

# Anales

del Jardín Botánico de Madrid

Volumen 65 N.º 2

julio-diciembre 2008

Madrid (España)

ISSN: 0211-1322



**CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS**

# A taxonomic study of *Albizia* (Leguminosae: Mimosoideae: Ingeae) in Mexico and Central America

by

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## Abstract

Rico, M. de L., S.L. Gale & N. Maxted. 2008. A taxonomic study of *Albizia* (Leguminosae: Mimosoideae: Ingeae) in Mexico and Central America. *Anales Jard. Bot. Madrid* 65(2): 255-305.

The genus *Albizia* is economically and environmentally important because many elements are multipurpose trees. A taxonomic study of 12 Central American and Mexican *Albizia* species is presented. Identification keys, illustrations and ecological information are provided together with some taxonomic comments. Distribution maps and conservation status are given for each native species in the area. Three epithets are lectotypified and three new name combinations are made. An interactive identification electronic key is available from the authors if requested. Full specimen records are available at [www.kew.org/herbcat](http://www.kew.org/herbcat).

**Keywords:** *Albizia*, multipurpose trees, conservation, Leguminosae, Mimosoideae.

## Introduction

*Albizia* is a pantropical genus that includes at least 470 names. Lewis & Rico Arce (2005) give a figure between 120-140 species; in Africa there are c. 36 endemic species and in the Neotropics 22. Twelve species of *Albizia* are native or naturalized in Mexico and Central America, this figure does not include the 'rain tree' *Albizia saman* currently recognised as *Samanea saman* (Nielsen, 1992; Polhill, 1994).

In Central America and Mexico *Albizia* species are fast growing, multipurpose trees; collecting trips to this part of the world by the Institute of Biology (Mexico), the Oxford Forestry Institute, and the Darwin Programme at the Natural History Museum (London) have provided numerous new collections. *Albizia* species are

## Resumen

Rico, M. de L., S.L. Gale & N. Maxted. 2008. Estudio taxonómico de *Albizia* (Leguminosae: Mimosoideae: Ingeae) en México y América Central. *Anales Jard. Bot. Madrid* 65(2): 255-305 (en inglés).

El género *Albizia* tiene importancia económica y ecológica porque en su mayoría está integrado por árboles con usos múltiples. Se presenta un estudio taxonómico para 12 especies con distribución en México y Centro América, se incluyen claves para la identificación de las especies, ilustraciones, mapas de distribución, estados de conservación de las especies nativas del área y comentarios ecológicos y taxonómicos. Se formaliza la lectificación de tres epítetos y se proponen tres nuevas combinaciones. Una clave electrónica interactiva para la identificación de las especies se puede solicitar a los autores. Finalmente el conjunto completo de los ejemplares de herbario puede ser consultado en el sitio Web de los Jardines Reales de Kew: [www.kew.org/herbcat](http://www.kew.org/herbcat).

**Palabras clave:** *Albizia*, árboles multiuso, conservación, Leguminosae, Mimosoideae.

highly valued in Central America as understory shade trees for crop plantations, soil erosion stabilisers, soil improvers and as nitrogen fixing species, providers of livestock fodder with a high crude-protein content, as timber trees and also as providers of water-soluble gum (Allen & Allen, 1981; Lowry & al., 1994; Escalante & al., 1998; Sprent, 2001).

The genus *Albizia* was first published by Durazzini in a rare periodical, *Magazzino Toscana* in 1772. The description was based on a plant grown from seeds from Asia which were brought by Fillippo Degli Albizzi in 1749 from Constantinople to Florence (Nielsen, 1979). The first classification of *Albizia* was that of Bentham (1875), although many current *Albizia* species were originally included in the genera *Pithecellobium* and *Acacia*. Bentham (1875) included 9 genera in the tribe Ingeae:

*Affonsea* St. Hill., *Albizia* Durazz., *Archidendron* F. Muell., *Calliandra* Benth., *Enterolobium* Mart., *Inga* Willd., *Lysiloma* Benth., *Serianthes* Benth., and *Pithecellobium* Mart.; subsequently there have been many classifications of *Albizia* and related genera, notably: Britton & Rose (1928), Mohlenbrock (1963), Nielsen (1981) and Barneby & Grimes (1996). For the Flora of North America, Britton & Rose (1928) divided the Ingeae into several smaller genera based on stipule characteristics, inflorescence type, leaf texture, mode of legume dehiscence, form of the fruit, and the presence of a seed aril. The South American species were studied by Britton & Killip (1936) and Kleinhoonte (1940), and the Ingeae for the rest of the world by Kostermans (1954). By the 1960's the tribe Ingeae consisted of 35 genera (Nielsen, 1981: 174-176), with the generic delimitations based on fruit, gynoeceum and leaf characters. Genera proliferated, as researchers tended to create a new genus every time a new fruit type was discovered. Mohlenbrock (1963) attempted to reclassify the tribe into 21 genera, but his system was similarly limited due to an over-reliance on fruit characters. For the 1978 International Legume Conference, Nielsen (1981) presented a chronological list of classifications of the tribe Ingeae, and moved from a largely fruit-based classification to one employing mainly inflorescence features. Nielsen (1981) reorganised the

tribe and pointed out that considerable work was needed for certain groups, especially those he provisionally named as genus A, B, C and D. Only 21 genera (including *Marmaroxylon*) were retained as good genera (Nielsen, 1981) and these 21 did not correspond to those recognised by Mohlenbrock (1963). The majority of Nielsen's work was based on the Asian, Australasian and Pacific Ingeae and through his (Nielsen, 1981; Nielsen & al., 1983) and other author's work (Kostermans, 1954; Mohlenbrock; 1963, Kanis, 1986) the species in this area are now reasonably well understood.

Barneby & Grimes (1996, 1997) and Barneby (1998) re-classified the tribe Ingeae focusing on the New World species and placed the genera into five informal alliances (Table 1). Novel characters such as branching pattern and developmental stages of vegetative and floral buds were used for the first time, allowing a broader phylogenetic analysis than was previously possible. As a result most *Albizia* species recognised in our treatment were placed as *Incertae sedis* taxa (i.e. taxa of unknown position; the genus *Albizia* was not included in one of the Barneby & Grimes' ingoid alliances). Other *Albizia* species recognised here were placed by Barneby & Grimes (1996) in the genera *Pseudosamanea* and *Hesperalbizia* in the *Samanea* and *Chloroleucon* alliances of the Ingeae. Rico Arce (2000) discussed the lack of support

**Table 1.** A generic conspectus of native American genera of the tribe Ingeae, based on Barneby & Grimes (1996) with the addition of the genus *Guinetia* L. Rico & M. Sousa (Rico Arce & al., 2000). \* Genera of unplaced position, and thus not a Barneby & Grimes' (1996) alliance. \*\* Intermediate between the tribes Ingeae & Acaciaeae.

Alliance as given by Barneby & Grimes, 1996	Genera in alliance growth	Branch & meristem	Dimorphic shoots	Flower heteromorphy	Fruit with mesocarp/septae
<i>Abarema</i>	<i>Hydrochorea</i> [ <i>Balizia</i> ], <i>Abarema</i>	Monopodial, sylleptic, unarmed	Absent	Present & absent	Present Present Present & absent
<i>Samanea</i>	<i>Hesperalbizia</i> <i>Pseudosamanea</i> <i>Samanea</i>	Monopodial, proleptic unarmed	Absent	Present & absent	Absent Absent Present
<i>Chloroleucon</i>	<i>Blanchetiodendron</i> <i>Leucochloron</i> <i>Chloroleucon</i>	Sympodial, proleptic, unarmed	Absent or commonly present	Present & absent	Absent Absent Present
<i>Pithecellobium</i>	<i>Sphinga</i> , <i>Havardia</i> <i>Ebenopsis</i> <i>Painteria</i> <i>Pithecellobium</i>	Sympodial or perhaps monopodial, proleptic, armed	Present	Absent	Absent Present Absent Present & absent
<i>Inga</i>	<i>Macrosamanea</i> , <i>Cojoba</i> , <i>Inga</i> , <i>Zygia</i>	Sympodial, proleptic or sylleptic, unarmed	Present	Absent	Absent
	<i>Albizia</i> * <i>Enterolobium</i> * <i>Cedrelinga</i>	Sympodial, proleptic, unarmed	Present & absent	Present & absent	Present & absent Present Absent
	<i>Calliandra</i> * <i>Zapoteca</i> * <i>Archidendron</i> *	Sympodial, proleptic, unarmed	Present	Absent	Absent Absent Absent & present
<i>Guinetia</i>		Sympodial, proleptic, unarmed	Present	Absent	Absent
<i>Lysiloma</i> **	<i>Lysiloma</i>			Absent	Present

for the genus *Balizia* and transferred the two species to *Albizia*. Lewis & Rico Arce (2005) gave an overview of the whole tribe across its distribution range and recognised 36 genera, of which 24 are New World endemics.

Molecular support for generic delimitation within the tribe Ingeae is not yet sufficiently well established, especially for the more recently described genera. Luckow & al. (2003), in a broad mimosoid survey, included less than 10 *Albizia* s.l. species, and Lewis & Rico Arce (2005) concluded that 'a new classification of the Ingeae will require sampling of all the genera not included by Luckow & al. (2003) and more extensive sampling of the larger and putatively non-monophyletic genera'; this includes *Albizia* s.l.

Herein taxa are treated following Barneby & Grimes (1996) and Lewis & Rico Arce (2005) with the exception of only two species: which are both, once again, placed in *Albizia*, *Pseudosamanea guachapele* and *Hesperalbizia occidentalis* (Table 2).

As presently understood *Albizia* is a genus of small to large (up to 30 m) trees of sympodial growth, often with a short bole and spreading crown. *Albizia* has a discontinuous circumtropical distribution, most highly diversified in tropical America, then Africa (including Madagascar), SE Asia and Malaysia. Based on our observations of herbarium collections we recognise 33 species for the New World (Southern USA to Argentina), of which 12 occur in Central America and Mexico. Species of *Albizia* occur in almost every vegetation type throughout these regions.

In Central American *Albizia* species have been treated in some regional Floras such as those by Standley & Steyermark (1946) and Rico Arce (2001). A complete comprehensive work is, however, not yet available for North America. The range and distribution of each species is determined by its tolerance or susceptibility to various environmental conditions although in general the species can tolerate a wide range of edaphic conditions including heavy clays, volcanic ash, acid soils (to pH 4.5) and water-logging. Species are also well adapted to poor soils and of-

ten serve as soil improvers. They occur in areas of mean annual rainfall ranging from 350-5000 mm and at altitudes of sea level to 2400 m. They are common in low bush, secondary forests along sandy riverbeds, and in savannas. Some species are fairly salt-tolerant and occur in coastal areas. *Albizia* trees can thrive on lateritic alluvial soils and sandy post-mining areas (Allen & Allen, 1981). The majority of the *Albizia* species in the area of study belong to the seasonally dry, a deciduous tropical forest formation which extends throughout the Pacific coastal zone of Central America and Mexico, with few species present in evergreen tropical forest (Fig. 1); *Albizia* seeds are often dispersed by seasonal rains or drifted by water in riparian habitats. Throughout history forests have been readily converted into cropping and grazing land and the cutting of valuable timber trees for construction and fuelwood has also contributed to their degradation. In Central America and Mexico there is only 2% of the original dry tropical forest remaining with only 0.8% of it situated within national parks or other conserved areas (Carton & al., 2005). This degradation has been exacerbated by fire, which is a common occurrence during the dry season.

## Material and methods

This study was based on the study of more than 600 herbarium specimens. All measurements were taken from dry material, except flowers, which were rehydrated before measuring. Dimensions of mature flowers were measured at anthesis. Petiole length was measured from the base of a leaf to the first pair of pinnae. Rachis length is the distance from the first pair of pinnae to the terminal pair of pinnae. Descriptive terminology uses several references as standards. Leaflet venation pattern terminology follows Hickey (1973) and Barneby & Grimes (1996: 7, Fig. 1). Indumentum terminology largely follows the definitions of Lawrence (1951). Descriptions of leaflet shapes are based on the "symmetric plane figures" given as standards by the Systematics Association Committee (1962). Types are annotated with an exclamation mark (!) when seen by at least one author.

**Table 2.** Major changes in the tribe Ingeae (1963-2005) including the various interpretations of *Albizia*.

Mohlenbrock (1963)	Nielsen (1981, 1985, 1992) and Nielsen & al. (1983, 1984)	Barneby & Grimes (1996)	Lewis & Rico Arce (2005)
<i>Albizia</i>	<i>Albizia</i>	<i>Albizia</i> , <i>Balizia</i> , <i>Pseudosamanea</i> , <i>Hesperalbizia</i>	<i>Albizia</i> , <i>Pseudosamanea</i> , <i>Hesperalbizia</i>
<i>Arthrosamanea</i>	<i>Albizia</i>	<i>Albizia</i> section <i>Arthrosamanea</i>	
<i>Cathormion</i>	<i>Cathormion</i>		<i>Cathormion</i>
<i>Chloroleucon</i>	<i>Chloroleucon</i>	<i>Chloroleucon</i>	<i>Chloroleucon</i>
<i>Cylindrokelopha</i>	<i>Archidendron</i>		<i>Archidendron</i>
<i>Parasamanea</i>	<i>Albizia</i>		
<i>Parenterolobium</i>	<i>Albizia</i>		
<i>Samanea</i>	<i>Samanea</i>	<i>Samanea</i>	<i>Samanea</i>
<i>Serialbizia</i>	<i>Albizia</i>		

The descriptions were produced using the DELTA set of programmes (Dallwitz & al., 1996) and manually edited to make them more readable. The DELTA files were then imported to LUCID ([www.lucidcentral.com](http://www.lucidcentral.com)) to make the interactive key. Authors' names were standardised following the International Plant names Index ([www.ipni.org](http://www.ipni.org)). Species descriptions follow a designed format in which we include the relevant features of the genus. The descriptions were based on completed score sheets for each species; these were especially made to include characters present in the genus following format details as suggested by Radford & al. (1974).

A representative number of specimens (at least 10 of each species) were scored so as to include the complete morphological range of each species. Representative collections are arranged alphabetically, first by country, next by state, department or district, and finally by collector name and number. Label data from each specimen studied was stored in a database using the comput-

er programme BRAHMS (V5.6202) (Filer, 2007). Reports and outputs were used to produce a list of numbered exsiccatae, the representative number of specimens; and a file with coordinates to produce the distribution maps. Phenology data is for the study material collected from each area. Regional or Global, Mexico and Central America Conservation status follows; IUCN categories and criteria (IUCN version 3.1, 2001) are given at the end of each taxon. A list of numbered exsiccatae is included as an index.

### Characters of the genus *Albizia* (focusing mainly on Mexican and Central American species)

#### *Habit*

Small to large trees of sympodial growth, armed only

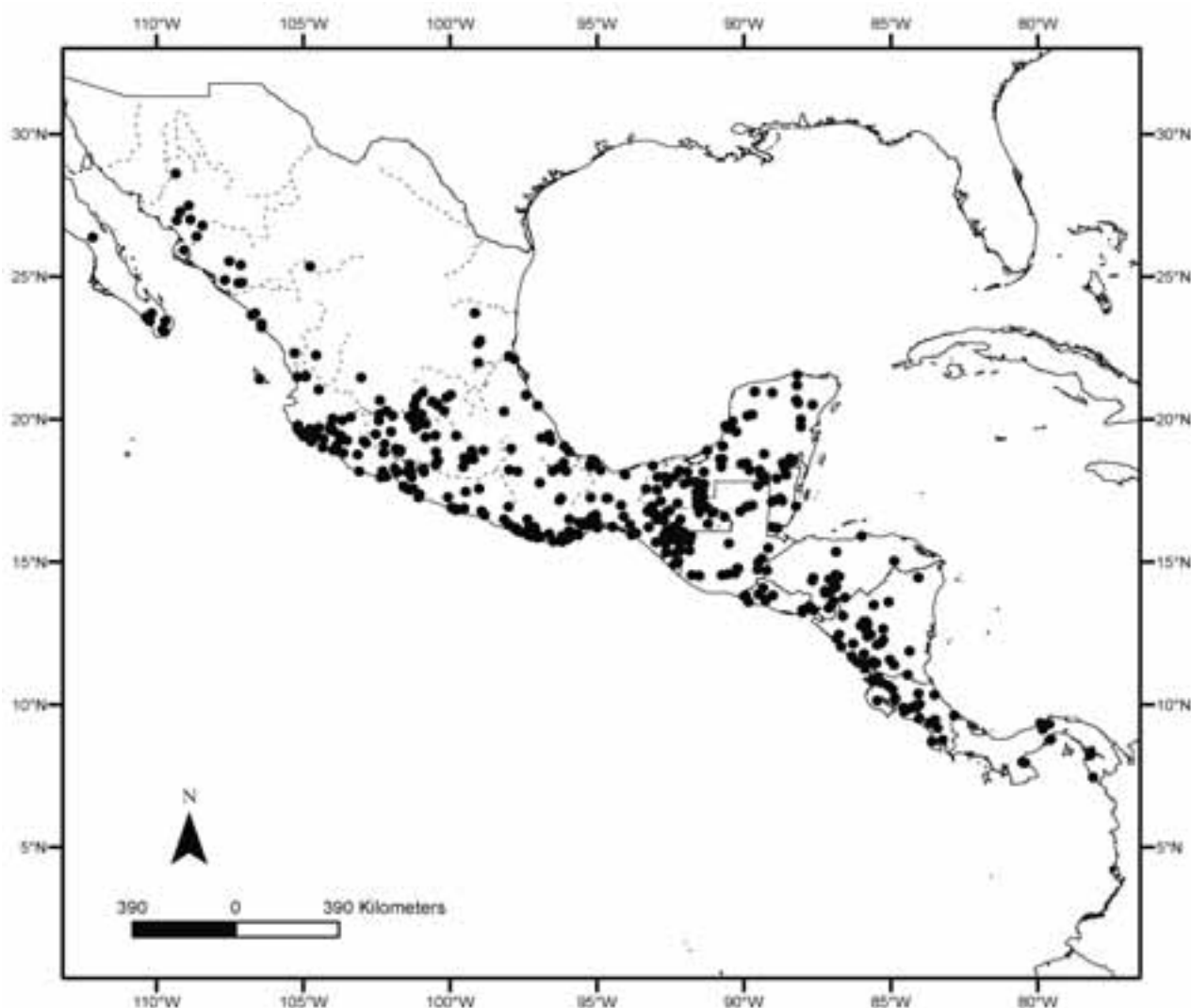


Fig. 1. Geographical range of the genus *Albizia* (●) in Mexico and Central America.



in very few African and Asian species (e.g., *A. corniculata*). Some species attain heights of 60 m (*A. leucocalyx*), and often have a short bole and a spreading crown, the canopy may be dense or open. The trees are usually single trunked, rarely herbarium labels describe the species as shrubs. The bark colour tends to be whitish-grey to light brown or brown, with the exception of *A. niopoides*, which is often yellow. Many members of the genus are deciduous and shed their leaves at the onset of the dry season, but some species such as *A. carbonaria* and *A. leucocalyx* are known to be evergreen or nearly evergreen (L. Rico Arce, field observations). Some species have shallow lateral roots making them susceptible to strong wind.

#### Indumentum

The pubescence of *Albizia* species is usually composed of simple pallid unicellular hairs. The thick pubescent indumentum that is present on the young developing stems, leaflets, inflorescences and legumes may be reduced with age (glabrescent). The presence or absence of indumentum on ovaries is a useful diagnostic feature between species. However, the exact type of pubescence generally varies within and between species, e.g., *Albizia adinocephala* consistently has a strigose indumentum on young branches and leaf axes and glabrous leaflets with some sparse strigose hairs. *Albizia guachapele* has a silky-pilose inflorescence that becomes glabrous.

#### Stipules

These are usually small, 1-6 mm long and caducous, less often they are persistent, as in *Albizia occidentalis*. The stipules in the genera of tribe Ingeae as a whole are very poorly differentiated, ephemeral and sometimes lacking. In *A. occidentalis* stipules are heart shaped, weakly nerved, and fall as the associated leaf expands; in *A. niopoides* stipules are < 2 mm long, filiform, and caducous. Other stipules in Central American *Albizia* species are either triangular-subulate or linear-subulate. Stipules do not greatly help to differentiate between species as they are so rarely seen on herbarium specimens.

#### Leaves

The leaves of *Albizia* are alternate, petiolate and bipinnate; usually they are not sensitive to touch. The majority of species have terete petioles and the rachis is grooved along the upper margin. There are glands [extrafloral nectaries] on the petiole and on the leaf rachis between some pinnae pairs, and less often between the pairs of leaflets on a pinna. Leaf characters are very useful in distinguishing the species; the number of pinnae in each leaf and the number of leaflets per pinna are relatively constant. The pinnae are opposite, with one to many pairs of opposite leaflets. *A. adinocephala* normally only has one pair of pinnae and therefore no leaf

rachis, only rarely does the species have 2 or 3 pairs of pinnae. The number of leaflet pairs varies from as few as four in *A. occidentalis*, to as many as 60 in *A. niopoides*. The leaflets are 3-60 mm long. Leaflet shape is elliptic, rhombic, obovate or oblong, and leaflets are sessile or shortly petiolate, with or without wrinkled insertion (pulvinus). Sometimes the terminal pair of leaflets are more asymmetric than the others on a pinna and tend to be obovate in shape.

#### Leaf Venation

The venation of some species is an important diagnostic feature and may be the only character used to distinguish between varieties (e.g. in *Albizia occidentalis*). The types of venation recognised in this paper follow Barneby & Grimes (1996: 7), these are: pinnate, in a symmetrical leaflet (*A. adinocephala*, Fig. 2 A); pinnate in a symmetrical rhombic leaflet (*A. leucocalyx*, Fig. 2 B); palmate-pinnate, 2-3 veins arise from the pulvinule, but secondary venation from the midrib is pinnate (*A. lebeck*, Fig. 2 C); palmate, several veins arise from the pulvinule, but the secondary veins from midrib are not as large as those from the pulvinule (*A. sinaloensis*, Fig. 2 D); dimidiate-palmate, in which the secondary veins in the acroscopic margin of the lamina are not as thick as those on the basiscopic half and the acroscopic margin of the lamina is straight or concave (*A. julibrissin*, Fig. 2 E).

#### Glands or extrafloral nectaries

Extrafloral nectaries are widespread in subfamily Mimosoideae and especially in the tribe Ingeae; these secrete nectar which is sugar enriched and invariably contains amino acids (Baker & Baker, 1973). It is thought that extrafloral nectaries are not directly associated with pollination, but rather they contribute to the plant's defence by attracting ants which may protect their foliage and reproductive parts from various herbivores (Vishwakarma & Thomas, 1991). Leaf nectaries are found in all species of Central American *Albizia*; they vary in number from one at the base or mid-way along the petiole, to indefinite numbers scattered along the rachis between the pinnae and occasionally between the leaflets. Young nectaries are green and conspicuous, but become greyish-brown and less evident with age. Nectar production from these glands in *Albizia* only occurs during the morning hours (Vishwakarma & Thomas, 1991). Nectaries vary in shape, from circular (*A. niopoides*) to broadly elliptic (*A. adinocephala*). Some are sunken (slit-like) into the petiole or rachis (*A. tomentosa*) whilst others are prominent and have a small apical pore (*A. leucocalyx*).

#### Inflorescence

The primary inflorescence unit of *Albizia* is a globose capitulum, a raceme, spike or corymb; these arise singu-

larly or in fascicles of two to six, from nodes subtended by a pair of caducous stipules, an expanded leaf, a rudimentary leafstalk or a simple bract (Barneby & Grimes, 1996). There is a heterochronic development of the leaf subtending the primary inflorescences. Heterochrony is defined as, “change in the relative time of appearance and/or rate of development for characters already present in the ancestor,” (Grimes, 1999). There are two possible outcomes, firstly that the leaf may be suppressed so that the leaf primordium develops into a small bract (e.g. in *Albizia occidentalis*). Secondly, the development of the leaf may be delayed so that the leaves complete development sometime near the end of anthesis or during the development of the fruit (e.g. in *A. niopoides*). Another inflorescence type encountered in *Albizia* is a pseudoraceme, which are fascicles of 2-6 pedunculate capitula usually on a long central axis, it is a slight heterochronic variation of the sort mentioned above.

### Flowers

The flowers are usually white or pale yellow, only one variety of *A. julibrissin* var. *rosea* (a hardy cultivated species of temperate regions) has pink stamens; flowers are often dimorphic e.g. *A. adinocephala* and *A. xerophytica*, although this is not always conspicuous. Each flower is subtended by a linear-lanceolate to broad ovate bract. The peripheral flowers are sessile or have a very short pedicel, a usually small calyx, 3.5 mm long, and a corolla 6.5 mm long in native species; a larger calyx up to 5.5 mm long, and corolla up to 7-12 mm long in naturalised species; these flowers are hermaphrodite. The central flower is usually male, with a thick staminal tube. The calyx is tubular, usually with five lobes as is the corolla, in some instances with six lobes, especially in cultivated or widespread species such as *A. lebbeck*. The calyx can be campanulate, tubular or cupuliform. There are at least 15 stamens that are united at least a third of the way up from the base to form a tube; the ovary can be sessile stipitate. The style is threadlike and often longer than the stamens.

### Pollen

Guinet & Grimes (1997) reviewed the pollen samples of sixteen New World species; the polyads consisted of 16 or (28)32 grains, sometimes variations of (28)32 grains in a single species is present. Guinet (1969) noted that the New World *Albizia* differed from their Asian counterparts in having an areolate-rugulate exine on the distal face of the central grains this imperceptibly areolate and foveolate in Asian species. He proposed to limit *Albizia* to those species with 16-celled polyads, but this was not generally accepted as this character state is known to be variable in other mimosoid genera, often within the same inflorescence (Guinet & Grimes, 1997).

### Fruit

The *Albizia* fruit length ranges from 5-36 cm long; it is usually flattened (laterally compressed), can be broadly linear to oblong, with or without constricted margins, usually with a terminal beak and a basal stipe (this ranges from a few mm to 3.5 cm long in *A. occidentalis*); the fruit valves are membranaceous, chartaceous or coriaceous, glabrous or pubescent. The legumes are indehiscent or tardily dehiscent along a single suture (folicular like), as in *A. pedicellaris* or along both sutures as in *A. tomentosa*; the seeds being immersed in a woody tissue and usually only being released upon decay of the legume as in *A. duckeana*. The epicarp is dull to glossy, brown to reddish, glabrous or pubescent, with or without prominent transverse veins. The mesocarp is occasionally developed as in *A. duckeana*, *A. leucocalyx* and *A. pedicellaris*, the seeds are separated by a coriaceous endocarp that forms septae, but the fruit does not break into individual articles (and never forms a loment). The latter only happens in some South American species of section *Arthrosamanea*, such as: *A. daluensis*, *A. pistaciifolia* and *A. multiflora*.

### Seeds

The seeds are of the orthodox type; with a pleurogram and areole (Fig. 3). Seeds mature on the trees and gener-

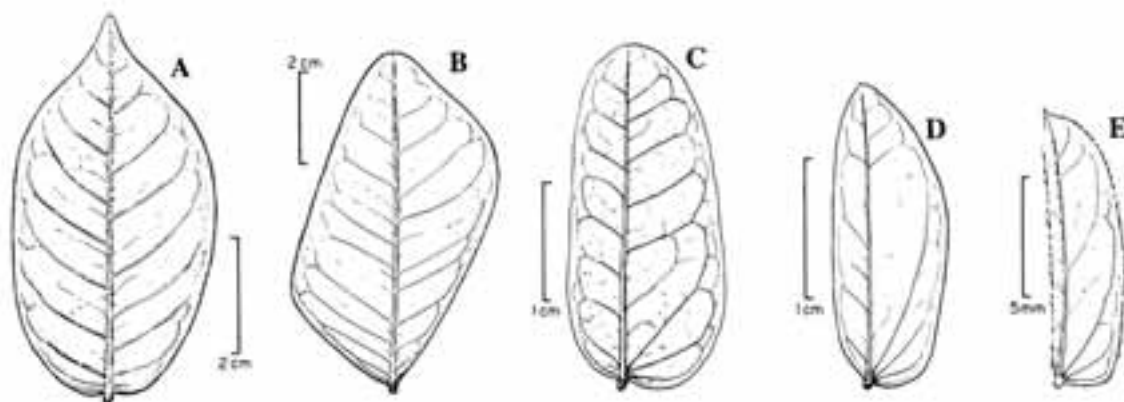


Fig. 2. Leaflet venation types according to Barneby & Grimes (1996: 7).

ally retain viability for several years following collection [at ambient temperatures]. Seeds have hard testas, are laterally compressed to flattened and usually elliptic in outline. Maumont (1990) studied seed teguments of 20 *Albizia* species of worldwide distribution; characters were submitted to Principal Component analysis and the *Albizia* assemblage showed great intra-generic variation, but grouped with the genera *Abarema*, *Paraserianthes*, *Lysiloma*, *Calliandra* and *Zapoteca*; *Lysiloma* presented intermediate features between *Albizia* and *Calliandra*.

#### Chromosome number

There are 16 chromosome reports for *Albizia* taxa (<http://mobot.mobot.org/W3T/Search/ipcn.html>); Rico Arce (1992) published chromosome counts and karyotypes for nine neotropical *Albizia* species; the taxa studied were *A. carbonaria*, *A. guachapele*, *A. lebecke*, *A. plurijuga*, *A. purpusii*, *A. occidentalis*, *A. niopoides*, *A. leucocalyx* and *A. tomentosa*. They all have a basic chromosome number of  $2n = 26$ , with similar karyotypes.

#### Utilization and Conservation (in situ and ex situ)

In Mexico and Central America twelve of the seasonally dry forest species of *Albizia* were studied by Hughes & Pottinger (1997), and Mejia (1997) these works excluded *A. leucocalyx* and *A. pedicellaris*, which are wet tropics species. They found that the majority of species were severely threatened and that populations of many species had recently been lost whilst others remained under threat. In the wild, *Albizia plurijuga* and *A. sinaloensis* appeared to be the most threatened, both having been reduced to small remnant populations. In contrast *Albizia tomentosa* was the only species that thrived following severe disturbance and forest clearance and has become weedy in a few areas along the Pacific coast of Mexico, remaining abundant. Conservation assessments were provisional and not formalised under the IUCN categories. For Mexico and Central America, to date, the only species in the IUCN Red List is *A. plurijuga* (Standley) Britton & Rose (EN B1+2c, assessed in 1998). In addition, the same species appears in the PROY-NOM-059, SEMARNAT (DOF, 2002) for Mexican species with a rating of "A" (amenazada).

*Ex situ* conservation studies and utilization tests were undertaken in Honduras by CONSEFORH (Forest Conservation and Tree Improvement Project). Mejia (1997) reported the performance of nine Mesoamerican species of *Albizia* grown in experimental plots in Honduras; data included from seed germination to adults up to 47 months old. The best species ranking by height, ddb and form as multipurpose trees were *A. plurijuga* and *A. occidentalis*. Although other species such as *A. guachapele*, *A. niopoides* and *A. adenocephala* were selected to produce outbred seed from selected trees of

known provenance to meet future promotion demands. These stands of native species are also designated for seed bank conservation purposes and many *Albizia* seeds are reported to be orthodox (Probert & Hay, 1999).

