Styrax tonkinensis

(Pierre) Craib ex Hartwich

Styracaceae

siam benzoin, gum benjamin

LOCAL NAMES

Chinese (an xi xiang); English (benzoin); French (saigon benzoë); Lao (Sino-Tibetan) (may tsi yong may nhan,phung,nhan ngwa,nhan mok,nhan khan thung); Thai (kam yaan); Trade name (siam benzoin,gum benjamin); Vietnamese (bo de,canh kien trang,mu khoa deng,nhan,kam yaan)

BOTANIC DESCRIPTION

Styrax tonkinensis is a tree up to 25 m tall and 30 cm in diameter with a clear bole for about 18-19 m. It is light branching, the branches upright towards the top. Young trees have a dense crown. The root system is shallow and as the tree ages, the tap root disappears. The bark is generally grey, smooth, and 6-9 mm thick when young, becoming brown and rough with longitudinal fissures with age.

Leaves simple, alternate, ovate to elliptical, light acuminate, 4.5-10 cm long by 2.6-5 cm wide and characteristically dark green and smooth on the upper surface and hairy and whitish green on the lower side. Petioles are 6-10 mm long.

Flowers bisexual and white in up to 18 cm long; inflorescences in double racemes in the upper axils of the leaves or at the terminal part of the shoot. They have a leafy base covered with yellowish stellate hair; the caducous bract and linear bracteoles are very hairy. The inflorescence is comprised of many small flowers, 12-15 mm long with 3-5 pedicels. The cup-shaped calyx is 3-4 mm long, densely covered with yellowish stellate hair on the outside and whitish hair on the inside, with 5 short lobes. The 8-12 mm long corolla has a 2.5-3 mm tube, five 6-8.5 mm x 2-3 mm overlapping lobes, felted with yellowish stellate hair on the outside, interspersed with simple hair on the inside.

Fruits ovoid, 10-12 mm long and 5-7 mm wide, covered with greyish stellate hair, dehiscent through three valves. ; pericarp thin, about 1 mm; seed one, rarely two per fruit.

Seeds three-angled, 6-10 mm long, with a warty, hard, thick, orange coloured episperm.

The genus Styrax (family Styracaeae) consists of about 120 species of trees and shrubs. The specific epithet is derived from the term 'Tonkinese', which means a native of The Gulf of Tonkin (a body of water that lies on the East Coast of North Vietnam and the West Coast of the island Haina).

BIOLOGY

S. tonkinensis is a semi-deciduous tree that sheds many of its leaves during the cool, dry season between November and February. Old trees shed more leaves than young trees. Flowering and fruiting time varies with location. The trees begin to flower when they are 4-5 years old. The flowering (which depend on location), usually occurs during April-June and the fruits mature from July to November.

ECOLOGY
S. tonkinensis is found in the secondary rainforests with medium to high altitudes. It is a light-demanding pioneer species that can quickly invade gaps in the forest. Under favourable, conditions, it often occurs in the upper storey and can occupy many hectares as almost pure stands. Associated species in secondary forests include Cinnamomum cassia, Quercus sp., Melia azedarach and Toona ciliate. In cultivation, however, it performs well with only 1300 mm rain/year and 3-6 dry months. It can survive extreme low temperatures of -4°C and high temperatures 45°C for brief periods

BIOPHYSICAL LIMITS
Altitude: 150-2 100 m
Mean annual temperature: 15-26ºC
Mean annual rainfall: 1 500-2 200 mm

Soil type: The prevalent soil texture is clay-loam with a higher portion of loam in the upper soil layers with medium to high-level organic matter (> 2.0%). The soil is acidic with a pH below 4.5 and a very low base saturation.

DOCUMENTED SPECIES DISTRIBUTION

Native: Laos, Vietnam
Exotic:

The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to your planting site.

PRODUCTS
Food: Benzoin's principal role in foods is as a flavouring agent in chocolate bars, ice cream, milk products, syrups and other products.

Fodder: Young trees are browsed by cattle

Fuel: Wood from thinnings is generally used as firewood.

Timber: The wood is light and soft with a density of 410-450 kg/m3 (at 15% moisture) and not suitable for construction. In Vietnam it is an important source of wood fibre for the pulp and paper mills and yield and quality of the pulp is comparable with many commercial pulpwood species. It is also used to make wooden shoes, pencils, chopsticks, toothpicks and matches. Wood from thinning is generally used as poles.

Gum or resins: The resin tapped from the tree trunk is of high quality and suitable for use by the perfume industry. The resin is commercially known as `Siam benzoin'. The benzoin resin is characterized by its content of benzoic acid (10-12%), coniferyl benzoate (65-70%) and more than 20 other aromatic esters. Benzoin resin absolute is thick, brownish-yellow oil with a sweet, balsamic odor and a hint of vanilla. Benzoin is used in the manufacture of fragrances which are then compounded and employed in a wide range of end-products which includes personal health care products such as toilet soap, shampoo, body lotion and cream, bath oil, aerosol and talcum powder, and household and other products such as liquid soap, air freshener, fabric softener, washing detergent and other cleaning agents.

