

Acacia senegal

gum arabic, gommier blanc

LOCAL NAMES

Afrikaans (driehaakdoring, gomdoring, geelhaak); Amharic (kontir, sbansagirar); Arabic (tur, hashab, harhey, alloba, asharat, temmar, adaad); English (gum arabic, Sudan gum arabic, gum acacia, three-thorned acacia); French (gommier, acacia du senegal, verrek); Fula (dibehi); German (Arabicumbaum, Gummibaum); Gujarati (kagar, goraduja baval); Hausa (dakwara); Hindi (khor, goraduja baval, kumat, kumta, humath); Sanskrit (snetā khadira); Somali (ethad-geri, adad, adad medu, adadgeti, edad); Spanish (goma arábica); Swahili (kikwata, mgunga); Tigrigna (qentib, qentiba, tsaeda kenteb); Trade name (gum arabic, gommier blanc); Zulu (isiKhambophane, umKhala)

BOTANIC DESCRIPTION

Acacia senegal is a deciduous shrub, growing to 15 m tall and usually branched from the ground. Branches fork repeatedly and in mature trees commonly form a rounded, flat-topped crown. The trunk may vary in diameter up to about 30 cm. The bark is greyish-white, although in old trees growing in the open it may be dark, scaly and thin, showing the bright green cambium layer just below the surface if scratched with a nail. The slash is mottled red. Powerful hooked thorns, 3-5 mm long, with enlarged bases appear at the nodes of the branches, usually in 3s. They are sharp, with some pointing forwards and others backwards.

Leaves bipinnate, 3-8 pinnae (glands between uppermost and lowermost pinnae); rachis up to 2.5 cm long; pinnacles are pairs of 8-15, green; 2 stipular spines strongly recurved with a 3rd pseudo-stipular between them.

Flowers yellowish-white and fragrant, in cylindrical, axillary pedunculate spikes, 5-10 cm long; calyx of each flower has 5 deep lobes, 5 petals and a mass of short stamens; pistil inconspicuous.

The pods are straight, thin, flat, shortly stipitate and oblong (7.5 x 2 cm), green and pubescent when young, maturing to shiny bronze, often with dark patches and bearing prominent veins; seeds 3-6, smooth, flat, rather small, shiny, dark brown.

Varietal differences in *A. senegal* are based on variation in natural distribution as well as differences in morphological characteristics such as the presence or absence of hair on the axis of the flower spike, colour of the axis, shape of pod tips, number of pinnae pairs, occurrence of a distinct trunk and shape of the crown. Four different varieties of *Acacia senegal* are recognized: var. *senegal*, var. *kerensis* Schweinf., var. *rostrata* Brenan and var. *leiorhachis* Brenan.

The generic name 'acacia' comes from the Greek word 'akis', meaning a point or a barb.

BIOLOGY

A. senegal is presumably insect pollinated. Flowering starts from June to July in Sudan, December to January in South Africa, February to March in Pakistan, and August to December in India. Fruits ripen in January in Burkina Faso, July-September in Kenya, August in Pakistan, October in South Africa, and November-December in southern and central Niger. The wind shakes seeds from the dehiscent pods, and sheet wash and grazing animals may extend the seed dispersal range.

(L.) Willd.

Fabaceae - Mimosoideae



Small tree of *Acacia senegal* near Jodhpur, Rajasthan, India. (Colin E. Hughes)



Tree habit - Somalia: Habit of fruiting tree of *A. senegal*, growing in arid rangelands of central Somalia where it is exploited for charcoal and fodder. (Chris Fagg)



Var. *senegal* - flowers (Chris Fagg)

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ECOLOGY

Drought-tolerant, *A. senegal* is the characteristic species in the drier parts of Anglo-Egyptian Sudan and the northern Sahara and is to be found throughout the vast area from Senegal to the Red Sea and to eastern India. It extends southwards to northern Nigeria, Uganda, Kenya, Tanzania and southern Africa. In India it is found chiefly in Sind and Ajmere. In Sudan, the tree both exists in the wild and is cultivated - mainly on sandy hills, but it also grows well in cotton soil.