#### Conservation threats

The conservation information collated from this study indicates that there is a need to create more *in situ* conservation sites in Central America to halt the erosion of the *Albizia* genepool. Field label data confirms the reports of Hughes & Pottinger (1997) that the environment *Albizia* trees occupy is being degraded and that only *A. tomentosa* is able to thrive under these conditions. The studied specimens indicate that the native *A. sinaloensis* is particularly threatened. The species grows in a somewhat poorly explored area of difficult access and new surveys for it may be necessary. In general our distribution maps are considered accurate but as the specimens on which they are based were collected between 1890-2006 some earlier collection sites may no longer have any native vegetation, and thus lack *Albizia* species.

In this treatment the conservation status of all native Mexican and Central American species are assessed according to the IUCN categories and criteria (IUCN version 3.1, 2001). The status is given at the end of each of the taxon accounts.



**Fig. 3.** Orthodox seeds of *Albizia occidentalis* showing pleurogram and areole (H. S. Gentry 4440, K).



In terms of *ex situ* conservation, some species are kept in cultivation in Kew. In addition, seed of five Mexican and Central American species treated in this paper are stored in the ICRAF SeedLab (ICRAF.SeedLab@cgiar.org). Data is indicated in the text for each species.

It is clear that further work needs to be undertaken to resolve the taxonomic problems within *Albizia*. Additionally collections need to be made especially in Panama (where species are poorly represented in herbaria). More flowering material is also desirable as well as seeds banking storage of species under threat in the wild.

## Taxonomic treatment

*Albizia* Durazz., Mag. Tosc. 3(4): 11. 1772

Type species *A. julibrissin* Durazz.

### KEY TO THE IDENTIFICATION OF THE SPECIES OF MEXICO AND CENTRAL AMERICA

1. Leaflets less than 3 mm wide; pinnae usually more than 8 pairs ..... 2
1. Leaflets more than 4 mm; pinnae usually up to 6 pairs ..... 6
2. Leaflets glabrous, linear, less than 1.5 mm wide .....  
..... **7. A. niopoides**
2. Leaflets pubescent or puberulous, elliptic, narrowly elliptic, oblong or narrowly oblong, more than 1.5 mm wide ..... 3
3. Leaflet venation palmate or palmate-pinnate; flowers sessile ..... **10. A. sinaloensis**
3. Leaflet venation with only the midrib conspicuous; peripheral flowers pedicellate ..... 4
4. Leaflets oblong, midrib marginal or submarginal; corolla less than 5 mm long; fruit papery, pubescent; without a developed mesocarp, margin not prominent .....  
..... **2. A. carbonaria**
4. Leaflets narrowly oblong or narrowly elliptic, midrib central or subcentral; corolla more than 5 mm long; fruit coriaceous, glabrous; mesocarp well developed, margin prominent ..... 5
5. Leaflets narrowly oblong, (6)10(14) pairs per pinna; corolla 5.3(7.4) mm long; fruit with late follicular dehiscence, opening only along a single suture ..... **9. A. pedicellaris**
5. Leaflets narrowly elliptic, 7-13 pairs per pinna; corolla 8-10 mm long; fruit indehiscent ..... **3. A. duckeana**
6. Leaflets rhombic-ovate, venation pinnate, the terminal leaflet conspicuously heteromorphic ..... **6. A. leucocalyx**
6. Leaflets oblong, elliptic or ovate, terminal leaflet not conspicuously heteromorphic ..... 7
7. Most leaflets (0.8)1.3-3 cm long; petiole gland sunken, slit-like ..... **11. A. tomentosa**
7. Most leaflets from 1.5 to 5.5 cm long; petiole gland always protuberant ..... 8
8. Flowers with pedicels more than 8 mm long; fruit with a lateral stipe ..... **4. A. guachapele**
8. Flowers with pedicels less than 7 mm long or sessile; fruit with a central stipe ..... 9
9. Flowers sessile ..... **8. A. occidentalis**
9. Flowers with pedicels to 2 mm ..... 10
10. Leaflets rounded at the apex ..... **5. A. lebbeck**
10. Leaflets acute at the apex ..... 11
11. Leaflets elliptic-ovate, with pinnate venation .....  
..... **1. A. adinocephala**

11. Leaflets oblong, with palmate venation .....  
..... **12. A. xerophytica**

**1. Albizia adinocephala** (Donn. Sm.) Britton & Rose ex Record, Trop. Woods 10: 22. 1927

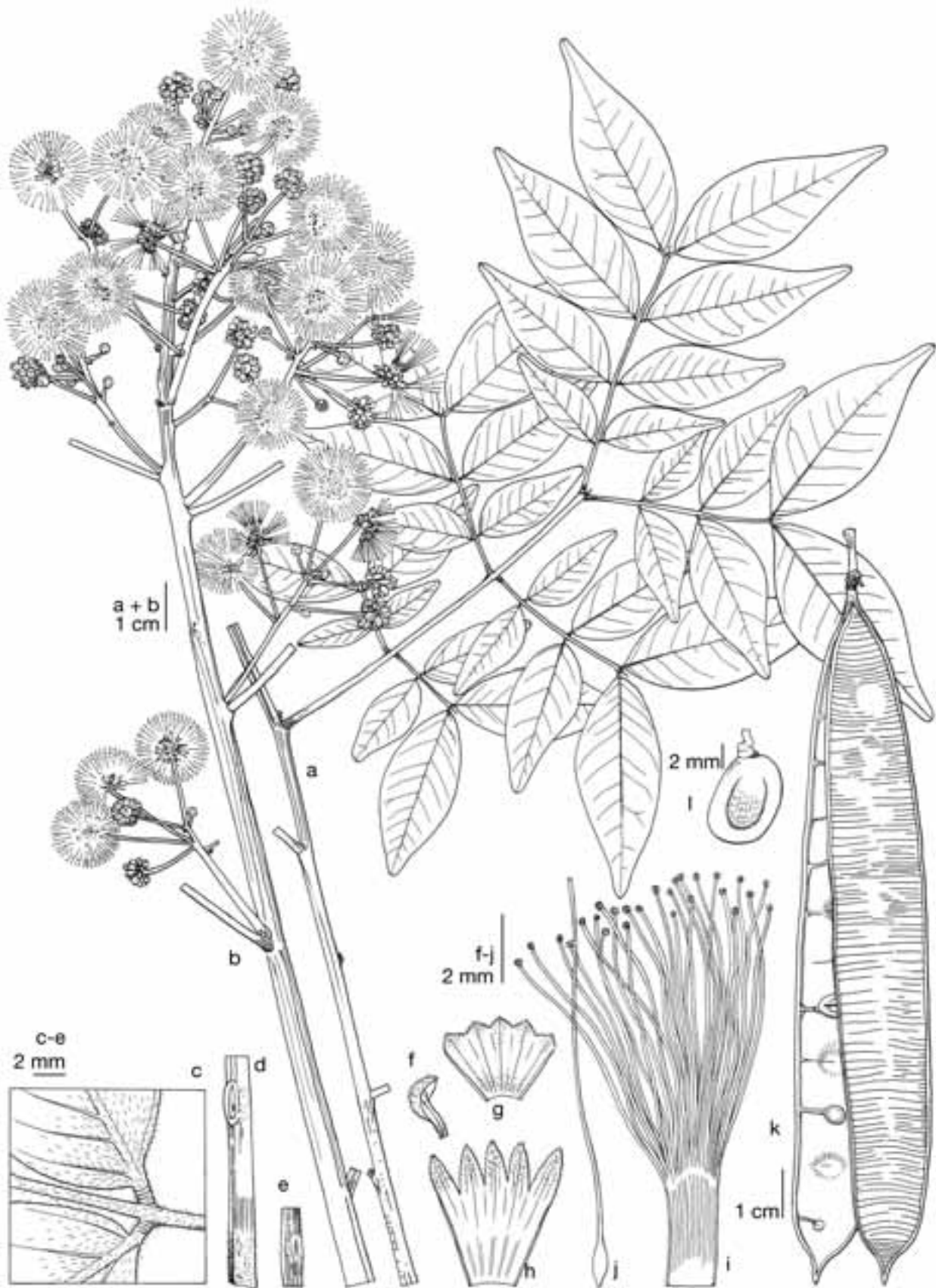
*Pithecellobium adinocephalum* Donn. Sm., Bot. Gaz. (Crawfordsville) 57: 419. 1914. *Pithecellobium discolor* Pittier, Contr. U.S. Natl. Herb. 20: 464. 1922, nom. illeg.

Type: COSTA RICA. Ad fundum La Verbena prope Alajuelita, San José, *Tonduz* 9077 (lectotype, selected by Barneby & Grimes, 1996, US; isolectotypes, G!, NY, US).

Small to medium *tree*, to 15(65) m tall, crown spreading. *Bark* pale-mid grey, marked with horizontal ribs. *Stipules* triangular, < 1 mm long, fugacious. *Leaves* 15(20) cm long; petiole 2-6 cm long, channelled, sparse puberulous, with a large gland near the base; rachis mostly absent, when present 2-3 cm long, puberulous, channelled; pinnae in 1(3) pairs, each 6-11 cm long. *Leaflets* 2-3(5) pairs per pinna, elliptic-ovate, apex acute, base attenuate, 4-5.5 × 1-2(3) cm, margins glabrous, adaxial surface glabrescent, abaxial surface puberulous, venation pinnate, with a circular gland between the terminal pair of leaflets. *Inflorescence heteromorphic*: flowers in a synflorescence of 2-3(6) pedunculate capitula, clustered on fascicles, each capitulum 6-8(10) mm diam., main axis 7-20 cm long, glabrous, often a secondary axis present, 6-7 cm long glabrescent; peduncles 13 mm long; bracts clavate, 1-3 mm long; pedicels 0.5-1 mm, floral bracts linear to clavate, 0.5 mm long, pubescent at apex. *Peripheral flowers*: calyx cupuliform, 1-2 mm long, 5-lobed, villose mainly towards the apex, *corolla* infundibuliform, 3-10 mm long, 5-lobed, glabrous; stamens c. 20 per flower, 8-11 mm long, tube up to 2.5 mm long; *ovary* glabrous, sessile, 1-1.5 mm. *Central flowers*: calyx cupuliform, 1.5-2 mm, 5-6 lobed, almost glabrous; *corolla* tubular, 3-4 mm long, 4-5 lobed, glabrous; *stamens* c.15-20 per flower, (6)8-12 mm long, tube up to 6 mm long; *ovary* glabrous, stipe short, 0.5 mm long. *Legume* straw-brown coloured when mature, at length dehiscent along both sutures, flat, straight, symmetrical, apex rounded, base acute 9.5-14.5 × 1.3-2.5 × 0.4 cm (including 0.25-7 mm beak and 5-10 mm stipe), valves chartaceous, with a puberulous indumentum when young, very small glandular dots present on the exocarp, 6-12 seeded. *Seeds* olive-off-white [dirty ivory] or ochre, oblong to circular, 5-10 × 4-5.5 × 1-1.5 mm, areole slightly darker than the rest of the seed, pleurogram 80-90%. Fig. 4.

*Distribution*. Widespread from S Mexico (Guerrero, Oaxaca, Chiapas), Guatemala (Peten) and Belize to central Panama (Cocle), planted in the canal zone of Panama (Fig. 5).

*Habitat*. Common in dry, low, and tall (stature) degraded seasonal forest; proliferate well in secondary veg-



**Fig. 4.** *Albizia adinocephala*: **a**, habit; **b**, inflorescence; **c**, leaflet bases and indument on abaxial surface; **d**, petiole gland; **e**, gland on pinnae rachis; **f**, floral bract; **g**, calyx opened out; **h**, corolla opened out; **i**, staminal tube and stamen filaments; **j**, style and ovary; **k**, fruit; **l**, seed showing pleurogram. **a**, **c**, from Robleto 1244; **b**, **d**-**j**, Skutch 2871; **k**-**l**, Hughes 1071. Drawn by E. Papadopoulos.

etation on slopes with superficial soil; less frequent in *Pine-Quercus* forest. Scattered with *Lysiloma*, *Trema*, *Lonchocarpus guatemalensis*, *Acacia*, *Leucaena*, *Dodonaea* and *Albizia occidentalis*. Between 0-100(1500) m. Requires 600-2400 mm rainfall, survives dry seasons of up to 7 months.

Nodulated species (Sprent, 2001).

*Phenology*. Flowering almost all year around. Fruiting throughout the year.

*Vernacular names and uses*. Palo Huade (Mexico), Gavilán & Gavilancillo (Honduras), Palometa (Guatemala), Chapulaltapa, Chipiltre, Chipilse, Chipilte, Conacaste blanco, Polvo de queso, (El Salvador), Barbona (Nicaragua). Used as timber, fuelwood, charcoal, and as a shade tree.

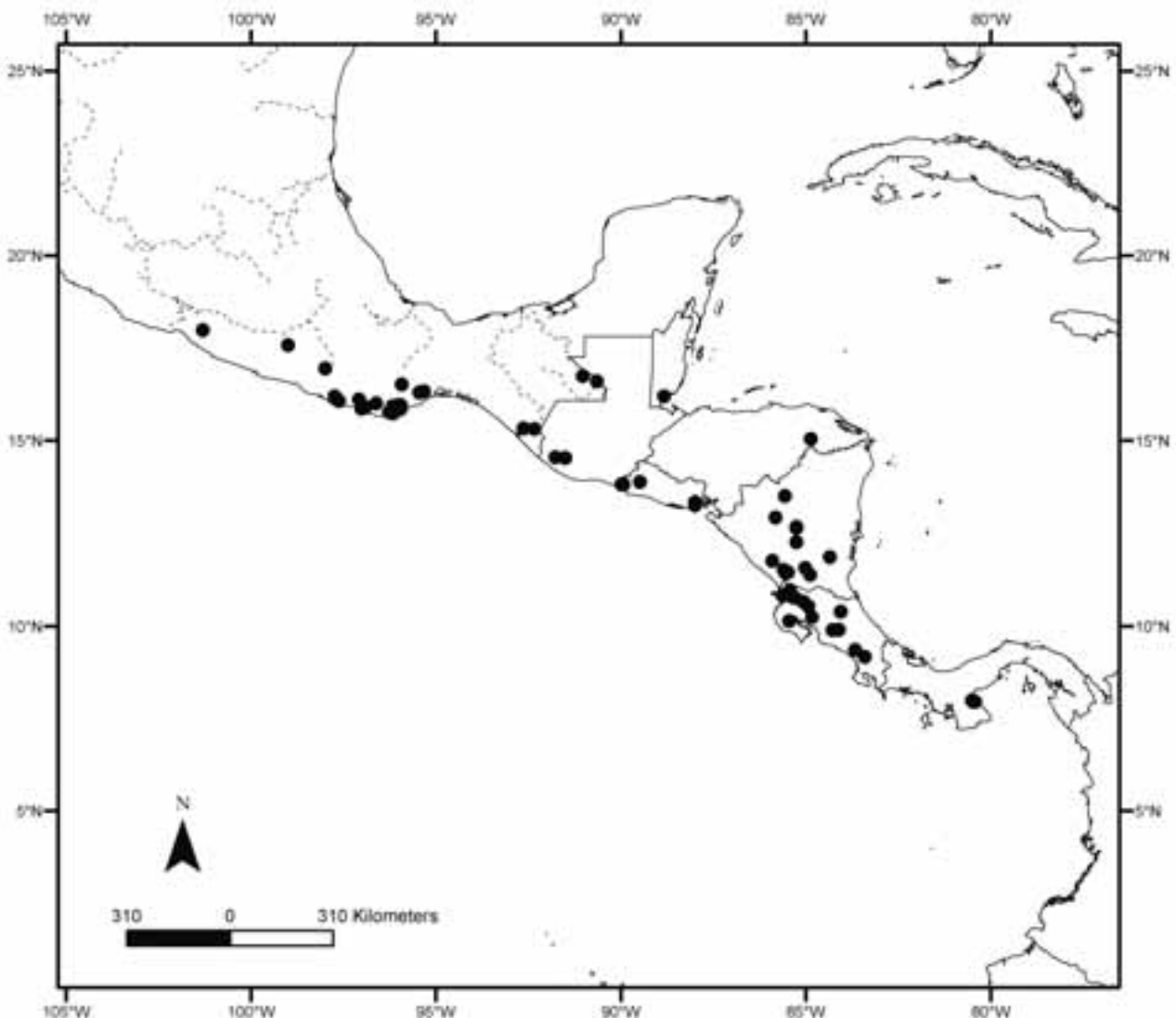
*Taxonomic comments*. Pittier (1922) described *Pithecellobium discolor* based on *Tonduz 9077*, which is the type of *P. adinocephalum*. Pittier based his new species

on its small flowers, straight flat coriaceous pods and the characters of the inflorescence. Initially Pittier found the specimen as *Pithecellobium auremotemo* Mart. (= *Abarema cochliocarpus*); a South American species with very similar leaflets but larger flowers and a coiled fruit. *Albizia adinocephala* has very distinct, large, almost glabrous, bicolourous leaflets.

*Conservation status*. In the wild, populations of this species do not appear to be threatened and often trees are left uncut to provide shade for cattle; a least concern (LC) conservation status is suggested for this species. Living collection of this species is growing in Kew and seed is stored in the ICRAF SeedLab (ICRAF.SeedLab@cgiar.org).

#### *Selected specimens*

BELIZE. **Toledo**: Jacinto Hills, 16°12'N, 88°50'W, 60 m, 10-IX-1933, *Schipp 1209* (BM, K). COSTA RICA: Cafetales de la Ver-



**Fig. 5.** Geographical range of *Albizia adinocephala* (●) in Mexico and Central America.



bona, III-1894, *Tonduz 9087* (BM). **Guanacaste:** Canton de Liberia, cordillera de Guanacaste, 10°59'26"N, 85°25'40"W, 300 m, 4-IX-1995, *Á. Fernández 1625* (CR, K). Cañas, río Naranjo, finca Montezuma, 10°40'35"N, 85°04'05"W, 500 m, 17-VII-1993, *G. Herrera 6264* (CR, K). Río Guajiniquil on Bahía de Santa Elena, 10°33'N, 84°56'W, 50 m, 5-I-1964, *A. Molina 26723* (BM). **Heredia:** Parque Nacional Braulio Carrillo, estación Magsasay, 10°24'N, 84°03'W, 150 m, 4-IV-1991, *R. Aguilar 123* (CR, K). **Nicoya:** Near Gubitancillo-Forets des collines de Nicoya, 10°09'N, 85°27'W, I-1900, *Tonduz 13531* (K). **Puntarenas:** Cordillera de Tilaran, Monteverde, San Luis Valley, Sandero Guanacaste, 10°15'N, 84°50'W, 560 m, 7-VIII-1995, *D. Penneys 647* (K). **San José:** Canton de Mora, zona protectora El Rode, Reserva de la Universidad para La Paz, 9°54'20"N, 84°16'30"W, 950 m, 13-I-1998, *A. Cascante 1389* (CR, K). El General 9°22'N, 83°40'W, 880 m, VIII-1984, *A.F. Skutch 2871* (K). **Santa Rosa:** Parque Nacional Santa Rosa, 10°50'15"N, 85°37'35"W, 200 m, 8-X-1994, *A. Cascante 303* (K). Bahía Salinas y Santa Cecilia, 10°50'N, 85°37'W, 300 m, 21-X-1993, *R. Espinoza 967* (K). EL SALVADOR. **Ahuachapán:** El Corozo, Mariposario zona baja Los Sánchez, 13°49'N, 89°59'W, 380 m, 9-III-2000, *J.M. Rosales 343* (K). Al E del principio del camino de Tacuba, 13°49'N, 89°56'W, 20-VI-1992, *E. Sandoval 473* (K, LAGU). El Imposible, Casco de San Benito, 13°50'N, 89°56'W, 21-IV-1990, *A. Sermeno 177* (K). GUATEMALA. **Retalhuleu:** 14°33'N, 91°46'W, VIII-1985, *Bernoulli 1145* (K). **Suchitepequez:** 10 km ESE of Cocales, between Mazatenango & Siquinalá, 14°32'N, 91°30'W, 350 m, 26-II-1984, *C.E. Hughes 134* (K). HONDURAS. **Choluteca:** Close to village of Agua Fría, in the hills to the South east of Choluteca about 12 km SE of the town of Yusguare, 13°15'N, 87°60'W, 700 m, 12-II-1988, *C.E. Hughes 1070* (K). **Gracias a Dios:** Transecto Botánico Cerro Krautara, 30 min al N de Krautara, río Patuca, 15°03'N, 84°52'W, 120 m, 20-III-1995, *P.R. House 2324* (BM). MEXICO. **Chiapas:** Río Lacantum, 5 km SE of Crucero Corozal, camino Palenque Boca Lacantum, 16°36'N, 90°39'W, 12-V-1985, *E. Martínez 12142* (BM, K, MEXU, MO). La Grada, 15°20'N, 92°38'W, 22-VII-1947, *Matuda 16725* (K). 2 km al SE de Toliman, en el camino a Ojo de Agua y Berriozabal, 15°19'N, 92°20'W, 1050 m, 10-III-1981, *M. Sousa 11826* (BM, MEXU). **Guerrero:** Vallecitos, on the slopes of the Sierra Madre del sur close to the main road from Zihuantanejo to Ciudad Altamirano about 10 km above the village of Vallecitos, 17°59'N, 101°18'W, 790 m, 22-IV-1988, *C.E. Hughes 1178* (K). Petatlán, 2 km NE of El Portal, 17°35'N, 99°00'W, 330 m, 4-II-1986, *J.C. Soto 12173* (K, MEXU). **Oaxaca:** 4 km N de San Gabriel Mixtepec, camino a Sola de Vega, 16°06'37"N, 97°04'45"W, 741 m, 21-IX-1982, *R. Cedillo 1808* (MEXU). Barra de la Cruz, 4.5 km E, Municipio Santiago Astata, 15°50'48"N, 95°57'29"W, 120 m, 18-II-1999, *M. Elorsa C. 1756* (MEXU). E of Coyula, Pacific Coast, about 20 km E of Puerto Angel along the coast towards Salina Cruz, 15°47'N, 96°13'W, 45 m, 27-III-1989, *C.E. Hughes 1339* (K). Coyul, arroyo entre Zapotal y Las Minas, 20 km al W de Tehuantepec, entrando por Las Pilas, 16°20'N, 95°19'20"W, 60 m, 5-I-1988, *C. Martínez 1169* (MEXU). E de Santa Rosa de Lima, en el Zanjón, Municipio San Pedro Tututepec, 16°04'16"N, 97°37'24"W, 40 m, 16-XII-1998, *A. Reyes García 2756* (MEXU). Arroyo de las Minas, al W del rancho El Limón, 24 km al W de Tehuantepec, entrando por Hierba Santa, en la carretera a Buenos Aires, 16°18'N, 95°27'W, 600 m, 23-I-1988, *R. Torres 11268* (MEXU). NICARAGUA. **Chontales:** Hacienda San Martín, near confluence of Río El Jordán and Río La Pradera, 12°17'N, 85°15'W, 390 m, 14-IX-1982, *W.D. Stevens 21824* (BM, MO). **Granada:** Faldas del Cerro Mombacho, 11°47'N, 85°54'W, 300 m, 1-II-1984, *M. Castro 32* (BM, MO). **Jinotega:** On the road from Jinotega, NE to San José de Bocay, 67 km from Jinotega, 13°30'N, 85°34'W, 20-III-1991, *D.J. Macqueen 69* (FHO, K, MEXU, MO). **Matagalpa:** N de Matagalpa, carretera

al Tuma, desvío a Pancasan, 15 km adentro, 12°55'N, 85°49'W, 6-XII-1982, *J.C. Sandino 3845* (BM, MO). **Río San Juan:** Carretera a San Miguelito, entre Río Oyate y San Miguelito, 11°35'N, 85°01'W, 100 m, 9-II-1984, *A. Grijalva 3583* (BM, MO). **Rivas:** Hacienda on slopes of Volcán Maderas, above Balgue, 11°28'N, 85°31'W, 500 m, 15-IX-1983, *M. Nee 28127* (BM, MO). Isla Ometepe, Volcán Concepción, pueblo de Altagracia, 11°32'N, 85°36'W, 300 m, 25-X-1984, *W. Robleto 1323* (BM, MO). Isla Ometepe, Volcán Concepción, sector Santa Rosa, 11°32'N, 85°36'W, 700 m, 30-X-1984, *W. Robleto 1475* (BM, MO). **Zelaya:** 0-1 km N of San Martín, 11°53'N, 84°21'W, 120 m, 6-IX-1983, *M. Nee 27835* (BM, MO). PANAMA. **Chitre:** Between the towns of Chitre and Parita, a few km north of Chitre, 7°58'N, 80°26'W, 30 m, 21-III-1986, *C.E. Hughes 786* (FHO, K). 2 km north-west of La Arena, Chitre to Divisía, about 5 km north of Chitre, 7°58'N, 80°29'W, 40 m, 4-X-1987, *C.E. Hughes 1026* (FHO, K). **Parita:** 1 km west of Parita on the road towards Los Castillos, 8°00'N, 80°31'W, 40 m, 21-III-1986, *C.E. Hughes 787* (FHO, K). **Pese:** 4 km W of La Arena, 5 km NW of Chitre, towards Pese, 7°58'N, 80°29'W, 40 m, 8-X-1987, *C.E. Hughes 1036* (FHO, K).

**2. *Albizia carbonaria*** Britton, *Sci. Surv. Porto Rico & Virgin Islands* 6(3): 348. 1926. *Pithecellobium carbonarium* (Britton) Niezgodá & Nevling, *Phytologia* 44: 310. 1979

Type: COLOMBIA. Grown at the forest station Río Piedras, Porto Rico, from seedlings received in 1921, from the Bureau of Plant industry; the seed was procured from Palmira (Valle de Cauca), Columbia [Columbia], in 1920, Oct. 1924, *C. L. Bates s.n.* (holotype, NY!).

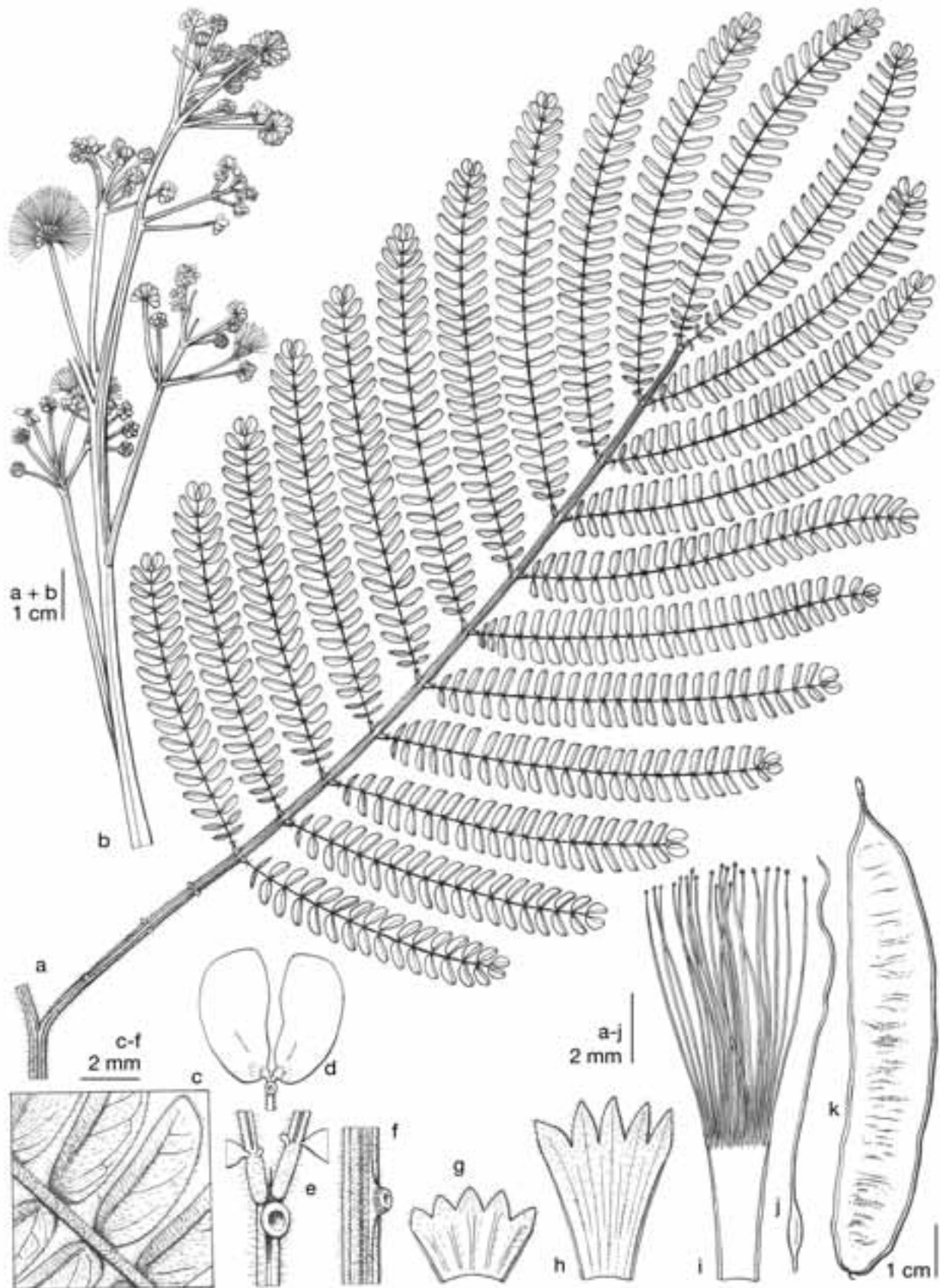
*Albizia malacocarpa* Standl., *Lista Pl. Salvador*: 96. 1925. nom. nud.

*Albizia sumatrana* Steenis, *Encycl. Ned.-Ind. ed. 2, Suppl. 6*: 864. 1931.

Type: "cultá Boekit Gompong, Theproefst. Ingeronden", June 1928, *Keuchenius s.n.* (holotype, BO; isotypes, A, BO).

