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**Reproductive Biology of Some *Shorea*
Species (Dipterocarpaceae) in Sri Lanka**

by

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Thesis

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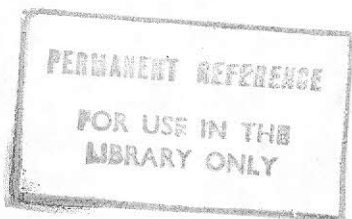
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ABSTRACT

Reproductive biology of Shorea cordifolia (Thw.) Ashton, S. disticha (Thw.) Ashton, and S. trapezifolia of section Doona and S. stipularis Thw. of section Anthoshoreae of the highly speciose tropical tree family Dipterocarpaceae was studied with the aim of gathering information for conservation and domestication of fast depleting forest resources. It is expected that such a study will contribute to a better understanding of the mode of speciation prevalent among rainforest trees.

All Shorea species studied were evergreen and flush intermittently. S. disticha and S. cordifolia showed brief, synchronous leaf flushing in May/June and October/November. Although flushing of S. trapezifolia appears continuous at the level of population, it is mainly due to asynchronous behaviour of individuals and prolonged duration of new growth.

All Shorea species studied flowered annually. Populations of S. trapezifolia flowered 4-5 times, S. stipularis 1-3 times and S. cordifolia and S. disticha only once per year. Three flowering seasons, March/May, June/July and September/December have been recorded. Among them March-July flowering appears as general flowering of Dipterocarps in Sri Lanka, when most of the species as well as most of the individuals in each species come into flower.

Flowering of different closely related Shorea species of section Doona was staggered with a certain amount of overlapping, but peak flowering of them did not coincide. However, flowering among conspecifics was highly synchronized. Two morphologically distinct varieties of S. stipularis flowered at different times of the year without overlapping.

Although the stimulus for flowering is not clear, individuals of S. trapezifolia came into flower one month after the increase in night temperature (23°C) and persisted at least for a week subsequent to a long duration of low ($<22^{\circ}\text{C}$) night temperature.

Populations of Shorea species in selectively logged as well as in undisturbed forest flowered concurrently. Flowering of S. trapezifolia and S. stipularis was always preceded by flushing and inflorescences were borne on twigs with young flush. In contrast to this, inflorescences of S. disticha and S. cordifolia arise in twigs with mature leaves and not associated with flushing.

Morphologically the inflorescences and flowers of all Shorea species of section Doona studied were similar except for differences in their size. Individual flowers of Shorea species of section Doona emanate pleasant fragrance and are adapted for bee pollination with slightly sticky yellow orange pollen grains. Anthesis occurs in the morning (0630-0700h) accompanying anther dehiscence. Corolla together with stamens are shed in the same afternoon. Exudates on petals, possibly "nectar" was present.

Flowers of S. stipularis have an urceolate corolla with creamish white stamens. Sizes of floral parts and inflorescence were larger in variety "B" than variety "A".

Wide array of insects foraged on flowers of Shorea species, section Doona but Apis dorsata and Apis indica were found to be the effective pollinators.

Crossing as well as selfing yielded successful fruiting in S. trapezifolia and S. cordifolia but in S. disticha selfing failed to set fruits. Crossing success was always much higher than selfing success. Highest self-compatibility was observed in S. trapezifolia. Potential level of outcrossing/selfing varied widely among individuals and the proportion of flowers that set fruits was positively related to the degree of self compatibility of the individual.

Fruit size was variable among different populations of S. trapezifolia. Growth rate of the wing was high during the early stages of fruit development and maximum size was attained during the first two months. Fruit losses during initial 30-40 days of development was higher than later stages.

Fruits are mainly dispersed by wind and dispersal was found to be relatively inefficient. Although fruits of S. cordifolia and S. disticha were predated by birds and mammals, it was not evident in S. trapezifolia. Larvae of the family Gelechidae and

Ichneumonidae were found to predate on S. trapezifolia fruits. However, they do not adversely affect germination or subsequent establishment.

Seeds of Shorea species studied lacked dormancy and percentage viability was found to be upto 100% in S. trapezifolia. Seeds remain viable for two weeks when they were stored under room temperature.

Germination success of S. trapezifolia seeds in fernland, Pinus plantation and natural forest soils under light and shade conditions was similar. Although establishment of S. trapezifolia seedlings under these three soils was similar, it was significantly different between light and shade treatments with less success under full sunlight.

The continuous flushing, prolific annual fruiting, absence of seed predation, good germination and establishment even in selectively logged sites makes the plywood timber species S. trapezifolia one of the most promising species for silvicultural development both in degraded forests as well as in Pinus plantations.