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# WOODY PLANTS OF THE NORTHERN CEARÁ CAATINGA

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# Acknowledgements

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Anecdotal information was obtained from project employees who have been life-long residents of the

area, notably Venceslau Alves Costa, and other local ranchers. Renato Braga's publication *Plantas do Nordeste, especialmente do Ceará* (1960) was relied upon heavily for plant descriptions and other items about each species.

The constructive comments of Dr. John C. Malechek, Dr. Brien E. Norton, and Dr. George Primov are greatly appreciated. We also wish to acknowledge the support and suggestions of Dr. Luis Carlos Freire, Ederlon Ribeiro de Oliveira, and other staff members at the CNPC in the preparation of this manuscript.

# Preface

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Native trees and shrubs provide an important source of dry season forage for cattle, sheep and goats in the caatinga. Most of the species are deciduous, furnishing a natural hay for livestock as the leaves fall at the onset of the long dry period each year. The occasional evergreen species offers green fodder even during the most severe drought periods; however, this green foliage is often out of reach of grazing animals. Although the importance of these plant species to livestock production is recognized by local ranchers, very little research has been done on their ecology and use. The Centro Nacional de Pesquisa de Caprinos (CNPQ/EMBRAPA) and the Department of Range Science, Utah State University, working jointly through the Small Ruminant Collaborative Research Support Program, have recognized this need for research. This publication is the result of a preliminary examination of the important woody species in northern Ceará state. We intend that it provide basic information on the forage value and habitat of these species as well as serve as a field guide to assist in the proper identification of the species during both the dry and the wet seasons.

The most important native woody species of northern Ceará are treated here. This work was done at the EMBRAPA goat research center (CNPQ) in Sobral Ceará, and pertains to that immediate region. Importance was determined on the basis of total numbers, value to the livestock industry and other economic factors.

Each species is treated separately. The common name used most frequently in the area is given,

followed by the genus, species, and family names. Important morphological characteristics of the plants are described for identification purposes. As this is intended to be a field guide, no characters requiring magnification are described here. Also, an attempt has been made to describe characters that will assist identification during the dry season. No illustration, and in most cases, no written description is given for tree crown characteristics, as most caatinga species have intermingled and tortuous canopies making it difficult to separate characteristics of individual species.

The habitat of the species is then described. This section provides ecological and distributional information. The section entitled "forage value" describes the importance of the species as forage for livestock of the area. Emphasis is given to forage value for sheep and goats, as only anecdotal information is available for cattle in this area. A section on other uses is included to emphasize the multi-use value of these plants. Often it is these other values, such as use of certain species as firewood, that is responsible for directing major use patterns of the caatinga vegetation. Where obvious, important research questions for the individual species are mentioned.

Although this field guide is primarily intended for the orientation of researchers in the identification and ecological understanding of the woody species, it will also be a useful guide for land managers, ranchers, and anyone interested in the characteristics of the trees and shrubs of this region.

EMBRAPA will be publishing a translated version in Portuguese in the near future.

# The Caatinga of Northern Ceará

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*Caatinga* is an indigenous word of uncertain meaning. The most likely original definition was *white vegetation* or *white forest*. As presently used, *caatinga* refers to the predominant vegetation type of the semi-arid northeastern part of Brazil. This is a deciduous woodland type that takes on a whitish-colored aspect during the dry season after the trees have lost their leaves.

The *caatinga* covers approximately 830,000 km<sup>2</sup> in northern Brazil (Figure 1) and includes parts of nine states: Alagoas, Bahia, Ceará, Minas Gerais, Paraíba, Pernambuco, Piauí, Rio Grande do Norte and Sergipe (Campos, 1941; Valverde 1969). However, this term is loosely applied, for want of a more precise terminology and in the absence of a detailed inventory of this highly varied vegetation

To the casual observer the vegetation of the *caatinga* may appear uniform in its distribution from one locality and from one region to the next, but, in fact, extensive variation exists in species composition and physiognomy. We emphasize that the information in this field guide pertains to the *caatinga* of northern Ceará, and in particular to the immediate area of the Sobral Municipality (Figure 1).

Sobral is located 3.5° south latitude at an elevation of 78 m. The landscape appears to have been shaped from an old eroded peneplain. There are some hills and small mountains, but for the most part the landscape is slightly rolling. A generally shallow soil (45-130 cm) covers a crystalline bedrock.

Predominant soil types are alfisols, entisols and vertisols. These soils are generally deficient in phosphorous and nitrogen and have pH values ranging from 5 to 7. Their infiltration rates are generally slow and their water holding capacity is limited. There is virtually no groundwater because of the crystalline bedrock. Soils are highly eroded, apparently as a result of past clearing and agricultural practices.

The climate is characterized by distinct wet and dry seasons. The annual dry season lasts from 6 to 11 months, typically beginning in early June and extending through December. The bulk of the summer and fall precipitation (December to June) is due to the southward migration of the Inter-Tropical Convergence Zone (ITCZ). The movement of the ITCZ is very unpredictable and largely controlled by the subtropical high pressure system situated over that region of the Atlantic Ocean (Trewartha, 1981). As a result, the 30-year average precipitation in Sobral is 750 mm, but year-to-year variation is extreme. Droughts are frequent and often severe. In addition to great variation in the amount of precipitation, the temporal and spatial distribution are highly erratic. For example, most of the season's rainfall may fall within a period of a few days in sudden and heavy downpours. Temperatures are consistently high with little seasonal variation. Daily average temperatures range from 22° C during the rainy season to 29° C during the dry season (Anuário Estatístico do Brasil, 1972). Relative humidity during the dry season ranges from a high of about 90

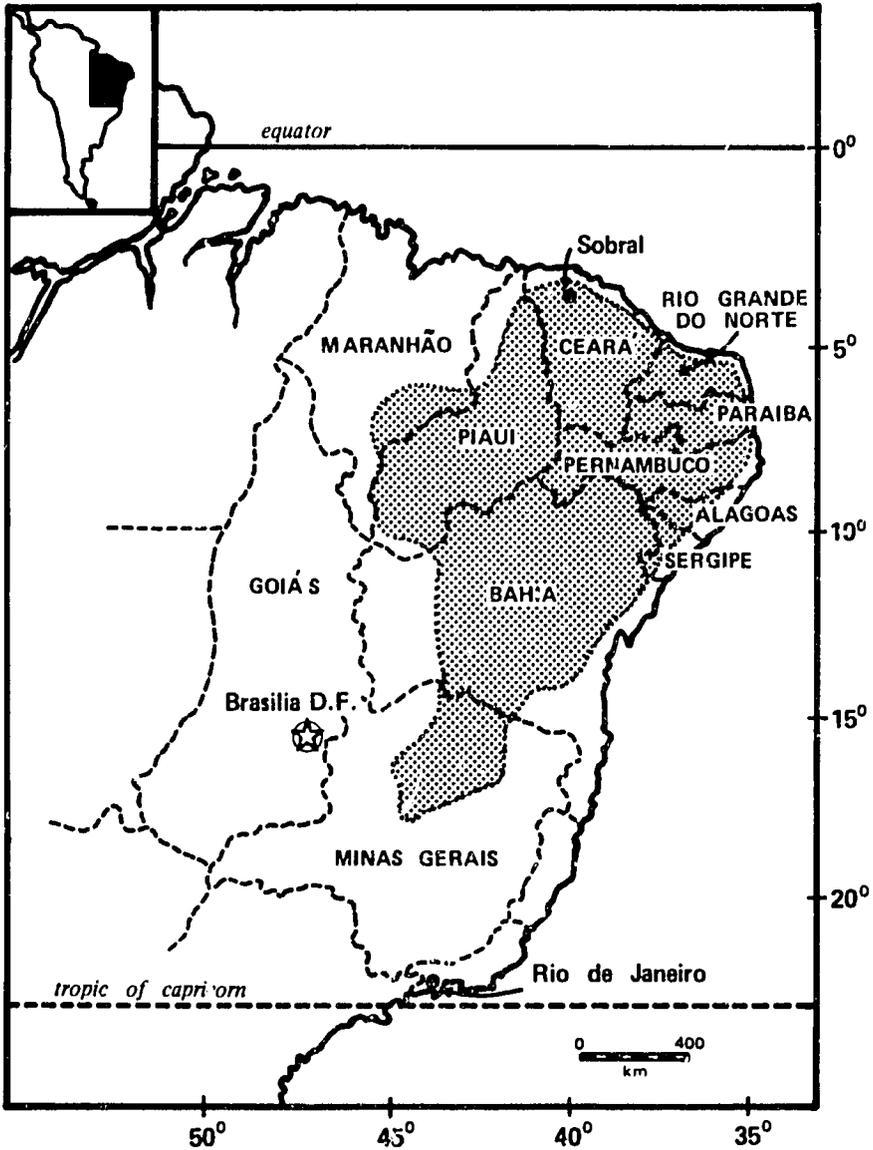


Figure 1. The caatinga zone of northeastern Brazil (shaded area). Its distribution includes all or parts of nine states.

percent in the early morning down to about 35 percent in the afternoon. No specific information is available on potential evaporation for Sobral, however, for the caatinga in general, potential evaporation ranges from 1000 to 1500 mm per year (Eiten and Goodland, 1979).

Local variation in the vegetation depends upon site-specific soil-moisture relations and upon the extent of disturbance by man. It is not unusual to find three distinct soil types on a single hectare of land. Clearing the woody vegetation (usually followed by burning of slash) for firewood, for farming, and for improvement of livestock forage has been so widely practiced that today a climax stand of caatinga probably does not exist. The

present-day vegetation may range from a dense stand with more than 5000 trees per hectare to areas with virtually no woody species present. Cover ranges from 25 to 100 per cent. As an indication of the extensive local variation in soils and attendant vegetation, a preliminary survey on a 300 km<sup>2</sup> area resulted in delineation of 13 different ecological sites.

Cattle, sheep, goats, horses and donkeys are the primary livestock of the region. A major limiting factor to livestock production is the low quantity and poor quality of dry season forage. Wood is recognized as an important product of this area, primarily for use as firewood, charcoal and fence posts.

# The Important Woody Species of Northern Ceará

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There are approximately 26 relatively common native woody species at the lower elevations of the region described. Of these, 10 are legumes. Nineteen of the most important species are described here.

# Angico

*Anadenanthera macrocarpa* Benth.  
Fam: Leguminosae (Mimosoideae)

## Habitat

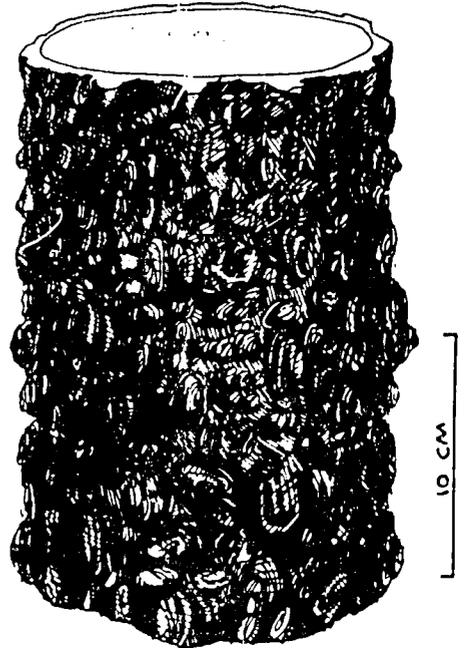
Widely distributed from Maranhão to Argentina. It prefers fertile and deep soils but is adaptable to a wide range of soil types.

## Forage Value

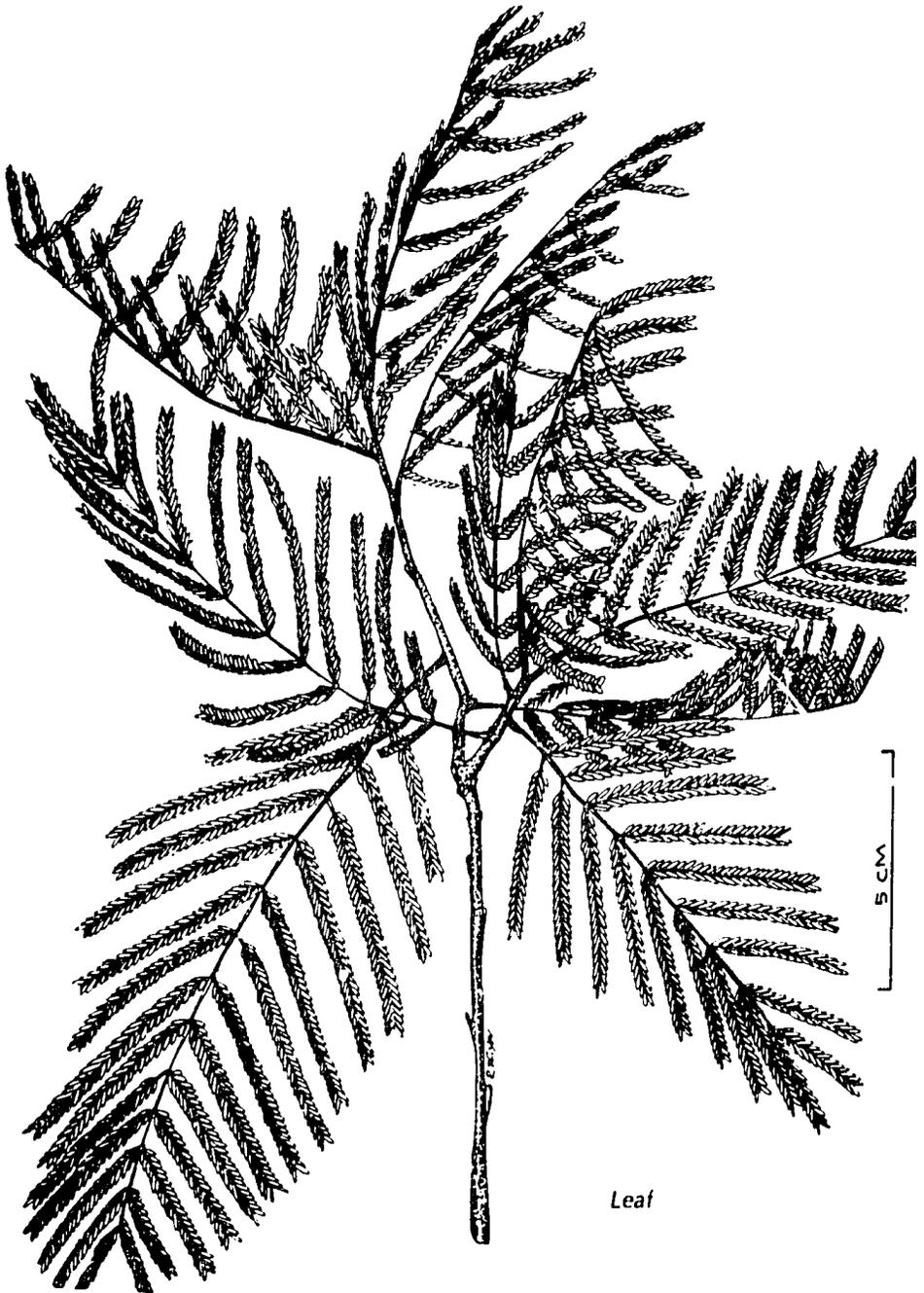
Can be toxic to cattle when green due to its high tannin content. It is palatable to both sheep and goats when green and is well accepted as forage by all livestock when dry.

