heavy, - Shrinkage: very large,

STRENGTH CLASSES: strong, medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: durable, WORKING QUALITIES:

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing,  
 Tool handle, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Philippines, Indonesia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: radial multiple, - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Banded: 1-3 cells,

RAYs - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: >12/mm,  
 - Ray tissues: heterogeneous type II,

MINERAL INCLUSIONS - Silica: present in ray cells, present in axial parenchyma cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa		
			Basic density	Air-dry density	R	T	R-Plane	T-plane			
Indonesia		15.8		1.015		105.4	113.3	10.00	9.83	54.0	61.0

TRADE NAME: Bitis      BOTANICAL NAME: Madhuca utilis H. J. Lam (Sapotaceae)  
 LOCAL NAME:

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: red, purple, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: very heavy, - Shrinkage: very large,

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: very durable, RESISTANCE TO TERMITES: moderately, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: difficult,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Sporting goods,  
 Agricultural implement wood, Tool handle, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Malaysia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: radial multiple, - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: very thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Banded: 1-3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: >12/mm, - Ray tissues: heterogeneous uniseriate,

MINERAL INCLUSIONS - Silica: present in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa		MPa	
Malaysia	5	14.0	0.92	1.120	171	171	23.8	22.7	90.3	93.3
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain		Resistance to splitting				
		Side grain	end grain	R	T	R-Plane	T-plane			
12.48	11.92	14860	14414	15.4	16.9	86	67			

TRADE NAME: Sawokecik      BOTANICAL NAME: Manilkara kauki Dubard (Sapotaceae)  
 LOCAL NAME: Sawo ketjik, Natioe (In.); Sawu djawa (Ja.); timbuwalo, Komea (cel.); Sawai (Ph.)

HABIT OF TREE: medium tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: very fine, - Weight: heavy, - Shrinkage:  
 STRENGTH CLASSES: strong,  
 SEASONING - Air drying rates: - Checking: - Deformation:  
 NATURE DURABILITY: durable, WORKING QUALITIES: moderately easy,  
 USES: House building, Furniture, Culture,  
 Turnery wood, Carving, Tool handle,  
 GEOGRAPHIC DISTRIBUTION: Burma, Malaysia, Philippines, Indonesia, India,  
 GROWTH RINGS: moderately distinct,  
 VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 50-100um,  
 - Vessel No.: 20-40/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,  
 FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: very thick,  
 AXIAL PARENCHYMA - Aportracheal p.: diffuse-in-aggregates, - Banded: 1-3 cells,  
 RAYS - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: >12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II,  
 MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Stress at limit proportionality MPa	Hardness N.	Shear paralel to grain MPa		Resistance to splitting N/cm			
		Side grain	end grain	R	T	R-Plane	T-plane

TRADE NAME: Kirakuli BOTANICAL NAME: Manikara hexandra Dubard (Sapotaceae)  
 LOCAL NAME: Khir (Ind.); Kes (Cam.); Ket (Th.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: red, purple, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: very fine, - Weight: very heavy, - Shrinkage:

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: very durable, WORKING QUALITIES: difficult,

USES: House building, Durable timber, Vehicle,

Agricultural implement wood, Tool handle, Oil press, Fuel, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Cambodia, Thailand, India, Sri Lanka,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: radial multiple, - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 50-100um,  
 - Vessel No.: 5-20/sq.mm, 20-40/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Banded: 1-3 cells,

RAYS - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm, >12/mm,

- Ray tissues: heterogeneous type I,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary, chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
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Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane
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TRADE NAME: Duyok-duyok BOTANICAL NAME: Manilkara merrilliana H. J. Lam (Sapotaceae)  
 LOCAL NAME: Koemea (In.)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: straight, wavy, - Texture: fine, - Weight: very heavy, - Shrinkage:

STRENGTH CLASSES: very strong,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: durable, WORKING QUALITIES: moderately difficult,

USES: House building, Durable timber,

Turnery wood, Tool handle, Oil press, Fuel, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Philippines, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean I.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Banded: 1-3 cells,

RAYS - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

TRADE NAME: Nyatoh BOTANICAL NAME: Palaquium obovatum Engl. (Sapotaceae)  
 LOCAL NAME: Nyatoh puteh (M.); Chay Gutta percha (Viet.); Chorni (Camb.); Kha-nunnok, Chiknom (Th.); Nato, Koema (In.)

