

NOTES

DISTRIBUTION OF *RHIZOPHORA STYLOSA* IN PENINSULAR MALAYSIA

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Rhizophora apiculata and *R. mucronata* are widely distributed throughout mangrove forest areas in Peninsular Malaysia. Both species are of economic importance in forestry and fishery industries. Poles and fishing stakes are products from thinning activities in managed mangrove forests. Besides these two commercial species, there is another lesser known species to Malaysian foresters, *Rhizophora stylosa*. There is little information about this species in Malaysia. Also known as *akik jalar* in certain parts of Johore, this third species does not grow extensively in all mangrove areas in Peninsular Malaysia and can only be found in restricted locations (Figure 1).

Rhizophora stylosa has a wide distribution in the Indo-Pacific region. It stretches from Queensland coast to as far as Taiwan (Ding Hou 1960). However, its distribution is very localized and restricted in very specific sites in Peninsular Malaysia. A study was undertaken to locate the distribution of this species. It has been reported that in the peninsula *R. stylosa* was only found in Pulau Langkawi, Melaka and Johore (Kochummen 1989). Other than these areas, our survey carried out in 2001 and 2002 showed that the species is also found in Sg. Kurung Tengar, Perlis (6° 22' N, 100° 08' E), Bagan Lalang mangroves, Sepang, Selangor (2° 35' N, 101° 41' E), Pulau Besar, Melaka (2° 07' N, 102° 19' E), Pulau Burung which is a small rocky island off the coast of Port Dickson (2° 32' N, 101° 47' E), two sites at Sg. Mawar, Endau, Johore (2° 36' N, 103° 46' E; 2° 36' N, 103° 47' E), and Pulau Sibul (2° 12' N, 104° 05' E) and Pulau Tinggi (2° 17' N, 104° 06' E), both islands are off the coast of Mersing, Johore. Over in East Malaysia, it has been reported that this species occurs in Sabah (Madani & Wong 1995).

Rhizophora stylosa grows best in hard sandy soil substrate or even on rocky islands. Its occurrence in muddy areas has rarely been reported. The species is not found in Matang mangrove areas which have soft muddy alluvial soil. Soil samples were collected from Bagan Lalang mangroves where *R. stylosa* was present. The soil was analyzed and results show that this species grows best in areas with higher contents of sandy materials compared with other soil components such as silt and clay (Table 1).

From our study carried out in Pulau Besar we found that *R. stylosa* dominated the mangroves on the island. Almost 95% of the mangroves on the island are of this species. Sandy beaches and rocky cliffs on the island are not suitable for other mangrove species to grow except for a few species that thrive in this kind of habitat including *Bruguiera cylindrica*, *Sonneratia alba* and *Avicennia alba*. These species are classified as true mangrove species. Also found in Pulau Besar are mangrove-associated species such as *Scaevola taccada* (shrub), *Pandanus tectorius* (pandan), *Terminalia catappa* (ketapang) and *Derris trifoliata* (climber/vine).

Rhizophora stylosa is a medium size tree growing to an average height of 8 m. However, a tree exceeding 15 m in height was found in Sg. Kurung Tengar. Individual trees are found to thrive and grow towards the sea front in Bagan Lalang mangroves (Figure 2). These trees have crooked and short stilt roots and bores, allowing it to withstand strong waves and sea current. Further towards inland in the forest stand, *R. stylosa* forms straight bores and good canopy crown. This species shows good growth performance comparable with other mangrove species in Bagan Lalang such as *R. apiculata* and *R. mucronata*.

A special characteristic feature of *R. stylosa* is its ability to produce prop roots from lower branches. *Rhizophora apiculata* and *R. mucronata* do not produce prop roots from branches. Phenotypically, *R. stylosa* species has similarities but could be distinguished from *R. apiculata* and *R. mucronata* (Table 2).

A transect measuring 20 × 200 m was laid out in Bagan Lalang mangroves from the sea front towards inland. All trees measuring > 5 cm dbh (diameter at breast height) were identified, recorded and mapped. For *R. stylosa*, all trees including saplings > 2 m high were recorded and mapped. A total of 470 trees were recorded in the 4000 m² plot. Within this 4000 m² plot, there were 155 individuals of *R. stylosa* > 2 m high and this constituted about 33% of the whole mangrove tree species. The Bagan Lalang mangroves consist of narrow strips of mangrove vegetation along dynamic and unstable coastline. Some parts of the coast show signs of erosion while accretion occurs in other parts of the area.

