

BRC 2003045/15607

## The morphology and preliminary phytochemistry of *Albizia saman* (Jacq.) F. Mull

A. E. Ayodele\*, D. K. Ibidun and A. A. O. Ogunshie

Department of Botany and Microbiology, University of Ibadan, Ibadan, Oyo State, Nigeria

(Received: September 26, 2003).

**ABSTRACT:** The morphology and phytochemistry of *Albizia saman* have been investigated. The leaflets are elliptic to oblong with attenuate to obtuse bases. The leaf apex is obtuse while the surface is glabrous with an entire margin. Epidermal cells are irregular to polygonal with straight to curved anticlinal walls on the adaxial surface. On the abaxial surface, the cells are polygonal with straight to slightly curved anticlinal walls. The leaves are hypostomatic with anomocytic stomata. Trichomes are simple, uniseriate and restricted to the abaxial surface of the leaf. Pollen grains are large and subprolate occurring either as monads occasionally or as polyads in most cases. Photochemical screening revealed the presence of alkaloids, cardiac glycosides and saponins in the leaf.

**Keywords:** Morphology, Phytochemistry, *Albizia sama*.

### Introduction

*Albizia sama* (Jacq.) F. Mull. (syn. *Samanea saman* (Jacq.) (Merr.) is a member of the subfamily Mimosoideae in the Leguminosae. It is a large to massive tree with a rounded crown usually broader than tall (Hutchinson and Dalziel, 1958, Burkill, 1995). The flowers occur in loose heads with greenish yellow corolla and dark pink stamens. The fruits are flat fleshy black pods which are elongated and thick but compressed, pulpy within and containing numerous seeds (Burkill, 1995).

*A. saman*, otherwise referred to as the rain tree or Monkey pod is native to tropical South America but introduced to many tropical countries including Nigeria, Ghana, India, Burma and Malaya (Burkill, 1995). It is a fast growing tree which is favoured by hot, moist conditions but still capable of growing in dry and barren soil. It is commonly grown as a shade tree for roadside avenues in many towns and villages in Africa. *A. saman* is of high economic value. The leaf is made into an infusion for treating blood pressure while the seed is chewed for inflammations of the gums and in the mouth and throat. The foliage and pods are good cattle fodder while the sugary pulp is edible and is like a jam or preserve. The high content of the sugar in the pods is utilized to produce alcohol by fermentation (Burkill, 1995). The plant is common sight on the University of Ibadan campus. It lays the major roads on the campus providing shade for passers-by along the routes. The tree is sometimes debarked for medicinal purposes by the inhabitants of the University community.

To whom correspondence should be addressed. E-mail: [bayodele@yahoo.com](mailto:bayodele@yahoo.com)

As part of the project investigating the seeds of this plant as suitable alternative to those of *Parkia biglobosa* (Jacq.) R. Br. Ex. Don in the preparation of the local condiment – 'Iru', this study is aimed at investigating the morphology of the plant as well as identifying the secondary metabolites which may be present in the Nigerian material. It is envisaged that the results obtained will enhance the botany of the plant as well as provide characters for its identification.

## Materials and Methods

Specimens of *A. saman* were studied at the herbarium of the Department of Botany and Microbiology, University of Ibadan (UIH), Ibadan and at the Forestry research herbarium (FHH), Ibadan. Fresh materials were collected and studied from the University of Ibadan campus, Abeokuta, Ijebu-Igbo and Ago-Iwoye. Voucher specimens are deposited at the University of Ibadan herbarium.

### Morphology

Characters of the leaf were assessed on mature leaves at comparable positions in all the available specimens. The characters include both qualitative e.g. leaflet, shape, apex, base, margin and surface as well as quantitative e.g. leaflet length, width, petiole length, blade length and number of leaflets per leaf. Others are pod length, pod width and number of seeds per pod. Over 500 pods were examined.

### Epidermal Preparation

Four specimens were assessed for the plant. Epidermal preparation followed the method of Sheteolu and Ayodele (1997). Drawings were made using a wild M12 microscope with camera lucida attachment.

### Pollen Preparation

Dried flower buds of *A. saman* were used for the preparation. The Acetolysis method of Erdtman (1960) was followed. The pollen grains were observed, studied and drawings made using a wild M12 microscope with Camera Lucida attachment.

