BANGKIRAI PROPERTIES

BOTANICAL NAME:
Shorea laevis Ridl. (Syn. S. laevifolia Endert), Dipterocarpeceae family.

LOCAL NAMES
Anggelam, balau kumus, selangan batu kumus, thakian-samphon, mikai, selangan kumus, kumus, penapak, benuas, bangkirai, balau tanduk,

OTHER NAMES
Bangkirai (UK, USA, Fr, Sp, It, Sw. NI, Gm).

GEOGRAPHICAL DISTRIBUTION
All over Kalimantan, Indonesia

HABITUS

The tree height may reach 50 m, the length of the clear bole is 35 to 40 m, the diameter is 100 cm and over. The buttress is as high as 2 m. The outer bark is grey, red or brown, sometimes even dark red with grooves and peels off in small thin pieces. The bark contains dark yellow resin.

GENERALCHARACTERISTICS

Colour
The Heartwood is brownish yellow, the sapwood yellowish pale light brown.

Texture
Wood texture ranges from fine to rather coarse

Grain
The grain is straight or interlocked.

Touch
The wood surface is smooth or alternately smooth and rough owing to the interlocked grain.

Gloss
The wood surface is glossy.

Figures
The radial section shows stripes in a lighter colour.

STRUCTURE

Vessels
Most vessels are solitary. A small part of them are in groups of 2 to 4 in radial direction, sometimes in tangential and oblique lines. They are round or oval, have a diameter of 1 00 to 300 ?? a frequency of 2 to 10 per Sq mm , and contain much tylosis. The perforation plates are simple.

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Parenchyma
The parenchyma are of the paratracheal type in the form of complete or incomplete borders to the vessels. There are also apotracheal parenohyma in the form of short, tangential bands besides diffuse parenchyma.

Rays
The rays are homogenous, fine and short, and have a frequency of 6 to 8 per mm. They sometimes contain a brown deposit.

Intercellular canals
The Intercellular canals are almost always smaller than vessels, occasionally of the same size. They are arranged in long series, and contain white resin.

Fibres
The fibres are 1,203 long with a diameter of 19.9 ; wall thickness of 1.9 and lumen diameter of 16.1.

PHYSICAL PROPERTIES

Specific gravity
0.91 (0.60 - 1.16)

Strength class
I – II

Shrinkage
Shrinkage to oven-dry condition is 4.5 % (R) and 8.3 % (T)

MECHANICAL PROPERTIES

Static bending stress (kg/cm2)	g	872
	d	857
Ultimate bending stress (kg/cm2)	g	1160
	d	1243
Modulus of elasticity (1,000kg/cm2)	g	189
	d	187
Work to proportional limit (kgm / dm3)	g	2.3
	d	2.2
Work to maximum load (kgm dm3)	g	7.0
	d	7.6
Radial (kgm / dm3)	g	30.5
	d	27.3
Tangential (kgm / dm3)	g	28.8
	d	32.2
Maximum crushing strength (kg/cm2)	g	6.27
	d	6.80
End (kg/cm2)	g	6.98
	d	6.20

Side (kg/cm2)	g d	- 6.08
Radial (kg/ cm2)	g d	65.3 91.8
Tangential (kg/cm2)	g d	75.5 102.8
Radial (kg/cm)	g d	49.1 65.7
Tangential (kg/cm)	g d	65.5 84.0
Radial (kg/cm2)	g d	36.0 36.0
Tangential (kg/cm2)	g d	43.0 40.0

CHEMICAL PROPERTIES

Content	
Cellulose	62.9 %
Lignin	24.0 %
Pentosan	16.8 %
Ash	1.0 %
Silica	0.4 %
Solubility	
Alcohol – benzene	3.0 %
Cold water	0.8 %
Hot water	2.6 %
1 % NaOH	10.9 %

DURABILITY AND TREATABILITY

Durability
Bangkirai wood belongs to durability class I – II (III), while its resistance to Cryptotermes cynocephalus light dry wood termites belongs to Class III.

Treatability
Bangkirai wood is difficult to treat.

DRYING

2.5 cm and 4 cm thick Bangkirai boards are kiln dried from 50% to 15% in respectively 6 and 9 days in a drying temperature of 43 degrees Centigrade to 71 degrees Centigrade and a relative humidity of 84% to 38%. Bangkirai wood is difficult to dry as it easily splits, checks, and deforms.

VENEER AND PLYWOOD
Bangkirai wood is unsuitable for veneer and plywood because of its high hardness and specific gravity.

WORKING PROPERTIES

Despite its hardness, bangkirai is not so difficult to work, e.g., with hardened tipped saws or it can be planed smoothly with small cutting angle. Holes should be drilled before nailing to prevent splitting.

USES

Due to its high strength and durability,- bangkirai wood is used for heavy construction under roof as well as in the open, such as bridges, railway sleepers, electric poles, flooring, marine construction, boat building, vehicular bodywork and housing.

SILVICULTURE

Habitat
The species grow together with other dipterocarp species in tropical rain forest with A and B rainfall types, in sandy, old basalt laterite and podzolic soils, primarily in flat land, which Is subject to frequent flooding of fresh water. They may also grow in groups or scattered in the hills at an altitude of up to 400 m.

Regeneration
Natural regeneration is quite good, though it is rather unevenly distributed. Hence, thinning is necessary to stimulate growth. Enrichment planting is helpful in cases of inadequate natural regeneration. Most artificial regeneration uses seedlings from natural forest as the species fruiting season is irregular. Soil packed or bare-rooted seedlings should be about 30 to 50 cm high. Seedlings reaching a height of 75 to 100 cm are still good as strump cuttings. Normal spacing is 3 m by 2 m or 4 m by 3m.

Fruiting
Fruit-bearing season is irregular depending on the climatic conditions. Occasionally the species bears heavily at 3 to 7 year intervals.

Pests and Diseases
Wild boars often damage seedlings in the natural environment.

Data are from Indonesia Wood Atlas Volume I, 1989; Department of Foresty Agency for Forestry Research and Development Forest Product Research and Development Centre Bogor-Indonesia.