Small tree, 4-15(30) m tall, wide spreading crown. *Stipules* 2-4 mm long, narrowly triangular, fugacious. *Leaves* 9-18 cm long; petiole 2-4.5 cm long, terete to channelled, tomentose to villous, gland near base of petiole; rachis 6.5-8.3 cm long, grooved, tomentose to villous, with a gland between the terminal 2 pairs of pinnae, pinnae in 7-9(13) pairs, each 2-6.8 cm long. *Leaflets* 11-20(30) pairs per pinna, asymmetric, oblong, apex acute to obtuse, base truncate, 6.5-8.3 × 1.2-3 mm, margins ciliate, adaxial and abaxial surfaces pale strigose, conspicuous midrib, marginal. *Inflorescence heteromorphic*: clusters of 2-3(6) fascicles of umbels; peduncles (8)10-30(40) mm long, puberulous, bracts linear, 3-5 mm long, puberulous; pedicel 1.1 mm long, floral bracts linear-clavate, 2 mm long. *Peripheral flowers*: calyx infundibuliform, 2.6 mm long, pubescent, 5-lobed; corolla 5.5 mm, infundibuliform, pubescent, 5-lobed; stamens 20-25 per flower, 13 mm long, tube up to 2.3 mm.; ovary pubescent, stipe 0.5 mm. *Central flowers*: calyx tubular, 4 mm long, pubescent, 5-lobed; corolla, infundibuliform, 6





**Fig. 6.** *Albizia carbonaria*: **a**, habit; **b**, inflorescence; **c**, leaflet lower surfaces; **d**, distal pair of leaflets; **e**, gland and paraphyllidia at the distal pair of pinnae; **f**, petiole gland; **g**, calyx opened out; **h**, corolla opened out; **i**, staminal tube and stamen filaments; **j**, style and ovary; **k**, fruit. a, b, d-f, from *Guevara 1356*; c, k, from *Breteler 4614*; g-j, from *Dawe 152*. Drawn by E. Papadopoulos.

mm long, pubescent, 5-lobed; *stamens* 15-20 per flower, 12 mm long, tube up to 8 mm long; *ovary* pubescent, sessile. *Legume* red-rusty brown, broadly linear, usually flat, exocarp raised over seeds when mature, rarely slightly twisted, margins inconspicuously thickened, tardily dehiscent along both sutures, apex acute to rounded, base acute,  $9.5-12 \times 1.7-1.8(2.3) \times 0.2$  cm (including a stipe up to 10 mm long, the beak usually breaks), papyraceous, tomentose, glabrescent, 18-26 seeded. *Seeds* brown to ivory in colour, elliptic,  $3.5-4.2 \times 1.6 \times 1.9$  mm, areole ivory, pleurogram 50 %. Fig. 6.

*Distribution.* Planted in Guatemala, Costa Rica, El Salvador, Nicaragua, Mexico and Panama (Fig. 7).

*Habitat.* Native to moist upland tropical forests of Colombia, Panama and Venezuela, planted as coffee shade and occasionally naturalized in Central America, tolerates acidic shallow soils, prefers well-drained soils, tolerates fire. Between 50-1250 m with reports of 1200-

1800 m elevation in South America. Requires 1600-1700 mm annual rainfall.

Nodulated species (Sprent, 2001).

*Phenology.* Flowering January, May to June, and September to November. Fruiting August to January and April

*Vernacular names and uses.* Pisquin (Nicaragua, El Salvador); Muche (Colombia); Quebracho (El Salvador). The leaves and fruit are used as animal fodder; wood as fuel, timber and local utensils; as the species is planted to control soil erosion and managed as multi-purpose tree in Central America.

#### *Selected specimens*

**COSTA RICA. Heredia:** Helicomias, Cuesta del Congo, San Miguel de Sarapiquí,  $10^{\circ}00'N$ ,  $84^{\circ}07'W$ , 550 m, 10-VIII-1965, *A.M. Jiménez 3445* (BM). Cuesta del Congo, a unos 300 m de San Miguel de Sarapiquí, 20-IX-1966, *A.M. Jiménez 4126* (BM).  
**Puntarenas:** R. F. Golfo Dulce-Península de Osa, Los Mongos,

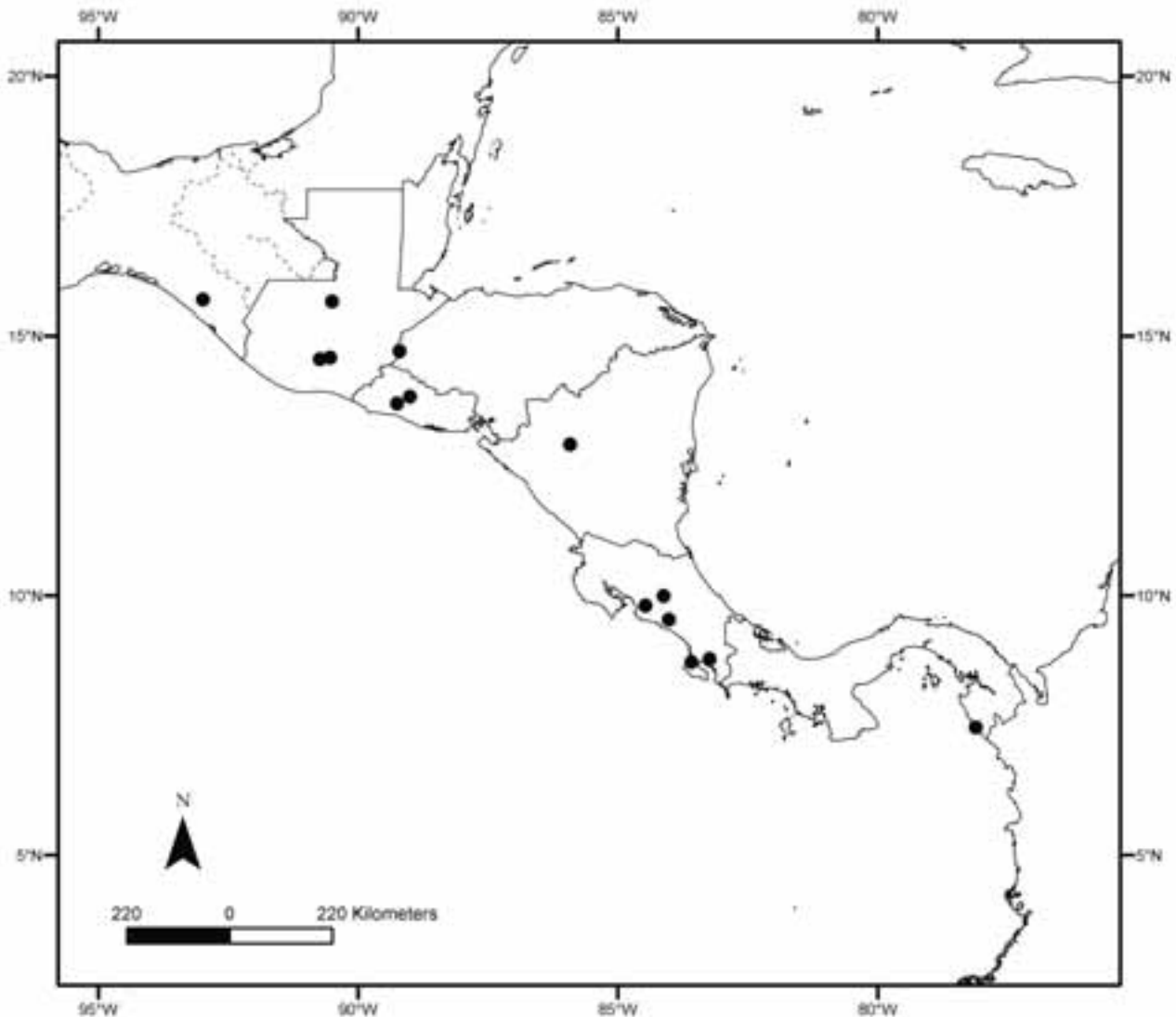


Fig. 7. Geographical range of *Albizia carbonaria* (●) in Mexico and Central America.

Santa Cecilia, 8°43'30"N, 83°34'50"W, 350 m, 7-V-1995, R. Aguilar 4120 (K). Río Piedras Blancas, 8°47'N, 83°14'W, 1-VIII-1951, P.H. Allen 6285 (BM). **San José:** Falda del Cerro Pelón, Z.P. Cerros de Turrubares, 9°48'50"N, 84°28'W, 1500 m, 7-XII-1990, R. Zuñiga 401 (MEXU, MO). EL SALVADOR: Paleca, 13°50'N, 89°00'W, 1931, S. Calderón 2596 (BM, K). **La Libertad:** Entrada a la clínica por la colonia Cumbres de Cuscatlán, 13°42'N, 89°15'W, 870 m, 8-X-1998, M.A. Renderos 524 (K). GUATEMALA. **Guatemala:** Ciudad de Guatemala, Ciudad Universitaria. Zona 12, 15°40'N, 90°30'W, 1530 m, 1-IV-1995, A. Baungarden s.n. (MEXU). **Sacatepequez:** 500 m de la Antigua a Ciudad Vieja, 14°33'N, 90°44'W, 1500 m, 2-I-2003, M. Véliz 12689 (MEXU). MEXICO. **Chiapas:** Finca El Cipresal, al S de la Finca Cuxtepeques, El Triunfo, Reserva de la Biósfera, polígono IV, 15°42'04"N, 92°58'54"W, 1250 m, 12-IV-2002, M.A. Pérez Ferrera 2687 (MEXU). NICARAGUA. **Matagalpa:** Near village of Vietnam about 40 km east of Matagalpa on road to Siuna, 12°55'N, 85°55'W, 860 m, 18-VI-1982, C.E. Hughes 192 (FHO, K). PANAMA. **Darien:** Ensenada del Guayabo River, 18 km SE Jaqué, 50 m, 12-I-1983, N.C. Garwood 174 (BM).

### 3. *Albizia duckeana* L. Rico, Kew Bull. 55: 404. 2000

*Albizia elegans* (Ducke) L. Rico, Novon 9: 556. 1999, nom. illeg., non *A. elegans* Kurz, 1875. *Pithecellobium elegans* Ducke, Arch. Jard. Bot. Rio Janeiro 3: 64. 1922. *Balizia elegans* (Ducke) Barneby & J.W. Grimes, Mem. New York Bot. Gard. 74: 40. 1996.

Type: BRAZIL. Pará: Alocabaça prope fl. Tocantins, 17 July 1916, Ducke 16271 [lectotype, designated by Barneby & Grimes (1996), MG; isolectotypes, BM!, G!, K!, P, US].

Large tree, 30-45 m tall. Bark rusty brown to yellow, smooth. Stipules 2.5-5 mm long, linear-lanceolate, caducous. Leaves 16-17 cm long, petiole 2-3 cm, channelled, villose, gland situated above mid-petiole, close to the first pair of pinnae; rachis 6.5-12 cm, channelled, villose, pinnae in 13-17 pairs, each (4)5-10 cm long. Leaflets (15)20-25 pairs per pinna, narrowly elliptic, 6-9.5 × 1.7-3 mm, apex acute, base obtuse, adaxial surface glabrous, abaxial surface marked with a yellow secretion forming raised discs around scabrous hairs, glabrescent, only the midrib conspicuous, almost central. Inflorescence heteromorphic: comprised of axillary umbels; peduncles (13) 30-45 mm, floral bracts <1 mm; pedicels 9-11 mm long. Flowers: calyx campanulate, 4-5 mm long, 5-lobed, puberulous; corolla campanulate, 8-10 mm long, 5-lobed, puberulous; stamens 25-35 per flower, 30-35 mm long, tube 3-5.5 mm; ovary densely pubescent, sessile. Central flowers: calyx tubular, 5-6 mm long, pubescent, 5-lobed; corolla infundibuliform, 11-12 mm long, pubescent, 5-lobed; stamens c. 30 per flower, 22 mm long, staminal tube 8-12 mm long; ovary pubescent, sessile. Legume dark brown, broadly linear, indehiscent, margins prominent, 3.6 mm wide, 2.8 mm high, apex acute, base rounded, 10-17.5 × 2.5-2.7 × 0.36-0.45 cm (including a 2-3 mm beak, without a stipe), coriaceous, glabrescent, 25 seeded. Seeds ivory coloured, oblong, 7 × 4 × 2 mm, areole ivory, pleurogram 100 %. Fig. 8.

*Distribution.* Bolivia, Brazil and Guiana (equator to 11°S), disjunct in Costa Rica and Honduras (Fig. 9).

*Habitat.* Primary rainforest; between 30-200 m.

*Phenology.* Flowering May to July and December. Fruiting April and June.

*Vernacular names and uses.* Tejo (Costa Rica), Tuburus pihni (Honduras). In Honduras, the bark (concha) is used as tannin and poison to kill fish; the bark has a 'garlic' smell when it is cut.

*Taxonomic comments.* The fruit of *Albizia duckeana* is similar to that of *A. leucocalyx* but the fruit margins of the later are not conspicuous and the base insertion is lateral. There is little material of this species in Central America; the few specimens match the K isolectotype specimen (in flower). The species is very closely related to *A. pedicellaris*, Barneby & Grimes (1996: 41) described peripheral flowers for *Balizia elegans* (= *A. duckeana*), but no description of terminal [central] flowers was given. The isolectotype of *Pithecellobium elegans* in K, has not heteromorphic inflorescence, but material with flowers of this species in Central America has. *A. pedicellaris* and *A. duckeana* were separated in Barneby and Grimes identification key by size of the peripheral flowers; smaller flowers for *A. pedicellaris* and larger flowers for *A. duckeana*. In terms of their geographical distribution there is, however, a disjunction. *A. pedicellaris* is rare in Nicaragua and widely distributed in South America, in contrast *A. duckeana* is restricted to Honduras, Costa Rica, Brazil and Bolivia.

*Conservation status.* The species is restricted to very small areas of primary forest; the extent of occurrence is disjunct and severely fragmented; as the area of occupancy is not more than 2000 km<sup>2</sup> and not more than 10 localities are known for this taxon, a vulnerable (VU B2a) conservation status is here proposed.

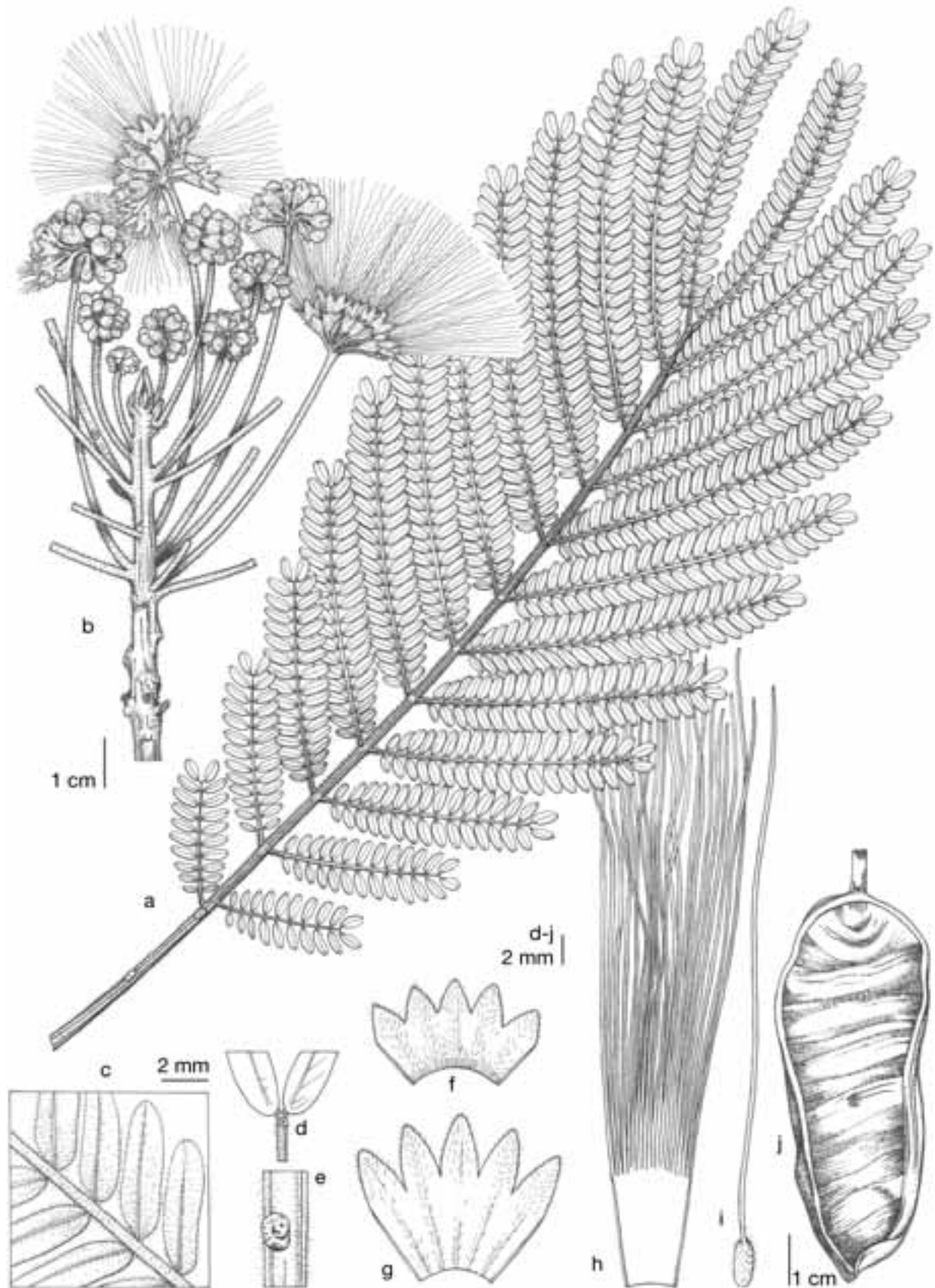
#### *Selected specimens*

COSTA RICA. **Limón:** 9°29'N, 83°29'W, 200 m, 29-VI-1989, A. Chacón 28 (MEXU, MO). 10°21'N, 83°30'W, 30 m, 2-XII-1988, R. Robles 2200 (MO). Talamanca, Fila Carbón, finca de Pedro Bolívar, 9°38'N, 82°50'W, 250 m, 25-V-1999, O. Valverde 1175 (CR, K). Asunción, 10°02'N, 84°00'W, 250 m, 23-IV-1989, B. Hammel 17319 (K, MEXU, MO). HONDURAS. **Gracias a Dios:** 1 km al SE de Krausirpe, 15°03'N, 84°50'W, 90 m, 10-II-1994, P.R. House 1880 (BM).

### 4. *Albizia guachapele* (Kunth) Dugand, Phytologia 13: 389. 1966

*Acacia guachapele* Kunth in Humboldt, Bonpland & Kunth, Nov. Gen. Sp. 6: 281. 1824. *Lysiloma guachapele* (Kunth) Benth., Trans. Linn. Soc. London 30: 533. 1875. *Pseudosamanea guachapele* (Kunth) Harms, Notizbl. Bot. Gart. Berlin-Dahlem 11: 54. 1930. *Pithecolobium guachapele* (Kunth) J.F. Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 13(3): 54. 1943.





**Fig. 8.** *Albizia duckeana*: **a**, leaf; **b**, inflorescence; **c**, leaflets and indument on abaxial surface; **d**, distal pair of leaflets and gland; **e**, petiole gland; **f**, calyx opened out; **g**, corolla opened out; **h**, staminal tube and stamen filaments; **i**, ovary and style. *A. pedicellaris*: **j**, fruit. a-i, from Hammel 17319; j, from Englesing 223. Drawn by E. Papadopoulos.



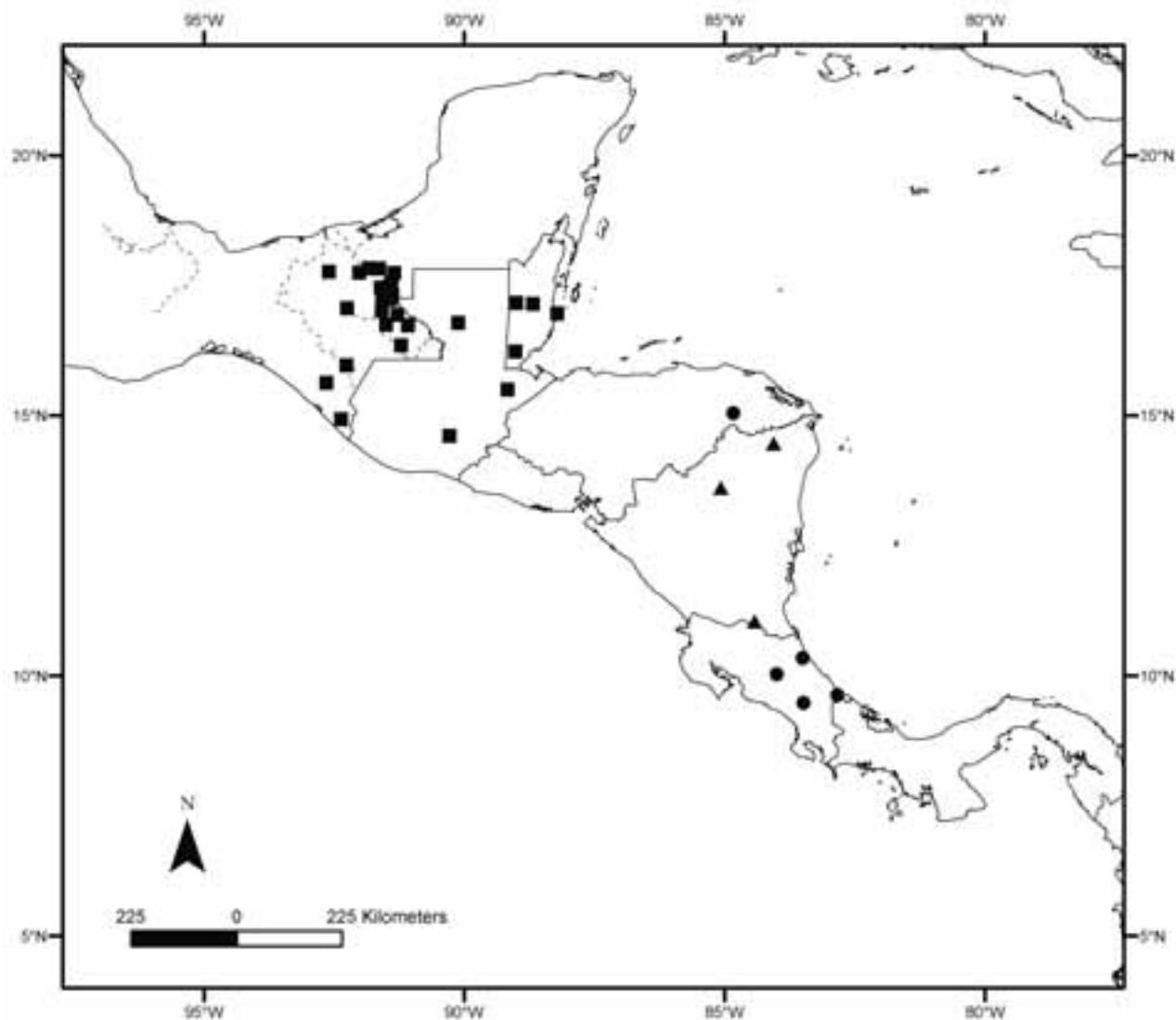


Fig. 9. Geographical range of *Albizia duckeana* (●), *A. pedicellaris* (▲) and *A. leucocalyx* (■) in Mexico and Central America.

*Pithecellobium guachapele* (Kunth) R.S. Cowan, Mem. New York Bot. Gard. 10: 144. 1958.

Type: ECUADOR. Crescit in sylvis, prope Guayaquil Quitensium, *Humboldt & Bonpland* 3805 [lectotype, selected by Dugan (1966), P-HBK; phototype NY].

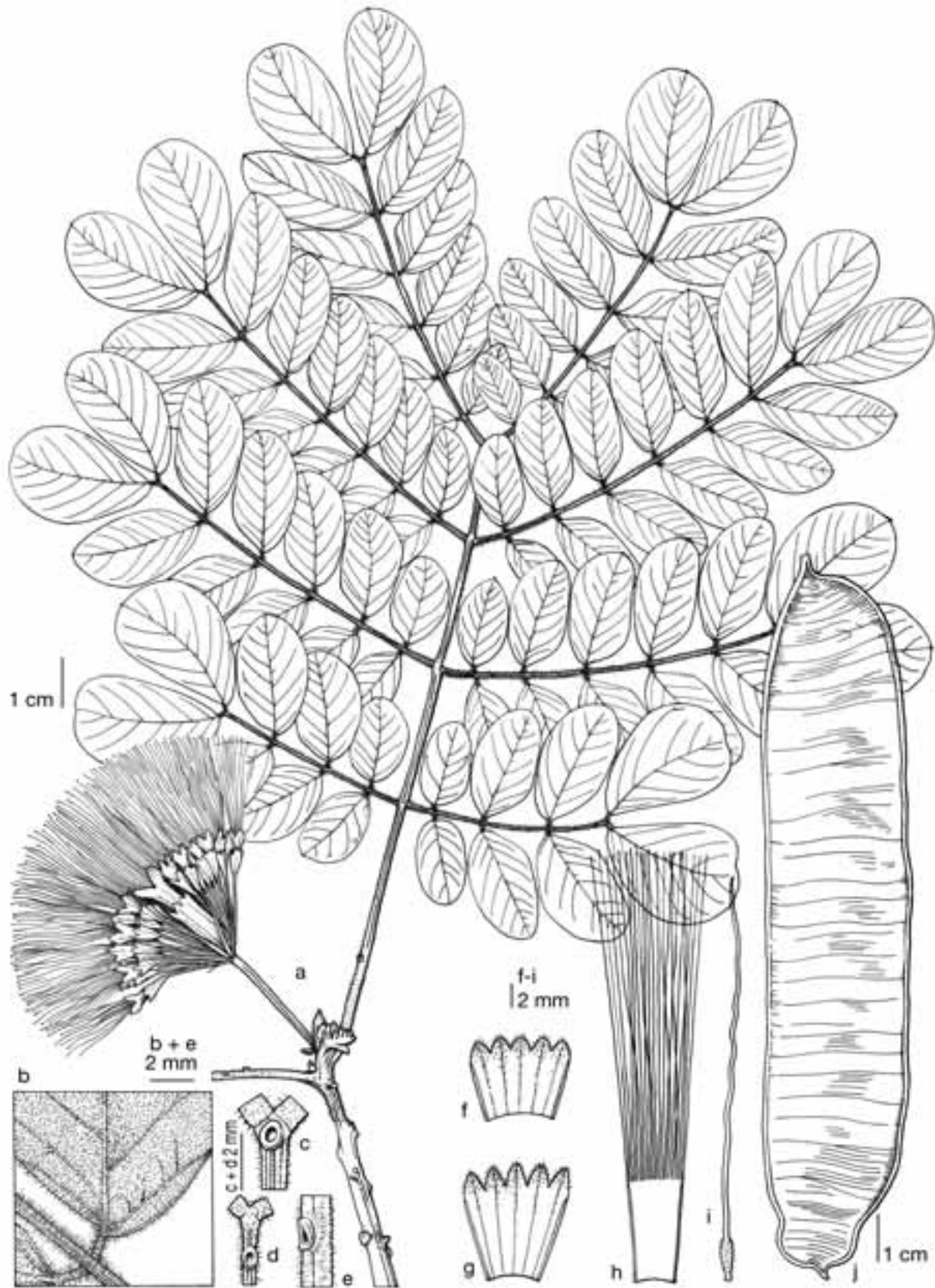
*Pithecellobium longepedatum* Pittier, Contr. U.S. Natl. Herb. 20: 464. 1922. *Albizia longipedata* (Pittier) Britton & Rose ex Record, Trop. Woods 11: 14. 1927.

Type: COSTA RICA. El Coyolar, near Orotina, C. *Werkle s.n.* (holotype, US).

*Samanea samanigua* Pittier, Bol. Ci. Técn. Mus. Com. Venezuela 1: 54. 1926.

Type: VENEZUELA. Alrededores de El Sombrero, 120 m, Feb. 1924, *Pittier* 11442 (holotype, VEN!; isotype, US).

Single trunked tree, 10-20(50) m tall, crown rounded. Bark grey/brown, fissured and scaling in thick strips, or rectangular plates. *Stipules* linear, 2-3 mm long, fugacious. *Leaves* 25-30 cm long; petiole 5-7.4 cm long, channelled, villous to velutinous, gland at base of, to mid, petiole; rachis 7.5-10 cm long, villous to velutinous, pinnae in 3-5 pairs, each 6-11.5 cm long, with a gland between the terminal pair of pinnae. *Leaflets* 5-7 pairs per pinna, elliptical to obovate, apex rounded, base oblique, 1.5-5.5 cm × 1-3 cm, adaxial and abaxial surfaces canescent pilose, venation pinnate, occasionally palmate at base. *Inflorescence heteromorphic*: flowers in an open panicle of 2-3 fascicles of umbels; peduncles 5-6 cm long, pubescent; bracts linear lanceolate, 4 mm long, densely pubescent; pedicels 12-15 mm long, villose. *Peripheral flowers*: calyx campanulate, 3-4 mm long, 5-lobed, densely villose; corolla campanulate to tubular, 10-12 mm long, 5-lobed, densely villose; *stamens* c. 28 per flower, 31 mm long,



**Fig. 10.** *Albizia guachapele*: **a**, flowering habit; **b**, leaflet base and indumentum on abaxial surface; **c**, gland between the terminal pair of pinnae; **d**, gland between distal pair of leaflets; **e**, petiole gland; **f**, calyx opened out; **g**, corolla opened out; **h**, staminal tube and stamens filaments; **i**, ovary and style; **j**, fruit. **a-e**, from Sousa, Rico & Basurto 10169; **f-i**, from Hughes 1103; **j**, from Garwood 2426A. Drawn by E. Papadopoulos.

