Dipterocarpus turbinatus Gaertn.

M.K. HOSSAIN and T.K. NATH
Institute of Forestry and Environmental Sciences
Chittagong University, Bangladesh

DIPTEROCARPACEAE (DIPTEROCARP FAMILY)

Dipterocarpus laevis Buch. Ham., *Dipterocarpus jourdainii* Pierre., *Dipterocarpus turbinatus* Dyer

Garjan, gurjan, gurjank uroisal, kaligarjan, kanyin, kanyin wettaung, kanyinni, kherjong, kur oil, kural sal, shweta garjan, tekigurjan, telya garjan, tikya gurjan, tilia gurjan, toligarjan (Brandis 1906, Das 1980, Gamble 1922, Joshi 1980, Regional Office for the Asia and the Pacific 1985, Troup 1921)

Dipterocarpus turbinatus is generally found in the tropical semievergreen, tropical wet evergreen, and tropical moist deciduous forests of Bangladesh, Myanmar, India, and Malaya Peninsula (Champion 1936). Of the 80 species in the genus growing primarily in the Indo-Malayan region (Joshi 1980), four grow in the hill forests of Bangladesh (Das 1980). In Bangladesh the species is scattered in the tropical wet evergreen forests and tropical semievergreen forests of Chittagong, Chittagong Hill Tracts, Cox's Bazar, and Sylhet (Champion 1936, Das 1980) in association with *D. gracilis* Blume, *Chukrassia tabularis* A. Juss, *Hopea odorata* Roxb., *Salmalia insignis* Schott & Endl., etc. In Myanmar, the species has a comparatively wide distribution in tropical semievergreen forests and tropical moist deciduous forests (Champion 1936) in association with *D. alatus, Mangifera* spp., *Syzygium* spp., *Lagerstroemia* spp., *Amoora* spp., *Sterculia alata, Garcinia* spp., *Hopea odorata, Artocarpus chaplasha, Artocarpus lakoocha,* and others, often with an undergrowth of various palms and canes (Troup 1921). In India, the tree is primarily found in the Cochar tropical evergreen forest, Cachar tropical semievergreen forest, Andaman tropical evergreen forest, and Andaman semievergreen forest (Champion and Seth 1968). In Andamans, *D. turbinatus* is found in association with other dipterocarps, including *D. griffithi* Miq., *D. alatusi* Roxb. & G. Don, and *Hopea odorata* with *Artocarpus chaplasha* Roxb., *A. gomeziana* Wall., *Calophyllum spectabile* Willd., *Terminalia bialata* F. Villar, and other trees; and with a dense undergrowth of canes, climbers, and climbing bamboos (Troup 1921). In Tripura, the species occurs sporadically, mixed either with *Shorea robusta* Gaertn. or miscellaneous evergreen and deciduous species, and sometimes occurs in small, pure groups (Joshi 1980).

Dipterocarpus turbinatus is a slow-growing, lofty, evergreen hardwood tree attaining 50 m in height and 159 cm d.b.h. with a clean, cylindrical bole and elevated crown. The species grows in soils that vary from clay to clayey loam on level ground and from sandy loam to coarse sand on hilly ground. Soil pH can range from 4.9 to 5.8. The species grows primarily in the northern and eastern aspects between 15.2 and 457.2 m. In the natural habitat of *D. turbinatus*, the temperature varies from 15.6 to 40.6 °C, and the rainfall varies from 1520 to 5080 mm.

Dipterocarpus turbinatus is basically a timber tree with a specific gravity of 0.655. Sapwood is greyish or brownish white; heartwood is reddish brown with lighter, interrupted, tangential lines (resin canals) at irregular and relatively close intervals, a fairly straight or somewhat interlocked grain, and an even or coarse texture (Regional Office for the Asia and the Pacific 1985). The lumber is moderately easy to air-season but seasons somewhat slowly. To accelerate the seasoning process, the timber is partially air-seasoned and then kiln-dried. The lumber is not durable under exposed conditions and lasts much longer under cover or when treated with preservatives. It is easy to saw and work and polishes well, although it requires a good deal of filling (Chowdhury and Ghosh 1958, Gottwald and Parameswaran 1966, Pearson and Brown 1932). The lumber produces a popular, commercial grade plywood. It is also used as rafters, beams, and planking. In Bangladesh, the lumber is used primarily for railway ties and boat building (Das 1980). In Myanmar, it is popular for dugout canoes (Gamble 1922). After treatment with a preservative the logs make acceptable transmission poles (Joshi 1980). The tree's oleoresin (processed garjan oil) is applied externally to treat ulcers, ringworm, and other cutaneous infections. It is also