### Phytochemical Screening

The leaves of *A. saman* were used. The leaves were obtained early in the day at about 8.00 am, dried at room temperature for eight weeks and later ground into powder with the aid of a mortar and a pestle. The leaves were screened for the presence of alkaloids, saponins, tannins and anthraquinones using the methods of Odebiyi and Sofowora (1978) and Trease and Evans (1995) with slight modifications.

The extract of the powdered leaves which was obtained by boiling with a small aliquot of distilled water was concentrated to a small volume and then diluted to obtain a clear but concentrated solution. Standard aliquots of the test solutions were reacted with Mayer's dragenduff's and Wagner's reagents for alkaloids, while freshly prepared 0.1% FeCl<sub>3</sub> and bromine water were used for tannins. The frothing test was used for saponins. The Borntrager's test was used for the detection of anthraquinones while the Keller-Killani test was conducted for cardiac glycosides.

## Results

### Macro morphological features

The leaflet of *A. saman* is elliptic to oblong in shape with an obtuse apex and an attenuate to obtuse base. The surface is glabrous with an entire margin. The leaflets at the apex have a mean size of 3.9 x 1.9 cm<sup>2</sup> while middle leaflets have a mean size of 2.6 x 1.3cm<sup>2</sup>. The smallest leaflets occur towards the base

with a mean size of  $1.5 \times 0.5\text{cm}^2$ . The petiolules have mean values of 1.3, 1.1 and 0.9cm for the apex, middle and basal leaflets respectively. There are usually about six leaflets per leaf of *A. saman*. The pods have a mean size of  $16.2 \times 1.7\text{cm}^2$  with about seventeen seeds per pod.

#### *Epidermal Morphology*

The adaxial epidermal cells are irregular or polygonal in shape, about  $24.3\mu\text{m}$  in diameter. Anticlinal walls are straight to curved on this surface. Trichomes and stomata are also absent from the surface (Fig. 1a). However, on the abaxial surface, the cells are polygonal with straight to slightly curved anticlinal walls about  $30\text{Nm}$  in diameter. Stomata and Trichomes are present on this surface. The stomata are of the anomocytic type with the surrounding cells indistinguishable from other epidermal cells. The trichomes are unicellular, simple and uniseriate and are usually densely distributed (Fig. 1b).

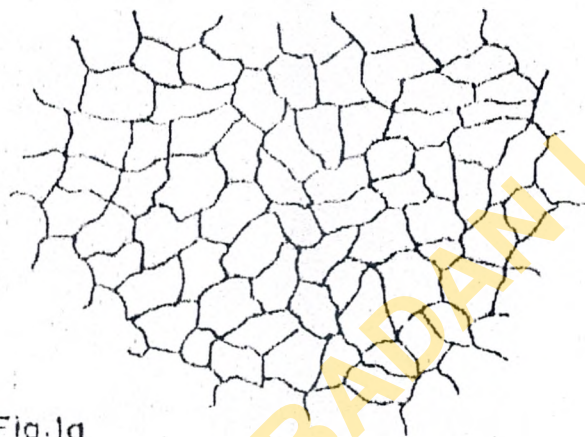


Fig.1a



Fig.1b

5.0mm

**Figure 1a:** drawing of adaxial epidermal surface of *A. saman* showing irregular to polygonal cells with straight to curved anticlinal walls.

**Figure 1b:** Drawing of abaxial epidermal surface of *A. saman* showing polygonal cells with straight to curved anticlinal walls.

### Pollen Morphology

The pollen grains of *A. saman* occur mostly in clusters i.e. as polyads (Fig. 2b and c). A few of the pollen occur singly (Fig. 2a). Each polyad contains about eight to twenty three grains with the equatorial diameter ranging between 100 $\mu$ m and 125 $\mu$ m (Fig. 2). The grains are spherical in shape, bilateral and large. Each grain i.e. monad may be triangular, obtuse, convex or quinquangular with a mean size of 34.2 x 25.8 $\mu$ m and a polar axis/equatorial (P/E) ratio of 1.32.6. The grains are subprolate and large (Fig. 2).

