Sesbania grandiflora (L.) Poiret

Fabaceae - Papilionoideae

LOCAL NAMES
Bengali (agusta,bake,bak,bagphal,agati); Creole Patois (pwa valet,pwa valye); English (flamingo bill,grandiflora,Australian corkwood tree,August flower,sesban,agati sesbania,West Indian pea,white dragon tree,vegetable-humming bird,agathi,tiger tongue,swamp pea); Filipino (pan,gauai-gauai,katurai,katuday); French (pois valliere,pois vallier,colbri vegetal,papillon,fleur papillon,fagotier,pois valette); German (Turibaum); Gujarati (agathio); Hindi (basna,bak,chogache,basma,agasti,hatiya,daincha); Indonesian (tuwi,turi,toroy); Italian (sesbania); Khmer (ângkiëdèi); Lao (Sino-Tibetan) (kh'ê: kha:w); Malay (petai belalang,kacang turi,sesban getih,sesban); Nepali (agasti); Sanskrit (agasti,agati,anari); Sinhala (murunga,kathuru); Spanish (paloma,cresta de gallo,baculo,zapaton blanco,gallito,pico de flamenco); Tamil (peragathi,agati,agathi); Thai (kae-ban,khae,ton kae); Vietnamese (so dua)

BOTANIC DESCRIPTION
Sesbania grandiflora is a small, loosely branching tree that grows up to 8-15 m tall and 25-30 cm in diameter; stems tomentose, unarmed; roots normally heavily nodulated with large nodules; the tree can develop floating roots.

Leaves alternate and compound; pinnate, 15-30 cm long with 12-20 pairs of oblong, rounded leaflets, 3-4 cm long and about 1 cm wide; leaves borne only on terminal ends of branches; leaves turn bright yellow before shedding.

Flower clusters hanging at leaf base have 2-5 large or giant flowers; pink, red or white, pealike, 5-10 cm in length, curved, about 3 cm wide before opening.

Pods long and narrow, hanging down 30-50 cm by 8 mm; septate, wide, flat, with swollen margins and about 15-40 pale-coloured seeds; seed is beanlike, elliptical, red brown, 6-8 in a pod, 3.5 mm, each weighting 1 g.

The generic name is derived from an Arab word for one of the species, S. sesban. The specific epithet means large-flowered in Latin.

BIOLOGY
The large-flowered hermaphroditic species appears to be pollinated by birds. S. grandiflora is able to produce ripe pods 9 months after planting. The tree has a life span of about 20 years.

Sesbania grandiflora flowers (Jerry E. Adrados)

(Chris Gardiner)

Flowers (edible) and foliage on trees at Dodangolla, Sri Lanka (Anthony Simons)

ECOLOGY

S. grandiflora is well adapted to hot, humid environments. It is a lowland species that lacks tolerance for cool temperatures (below about 10 deg. C). It has an outstanding ability to tolerate waterlogging and is ideally suited to seasonally flooded environments. When flooded, it initiates floating, adventitious roots, and protects their stems. It seems to prefer a bimodal rainfall distribution, growing rapidly during the wet season, but is capable of withstanding prolonged dry seasons of up to 9 months. It is not wind resistant. It is commonly seen growing on rice bunds, along roadsides, in home gardens and in mixed croplands.

BIOPHYSICAL LIMITS

Altitude: 0-1 000 m, Mean annual temperature: 22-30 deg. C, Mean annual rainfall: (800) 2 000-4 000 mm

Soil type: It can be grown on a wide range of soils including those that are poor and waterlogged. It tolerates saline and alkaline soils and has some tolerance to acidic soils down to water pH 4.5.

DOCUMENTED SPECIES DISTRIBUTION

Native: Australia, India, Indonesia, Malaysia, Myanmar, Philippines

Exotic: Benin, Burkina Faso, Cameroon, Chad, Cote d'Ivoire, Cuba, Djibouti, Dominican Republic, Eritrea, Ethiopia, Gambia, Ghana, Guadeloupe, Guinea, Guinea-Bissau, Haiti, Kenya, Liberia, Mali, Martinique, Mauritania, Mauritius, Mexico, Nepal, Niger, Nigeria, Puerto Rico, Senegal, Sierra Leone, Somalia, South Africa, Tanzania, Togo, Uganda, United States of America

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: Leaves, seeds, pods and flowers of S. grandiflora are edible. Flowers are the most widely used part, and white flowers are preferred to the red. In the Philippines, unopened white flowers are a common vegetable, steamed or cooked in soups and stews after the stamen and calyx have been removed. The raw flowers are eaten as salad in Thailand. Young leaves are also eaten, usually chopped fine and steamed, cooked or fried. Tender pods are eaten as string beans.

Fodder: Leaves and pods are valued for fodder. The tree produces leaves for fodder within 4 months of establishment. The leaves contain 36% crude protein (dry weight) and 9600 IU vitamin A in every 100 g. For fodder production, the tree is cut when 90-120 cm tall (1.8 kg) and fed to animals in a rice straw diet. This regime showed growth increases comparable with those obtained by feeding formulated diets. The most effective method of feeding the fodder to ruminants is to supplement with it up to 15-30% of the total diet. Because of its high protein content, S. grandiflora should not be solely fed to animals but should be combined with a roughage that is low in protein and high in energy, such as rice or maize straw. Intake of low-quality feed materials can be increased by supplementing them with S. grandiflora fodder. The fodder can be fed fresh, wilted or dried. The dried fodder can be stored and saved for times of shortage; for example, in Indonesia it provides 70% of the diet of cattle and goats during the dry season. Forage production of 4.5-9.1 kg/ha per year could be expected. S. grandiflora leaves are toxic to chickens and should not be fed to them or other monogastric animals. The fruit is also used as forage.

