THE CORRECT GENERIC PLACEMENT OF *ALBIZIA CARBONARIA* BRITTON

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A survey of the pollen of tribe Ingeae (Mimosoideae) by Scanning Electron Microscopy and light microscopy was initiated to determine the usefullness of this character in the taxonomy of the tribe. The tribe is characterized by pollen that regularly occurs in 16-20-24-28-32-grained polyads. Almost all the high number polyads occur in New World taxa; the majority of the Old World genera have 16-grained polyads only. During the course of this study an interesting polyad was found in the genus *Albizia* The characteristic polyad of *Albizia* is composed of 16 pollen grains which agrees with the results of other recent pollen studies. Guinet (1969) in his treatment of the Mimosoideae reported the pollen of all the species of *Albizia* that he examined as polyads with 16 grains. Sorsa (1969), in a similar study, listed only one species from Africa (*Albizia amara ssp. seriocephala*) as having an occational 32-grained polyad. A sample of this species' pollen contained 16 grains per polyad consistently with only one 32-grained polyad observed. It would seem that this chance occurrence may be the result of an aberrant division. Such irregularities commonly are found in other genera of the Ingeae.

As an extension of the pollen study, the stigmatic surfaces also were examined. It was noted that stigma size usually corresponds to the diameter of the polyad, and the stigmatic area can accomodate only one polyad. Such a system of pollination coupled with the fertilization of all the ovules by a single polyad would ensure maximum seed production with the least amount of energy expended. There should be many ovules/ovary in *Albizia* flowers as there is a significant correlation between morphologically permanent tetrads, polyads, and pollinia and high ovule number (Walker, 1971b). Under these circumstances it would be expected that a polyad of 16 grains should produce a maximum of 16 seeds per pod with correspondingly higher numbers for larger polyads. All available fruits on *Albizia* herbarium specimens at Field Museum were examined to see if a correlation could be established between seeds/pod and grains/polyad. The results of the examination agreed with predictions: the 16-grained polyad species of *Albizia* had fruits with 10-14 seeds. However, one specimen, an *Albizia* from Central and South America, did not seem to fit the otherwise established pattern (less than 16 seeds per fruit). This species had 25 seeds/pod which would not correlate with a fertilization by a single 16-grained polyad. Subsequent

examination of the flowering material revealed that the polyads were consistently 32- rather than 16-grained. Either this is a unique species of *Albizia* or it has been incorrectly placed.

In examining the material it was found that specimens of this species have been previously identified as three separate species of *Albizia*, *A. carbonaria*, *A. filicina*, and *A. malacocarpa*. The oldest epithet is *malacocarpa* published in 1925 by Standley in the Flora of El Slavador but it lacks a species description. Subsequently, the name was validly published by Standley in North American Flora in 1928. However, in 1926, Britton established *A. carbonaria* for a tree that was growing at the Rio Piedras Forest Station in Puerto Rico. At a later date, 1936, Britton and Killip in the Mimosaceae and Caesalpinaceae of Colombia placed *A. malacocarpa* in synonomy with *A. carbonaria*. The third epithet, *filicina*, is handwritten on specimens in the herbarium at Field Museum as sp. nov. Standley. There has been no publication of this epithet.

Native to Colombia, *Albizia carbonaria*, has been introduced in El Slavador and Puerto Rico (type specimen). It is also found in Venezuela, Panama, and Costa Rica. Traditionally the genus *Albizia* had been classified as entirely Old World, being native to Asia and possibly Africa. But this distinction has been obscured as it has become very widespread in the New World due to the cultivation of many species as ornamentals (for example, *A. julibrissin*). Morphologically the genus is most closely allied to *Pithecellobium* (primarily New World) and is distinguished from it primarily on fruit characters.

Albizia - Fruit broadly linear, straight, plano-compressed, thin, not dehiscent, or 2-valved, continuous inside, the valves neither elastic not twisted (Hutchinson, 1964).

Legume oblong, flattened, straight, tapering at the base and apex, nonseptate, chartaceous to coriaceous, dry, indehiscent to tardily dehiscent, the valves thin, slightly thickened at the margins (Elias, 1974).

Pithecellobium - Fruit compressed, circinate, variously twisted, falcate, or rarely nearly straight, 2-valved or rarely not opening or splitting into joints, valves often twisted but not elastically revolute (Hutchinson, 1964).