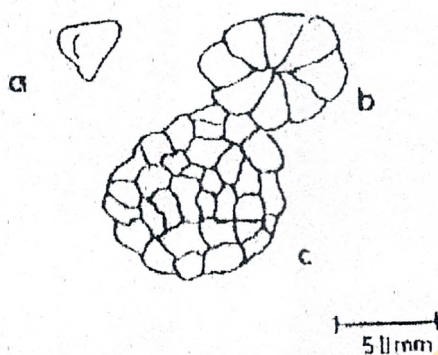


Figure 2: Pollen grains of *A. saman*

- a. Single grain
- b&c Clustered grains.

### Phytochemical Screening

The study revealed the presence of alkaloids, cardiac glycosides and saponins while tannins and anthraquinones were not detected in the leaves.

### Discussion

*Albizia saman* is an important plant which dominates the entrance of the University of Ibadan through the main gate. Its huge spreading branches and consequent massive domed crown provide shade to passers-by along the major routes of the University. However, the importance of this plant transcends just the shade it provides, as it is extensively used in medicine for treating blood pressure and inflammations of the gums, throat and mouth. The plant is also used to regulate male fertility as it has been found to interfere either with sperm production and maturation (Oliver – Bever, 1986) or with sperm storage or with their transport in the female genital tract. Its spermicidal activity to rat and human sperm (Oliver-Bever, 1986) has been found to be associated with compounds linked to a particular sequence of sugar moieties (Oliver-Bever, 1986).

The phytochemical screening showed that alkaloids, saponins and cardiac glycosides are present while anthraquinones and tannins are absent. Pithecolobine and samarin are alkaloids which have been detected in the bark, the earlier also in the wood, leaves and seed (Burkill, 1995). The presence of cardiac glycosides which has not been earlier reported may indicate the plant in the treatment of heart related

problems. It has been suggested that the high sugar content of the pods can be utilized to produce alcohol by fermentation (Burkill, 1995). The fermentation of the seed to produce local condiment akin to 'Iru' of *parkia biglobosa* has been successfully achieved in the department of Botany and Microbiology, University of Ibadan and that success actually initiated this complementary part of the study.

Except for a general description of the pollen of the Leguminosae and the Mimosoideae in particular by Erdtman (1986), this is about the first time the pollen of *Albizia saman* is being documented. According to Erdtman (1986), the pollen grains in the Leguminosae are single or united in tetrads or polyads. Monads are usually 3 – colpate sometime provided with 2, 4, or 6 apertures and ranging from peroblate to prolate. *Albizia sama* pollen grains are usually in polyads and sometimes occur singly (monads), large and subprolate. The hypostomatic nature of the leaves, curved walls and polygonal cells in *A. saman* are mainly regarded as mesophytic characters (Stace, 1965) and this is evident in the distribution of the species particularly in Nigeria. *A. saman* therefore remains a very valuable tree plant with all parts useful and whose resources are waiting to be utilized for the benefit of mankind.

## References

- Burkill, H.M. (1995). The useful plant of West Tropical Africa, families J-L, Royal Botanic gardens, kew, 857pp.
- Erdtman, G. (1960). The acetolysis method-a-revised description. Svensk Bot. Tidskr 54: 561 – 564.
- Erdtman, G. (1986). Pollen Morphology and Plant taxonomy. Brill, E.J. and Leiden, The Netherlands, 533pp.
- Hutchinson, J. and Dalziel, J. (1958). Flora of West Tropical Africa, Vol. 1, part 2, Crown Agents for Overseas Governments and Administrations, London, 828pp.
- Odebiyi, O.O. and Sofowora, E.A. (1978). Phytochemical Screening of Nigerian medicinal Plants. Part II, Llodia 41: 234 – 246.
- Oliver-Bever, B.E.P. (1986). Medicinal Plants in tropical West Africa. Cambridge University Press, Cambridge, London, 375pp.
- Sheteolu, A.O. and Ayodele, A.E. (1997). Epidermal morphology of the genus *Dialium* (Fabaceae: Caesalpinoideae). Feddes repertorium 108(3-4): 151 – 158.
- Stace, C.A. (1965). Cuticular studies as an aid to plant taxonomy. Bull. Brit. Mus. (Nat. Hist.). BOT 4: 1 – 78.
- Trease, G.E. and Evans, W.C. (1995). A Textbook of Pharmacology, 13<sup>th</sup> edn. Bailliere Tindall Ltd., London, 617pp.