Medicine: Siam benzoin is used in modern pharmaceuticals as an inhalant with steam for the relief of cough, laryngitis, bronchitis and upper respiratory tract disorders or as a mild antiseptic. Also, benzoin extract is used in Purol, a well-known antibacterial powder used to freshen and soothe dry skin and ameliorate skin allergies. It is used in traditional medicine in China to treat rheumatism, coughs, colds, stomach ache and heart burn: it has also been used in the treatment of apoplexy, dizziness, convulsions and glycosuria. A rose and benzoin combination is a pleasant, soothing scent, comforting and warming.

Other products: The sweet fragrance has been used in incense blends for years

SERVICES
Erosion control: The species is used to restore eroded soils and provide green fire belts where it has been introduced

Shade or shelter: In Vietnam, it is sometimes planted to provide shade in tea plantations

Reclamation: It was used to restore eroded soils

Boundary or barrier or support: It is planted to provide green fire breaks in Guinea in West Africa

Intercropping: alley-cropping system with rice and peanuts inter-planted between rows of styrax seedlings have been tried in Laos

Other services: Although the market has decreased, it is still an important contribution to the local economy for people in the highlands of Laos

TREE MANAGEMENT
In Laos, natural regeneration of S. tonkinensis is a function of the shifting cultivation cycle without any systematic silvicultural treatments. Old regrowth styrax forest is cleared and burnt at the end of the dry season. Upland rice is sown at the beginning of the rainy season, normally in April or May. The styrax fruits, which fall during the clear felling, germinate in the rainy season and the dense seedling growth is thinned to about 500-600 stems/ ha during weeding. After the rice harvest, the plot is left untended and becomes very dense with a diversity of undergrowth competing with the styrax trees. The benzoin tapping from styrax trees is initiated in year 6-7 and continues for 3-4 years or until production declines. The whole stand is then cleared and another cycle of regeneration begins.

The age at which old re-growth forests is cleared for rice cultivation has been greater than 10 years, sometimes up to 14-15 years. This tradition has gradually changed due to rapid population growth and the pressures exerted by villagers who need land for rice cultivation. Now more often, styrax forests are cleared at a much younger age and before the trees reach their full potential age for benzoin production, i.e. 7-8 years old. Often stands as young as 5 years old are cleared. This results in the loss of an important source of household income from benzoin tapping. However, in more remote areas, this change is less predominant.

Stands of S. tonkinensis are established either by natural regeneration or artificial planting (both direct sowing and planting containerised stock). Site preparation includes clearing and burning of ground vegetation. For direct sowing, 5-6 seeds are placed in each hole. Planting density varies within the range of 1600-3300 seedlings/ha, depending on the soil fertility and end use of the wood product.

In the first two years, styrax plants are ideally kept free of weed competition by regular removal of adjacent ground vegetation. For older plantations, maintenance generally consists of clearing climbers and unwanted surrounding vegetation on an as-needed basis.

To promote early growth and a uniform plantation tree population, fertilizer application is necessary. Nitrogen fertilizer is applied immediately after out-planting to help the new seedlings establish themselves within the shortest possible time. The recommended application rate is 60 g N of fertilizer per tree, divided into three applications of 20 g each.

Thinning forms part of the routine management in styrax plantations because of the high initial stocking rate at establishment. 2-3 thinnings may be required before the plantation reaches the minimum rotation age of 10 years. Final stocking density is generally 600-800 stems/ha. Pruning is not necessary owing to the excellent self-pruning characteristics of this species.

S. tonkinensis is fast growing and under favorable conditions can attain annual height increments of 3 m during the first three years. A mean height of 18-25 m and DBH of 20-24 cm are obtainable at 10 years. Such growth would give a wood yield of about 150 m3/ha based on final stand densities of approximately 600-800 stems/ha.

GERMPLASM MANAGEMENT
The seeds are ripe and ready for collection when the fruits have changed from green to yellow, have cracks on the surface, the seed-coat is hard and black and endosperm white, firm with a bitter taste. The fruits can be collected from the tree or by shaking the branches over tarpaulins. Collection from the ground of fruits that have been shed naturally is not recommended. A fully mature tree can produce up to 40 kg of fruit annually.

To extract the seeds, the fruits are dried slightly in the shade for 2-3 days and then macerated by hand. 2-3 kg of fruits contain 1 kg seed. Seeds that are immature can be after-ripened. The fruits are placed in 30-40 cm layer in trays in the shade for 5-6 days and every day turned over for aeration. When the pericarp has turned yellow or grey, the seeds are extracted and then dried in the shade for 4-5 days.

The seed storage behaviour is intermediate. The seeds can be stored for 1 year in sealed PE bags at 20° C, with a moisture content on 18-20%. There are 7000-9000 seeds/kg.

PESTS AND DISEASES
A defoliator, Fentonia sp. (Lepidoptera: Notodontidae), is reported to damage thousands of hectares of S. tonkinensis plantations in Viet Nam. The stems of young plants in newly established plantations are bitten off by crickets (Tarbinskiellus portentosus). Seedlings in the nursery are susceptible to damping off. Control by chemical sprays has been recommended during the outbreak. Soil cultivation around the trees in young plantations not only reduces weeds, but also kills up to 90% of Fentonia pupae.

FURTHER READNG

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SUGGESTED CITATION

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