Legume straight or curved, flattened to terete, 2-valved, dehiscent (or indehiscent), the valves continuous or interrupted within, dehiscence occurring along both sutures at the same time or proceeding from on the adaxial suture to the abaxial suture (usually incomplete), the valves being contorted after dehiscence (Elias, 1974).

A. carbonaria - Legume 8-11 cm. long, about 2 cm. wide, densely puberulent, stipitate, narrowed at the base, at length dehiscent (Standley, 1928 - as *A. malacocarpa*).

Pod flat, linear-oblong, 7-10 cm. long, 14-18 cm. wide, pubescent, short-pointed, narrowed at the base, the valves with thickened margins, its stalk about 1 cm. long (Britton, 1926).

Examination of fruiting specimens of *A. carbonaria* further reveals that the fruit is septate (note written on specimen - author unknown). In the Flora of Panama (Schery, 1950) a question is raised as to its placement: "On the basis of certain characters *A. carbonaria* might well be considered *Pithecellobium* (or *Samanea*, if this be recognized as distinct from *Pithecellobium*) instead of *Albizzia*. Yet the legume better fits *Albizzia*." The separation of *Albizia* from *Pithecellobium* based solely on fruit morphology is considered questionable by Elias (1974).

It has been traditional for workers in the Mimosoideae to use fruit characteristics as a major indicator of generic relationships or as determiners of generic boundaries. The widespread use of the fruit character has not resulted in a stabilized taxonomy that reflects, at least to some extent, natural relationships. We believe that fruit was chosen as a "key character" simply because they are generally large, easily observable, and forestall the need to make extensive dissections of small (usually) flowers. In our opinion floral morphology affords better opportunities for determining relationships as they appear to be intimately associated with particular pollination strategies. The fruit appears to be a secondary evolutionary character more closely attuned to habitat than to a set generic ground plan. What is needed to demonstrate this, is a broad survey that attempts to correlate fruit type with habitat and seed dissemination type. The latter would be difficult to perform because of our very limited knowledge of this subject within the Mimosoideae. Until such time as the proposed correlation can be demonstrated or disproven, we believe that prudence would tend to dictate that we "forget the fruit".

The individual pollen grains of tribe Ingeae are not differentiated to a great extent. However, with the exception of the larger genera (*Inga* and *Pithecellobium*), the pollen is consistent in the number of grains per polyad having either 16- or 32-grained polyads (Table 1). Of the genera having 32-grained polyads, *Affonsea*, *Enterolobium*, *Inga*, *Pithecellobium*, *Pseudosamanea*, and *Samanea*, only *Pithecellobium* possesses the morphological features that would allow the placement of *A. carbonaria* within the genus. Figures 1-4 are Scanning Electron micrographs of the 32-grained polyad of *A. carbonaria*, the characteristic 16-grained polyad of *Albizia*, and the 32-grained polyad of *Pithecellobium* for comparison.

In summary, the genus *Albizia* is not well defined nor separated easily from some members of the Ingeae. The characters of the fruit are limited in their value in segregation of genera and useless when only flowering specimens are available. All Old World *Albizia* species have pollen that is consistently in 16-grained polyads. To date, with the exception of *A. carbonaria*, all the New World species that have been examined conform in this character. Therefore, we are transferring *A. carbonaria* to *Pithecellobium*, the genus most closely allied to *Albizia* in morphological and palynological characters. We are limiting the genus *Albizia* to those species which only have 16 pollen grains per polyad.

Pithecellobium carbonaria (Britton) Niez. & Nevl.

Albizia carbonaria Britton, Sci. Surv. Porto Rico & Virgin Islands 6: 348, 1926. (TYPE: *C. L. Bates s.n.*).

Albizia malacocarpa Standley, Fl. Salvador 96, 1925; nomen nudum. N. Am. Flora 23: 44, 1928. (TYPE: *Calderon 2042*).