HABIT OF TREE: medium tree, large tree,  
 PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage: small, comparatively large,

STRENGTH CLASSES: weak,  
 SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,  
 NATURE DURABILITY: durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately difficult,  
 USES: House building, Interior finish, Ship and boat manufacturing, Furniture, Veneer, Plywood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Burma, Malaysia, India,  
 GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Banded: 1-3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered, - Silica: present in ray cells,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Thailand	14		0.65		82.2	6.569	29.8
Stress at limit proportionality MPa	Hardness N.	Shear paralel to grain MPa		Resistance to splitting N/cm			
		Side grain	end grain	R	T	R-Plane	T-plane
				15.9	18.0		

TRADE NAME: Bitis      BOTANICAL NAME: Palaquium ridleyi King et Gamble (Sapotaceae)  
 LOCAL NAME: Nyatau (Br.); Nyatoh batu (Sab. Sar.); Nyatoh (Sab.); Nyatoh kelalang (Sar.); Bitis paya (M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: red, purple, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: very heavy, - Shrinkage: small, comparatively large,

STRENGTH CLASSES: Very strong,

SEASONING - Air drying rates: slow, - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: very durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: difficult,

USES: House building, Durable timber, Ship and boat manufacturing, Vehicle,

Oil press, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia, Singapore, Indo-china, Papua New Guinea,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: radial multiple, - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Banded: 1-3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: 4-12/mm, >12/mm, - Ray tissues: heterogeneous uniseriate,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	MPa	MPa	MPa	MPa
Indonesia		35	0.85	1.043	94.3	157.7	17.84	21.0	49.0	87.4
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane	T-plane			
				5.3	5.7	9.6	10.4			

TRADE NAME: Kete BOTANICAL NAME: Planchonella thyrsoides C.T. white ex F.S. Walker (Sapotaceae)  
 LOCAL NAME:

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, yellow, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: light, - Shrinkage: small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: easy,

USES: House building, Furniture, Plywood,

Packing boxes, Cooperage, Turnery wood, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Indonesia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,

- Vessel grouping: radial multiple, - Perforation plates: simple, - Intervessel pits: alternate,

- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200µm,

- Vessel No.: <5/sq.mm, - Vessel element mean length: >800µm,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600µm, - Wall thickness: very thin,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, - Banded: 1-3 cells,

RAY - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type I, heterogeneous type II,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry-density			
Stress at limit proportionality MPa	Hardness N		Shear parallel to grain MPa		Resistance to splitting N/cm		
	Side grain	end grain	R	T	R-Plane	T-plane	



TRADE NAME: Magasawih BOTANICAL NAME: *Duabanga grandiflora* Walp. (Sonneratiaceae)  
 LOCAL NAME: Lampati (Bur.In.); Phay (Viet); Berembang bukit; Pedata bukit (M.); Amas, Tawo (In.); Banderbola (Pak.); Loktoh (Ph.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, brown, - Odour:  
 - Grain: straight, - Texture: medium, - Weight: light, - Shrinkage: large,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: easy,

USES: Interior finish, Furniture, Plywood,

Packing boxes, Battery separators, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia, Burma, Malaysia, Philippines, Indonesia, China, Parkistan, India,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: vasicentric, aliform, confluent,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Malaysia		11.8	0.511		63.2	62.6	8.235	7.063	38.0	34.7
Stress at limit proportionality		Hardness N/mm <sup>2</sup>		Shear paralel to grain		Resistance to splitting				
MPa		Side grain	end-grain	R	T	R-Plane	T-plane	N/cm		

TRADE NAME: Benuang laki      BOTANICAL NAME: Duabanga moluccana Blume (Sonneratiaceae)  
 LOCAL NAME: Magasawih(M.); Loktob(Ph.); Magas, Tagahas(Sab.); Sawih(Sar.); Phay(Viet); Berambang(Br.); Dem chhoeuter(Cam.); Banderbola(Pak.); Lampati(Bur.); Myaukngo(Bur.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight, - Texture: medium, - Weight: light, - Shrinkage: large,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately easy,