## Other Uses

**WOOD:** Angico wood is very highly prized for fine and durable wood carvings, for use as tool handles, rack wheels, and for fine furniture and wood floors. It is used for beams, rafters, and frames of houses, but is not suitable for outside construction. **TANNING:** The bark contains up to 32 per cent tannin and is the principal species used for tanning leather in this region. **ANECDOTAL:** The bark has hemostatic qualities. People chew (like chewing gum) a resinous substance from the bark. A tea of the bark is used for colds.



Bark



**Description**

**HABIT:** Large, straight-trunked tree; fast growing. **LEAVES:** Alternate, feathery bipinnate, leaflets 10-25, pinnules 20-80, linear falciform. **FRUIT:**

A pod, flat, long (up to 32 cm). **BARK:** knobby, rough, cracked. **WOOD:** Very dense.

# Aroeira

*Astronium urundeuva* (F.All.) Engl.  
Fam: *Anacardiaceae*

## Habitat

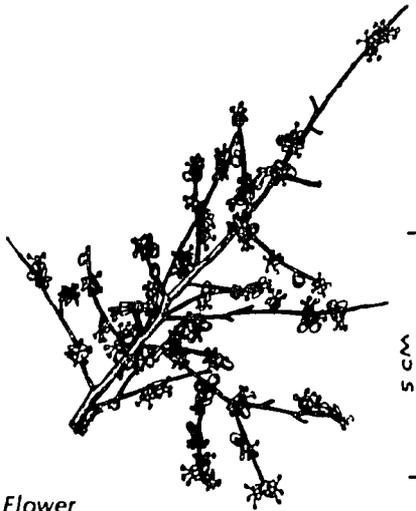
Distribution ranges from Ceará to Paraguay. Ubiquitous in Ceará except on poorly drained sites. If young trees are protected from livestock it may be a significant component of early successional stages. This species is becoming rare due to its high wood and forage values.

## Forage Value

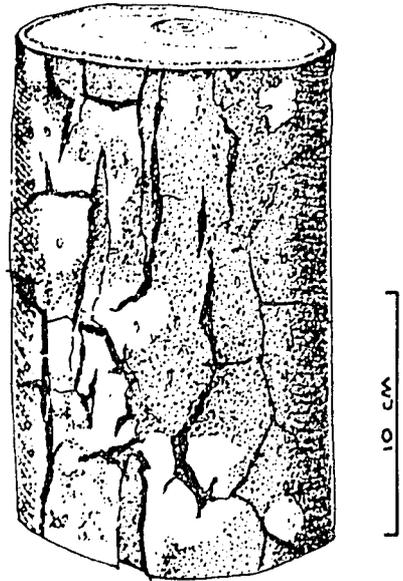
Sheep and, especially, goats seek out the green aroeira leaves. Branches are lopped as feed for animals. This tree may be maintained in a shrub form if regularly lopped for feed.

## Other Uses

WOGD: Highly valued for construction purposes. Under humid conditions it is highly resistant to rot. ANECDOTAL: The bark has hemostatic qualities. A tea made from the bark is used for menstrual relief and to help pass retained placenta. The bark is chewed to alleviate stomachache and to stop diarrhea.



Flower



Bark



*Leaf*

**Description**

**HABIT:** Tall, slender, straight trunked tree with spreading crown; slow-growing and deciduous. **LEAVES:** Alternate, even-pinnate, 4-7 pairs of leaflets, each 5-6 cm long, oval, pubescent on both sides. Venation pinnate but major veins arise from prominent midvein at angles of 75-90°, not the usual 30-45° angle. **FLOWERS:**

Small, yellow, and presented on a panicle. **FRUIT:** Small, oval shaped. **BARK:** On young trees resemble the bark of the marmeleiro. On older trees bark is rough, gray brown, and has rounded-edged scales that flake off. **WOOD:** Hard, dense, durable, dark purple in color with a clear grain; resistant to decomposition.

# Canafistula de boi

*Pithecolobium multiflora* Benth.  
Fam: Leguminosae (Mimosoideae)  
Other common name: Canafistula

## Habitat

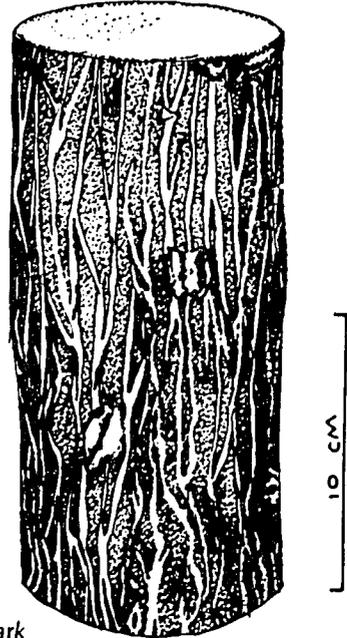
Widely distributed throughout the coastal northeast; mostly found on deep alluvium and swales. This is the only caatinga species cultivated by ranchers. It reproduces by seed or root cuttings. Several varieties exist. This species is said to have been introduced from Asia.

## Forage Value

Canafistula is one of the most valuable forage species of the northeast, being highly nutritious and palatable. It is especially valued as harvestable dry season green fodder and can withstand up to four harvests (loppings) per year. It is usually fed to milch cows. The seed pod is also palatable to livestock.

## Other Uses

**WOOD:** The wood has some value for carvings and fine furniture. Barbers use a piece of this wood for sharpening razors.



Bark



**Description**

**HABIT:** Medium to large tree. Can grow as tall as 12-15 m. Full canopy and straight trunk. Canopy is usually lopped and has a stumpy appearance. Evergreen. **LEAVES:** Alternate, bipinnate, 1-4 pairs of leaflets, 6-13 pairs of pinnules. Pinnules small,

elliptical. **FLOWERS:** Small, yellow, presented on terminal racemes. **FRUIT:** A pod, thin flat, dark brown, 6-8 cm long, constricted between the seeds. **BARK:** Rough, scales flake off, gray-brown or gray-green in color.

# Carnaúba

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*Copernicia cerifera* (Arr. Cam.) Mart.  
Fam: *Palmeaceae*

## Habitat

Center of distribution is Ceará, Piauí and Rio Grande do Norte. The species ranges from Maranhão to Argentina and grows primarily on deep alluvial soils prone to flooding. It is also found on clay soils and the unfertile open areas of the caatinga (tabuleiros). It is not shade tolerant and only grows below 300 m elevation.

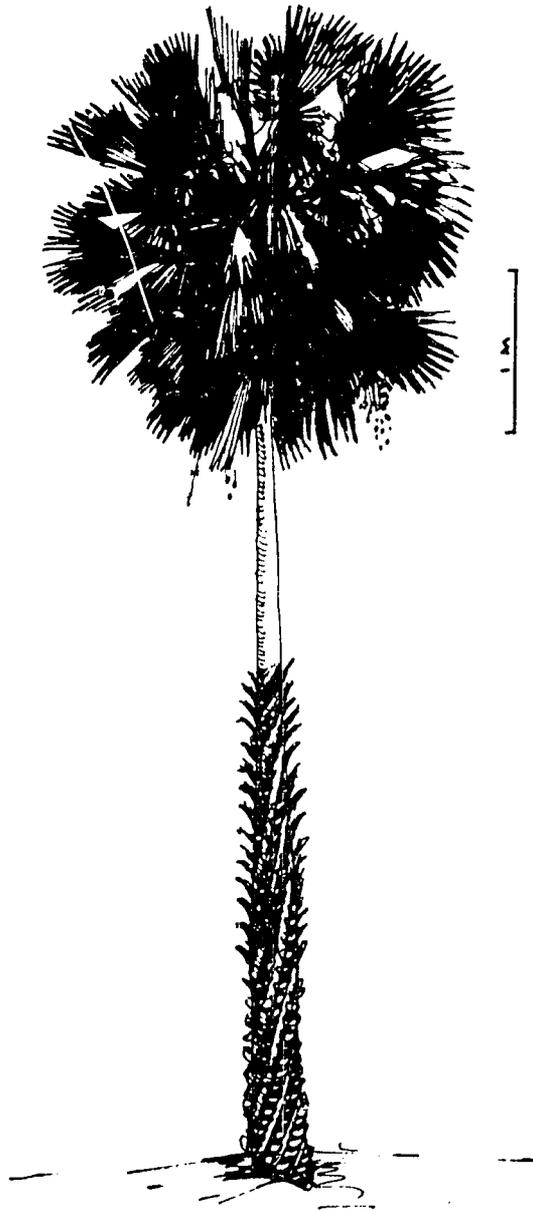
## Forage Value

Leaves can provide some feed during the most severe drought periods. The seed is eaten by livestock.

## Other Uses

Carnaúba is second only to cotton as the most important economic plant species in Ceará. It has many uses for export and the home. WOOD: The uniformly round and straight trunk is highly resistant to decomposition and insect damage. It is used for all types of construction requiring durable wood. It is especially used for house beams and supports in Ceará. LEAVES:

A fine straw fiber is obtained from the leaves and is used for weaving hats, sacks and other household items. Hat weaving is an important cottage industry in Ceará and the hats represent a major export of the region. The fiber is also used for house construction and as thatch roofing material. FRUIT: Eaten by people and animals. WAX: The underside of the leaf is covered with a fine wax. This wax is the most important export product of the carnaúba and is used in many industrial products. A hectare of land planted in carnaúba is capable of producing from 50-300 kg of wax per year (Duque, 1980). Wax from the old leaves is dark colored while the wax from younger leaves is cream colored. The lighter colored wax is the most valuable. Wax production on the carnaúba leaves is limited to the arid range of its habitat. The harvest time of the wax is September to December, thus it does not interfere with other agricultural activities.



### **Description**

**HABIT:** Stately, tall (10-20 m) palm tree. Slow growing. Long lived.

**LEAVES:** Fan shaped, 60-100 cm diameter, bright green. Petioles are long (1-1.5 m) with spines along the

edges and are yellow in color. **FRUIT:** A berry, round, 2 cm long, clustered on a hanging raceme, red when mature. **FLOWER:** Small, numerous, presented on a panicle.

# Catingueira

*Caesalpinia pyramidalis* Tul.  
Fam: *Leguminosae* (*Caesalpinioideae*)

## Forage Value

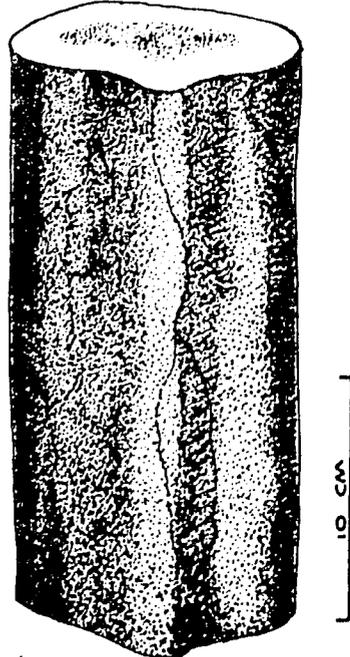
One of the first caatinga species to leaf out after the onset of rains, it has been observed to foliate after as little as 25 mm rainfall and has taken only two days to leaf out after a 90 mm starter rain. According to Gomes (1977), this species will leaf out with a major increase in relative humidity. The young shoots are eaten readily by all livestock and can be an important source of green forage at critical times of the year. The leaves emit a pungent odor after 8 to 10 days of age at which time they are no longer accepted by livestock. This characteristic has earned the species the name *catingueira*, as the word *catinga* (not caatinga) in Portuguese means "bad smell". After dropping from the tree, the leaves lose their disagreeable odor and are again taken by the livestock as an important source of dry season forage. The bark is also eaten by goats.