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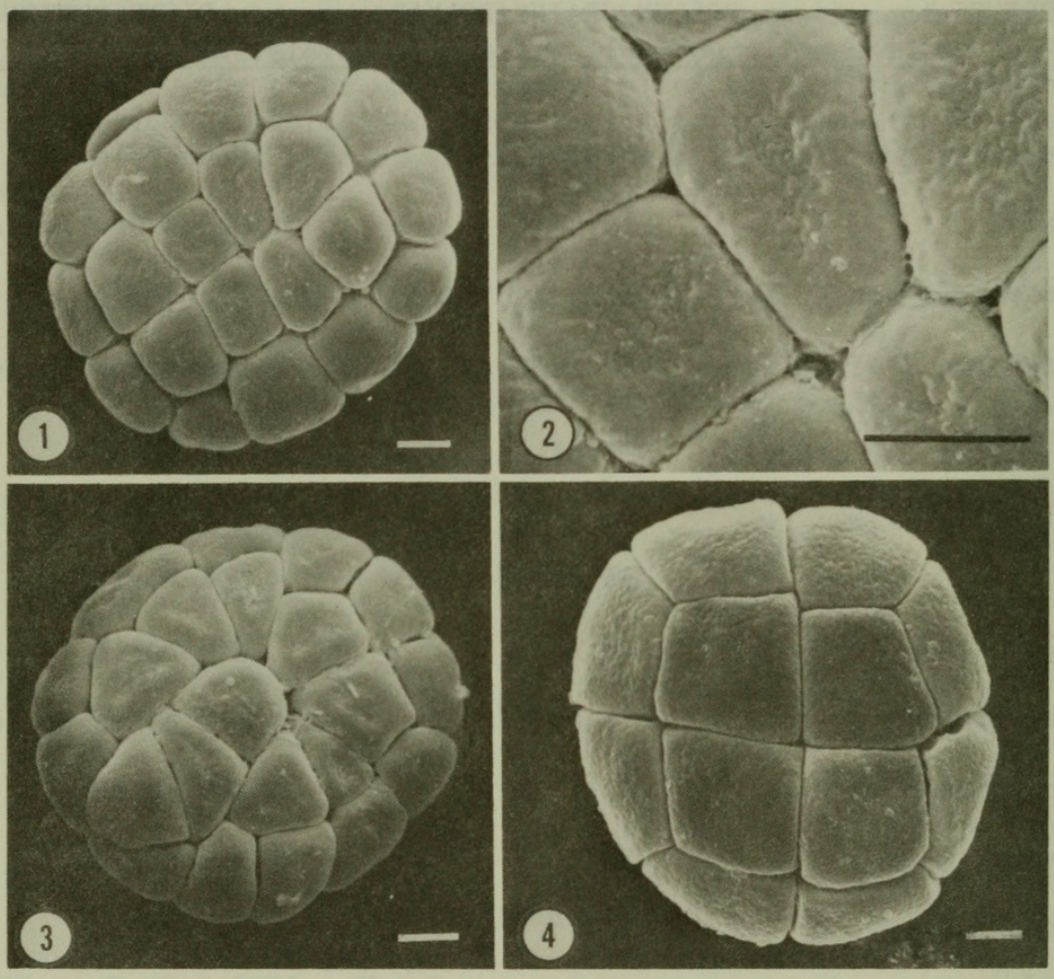
TABLE 1:

GENUS	POLLEN GRAINS/POLYAD	DISTRIBUTION
Affonsea	32	New World
Albizia	16	Old & New World
Archidendron	16	Old World
Calliandra	8 or 16*	Old & New World
Cedrelinga	16	New World
Enterolobium	32	New World
Inga	16 to 32	New World
Lysiloma	16	New World
Pithecellobium	16 to 32	Old & New World
Pseudosamanea	32	New World
Samanea	32	New World
Serianthes	16	Old World
Wallaceodendron	16	Old World

*_Calliandra_ as presently circumscribed consists of at least two genera. Those with an 8-grained polyad may not belong in the Ingeae.

The pollen data comes from a compilation of our studies, Sorsa, and Guinet; the distribution data is from Hutchinson.



FIGURES 1-4. - Scanning Electron Micrographs (line = 10 u): 1 & 2, *Pithecellobium carbonaria*; 3, *Pithecellobium daulense*; 4, *Albizia retusa*.

Nevling, Lorin I. and Niezgoda, C J. 1979. "The correct generic placement of Albizia carbonaria Britton." *Phytologia* 44, 307–312.

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