USES: Interior finish, Furniture, Veneer, Plywood,

Matches, Battery separators, Buys, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSLS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,

- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm., - Vessel element mean length: >800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: vasicentric, aliform, confluent,

RAYs - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	MPa	MPa		
Philippines	1	green	0.37	0.446	43.0	61	7.80	8.1	19.6	33.4
Stress at limit proportionality		Hardness N. Side grain	Shear paralel to grain		Resistance to splitting					
MPa	MPa		end grain	R	T	R-Plane	T-plane			
3.98	2.3	2020	2560	5.74	8.4					

TRADE NAME: Perepat Laut BOTANICAL NAME: Sonneratia alba J. Smith, (Sonneratiaceae)  
 LOCAL NAME: Penata(Sab.); Perepat (M. Sab. Br.); Balombo, Baropa, Bolombo peropa (In.); Pagat pat (Ph.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: red, purple, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, heavy, - Shrinkage: very small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Furniture, Sporting goods,  
 Gunstocks, Fuel, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate, - Vestured pits present,  
 - Vessel-ray pitting: similar to intervessel pits, large, gash-like, - Mean T.D.: 50-100um,  
 - Vessel No.: 5-20/sq.mm, 20-40/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - absent or extremely rare,

RAYS - Width: exclusively uniseriate, - Numbers: 4-12/mm, >12/mm, - Ray tissues: heterogeneous uniseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

Stress at limit proportionality MPa	Hardness N.	Shear parallel to grain MPa		Resistance to splitting N/cm
		Side grain	end grain	

TRADE NAME: Mangkulang · BOTANICAL NAME: Heritiera javanica Kost. (Sterculiaceae)  
 LOCAL NAME: Mangkulang jari (M.); Kembang (Sab.); Lumbayau (Ph.); Chum-phraek (Th.); Palapi (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: brown, red, with streaks, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: medium, weak,

SEASONING - Air drying rates: fast, - Checking: slight risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Plywood, Sporting goods,  
 Pulpwood,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Philippines, Indonesia, India,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, terminal, - Paratracheal p.: scanty, vasicentric, - Banded: 1-3 cells,

RAYs - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Sheath cells present,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary,  
 - Silica: present in ray cells, present in axial parenchyma cells,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied, Axial intercellular canals in short tangential lines,  
 Axial intercellular canals in diffuse, Intercellular canals of traumatic origin,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density						
Malaysia	1	51	0.52	0.640	68	92	10.6	12.2	31.8	50.3
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane		T-plane		
4.21	5.4	4230	4674		9.9	11.7	57		63	

TRADE NAME: Tan-ag      BOTANICAL NAME: Kleinhovia hospita L. (Sterculiaceae)  
 LOCAL NAME: Gontoge, Hoentake, Katimoho, Tokoelo (In.); Timahar, Timangal (Sab.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight, - Texture: fine, - Weight: light, - Shrinkage: small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: easy,

USES: Interior finish, Wood based panel,

Household appliance, Buoys, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia, China, India,

GROWTH RINGS: distinct, moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty,

RAYs - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III, - Tile cells: Durio type,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - crystalliferous cells: ordinary,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Philippines	1	12	0.50	0.591	81.9	75.1	8.99	8.34	35.5	32.8
Stress at limit proportionality	MPa	Hardness N.	Side grain		Shear parallel to grain		Resistance to splitting		N/cm	
			MPa	MPa	R	T	R-Plane	T-plane	N/cm	N/cm
8.75	7.57	4300	3913	5790	5269	8.24	8.52			



TRADE NAME: Bayur BOTANICAL NAME: Pterospermum javanicum Jungh. (Sterculiaceae)

LOCAL NAME: Kedah (M.); Bajur biasa (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,

- Grain: straight, - Texture: fine, - Weight: light, - Shrinkage: small,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: fast, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, - WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Plywood,

Packing boxes,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand, Malaysia, Indonesia,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,

- Perforation plates: simple, - Intervessel pits: alternate,

- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,

- Vessel No.: 5-20/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, vasicentric,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II, - Tile cells: Pterospermum type,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %		Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
		Basic density	Air-dry density	R	T	R-Plane	T-plane				
Malaysia	1	17.7	0.42	0.495	54	68	7.5	7.0	28.8	35.5	
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm					
4.00	4.49	Side grain	end grain	R	T	R-Plane	T-plane				
		3290	3556	7.0	8.6	45	47				