A. senegal is associated with a wide range of vegetation types, from semi-desert grasslands to *Anogeissus* woodlands. It prefers clay plains and rocky hill slopes. It can easily become a serious weed. South Africa and Australia have policies against further introduction of this noxious weed.

BIOPHYSICAL LIMITS

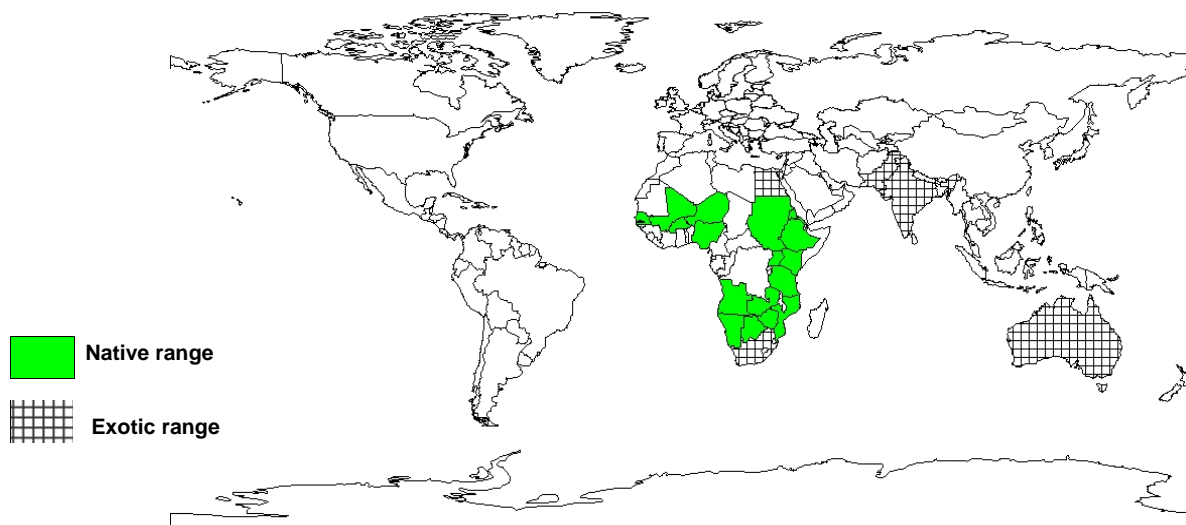
Altitude: 100-1700 m, Mean annual temperature: -4 -48 deg. C, Mean annual rainfall: 300-1200 mm.

Soil type: Varies from coarse-textured, deep sandy soils to dry, rocky soils, slightly acidic to moderately alkaline. It is intolerant to waterlogging.

DOCUMENTED SPECIES DISTRIBUTION

Native: Angola, Botswana, Burkina Faso, Eritrea, Ethiopia, Gambia, Kenya, Mali, Mozambique, Namibia, Niger, Nigeria, Senegal, Sudan, Tanzania, Uganda, Zambia, Zimbabwe

Exotic: Australia, Egypt, India, Pakistan, Puerto Rico, South Africa, Virgin Islands (US)



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.

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PRODUCTS

Food: The seeds are dried and preserved for human consumption as a vegetable. The dried seed is the main component of panchkut, a delicacy in Jodhpur, India, also containing fruits of *Capparis decidua*, *Cucumis sativa* and *Prosopis cinerearia*.

Fodder: Leaves and pods are browsed by sheep, goats and camels. Crude protein values are 20% for leaves, 22% for green pods, and 20% for dry pods (expressed as a percentage of dry matter).

Apiculture: Bees seek the nectar from the flowers. Honey amber in colour, with a mild aroma and granulates rapidly.

Fuel: An excellent fuelwood-sometimes the only wood species to survive in dry areas. The calorific value is estimated at 3000 kcal/kg. Wood yields of 120-190 cubic metres per hectare, with annual increments of 0.5-1.0 cubic metres per hectare have been recorded. The dense wood also yields charcoal.

Fibre: The long, flexible surface roots yield a strong fibre used for cordage, ropes and fishing nets.