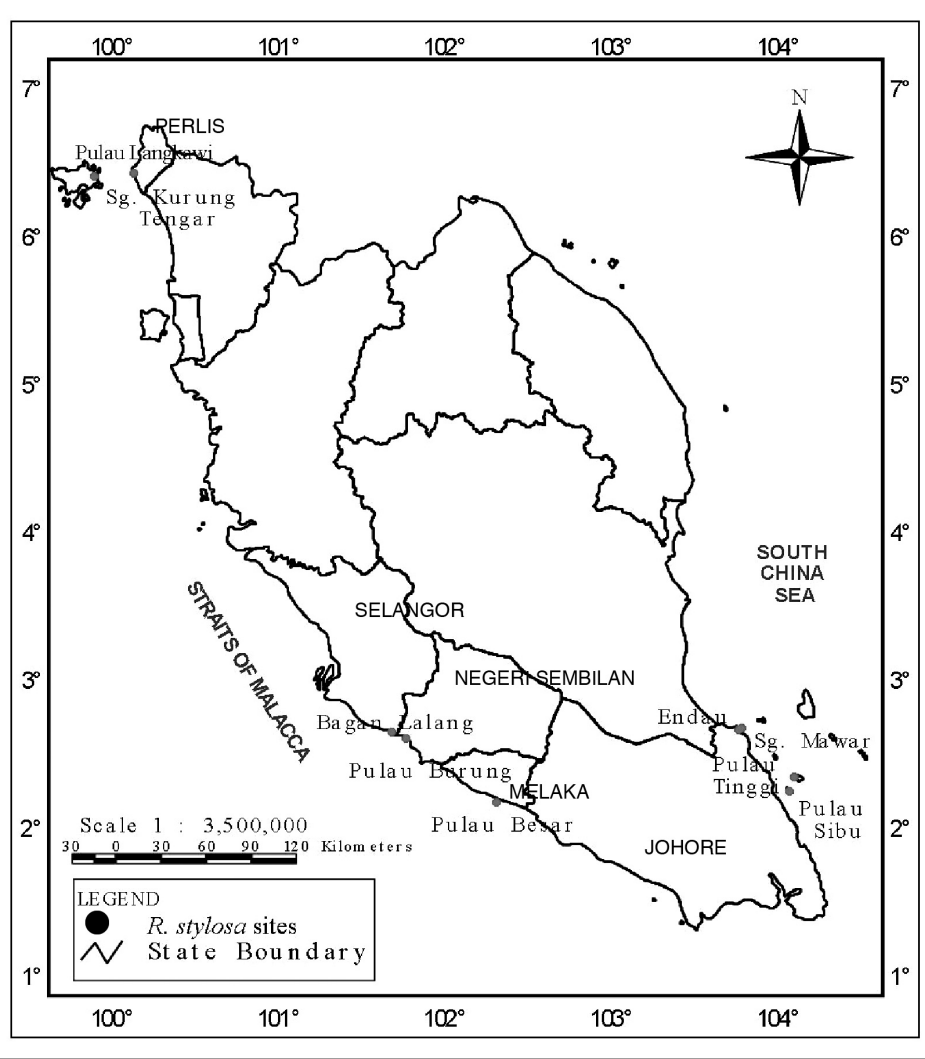


Figure 1 Distribution of *Rhizophora stylosa* in Peninsular Malaysia

Table 1 Characteristics of soil taken from Bagan Lalang mangroves where *Rhizophora stylosa* was found (based on current study)

Sampel	Depth (cm)	Wet pH	Course sand %	Fine sand %	Silt %	Clay %
1	0–25	7.23	5	94	2	2
	25–50	7.48	4	94	0	5
	50–75	7.12	11	81	2	7
	75–100	5.60	10	64	2	19
	> 100	5.56	3	46	42	10
2	0–25	7.55	5	91	2	5
	25–50	7.52	11	71	0	22
	50–75	5.95	3	87	3	5
	75–100	6.42	3	62	22	16
	> 100	7.13	5	79	0	15



Figure 2 Individual tree of *R. stylosa* found towards the seafront in Bagan Lalang coast, Sepang, Selangor

Table 2 Diagnostic, phenotypic and morphological features of *R. apiculata*, *R. mucronata* and *R. stylosa*

	<i>R. apiculata</i> ¹	<i>R. mucronata</i> ¹	<i>R. stylosa</i> ²
Tree	Up to 20 m high	Up to 22 m high	Up to 8 m high
Stilt root	Very prominent, large to support tree crown	Very prominent, large to support tree crown	Numerous in isolated trees at sea front. Quite often lower branches protrude stilt roots into soil substrate to support tree weight.
Bark	Dark grey with shallow fissures	Light grey in colour, large scaly bark	Reddish brown with no fissures
Leaf	Stalk 1.5–3.0 cm, midrib with pinkish tinge at under surface, elliptic oblong to sublanceolate, apex blunt to pointed, clear venation at upper surface, fine black dots at under surface	Stalk 2.5–3.5 cm, midrib pale in colour at under surface, broader and larger, apex pointed, faint venation on upper surface, very prominent black dots under surface	Stalk 2.5–3.5 cm, midrib pale green at under surface, broadly elliptic, apex ends with sharp pointing needle, faint venation at under surface, black dots are smaller but prominent at under surface
Inflorescence	Always with single pair of buds borne on stout peduncle	Longer flower stalks, branch 2 or 3 times, flower buds 4–8 per branch	Branched 2–4 times, 4–8 buds borne on elongated peduncle
Flower	Petals glabrous, stamen sessile, style 1 mm	Petals 4, hairy on the outside, stamens 8, style short	Petals hairy on the outside, stamens with distinct filaments, style 4–5 mm
Fruit	Brown when ripe, 2–2.5 cm	Brown when ripe, bigger and curled a little 2.5–4.0 cm	Brown when ripe, ovate, 2 cm
Propagule	Hypocotyle cylindrical, club-shaped with blunt tip, up to 30 cm	Large hypocotyle, warty and pointed hypocotyle, up to 70 cm	Hypocotyle cylindrical, somewhat warty with pointed tip, up to 30 cm

Sources: ¹ Chan (1996)

² Current study

Rhizophora stylosa is mostly found between 100 and 140 m from the lowest tide and tend to grow in high density within a 20 × 40 m subplot from the sea front. With tidal influence, the area can be classified as

Inundation Class II (Watson 1928). Due to its ability to grow towards sea front site, though in its thriving condition, it may have potential to act as barriers to minimize coastal erosion.

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