TRADE NAME: White tulip oak      BOTANICAL NAME: Pterygota horsfieldii Kosterm. (Sterculiaceae)  
 LOCAL NAME: Pterygota, Impa(N.G.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, coarse, - Weight: moderately heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: moderately durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber, Furniture, Veneer,  
 Packing boxes, Carving, Tool handle,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia, Papua New Guinea,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel.No.: <5/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Banded: 1-3 cells; >3 cells,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, - Ray tissues: heterogeneous type II, - Sheath cells present, - Tile cells: Pterospermum type,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary,

MISCELLANEOUS: Axial parenchyma storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa				
Malaysia		80	0.48	0.575	51	84	9.200	11.10	27.6	45.8
	Stress at limit proportionality		Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm			
	MPa	Side grain	end grain	R	T		R-Plane	T-plane		
				7.3	10.8					



TRADE NAME: Sâmrong BOTANICAL NAME: Scaphium macropodum Beumee ex Heyne (Sterculiaceae)  
 LOCAL NAME: Kembang semangkok (M.); Kapas-kapas (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: strong, medium,

SEASONING - Air drying rates: fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, - WORKING QUALITIES: easy,

USES: Interior finish, Furniture, Veneer, Plywood,

GEOGRAPHIC DISTRIBUTION: Thailand, Malaysia, Indonesia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: terminal, - Paratracheal p.: vasicentric, aliform, confluent, - Banded: 1-3 cells, >3 cells,

RAYS - rays of two distinct sizes, - Width: commonly 4-10 seriate, commonly >10 seriate, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Silica: present in ray cells, present in axial parenchma cells,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa				
Malaysia	3	16.8	0.59	0.705	92	103	17.0	17.0	50.2	59.5
Stress at limit proportionality		Hardness N.		Shear paralel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane	T-plane			
		4940	5207	10.1	12.0	34	52			



TRADE NAME: Samak      BOTANICAL NAME: Schima wallichii choisy (Theaceae)  
 LOCAL NAME: Mang-tan, Ta-lo (Th.); Chilauni (Ind.); Puspa (In.); medang Gatal (Sab.); Kelinchi padi (Br.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour:  
 - Grain: oblique, - Texture: very fine, - Weight: moderately heavy, - Shrinkage: very large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: high risk of checking, - Deformation: high risk of deformation,

NATURE DURABILITY: non-durable, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: moderately easy,

USES: Durable timber, Vehicle, Furniture, Veneer, Plywood,

Packing boxes, Food containers, Turnery wood,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand, Malaysia, Indonesia, China, India,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,

- Vessel grouping: exclusively solitary, solitary vessel outline angular, - Perforation plates: scalariform, - Intervessel pits: extremely rare or absent,

- Vessel-ray pitting: large, rounded, large, gash-like, - Vessel with helical thickenings, - Mean T.D.: 50-100um,

- Vessel No.: 20-40/sq.mm, 40-100/sq.mm, - Vessel element mean length: >800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type I, heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, - crystalliferous cells: chambered,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Malaysia	3	16.7	0.59	0.720	88	98	12.0	11.9	46.3	54.6
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain		Resistance to splitting		N/cm		
		Side grain	end grain	R	T	R-Plane	T-plane			
5.45	5.87	5650	5938	12.3	14.7	67	89			

TRADE NAME: Tapnis      BOTANICAL NAME: Ternstroemia megacarpa Merr. (Theaceae)  
 LOCAL NAME:

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: interlocked, - Texture: very fine, - Weight: light, moderately heavy, - Shrinkage:

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: WORKING QUALITIES: easy,

USES: Furniture, Plywood,  
 Packing boxes, Household appliance,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Vessel grouping: exclusively solitary, solitary vessel outline angular, - Perforation plates: scalariform, - Intervessel pits: opposite, scalariform  
 - Vessel-ray pitting: similar to intervessel pits, - Vessel with helical thickenings, - Mean T.D.: 100-200um,  
 - Vessel No.: 20-40/sq.mm, - Vessel element mean length: >800um,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - Numbers: 4-12/mm,  
 - Ray tissues: heterogeneous type I, heterogeneous type II,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