## Other Uses

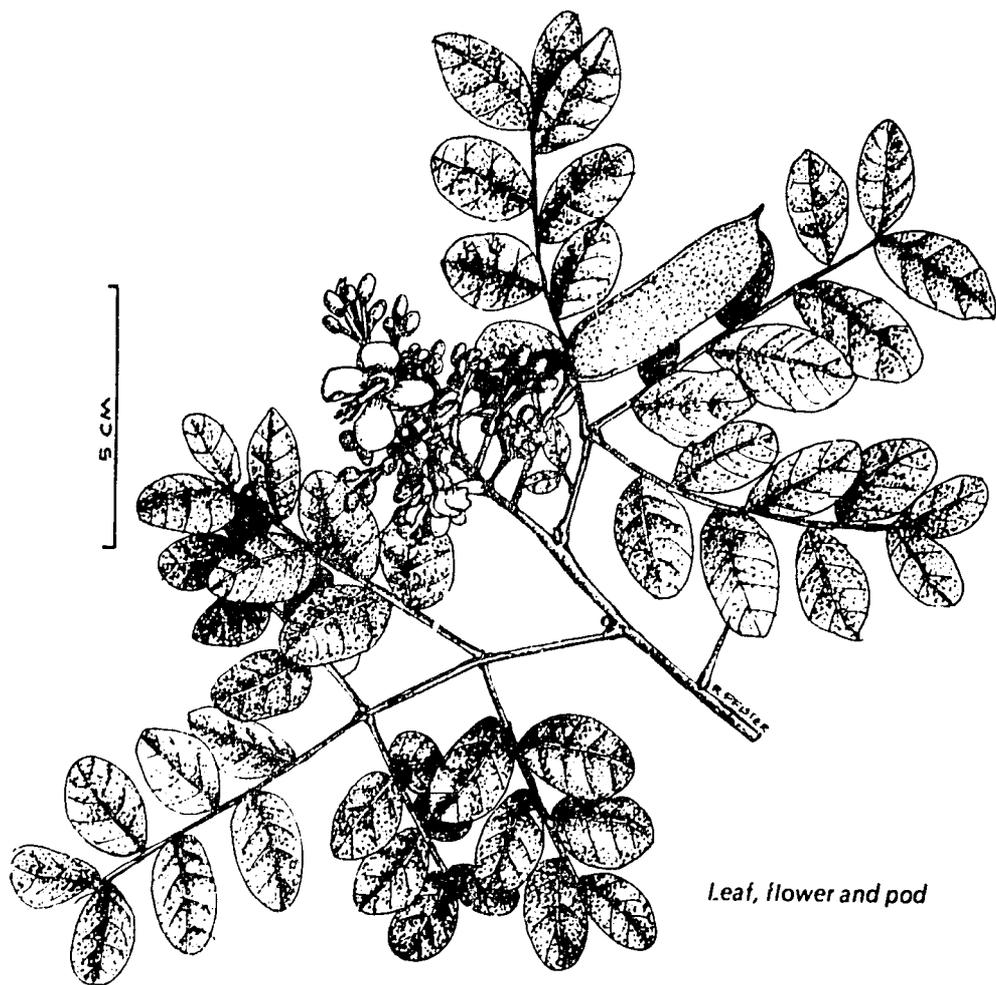
**WOOD:** It is not a construction timber but is employed in fence construction and in daub and wattle dwellings (*casa de taipa*). It is used extensively for firewood and charcoal, and is a preferred wood for firing ceramics.  
**WILDLIFE HABITAT:** The heartwood of older trees rots, leaving a hollow trunk. A variety of small animals, birds, and insects (including bees) take advantage of this natural cavity.  
**ANECDOTAL:** The leaves, flowers and bark are used for the treatment of common colds, dysentery and diarrhea. Tea made from the bark is used to treat hepatitis and anemia. Ashes from the wood are high in potassium and are used in soap making.

## Research Potential

*Catingueira* is probably the most underrated woody species of the northern caatinga. Its natural defense, the odor of the mature green leaves, protects the seedlings and the leaf tissue during the active growing period. The leaves then become available and palatable during the dry season. The leaves are durable and decompose slowly during the dry season, thus providing a natural hay. This species should be protected during range improvement operations involving thinning treatments.



Bark



*Leaf, flower and pod*

### **Description**

**HABIT:** A medium height tree of 4-6 m, but may reach 10 m. Forms a spreading, irregular and open crown. Deciduous. **LEAVES:** Alternate, bipinnate. Leaflets, 5-11 pairs, alternate, sessile, oblong-oval, hard textured. **FLOWERS:** Yellow, small, **FRUIT:** A pod, flat, thin, dark colored. **BARK:** Smooth, gray, camouflage appearance with yellow, green and white patches. **TRUNK:** Twisted irregular shaped, often hollow after heartwood rots.

### **Habitat**

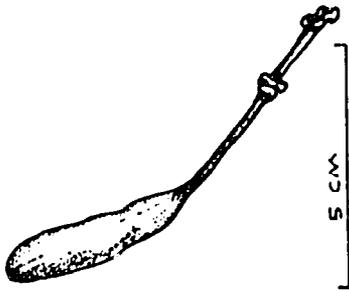
Catingueira is widely distributed throughout most of the arid northeast. It is a very typical caatinga species and prefers coarse textured soils but is adaptable to many soil types including the poorest. It is not fire tolerant and reproduces by seed.

# Feijão Bravo

*Capparis cynophallophora* L.  
Fam: *Capparaceae*

## Habitat

This tree is most commonly found in dense stands of caatinga vegetation where it reaches the superior layer of the canopy as a climber. It does best on deep fertile soils but is also found on hillsides and river banks. It reproduces by seed.



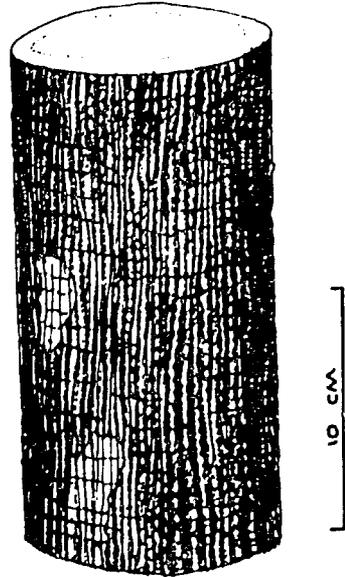
Pod

## Forage Value

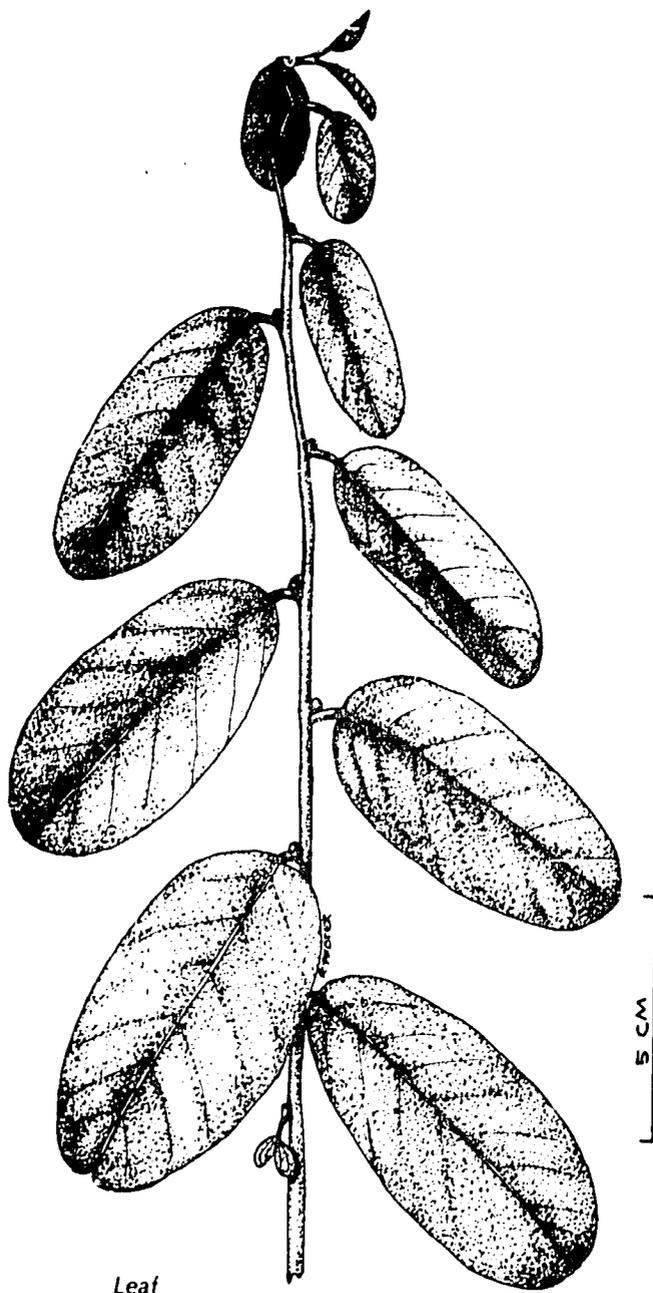
The leaves are nutritional and palatable for all livestock, in both the green and dry states, but is most palatable to livestock when dry. It is important dry season forage, which is lopped and fed to livestock. Flowers are readily consumed by goats and sheep during the dry season.

## Other Uses

ANECDOTAL: Shavings from the bark are used to relieve toothaches.



Bark



Leaf

### Description

**HABIT:** A small tree that reaches the upper heights of the forest canopy by taking on a climber habit in the crowns of adjacent trees. Evergreen. Open and sparse canopy. **LEAVES:** Alternate, simple, elongated oval, glabrous, 8 to

10 cm long. **FLOWER:** Large, white, many stamens, delicate, fragrant. **FRUIT:** A capsule, cylindrical, slightly curved, dark green, present in late dry season. **BARK:** Rough, gray-green in color. **TWIG:** Zig-zag configuration.

# Imburana de cheiro

*Torresea cearensis* Fr. All.

Fam: Leguminosae (Papilionoideae)

Other common name: Cumaru

## Habitat

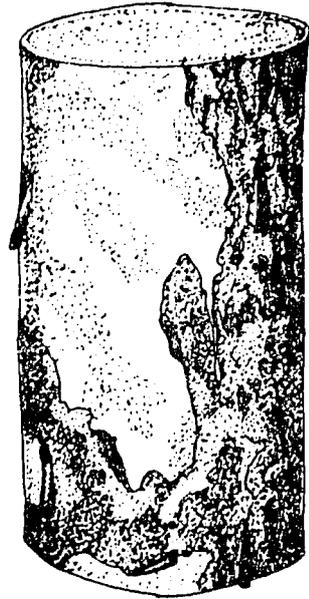
An important tree in Ceará, it is adaptable to all soils and does very well on light textured soils. It is, however, very susceptible to fire.

## Forage Value

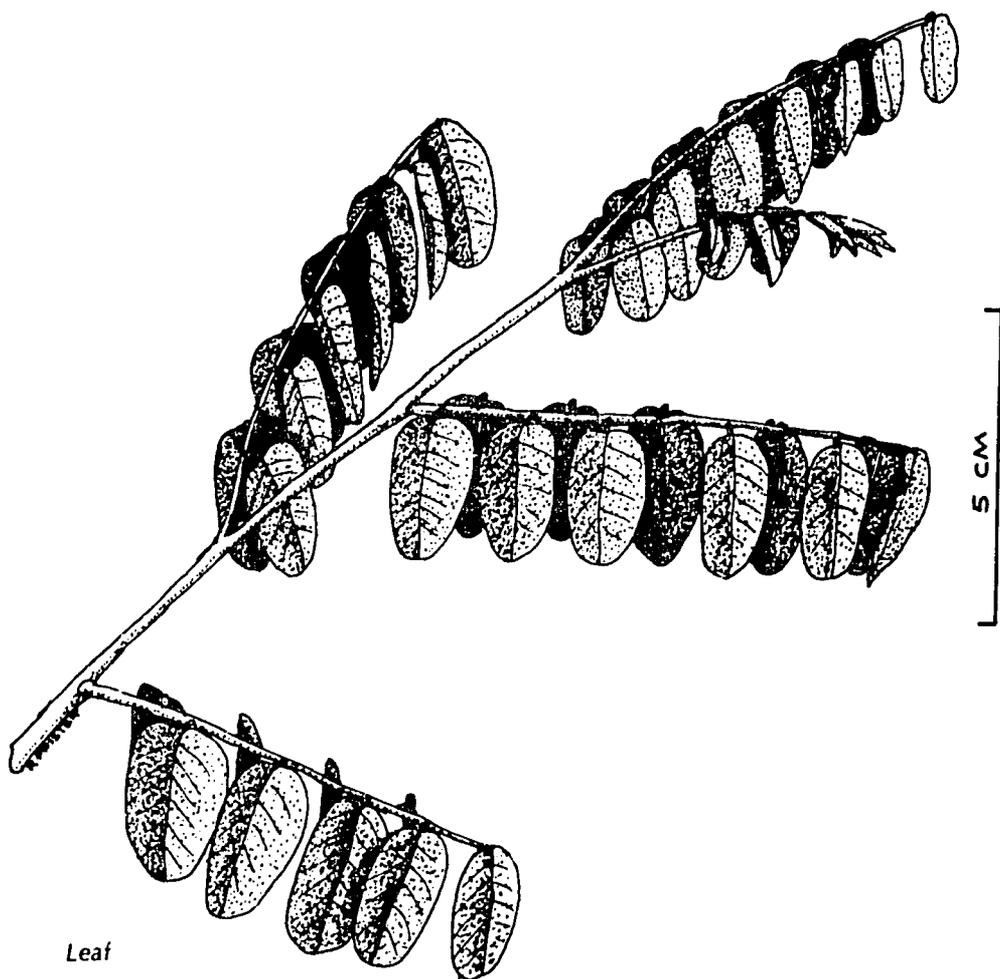
Not a preferred forage, it is more acceptable to livestock when dry.

## Other Uses

**WOOD:** The wood is valued for furniture and other household uses because of its ability to repel insects. It is easy to work and has a pleasant aroma. **SEEDS:** Used as a perfume for clothing. **ANECDOTAL:** Rheumatic pains are said to be alleviated by bathing in a solution made from steeped bark. This bark solution is also applied to the face for relief of sinus problems.