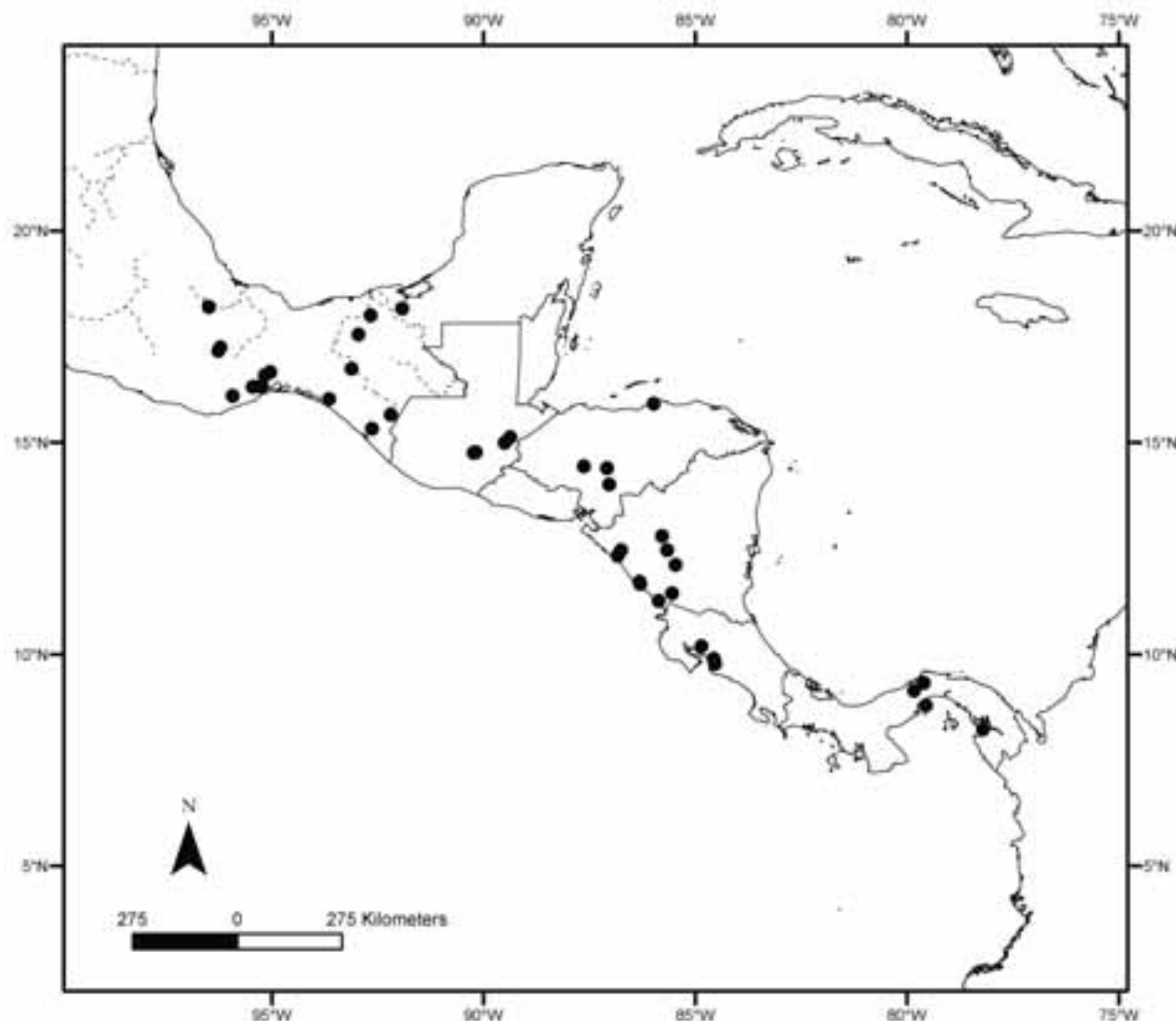


Fig. 11. Geographical range of *Albizia guachapele* (●) in Mexico and Central America.

tube up to 5 mm long; *ovary* pubescent, sessile. *Central flowers*: *calyx* campanulate, 10 mm long, 5-lobed, villose; *corolla* campanulate, 20 mm long, 5-lobed, villose; *stamens*, c. 30 per flower, 40 mm long, tube up to 20 mm long; *ovary* pubescent, sessile. *Legume* green to brown, late dehiscent along both sutures, valves undulating, slightly raised over the seeds; margin slightly constricted between the seeds, flat and straight, apex acute, base rounded, stipe with a conspicuous asymmetric insertion, 16-19.6 × 1.6-2.4 × 0.3 cm (including a 2 mm beak and 5-15 mm stipe), velvety pubescent, 15-30 seeded. *Seeds* ivory, elliptic, 8-10 × 3-5(8) × 2 mm, monochromic, areole ivory, pleurogram 90-95 %. Fig. 10.

*Distribution*. Widespread from south Mexico (Campeche, Chiapas, Oaxaca and Tabasco) through Central America, mostly on the Pacific coast, to Panama (Fig. 11). Often cultivated as multipurpose tree.

*Habitat*. A fast growing tree found in drought tolerant deciduous woodland and at the dry edges of gallery forest, surviving as a shade tree in pastures and along hedgerows, sometimes cultivated, recorded as growing with *Guazuma*, *Gliricida* and *Leucaena*. In Mexico and Central America it is found between 10-500 m; Barneby & Grimes (1996) have reported it for Colombia at 3000 m. Requires 600-2400 mm annual rainfall, survives up to a seven-month dry season.

Nodulated species (Sprent, 2001).

*Phenology*. Flowering October, December to March, fruiting October to June

*Vernacular names and uses*. Lagarto, Cadeno (Guatemala), Flor de canela, Tepanahuaste (Mexico), Canilla de mula, Carreto, Memble, Cenicero, Zorrillo (El Salvador), Guárico (Venezuela). The species is planted as a coffee and cattle shade tree; the wood is used in construction of roofs (El Salvador).



**Taxonomic comments.** The species is treated under *Pseudosamanea* by Barneby & Grimes (1996), who recognised only two species: *P. guachapele* and *P. cubana*. These two species were analysed together with ten other Ingeae, including *Pararchidendron* (from the old tropics) as an outgroup by Barneby & Grimes (1996). In their analysis *Pseudosamanea* nested with the *Samanea* clade due to the presence of heteromorphic flowers and narrowly elliptic seeds. *Pseudosamanea* was supported as distinct by having buff or ivory-white seeds, and separated from its sister taxon *Samanea* based on fruit features (*Samanea* has a thick well developed mesocarp) and seed form. Characters treated as synapomorphies to support *Pseudosamanea* are homoplasious within other *Albizia* species; for example, similar seeds are present in *A. niopoides*. The presence of heteromorphic flowers is also highly homoplasious in the Barneby & Grimes (1996) analysis. In our opinion, the poor sampling of taxa and low support of the synapomorphies do not provide strong evidence for the recognition of *Pseudosamanea*, and we treat *P. guachapele* as an *Albizia*. Vegetatively *A. guachapele* is similar to *A. occidentalis* and *A. lebbeck*; the first two have pubescent leaflets, *A. lebbeck* has not. *A. guachapele* has leaflets densely pilose canescent on both surfaces; *A. occidentalis* has leaflets with adaxial glabrous surface and puberulous to white pilose abaxial surface.

**Conservation status.** *Albizia guachapele* is a fast growing tree and produces large quantities of seed with a high germination rate; it is often cultivated. In the wild, populations of this species are individual rich and do not seem threatened. Trees are often left to provide shade for cattle. In Mexico and Central America a least concerned (LC) conservation status is suggested. Living collection of this species is growing in Kew.

#### Selected specimens

**COSTA RICA.** **Aguada del León:** Carara Biological Reserve, 9°47'N, 84°32'W, 100 m, 9-XII-1989, R. Zúñiga 22 (K). **Guacacaste:** Guacimal City, río Guacimal, near Guanacaste-Puntarenas boundary, along international Highway, 10°12'N, 84°51'W, 100 m, 27-XII-1966, W. Burger 4049 (BM). Río Guacimal, 100 m, 6-I-1964, A. Jiménez 1574 (BM, F). **Puntarenas:** Carretera Interamericana at junction with Río Lagartos, 100 m, 18-II-1984, R. Khan 1158 (BM). **GUATEMALA.** **El Progreso:** Entrada a Sanarate, km 55, 14°47'N, 90°11'W, 500 m, 7-III-2003, A. Cobar AC111 (BIGU, MEXU). 5 km East of Quezaltepec, 55 km W of La Florida borderpost, 15°00'N, 89°30'W, 450 m, 16-I-1993, D.J. Macqueen 492 (K). **Zacapa:** 1 km west of Mayuelas, 1 km north of Gualan, río Motagua, 15°08'N, 89°22'W, 130 m, 1-III-1988, C.E. Hughes 1103 (K). **HONDURAS.** **Choluteca:** 30 km south of Talanga in valley of río Choluteca 14°24'N, 87°05'W, 18-III-1982, C.E. Hughes 114 (K). **Colón:** Base of Cerro Puerto Arturo on main road, 4 mi E of Trujillo, 15°55'N, 85°59'W, 20-II-1981, J. Saunders 1045 (BM). **Comayagua:** 1 km east of Las Palmas, 14°27'N, 87°38'W, 650 m, 19-III-1982, C.E. Hughes 117 (K). Valley between Comayagua and Palmerola, 500 m, 15-V-1971, A. Molina 26026 (BM). **Morazán:** Escuela Agrícola Panamericana, edge of Jicaró River, 14°01'N, 87°02'W, 800 m, 5-II-1987, A. Molina 33984 (MEXU). **MEXICO.** **Campeche:** River Palizada, 18°10'N, 91°55'W, 8 m, 22-IV-1986, C. Chan 6502 (CICY, K). **Chiapas:** Es-

peranza, Escuintla, 15°20'N, 92°38'W, 25-II-1948, Matuda 17607 (K, MEXU). 12 km al W de Frontera Comalapa, sobre carretera México 211, hacia Motozintla, 15°39'30"N, 92°11'29"W, 810 m, 6-II-1990, A. Reyes García 1572 (BM, MEXU). 3 km al W de El Diamante, 2 km al E de El Altillo, 16°06'23"N, 95°55'25"W, 610 m, 2-III-1988, M. Sousa 13211 (BM, MEXU). **Oaxaca:** Isabel María, San Miguel Soyaltepec, Presa Temascal, 18°12'03"N, 96°28'59"W, 70 m, 5-IV-1987, L. Cortés 821 (MEXU). El Limón, 17 km al W de Tehuantepec, Municipio Tehuantepec, 16°19'28"N, 95°17'20"W, 55 m, 27-XII-1985, C. Martínez 343 (MEXU). Nizanda, arroyo Mazhua, faldas del Cerro Verde a 2 km al NE de Nizanda, 16°40'N, 95°02'W, 180 m, 17-III-1996, E. Pérez García 1035 (K, MEXU). 2.7 km al ENE de Santa María Tavehua, Mojonera, Municipio San Andrés Solaga, 17°14'59"N, 96°12'45"W, 867 m, 8-X-2001, A. Saynes 2725 (MEXU). Chihuitan, 9 km al NW de Ixtepec, 16°35'20"N, 95°09'42"W, 40 m, 17-XII-1978, M. Sousa 10169 (BM, MEXU). 7 km al N se San Pedro Cajonos, hacia Zaachila, 17°10'05"N, 96°15'40"W, 960 m, 15-V-1983, R. Torres 2899 (MEXU). **Tabasco:** Pénjamo-Zapata road 10 km from Zapata, 18°00'N, 92°40'W, 60 m, 12-III-1968, T.D. Pennington 9541 (K). Puente río Puyacatengo, a 5 km al N de Puyacatengo, 2 km al SE de Teapa, 17°33'N, 92°57'W, 100 m, 5-III-1981, M. Sousa 11741 (BM, MEXU). **NICARAGUA.** **Boaco:** Municipio de Teustepe, 3 km sobre la carretera a San José de los Remates, 12°28'N, 86°45'W, 300 m, 13-IV-1999, P.P. Moreno 29090A (BM, MO). **Carazo:** Río Mayito, 11°43'N, 86°19'W, 190 m, 24-I-1984, M. Araquistain 3753 (BM, MO). Between Amayito and Barranco Bayo, 11°40'N, 86°18'W, 30 m, 12-I-1984, W.D. Stevens 22769 (BM, MO). **Chontales:** Hacienda Corpus, W of Juigalpa, 12°07'N, 85°28'W, 100 m, 28-XII-1983, W.D. Stevens 22628 (BM, MO). **Estelí:** Las Animas de la Cañada, 22-III-1984, A. Laguna 352 (BM, MO). **León:** Camino a Salinas Grande, 12°20'N, 86°50'W, 80 m, 18-I-1983, A. Grijalva 2211 (BM, MO). **Matagalpa:** Valle Pueblo Viejo, 12°48'N, 85°47'W, 500 m, 2-II-1984, P.P. Moreno 22941 (BM, MO). **Rivas:** Entre Nacascolo y Marsella, 11°16'N, 85°52'W, 10 m, 15-III-1984, M. Araquistain 3831 (BM, MO). El Escobillo, 25-I-1984, P.P. Moreno 22876 (BM, MO). **PANAMÁ.** **Cocle:** Barro Colorado Island, Bat Cove, 8°14'N, 78°13'W, 17 m, 19-V-1988, D. García 2426 (BM). Shoreline of Bat Cove, 9°09'N, 79°50'W, 79 m, 19-VI-1988, N.C. Garwood 2426A (BM). Taboga, 8°48'N, 79°33'W, Seemann 656 (BM, E), near Panamá, 2-VII-1862, S. Hayes 680 (BM). **Colón:** Salamanca, hydrographic station, 9°20'N, 79°36'W, 26-XII-1935, J. A. Steyermark 17155 (BM).

#### 5. *Albizia lebbeck* (L.) Benth., London J. Bot. 3: 87. 1844

*Mimosa lebbeck* L., Sp. Pl.: 516. 1753. *Acacia lebbeck* (L.) Willd., Sp. Pl. 4: 1066. 1806. *Feuilleea lebbeck* (L.) Kuntze, Rev. Gen. Pl. 1: 184. 1891.

Type: [Upper] Egypt (lectotype, selected by Codd (1958), LIN-1228.16).

*Pithecellobium splitgerberianum* Miq., Stirp. Surinam. Select: 5. 1851.

Type: SURINAM. Herb. Hostmann 459 (holotype, U; isotype, G!).

*Albizia lebbeck* var. *pubescens* Benth., London J. Bot. 3: 87. 1844.

Type: INDIA. East India (lectotype, here selected, K! Herb. Benthamianum, 1854; isolectotype, K! Herb. Hookerianum, 1867).





**Fig. 12.** *Albizia lebbeck*: **a**, flowering habit; **b**, flower; **c**, staminal tube, stamen filaments, ovary and style; **d**, anther; **e**, fruit. Drawn by M. Grieson for Townsend & Guest, Flora of Iraq (1974) reproduced with permission of the artist.

*Mimosa speciosa* Jacq. Icon. Pl. Rar. 1: 9, tab. 198. 1786.

*Acacia speciosa* (Jacq.) Willd., Sp. Pl. 4: 1066. 1806.

Type: Jacq. coll. 1 [plate] pag. 119, [lectotype selected by Barneby & Grimes (1996)].

Small to medium *tree*, up to 10 m tall, crown rounded. *Bark* with conspicuous pale lenticels present on main axis. *Stipules* 2-4 mm long, fugacious. *Leaves* 12-30 cm long, petiole 6-7(9.5) cm long, ribbed to channelled, occasionally pilose, with a gland near the base; rachis 5-9 cm long, pilose, 2-3 pairs of pinnae, each 7-14 cm long, an elliptic gland between the last pair of pinna. *Leaflets* 5-7 pairs per pinna, oblong to ovate, apex rounded, mucronate, base acute, 2-4(5) × 1-2(2.5) cm, adaxial surface glabrous, abaxial surface usually glabrous, occasionally translucent pilose, venation palmate-pinnate. *Inflorescence heteromorphic*: flowers in pedunculate capitula, clustered on 2-3 capitula, main axis 180 mm long with pilose pubescence; peduncles 7-8 cm long; bracts linear, 3 mm long; pedicels 2 mm long, floral bracts linear, 2 mm long. *Peripheral flowers*: calyx tubular, 3-6 mm long, 5-6-lobed, very short-pubescent; corolla campanulate, 4-10 mm long, 4-5-lobed, glabrous except for the lobes; stamens white, c. 30 per flower, 15-25 mm long, tube up to 4 mm long; ovary glabrous, sessile. *Central flowers*: calyx tubular, up to 5.5 mm long, 5-lobed, pilose; corolla 10-11 mm long, campanulate, 5-lobed, glabrescent; stamens c. 20-30 per flower, up to 23 mm long, tube up to 10 mm long; ovary glabrous, sessile. *Legume* ochre-brown, usually dehiscent along one suture, valves undulating, raised over the seeds, the margins straight to slightly constricted between the seeds, apex acute, base rounded, 1.2-18.6(25) × 3.7-6 × 0.2-0.6 cm (including a 10 mm beak at apex, without stipe), glabrescent, 4-11 seeded. *Seeds* dark brown, circular in outline, 7-8 (12) × 7-9 × 1.5-2 mm, areole brown, but paler than the rest of the seed, pleurogram 80-90%. Fig. 12.

*Distribution*. Native of tropical E Asia, introduced in the Neotropics widespread from W and lowland Gulf of Mexico (Sinaloa; Tamaulipas to Yucatan Peninsula), to the south through Chiapas and Central America to Panama (Fig. 13); by the mid-nineteenth century the species was already randomly circumtropical.

*Habitat*. Usually an ornamental tree, planted in villages, specially along the Yucatan coast, occasionally becoming naturalized and a weed in disturbed woodland; sea level to 1826 m; requires 500-2500 mm annual rainfall; tolerates acid to alkaline soils, prefers well drained soil, but tolerates waterlogging and soil compaction; resists dry seasons as long as up to six months; temperature range 5-46 °C, tolerates frost; mature trees can survive fire. *A. lebeck* is indigenous to the Indian subcontinent, where it is well known as 'Siris' and bears a marked dry season (below 800 mm annual rainfall).

Nodulated species (Sprent, 2001).

*Phenology*. Flowering February to November. Fruiting throughout the year.

*Vernacular names and uses*. Acacia (Mexico and Central America), Canjor, Canjuro (El Salvador), Mata-ratón (Panama). Frequent as living fence species, an ornamental, grown for fodder (leaves, although new growth is reported to be toxic) and wasteland reclamation.

*Taxonomic comments*. Within the large leafleted *albizias*, *Albizia lebeck* is similar in leaflet shape and size to *A. guachapele*, but the latter has very pubescent leaflets; the flowers of *A. lebeck* present shorter pedicels, to 2 mm long, *A. guachapele* has pedicels to 8 mm long. The seeds of *A. lebeck* have an areole with a cracked cross-hatched pattern. Seedlings have epigeous germination; the first pair of leaves are alternate and once pinnate; the second pair are bipinnate, with two pairs of pinnae; pinnae number per leaf increases as successive leaves develop. Barneby & Grimes (1996) quoted that no type specimen for *Albizia lebeck* var. *pubescens* Benth. was identified at Kew in 1990. After searching within the collections from India (Kew Herbarium), 2 sheets were located, one annotated by Bentham which has been chosen here as the lectotype.

#### *Selected specimens*

EL SALVADOR. Herbario Jardín Botánico La Laguna Zone 7, 13°40'N, 89°15'W, 800 m, 23-IV-1991, R. Villacorta 775 (K, LAGU). MEXICO. **Campeche**: Francisco Escárcega, 18°20'41"N, 90°45'41"W, 85 m, 27-IX-1983, E. Cabrera 5584 (MEXU). Holpechen, 2 km antes del límite del estado de Yucatán, 20°10'05"N, 89°42'15"W, 30 m, 26-VII-1985, C. Chan 5586 (MEXU). Barrio La Fátima, 20°07'43"N, 89°51'35"W, 36 m, 4-IV-1999, J. Criollo Can s.n. (MEXU). Km 0,5, desviación Campeche-Mérida, 19°47'N, 90°37'W, 10 m, 12-XII-1994, Juárez Palomillas 307 (MEXU). San Antonio Ebula, 19°48'11"N, 90°26'38"W, 19 m, 22-III-2003, C. Pavón Lanz 536 (MEXU). **Chiapas**: Chiapa de Corzo, 16°42'25"N, 93°00'50"W, 500 m, 6-I-1972, D.E. Breedlove 23573 (MEXU). Arista, 15°58'N, 93°49'W, 20-XII-1947, Matuda 17328 (K, MEXU). Talisman, 250 m, 7-VIII-1984, E. Ventura 121 (MEXU). **Guerrero**: Acapulco, 20°32'29"N, 100°24'42"W, 30 m, 20-VII-1971, W. Boege 1874 (MEXU). Iguala, 18°20'41"N, 99°32'23"W, 750 m, II-1943, J.R. Bruff 1508 (MEXU). Grutas de Cacahuamilpa, hacia el río, 17,6 km al NE de Taxco, 18°39'54"N, 99°30'22"W, 1020 m, 2-VII-1998, R. Cruz Durán 2468 (FCME, MEXU). Tlalchapa, 18°24'32"N, 100°28'40"W, 325 m, 27-III-2002, P. Serrato Beas s.n. (MEXU). **Michoacán**: Altamirano-Coyuca de Catalán, 5-IV-1977, J.C. Soto 45bis (MEXU). **Morelos**: 0,5 km antes del entronque Zacatepec-Tequesquitengo (Alpuyeca-Zacatepec), 1050 m, 26-VI-1982, O. Dorado 736 (MEXU). Cuernavaca, Av. Niños Héroes, colonia Buenavista, 18°55'N, 99°15'W, 1770 m, 15-VI-1983, Dorado, O. 1167 (K). Puente de Ixtla, entrada, 7 km SE de la caseta Alpuyeca, carretera Cuernavaca-Acapulco, 18°55'01"N, 98°51'03"W, 1660 m, 8-VI-1986, G. Flores 8 (MEXU). Jojutla-Zacatepec, a 1 km antes del Tecnológico de Zacatepec, 18°36'53"N, 99°10'49"W, 890 m, 22-VI-1988, Q.F. Fuchs 1967 (MEXU). Tonintana, Calzada Atzingo, 23-V-1971, J. Vázquez 3213 (MEXU). **Nayarit**: 3 km de Tepic, carretera Mazatlán [NW], 21°31'N, 104°53'40"W, 950 m, 23-I-1977, A. Delgado Salinas 421 (MEXU). Paseo de La Loma, Tepic, 21°30'N, 104°54'W, 19-III-1988, R. Ruenes 118 (MEXU). San Miguel, 22°20'N, 105°17'W, 1000 m, 17-XII-1983, F. J. Santana 1412 (MEXU). **Oaxaca**: Ixtepec, 16°33'36"N, 95°06'W, 100 m, 9-VI-1981, M. Cházaro 3382

(MEXU). Juchitan, entrada de Istmo de Tehuantepec, 16°26'N, 95°01'10''W, 20 m, 21-III-1997, *K. Musalem Castilejos 5* (CHAP, MEXU). 14 km al E-SE de Chahuites, 16°14'29''N, 94°27'16''W, 20 m, 17-VI-1977, *M. Sousa 7394* (MEXU). San Mateo del Mar, 16°12'32''N, 94°58'51''W, 4 m, 10-IV-1979, *D Zizumbo 530* (MEXU). **San Luis Potosí:** 6.5 km al W de Valles, carretera río Verde, 21°59'37''N, 99°02'10''W, 70 m, 24-V-1979, *S. Zárate 321* (MEXU). **Sinaloa:** Jardines INIFAP, carretera Tepic-Mazatlán, desvío al aeropuerto de Sinaloa, 10-X-1992, *A. González s.n.* (MEXU). Entronque con el aeropuerto de Mazatlán, campo INIFAP, 1-VI-1994, *E. Guízar 3196* (CHAP, MEXU). Arroyo Grande, 24°48'N, 107°04'W, 2-XII-1997, *Rangel 445* (COCA, MEXU). Meseta de Cacaxtla, km 54 maxipista Mazatlán-Sinaloa, Ejido Guillermo Prieto, área natural protegida, 23°39'06''N, 106°44'34''W, 90 m, 9-V-2006, *M. Ruiz 2006-418* (MEXU). **Tabasco:** Jardín Botánico de la Universidad Autónoma de Chapingo, 17°31'34''N, 92°55'44''W, 30-I-2002, *J. Calónico 21161* (MEXU). Lago Ilusiones, Jardín de la UJAT, 17°59'21''N, 92°55'14''W, 10 m, 11-V-1986, *O. Castillo 602* (MEXU). SW de La Venta, 18°04'N, 94°02'W, 40 m, 8-X-1996, *M. Sousa 13462* (MEXU). 4 km al W de Tenosique, 17°29'N, 91°27'W, 21-IX-

1979, *O. Téllez 902* (BM, MEXU). **Tamaulipas:** Mante, área urbana, 22°44'33''N, 98°58'20''W, 80 m, 21-III-1983, *A. Brito s.n.* (MEXU). Altamira, 60 m, 21-IX-1978, *G. Castillo 281* (MEXU). Victoria, 23°44'10''N, 99°08'46''W, 320 m, 21-III-1983, *M.H. Cervera 148* (MEXU). Ejido Congregación Quintero, Mante, 22°39'40''N, 99°02'12''W, 115 m, 7-X-1999, *M. Galván 774* (MEXU). **Veracruz:** Tecolutla, 20°28'47''N, 97°00'36''W, 10 m, 28-XII-1969, *W. Boege 1320* (MEXU). El Salto de Eyipantla, 6 km a Sihuapán, 18°23'20''N, 95°12'02''W, 200 m, 19-I-1973, *J.I. Calzada 972* (K, MEXU). 5 mi S of Salinas, 18°53'25''N, 95°56'37''W, 10 m, 17-VII-1977, *J.D. Dwyer 14558* (MEXU). Río Otatitlán, 18°12'N, 96°02'W, 5 m, 28-V-1967, *G. Martínez Calderón 1394* (MEXU). Orilla del río Tuxpan, 2 km del mar, 20°51'N, 97°24'W, 3 m, 6-VI-1999, *B. Rodríguez s.n.* (CHAP, MEXU). Ojochapán, al SE de Coyame, orilla NE laguna de Catemaco, 18°26'02''N, 95°00'42''W, 250 m, 12-I-1974, *M. Sousa 4307* (MEXU). **Yucatán:** Mérida, 20°59'N, 89°37'W, 8 m, 10-XII-1980, *M. Burgos 2* (MEXU). Mérida, 20°59'N, 89°37'W, 8 m, 22-IV-1981, *J.S. Flores 8141* (MEXU). Ciudad de Mérida, Valladolid, 20°41'N, 88°12'W, 10 m, 13-IV-1985, *C.E. Hughes 670* (FHO, K). Mérida, 20°59'N, 89°37'W, 8 m, 11-VIII-1983, *M. Narváez 1042*

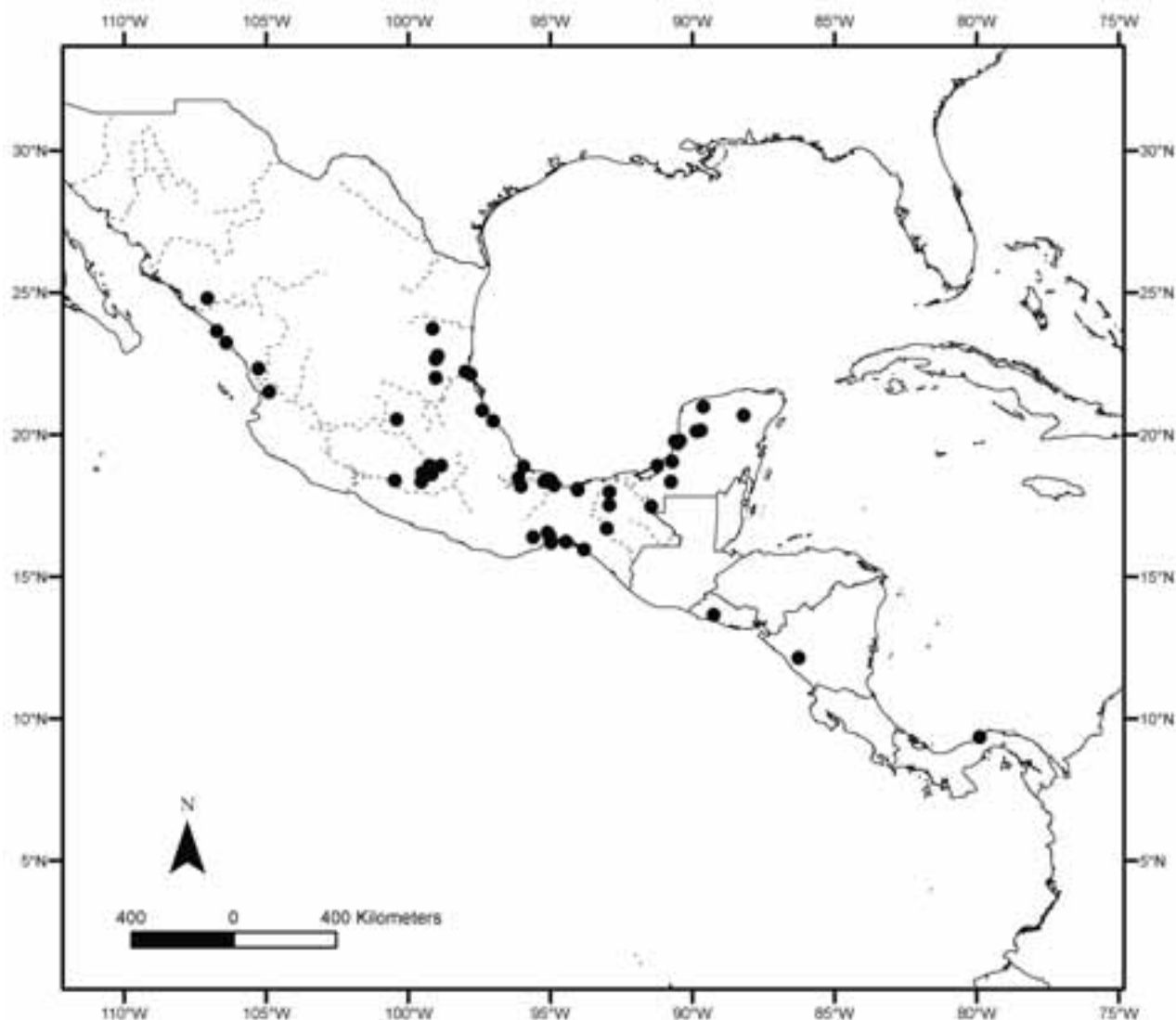


Fig. 13. Cultivated and naturalized geographical range of *Albizia lebeck* (●) in Mexico and Central America.



(MEXU). NICARAGUA. **Managua**: Parque Central de Managua, 12°09'N, 86°16'W, 40 m, 30-IX-1983, *M. Araquistain* 3710 (BM, MO). PANAMA. **Colón**: 9°21'33"N, 79°54'05"W, 17-VI-1914, *H. Pittier* 6672 (BM).

**6. *Albizia leucocalyx*** (Britton & Rose) L. Rico, Bot. J. Linn. Soc. 108: 272. 1992

*Samanea leucocalyx* Britton & Rose, N. Amer. Fl. 23: 34. 1928. *Pithecellobium leucocalyx* (Britton & Rose) Standl., Publ. Field Columbian Mus., Bot. ser. 4(8): 308. 1929.

Type: MÉXICO. Tabasco, El Limón [17°44'31"N, 91°20'49"W], 12 July 1891, *J.N. Rovirosa* 976 (holotype, US-1319837!; photograph of type, NY!).