TRADE NAME: Punah      BOTANICAL NAME: Tetramerista glabra Miq. (Tetrameristaceae)  
 LOCAL NAME: Entuyut, Kaju hujan (Sar.); Tuyot (Sab.); Punak, Bangkalis (In.); Amat (Br.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: brown, red, with streaks, - Odour: indistinct,  
 - Grain: straight, - Texture: medium, - Weight: heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: strong, medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: easy,

USES: House building, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Sporting goods,  
 Agricultural implement wood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
 - Vessel grouping: radial multiple, - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: >800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: >1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type-I, - Sheath cells present,

MINERAL INCLUSIONS - Crystals: Raphides crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Malaysia	1	18.9	0.63	0.785	87	105	15.4	15.8	49.4	64.1
Stress at limit proportionality		Hardness N.		Shear paralel to grain		Resistance to splitting				
MPa	MPa	Side grain	end grain	R	T	R-Plane		T-plane		
5.72	6.72	4670	5216	9.7	12.3	43		80		

TRADE NAME: Ramin      BOTANICAL NAME: *Gonystylus bancanus* (Miq.) Kurz (Thymelaeaceae)  
 LOCAL NAME: Ramin telur (Sar.); Ramin melawis (M.); Lanutan-Bagio (Ph.); Gaharu buaya, Garu buaja (In.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: strong, medium,

SEASONING - Air drying rates: fast, - Checking: slight risk of checking, - Deformation:

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Veneer, Plywood, Culture,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200µm,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800µm, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600µm, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: aliform, confluent, - Banded: 1-3 cells,

RAYS - Width: exclusively uniseriate, - Numbers: 4-12/mm, - Ray tissues: homogeneous uniseriate,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, Styloid crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength		
			Basic density	Air-dry density	MPa		GPa	MPa			
Malaysia	5	18.6	0.58	0.675	88	105	15.9	16.3	48.8	57.6	
Stress at limit proportionality	MPa	Hardness N.		Shear parallel to grain		Resistance to splitting					
		Side grain	end grain	R	T	R-Plane	T-plane	N/cm			
		4580	5075			8.5	10.7			34	44

TRADE NAME: Balobo BOTANICAL NAME: Diplodiscus paniculatus Turcz. (Tiliaceae)

LOCAL NAME:

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
- Grain: straight, - Texture: fine, - Weight: moderately heavy, - Shrinkage: large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: non-durable, WORKING QUALITIES: easy,

USES: House building, Interior finish, Textile timber, Sporting goods,

Agricultural implement wood, Packing boxes, Turnery wood, Tool handle, Pulpwood, Disposable chopsticks etc.,

GEOGRAPHIC DISTRIBUTION: Philippines,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern,  
- Vessel grouping: radial multiple, - Perforation plates: simple, - Intervessel pits: alternate,  
- Vessel-ray pitting: large, gash-like, - Mean T.D.: 100-200um,  
- Vessel No.: 5-20/sq.mm, 20-40/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, terminal, - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa		
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa	
Philippines	2	12	0.64	0.750	128	117	14.6	13.5	56.4	52.1	
Stress at limit proportionality	MPa	Hardness N.				Shear parallel to grain MPa		Resistance to splitting N/cm			
		Side grain	end grain	R	T	MPa	MPa	R-Plane	T-plane	N/cm	N/cm
11.9	10.3	7300	6643	9400	8554	11.4	11.8				

TRADE NAME: Thitka      BOTANICAL NAME: Pentace burmanica Kurz. (Tiliaceae)  
 LOCAL NAME: Burma Mahogany, Kashit (Bur.); Sisiat-pluak (Th.); melunak (M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: moderately heavy, - Shrinkage: large,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately difficult,

USES: House building, Interior finish, Ship and boat manufacturing, Vehicle, Furniture, Plywood,  
 Household appliance, Turnery wood, Carving,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200um,  
 - Vessel No.: 5-20/sq.mm, 20-40/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse, diffuse-in-aggregates, terminal, - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			
Burma					90.6	17.94	51.1
Stress at limit proportionality	MPa	Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm	
		Side grain	end grain	R	T	R-Plane	T-plane



TRADE NAME: Nghien      BOTANICAL NAME: *Pentace tonkinensis* A. Chev. (Tiliaceae)