Timber: The heartwood is almost black and takes polish well. It is used for making carts and Persian wheels, sugar cane crushers, agricultural implements, horse girths and tool handles.

Gum or resin: Gum arabic exudes from the duct of the inner bark; it is tapped in the hot season (May-June) when the trees are stressed. Tapping begins when trees are 4-5 years old. It commences after leaf fall and ceases during the colder months of the dry season. Gum nodules form in 3-8 weeks, exuding from the former broken abscission scars. Care should be taken to keep the gum clean. Annual yields stand at 188-2856 g for young trees and 379-6754 g for older trees (7-15 years). Gum production is excellent on poor soils and higher in stressed trees.

Essential oil: Seeds contain fat (khakhan), which is used both for medicine and for soap making.

Medicine: Roots are used to treat dysentery, gonorrhoea and nodular leprosy.

SERVICES

Erosion control: *A. senegal* has been used for desertification control, re-establishment of a vegetative cover in degraded areas, sand dune fixation and wind erosion control. The *rostrata* and *leiocarpa* varieties are useful for soil stabilization because of their weediness.

Nitrogen fixation: The nitrogen-fixing ability of *A. senegal* is questionable.

Soil improver: Improves soil fertility by nutrient cycling after leaf fall.

Ornamental: It is grown as an ornamental tree in Puerto Rico and the Virgin Islands.

Boundary or barrier or support: Cut branches are useful for fencing in cattle because of their spines.

Intercropping: It is a highly suitable tree for agroforestry systems, widely grown in combination with watermelon, millets and forage grasses. In the Sudan, *A. senegal* is grown in 'gum gardens' for gum as well as to restore soil fertility. A traditional bush-fallow system is followed with a 20-year rotation during which time *A. senegal* is grown for 15 years. Agricultural crops are grown for five years (millet, sesame, sorghum, groundnuts), followed by five years with young, unproductive *A. senegal* trees, which later produce gum during the last 10 years of the rotation. Corresponding to this rotation, 1/4 of the land is kept in agricultural crops, 1/4 in young unproductive trees and 1/2 in productive trees.

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TREE MANAGEMENT

Weeding should be immediate in the season following planting and for the following 2 growing seasons. Protection of young trees from livestock browsing is essential. Seedlings are rather slow growing with initial annual increments of 30-40 cm. For firewood production, trees can be cut on a rotation of 20 years using coppice with standards, lopping up to 50% of the lower crown in rainy season.

GERMPLASM MANAGEMENT

Seed should be harvested before pods have dried for easy collection and to avoid insect attack. Seed is easily extracted by hand. Freshly extracted seed should immediately be dusted with an insecticide. There are 10,000-30,000 seeds/kg. Seed storage behaviour is orthodox; 5% germination following 51 years open storage at room temperature; viability can be maintained for 6 years with air-dried seeds stored at room temperature; viability can be maintained for several years in hermetic storage at 10 deg. C with 4.5-9% mc.

PESTS AND DISEASES

The buffalo treehopper (*Stictocephala bupalus*) may destroy seed crops. Spiders (*Cyclops* sp.) can smother young growing apices. Larval stage of Coleoptera (bruchids), Lepidoptera, and Hymenoptera damage the seed. Locusts (*Acridium melanorhodon*) can defoliate vast areas overnight. *A. senegal* is also attacked by the fungi *Cladosporium herbarium*, *Fusarium* sp., *Ravenelia acaciae-senegalae* and *R. acaciocola*.