Bark



Leaf

### Description

**HABIT:** Medium sized tree with maximum height of about 10 m. Terminal branching reaching skyward forming a flattish or umbrella-shaped crown. **LEAVES:** Alternate, odd pinnate, 7-12 oval leaflets, 3-4 cm long. **FLOWER:** White, small, aromatic.

**FRUIT:** A pod, flat, black, winged seed. **BARK:** Thin reddish-brown outer bark that peels off to uncover a powdery yellowish-green inner bark. This inner layer may have the capacity to photosynthesize. *ze.*

# Juazeiro

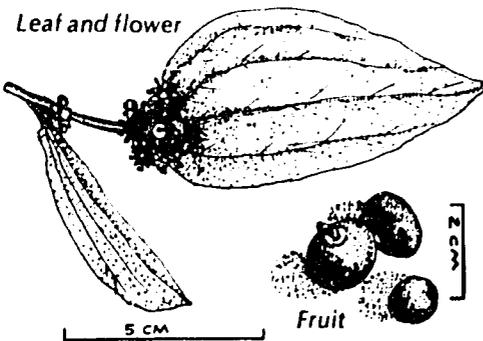
*Zizyphus joazeiro* Mart.  
Fam: *Rhamnaceae*

## Habitat

Juazeiro is distributed from Piauí to Minas Gerais and is an important caatinga species of Ceará. Usually it occurs as individuals in swales where the soils are deep but it is also adaptable to poor soils. It is common in elevated plateaus (chapadas), along river margins and in open areas (tabuleiros). Often juazeiro is protected and is the only remaining tree after a clearing operation.

## Forage Value

A nutritious and palatable forage for all livestock, either dry or green, it is customary to lop off branches and feed to livestock during the dry season. It can be toxic if a major portion of the diet is composed of the green leaves. Ranchers advise letting the leaves dry for a few hours before feeding to hungry animals. Animals often rest under juazeiro trees during the month of October waiting for the leaves to drop. The fruits and seeds are also consumed by livestock and are available in January near the end of the dry season.

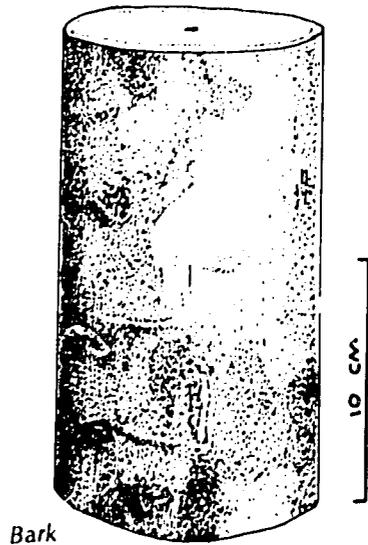


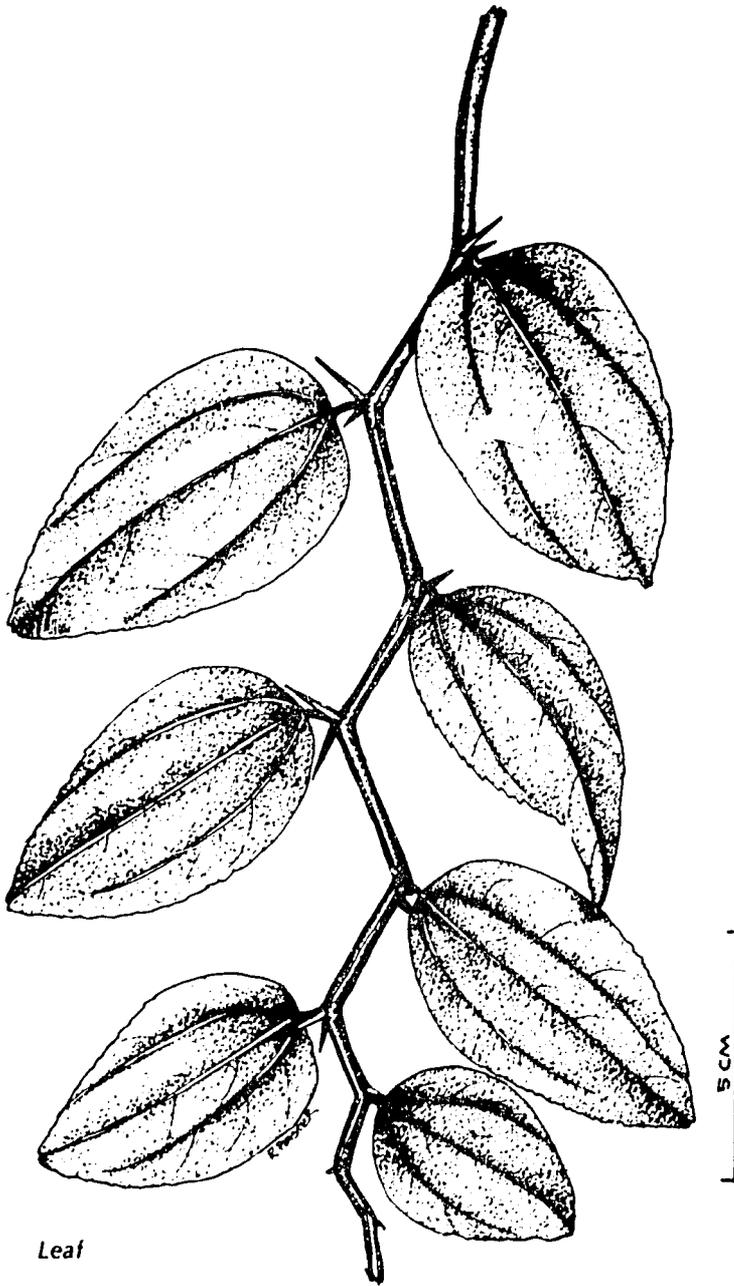
## Other Uses

**FRUIT:** The fruit is a sweet, edible drupe high in Vitamin C. **ANECDOTAL:** Bark shavings are used as a cleanser, as a dandruff shampoo and as toothpaste. Asthma is reportedly relieved by drinking a broth made from root bark shavings. **SHADE:** The tree provides year-round shade for livestock in open pastures. A traditional belief is that if flowering comes late, the following wet season will be deficient of rain.

## Research Potential

Good potential resides in this species for improving pastures for shade and dry season forage.





Leaf

**Description**

**HABIT:** A medium to large tree with a large and full crown. May be a single straight bole or multi-trunked and twisted. Protected by large (1-2 cm) thorns on branches. Evergreen, replacing leaves and flowering during the dry season (October). Long-lived.  
**LEAVES:** Alternate, oval, slightly

serrate, palmate venation (3 major veins). **FLOWERS:** Small, yellowish-green, presented on cymes. Flowers during the dry season. **FRUIT:** A drupe, smooth coat, yellowish, large stone surrounded by a sweet (edible) white pulp. **BARK:** Gray-brown, scales flake off.

# Jucazeiro

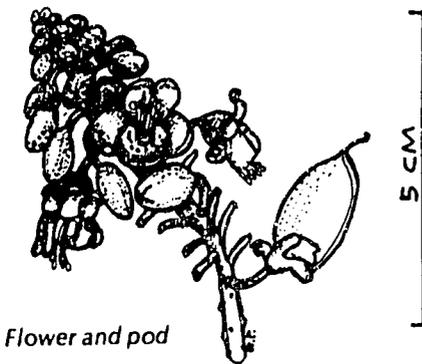
*Caesalpinia ferrea* Mart.  
Fam: Leguminosae (Caesalpinioideae)  
Other common names: Pau Ferro, Jucá

## Habitat

Distributed from Ceará to Bahia, this tree grows under a wide spectrum of conditions but prefers deep loamy to fine textured soils. Most commonly it is found along river and stream banks, on elevated plateaus, and at the foot and skirt of mountains. It is highly resistant to fire. Jucazeiro reproduces by a very hard seed that passes through the digestive tract of ruminants unharmed, but seedlings are not resistant to grazing.

## Forage Value

Both the leaves and the seed pods are highly nutritious and palatable to all livestock. The branches are lopped off and fed to livestock during the dry season and the pods are collected as fodder.



Flower and pod

## Other Uses

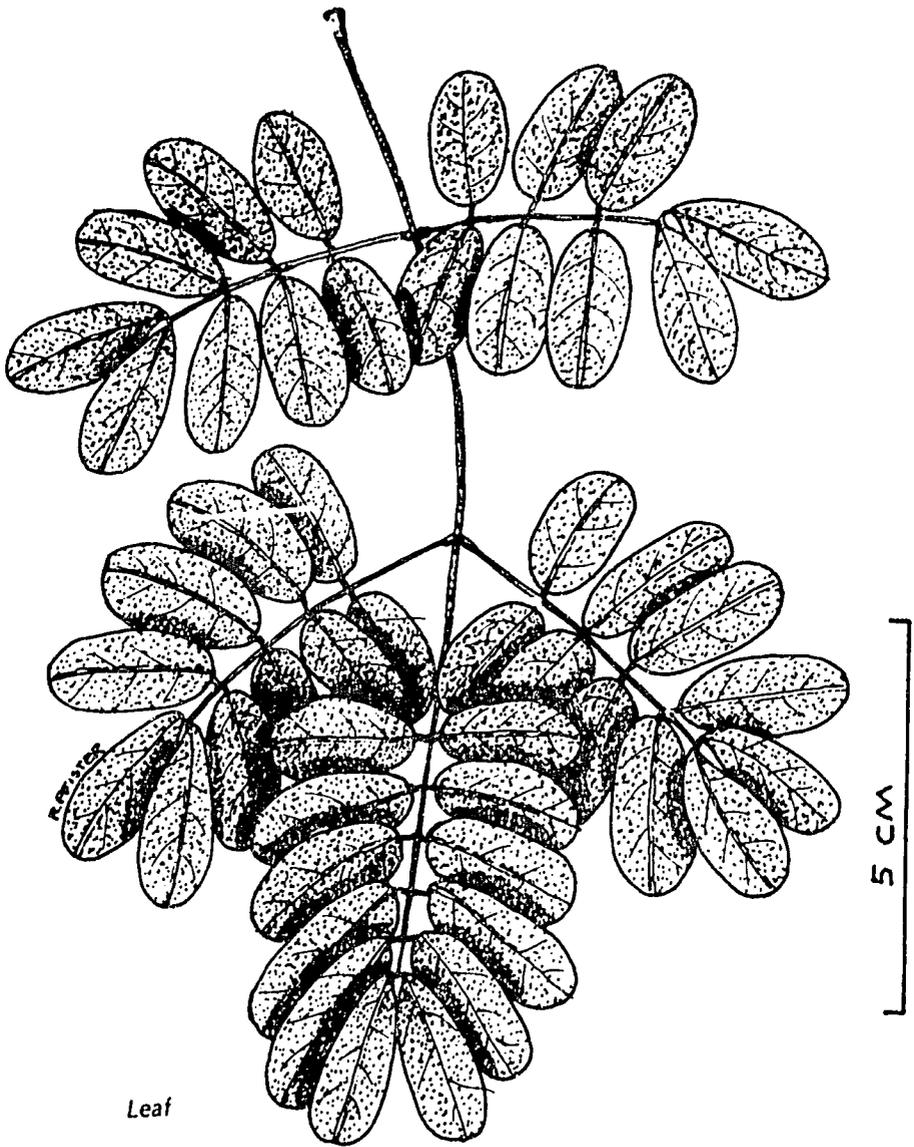
**WOOD:** The wood is very hard and durable, and is used in the manufacture of night sticks. **ANEC-DOTAL:** A tea of the seed pod is used for lung problems. Also, a powder is prepared from the bark and is used to heal cuts.

## Research Potential

This species has good potential for use on revegetation projects for improving dry season forage.



Bark



**Description**

**HABIT:** Small tree less than 4 meters in height. Evergreen species that renews leaves each October and November.  
**LEAVES:** Alternate, bipinnate. Leaflets contain 4-5 pairs of pinnules. Pinnules oblong, 1.5-2 cm long.  
**FLOWERS:** Small, yellow, presented on a terminal

panicle. **FRUIT:** A pod, short, flat, curved, yellow-brown in color. **BARK:** Thin, smooth, gray camouflage with reddish brown and yellow-gray patches. Peels off each year. **WOOD:** Very hard, thus its name "pau ferro" (iron wood).

# Jurema branca

*Pithecolobium dumosum* Benth.  
Fam: Leguminosae (Mimosoideae)

## Habitat

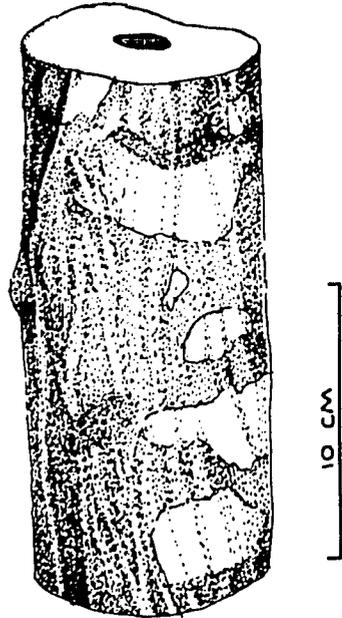
It is adaptable to a wide range of soil types, however, it prefers deep soils. The species appears not to be shade tolerant as is usually seen in the more open caatinga stands. It is also found on elevated plateaus (chapadas) and in mid-seral stages of succession (capoeiras).