LOCAL NAME: Trasiët( ); Siset (Cam.);

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: brown, red, - Odour: indistinct,  
- Grain: interlocked, - Texture: fine, - Weight: very heavy, - Shrinkage:

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: very durable, WORKING QUALITIES: very difficult,

USES: House building, Durable timber, Ship and boat manufacturing, Vehicle,  
Household appliance, Tool handle, Oil press, Bedding wood material,

GEOGRAPHIC DISTRIBUTION: Vietnam, Cambodia,

GROWTH RINGS: moderately distinct, indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diagonal and/or radial pattern, in diffuse,  
- Perforation plates: simple, - Intervessel pits: alternate,  
- Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
- Vessel No.: 5-20/sq.mm, 20-40/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: 900-1600um, - Wall thickness: very thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYS - Width: 1-3 cells, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in ray cells, - Crystalliferous cells: ordinary,

MISCELLANEOUS: Rays storied, Axial parenchyma storied, Vessels storied, Fibres storied,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa	Modulus of elasticity GPa	Maximum crushing strength MPa
			Basic density	Air-dry density			

TRADE NAME: Magabuyo      BOTANICAL NAME: Celtis luzonica Warb. (Ulmaceae)  
 LOCAL NAME: Kaju lulu (In.)

HABIT OF TREE: medium tree, large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: - Heartwood Color: white to grey, yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: medium, - Weight: moderately heavy, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: - Deformation:

NATURE DURABILITY: RESISTANCE TO TERMITES: moderately, WORKING QUALITIES: easy,

USES: House building, Furniture, Plywood, Sporting goods,  
 Pulpwood,

GEOGRAPHIC DISTRIBUTION: Philippines, Indonesia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: 100-200um,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: aliform, confluent,

RAYS - Width: commonly 4-10 seriate, - Numbers: 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

MINERAL INCLUSIONS - Crystals: Prismatic crystals present, in axial parenchyma cells, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Philippines	2	12	0.56	0.648	83.2	76.3	10.3	9.55	44.9	41.5
Stress at limit proportionality	MPa	Hardness N.				Shear parallel to grain		Resistance to splitting		
		Side grain	end grain	R	T	MPa		N/cm <sup>2</sup>	R-Plane	T-plane
8.89	7.69	4830	4395	6300	5733	12.8	13.2			

TRADE NAME: Anabiong BOTANICAL NAME: *Trema orientalis* (L.) Bl. (Ulmaceae)

LOCAL NAME: Menarong, Mengkirai (M.); Anggerung besar, Kurai, kawae mogane, Kaoetoe, Mawa, Siapo, Ngawoi (In.); Halin-dagang (Sab.); Marong (Sar)

HABIT OF TREE: medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, brown, - Odour: indistinct,

- Grain: straight, - Texture: fine, - Weight: very light, - Shrinkage: very large,

STRENGTH CLASSES: very weak,

SEASONING - Air drying rates: fast, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: easy,

USES: Interior finish,

Packing boxes, Household appliance, Buoys, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines, Indonesia, China,

GROWTH RINGS: indistinct or absent,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,

- Perforation plates: simple, - Intervessel pits: alternate,

- Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: 100-200 $\mu$ m,

- Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800 $\mu$ m, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Mean length: >1600 $\mu$ m, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Paratracheal p.: scanty,

RAYS - interconnected (fused) rays; - Width: 1-3 cells, - Numbers: 4-12/mm,

- Ray tissues: heterogeneous type II, heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density						
Philippines	1	12	0.36	0.432	60.3	60.3	6.37	5.48	26.7	24.7
-----										
Stress at limit proportionality		Hardness N.		Shear parallel to grain		Resistance to splitting				
MPa		Side grain	end grain	R	T	R-Plane		T-plane		
3.65	3.16	2450	3360	8.64	8.93					

TRADE NAME: Gamari BOTANICAL NAME: Gmelina arborea L. (Verbenaceae)  
 LOCAL NAME: Gumhar (Ind.); Yamane (Bur.); Kaju titi (In.); Gumari, So, Saw (Th.); Gmelina, Yemane (Ph.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: white to grey, yellow, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, wavy, - Texture: medium, - Weight: light, - Shrinkage: comparatively large,