Medium to large tree, 20-30(60) m tall, crown rounded. *Bark* from smooth to scaly, greyish, internal bark creamish pink, of a crumbly texture, with a translucent and sticky exudate. *Stipules* linear, 2-5.5(7) mm long, fugacious, pubescent with brownish ferruginous indumentum. *Leaves* 5.5-23(30) cm long, petiole 2.5-6.3 cm long, terete, villous, often with a gland mid way along the petiole; rachis (2.5)4-7.3 (13) cm long, terete, channelled, villous, pinnae in 2-5 pairs, each (6)7-13.5 cm long, usually with a gland between each pair of pinnae. *Leaflets* (3)6-10 pairs per pinna, asymmetric, rhombic-ovate, apex rounded to truncate, base rounded to truncate, 1.8-4 × 0.9-2.1 cm, margins ciliate to glabrous, adaxial surface glabrous, abaxial surface puberulous, venation pinnate; the terminal pair of leaflets differ in shape, they are obovate and slightly larger (1.3)3-5 (7) × 1.8-2.5(5) cm, with a rounded apex, and acute base. *Inflorescence heteromorphic*: some flowers in synflorescences, some in pseudoracemes, others in clusters of 2-3 umbels; main axis to 9 cm long, peduncles 30-55 mm long, bracts linear, 5-6 mm long; pedicels 4(7) mm long, floral bracts linear, 3-5 mm, ferruginous pubescent. *Peripheral flowers*: calyx campanulate, 3-3.3(4.5) mm, 5-lobed, adpressed-villose; corolla infundibuliform, 6-7(9.3) mm, 5-lobed, adpressed-villose; stamens 15-25(36) per flower, (15)25-36 mm long, tube 1.5-3(4.6) mm long; ovary pubescent, sessile. *Central flowers*: calyx campanulate, 4 mm long, pubescent, 5-lobed; corolla infundibuliform, 7.5-12 mm, pubescent, 5-lobed; stamens c. 20 mm long, tube 8-15 mm long; ovary sessile, pubescent, with an intrastaminal nectary c. 0.5 mm high. *Legume* dark red to black, septae between the seeds, breaking into one-seeded units, straight or slightly curved, margins inconspicuous, not protuberant, tardily dehiscent, apex truncate, base acute, the peduncle with a lateral insertion, 6-11.7 × 1.9-3 × 0.7-1 cm (including a beak up to 7 mm, without stipe), coriaceous, with a well developed mesocarp, and a septum between the seeds, glabrous, 12 seeded. *Seeds* ivory coloured, narrowly oblong, 12-16 × 4-5 × 2-3 mm, areole very slightly greenish, pleurogram 100%. Fig. 14.

*Distribution*. Lowlands of SE Mexico (Tabasco northern Chiapas), eastern Guatemala (Peten, Izabal) and Belize (Fig. 9), recently reported (Zamora, pers. comm.) in Honduras.

*Habitat*. In tropical evergreen forest, often on river banks and in pastures. Between 20-900(1760) m.

*Phenology*. Found in flower from May to July, in fruit from April to January.

*Vernacular names and uses*. Guaciban (Chiapas-Mexico), Caracocillo (Tabasco-Mexico). Used as timber wood.

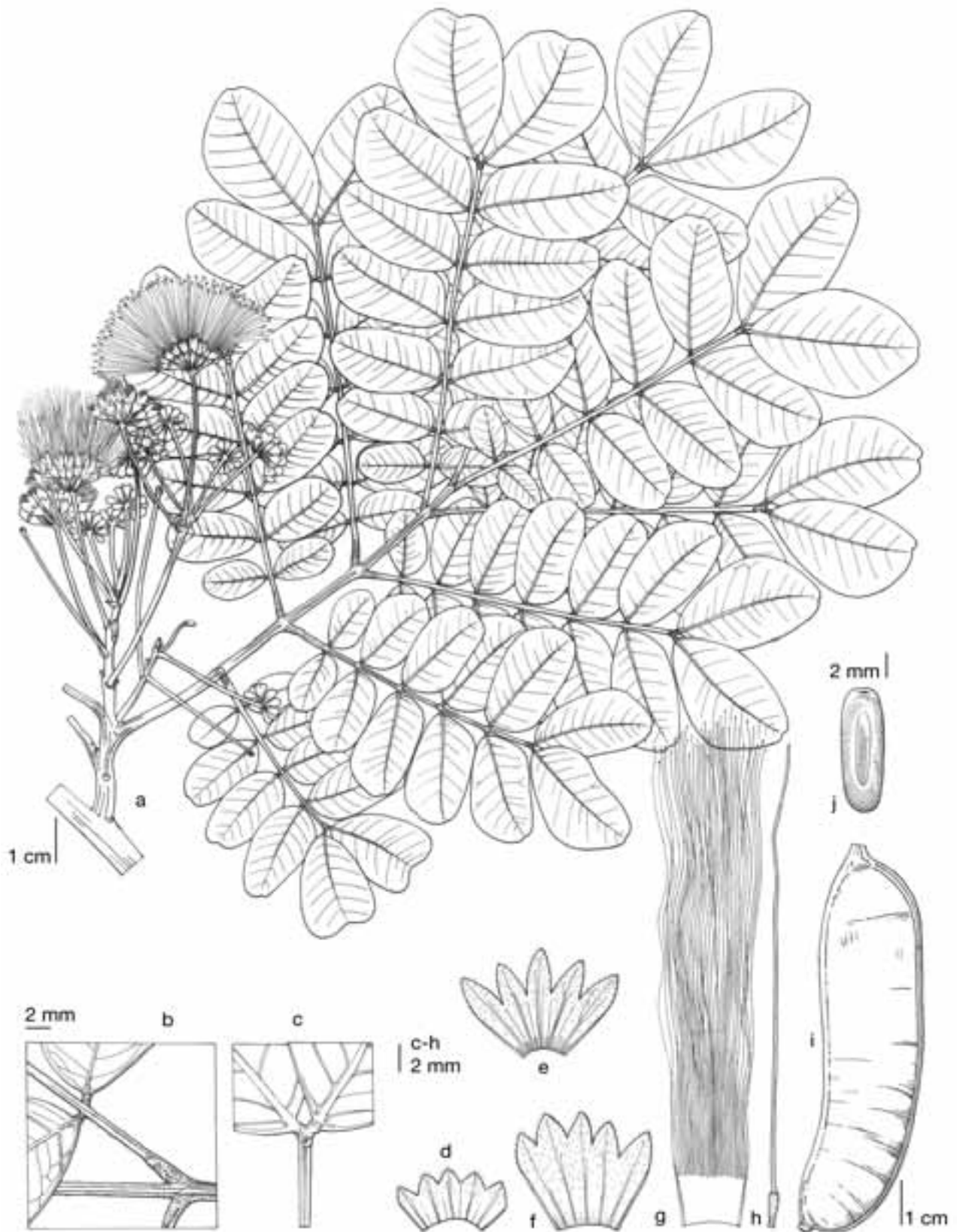
*Conservation status*. The habitat of *Albizia leucocalyx* is becoming restricted to river banks and pastures due to the reduction in tropical evergreen forest; the amount of large size individuals is decreasing in the field; due to the restricted current distribution and the threats to its reduced environment, a conservation status of vulnerable (VU B2b(ii,iii,v)) is suggested for this species.

*Selected specimens*

BELIZE. **El Cayo**: 49 mi. Section, 17°10'N, 89°00'W, 15-V-1956, *Gentle* 9101 (MEXU). 5 km al NW de Cave's Branch, carretera a Dangriga, 17°09'N, 88°41'W, 210 m, 2-XII-1981, *M. Sousa* 12150 (MEXU). **Stann Creek**: Creek Valley, Big Edge Ridge, 16°58'N, 88°13'W, 8-I-1941, *Gentle* 3481 (MEXU). **Toledo**: Near San Antonio, 16°14'N, 89°01'W, 124 m, 12-XII-1945, *Gentle* 5413 (MEXU). Westmoreland, 61 m, 7-XII-1932, *Schipp* 1024 (K). GUATEMALA. **Izabal**: 4 km from La Ruta del Atlántico, 15°30'N, 89°10'W, 21-V-1971, *E. Contreras* 10806 (MEXU). **El Peten**: Brecha Chinaja, 10 km from laguna Petexbatum, 14°37'N, 90°17'W, 20-V-1965, *E. Contreras* 5400 (MEXU). La Libertad, 16°47'N, 90°07'W, 20-V-1933, *Lundell* 3339 (K). MEXICO. **Chiapas**: Rancho Romo, camino a Palenque, 17°14'07"N, 91°34'30"W, 183 m, 12-VI-2002, *G. Aguilar* 1373 (K, MEXU). Chancala, 12 km Penjamo-Chancalá, 17°14'N, 91°26'W, 8-VI-1968, *J. Chávelas* ES-3034 (K, MEXU). Hacienda Tabasco, estación Lacandon, 17°01'N, 91°35'W, 899 m, 5-IX-1951, *O.G. Enríquez* 7302 (MEXU). La Arena, 15°38'N, 92°39'W, 1760 m, 14-V-1952, *O.G. Enríquez* 7603 (MEXU). Catzajá, San Diego, 17°45'N, 92°01'W, 17-XII-1965, *A. Gómez-Pompa* 1286 (K, MEXU). Carretera Emiliano Zapata-Tenosique, a unos 34 km de Zapata, 17°19'N, 91°23'W, 150 m, 14-V-1968, *T.D. Pennington* 9614 (K). Colonia Benito Juárez Miramar, sobre el camino a la laguna Miramar y a Nueva Galilea, 16°21'N, 91°13'W, 250 m, 1-XII-1993, *A. Reyes García* 2431 (BM, MEXU). **Tabasco**: 13.6 km de Tenosique por la carretera a Zapata, 17°29'N, 91°27'W, 800 m, 1-XII-1966, *González Leija* GH-152 (K, MEXU). 3.4 km de Pénjamo, por carretera a Zapata, 17°27'43"N, 91°36'06"W, 40 m, 2-XII-1966, *González Leija* GH-179 (MEXU). Estapilla, 17°33'N, 91°24'W, 18-VI-1939, *Matuda* 3486 (K). Ejido El Arenal, 17°49'29"N, 91°38'01"W, 20 m, 29-VII-1984, *G. Ortiz* 6 (MEXU). Macuspana, frontera Chiapas-Tabasco, 17°46'N, 92°36'W, 8-VII-1981, *T.P. Ramamoorthy* 2557 (K, MEXU). 18 km al NW del Puente Usumacinta, 17°50'N, 91°50'W, 80 m, 7-XII-1981, *M. Sousa* 12276 (K).

**7. *Albizia niopoides*** (Spruce ex Benth.) Burkart, Legum. Argent., ed. 2: 542. 1952

*Pithecolobium niopoides* Spruce ex Benth., Trans. Linn. Soc. London 30: 591. 1875.



**Fig. 14.** *Albizia leucocalyx*: **a**, flowering habit; **b**, pinna base showing rachis indument; **c**, distal pair of leaflets and gland; **d**, calyx opened out; **e**, **f**, corolla opened out showing regular and irregular petal lobes; **g**, staminal tube and stamen filaments; **h**, ovary and style; **i**, fruit; **j**, seed showing 100% pleurogram. a, c-h, from *Matuda 3486*; b, j, from *Lundell 3339*; i, from *Pennington 9614*. Drawn by E. Papadopoulos.

Type: BRAZIL. Pará; Santarem, *Spruce 1088* [lectotype, selected by Rico Arce (1992), K!].

*Pithecellobium caribaeum* Urb., Symb. Ant. 2: 260. 1900. *Albizia caribaea* (Urb.) Britton & Rose, N. Amer. Fl. 23: 44. 1928.

Type: TOBAGO. *Eggers 5920* [lectotype, selected by Barneby & Grimes (1996), K!; isolectotype, P!].

*Pithecellobium hassleri* Chodat, Bull. Herb. Boissier, ser. 2: 4: 483. 1904. *Albizia hassleri* (Chodat) Burkart, Darwiniana 7: 517. 1947.

Type: PARAGUAY. San Bernardino, *E. Hassler 3719* (lectotype, here designated, K!; isolectotypes, BM!, G!, NY, P).

*Albizia richardiana* King & Prain, Ann. Roy. Bot. Gard. (Calcutta) 9: 32. 1906.

Type: INDIA. Calcutta; cultivated in the Botanic Gardens, "Div. xvii" May & July 1898, *D. Prain s.n.* (lectotype, here designated, K! [fl. & fr.]; isolectotype, K! [fl.]).

*Senegalia liebmanni* Britton & Rose, N. Amer. Fl. 23: 116. 1928.

Type: MEXICO. Oaxaca; Pacific Coast of Oaxaca, *Liebmann 4380* (holotype, US; isotype [fragment] NY!).

*Senegalia guacamayo* Britton & Killip, Ann. New York Acad. Sci. 35: 142. 1936. *Albizia guacamayo* (Britton & Killip) Cárdenas, Ernstia 1: 133. 1992.

Type: COLOMBIA. Santa Marta, Prado, 13 Jan. 1930, *S.J. Record 7* (holotype, NY!).

*Gagnebina richardiana* Wall. ex Voigt, Hort. Suburb. Calcutt.: 257. 1945, *nom.nud.*

*Albizia paludosa* T. Anderson, Cat. Pl. Roy. Bot. Gard. Calcutta: 18. 1847, *nom.nud.*

Medium to large *tree* 10-25(30) m tall, with a short bole, limited branching, and a spreading flat-topped crown. *Bark* golden yellow, smooth, powdery. *Stipules* 1-1.5 mm long, narrowly linear or triangular, fugacious. *Leaves* 9-15 cm long; petiole 2-3 cm long, slightly channelled, glabrous or shortly pubescent, with one prominent circular shaped gland mid way along petiole, occasionally bearing a second gland close to the base of the first pair of pinnae; rachis 2-7 cm long, channelled, hispid, pinnae 3-8(9) pairs per leaf, each 2.5-6.5 cm long. *Leaflets* 20-50 pairs per pinna, linear, apex acute, base truncate, 4-6 × 1 mm, margin ciliate, adaxial and abaxial surface glabrous, the midrib conspicuous, submarginal. *Inflorescence homomorphic*: flowers in racemes of usually of 8-16 capitula, along main axis, this to 15 cm long, a secondary axis 15-30 mm long, tomentose, inflorescence bracts (usually two) c. 4 mm long; peduncles of the capitula up to 7 mm long, with 2 mm long bracts at the

base; flower bract linear 1-2 mm long; pedicel absent; floral bracts linear < 1 mm long. *Flowers* sessile, *calyx* campanulate, 1-2 mm long, glabrous, 5-lobed, glabrous except for the apex of the lobes; *corolla* campanulate, 3 mm long, 5-lobed, glabrous except for the apex of the lobes; *stamens*, c. 25-30 per flower, 7-8 mm long, staminal tube up to 4 mm long; *ovary* glabrous, with a short stipe of 0.1-0.3 mm. *Legume* straw brown to chocolate brown coloured when mature, dehiscent along both sutures, with prominent margin, valves flat, straight, apex and base acute, 8-13 × 1.3-1.8 × 0.2 cm (including a 2 mm beak and a 3-5 mm stipe) chartaceous, glabrescent, 10-12 seeded. *Seeds* ivory to olive coloured, circular-elliptic, 5-6 × 3-6 × 1-2 mm, areole the same colour as the rest of the seed, pleurogram 80-90%. Fig. 15.

*Distribution*. From Mexico S (Campeche, Chiapas, Oaxaca, Tabasco and Yucatan), scattered throughout Central America to Panamá (Fig. 16); West Indies; South America (Argentina, Bolivia, Brazil, Ecuador, Guyana, Paraguay, Peru and Venezuela). Known to be cultivated in India, Madagascar, the Mascarenes and Nigeria.

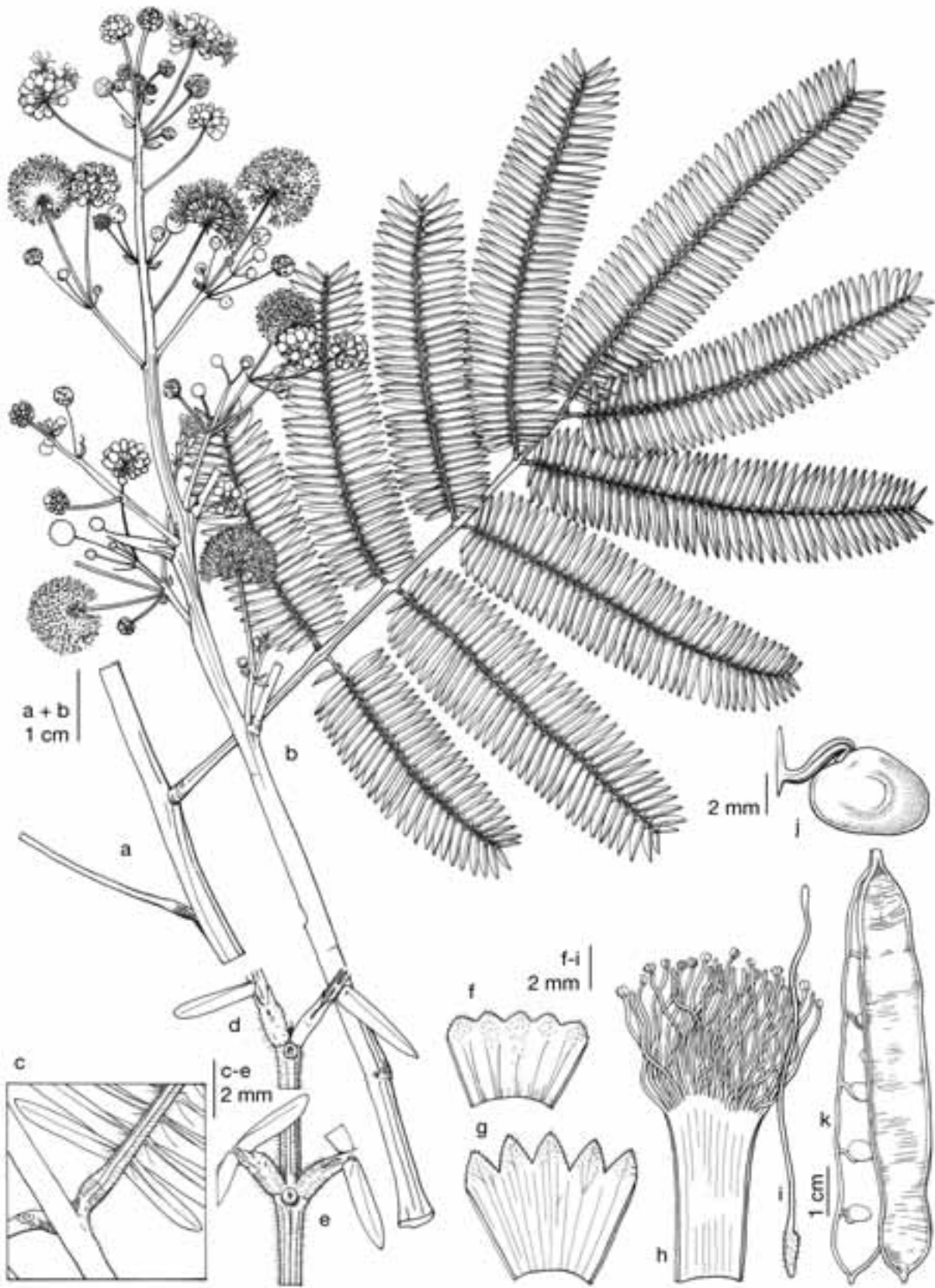
*Habitat*. The species grows in seasonally deciduous or semi-deciduous woodlands, in moister gallery and tropical evergreen forest and pastures. It is occasionally found on coastal sands, growing with *Caesalpinia exostemma* DC., *Gliricida septium* (Jacq.) Steudl., *Pithecellobium dulce* (Roxb.) Benth., *Crescentia alata*, *Bauhinia* and *Cordia* spp. It is browsed by howler monkeys. In Mexico and Central America is found between 10-690 m elevation, but is recorded between 1100-1300 in Brazil and Peru. *A. niopoides* requires 500-2400 mm annual rainfall; it tolerates a seven-month dry season and bush fires.

*Phenology*. Flowering from May to July. Fruiting from November to July.

*Vernacular names and uses*. Guanacaste blanco (Mexico and Guatemala), Conocaste blanco, Sonsonate (El Salvador) Gallinazo, Guanacaste blanco (Honduras and Nicaragua). Outside Mexico and Central America it is known as: Angico blanco, mapuchicuy, pau mulata, mulaterira, camisa fina (Brazil); jevio (Bolivia); agbonyin (Nigeria); ypacaray (Paraguay); cocobolo, pashaco blanco, pashacho amarillo (Peru); tantakayo (Trinidad and Tobago); camburi chiquito, palo blanco (Venezuela). The species is used for timber, fuelwood, coffee shade, forage and mulch, as an ornamental and in hedgerows.

*Taxonomic comments*. Barneby & Grimes (1996) recognised two varieties for this species: *A. niopoides* var. *niopoides* and *A. niopoides* var. *colombiana*, the first is present in Mexico, Central America and Paraguay; the second endemic to Colombia and Venezuela. The varieties were distinguished by the leaflet size to 8.5(10) mm long and the fruit colour tan, greenish fuscous (straw brown to chocolate brown) in var. *niopoides*; leaflets 8.5-





**Fig. 15.** *Albizia niopoides*: **a**, leaf; **b**, compound inflorescence; **c**, leaflet bases and indument on adaxial surface; **d**, distal pair of pinnae and gland; **e**, gland between first pair of pinnae; **f**, calyx opened out; **g**, corolla opened out; **h**, staminal tube and stamen filaments; **i**, ovary and style; **j**, seed; **k**, fruit. **a**, **b**, from Hughes 649; **c**-**e**, from Hughes 1155; **f**-**j**, from Hughes 419. Drawn by E. Papadopoulos.

13 mm long and fruit nigrescent and pruinose (covered with a waxy frost-like powder) for var. *colombiana*.

**Conservation status.** The species is widely distributed across Mexico and Central America; it is represented by a large number of collections in herbaria. Collections made recently indicate that previously known populations are still extant; it is a multipurpose tree and seems well managed; it produces a large amount of seed with a high germination rate. A conservation status of least concern (LC) is suggested for this species. Seed of the species is stored in the ICRAF SeedLab (ICRAF.SeedLab@cgiar.org).

#### Selected specimens

EL SALVADOR. **La Unión:** Barrancones, 13°27'29''N, 87°45'34''W, 30 m, 1-XII-1998, *G. Davidse* 37337 (BM, LAGU). **Santa Ana:** C. Piedras Negras, 2 km al E de Texistepeque, 14°06'N, 89°20'W, 350 m, 5-V-1995, *J.L. Linares* 2685 (MEXU). **Sonsonate:**

About 6 km N of the coastal town of Acajutla the Guatemala frontier, 13°37'N, 89°50'W, 90 m, 16-II-1989, *C.E. Hughes* 1231 (K). GUATEMALA. **Chiquimula:** Close to village of San Esteban which lies 8 km South of the departmental town of Chiquimula close to the main road towards Quetzaltepeque & Esquipulas, 14°45'N, 89°31'W, 390 m, 18-III-1988, *C.E. Hughes* 1113 (K). HONDURAS. **Choluteca:** 3 km NW of Choluteca close to road towards Orocuina, 13°19'N, 87°38'W, 40 m, 19-II-1984, *C.E. Hughes* 419 (K). Between Tapaire & El Pillado, 13°24'N, 87°06'W, 80 m, 20-II-1984, *C.E. Hughes* 420 (K). **Comayagua:** 12 km north of La Paz on west side of Comayagua valley, 14°21'30''N, 87°40'W, 690 m, 19-III-1982, *C.E. Hughes* 120 (FHO, MEXU). 5 km E of La Paz, near the bridge over río Humuya, valley Comayagua, 14°27'N, 87°38'W, 620 m, 10-III-1983, *C.E. Hughes* 320 (K). MEXICO. **Campeche:** Campamento El Tormento, km 5 Escárcega-Candelaria, 18°36'48''N, 90°47'49''W, 80 m, 30-XII-1965, *J. Chávelas* ES-303 (MEXU). Tuxpeña, 18°27'N, 90°05'W, 29-XII-1931, *Lundell* 877 (K). Edzna, 19°35'N, 90°15'W, 25-XII-1992, *M. Mendes* 543 (K). Estación Biológica Hampolol, 19°56'N, 90°22'W, 14-III-1998, *C.P. Zamora* 6209 (MEXU). **Chiapas:** 15 km W of Villa Flores on the road towards Santa Isabel, 16°14'N,

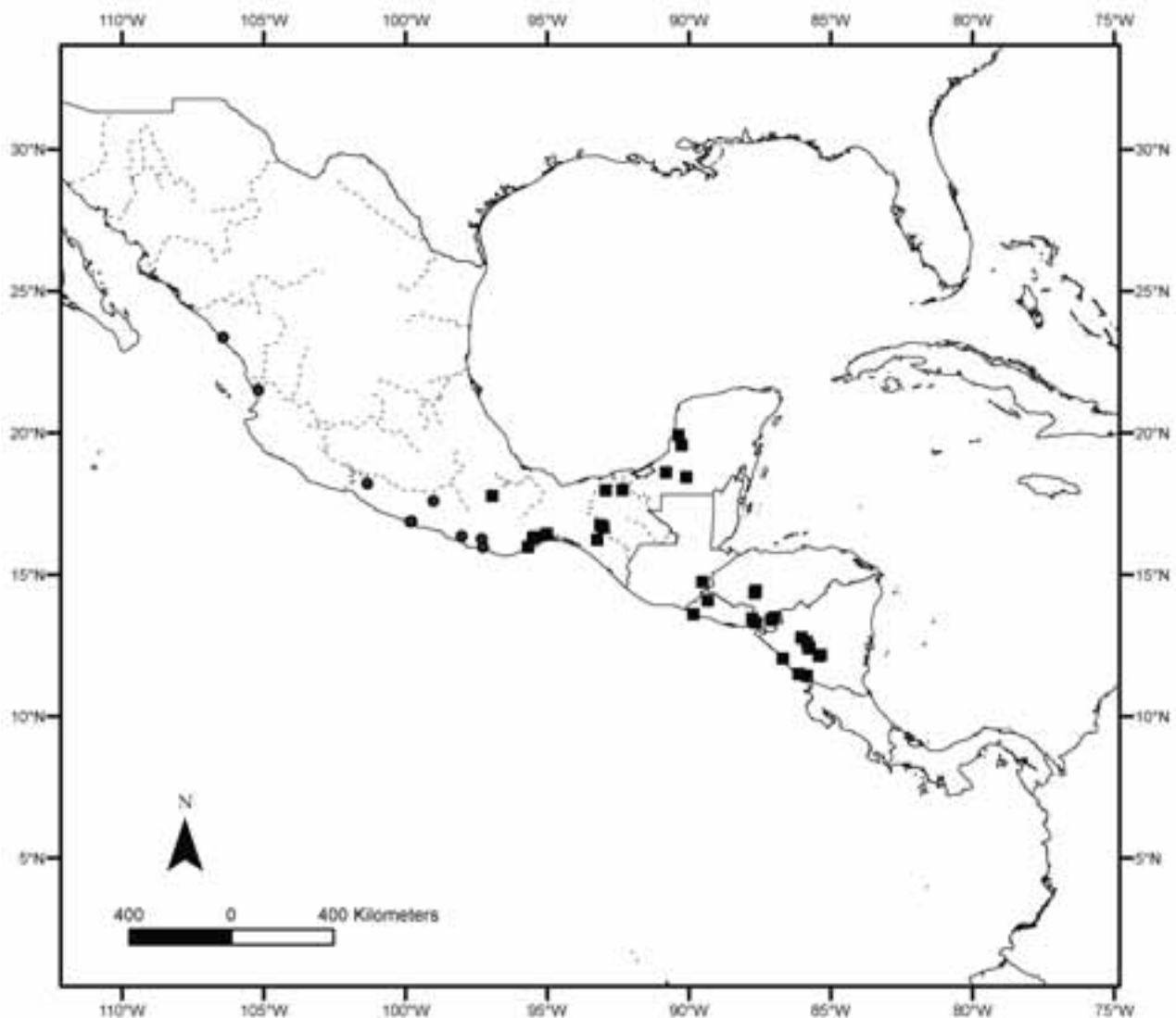


Fig. 16. Geographical range of *Albizia niopoides* (■) and *Albizia tomentosa* var. *nayaritensis* (●) in Mexico and Central America.

93°14'W, 550 m, 12-II-1985, *C.E. Hughes 521* (K). Rivera de Cupia (SE de Tuxtla G.), 16°40'05"N, 93°00'50"W, 400 m, 3-VII-1951, *F. Miranda 7226* (MEXU). Lagartero San Jerónimo, a 6 km al NE de San Gregorio, 600 m, 12-XII-1980, *M. Sousa 11597* (BM, MEXU). **Oaxaca:** 4 km south of small village of Huazantlan del Río, Cuauhtemoc, 16°18'N, 95°30'W, 5 m, 5-IV-1987, *C.E. Hughes 950* (K). 5 km north San Juan Bautista Cuicatlan banks of the Río Grande, 17°47'N, 96°56'W, 580 m, 7-IV-1988, *C.E. Hughes 1155* (K). 24 km al E-NE de Santiago Ostata, 25 m, 12-XII-1978, *M. Sousa 10141* (BM, MEXU). Salida NE a Juchitán, 16°26'N, 95°01'10"W, 70 m, 13-III-1981, *M. Sousa 11932* (BM, MEXU). **Tabasco:** Carrizo, W de Villahermosa, 17°59'21"N, 92°55'45"W, 16-XII-1965, *A. Gómez-Pompa 1274* (MEXU). Panga Pitahaya, camino a Pemex-Jonuta, 18°00'N, 92°20'32"W, 10 m, 25-II-1984, *R. Hernández N. 2308-A* (ENCB, MEXU). NICARAGUA. **Boaco:** Hacienda San Antonio, carretera a Boquito, 12°26'N, 85°44'W, 200 m, 17-I-1984, *P.P. Moreno 22813* (BM, MO). Km 69, carretera al Rama, Tierra Blanca, 12°24'N, 85°47'W, 200 m, 17-I-1984, *P.P. Moreno 22829* (BM, MO). **Carazo:** Refugio de Vida Silvestre Chococente, 11°30'N, 86°07'W, 20 m, 14-IV-1984, *J. C. Sandino 4974* (BM, MO). **Chontales:** San Nicolás, intersección que va a Cuapa, Juigalpa-Managua, 12°10'N, 85°20'W, 120 m, 2-VI-1985, *M. Sousa 13015* (BM, MEXU). 1.4 km from highway on road to Cuapa, 12°08'N, 85°24'W, 90 m, 13-VI-1984, *W.D. Stevens 22962* (BM, MO). **Granada:** Cerro El Llano, 1.5 km al SE de la UPE-La Habana, 100 m, 17-XII-1983, *A. Grijalva 3248* (MEXU). **León:** 2.1 km NE of El Transito on road to highway 12, 12°03'N, 86°41'W, 50 m, 10-XII-1977, *W.D. Stevens 5471* (MEXU, MO). **Managua:** Río Santa Clara, near km 34.5 carretera a León, 150 m, 2-XII-1977, *D. Neill 2882* (BM, MO). **Matagalpa:** Carretera Sébaco-Dário, cerro Chaguite Grande, 8 km al SE de Ciudad Dário, 12°47'N, 86°01'W, 22-VII-1983, *A. Grijalva 2801* (BM, MO). Río Grande de Matagalpa, 6 km al SW del poblado de Equipulas, 12°38'N, 85°50'W, 340 m, 19-XI-1984, *P.P. Moreno 25074* (BM, MO). **Rivas:** Between Pan-american highway & Lago de Nicaragua, few km N of Belén, 20 km N of departmental town of Rivas, 11°26'N, 85°50'W, 60 m, 13-IV-1986, *C.E. Hughes 811* (K).