## Forage Value

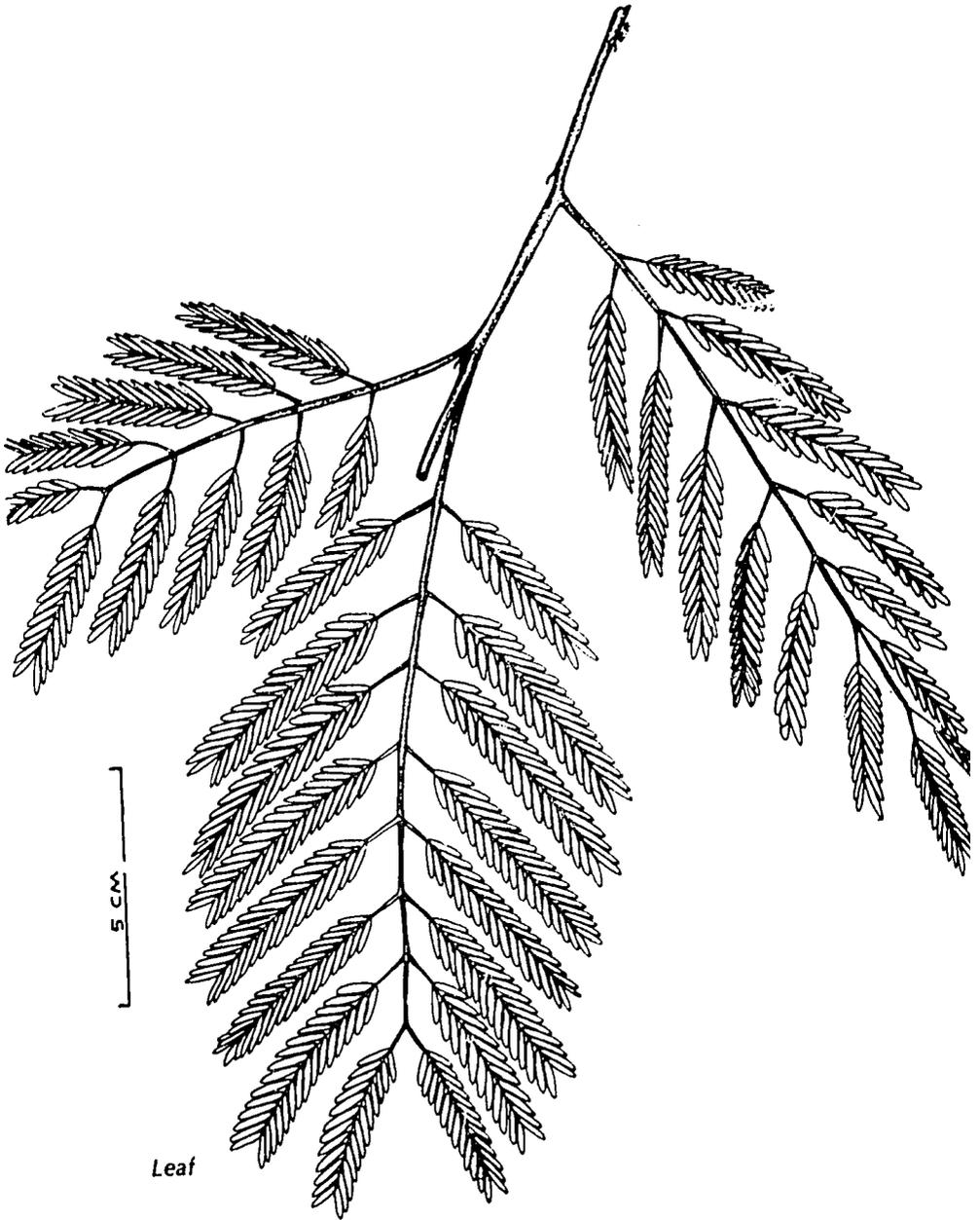
A good forage, both green and dry, for all livestock.

## Other Uses

WOOD: The wood is used for firewood, charcoal and in fence construction.



Bark



**Description**

**HABIT:** Medium sized spiny tree.  
Twisted angled trunk. Deciduous.

**LEAVES:** Alternate, feathery bipinnate,  
6-10 leaflets, pinnules, small, oblong,

25-30 pairs. **FLOWERS:** Small, on  
globose capitulum. **FRUIT:** A pod.

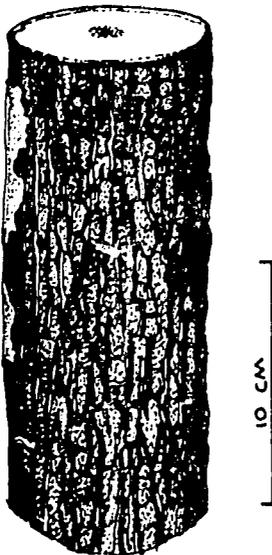
**BARK:** Smooth, gray-brown with large  
white and gray patches.

# Jurema preta

*Mimosa acutistipula* Benth.  
Fam: Leguminosae (Mimosoideae)

## Habitat

Jurema is a widespread tree in the northeast, and is an especially important caatinga species in Ceará. It ranges from Piauí to Bahia and is adaptable to the poorest of soils, where it often forms pure stands of small trees. It will not grow on extremely shallow soils, but is tolerant of water logged conditions. It is an early successional species, as it is often the first to appear in recently cleared areas. Burning appears to favor germination of jurema seeds. It decreases in abundance with increased canopy coverage by community associates.



Bark

## Forage Value

Jurema can be an important source of green forage for all livestock during the most critical part of the dry season. The flowers and seed pods are readily taken by goats and sheep.

## Other Uses

WOOD: Jurema is the most important commercial charcoal wood in Ceará. It is very high in caloric content and is preferred by blacksmiths. The wood is also used as firewood and for construction of fences and daub and wattle houses. ANECDOTAL: The bark and ashes from the wood are used to heal cuts.

## Research Potential

Considering its ubiquity and its dominance of sites after clearing, research on the tree's ecology and potential values is clearly needed. Following is a listing of some priority questions:

1. Biological control by goats.
2. Effects of fire on seed germination.
3. Taxonomic work on varieties with different deciduous cycles and varieties with difference in spines.
4. Potential for propagation as a firewood crop in other arid areas of the world as it is fast growing, rugged, drought resistant, not highly palatable, capable of coppicing readily when cut and wood is dense and high in caloric value.
5. Potential use in revegetation of degraded sites.



*Leaf and flower*

**Description**

**HABIT:** Small thorny tree usually less than 4 meters in height but capable of reaching heights of 6-7 m. Typical growth form is something like a Texas mesquite, however, this is variable depending on whether the tree has been previously cut. Facultatively deciduous. One variety appears to have a reverse deciduous cycle whereby it loses leaves during the rainy season. Taprooted. **LEAVES:**

Bipinnate with 4-5 pairs of leaflets. Pinnules small and elliptical. Some are pubescent **FLOWERS:** Small, yellow, presented on a spike. **FRUIT:** A pod, short, spiraled, constricted between the seeds. **BARK.** Rough, dark gray or near black, fissured longitudinally. **SPINES:** Varieties exist with large, medium or no spines. **WOOD:** Reddish brown, hard.

# Marmeleiro

*Croton hemiargenteus* Muell. Arg.  
Fam: Euphorbiaceae

## Habitat

Marmeleiro prefers sandy soils but is adaptable to most soils including the poorest. The surface characteristics of the soil determine how this species performs. It is not tolerant of water logged or hard compacted soils. Marmeleiro is an invader species and will entirely dominate a coarse-textured, infertile site after disturbance. The roots may spread virtually at the soil surface under a layer of leaves. Marmeleiro exist as clones and can form pure stands. It is difficult to control mechanically as it is rhizomatous.

## Forage Value

It is not a preferred forage by livestock in general. However, marmeleiro is one

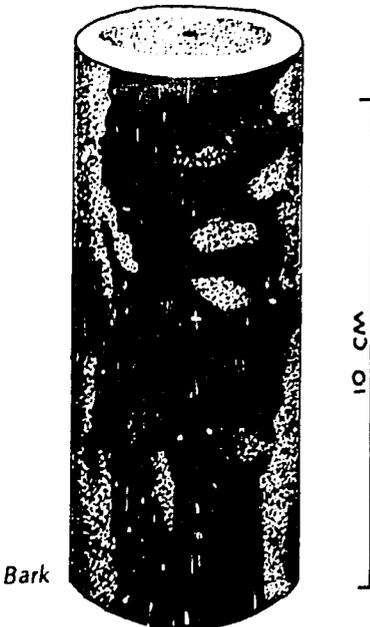
of the first caatinga species to leaf out after ephemeral rains and the new leaves are taken by livestock. Goats eat the bark.

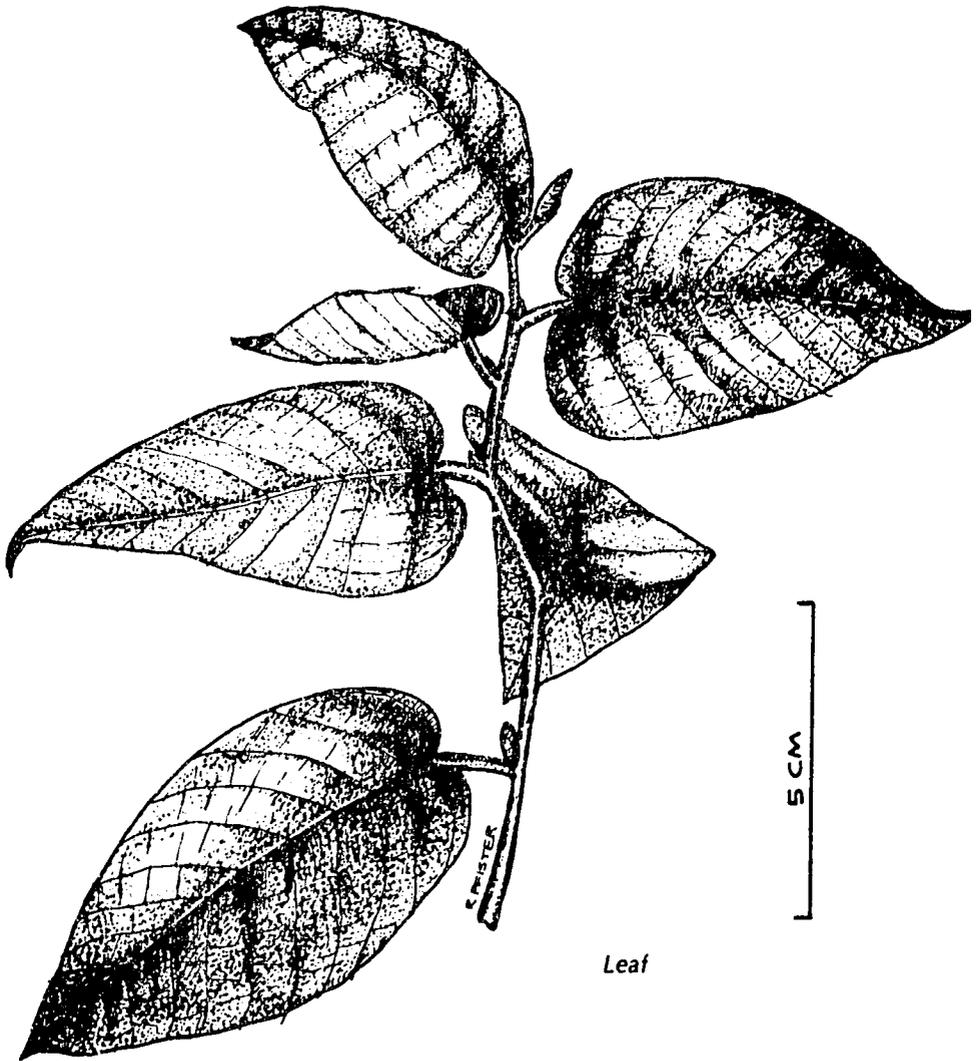
## Other Uses

**WOOD:** The very uniform sized stakes are used for house rafters. The wood is also used for fence construction and firewood. Wood shavings of marmeleiro ignite very easily. **ANEC-DOTAL:** A powder made of shavings of marmeleiro is sniffed to alleviate sinus problems. A tea is made of the bark for the relief of gastrointestinal stress. The bark is also chewed to relieve stomach aches.

## Research Potential

Research is being conducted to determine economic potential of extracting oil from the seed. Other research is needed to determine more effective control methods for this invader species.





Leaf

### Description

**HABIT:** A small tree or shrub with consistent sized branching from the base. Very shallow rooted. Deciduous. **LEAVES:** Alternate, elongated cordate, pubescent, aromatic. **FLOWER:** Small, white, aromatic, presented on a spike.

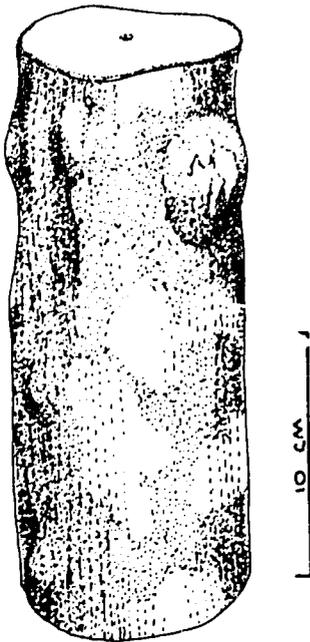
**FRUIT:** A 3-seeded capsule. **BARK:** Smooth, thin, reddish-brown with white spots, longitudinal coloration lines. When older, bark develops light gray scales.

# Mofumbo

*Combretum leprosum* Mart.  
Fam: Combretaceae

## Habitat

Its distribution is from Piauí to Bahia. Mofumbo is adaptable to all sites and is capable of surviving on extremely degraded sites, but does best on fine textured, moderately deep (50 cm) and deeper soils. It prefers river banks and open areas but can be found in any caatinga. It is highly tolerant of water logged conditions and is equally resistant to fire. It is a minor component of stable plant communities.



