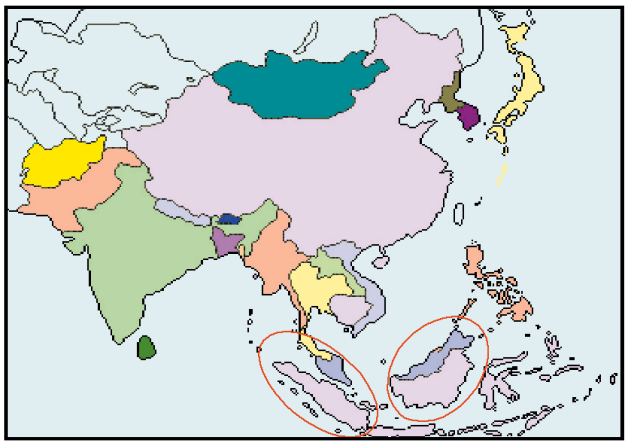
Shorea leprosula Miq.

Family: Dipterocarpaceae

Vernacular names: Malaysia: meranti tembaga (general), meranti pusuh (Sarawak), seraya tembaga (Sabah). Indonesia: meranti tembaga (general), meranti merah, kontoi bayor (West Kalimantan), lempong kumbang (East Kalimantan). Thailand: saya-daeng (general name), kalo khao, pha yom daeng, ta yom (Peninsular Thailand).

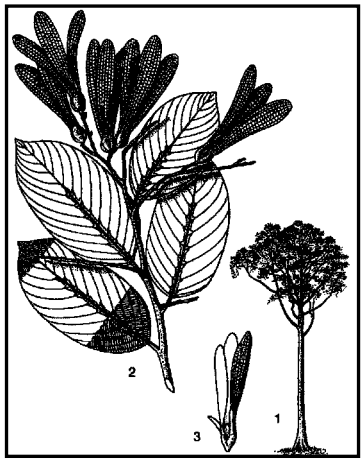
Distribution and habitat: Distributed from Southern Thailand (Pattani), throughout Peninsular Malaysia, Sumatra and to Borneo. It is common on well-drained sites on deep clay soil in lowland dipterocarp forests below 700 m altitude. In Peninsular Malaysia, it is one of the most common and widespread emergent species in lowland dipterocarp forests, lower hill slopes, and valleys in hill dipterocarp forests. It is seldom found on ridges and plantation trials have shown that it grows better in the foothills than on the ridge tops. At Bukit Lagong (Kepong, Malaysia) and Bukit Timah Forest Reserves (Singapore), it is suspected to hybridize with *S. curtisii* at the ecotonal zones.



Distribution restricted to Peninsular Malaysia, Sumatra and Borneo

Uses: S. leprosula is one of the most common light red meranti timbers and has a density of 425-685 kg/m^3. It is valuable for joinery, furniture, paneling, flooring and also used for plywood manufacture. The resin, called 'damar daging' is found between the roots and is used in traditional medicine. The bark is used for tanning.

Description: The trees are readily recognized from a distance by the coppery crown, due to yellow-brown or grey-brown tomentose on the underside of the leaves. A large tree can reach up to 60 m in height and 175 cm in diameter. Buttresses can reach to 1.5 m in height and are spreading and concave. The crown tends to shape as an umbrella, wide-spreading with horizontal branches and persistent leader. The first bole branch can be found as high as 35 m in height. The bark of the tree is light gray to gray brown, smooth when young and aregularly longitudinally fissured with concave ridges in older specimen. Slash inner bark is reddish brown, sapwood is cream-colored and heartwood is light red-brown with conspicuous radial resin canals.



1: tree habit; 2: fruiting twig; 3: fruit.
From: Plant Resources of South East Asia 5:1

Reproductive biology: Flowering behavior is sporadic throughout the year and gregarious at intervals of three to five years. Most of the mature trees in population may flower heavily and synchronously during a general flowering. It is the last species in the flowering sequence of Section *Muticae*. The flowers open in the evening, are strongly scented and are visited primarily by low energetic, common flower thrips (Thysanoptera), mainly of the genera *Thrips* and *Megalurothrips*. The tree is a diploid (2n = 14) and mainly outcrossing. The fruits fall some 14 weeks after flowering. Seed dispersal is mainly gravital and seldom exceeds 50 m from the mother trees.

Ecology: At the lowland dipterocarp forest of Pasoh Forest Reserve in Peninsular Malaysia, the density of *S. leprosula* with diameter > 30 cm is three trees per ha. However, it is much less common in Borneo where it is apparently replaced by *S. smithiana*. In natural habitat, it is dynamic with high seedling mortality and high percentage of recruitment. It requires partial shade for the initial establishment but its later growth responds greatly to light. Spatial distribution studies in lowland and hill dipterocarp forests of Peninsular Malaysia have showed that the species is highly aggregated.

Conservation status and tree improvement: The species has suffered a reduction in population mainly because of timber exploitation. On the International Union for Conservation of Nature and Natural Resources (IUCN) Red List it is categorized as endangered. *In situ* and *ex situ* conservation efforts for the species have been

Fruiting twig: from the fruiting season of dipterocarps year 2000 in Pasoh Forest Reserve, Malaysia. *Photo: S.L. Lee.*

initiated in Malaysia and Indonesia but are still in the infant stage. An International Tropical Timber Organization (ITTO) project has been initiated in Indonesia to increase the genetic diversity of *S. leprosula* for breeding and genetic improvement. Provenance trials using half-sib families of selected plus trees of *S. leprosula* have been reported in Peninsular Malaysia.

Research on genetic conservation: The species produces recalcitrant seeds and normally cannot be stored more than 21 days. Stem cuttings root well; indole butyric acid significantly increases rooting. Tissue culture through *in vitro* techniques has been well studied in this species. A high diversity of ectomycorrhizae is known to be associated with the species in natural forest but there is no conclusive evidence to support that the infection is correlated with growth at the early stage of seedling development. Pests and diseases are rarely reported. An allozyme study throughout Malaysia showed that the species exhibits high levels of genetic diversity and most of the diversity is partitioned within population; *in situ* conservation with more than five strategically placed populations should maintain 99% of their total genetic diversity and initial selection of planting materials for *ex situ* conservation or tree improvement should focus on the central region populations of Peninsular Malaysia with high genetic diversity within populations. Spatial genetic structure studies in lowland and hill dipterocarp forests of Peninsular Malaysia showed that it is highly structured. Twenty highly polymorphic microsatellite markers have been developed for the species and ready to be used for paternity analysis and genome mapping. Direct estimation of gene flow in lowland dipterocarp forest of Peninsular Malaysia showed that the pollen flow of the species is moderately extensive (mean pollen flow distance = 298.7m) and the mean breeding unit size was estimated to be 224.3 individuals. The impacts of logging on genetic diversity of *S. leprosula* are extensively studied in lowland and hill dipterocarp forests of Peninsular Malaysia; preliminary results show that logging activities significantly reduces the levels of genetic diversity. Simulation studies show that reduction in the level of genetic diversity is exponentially associated with the percentage of individuals removed and removal of individuals in clump reduces the level of genetic diversity more drastically than removal of individuals at random.

Agencies active in genetic conservation of this species: Forest Research Institute Malaysia (Malaysia); Forest Department of Peninsular Malaysia (Malaysia); Forest Department of Sarawak (Malaysia); Forest Department of Sabah (Malaysia); Universiti Putra Malaysia (Malaysia); Gadjah Mada University (Indonesia); Biotechnology and Forest Research and Development Centre (Indonesia).

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