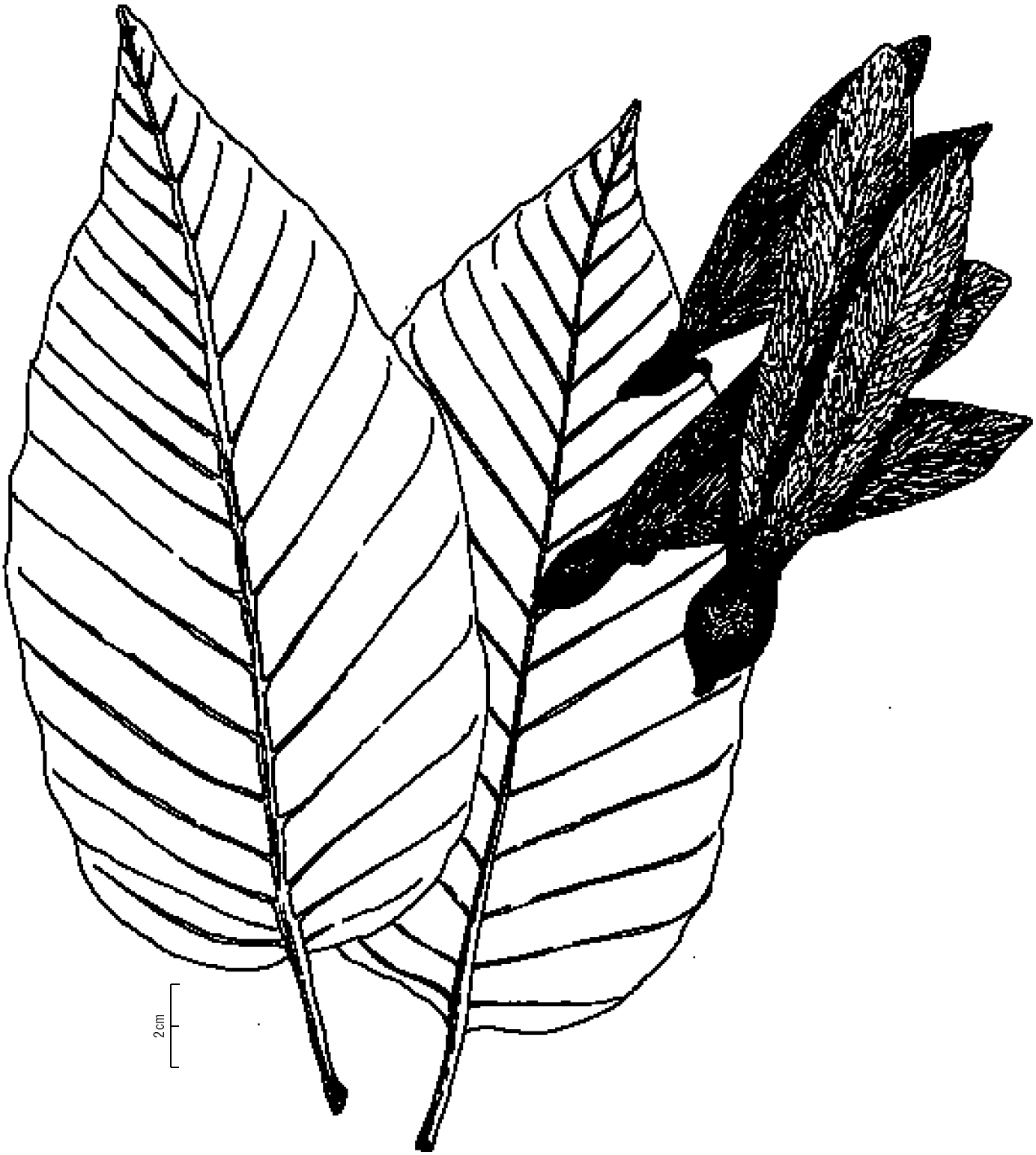
used to stimulate mucous surfaces and as a diuretic (Kirtikar and Basu 1918, Martindale 1958).

Flowers appear from January through March and occasionally up to April. Flowers are 3 to 3.5 cm long, white or pinkish, and emerge in a few flowered racemes from the axils of fallen leaves. Fruiting occurs in May and June. Fruits swell to 2 to 2.8 cm in diameter and 2.8 to 3.5 cm in length and can be recognized easily because two of the five calyx lobes are enlarged into wings (Gamble 1922, Troup 1921). Fruit ripens and falls from about the middle of May to the middle of June. Seeds have a hygroscopic, spongy, thick, dome-shaped part of the pericarp located just above the embryo (Banik 1980).

The tree's height usually discourages manual collection. Before collection, the ground should be cleaned and all seeds removed. Seeds should be collected daily as they fall to reduce insect attack. In Bangladesh, seeds should be collected between the last week of May and the first week of June and should be sowed within 10 days of collection (Haque and others 1984) because they do not store well. Seeds average about 154 per kg (Chowdhury 1975, Joshi 1980).

The seeds do not require pretreatment. Germination of the seeds is hypogeous. Sowing time and position determine germination success. Straight seedlings and 82.2-percent germination resulted within 3 to 10 days when the seeds were sowed in horizontal, half-buried conditions (Banik 1980). High survival rates in the field are attained when seedlings are grown in containers such as polyethlene bags.

Dipterocarpus turbinatus has been raised in the nursery and outplanted in regeneration areas. Line sowing is recommended if sufficient seeds are available. Shading is unnecessary in the nursery. Seedlings 15 cm high with a ball of earth are outplanted in the regeneration areas during the rainy season. To attain satisfactory survival rates, seedlings must be outplanted immediately after removal from the nursery beds. *Dipterocarpus turbinatus* also propagate by air layering (Rashid and Serajuddoula 1984) and clonal propagation (Smits 1993, Zabala 1994). Because the species is extremely sensitive to fire, adequate fire protection measures must be adopted (Blanford 1915, Homfray 1935). Some larvae, primarily of the order *Lepidoptera,* bore into *D. turbinatus* seeds and fruits (Joshi 1980).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