**8. *Albizia occidentalis*** Brandegees, Proc. Calif. Acad. Sci. ser. 2, 3: 222. 1892. *Hesperalbizia occidentalis* (Brandegee) Barneby & J.W. Grimes, Mem. New York Bot. Gard.74: 112. 1996.

Type: MEXICO. Baja California, Cape Region, Plaza de San José del Cabo, *C. Dodero s.n.* (lectotype, selected by Barneby & Grimes, 1996, UC).

Small to large, 6-30 m tall, single trunked, deciduous tree, with a compact to spread, slightly rounded crown. *Leaves* 14-28(30) cm long; petiole terete (1)2-7(11) cm long, with conspicuous white lenticels along, glabrous, a canoe shaped gland near the base; rachis (2)9-15(19.5) cm long, channelled, glabrous to glabrescent, pinnae in 2-5(8) pairs, each 4-15 cm long. *Leaflets* (2)4-5 pairs per pinna, oblong to elliptic, terminal pair obovate and asymmetric, apex acute, often mucronate, base obtuse. *Inflorescence homomorphic:* flowers in capitula, clustered in groups of 2-3 capitula, main axis 4.5-7 cm long, sparsely puberulous; peduncles (2)3-8 cm long; floral bracts triangular-rhombic, 0.8-1.2 mm long, pubescent at apex. *Legume* dehiscent along both sutures, flat,

straight, apex acute, base rounded, chartaceous to coriaceous, glabrous, (8)11-14 seeded. *Seeds* brown, ovate, circular to elliptic, areole distinctive green colour, pleurogram 100%.

This species has characteristic oblong to elliptic leaflets usually with a pinnate venation, except for the obovate and asymmetric terminal leaflets pair. Two varieties are recognised.

#### KEY TO THE VARIETIES OF *ALBIZIA OCCIDENTALIS*

1. Stipules 1.5 mm long, heart-shaped; leaflets (2)4-5 pairs per pinna; peduncles (2)3-8 mm long; corolla 6.5-11 mm long; stamens 30-60 per flower, 20-30 mm long ..... *8a. var. occidentalis*
1. Stipules 2 mm long, narrowly triangular; leaflets 4-9 pairs per pinna; peduncles 4-4.7 mm long; corolla 5-7 mm long; stamens 20-45 per flower, 10-14 mm long .... *8b var. plurijuga*

#### **8a. *Albizia occidentalis*** Brandegees var. **occidentalis**

*Tree*, with a compact to spread, slightly rounded crown. *Bark* silvery grey to white yellowish, smooth, mature bark fissured. *Stipules* 1.5 mm long, heart-shaped, amplexicaul at base, usually persistent. *Leaves* 14-28(30) cm long; petiole terete (1)2-7(11) cm long; rachis (2)9-15 cm long, glabrous to glabrescent, pinnae in 2-5(8) pairs, each 4-15 cm long. *Leaflets* (1.5)2-3.5 × (0.7)1-3.5(4) cm, margin ciliate, adaxial surface glabrous, abaxial surface puberulous to white-pilose, venation pinnate (base occasionally palmate-pinnate). *Flowers sessile; calyx* campanulate, 2-3 mm long, 5-lobed, sparsely short-pubescent; *corolla* campanulate, 6.5-11 mm long, (4)5-lobed, glabrous except for the apex of the lobes; *stamens* c. 30-60 per flower, 20-30 mm long, staminal tube 5-8 mm long; *ovary* glabrous, stipe 1.2-1.5 mm long. *Legume* brownish red when young, beige or speckled straw-brown/beige at maturity, dehiscent along both sutures, flat, straight, apex acute, base rounded, 15-27 × 2.1-4.3 × 0.2-0.3 cm (including a 5 mm beak and a 1.5-3.5 mm stipe), chartaceous, (8)11-13 seeded. *Seeds* circular to elliptic, 8-11 × 6-8 × 2.5 mm, areole distinctive pistachio green colour. Fig. 17.

*Distribution.* W Mexico: Cape Region, Baja California Sur, southwards from La Paz, and sometimes planted; coastal plains and foothills of Pacific slope from central Sinaloa to S and E to W (Zacatecas, Jalisco, Colima, Michoacan, Guerrero and Oaxaca), Fig. 18; cultivated in Central America.

*Habitat.* Found in tropical and subtropical areas, dry primary and degraded forest, scrub, along stream margins and roadsides, borders of cultivated lands, associated with *Lysiloma*, *Cryptocarpa*, *Bursera*, *Caesalpinia* and *Lonchocarpus*. Between 20 m to 1570 m. Requires 600-2400 mm annual rainfall, tolerates a seven-month dry season.





Fig. 17. *Albizia occidentalis* var. *occidentalis* (H. S. Gentry 4440, K).

**Phenology.** Cultivated specimens flowering throughout the year, fruiting October to June (dry season); often cultivated and sometimes naturalized.

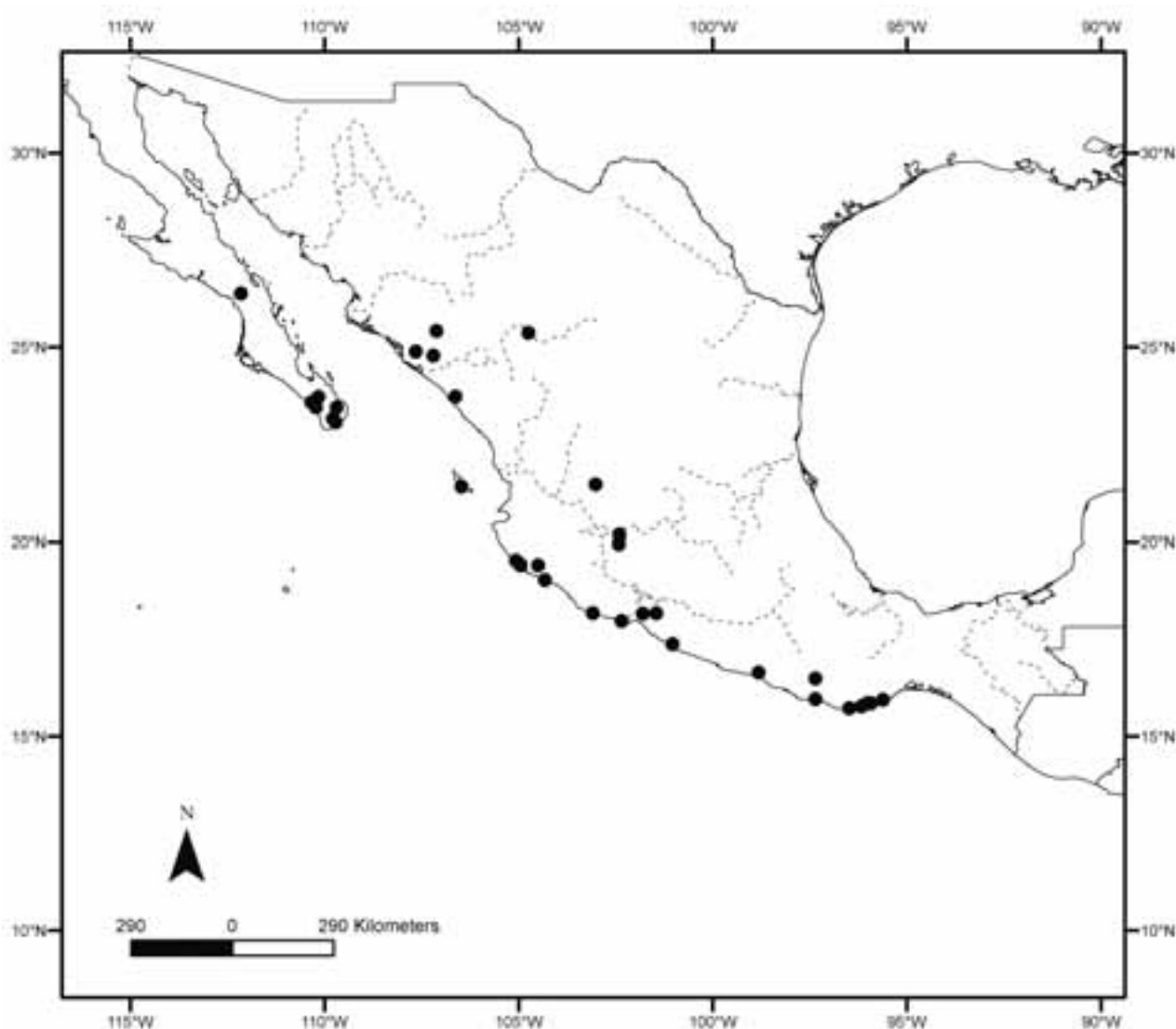
**Vernacular names.** Capiro, Guaje negro, Palo escopeta, Palo fierro (Mexico).

**Conservation status.** *Albizia occidentalis* var. *occidentalis* forms well established populations in its wild distributional range; the populations in the reserves of Chamela and Cuixmala are well protected and ecologically managed; the species at present is not threatened, but the constant reduction of its habitat due to the expansion of urban areas and settlements outside of reserves is affecting its distribution, so a near threatened (NT) status is suggested for this taxon. Living collection of this variety is growing in Kew.

#### Selected specimens

MEXICO. **Baja California Sur:** SE of Todos Santos, 23°27'N,

110°13'W, 29-XII-1947, *A. Carter* 2459 (K). La Burrera, Sierra Laguna, 23°26'41"N, 109°41'15"W, 700 m, 26-III-1939, *H.S. Gentry* 4440 (K). 3 km of Santa Catarina, 23°09'N, 109°47'W, 55 m, 22-IV-1987, *C.E. Hughes* 163 (FHO, K). Sierra la Laguna, about 1 km E of rancho La Burrera, 20 km ENE of Todos Santos, 23°35'N, 110°20'W, 500 m, 21-IV-1987, *C.E. Hughes* 964 (K). San José, 26°23'N, 112°09'W, I-1901, *Purpus* 330 (K). Near el Valle Perdido, E of La Paz-Todos Santos road, 23°43'N, 110°09'W, 350 m, 8-XII-1959, *I.L. Wiggins* 15387 (K). **Colima:** Manzanillo, 19°02'N, 104°19'W, XII-1990, *E. Palmer* 981 (K). **Guerrero:** 7 km E of San Marcos, on road towards Cuajincuilapa 67 km E of Acapulco, 18°11'N, 101°27'W, 60 m, 26-III-1985, *C.E. Hughes* 646 (FHO, K). N of La Unión towards Las Juntas del Río, 18°10'N, 101°48'W, 20 m, 13-II-1992, *D.J. Macqueen* 442 (K). 2 km NE de Coyuquita, camino a El Porvenir, 17°23'N, 101°02'W, 100 m, 23-X-1985, *J.C. Soto* 11310 (E). **Jalisco:** Rancho Cuixmala, along road on W side of río Cuixmala, NE of Puerto Vallarta-Barra de Navidad, 19°26'N, 104°57'W, 100 m, *E.J. Lott* 3164 (K). Estación Biológica-Chamela, arroyo el Colorado, 19°32'N, 105°04'W, 8-II-1990, *L. Rico* 835 (K). Chamela, estación de Biología, 19°32'N, 105°04'W, 9-II-1991, *L. Rico* 844 (K). **Michoacán:**



**Fig. 18.** Geographical range of *Albizia occidentalis* var. *occidentalis* (●) in Mexico.

5-10 km W of Huahua on main coastal road West of Playa Azul, 17°59'N, 102°21'W, 19-III-1985, C.E. Hughes 626 (K). Ixtlán, 20°11'N, 102°24'W, 1570 m, 1-X-1984, J.N. Labat 1287 (MEXU). 6 km E de Santiago Tangamandapio, 19°57'23"N, 102°25'W, 1700 m, 1-IV-1981, J.C. Soto 2901 (MEXU). **Nayarit:** Tres Marías, Islas, María Madre, arroyo Honda, 21°25'N, 106°28'W, 18-V-1925, H.L. Mason 1757 (K). **Oaxaca:** 3 km N of Bahías de Santa Cruz, 40 km E of Pochutla, 15°47'N, 96°10'W, 30 m, 16-II-1987, C.E. Hughes 860 (K). 2 km E of village of San Isidro, Llano Grande, west of Pinotepa Nacional, 30 km W of Puerto Escondido, 16°30'N, 97°21'W, 20 m, 18-II-1987, C.E. Hughes 869 (K). 5.5 km al NW de Barra de la Cruz, camino a Xadani, 15°52'N, 96°01'W, 180 m, 6-VI-1993, I. Trejo 2887 (MEXU). **Sinaloa:** San Blas, 24°53'N, 107°39'W, 20 m, 6-VIII-1924, J. González Ortega 1997 (K). Mazatlán, Zuchite, Los Zapotes, 25°25'N, 107°07'W, 60 m, 26-II-1926, J. González Ortega 5223 (K). Rancho Los Canobio, Juantillos, comunidad San Marcos, La Noria, 28-V-1994, E. Guízar 3190 (CHAP, MEXU). El Chaparral, 24°46'43"N, 107°11'42"W, 2-XII-1997, J.L. Pineda 481 (COCA, MEXU). Ejido Los Llanitos, Mazatlán-Culiacán, km 29, área Natural Protegida Meseta de Cacaxtla, 23°43'19"N, 106°37'20"W, 82 m, 30-III-2006, M. Ruiz 2006-340 (MEXU). **Zacatecas:** Fco. I Madero, brecha Apozol-Palma Cuata, 21°28'N, 103°01'W, 1499 m, 20-X-1992, D. Enríquez 304 (MEXU)

**8b. *Albizia occidentalis* var. *plurijuga* (Standl.) L. Rico & S. Gale, comb. & stat. nov.**

*Leucaena plurijuga* Standl., Contr. U.S. Natl. Herb. 20:189. 1919. *Albizia plurijuga* (Standl.) Britton & Rose, N. Amer. Fl. 23: 48. 1928, non *A. plurijuga* Dom., 1926.

Type: MEXICO. Michoacan, collected at Monte León, 12 Nov. 1892, C.G. Pringle 5352 (holotype, US-246386!).

Medium-sized *tree*, 12-22(30) m tall, with an upright branching habit and spreading crown. *Stipules* 2 mm long, narrowly triangular, fugacious. *Leaves* 18-30 cm long, petiole 4-9 cm long; rachis 4-19.5 cm long; pinnae in 3-9 pairs, each 7-16 cm long. *Leaflets* 4-9 pairs per pinna, elliptic, terminal pair obovate and asymmetric, apex acute, base obtuse, 2-3 × 1-1.8 cm, adaxial and abaxial surfaces glabrous, occasionally sericeous; venation pinnate-palmate. *Inflorescence homomorphic*: peduncles 4-4.7 cm, bracts clavate, 1.2 mm long; floral bracts clavate, 1.2 mm long, densely pubescent, *corolla* campanulate, 5-7 mm long, pubescent only on the 5 lobes; *stamens* c. 20-45 per flower, 10-14 mm long; *ovary* stipe 0.5 mm long. *Legume* orange-straw-brown in colour, base acute, (5)12-32.5 × 3-4 × 0.2 cm (including a 10 mm beak and a 10-30 mm stipe), slightly coriaceous, 8-14 seeded. *Seeds* brown, ovate-circular, 10-12 × 6-10 × 2-2.5 mm, areole green. Fig. 19.

*Distribution.* Occupying a similar area to *A. occidentalis* var. *occidentalis* but with a southern distribution, spreading from Central Mexico (Nayarit through Oaxaca) to Chiapas (Fig. 20). There is one cultivated record from the experimental site Los Magos, Honduras (C.E.

Hughes 1452), in which morphology corresponds to the variety.

*Habitat.* In semi-deciduous woodland and highly degraded dry deciduous forest, associated with *Leucaena esculenta*, *Acacia*, *Prosopis*, various cacti and *Senna atomaria*. There are two distributional ranges, 450-900 m and 1500-2400 m. Requires 600-2400 mm annual rainfall; tolerates a seven-month dry season. There is an allied form at middle elevations in Chiapas extending throughout Central America but this has no formal taxonomic name.

*Phenology.* Flowering March to May, fruit found almost throughout the year, except in June.

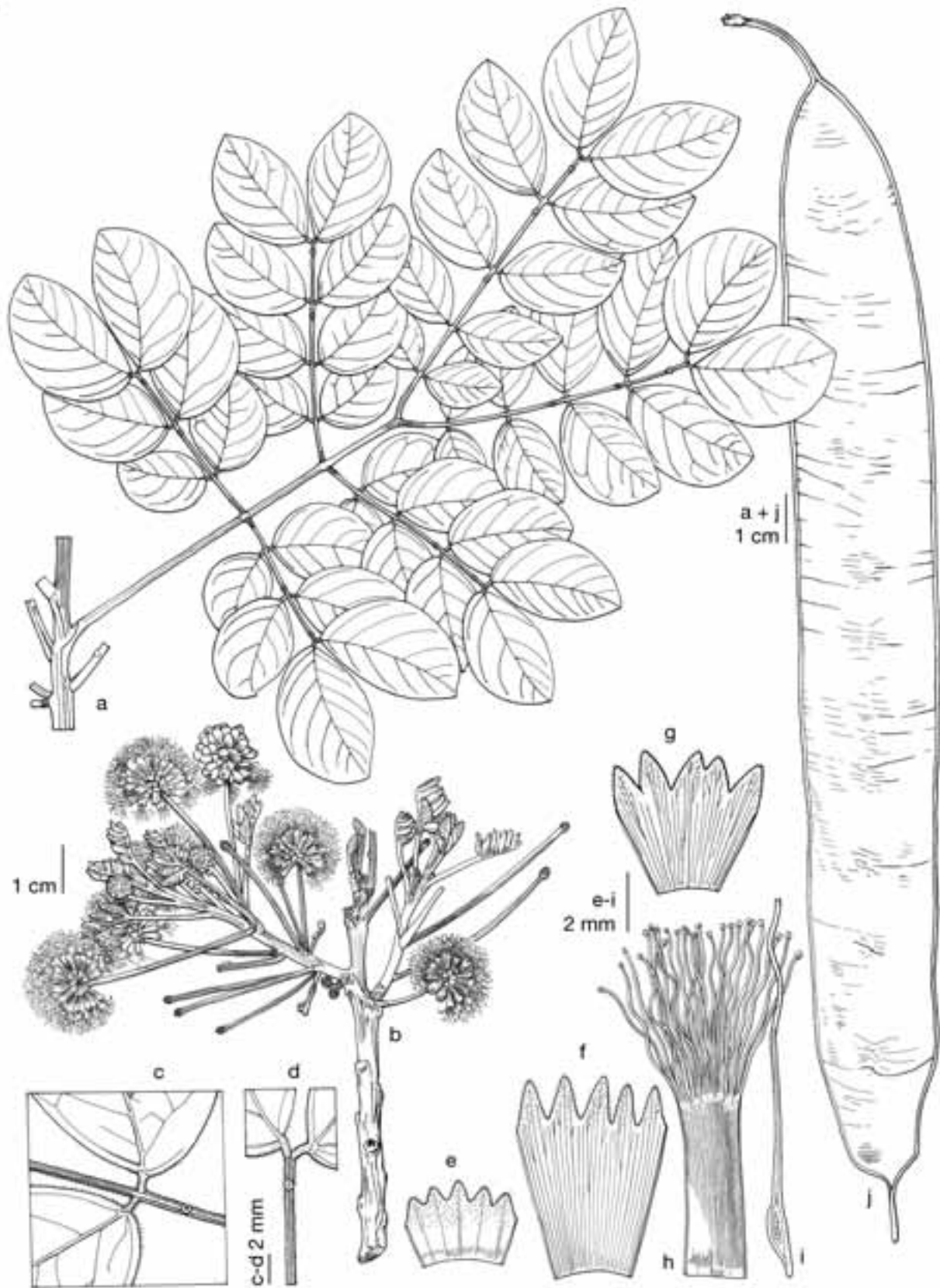
*Taxonomic comments.* *Albizia occidentalis* var. *occidentalis* and *A. occidentalis* var. *plurijuga* share similar morphological characteristics, most noticeably the distinct heart-shaped stipules (also evident by the shape of the stipule scar). Many specimens referred to *A. occidentalis* var. *plurijuga* have smaller leaves and more pinnae per leaf than *A. occidentalis* var. *occidentalis*. Subpopulations *A. occidentalis* var. *plurijuga* found between 1500-2400 m altitude seem to differ in the size of flower and shape and size of leaflets.

*Conservation status.* The taxon is listed as "A" (amenazado = threatened) in the NOM-059 (DOF, 2002); it is vulnerable (VU) according to the IUCN criteria, and it was registered as such that in 1997. The taxon was reassessed in 1998 and currently appears as EN B1+2c (IUCN ver. 2.3, 1994). Without doubt *Albizia occidentalis* var. *plurijuga* has a more restricted distribution than var. *occidentalis*. Here we reassess the taxon using the IUCN categories (ver. 3.1, 2000); based on the extent of occurrence and area of occupancy, quality of habitat and number of mature individuals, a category VU B2b (i,iii, iv, v) is suggested for this taxon. Living collection of this variety is growing in Kew.

*Selected specimens*

MEXICO. **Chiapas:** Boquerón to Ejido Mújica, 18 km SW of La Trinitaria, 16°04'N, 92°03'W, 900 m, 8-XII-1976, D.E. Breedlove 42357 (MEXU). Tuxtla Gutiérrez towards Concordia and Revolución Mexicana about 5 km south of the small village of Narcisco Mendoza, 16°37'N, 92°58'W, 400 m, 9-III-1989, C.E. Hughes 1296 (BR, FHO, K, MEXU, NY). 10 km N of Tuxtla Gutiérrez, road to San Cristóbal, 16°45'N, 92°38'W, 800 m, 15-V-1987, E. Martínez 20898 (BM, K, MEXU). Arroyo Jeshab, 16°49'N, 92°31'W, 800 m, 20-IV-1983, A. Méndez 5870 (MEXU). N de Tuxtla. Barranca Cueva Tigre, 16°46'N, 93°07'W, 3-XII-1950, F. Miranda 6734 (MEXU). El Chorreadero, 16°27'N, 92°43'W, 900 m, 4-IV-1951, F. Miranda 7114 (MEXU). La Concordia, Río, c. Rancho Chuciyaca, 16°07'N, 92°33'W, 600 m, 23-X-1991, E. Palacios Espinosa 2008 (MEXU). 5 km al NE de Planta de La Angostura, 16°27'N, 92°43'W, 600 m, 5-XII-1980, M. Sousa 11347 (MEXU). **Guanajuato:** 20°06'31"N, 101°23'19"W, 1880 m, XII-1981, D. Almanza Tinoco s.n. (CHAP, MEXU). 2 km al N de Corralejo, 20°57'06"N, 100°55'15"W, 1850 m, 20-XII-1995, E. Carranza 4951 (IEB, MEXU). Cerro Morales, al S de El Cerano, 1910 m, 21-XII-1981, T. González Guízar 5 (MEXU). La Salitrera, Salamanca, 20°45'22"N, 101°07'42"W, 1660 m, 26-VIII-





**Fig. 19.** *Albizia occidentalis* var. *plurijuga*: **a**, leaf; **b**, inflorescence; **c**, gland on the petiole; leaflet bases and indument on adaxial surface; **d**, terminal leaflet pair bases and gland on rachis; **e**, calyx opened out; **f**, **g**, corolla opened out, showing morphological variation of the petal lobes; **h**, staminal tube and stamen filaments; **i**, ovary and style; **j**, fruit. *a*, *c*-*j*, from *Soto 1688*; *b*, from *Hughes 1184*. Drawn by E. Papadopoulos.

1987, *A. Mora* 897 (MEXU). Ixtla, 20°38'N, 100°36'W, 2000 m, 26-VIII-1981, *Rzedowski* 37543 (ENCB, MEXU). San Antonio, 20°29'52"N, 101°12'46"W, 1800 m, 12-IV-1986, *Rzedowski* 39627 (MEXU). Santa Teresa, 20°11'04"N, 100°57'38"W, 1700 m, 2-XI-1983, *S. Sánchez Cuna s.n.* (CHAP, MEXU). Magdalena de Aracco, 20°18'38"N, 101°10'53"W, 1900 m, 7-VII-1967, *M. Sousa* 3119 (MEXU). El Coyoncle, laguna de Yuriria, 20°12'N, 101°09'W, 1785 m, 2-X-1986, *S. Zamudio* 4638 (IEB, MEXU). **Guerrero:** Al W de La Presa cerca de Chilpancingo, 17°28'10"N, 99°27'22"W, 26-V-1965, *J. Cbávelas* GR-74 (ENCB, MEXU). 5 km al NE de La Unión, 17°16'34"N, 100°03'45"W, 120 m, 28-V-1995, *S. Peralta* 488 (MEXU). Guayameo, en el Huindurí, carretera al Infierno, 18°12'N, 101°19'W, 350 m, 20-IX-1979, *J.C. Soto* 1688 (K). **Jalisco:** Al S de la Citala, 20°05'N, 103°22'35"W, 1850 m, 14-III-1993, *J. A. Machuca* 6949 (MEXU). Road ascending to Tapalpa, from Amacueca, 19°58'N, 103°40'W, 1500 m, 3-XII-1960, *R. McVaugh* 20725 (MEXU). **Michoacán:** Après de Morelia, 19°42'N, 101°11'W, 11-XII-1909, *Arsène s.n.* (E). Quinceo, 19°35'N, 101°59'58"W, 2400 m, 11-XII-1909, *Arsène* 3213 (MEXU). Cerro Las Tetillas, 19°29'41"N, 102°31'12"W, 2100 m, 26-X-1985, *V.M. Huerta* 273 (IEB, MEXU). Barranca W

de Arroyuelos, 20°07'56"N, 101°56'34"W, 1800 m, 19-VII-1986, *J. N. Labat* 1600 (MEXU). Manga La Corona, lomerio 3 km al W de Santa Ana Maya, 20°00'N, 101°00'W, 1900 m, 24-VIII-1986, *J. Santos Martínez* 1680 (IEB, MEXU). 4 km al NW de Huanacareo, carretera a Villa Morelos, 19°60'24"N, 101°17'W, 2000 m, 26-VIII-1986, *S. Zamudio* 4456 (IEB, MEXU). **Nayarit:** 2,8 km al NW de Jesús María, camino a Jesús María-Mesa del Nayar, 22°15'N, 104°33'W, 970 m, 23-IX-1989, *G. Flores* 1289 (MEXU). **Oaxaca:** Barra de la Cruz, 3 km al SW camino a playa Zimatán, 15°49'42"N, 95°58'18"W, 120 m, 18-VIII-2000, *M. Elorsa* 3430 (MEXU). La Vagueta, 500 m al E de la desviación de Barra de la Cruz, 15°51'02"N, 95°58'14"W, 120 m, 24-VIII-2000, *M. Elorsa* 3476 (MEXU, SERO). Santa María Huamelula, km 80 de la carretera costera, 16°00'N, 95°42'W, 29-I-1988, *C. Martínez* 1229 (MEXU). **Puebla:** Entre San Jerónimo Zayacatlán y Zayacatlán de Bravo, SE de Puebla, 18°14'12"N, 97°58'33"W, 1260 m, 8-IV-1982, *González Medrano* 12451 (MEXU). Acatlán, 18°59'N, 97°55'W, 2315 m, 12-X-1942, *F. Miranda* 2471 (MEXU). **Querétaro:** El Batán, 20°18'12"N, 100°11'07"W, 2100 m, 18-II-1979, *E. Argüelles* 1200 (MEXU). Fraccionamiento Tejada, 20°32'39"N, 100°24'42"W, 1860 m, 22-VII-2003, *P. Balderas* 306 (MEXU,

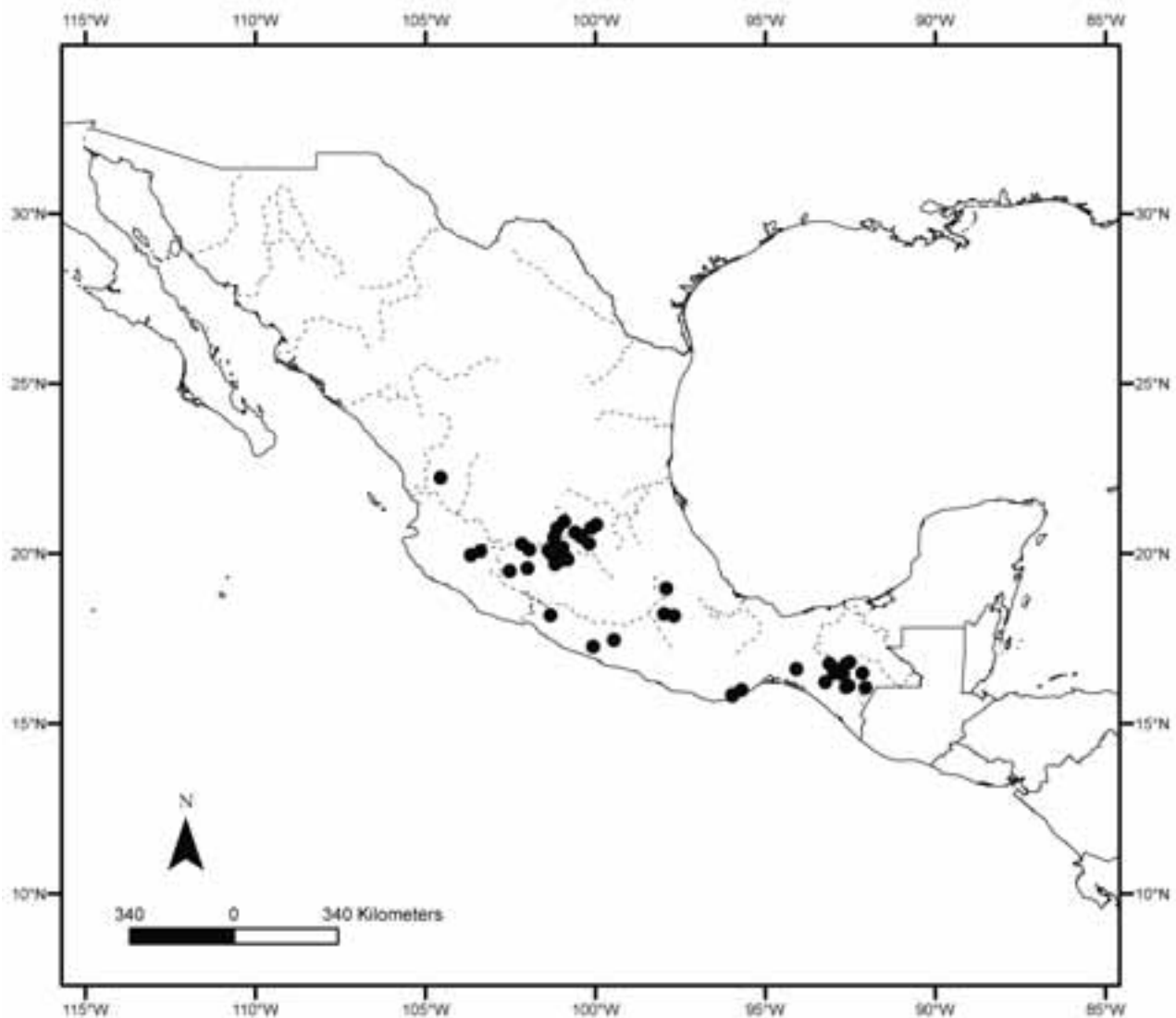


Fig. 20. Geographical range of *Albizia occidentalis* var. *plurijuga* (●) in Mexico and Central America.