STRENGTH CLASSES: weak,

SEASONING - Air drying rates: fast, - Checking: - Deformation:

NATURE DURABILITY: durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: easy,

USES: House building, Interior finish, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Plywood,  
 Wood mould, Turnery wood, Carving, Matches, Pulpwood,

GEOGRAPHIC DISTRIBUTION: Cambodia, Burma, Thailand, Philippines, China, India,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: terminal, - Paratracheal p.: scanty, vasicentric, aliform, confluent,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: <4/mm,  
 - Ray tissues: homogeneous multiseriate, heterogeneous multiseriate,

MINERAL INCLUSIONS - Crystals: Acicular crystals present, in ray cells, - crystalliferous cells: ordinary,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength MPa		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	R	T	R-Plane	T-plane		
Malaysia	5	16.9	0.41	0.480	61	75	9.6	8.9	32.5	38.7
Stress at limit proportionality MPa		Hardness N.		Shear parallel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane		T-plane		
2.97	3.22	2580	2727	7.7	9.2	49		53		

TRADE NAME: Sungkai      BOTANICAL NAME: *Peronema canescens* Jack. (Verbenaceae)  
 LOCAL NAME: Sukai, Cherek (M.); Djati sabrang (In.).

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour:  
 - Grain: straight, - Texture: medium, - Weight: moderately heavy, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: moderately fast, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, AMENABILITY TO PRESERVATIVE TREATMENT: good, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber, Vehicle, Furniture, Veneer, Plywood,

GEOGRAPHIC DISTRIBUTION: Burma, Thailand, Malaysia, Indonesia,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood ring-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.:  
 - Vessel No.: - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: simple to minutely bordered pits, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aporacheal p.: terminal, - Paratracheal p.: scanty, aliform, confluent,

RAYS - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II, heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa	MPa	GPa	GPa	MPa	MPa
Indonesia			0.83	0.725	66.96	69.75	8.235	7.995	31.08	33.78
Stress at limit proportionality	MPa	Hardness N.		Shear paralel to grain				Resistance to splitting		
		Side grain	end grain	R	T	MPa	MPa	R-Plane	T-plane	
				6.1	4.2	6.9	4.8			

TRADE NAME: Teak      BOTANICAL NAME: *Tectona grandis* L. f. (Verbenaceae)  
 LOCAL NAME: Jati (In.); Kyun (Bur.); Mai sak (Th.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: clearly distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: coarse, - Weight: moderately heavy, - Shrinkage: small,

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: fast, - Checking: no risk of checking, - Deformation: no risk of deformation,

NATURE DURABILITY: very durable, RESISTANCE TO TERMITES: yes, AMENABILITY TO PRESERVATIVE TREATMENT: low, WORKING QUALITIES: moderately easy,

USES: House building, Interior finish, Durable timber, Ship and boat manufacturing, Vehicle, Furniture, Veneer, Plywood, Musical instruments,  
 Packing boxes, Wood mould, Cooperage,

GEOGRAPHIC DISTRIBUTION: Vietnam, Burma, Thailand, Philippines, Indo-china, China, India,

GROWTH RINGS: distinct,

VESSELS/PORES - Porosity: wood ring-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: 5-20/sq.mm, - Vessel element mean length: <350um, - Tyloses: present,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Septate fibres: common, - Mean length: 900-1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Apotracheal p.: terminal, - Paratracheal p.: scanty, vasicentric,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm,  
 - Ray tissues: homogeneous uniseriate and multiseriate, heterogeneous type III,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa		
			Basic density	Air-dry density	MPa						
Malaysia	9	15.0	0.54	0.625	86	90	10.3	10.0	45.8	49.8	
Stress at limit proportionality MPa		Hardness N. Side grain   end grain		Shear parallel to grain MPa R   T		Resistance to splitting N/cm R-Plane   T-plane					
5.79	5.79	4805	4805			10.6	12.0			59	73

TRADE NAME: Entapuloh      BOTANICAL NAME: Teijsmanniodendron sp. (Verbenaceae)  
 LOCAL NAME: Buak buak(Sab.)