Bark

## Forage Value

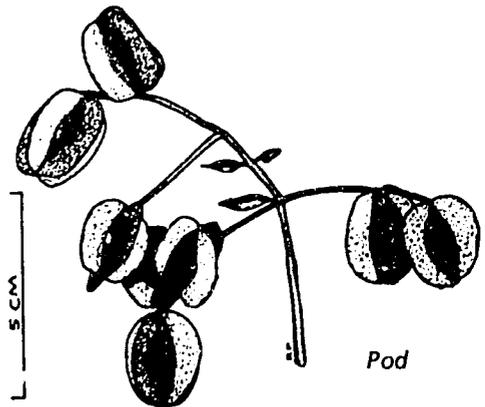
Mofumbo provides very little forage value, and is only taken in small amounts when green or dry. It is a difficult species to control and its importance increases with disturbance.

## Other Uses

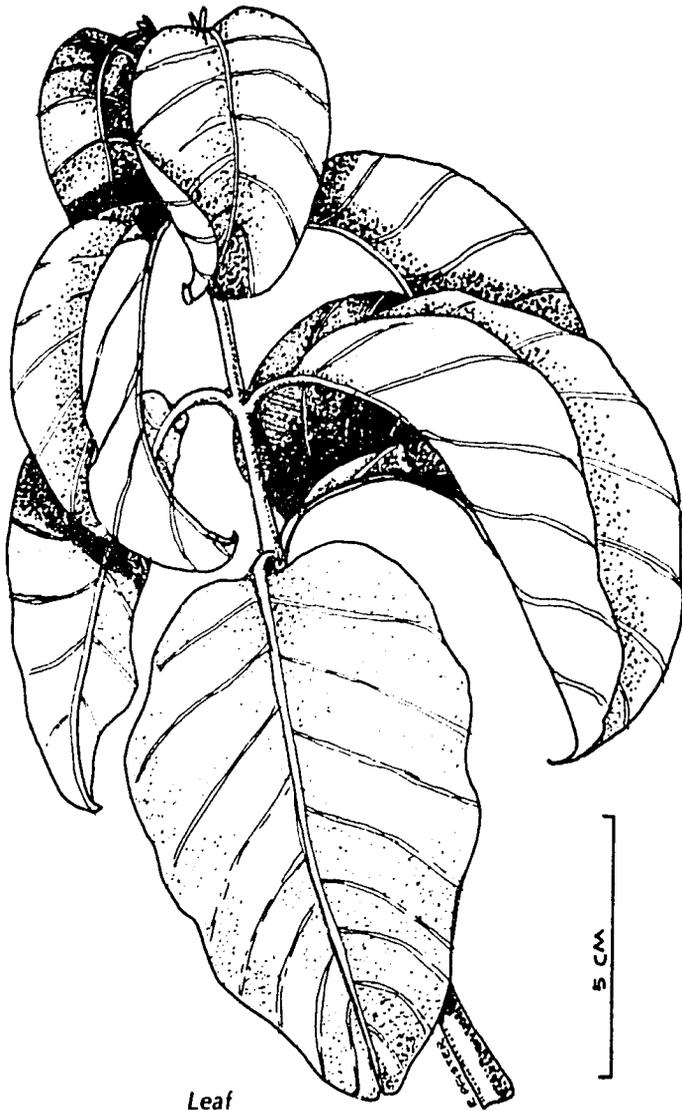
**WOOD:** The wood is used for firewood and charcoal. It has no construction value other than as decorative pieces for artisan objects. **ANECDOTAL:** The meristems and new leaves are chewed until soft and placed on cuts to stop bleeding. A tea of the seeds is taken for hemorrhage or retained placenta problems. Also, a tea made from the nodes is used for some postpartum problems.

## Research Potential

Research is needed on development of effective control methods.



Pod



Leaf

**Description**

**HABIT:** Many-branched shrub that can form a thicket. Sprawling, knotted branches. Under a forest canopy, it becomes a climber. Leaves are persistent. **LEAVES:** Opposite, oval-oblong, pointed at the end. **FLOWER:** Small,

yellow-cream on a terminal panicle. **FRUIT:** Four-winged samara. **BARK:** Thin, gray with white patches giving a camouflaged appearance. Older bark forms scales.

# Mororó

*Bauhinia forficata* Link

Fam: Leguminosae (Caesalpinioideae)

## Habitat

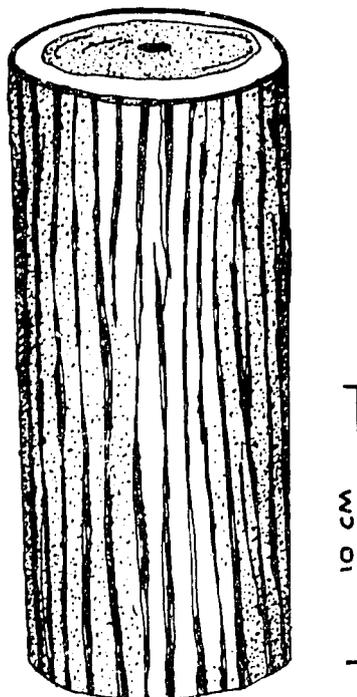
Mororó is found throughout most of the northeast. It prefers deep soils, and is very resistant to droughts.

## Forage Value

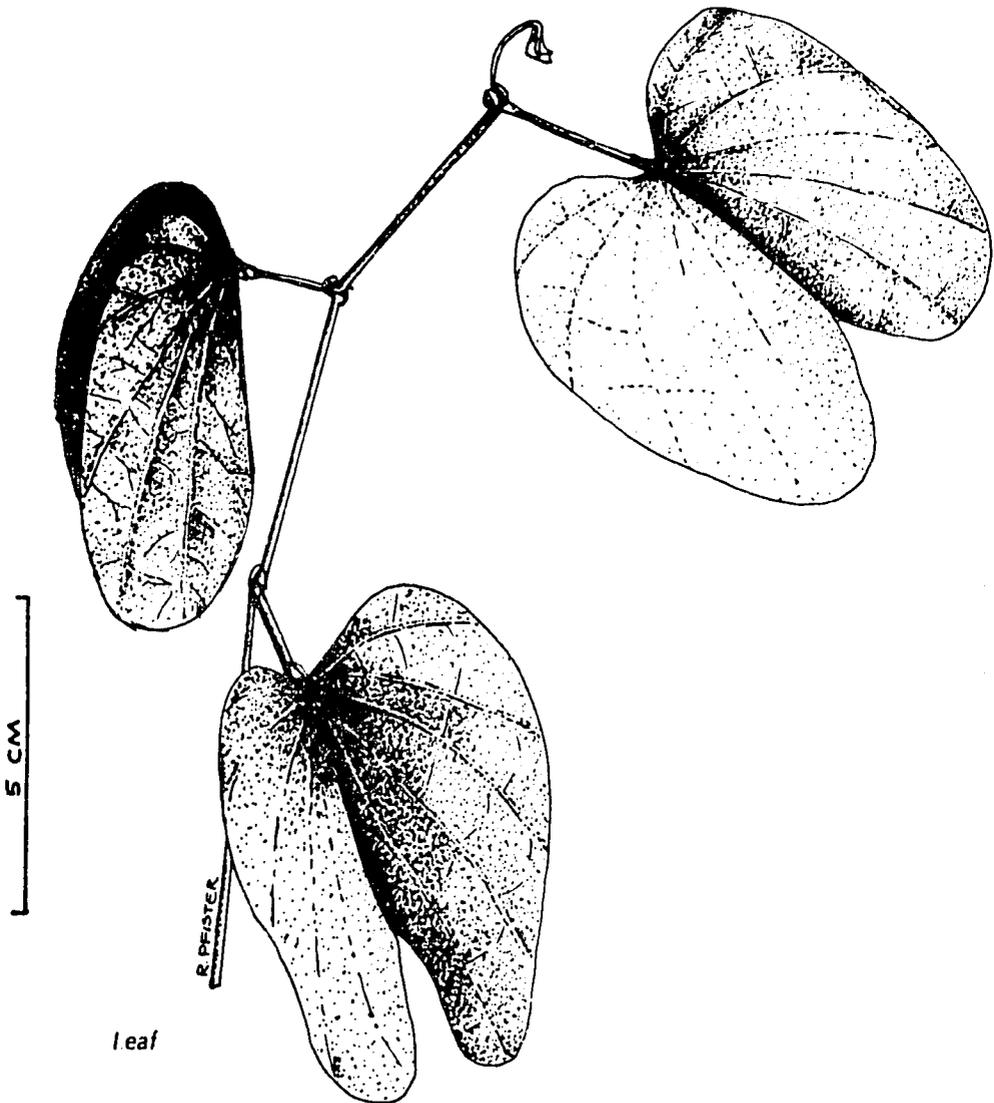
It provides excellent forage for all livestock, either green or dry. A chemical analysis of the leaves by the Instituto de Quimica Agricola do Ministério de Agricultura (cited by Renato Braga, 1960) showed a crude protein content of 19 per cent. It may be the most preferred leaf litter of any tree species of this region; however, the leaves decompose more rapidly than those of other species, possibly due to their high nitrogen content.

## Other Uses

**WOOD:** The wood is used for firewood, fence posts and house supports. It is very hard. **ANECDOTAL:** Smoke from the bark is said to alleviate chest congestion.



Bark



leaf

**Description**

**HABIT:** Small to medium sized tree. Closely resembles sabiá during the dry season. Deciduous. **LEAVES:** Alternate, simple, bilobed. **FLOWERS:** Called the orchid tree because of the large and showy cream-pink flower. Presented on

a raceme. **FRUIT:** A pod, 15-20 cm long, thin, dark brown. **BARK:** Rough, gray-brown, deep longitudinal fissures separating scaly ridges. Easily confused with sabiá.

# Oiticica

*Licania rigida* Benth  
Fam: Rosaceae

## Habitat

Oiticica is found from Piauí to Bahia. It is characteristic of deep alluvial sites, and is most commonly seen along banks of rivers and annual streams. It is strictly a low elevation species never occurring above about 200 m elevation.



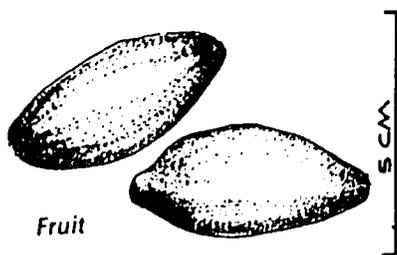
dark

## Forage Value

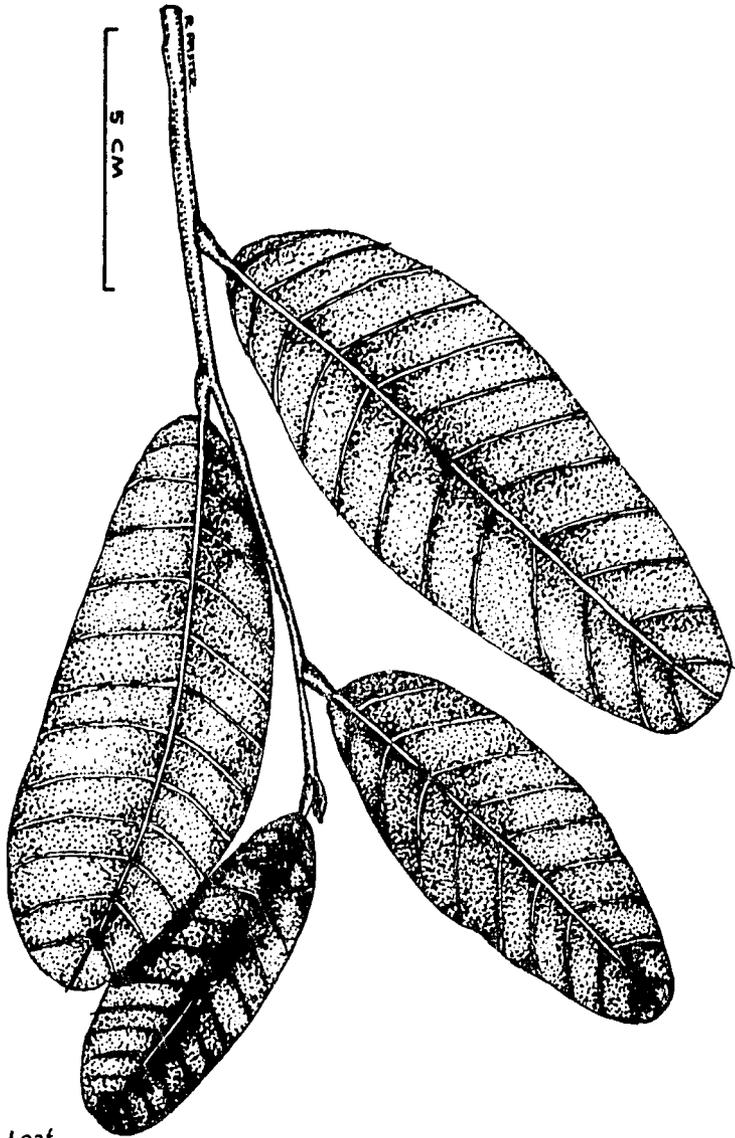
It is not considered a source of livestock forage except in the most severe drought periods.

## Other Uses

**WOOD:** The wood is used for wagon wheels as it is resistant to shock. **SEED:** The seed is high in oil content. Braga (1960) rates it as containing 60 per cent oil. Oil extraction for use in high quality lubricants has become an important industry in Ceará. An average of 8,900 tons per year of this oil was exported from Ceará during the 15-year period from 1956 to 1970 (Anuário Estatístico do Brasil, 1972). The oil of oiticica is also used in the sertão to make soap.



Fruit



Leaf

**Description**

**HABIT:** Large tree (10-15 m) characterized by a massive and spreading crown which clothes the greater portion of the trunk. Branching begins near the base. Evergreen. Slow growing. **LEAVES:** Alternate, oblong,

10-20 cm long, rigid, leathery. **FLOWERS:** Small, yellow, presented on branched spikes. **FRUIT:** An oil-containing drupe. **BARK:** Rough, gray-brown with scaly ridges that flake off.