QMEX). Entre Los Nogales y La Zorra, 20°45'55"N, 100°07'W, 2100 m, 18-VIII-1993, R. Hernández M. 10224 (MEXU). 1 km al SW de la cortina de la presa El Batán, 20°30'44"N, 100°25'12"W, 1950 m, 16-VII-1997, L. Hernández 4092 (MEXU, QMEX). San Miguel, 20°52'N, 99°58'W, 1500 m, 10-XII-1977, S. Zamudio 2576 (MEXU).

9. *Albizia pedicellaris* (DC.) L. Rico, Novon 9: 555. 1999. *Inga pedicellaris* DC., Prod. 2: 441. 1825. *Pithecellobium pedicellare* (DC.) Benth. in Hook., London J. Bot. 3: 219. 1844. *Feuillea pedicellaris* (DC.) O. Kuntze, *Samanea pedicellaris* (DC.) Killip ex Record, Trop. Woods 63: 4. 1940. *Macrosamanea pedicellaris* (DC.) Kleinhoonte in Pulle, Fl. Suriname 2(2): 329. 1940. *Balizia pedicellaris* (DC.) Barneby & J.W. Grimes, Mem. New York Bot. Gard. 74: 37. 1996.

Type: Cayenne (lectotype, selected by Barneby & J.W. Grimes, (1996), G-DC!).

*Tree* (7)8-20(40) m tall, bole c. 11.5 m tall. Bark brown. *Stipules* 2.5-8 mm long, linear-lanceolate, fugacious. *Leaves* 11-20(30) cm long; petiole (1.5)2-4.2(5) cm long, channelled, tomentose-villous, gland mid way along petiole, between first pair of pinnae and between the 1-2 distal pair of pinnae; rachis (6) 9-17(21) cm long, channelled, tomentose-villous, pinnae in 6-10(15) pairs, each 2.5-5(7) cm long. Leaflets (9)12-16(30) pairs per pinna, narrowly oblong, apex acute, base acute to rounded, 5-7(10.35) × 1.8-3.3(4) mm, margins ciliate, adaxial surface glabrous, abaxial surface scabrous with pallid hairs embedded in a yellow secretion only the main vein conspicuous, central; the terminal leaflets heteromorphic, elliptic. *Inflorescence heteromorphic*: clusters of very short racemes umbel-like; peduncle (20)30-65(80) mm, floral bracts minute, < 1 mm long; pedicels (4)4.5-7.5 mm. *Peripheral flowers*: calyx campanulate, (1.5)2.3-3 mm long, pubescent, 5-7-lobed; *corolla* infundibuliform, (4)5.3(7.4) mm long, pubescent, 5-lobed; *stamens* (12)28-29 per flower, 17-26(36) mm long, tube (1.5)2.3-3.7 mm long; *ovary* sessile, distinctly pubescent only at apex. *Central flowers*: calyx tubular, (1.5)3.4-5 mm long, pubescent, 5-lobed; *corolla* infundibuliform, (6.5)7-11 mm, pubescent, 5-lobed; *stamens* c. 20 per flower, 25-30 mm long, tube 7-12(18) mm; *ovary* sessile, pubescent at apex. *Legume* dark brown, dehiscent along one suture, broadly linear, apex and base truncate, 7-14(40) × (1.7)1.8-3.5 × 0.5 cm (including a 10 mm beak, this often broken on herbarium specimens, without stipe), coriaceous, indument of a few pilose hairs, glabrescent, or mainly glabrous, 10-20 seeded. *Seeds* brown or greenish, oblong-elliptic, (6)7.5-9 × 3-4 mm, areole the same colour as the rest of the seed, pleurogram 50 %. Fig. 8.

*Distribution*. Nicaragua (Fig. 9) and South America (Bolivia, Brazil, Ecuador, Guiana, Peru and Venezuela).

*Habitat*. Native in non-inundated primary rainforest. In Central America between 100-340 m; in Amazonian Ecuador and Bolivia the species has been recorded between 700-755 m.

*Phenology*. In Central America collected in flower in March, in fruit in February. South American specimens with flowers were collected almost throughout the year, except in March, April and October, with fruit collected in January, April to December.

*Vernacular name*. Gallinazo, Guanacaste blanco (Nicaragua), Esponjeira (Brazil).

*Taxonomic comments*. The fruit of *Albizia pedicellaris* is similar to that of *A. leucocalyx*, but has a follicular dehiscence, in the latter the fruit is indehiscent; the fruit margins of *A. pedicellaris* are more robust and protuberant; both species have sessile fruits with a lateral base insertion and white seeds. The species presents a wide range of flower sizes; the central flowers have an exerted staminal tube and a stemozone of 5 mm. See also comments for *A. duckeana*.

*Conservation status*. *Albizia pedicellaris* is common in Southamerica, especially in Brazil, where it seems not to be threatened, but in Central America it is known only by four collections from Nicaragua made in the 1980s. A regional endangered conservation estatus [EN B 2b(ii, iii, iv, v)] is suggested for the species in the area under study.

#### *Selected specimens*

NICARAGUA. **Atlántico Norte**: 14°28'N, 84°03'W, 100 m, 23-III-1971, E.L. Little 25311 (MO). Caño El Ocote, 13°37'N, 85°04'W, 340 m, 1-IV-1983, F. Ortiz 1393 (MO). **Río San Juan**: Río Santa Cruz, 11°03'N, 84°25'W, 70 m, 24-II-1984, P.P. Moreno 23350 (MO). Without exact locality, 16-IV-1928, Englesing s.n. (K).

10. *Albizia sinaloensis* Britton & Rose, N. Amer. Fl. 23: 45. 1928

Type: MEXICO. Sinaloa, from the vicinity of Fuerte, 26 March 1910, Rose, Standley & Russell 13559 (holotype, NY!).

Medium-sized *tree*, 15-20 m tall with a spreading crown. *Bark* pale yellow/brown, with a smooth, powdery surface. *Stipules* < 1 mm long, narrowly triangular, fugacious, densely white-pubescent. *Leaves* 8-18 cm long; petiole 2.5-4 cm long, tomentose-hispid, occasionally woolly, with an elliptic gland at base of the petiole; rachis 3.2-7 cm long, channelled, tomentose-hispid, pinnae in 3-6(8) pairs, each 3-6.2 cm long, usually with a gland between the distal pair. *Leaflets* 8-18 pairs per pinna, usually with a gland between the 3 distal pairs, oblong, symmetric, terminal pair homomorphic, apex rounded to acute, base truncate to obtuse, 0.9-1.1 × 0.3-0.4 cm, margins ciliate, both surfaces usually with a very sparse white pubescence, less often tomentose to strigose, venation





Fig. 21. *Albizia sinaloensis* (González Ortega 4554, K).

palmate. *Inflorescence homomorphic*: pedunculate capitula clustered in groups of 2; peduncles 10-35 mm long, densely pubescent, floral bracts 1.5-2 mm long, spatulate or clavate, pubescent. *Flowers sessile*: calyx campanulate, 2 mm long, pubescent, 5-6-lobed; corolla campanulate, 3.8 mm long, pubescent, 5-7-lobed; stamens c. 36 per flower, 5-5.5 mm long, staminal tube up to 2-3 mm long; ovary glabrous, sessile. *Legume* ochre, yellowish speckled, dehiscent along both sutures, linear, straight, apex obtuse, base acute,  $7.2-13 \times 2-2.2 \times 0.1-0.2$  cm (including a 2 mm long beak and a 6-8 mm long stipe), chartaceous, white-tomentose over entire surface, glabrescent, 5-10 seeded. *Seeds* ivory coloured, elliptic-oblong,  $8 \times 5 \times 2$  mm, areole slightly paler than the rest of the seed surface, pleurogram 40-60 %. Fig. 21.

*Distribution*. Mexico only in the states of Sinaloa and Sonora (Fig. 22).

*Habitat*. In deep alluvial soils of river valleys surrounded by desert or thorn scrub, gully groves; hills and mountains with rhyolite stones; 50-430 m. Associated with *Ficus insipida*, *Prosopis*, *Havardia*, *Guazuma* and *Pithecellobium dulce*.

*Phenology*. Collected in flower in May, in fruit in September to January, and March to April; not registered in February.

*Vernacular names and uses*. Palo Joso (Mexico); the wood is used locally for rifle stocks.

*Taxonomic comments*. Although the flowers appear to be generally homorphic, two types can be distinguished: some, with their parts not 5-merous, present a long exerted style (to 20 mm long), a very reduced ovary; and a robust stemonozone up to 1.5 high on the other hand, 5-merous flowers have no stemonozone and an ovary up to 2 mm long, with the style equalling the stamens in length.

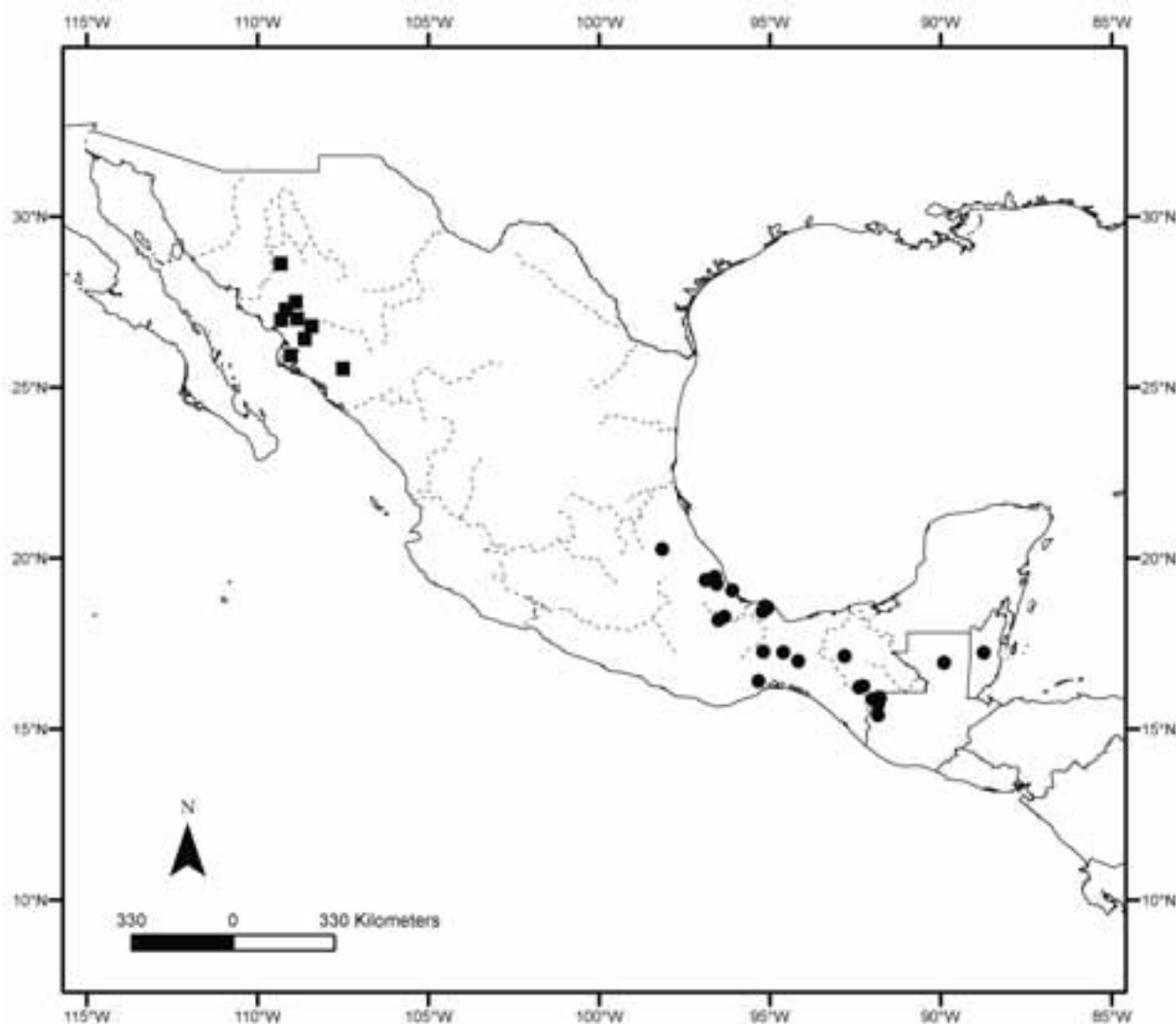


Fig. 22. Geographical range of *Albizia sinaloensis* (■) and *Albizia tomentosa* var. *purpusii* (●) in Mexico and Central America.

The species is easily recognised because of the whitish pubescent throughout and the palmate venation at the base of the leaflets (this becomes conspicuously brochidromous). The species is similar to *A. tomentosa* but has narrowly elliptic leaflets (these are narrowly oblong in *A. tomentosa*).

*Conservation status.* *Albizia sinaloensis* does not form dense populations; although recorded to be a common species in 1998, it is restricted to small scrub areas along river valleys; due to its very small extent of occurrence a vulnerable rating (VU) is suggested for this species. Seed of this species is stored in the ICRAF SeedLab (ICRAF.SeedLab@cgiar.org).

#### *Selected specimens*

MEXICO. **Sinaloa:** Vacateve, Sierra Bacatete, 17-XII-1988, R.S. Felger 88-632 (MEXU). About ¼ mile east of Cachuana, bank of río Fuerte (east of Guayano), 22-IX-1963, R.S. Felger 8730 (MEXU). Near Fuerte, 26°24'59"N, 108°37'04"W, 80 m, 11-XII-1939, H.S. Gentry 4921 (MEXU). Las Palmas, 25°33'N, 107°30'W, 16-VIII-1924, J. González Ortega 4554 (K). Between Sinaloa de Leyra and Agua Caliente de Zevala Sinaloa, 26°48'N, 108°25'W, 160 m, 13-III-1983, C.E. Hughes 599 (FHO, K). San Miguel, 25°56'N, 109°02'W, 50 m, 15-XII-1980, M. Robles A. 149 (MEXU). **Sonora:** Arroyo Aguacaliente a 2 km al W de Tectoripa, 28°37'25"N, 109°19'30"W, 400 m, 8-V-1996, A. Búrquez 96-107 (MEXU). Yaqui region, c. 5 km below (northward) from the ruins of the Yaqui cuartel at Bacateve, Sierra Bacatete, 13-III-1989, R.S. Felger 89-131 (MEXU, SD). Mútica, río Yaqui, 27°16'53"N, 109°10'23"W, 230 m, 5-V-1936, H.S. Gentry 2197 (MEXU). Chinobampo, río Mayo, lower Sonora in Mesquite Valley, 26°59'N, 109°18'W, 10-I-1937, H.S. Gentry 2980 (K). Corral, Yaqui River side, 26-X-1939, H.S. Gentry 4744 (MEXU). In small village of El Tezal, 1 km N Navojoa-Alamos 27°30'N, 108°53'W, 430 m, 31-I-1992, C.E. Hughes 1576 (FHO, K). Álamos, 27°01'N, 108°50'W, 360 m, 26-X-1998, A.L. Reina 98-2060 (MEXU).

**11. *Albizia tomentosa*** (M. Micheli) Standl., J. Wash. Acad. Sci. 13: 6. 1923

*Pithecolobium tomentosum* M. Micheli, Mem. Soc. Phys. Genève 34: 285, tab. 28. 1903.

Type: MÉXICO. Michoacán, rives de l'Espíritu Santo, 600 m, *Langlassé 107* [lectotype, designated by Standley (1922), US-385667; isolectotypes, G!, K!, P, NY(fragment)].

Small to medium-sized tree, (3) 5-15(30) m tall, with a rounded crown. Bark grey/brown, smooth, horizontally ribbed. Stipules 1-2 mm long, triangular, densely pubescent when young, fugacious. Leaves 18-30 cm long; petiole (2)3-9.2 cm long, velutinous to tomentose, with an elliptic sunken slit-like gland near the base; rachis (1.6)3.1-9(14) cm long, velutinous to tomentose, channelled; pinnae in 2-8 pairs per leaf, each 6-8(11) cm long. Leaflets (6)7-22 pairs per pinna, oblong to elliptic, apex obtuse (often mucronate), base truncate to rounded, 1.3-2.8 × 0.4-0.8 cm, margins glabrous to ciliate, revolute, adaxial

and abaxial surfaces golden to whitish puberulous to strigose, venation palmate, midrib subcentral or central. *Inflorescence heteromorphic:* flowers in a synflorescence, 1-4 pedunculate capitula clustered up to 8 fascicles per synflorescence, main axis 3.5-14 cm long; peduncles 15-20 mm long, pubescent; pedicels 0.8-2.2 mm long, floral bracts clavate, 0.8 mm long, densely pubescent. *Peripheral flowers:* calyx campanulate, 1.5-2 mm long, short-villose, 5-lobed; corolla infundibuliform, 3-4 mm long, sparsely pubescent to glabrous, (4)5-lobed; stamens c. 20-30 per flower, 9-10.5 mm long, staminal tube up to 4 mm long; ovary glabrous, sessile. *Central flowers:* calyx campanulate, 2-2.2 mm long, pubescent, 5-lobed; corolla tubular, 4-5 mm long, (4)5(6)-lobed; stamens c. 40 per flower, (8)12-15 mm long, staminal tube up to 6-7 mm long; ovary glabrous, sessile. *Legume* green/brown to straw-brown at maturity, dehiscent along both sutures, flat, straight, apex rounded, base acute, 10.5-17 × 1.9-2.1 × 0.12-0.3 cm (including an 8 mm beak and a stipe of up to 10 mm), chartaceous, densely short-villose, 9-14 seeded. Seeds ochre-ivory, oblong to ovate, 9-10 × 4-7 × 0.7-1.1 mm, areole ivory and appearing paler than the rest of the seed, pleurogram 70-90 (100)%.

The species has a characteristic tomentose indument and slit-like sunken petiole gland.

#### KEY TO VARIETIES OF *ALBIZIA TOMENTOSA*

1. Mature leaflets < 1 cm wide, 3-4(5) main veins arising from the leaflet base, apex acute or obtuse, margins revolute ... 2
1. Mature leaflets > 1 cm wide, 5-6 main veins arising from the leaflet base, apex rounded, margins plane ..... 11b. var. *nayaritensis*
2. Leaflets 4-8 mm wide, apex obtuse, midrib subcentral or central ..... 11a. var. *tomentosa*
2. Leaflets 3-4(6) mm wide, apex acute, midrib submarginal to marginal ..... 11c. var. *purpusii*

**11a. *Albizia tomentosa*** (M. Micheli) Standl. var. **tomentosa**

*Albizia hummeliana* Britton & Rose, N. Amer. Fl. 23: 46. 1928.

Type: BELIZE. Near Hill Bank, New River Lagoon, 26 Jan. 1926, S.J. Record 27 (holotype, US; isotype, (fragment) NY!).

Leaves 18-23 cm long. Leaflets (6)7-18 pairs per pinna, oblong to elliptic, apex obtuse (often mucronate), base truncate to rounded, 1.3-2.8 × 0.4-0.8 cm, margins glabrous to ciliate, revolute, both surfaces golden to whitish puberulous to strigose, venation palmate, midrib subcentral or central. Fig. 23.

*Distribution.* Scattered in lowland tropical Mexico and adjacent Belize and Guatemala; in Mexico extending along the Pacific slope from Jalisco through the Balsas Basin and along the coast to Chiapas and on the [Gulf] Caribbean slope from central Veracruz to Yu-





Fig. 23. *Albizia tomentosa* var. *tomentosa* (Langlassé 280).

catan, then southwards into Belize and NW Guatemala (Fig. 24).

**Habitat.** Found in a wide range of habitats from drought deciduous woodland to the edges of evergreen forest and mountain forest, or in savanna tree islands, and along rivers; 10-1400 m elevation. Associated genera include *Lysiloma*, *Enterolobium*, *Byrsonima* and *Pterocarpus*. Requires 600-2400 mm annual rainfall; tolerates acid, low nutrient, rocky, sandy or clay soils and long periods of drought.

**Phenology.** Flowering January to October, fruiting August to May.

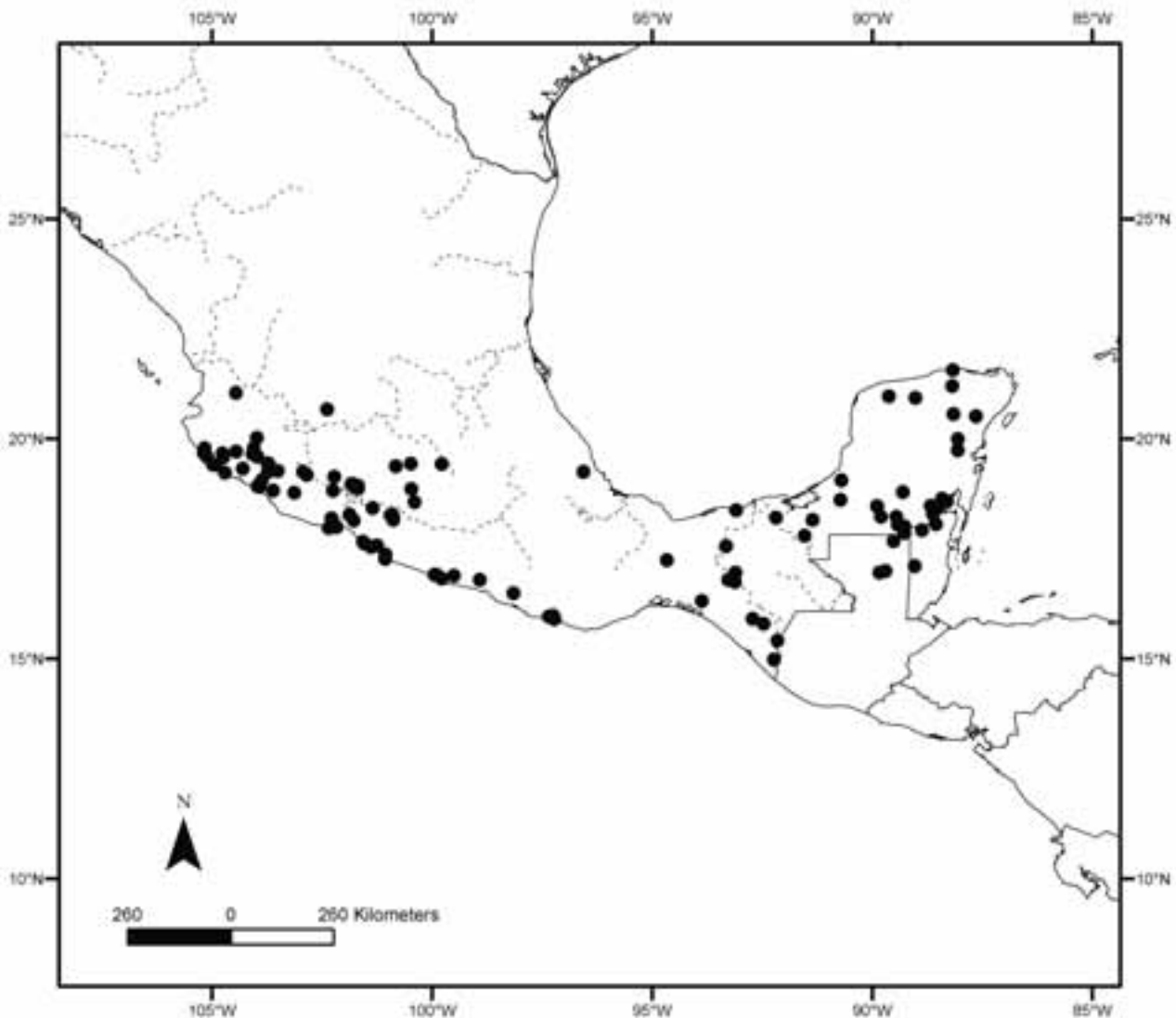
**Vernacular names and uses.** Guajillo, Guaje blanco, Hedionillo, Parotilla, Parotillo (Mexico), there are reports of its use as a timber, although its wood is soft. The flowers are used as a bee forage (in Colima).

**Conservation status.** The taxon has a wide area of dis-

tribution, at present its habitat is not threatened; a least concern rating (LC) is given to this variety. Living collection of this variety is growing in Kew; seed of this variety is stored at the MSB (Kew) and the ICRAF Seed-Lab (ICRAF.SeedLab@cgiar.org).

#### *Selected specimens*

**BELIZE. Orange Walk:** Hillbank, 17°07'N, 89°02'W, 14-VII-1928, *S.C. Brown s.n.* (K). Hillbank beside New River Lagoon, 18°04'N, 88°33'W, 13-IX-1992, *Whiteford 8152* (BM, MEXU). **GUATEMALA. El Peten:** Lake Peten Itza, 16°58'N, 89°50'W, 2-II-1968, *E. Contreras 7515* (MEXU). Dos Lagunas, Ixcanarior river, 17°41'N, 89°31'W, 181 m, 27-V-1969, *E. Contreras 8681* (MEXU). Remate road, 17°00'N, 89°42'W, 6-VII-1959, *Lundell 16232* (MEXU). **MEXICO. Campeche:** N Narciso Mendoza, 18°14'N, 89°27'W, 169 m, 21-I-1998, *D. Álvarez 635* (MEXU). 33 km S de Candelaria, sobre camino a colonia Candelaria, 18°10'N, 91°21'W, 10 m, 4-VI-1983, *E. Cabrera 4799* (BM, MEXU). Cam. El Tormento, Escárcega a Candelaria, km 5,