Fuel: The wood is rather light and not highly regarded as a fuel because it smokes excessively when burning. Having a weight of only 500 kg/square m, it burns rapidly without much heat. But its fast growth and availability within a year of planting make it a locally popular fuelwood. The wood should be well dried, as it deteriorates in storage and becomes corky, dusty and unfit for burning. Its calorific value is 17.91 MJ/kg, with a high ash content (6%) and low percentage of carbon (11.7%).

Fibre: At a very short rotation of 3-4 years, S. grandiflora is capable of producing much higher cellulose raw material per unit area than most other pulp woods. Even trees 3-4 years old can be pulped without debarking and are suitable for chemical pulping for use as cheap printing, writing, magazine and newsprint paper. The fibres are short. Fibre can also be blended with long-fibred bamboo pulp in suitable proportions to give good strength. On a 3-year rotation, about 41 t/ha per year of pulp can be harvested.

Timber: The density of the wood increases with age, and the timber from 5 to 8 year-old trees can be used in house construction or as craft wood. The trunk has been used for poles but may not last long due to rot and insect infestation. The light wood is used in floating fishing nets.

Gum or resin: Bark exudate and seed endosperm gums are produced. The clear gum from the bark is used in foods and adhesives as a substitute for gum arabic. The bark yields tannins.

Medicine: Crushed leaves are applied to sprains and bruises of all kinds. A tea made from the leaves is believed to have antibiotic, anthelmintic, antitumour and contraceptive properties. The bark is considered as a tonic and an antipyretic, a remedy for gastric troubles, colic with diarrhoea and dysentery. A bark decoction is taken orally to treat fever and diabetes. Juice of flowers put in the eyes is said to relieve dimness of vision. The leaves also have medicinal value and are reported to cure night blindness in cattle. In India, all plant parts are reputed to cure night blindness. The root is a well-known medicine for malaria.

Leaves and flowers are used as poultices. The principal medicinal effects are due to the tree's astringency, hence it is used against inflammation, venom and other poisons, bacterial infections and tumors. Root juices are used for poultices and the leaves are applied for rheumatism, swellings, bruises and itching. For systemic disorders, decoctions are taken internally. Root resin, mixed with honey, is taken orally for phlegm and root juices are taken as an expectorant. Sinus congestion is reduced by taking a flower decoction.

SERVICES
Shade or shelter: S. grandiflora has been used to shade nurseries and some crops such as coffee, tea and cocoa, and as windbreaks for citrus, banana and coffee.

Reclamation: S. grandiflora is ideal for rehabilitating eroded hills.

Nitrogen fixing: S. grandiflora has excellent root nodulation and hence fixes nitrogen, although this ability may be suppressed by nematodes or high acidity of the soil.

Soil improver: Fruits, falling leaflets and flowers make excellent green manure or mulch and improve soil fertility. It is a well-suited annual for dense planting, growing for short periods and ploughing under to improve soil before planting food crops.

Ornamental: S. grandiflora is widely planted for beautification because of its giant showy flowers and long pods.

Boundary or barrier or support: S. grandiflora can be used as a living fence or a live support for crops such as vanilla and pepper.

Intercropping: Crops continue to grow well when interplanted with S. grandiflora, as its open canopy allows sunlight to pass. However, the species shows a mortality of up to 80% when coppiced.

TREE MANAGEMENT
The species is very fast growing, hence does not live long and can be harvested on a 3-year short rotation. The growth rate depends on type of soil, cultural practices and amount of water available, which can be supplemented by irrigation. S. grandiflora plantations have reached 3.2 m in 9 months when raised in loamy soils, but only 1.8 m in sandy soils. In well-drained, deep loamy soils, plantations raised at 0.9 x 0.9 m can yield 4 t/ha per year. In Indonesia, 20-25 cu. m/ha per year of wood yields have been obtained. Studies on biomass production at different sites found that best production was at the riverside (65.1 kg/tree at 3.5 years of age); under silvopasture, it was 20.5 kg/tree, and by canals 10.2 kg/tree. The height growth is extremely fast in the 1st year; it slows down considerably in the subsequent 1-2 years, but the diameter growth rate does not slow down.

S. grandiflora will not tolerate repeated cutting of the main stem above a certain height. Intensive harvesting, such as managing for a hedgerow, shortens the life of the tree. A suitable system involves cutting for fodder only the side branches of trees, leaving the main growing stem untouched. When the foliage is no longer within easy reach, the trees are felled and the long, straight pole can be used for firewood or construction. Under irrigation it grows well, and when grown in backyards the tree normally grows well as it gets waste water from the kitchen. For fodder production, S. grandiflora can be grown individually in gardens, house lots and mixed planting. It can also be planted in fence lines, field borders, rice paddy bunds and irrigation ditches.

GERMPLASM MANAGEMENT
Seed storage is orthodox. Due to the lack of a seed coat, if viability is to be maintained, the species should be stored in sealed containers at a temperature of 4 deg. C or less and mc of less than 10%. Viability can also maintained for 2 years in open storage at room temperature. Seed weight is 17 000-30 000 seeds/kg.

PESTS AND DISEASES
A major problem in raising S. grandiflora is its susceptibility to severe pest attacks. Major pests are leaf webbers, leaf feeders and stem borers. In India, the stem borer Azygophleps scalaris has caused some damage. Larvae of the insect Bruchophagus mellipes infest and damage seeds. Susceptibility to nematodes has been reported. Reports on the fungus Pseudocercospora sesbaniae (grey leaf-spot) are only from India, as is the occurrence of the sesbania mosaic virus.

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SUGGESTED CITATION

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