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FURTHER READING

- Albrecht J. ed. 1993. Tree seed hand book of Kenya. GTZ Forestry Seed Center Muguga, Nairobi, Kenya.
- Anon. 1986. The useful plants of India. Publications & Information Directorate, CSIR, New Delhi, India.
- Baumer M. 1983. Notes on trees and shrubs in arid and semi-arid regions. Rome FAO. Forestry Division.
- Beentje HJ. 1994. Kenya trees, shrubs and lianas. National Museums of Kenya.
- Bein E. 1996. Useful trees and shrubs in Eritrea. Regional Soil Conservation Unit (RSCU), Nairobi, Kenya.
- Bekele-Tesemma A, Birnie A, Tengnas B. 1993. Useful trees and shrubs for Ethiopia. Regional Soil Conservation Unit (RSCU), Swedish International Development Authority (SIDA).
- Booth FEM, Wickens GE. 1988. Non-timber uses of selected arid zone trees and shrubs in Africa. FAO Conservation Guide. No. 19. Rome.
- Coates-Palgrave K. 1988. Trees of southern Africa. C.S. Struik Publishers Cape Town.
- Dale IR, Greenway PJ. 1961. Kenya trees and shrubs. Buchanan's Kenya Estates Ltd.
- Eggeling. 1940. Indigenous trees of Uganda. Govt. of Uganda.
- El Amin HM. 1973. Sudan acacias. Forest Research Institute Publishing Section Information Department.
- Hines DA, Eckman K. 1993. Indigenous multipurpose trees for Tanzania: uses and economic benefits to the people. Cultural survival Canada and Development Services Foundation of Tanzania.
- Hocking D. 1993. Trees for Drylands. Oxford & IBH Publishing Co. New Delhi.
- Hong TD, Linington S, Ellis RH. 1996. Seed storage behaviour: a compendium. Handbooks for Genebanks: No. 4. IPGRI.
- ICRAF. 1992. A selection of useful trees and shrubs for Kenya: Notes on their identification, propagation and management for use by farming and pastoral communities. ICRAF.
- Katende AB et al. 1995. Useful trees and shrubs for Uganda. Identification, Propagation and Management for Agricultural and Pastoral Communities. Regional Soil Conservation Unit (RSCU), Swedish International Development Authority (SIDA).
- Keay RW. 1989. Trees of Nigeria. Clarendon Press Oxford.
- Kund T. 1991. Regeneration of woody legumes in the Sahel. Botanical Institute, Aarhus University.
- Luna R K. 1997. Plantation trees. International Book Distributors.
- MacDicken GK. 1994. Selection and management of nitrogen fixing trees. Winrock International, and Bangkok: FAO.
- Mbuya LP et al. 1994. Useful trees and shrubs for Tanzania: Identification, Propagation and Management for Agricultural and Pastoral Communities. Regional Soil Conservation Unit (RSCU), Swedish International Development Authority (SIDA).
- National Academy of Sciences. 1979. Tropical legumes: resources for the future. National Academy Press. Washington D.C.
- NFTA. 1991. Acacia senegal-gum tree with promise for agroforestry. NFTA 91-02. Waimanalo.
- NFTA. 1996. Acacia auriculiformis- a multipurpose tropical wattle. NFTA 96-05. Waimanalo.
- Noad T, Birnie A. 1989. Trees of Kenya. General Printers, Nairobi.
- Palmer E, Pitman N. 1972. Trees of Southern Africa Vol. 2. A.A. Balkema Cape Town.
- Sahni KC. 1968. Important trees of the northern Sudan. United Nations and FAO.
- Tietema T, Merkesdal E and Schrotten J. 1992. Seed germination of indigenous trees in Botswana. Acts Press.
- Timberlake J, Fagg C and Barnes R. 1999. Field guide to the Acacias of Zimbabwe. CBC Publishings, Zimbabwe.
- Timberlake J. 1980. Handbook of Botswana Acacias. Ministry of Agriculture, Botswana.
- Vimal OP, Tyagi PD. Fuelwood from wastelands. Yatan Publications, New Delhi, India.
- Vogt K. 1995. A field guide to the identification, propagation and uses of common trees and shrubs of dryland Sudan. SOS Sahel International (UK).

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Weber F, Stoney C. 1986. Reforestation in arid lands. VITA Arlington, Virginia.

SUGGESTED CITATION

Orwa C, A Mutua, Kindt R, Jamnadass R, S Anthony. 2009 Agroforestry Database: a tree reference and selection guide version 4.0 (<http://www.worldagroforestry.org/sites/treedbs/treedatabases.asp>)