# Pau branco

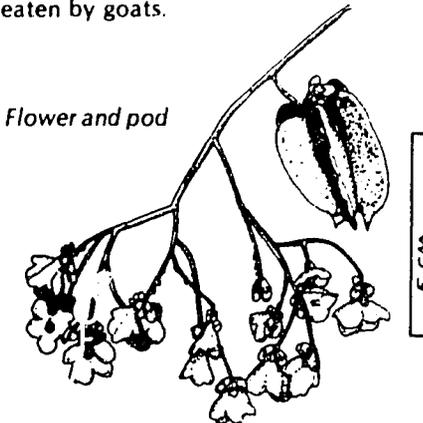
*Auxemma onocalyx* (Fr. Alem) Taub.  
Fam: *Boraginaceae*

## Habitat

Its center of distribution is in Ceará. Within the northern region it is encountered on all sites except extremely shallow and poorly drained ones. It tolerates only short periods of water logging. On fine and medium textured, moderate to deep soils, it forms almost pure stands. On fertile soils, resprouting pau branco grows very fast and can reach four meters within four to five years. It is not resistant to fire and is strictly a low elevation species. Apparently, it is a climax species as it reproduces readily under a full canopy. Numerically, it is the most important species in the municipality of Sobral.

## Forage Value

The forage value for sheep and goats is low. Green or dry leaves from older trees are consumed only occasionally. Anecdotal sources indicate that cattle readily consume leaves from older trees. Leaves on young pau branco shoots that re-grow following coppice cutting are acceptable to goats and are readily consumed by sheep. Partially decomposed fruits are eaten by goats.



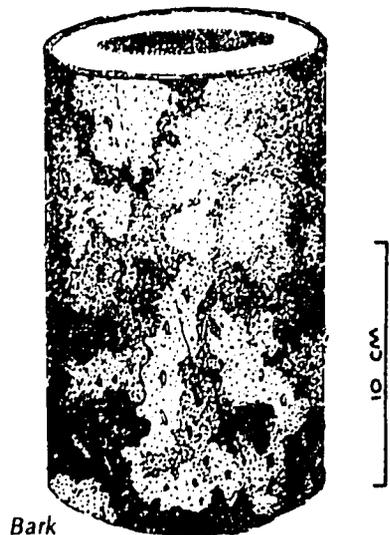
## Other Uses

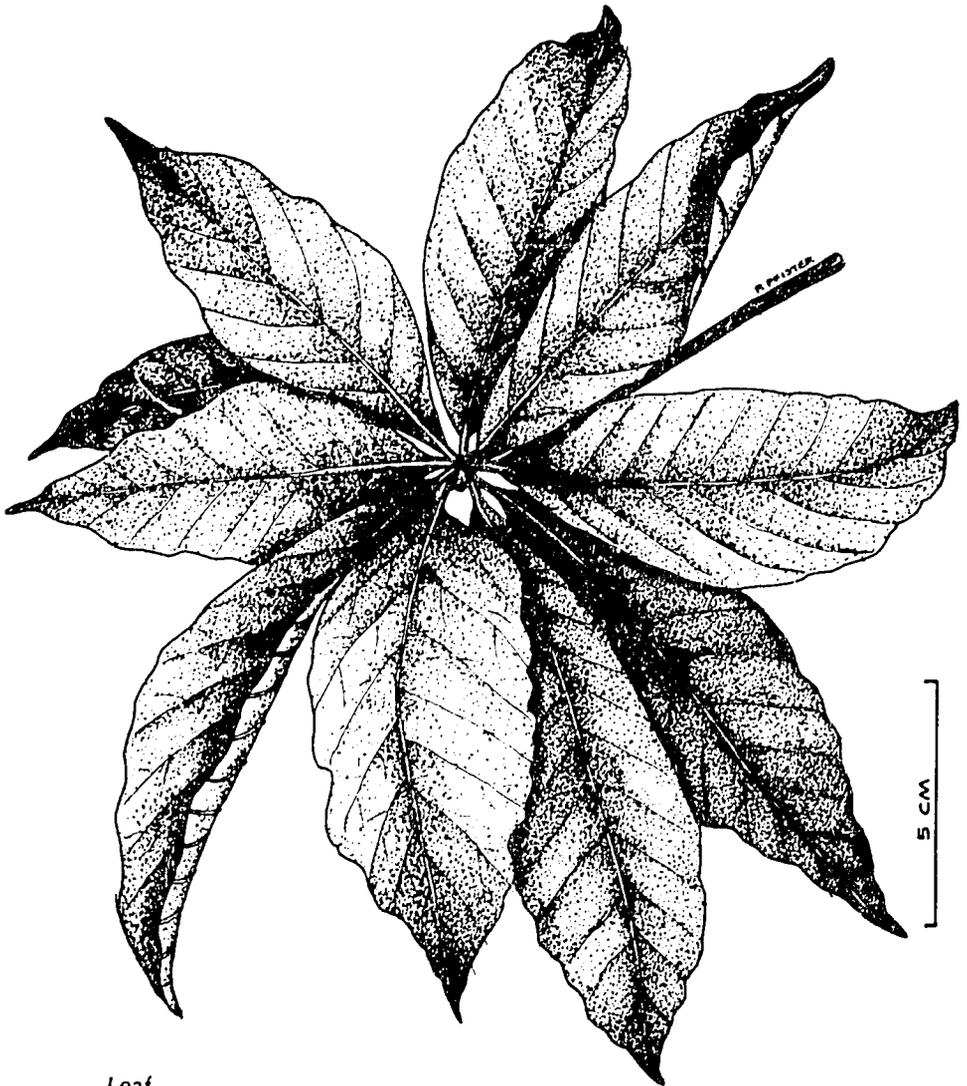
**WOOD:** Pau branco is the major construction wood in Sobral, Ceará. It can produce saw timber in 5 years, and is an important source of income to ranchers. A 2-meter long saw log currently sells for the equivalent of US\$1.

## Research Potential

This economically important species needs research in the following areas:

1. Management techniques to increase saw timber production.
2. Factors responsible for persistence of green leaves on cut and resprouting coppice growth.
3. Potential for propagation as a firewood crop in other arid areas of the world as it is fast growing, coppices readily when cut and is not highly palatable to livestock.





Leaf

### Description

**HABIT:** A small to medium sized tree, seldom more than 6-8 m in height. Coppices readily from the base when cut, giving the appearance of a cluster of branches from the ground level. Deciduous. **LEAVES:** Alternate, whorled, elongated, 20-35 cm long, serrate. **FLOWERS:** Small, white,

presented on a corymb. **FRUIT:** A drupe, seed enclosed in a 5 winged bladder. **BARK:** Thin, gray-white, spotted. **WOOD:** Heavy, hard, strong, coarse-textured, straight grained. Heartwood is purplish-brown or chocolate colored and the sapwood is yellowish white.

# Pau mocó

*Luetzelburgia auriculata* (Fr. All.) Ducke  
Fam: Leguminosae (Papilionoideas)

## Habitat

In Piauí and Ceará it is seen primarily on shallow rocky soils derived from sandstone. It is typically found on elevated plateaus (chapadas) and hillsides.

## Forage Value

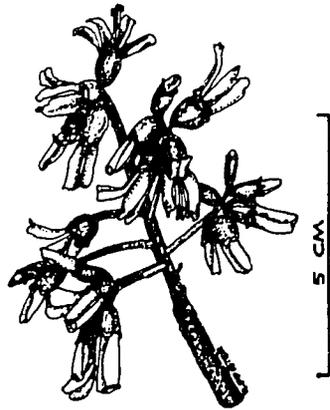
Pau mocó has no forage value, even though it is an evergreen species.

## Other Uses

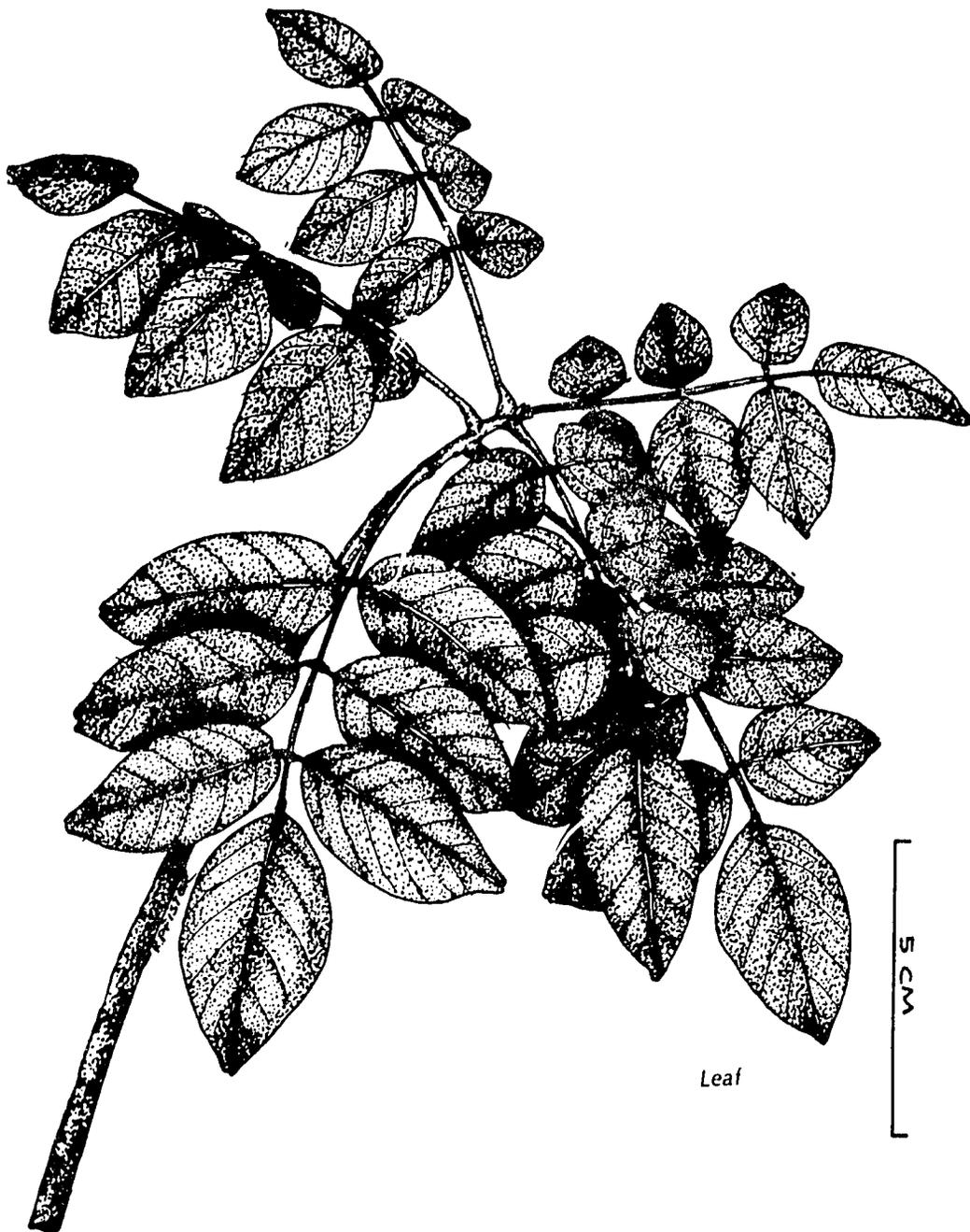
**WOOD:** The wood is used for firewood and fence construction. **SHADE:** The canopy provides shade during the dry season. **ANECDOTAL:** The smoke of burning pau mocó branches is said to cause blindness. **TUBEROUS ROOT:** During severe droughts, a flour is made of the root and eaten as an emergency food.



Bark



Flower



5  
CM

Leaf

### Description

**HABIT:** Medium sized tree. Reaches 4 m in height. Remains green during the latter part of the dry season. **LEAVES:** Alternate, odd-pinnate, 7 leaflets, elliptical. **FLOWERS:** Small, yellow-purple, presented on a terminal panicle. Flowers at the beginning of

the dry season when the leaves are shed. **FRUIT:** A legume, flat, thin, 12-14 cm long, reddish-brown, constricted between the seeds. **BARK:** Rough to smooth, separating scaly ridges, gray-brown. **ROOTS:** Tuberose, starchy.

# Pereiro

*Aspidosperma pyrifolium* Mart.  
Fam: Apocinaceae

## Habitat

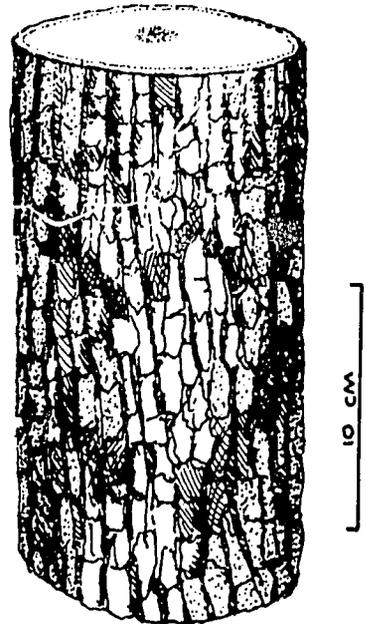
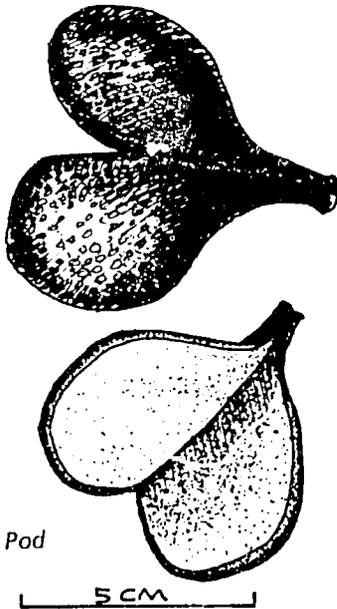
It is adaptable to soils of all textural classes and all depths short of exposed bedrock. Pereiro is tolerant of water logged conditions and is very capable of growing on severely eroded sites where its presence becomes more noticeable. It is very resistant to long and hard droughts. In some areas it may remain green year-round.