**Fig. 24.** Geographical range of *Albizia tomentosa* var. *tomentosa* (●) in Mexico and Central America.

18°37'N, 90°43'W, 24-XII-1965, *J. Chávelas ES-1141* (MEXU). 39 km al S de la entrada a Calakmul, 18°14'N, 89°48'W, 170 m, 19-X-1997, *E. Martínez 29107* (MEXU). **Chiapas:** 3 km N along road to Mal Paso, 14°59'N, 92°14'W, 900 m, 1-IX-1976, *D.E. Breedlove 39863* (MEXU). La Peñita, N of Tuxtla Gutiérrez, 16°45'N, 93°07'W, 1000 m, 5-VII-1949, *F. Miranda 5320* (MEXU). Las Ventas, Berriozabal, 16°48'N, 93°16'W, 18-XII-1949, *F. Miranda 5868* (MEXU). Mirador Manos que Imploran, 16°57'55"N, 93°06'17"W, 700 m, 7-V-1988, *A. Reyes García 525* (BM, MEXU). Cerro La Mesilla, 25 km NW de Tzimol, 15°48'N, 92°28'W, 550 m, 15-III-1981, *M. Sousa 11900* (BM, MEXU). **Colima:** 1 km al N de río Armería, 18°56'N, 103°58'W, 21-III-1980, *J.A.S. Magallanes 2209* (K, MEXU). Cerro del Cuartel, 19°15'N, 103°44'W, 900 m, 22-VII-1992, *M. Navarrete de la Paz 14* (MEXU). El Cañón, a 2 km al NW de la hacienda San Antonio, 19°26'N, 103°44'W, 1190 m, 8-II-1992, *L. Rico 996* (K). 2 km de Cáleras, rumbo a Madrid, 18°55'N, 103°55'W, 70 m, 28-V-1990, *L. Roman M. 1341* (MEXU). Rancho El Jabalí, 22 km NNW of Colima in the SW foothills of the Volcán de Colima, 19°27'N, 103°44'W, 110 m, 15-V-1991, *A.C. Sanders 1026* (K). 7 km al S de Madrid, 19°04'06"N, 103°52'16"W, 100 m, 23-V-1984, *F. J. Santana 258* (MEXU). Rancho La Palma, 8 km al SE de Manzanillo, 28-V-1978, *J.C. Soto 751* (MEXU). **Guanajuato:** 14 km al SW de San Luis Acatlán, 16°48'N, 98°55'W, 270 m, 30-I-1985, *P. Tenorio 3098* (BM, K). **Guerrero:** Playa La Ropa, Bahía de Zihuatanejo, 17°40'N, 101°34'W, 200 m, 4-IV-1991, *G. Castillo 6377* (MEXU, XAL). Lomas de Chapultepec, orilla de la laguna de Tres Palos, 16°49'47"N, 99°46'42"W, 50 m, 5-IX-1987, *N. Diego 4440* (MEXU). 25 km al S de Amatepec, terracería Amatepec-Arcelia, 16°53'48"N, 99°30'26"W, 1195 m, 5-V-1988, *G. Flores 743* (MEXU). 3.8 mi N of Puerto Marquez Circle, E side of Acapulco, 2-II-1971, *J. Freeland 204* (MEXU). 1/2 km Ixtapa-Zihuatanejo, en brecha al Cerro de Piedra, 17-V-1977, *M.T. Germán 294* (MEXU). 5 km al NE de La Unión, 17°16'34"N, 101°03'45"W, 120 m, 28-V-1995, *M. Gual Díaz 597* (MEXU). Paraje El Reparo, El Entronque-El Petatillo, 18°00'03"N, 102°10'19"W, 20 m, 18-XII-1995, *E. Guízar 3452* (CHAP, MEXU). Zihuatanejo Veladero, Parque Nacional El Veladero-Colonia Francisco Villa, 18°12'N, 100°53'W, 13-XII-1984, *N. Noriega 220* (K). 6 km al NW de Placeres del Oro, 18°15'20"N, 100°55'W, 17-V-1978, *J.C. Soto 662* (MEXU). C. del Pinzan Morado, 18°10'N, 100°53'W, 500 m, 17-V-1985, *J.C. Soto 8607* (MEXU). 15 km al S de El Viejo, Altamirano-Zihuatanejo, 920 m, 2-VIII-1982, *R. Torres 1281* (MEXU). **Jalisco:** Bellavista, 19°42'58"N, 104°27'10"W, 1000 m, 21-I-2001, *L. Ancira Sánchez 14* (MEXU). Barranca La Cienega, Toliman, 900 m, 25-X-1992, *M. Cházaro 7009* (MEXU). Tomatlan, 10-I-1970, *C. Díaz Luna 1641* (MEXU). 10-11 km al SW de Tuxcacuesco, 8-9 km SE de El Aguacate, 19°39'34"N, 104°04'42"W, 800 m, 12-II-1991, *L. Guzmán 1166* (MEXU, ZEA). Ejido La Fortuna, Pto. Vallarta-Barra de Navidad, 19°35'50"N, 105°06'36"W, 10 m, 10-V-1978, *J.A.S. Magallanes 1020* (MEXU). El Aguacate, 8 km al SE de Melaque, carretera Cihuatlan, 19°14'N, 104°42'30"W, 10-III-1981, *J.A.S. Magallanes 2846* (MEXU). El Cercón, 1 km al S de Cofradía de Jalpa, 20°01'50"N, 103°59'05"W, 1060 m, 9-V-1997, *A. Navarro 1792* (MEXU). El Cañón, a 2 km al NW de la hacienda San Antonio, 19°26'N, 103°44'W, 1030 m, 8-II-1992, *L. Rico 1000* (K). 6 km al SW de Tuxpan, en la desviación Colima-Guzmán, 27-V-1978, *J.C. Soto 739* (MEXU). **México:** Salitre-Cañitas, 19°26'N, 99°47'W, 1300 m, 23-IV-1933, *G. B. Hinton 3815* (K). Nanchilita, 18°52'N, 100°28'W, 23-V-1933, *G. B. Hinton 3966* (BM, K). El Palmar, Temascaltepec, 18°34'N, 100°24'W, 1-V-1934, *G. B. Hinton 6046* (BM, K). **Michoacán:** 5 km camino Aquila-La Placita, 40 m, 9-XII-1979, *B. Guerrero 526* (MEXU, XAL). Playa del Sol, 5 km al N de la Huacana, 18°58'44"N, 101°48'23"W, 480 m, 30-IV-1982, *E. Martínez 454* (MEXU). Tepalcatepec, 19°11'N, 102°51'W, 400 m, 21-V-1963, *Rzedowski 16627* (ENCB, MEXU). Devanador, Temascal-Huetamo, 19°23'05"N, 100°49'30"W, 1060 m, 30-XII-1977, *J.C. Soto 559* (MEXU). Los Carrizos, 27 km al SW de Tepalcatepec, carretera a Coalcoman, 19°15'21"N, 102°55'46"W, 400 m, 10-IX-1978, *J.C. Soto 1060* (MEXU). 4 km al SE de La Huacana, carretera a Inguaran, 18°56'N, 101°47'W, 500 m, 13-IX-1979, *J.C. Soto 1576* (MEXU). La Calichosa, 10 km al NE de Coalcoman, carretera Aguililla, 18°47'N, 103°08'W, 1200 m, 20-X-1979, *J.C. Soto 1905* (MEXU). 4 km al NE de Playa Azul, carretera a Nueva Italia, 150 m, 25-III-1980, *J.C. Soto 2108* (MEXU). 7 km al NW de la Huacana, 18°59'N, 101°50'W, 750 m, 17-VII-1979, *M. Sousa 10673* (BM, MEXU). San Ignacio 7 km al SW de Cangrejo, carretera de la Huacana, 18°58'N, 101°49'W, 920 m, 29-IV-1982, *R. Torres 368* (K, MEXU). **Nayarit:** Camino a Jala, 21°02'58"N, 104°27'36"W, 1020 m, 9-V-1988, *R. Guzmán 27* (MEXU). **Oaxaca:** 1 km S of Hidalgo about 1 km from Puerto Econdido, 15°59'N, 97°15'W, 10 m, 9-IV-1987, *C.E. Hughes 959* (K). On the road from Putla de Guerrero to Santiago Pinotepa, 32 km to the North of Santiago Pinotepa, 16°26'N, 98°01'W, 200 m, 6-II-1992, *D.J. Macqueen 401* (K). **Quintana Roo:** Calderitas, 2 km al W, camino a Laguna Guerrero, 18°39'N, 88°25'W, 27-VII-1982, *E. Cabrera 3192* (MEXU). Camino a Vigía Chico, 18°25'N, 88°32'W, 15 m, 12-VI-1983, *R. Durán 202* (MEXU). Sacbe; entre el grupo Arqueológico Coba-Nucmul, 20°31'N, 87°39'W, 20 m, 9-VIII-1975, *R. López Franco 493* (MEXU). SE de El Civalito, camino a Arroyo Negro, 17°52'N, 89°16'W, 50 m, 27-X-1997, *E. Martínez 29397* (MEXU). 44 km W de Ucum, 18°29'N, 88°40'W, 4 m, 29-IX-1979, *O. Téllez 1030* (MEXU). 50 km N de F. Carrillo Puerto, 19°45'N, 88°03'W, 6-VII-1980, *O. Téllez 2368* (MEXU). **Tabasco:** Laguna Meacoacan Region, 20 km NE of Comalcalco, 18°23'N, 93°05'15"W, 16-V-1963, *F.D. Barlow 28/15* (BM). La Palma, Balancan, 18°13'N, 92°11'W, 6-VI-1939, *Matuda 3267* (MEXU). Entronque de la carretera Tabasco-Balancan, 17°48'N, 91°32'W, 35 m, 3-XII-1975, *A. Novelo 96* (MEXU). **Veracruz:** 5 km al camino de Plan de Arroyos-Álvarez Obregon, Hidalgotitlan-Veracruz, 17°15'N, 94°40'W, 150 m, 2-IV-1974, *Brigada Dorantes 2732* (K). Remudadero, 19°15'35"N, 96°33'46"W, 260 m, IV-1929, *Purpus 12039* (BM). **Yucatán:** Xocen, NE de Chilchimila, 20°34'N, 88°09'W, 30-X-1955, *O.G. Enriquez 255* (K, MEXU). Izamal, 20°56'N, 89°01'W, *G.F. Gaumer 723* (BM, K). 2 km al S, 21°34'N, 88°10'W, 16-VI-1993, *F. May 828* (MEXU). Mérida, 20°58'04"N, 89°37'18"W, VI-1865, *Schott 526* (BM). Kohunlinch (zona arqueológica), 100 m, 16-XII-1980, *E. Ucan 688* (MEXU).

**11b. *Albizia tomentosa* var. *nayaritensis*** (Britton & Rose) L. Rico, **comb. & stat. nov.**

*Albizia nayaritensis* Britton & Rose, N. Amer. Fl. 23: 47. 1928.

Type: MEXICO. Nayarit; San Blas, La Palma, 20 m, 1923, *J. González Ortega 90N* (holotype, US; isotype, K!).

Small to medium-sized tree, 3-15 m tall. Leaves 18-21 cm long; petiole (2)3-4 cm long, velutinous to tomentose, with a elliptic sunken slit-like gland near the base; rachis (2)3.1-8.5(10) cm long, velutinous to tomentose, pinnae in 4-5 pairs per leaf, each 3.5-11 cm long. Leaflets 5-10 pairs per pinna, oblong to elliptic, apex rounded, base truncate to rounded, 1.3-2.8 × 0.8-1.3 cm, margins glabrous to ciliate, flat, adaxial surface glabrous, abaxial surface sparsely pubescent to strigose, venation palmate, midrib subcentral or central. Fig. 25.





Fig. 25. *Albizia tomentosa* var. *nayaritensis* (Hughes 648, FHO, K).

*Distribution.* Restricted to Guerrero, Oaxaca, Nayarit and Sinaloa states in Mexico (Fig. 16).

*Habitat.* Seasonally dry forest, 20-200 (940) m elevation.

*Phenology.* Flowering in June and September, fruiting in February and March.

*Taxonomic comments.* The variety has oblong to elliptic leaflets with yellowish palmate veins; these are slightly more conspicuous than in the other two varieties.

*Conservation status.* Just a few collections are known of this variety, most collected in the seasonally dry forest in Oaxaca; based on the extent of occurrence, the reduction of its habitat and the known presence of only a few mature individuals, a vulnerable rating (VU) is given for this variety.

#### Selected specimens

MEXICO. **Guerrero:** Petatlán, 17°35'N, 99°00'W, 16-VI-1937, G. B. Hinton 10326 (BM, K). Carretera Acapulco-Pinotepa Nacional, km 32 al E de Acapulco, 16°51'N, 99°49'W, 30 m, 23-III-1982, E. Martínez 94 (BM, MEXU). 5 km al E de Guayameo, Guayameo-Pláceres del Oro, 18°12'N, 101°20'W, 940 m, 21-III-1983, E. Martínez 3612 (BM, MEXU). Km 32 al E de Acapulco, Acapulco-Pinotepa Nacional, 16°51'49"N, 99°46'W, 23-III-1982, J.C. Soto 94 (MEXU). **Nayarit:** San Blas, La Palma, 21°29'25"N, 105°10'46"W, 20 m, 1923, J. González Ortega 90N (K). **Oaxaca:** 4 km al E del entronque de la carretera a Puerto Escondido, camino a Tututepec, 110 m, 22-VI-1982, R. Cedillo 1511 (K, MEXU). 5 km al NW de La Húmedad, 200 m, 26-VI-1979, M. Sousa 10571 (BM, MEXU). Hidalgo, a 12 km al W de Los Bajos de Chila, 15°57'N, 97°15'35"W, 20 m, 26-VI-1979, M. Sousa 10565 (BM, MEXU). Barranca del Zapote, 8 km al NW de Pinotepa Nacional, carretera a Cacahuatpec, 16°20'N, 98°00'W, 150 m, 27-VI-1979, M. Sousa 10579 (BM, MEXU). 13 km al NW de Puerto Escondido a 8 km al S de San Pedro Mixtepec, 16°14'N, 97°18'W, 160 m, 24-IX-1982, M. Sousa 12560 (BM, K). **Sinaloa:** El Habal, 23°21'N, 106°25'W, 200 m, 26-II-1926, J. González Ortega 4895 (K).

#### 11c. *Albizia tomentosa* var. *purpusii* (Britton & Rose) L.Rico & S. Gale, **comb. & stat. nov.**

*Albizia purpusii* Britton & Rose, N. Amer. Fl. 23: 45. 1928

Type: MEXICO. Veracruz, Rancho Remudadero, 19°15'N, 96°34' W], April 1922, C.A. Purpus 8723 (holotype, NY!; isotypes, UC-214372, US-1169664).

Small to medium-sized tree (7)14-25 m tall. *Stipules* persistent. *Leaves* 25-30 cm long; petiole 2.5-4.8(8) cm long, tomentose; rachis 11-19(23.5) cm long, channelled, tomentose, pinnae in 6-11(18) pairs per leaf, each (2.2) 3.5-8(14) cm long. *Leaflets* 15-22 pairs per pinna, oblong to linear, all leaflets asymmetric, apex acute (sometimes mucronate), 8-15(20) × 3-4(6) mm, margins ciliate, revolute. *Inflorescence heteromorphic:* flowers in a synflorescence, in pedunculated capitula, these clustered into 3-5 fascicles, main axis 13-14.2 cm long; peduncle 15 mm long; pedicels 0.5-2 mm long, floral bracts 1.5 mm long.

*Peripheral flowers:* calyx 1.5-2.3 mm long, pubescent; *corolla* 4 mm long, pubescent, 5-6 lobed; *stamens* c.15-20 per flower, 8 mm long, tube 3-3.5 mm. *Central flowers* calyx campanulate to tubular, 2.2 mm long, pubescence, 5-lobed; *corolla* infundibuliform to tubular, 4-5 mm long; *stamens* 20-30 per flower, 19 mm long, staminal tube up to 10 mm long and thickened; *ovary* glabrous to pubescent. *Legume* honey-brown mottled grey-brown, 8-13.5 × 1.6-2.1 × 0.2-0.3 cm (including a 10 mm long beak and a 3 mm stipe), glabrescent, 10-12 seeded. *Seeds* olive, ovate-oblong, 6-9 × 16-19 × 1-1.2 mm, areole sometimes orange, pleurogram 80-100 %. Figs. 26 and 27.

*Distribution.* Found in Guatemala, Belize and Mexico (Chiapas, Oaxaca, Puebla and Veracruz) (Fig. 22).

*Habitat.* Scattered in highly degraded dry deciduous forest; 30-1500 m elevation (the lowest altitude specimens are found in Veracruz State). Growing in association with *Senna atomaria* (L.) H.S. Irwin & Barneby, *Gyrocarpus americanus* Jacq. and *Lonchocarpus acuminatus* (Schltdl.) M. Sousa. Requires 600-2400 mm annual rainfall, tolerates a seven-month dry season.

*Phenology.* Flowering January to June, fruiting in June to July and September to April.

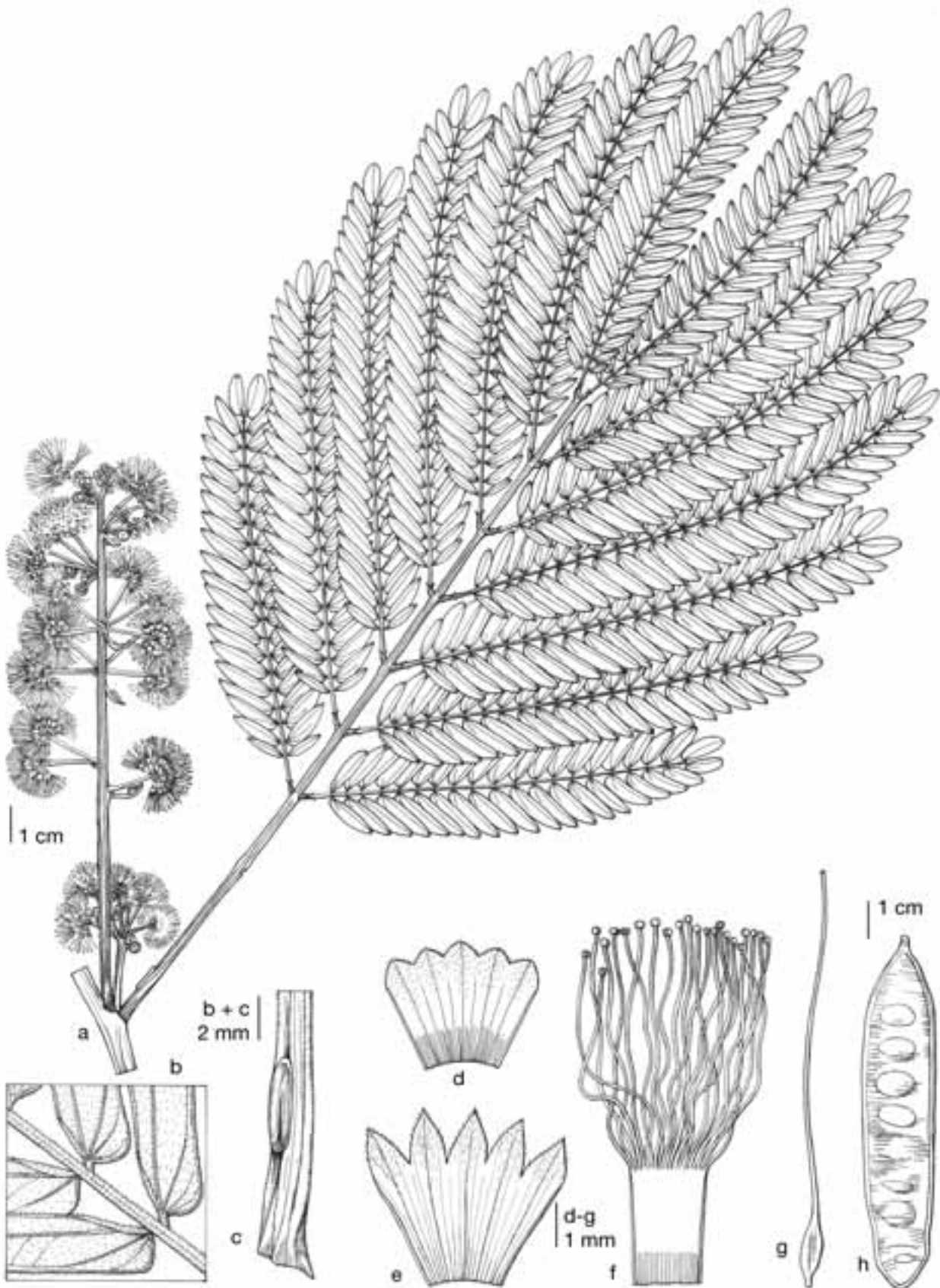
*Vernacular name.* Palo dormilón (Mexico).

*Conservation status.* The variety is scattered across its area of distribution (which is smaller than variety *tomentosa*); it has been recorded as infrequent; at present its habitat is being reduced by the introduction of sugar cane and by urban development; although the taxon does not currently appear to be threatened it soon might become so; a near threatened (NT) rating is suggested for this variety. Living collection of this variety is growing in Kew and seed is stored in the ICRAF SeedLab (ICRAF.SeedLab@cgiar.org).

#### Selected specimens

BELIZE. **El Cayo:** 7 km E Belmopan, 17°15'N, 88°45'W, 60 m, 28-XII-1981, M. Sousa 12074 (BM, MEXU). GUATEMALA. **Huehuetenango:** 10 km north-north-east of Camoja Grande close to the road towards Nenton near the turnoff to Agua Zarca and San Antonio Huistla, 15°44'N, 91°50'W, 800 m, 30-III-1988, C.E. Hughes 1136 (FHO, K). **El Peten:** San Andrés, a 10 km, Santa Elena, 16°57'N, 89°54'W, 9-I-1970, R.T. Ortiz 544 (BM). MEXICO. **Chiapas:** 3 km NW of San Gregorio, about 25 km from La Trinitaria, 15°53'N, 92°00'W, 650 m, 3-IV-1988, C.E. Hughes 1140 (FHO, K). 24 km al S de Villa las Rosas, camino a Tzimol, 16°16'N, 92°16'W, 660 m, 22-IV-1987, E. Martínez 20199 (K, MEXU). San Jerónimo, 6 km al NE de San Gregorio, 17°09'N, 92°49'W, 600 m, 15-XII-1980, M. Sousa 11598 (BM, MEXU). **Oaxaca:** Tierra Blanca, Temascal, 18°18'N, 96°20'W, 30 m, 13-III-1989, C.E. Hughes 1307 (FHO, K). Juchitán, San Antonio Nuevo Paraíso, camino al Plan de la Ceiba, 17°16'29"N, 95°11'56"W, 350 m, 28-VI-1999, J. Rivera 1472 (K, MEXU). Presa Temascal, a 9 km al E-SE del Pueblo y Cortina de Temascal, 18°12'N, 96°30'W, 60 m, 21-V-1986, M. Sousa 13065 (K). **Puebla:** 3 km al N de Pahuatlán, 20°16'50"N, 98°09'W, 19-I-1979, P. Basurto 151 (MEXU). **Veracruz:** Popótepec, 18°26'59"N, 95°12'44"W, 300 m, 9-IV-1985, R. Cedillo 3200 (MEXU). La





**Fig. 26.** *Albizia tomentosa* var. *purpusii*: **a**, flowering habit; **b**, pinna section showing leaflet bases and indument on abaxial surface; **c**, petiolar gland; **d**, calyx opened out; **e**, corolla opened out; **f**, staminal tube and stamens; **g**, ovary and style; **h**, fruit. All from Hughes 1150. Drawn by E. Papadopoulos.





Fig. 27. *Albizia tomentosa* var. *purpusii* (Martínez 20199 & A. Reyes, K, MEXU).



Fig. 28. *Albizia xerophytica* (Hellin & Hughes 6, FHO, K).

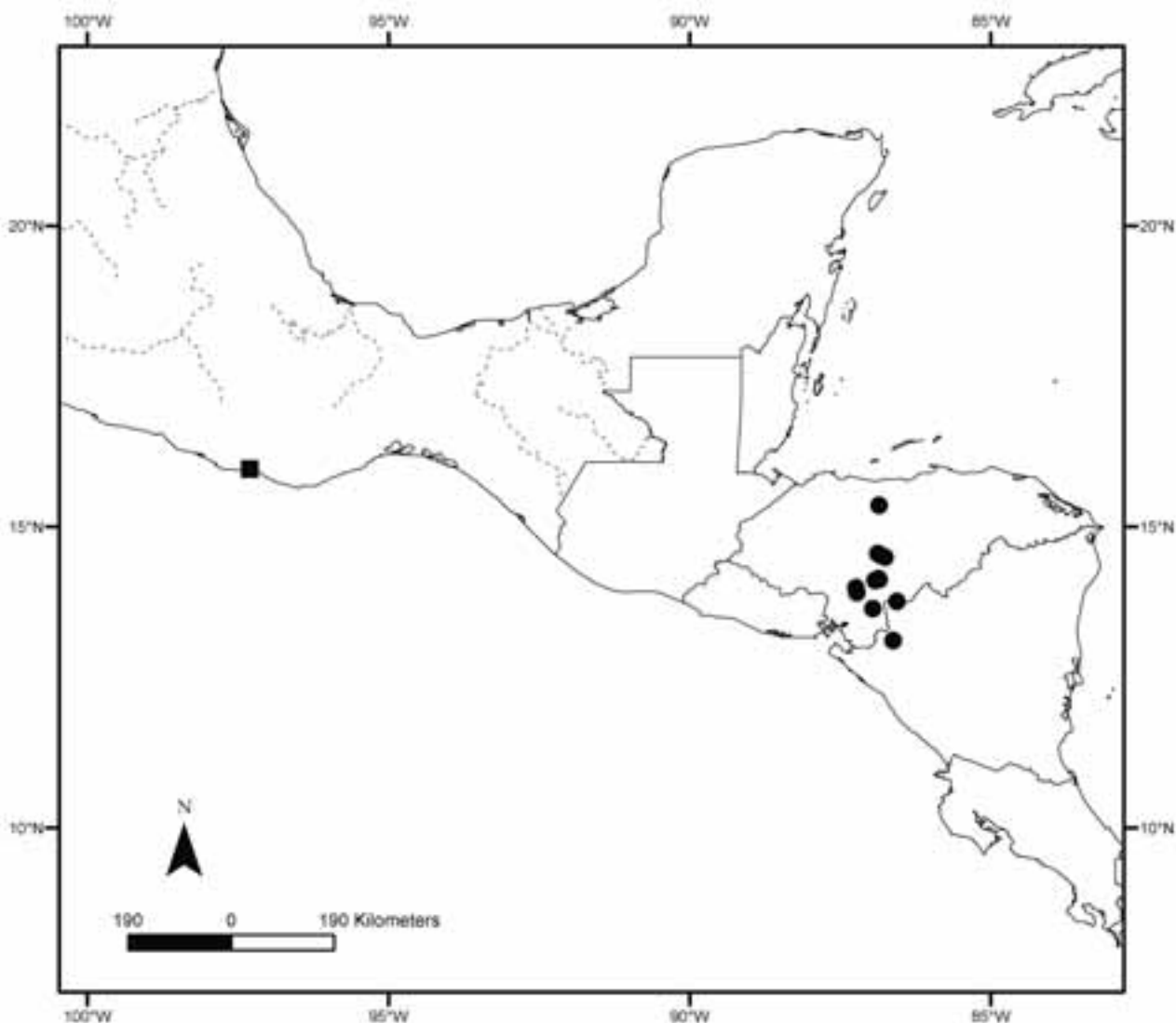
Bándera, about 9 km SE of Actopan, 19°28'N, 96°37'W, 250 m, 14-III-1987, *C.E. Hughes 909* (FHO, K). Estación de Biología Tropical Los Tuxtlas, El Vigía, 18°36'N, 95°09'W, 200 m, 30-IX-1983, *G. Ibarra 926* (MEXU). 3 km al NE de Boca del Río, 19°04'22"N, 96°06'15"W, 40 m, 11-II-1995, *G. Ibarra 3911* (MEXU). La Escuadra-Hnos. Cedillo, por el Río Xoloxuchil, 17°15'09"N, 94°36'46"W, 80 m, 1-VI-1974, *M. Vázquez 746* (MEXU). 3.8 km al E de Tuzamapa, 19°22'N, 96°53'W, 18-XII-1975, *M. Vázquez 2265* (MEXU, XAL).

**12. *Albizia xerophytica* J. Linares, Revista Mex. Biodiversidad 76: 7, fig. 1-2. 2005**

Type: HONDURAS. El Paraíso, Municipio Morocelí; Orillas de Quebrada Grande c. 3.9 km al NE de Morocelí por el camino hacia El Plan, 14 Feb 2002, *J.L. Linares, G.M. Linares, D. Angulo, S. Zabala & R. Rivera 5674* (holotype, MEXU!; isotype, EAP).

Small to medium-sized *tree*, 5-10 m tall, with an open

spreading crown. *Bark* pale grey-whitish, slightly rugose on young stems. *Stipules* 1 mm long, widely triangular, fugacious. *Leaves* 11-18 cm long; petiole 1-5.5 cm long, terete, glabrous, a circular gland near the base [above the pulvinus]; rachis usually absent, when present 5-8.5 cm long; pinnae in 1(2-3) pairs per leaf, 6-11 cm long, with a gland between the distal pair, glabrous. *Leaflets* 3-6(8) pairs per pinna, asymmetrically elliptic to broadly-elliptic, apex acute to obtuse, base obtuse to subcordate, 1-5.3 × 0.6-2.4 cm, glabrous on both surfaces, venation pinnate. *Inflorescence(sub)homomorphic*: flowers in racemes of pedunculate capitula, clustered in 2-5 capitula, main axis 3-6(8) cm long, glabrescent; peduncles 13 mm long; capitula 1.4-1.8 cm in diam., floral bracts clavate 5 mm long; pedicels 1-1.5 mm long. *Flowers* subequal (not strongly heteromorphic) *calyx* cupuliform, 1.5 mm long, glabrous, 5-lobed; *corolla* infundibu-



**Fig. 29.** Geographical range of *Albizia xerophytica* (●) and *Albizia xerophytica vel sp. aff.* (■) in Mexico and Central America.



liform, 5 mm long, glabrous, 5-lobed; *stamens* c.15-20(32) per flower, 12-15 mm long, staminal tube 3.5 mm long; *ovary* almost sessile, glabrous, 1 mm long, style 6 mm long. *Legume* red-blackish when immature, straw-brown when mature, tardily dehiscent along both sutures, flat, straight, symmetrical, apex rounded, base acute, (9.3) 12.3-21.5 × 2.2-3.1 × 0.3 cm (with a beak to 7 mm long, and a stipe 5-10 mm long), valves chartaceous, glabrous, almost smooth young, with well marked parallel reticulate venation pattern when mature; 5-10 seeded. *Seeds* ivory, oblong to circular, 6-10 × 6-9 × 2 mm, areole ivory, pleurogram 90%. Fig. 28.

*Distribution.* Honduras and Nicaragua (Fig. 29), recently reported (Berendsohn, pers. comm.) in El Salvador.

*Habitat.* Riparian vegetation in highly and degraded seasonally dry forest, sometimes in vegetation surrounded by pine forest; *Pinus caribaea* Morelet var. *hondurensis* (Sénécl.) W.H.G. Barrett & Golfari, *Pinus oocarpa* Schiede & Schldl. Between 620-1400 m.

*Phenology.* Collected in flower in February, March, July, August and November, in fruit February to September.

*Conservation status.* *Albizia xerophytica*, first described in 2005, grows in areas where the original vegetation is disappearing. Its area of occupancy is thus severely fragmented and the species is restricted to small pockets in Honduras and Nicaragua; the number of mature individuals known at present is fewer than 500; a vulnerable [VU B1(i, iii, v)] rating is thus given to this species. The specimen *Hughes 589* from Oaxaca (Mexico) has characteristics very similar to this species. We have no material in flower; at present it has been named as *A. xerophytica*, vel sp. aff. (Fig. 30). It is worth mentioning that the Oaxaca locality is known by some species of disjunctive distribution (Mexico-Nicaragua), for example, *Havardia campylacantha* (L. Rico & M. Sousa) Barneby & J.W. Grimes. In addition this is one area in Mexico with high endemism [*Dalea sousae* Barneby, *Mimosa sousae* Barneby and *Chamaecrista serpens* var. *istmogenes* H.S. Irwin & Barneby (Sousa & al., 2004)].

#### Selected specimens

HONDURAS. **El Paraíso:** 4 km al E de Moriceli, por el camino a El Plan, 14°07'N, 86°55'W, 7-VII-2001, *J.L. Linares 5406* (EAP, MEXU). Quebrada Grande, 1,5 km al N de Moriceli, 14°30'N, 86°45'W, 22-VII-2001, *J.L. Linares 5492* (EAP, MEXU). Quebrada Grande, 1,5 km al N de Moriceli, 14°08'N, 86°51'W, 740 m, 22-VII-2001, *J.L. Linares 5494* (EAP, MEXU). Tolobre, 15 km al S de San Lucas, 13°39'N, 86°57'W, 7-VIII-2002, *J.L. Linares 6231* (EAP, MEXU). Quebrada Grande, 2 km al N de Moriceli, 14°08'55"N, 86°51'30"W, 740 m, 22-XII-2002, *J.L. Linares 6399* (EAP, MEXU). **Francisco Morazan:** Quebrada Las Anonas, km 1 carretera Tegucigalpa-Valle de Ángeles, frente al establo El Molino, 13°55'N, 87°13'W, 1050 m, 11-VI-2002, *J.L. Linares 6153* (EAP, MEXU). 1 km al S de Sabana Grande, carretera Tegucigalpa-Choluteca (km 45), 14°34'N, 86°52'W, 1000 m, 14-VIII-2002,

*J.L. Linares 6263* (EAP, MEXU). 1 km al S de Sabana Grande, Tegucigalpa-Choluteca (km 45), 14°34'N, 86°52'W, 1000 m, 14-VIII-2002, *J.L. Linares 6264* (EAP, K, MEXU). Guaimaca, aguas arriba del río Jolan, 14°32'N, 86°49'W, 800 m, 22-V-1950, *A. Molina 2945* (BM). **Santa Ana:** PN Montecristo frente al camino del Apante, 1400 m, 14-II-2002, *V. M. Martínez 437* (EAP, MEXU). **Yoro:** About 3 km WSW of the small town of Arenal close to the road towards Jocon on the lower slopes of hills immediately south of the Aguan Valley, 15°22'N, 86°51'W, 230 m, 16-II-1991, *J.J. Hellin 6* (EAP, FHO, K, MEXU, NY). NICARAGUA. **Estelí:** About 8 km S of the small town of San Juan de Limay close to the road to San José Achuapa near the small settlement of Portillo de las Tablas, on dry hills S of the Limay Valley, 13°07'N, 86°37'W, 620 m, 14-III-1991, *C.E. Hughes 1435* (EAP, FHO, K, MEXU, NY). **Nueva Segovia:** 13°46'N, 86°33'W, 1147 m, 16-IX-1985, *P.P. Moreno 26436* (MO).

## Enumeration of cultivated species

Most commonly introduced species of *Albizia* in Mexico and Central America that have not naturalized and therefore were not treated in this study.

*Albizia adianthifolia* W.F. Wight; native of Africa.

*Albizia chinensis* Merr.; native of Asia.

*Albizia julibrissin* Durazz.; native of Asia.

*Albizia lebbekoides* (DC.) Benth.; native of Indo-China and Malesia.

*Albizia procera* Benth.; native of India, Myanmar [Burma], Australia (Queensland), Indo-China and Malesia.

## Acknowledgements

Thanks to Dr G. P. Lewis for his valuable help with the edition of the manuscript, useful comments, encouragement and corrections, to Steve Bachman for producing the maps and helping with conservation assessments matters, Dr G. Davidse for checking critical Nicaragua collections in the Herbarium MO. Dr. Mario Sousa for his critical and valuable comments that improved the manuscript.

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Associate Editor: C. Aedo

Received: 9-VI-2008

Accepted: 1-IX-2008

