Calliandra calothyrsus

Meissner

Fabaceae - Mimosoideae

LOCAL NAMES
English (red calliandra,kalliandra merah,calliandra); French (calliandre,calliandra); Indonesian (kaliandra); Malay (kaliandra); Spanish (palo de ángel,Cabello de ángel); Swahili (mkaliandra)

BOTANIC DESCRIPTION
Calliandra calothyrsus is a small, thornless, often multistemmed shrub. Under optimum conditions it can attain a height of 12 m and a trunk diameter of 30 cm, but its average height is 5-6 m and diameter 20 cm. Bark colour varies from white to dark red-brown and is normally glabrous but occasionally can be finely pubescent. It has both superficial and deep-growing roots. Sometimes a taproot is formed.

Leaves alternate, petiolate, bipinnately compound, 10-19 cm long and without an upper waxy sheen. Pinnae vary in number from 6 to 20 pairs and possess 19-60 pairs of linear, acute or obtuse leaflets.

Flowers in a subterminal inflorescence with numerous long, hairlike stamens. Flowers and sepals green, staminal filaments purple or red.

Fruits broadly linear and flattened with a pod 8-13 cm long which breaks open, each half curling back to set free 3-15 shiny, black seeds. Pods 11-16 mm wide, long, attenuate to the base and sharply acute at the apex.

The generic epithet Calliandra is derived from 'calli' meaning beautiful and 'andra' for the male floral parts describes the beautiful and prominent anthers characteristic of this leguminous plant. The specific epithet describes the equally beautiful inflorescence of the species.

BIOLOGY
Flowering may start in the 1st year, but good fruit set starts in the 2nd year. Protandrous flowering and the difference in length between the stamens and style indicate out-crossing; the species has a low tolerance of selfing. Pollination is by insects and bats, for example honeybees that collect nectar and pollen; fruits ripen 3 months after anthesis.

The actual dates of flowering and fruiting are extremely variable, both within and between populations. The time between flowering and fruit maturity can range from 55 to 90 days and is dependent on environmental conditions during the ripening phase, thus making the exact timing of seed collection unpredictable. The dispersal mechanism of C. calothyrsus seed is that of explosive apical dehiscence generated by drying tensions in the pod walls.

Flowers showing nectar release. (Anthony Simons)

Unripe green pods of C. calothyrsus. Pods ripen progressively up the flowering shoots and when ripe dehisce explosively from the tip. (Colin E. Hughes)

Calliandra calothyrsus:
Fodder bank: Farmer with Calliandra row in Embu, Kenya. (Alan Pottinger)

ECOLOGY
Although originally described from Surinam, where it was probably introduced, C. calothyrsus is native to humid and subhumid Central America from southern Mexico to central Panama, 8-19 deg. N.

The species occurs in secondary vegetation, often in thickets. It is an aggressive colonizer on disturbed sites such as recent landslides and roadsides. Best development occurs at moderate elevations below 1300 m. On Java, the species is planted up to 1500 m altitude, but it grows best between 250-800 m in areas with 2000-4000 mm annual rainfall and a 3-6 month dry period. Growth decreases on compacted soils and trees die after 2 weeks of oxygen depletion due to waterlogging.

BIOPHYSICAL LIMITS
Altitude: 250-1800 m, Mean annual temperature: (20) 22-28 deg. C, Mean annual rainfall: 700-4000 mm

Soil type: Grows well on a wide range of soil types but prefers light textured, slightly acidic soils. It can tolerate infertile and compacted or poorly aerated soils but does not tolerate waterlogged and alkaline soils.

DOCUMENTED SPECIES DISTRIBUTION

Native: Colombia, Guatemala, Honduras, Mexico, Nicaragua, Panama

Exotic: Australia, Bolivia, Brazil, Cameroon, Ethiopia, Indonesia, Kenya, Rwanda, Samoa, Sri Lanka, Tanzania, 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

Fodder: Leaves and pods are rich in protein and do not contain any toxic substances. Protein content is 22% (dry matter) and annual fodder yield (dry matter) amounts to about 7-10 t/ha. The fodder can be given to all types of ruminants and fulfils 40-60% of their needs. Although no toxic substances have been found in the foliage, high concentrations of condensed tannins (up to 11%) have been reported, which may reduce the digestibility of protein for livestock to about 40%. Freshly cut (4-6 hours) forage has a higher digestibility value (60-80%). For fodder production, spacing can be dense: 0.5 x 0.5 m to 0.75 x 0.75 m. In Asia, it is planted in rice field dikes to produce fodder for fish.