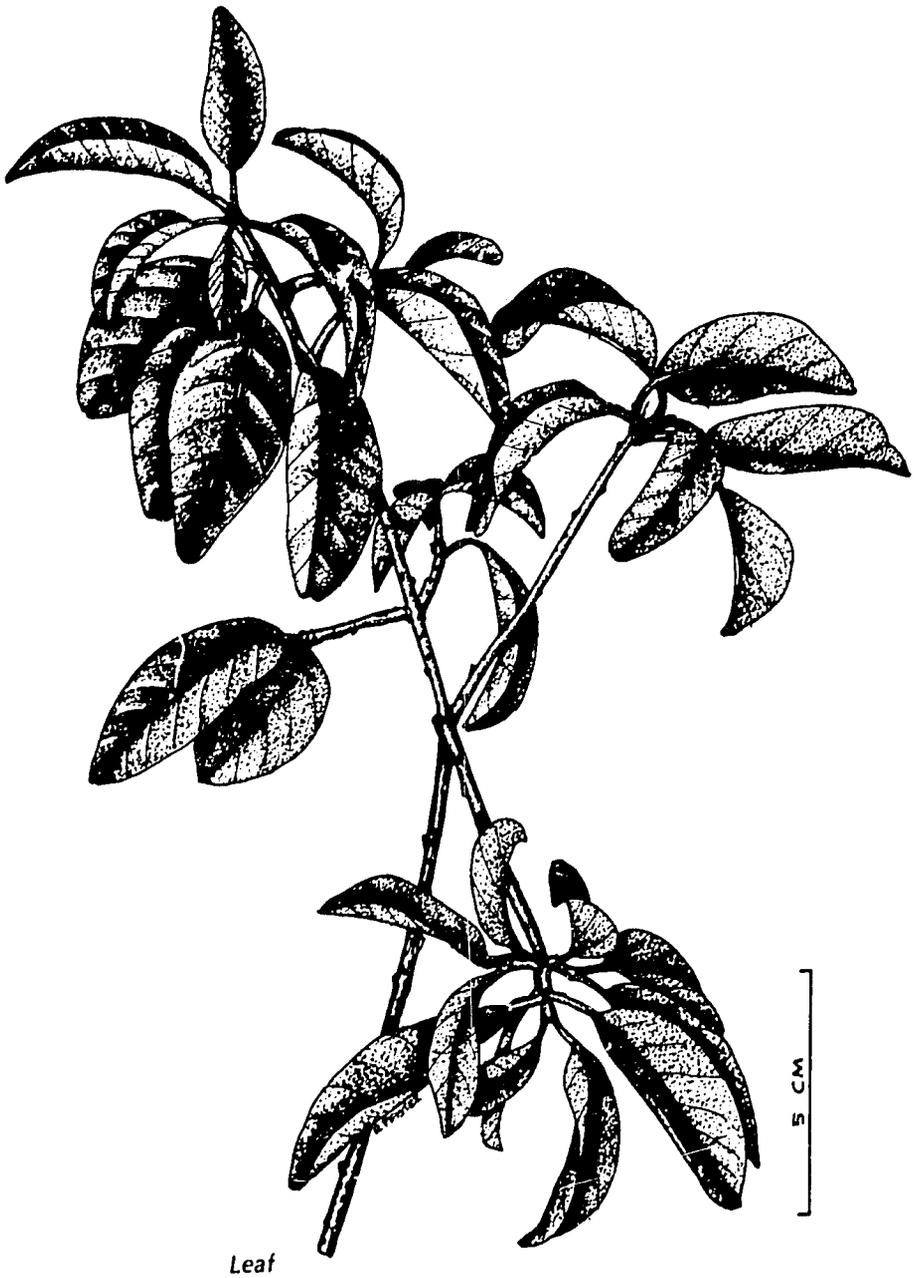
## Forage Value

It has no forage value, and the seeds are said to be toxic.

## Other Uses

WOOD: Pereiro yields good quality wood for furniture (especially chairs). It is also used in house and fence construction and for firewood and charcoal.





Leaf

### Description

**HABIT:** Small to medium sized tree. Grows straight. Very slow growing.  
**LEAVES:** Whirled, oval, 7-9 cm long, arcuate, leathery. **FLOWERS:** Small, cream colc. ad on terminal cyme.

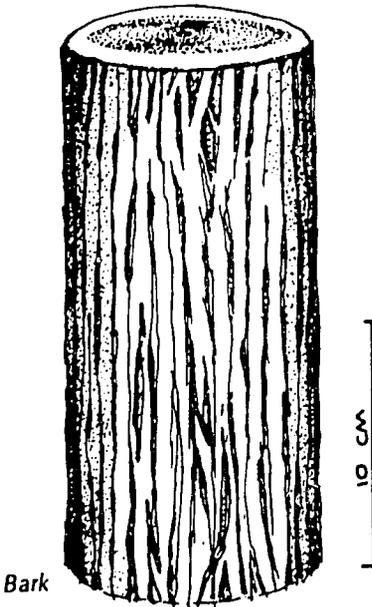
**FRUIT:** A follicle. **BARK:** Smooth, gray, spotted when young. With aging it becomes rough and flaky with whitish and dark rings.

# Sabiá

*Mimosa caesalpiniaefolia* Benth.  
Fam: Leguminosae (Mimosoideae)

## Habitat

Sabiá is a characteristic plant of the caatinga of Ceará and Piauí and is also found in other areas of the northeast. It is adaptable to a wide spectrum of conditions, however, it competes best on shallow soils. On infertile shallow soils it tends to become hollow. On fertile soils a resprouting sabiá yields fence post-sized material within six years. It is a prolific seed producer, and if protected from grazing animals, it may be a significant component of initial seral stages of secondary succession following clearing and burning. Its high palatability appears to be a key factor in controlling its distribution.



## Forage Value

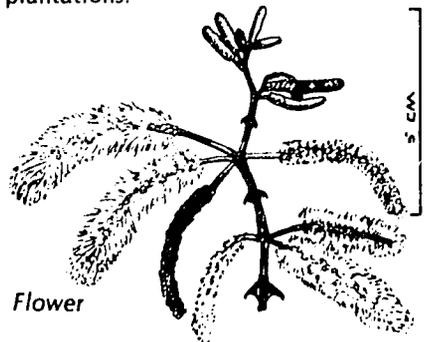
Dry or green, sabiá is probably one of the most preferred browse species to all livestock. The leaves are soft and contain about 17 per cent crude protein when green (Brago, 1960). The seed pods are also consumed by livestock. The species resprouts readily from the stump when cut and provides a more accessible form of green forage. Sabiá multiplies from both seed and cuttings. It is very difficult to herd livestock in an area of young sabiá because of the thorns.

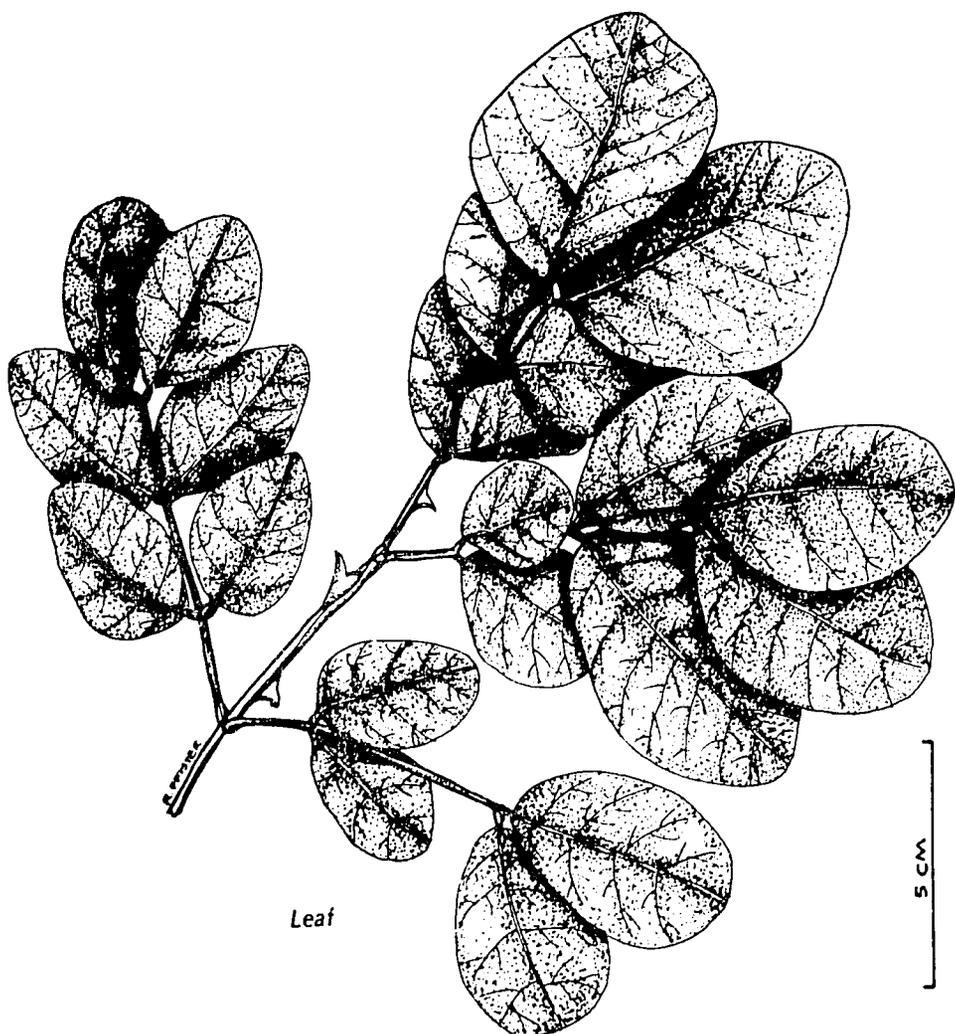
## Other Uses

**WOOD:** Sabiá is the most important source of fence posts in Ceará, being highly resistant to decomposition. It has a high commercial value on local ranches where individual sabiá posts presently sell for US\$0.25. The wood is also used as firewood and charcoal. **ANECDOTAL:** The bark is rubbed into cuts as an aid to healing. A tea is made of the inner bark to alleviate stomach ailments.

## Research Potential

Good potential exists for use in combination forage and fence post plantations.





### Description

**HABIT:** A medium sized tree of 4-7 m in height. Profusely branched and thorny when young. Rapid growing. Coppices readily from trunk when cut and tends to form a thicket. Early deciduous. Some thornless varieties. **LEAVES:** Opposite, even-pinnate. Leaflets oval and slightly curved, soft texture. **FLOWERS:** Small, white, melliferous, presented on a spike.

**FRUIT:** A pod, short, with soft and small seeds. **BARK:** When young, reddish-brown with white patches, having a darker colored strip running from thorn to thorn. When older, grayish-brown with rough longitudinal furrows. Rectangular strips begin to flake away. **WOOD:** Dark red with yellowish-white sapwood.

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# Glossary

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**ACHENE:** a dry, 1-seeded, indehiscent fruit whose pericarp and seed coat are separate, except at the funiculus.

**ALTERNATE:** the leaf arrangement characterized by a single leaf per node.

**ALVEOLATE:** resembling the surface of a honey comb.

**ARCUATE:** leaf venation pattern in which principal veins tend to parallel the margin.

**AXILLARY:** borne on an axil.

**BIPINNATE:** twice pinnately compound leaf.

**BOLE:** the main tree trunk.

**CAATINGA:** term that applies to the deciduous woodland vegetation type of the arid northeast part of Brazil.

**CANOPY:** the layer of tree crowns in a forest.

**CAPITULUM:** an inflorescence type characterized by an aggregation of sessile or almost sessile flowers on a common receptacle.

**CAPOEIRA:** caatinga vegetation during the second or third year after clearing. Early seral stage of secondary succession.

**CAPSULE:** a simple, dry, dehiscent fruit, splitting along 2 or more lines of suture.

**CHAPADAS:** elevated plateau with closed caatinga vegetation.

**PANICLE:** a compound or branched raceme. Flowers on ultimate branchlets.

**PENEPLAIN:** a once high, rugged area which has been reduced by erosion to a low, gently rolling surface resembling a plain (Soil Science Society of America).

**PETIOLE:** a stalk that attaches a leaf to a stem.

**PINNATE:** A featherlike arrangement in which leaflets or veins are arranged in one plane or two sides of a central axil.

**PINNULE:** blade of a twice compounded leaf.

**POD:** the dehiscent dry fruit characteristic of the legume family.

**PUBESCENT:** general term for hairiness.

**RACEME:** a simple, elongated, indeterminate inflorescence, with stalked flowers.

**RANGE SITE:** an area of land having uniform edaphic, climatic, topographic and biotic factors such that the production potential is significantly different from other areas.

**RHIZOMATOUS:** having underground stems that bear reduced scaly leaves; reproducing from these stems.

**SAMARA:** a winged achene, single seeded, indehiscent fruit.

**SERAL:** pertaining to an intermediate successional stage.

**SERTÃO:** the arid and semi-arid interior of the northeast part of Brazil—the backlands.

**SERRATE:** leaf margin having sharp teeth pointed forward.

**SESSILE:** attached directly (without a stalk) to the supporting structure (i.e., branch).

**SPIKE:** an erect, elongated, indeterminate, unbranched inflorescence with sessile flowers.

**SUCCESSION:** replacement of one plant community by another. (Also changes within a plant community).

**TABULEIROS:** open areas of the sertao of low fertility.

**TERMINAL:** an inflorescence that terminates a shoot is said to be a terminal inflorescence.

**WHORLED:** a circular arrangement of three or more leaves about a node.