HABIT OF TREE: small tree, medium tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: distinct, - Heartwood Color: yellow, brown, - Odour: indistinct,  
 - Grain: straight to fairly interlocked, - Texture: fine, - Weight: light, moderately heavy, - Shrinkage:

STRENGTH CLASSES: medium,

SEASONING - Air drying rates: - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: moderately durable, non-durable, - AMENABILITY TO PRESERVATIVE TREATMENT: medium, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture,

Agricultural implement wood, Packing boxes,

GEOGRAPHIC DISTRIBUTION: Malaysia, Philippines,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Perforation plates: simple, - Intervessel pits: alternate,  
 - Vessel-ray pitting: large, rounded, large, gash-like, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, 5-20/sq.mm, - Vessel element mean length: 350-800um,

FIBRES AND FIBRE TRACHEIDS - Pits: moderately distinct bordered, - Septate fibres: common, - Mean length: >1600um, - Wall thickness: thin to thick,

AXIAL PARENCHYMA - Aportracheal p.: diffuse, terminal, - Paratracheal p.: scanty,

RAYS - Width: commonly 4-10 seriate, - Numbers: <4/mm, 4-12/mm, - Ray tissues: heterogeneous type II,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity GPa		Maximum crushing strength MPa	
			Basic density	Air-dry density	MPa	MPa	elasticity GPa	MPa		
Malaysia		15		0.763	90	93.8	11.7	11.36	45	48.9
Stress at limit proportionality	MPa	Hardness N.		Shear paralel to grain MPa		Resistance to splitting N/cm				
		Side grain	end grain	R	T	R-Plane		T-plane		
				10	11.4					





TRADE NAME: Lilin      BOTANICAL NAME: Xanthophyllum excelsum Miq. (Xanthophyllaceae)  
 LOCAL NAME: Bok-bok (Ph.); Gading, Kiendog, Mendjalin, minak angkat (In.); Nyalin (M.)

HABIT OF TREE: large tree,

PHYSICAL PROPERTIES - Heartwood and Sapwood: indistinct, - Heartwood Color: yellow, - Odour: indistinct,  
 - Grain: straight, - Texture: medium, coarse, - Weight: moderately heavy, - Shrinkage: comparatively large,

STRENGTH CLASSES: strong,

SEASONING - Air drying rates: moderately slow, - Checking: slight risk of checking, - Deformation: slight risk of deformation,

NATURE DURABILITY: non-durable, RESISTANCE TO TERMITES: no, WORKING QUALITIES: easy,

USES: House building, Interior finish, Furniture, Plywood,

GEOGRAPHIC DISTRIBUTION: Philippines, Indonesia,

GROWTH RINGS: moderately distinct,

VESSELS/PORES - Porosity: wood diffuse-porous, - Arrangement: in diffuse,  
 - Vessel grouping: exclusively solitary, - Perforation plates: simple, - Intervessel pits: alternate, extremely rare or absent,  
 - Vessel-ray pitting: similar to intervessel pits, - Mean T.D.: >200,  
 - Vessel No.: <5/sq.mm, - Vessel element mean length: 350-800um, Gums and other deposits,

FIBRES AND FIBRE TRACHEIDS - Pits: distinct bordered, - Mean length: 900-1600um, - Wall thickness: thin to thick,

TRACHEIDS: vasicentric, AXIAL PARENCHYMA - Apotracheal p.: diffuse, diffuse-in-aggregates, - Paratracheal p.: scanty, - Banded: 1-3 cells,

RAYS - interconnected (fused) rays, - Width: 1-3 cells, - multiseriate portion(s) as wide as uniseriate, - Numbers: 4-12/mm, >12/mm,  
 - Ray tissues: heterogeneous type I, - Tile cells: Pterospermum type,

TABLE OF PHYSICAL AND MECHANICAL PROPERTIES

Locality of growth	No. of trees tested	Moisture content %	Density g/cm <sup>3</sup>		Bending strength		Modulus of elasticity		Maximum crushing strength	
			Basic density	Air-dry density	MPa		GPa	MPa		
Philippines	5	12	0.64	0.807	120	110	15.2	14.1	61.9	57.2
Stress at limit proportionality	MPa	Hardness N.				Shear parallel to grain		Resistance to splitting		
		Side grain	end grain	R	T	MPa		N/cm	R-Plane	T-plane
11.4	9.86	7570	6889	9280	8445	12.1	12.5			



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