Apiculture: Flowers contain nectar and because flowering lasts throughout the year bee keeping is profitable. The honey produced by C. calothyrsus has a pleasant bitter sweet flavour. A production of one t of honey/ha has been reported.

Fuel: A good firewood species because it is fast growing, multi-stemmed, easy to regenerate and thornless. One year after planting, annual wood yields have been reported in the order of 15-40 t/ha with annual coppice harvests continuing for 10-20 years. Yields from C. calothyrsus are extremely good in coppice; after being cut at 50 cm from the ground, 3 m high coppices are formed in only 6 months rotation. The rootstock is very vigorous and will sprout readily. For firewood, optimum spacing is 1 x 2 m with a minimum of 1 x 1 m. Returns from charcoal production are higher than fuelwood because the wood is a quick burner. C. calothyrsus can produce 14 t/ha of charcoal annually. Wood is suitable as a smoking fuel for the production of smoked sheet rubber. There has been a demand for smoking fuel since old rubber trees, the traditional source, are increasingly used by furniture manufacturers.

Fibre: The pulp and papermaking properties of C. calothyrsus are satisfactory and are comparable to dipterocarps and appropriate for kraft paper manufacture. C. calothyrsus pulp is easily bleached, but wood dimensions are generally small, making handling and chipping difficult. The wood is also suitable for pulp and papermaking and is used in Asia.

Other products: As an additive to leaf meal, it has shown promise both as a protein source and as a source of carotene to maintain yolk colour in commercially produced eggs. It is also a suitable host for shellac-producing insects.

SERVICES

Erosion control: C. calothyrsus can be used to rehabilitate erosion-prone areas and recover land exhausted by agriculture, where it easily dominates undesired weeds such as Eupatrium spp., Saccharum spp., and Imperata cylindrica.

Shade or shelter: C. calothyrsus is often planted as a shade tree around houses. The dense foliage provides protective cover against sun and rain. In forestry it is used as a nurse tree for partially shade-tolerant timber trees such as Agathis species.

Nitrogen fixing: Roots are able to fix atmospheric nitrogen because of the symbiosis with Rhizobium bacteria (to which root nodules bear witness) and the symbiosis with root fungus.

Soil improver: High leaf biomass production and high yields of protein leaf material on less fertile soils make it very suitable as a green manure and it is used in alley-cropping systems. Due to litter and the combination of a deep and well-developed lateral rooting system, the soil and productivity of the land is improved. However, the relatively high level of tannins present in its leaves slows the rate of microbial breakdown of the organic matter.

Ornamental: Its beautiful red ‘powder puff’ flowers make it an attractive ornamental.

Boundary or barrier or support: Suitable for hedgerow boundaries.

Intercropping: C. calothyrsus is compatible with crops, with both deep roots and extensive fibrous roots. It has shown promise as an understorey plant in coconut plantations with about 60% light transmission.

TREE MANAGEMENT
C. calothyrsus is fast growing, easy to regenerate and manage. Because seedlings grow quickly, no special plantation management is needed, except for weeding in the 1st year. On infertile soils, fertilizer will improve early growth, although C. calothyrsus is less responsive to fertilizer than other tree legumes. In alley-cropping systems, C. calothyrsus should be pruned in cycles or up to 4 months to limit shade on associated crops. Highest yields obtained from coppicing when cut at 1 m. With seedlings, root pruning and side pruning is recommended to keep taproot checked and to encourage lateral root development.

GERMPLASM MANAGEMENT
Orthodox storage behaviour; viability can be maintained for several years in hermetic storage at 3 deg. C with 6-10% mc. There are approximately 19 000 seeds/kg.

PESTS AND DISEASES
Attacked by the teak sapling borer (Sahyadrassus malabaricus) in India. Forage tree legumes planted in close proximity to teak plantations, for example, may be subjected to higher rates of colonization by this pest than trees further from teak plantations. In Kenya a coleopteran, Pachnoda ephippiata, feeds on the fruits, flowers and foliage, causing floral abortion and failure of seed production. The degree of infestation seems to be aggravated by prolonged dry spells when insect populations on the plants are high. In India, the polyphagous leaf feeder Myllocerus viridanus is responsible for considerable defoliation. Beetles also attack C. calothyrsus flowers and hence reduce the seed production. It is often attacked by ants.

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SUGGESTED CITATION

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