

THE MORPHOLOGY AND ECOLOGY OF THE GENUS *SYNSEPALUM* (A. DC) DANIELL (SAPOTACEAE) IN NIGERIA

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ABSTRACT

The genus *Synsepalum* is represented by three species in Nigeria. It is confined to the lowland rainforest region of the country. *Synsepalum dulcificum* is called the 'miraculous' berry or the 'magic plant' on account of the protein based sweetening agent miraculin found in the pulp of the fruit. The plant also produces a fairly hardwood which is particularly used as firewood by the indigenous people while the twigs are used as chewsticks. *S. stipulatum* popularly called the "Blacksmiths' charcoal wood" is known to supply the best charcoal to the Benin blacksmiths. *S. glycydorum* is not of much economic importance to the people but it is restricted in its distribution to the Southeastern part of Nigeria. From the standpoint of uses and restricted distribution, there is need for in-situ and ex-situ conservation of these species for sustainable utilization. The largest leaves with the longest petioles are found in *S. stipulatum*, while the smallest leaves with the shortest petioles are in *S. dulcificum*. The leaves and petioles of *S. glycydorum* are intermediate of the other two species. The leaves generally are elliptic to oblong to oblanceolate in shape with acuminate apices. However, the apex in *S. dulcificum* may be acute, rounded or rarely retuse. The leaf bases in the genus are usually cuneate. The leaves are glabrous except in *S. dulcificum* which may be hairy on the abaxial surface.

INTRODUCTION

The genus *Synsepalum* (A. DC) Daniell is represented by three species in Nigeria (Hutchinson and Dalziel, 1963; Keay *et al.*, 1964) of which *S. dulcificum* (Schum. and Thonn.) Daniell is the best known and cultivated for its high economic value which however remains to be utilized on a commercial basis. It is called the 'magic plant' on account of the miraculous berry (fruits) it produces.

The pulp of the reddish yellow fruit contains a protein based sweetening agent called miraculin (Dalziel, 1948; Irvine, 1961) similar to thaumatin found in *Thaumatococcus daniellii* (Benn.) Benth and Molenin in *Dioscoreophyllum cumminsii* (Stapf.) Diels. Thaumatin is now being formulated into a drink particularly recommended for diabetic patients who are advised to reduce sugar intake in the body.

Miraculin is known to have a greater effect in sweetening acidity than countering bitterness

(Dalziel, 1948; Irvine, 1961). Thus, for example, it is used to sweeten palm wine (Dalziel, 1948; Irvine, 1961). The fairly hard wood of *S. dulcificum* is used as firewood by the indigenous people while the twigs are used as chewsticks (Irvine, 1961).

The other two species are usually found in the wild. *S. stipulatum* (Radlk.) Engl. is known as the 'Blacksmiths' charcoal because it supplies the best charcoal to the Benin blacksmiths in the present-day Edo State, Nigeria (Keay *et al.*, 1964; Dalziel, 1948). The stems of small trees of these plants are used for axe-handles and the wood is also cut into planks (Dalziel, 1948). *S. glycydorum* Wernham is the most uncommon and relatively unknown from an economic standpoint.

The Nigerian forest today is under a tremendous pressure resulting from technological advancement, pharmaceutical products and timber utilization and fuel among others. The rate of degradation is so alarming that many of the yet unknown flora or those in danger of extinction will be lost to science in the foreseeable future. Most of the affected plants are of high economic value which if harnessed could boost the dwindling economy of our country. However, the point here is not in the utilization of these plant parts but on their conservation in-situ and ex-situ for a sustainable utilization. It is from this perspective that the present paper discusses the morphology with particular reference to the leaf and the distribution of the genus *Synsepalum* in the Nigerian forest. It highlights the important taxonomic characters of the leaf which

are of value in the identification of the three species in the forest. It also forms the first part of a series of papers using leaf morphological (micro and macro) in the identification and delimitation of gradually disappearing forest species groups in Nigeria.

MATERIALS AND METHOD

All specimens of the three species treated in this study were examined at the Forestry Research Institute Herbarium (FHI), Ibadan and the University of Ibadan Herbarium (UCI or UIH). Information on all the specimens were recorded and the following quantitative and qualitative leaf morphological characters were scored - leaf length, width, blade length, petiole length, leaf apex, base, shape and margin.

RESULTS

Leaf Morphology

The leaves vary from elliptic to oblong through to oblanceolate with usually acuminate apex though in *S. dulcificum* the apex may be acute, rounded or rarely retuse. The base is usually cuneate while the margin is entire (Table 1, Fig. 1). The largest leaves are found in *S. stipulatum* with a mean size of 7.84 x 3.14cm. *S. glycydorum* usually has the size of the leaf intermediate of the others with a mean size of 16.20 x 4.82cm (Table 1). The petiole length also ranges from 0.35cm in *S. dulcificum* to 2.38 in *S. stipulatum* with *S. glycydorum* (1.42cm) intermediate (Table 1). The leaves are usually glabrous on both surfaces except for some form of hairiness on the abaxial surface of *S. glycydorum*. The leaves of *S. dulcificum* occur in clusters near the end of the branchlets. The larger leaves at each end are subtended by two

smaller leaves of 4.14 x 1.72cm in size and with very short petioles, 0.20cm long.

Distribution

The genus is restricted to the lowland rainforest region of Nigeria (Fig. 2) with *S. stipulatum* being the most widespread of the three species. It extends from Ogun and Benin forests to Owerri, Onitsha and Uyo all located in Southeastern Nigeria. Most of the collections of these species are from the forest of Benin in Edo state and its environs. *S. glycydorum* is said to be only known in Nigeria (Keay *et al.*, 1964) and it is of limited occurrence, usually restricted to the forests of Umudike, Umuahia, Owerri and Calabar towards the eastern part of the country. It is thus the most threatened species in the genus in the country. *S. dulcificum* is the most widespread in Oyo and Ogun forests particularly around Ibadan and Abeokuta in southwestern Nigeria from where many collections have been made. However, few collections are also from Uyo in Akwa-Ibom state. The species are usually found in wet, damp localities in the forest.

DISCUSSION

A number of factors have been listed to assess the vulnerability of species to use by people in the forests (cf. Cunningham 1987, 1991, 1994, 1996; Wild and Mutebi, 1996). *S. dulcificum* which has the highest potential for economic importance in the genus is a slow growing small tree or shrub, less abundant and of restricted habitat usually

preferring areas where the rainfall is not less than 1200mm per annum. These coupled with the fact that fruits, twigs and wood are used by the indigenous people, the plant may thus qualify as one of the forest species under threat and consequently in dire need of protection. If and when the berries are utilized for commercial purposes other than the subsistence purposes, it is doubtful if there would be enough of the trees remaining in the Nigerian forest to cope with such usage. However, the alternatives in using *Discoreophyllum cumminsi* or *Thaumatococcus danielli* as sources of molenin and thaumatin respectively may reduce the heavy dependence on miraculin from *S. dulcificum*.

The most vulnerable of the three species treated in this paper is *S. glycydorum* which is said to be known only in Nigeria and which is restricted to the Southeastern forests. With the current rate of deforestation of the lowland rainforest in Nigeria, it seems unlikely if the species will not be extinct in the nearest future if efforts are not made to conserve it.

The maintenance of essential ecological resources and life support systems, preservation of genetic diversity and sustenance of any useful species or ecosystems are the three objectives emphasized by the World Conservation Strategy (IUCN, UNEP and WWF, 1980) which are imperative for sustainable existence. In Nigeria, these are goals which must transcend organised in-door fora. The sincere pursuance of these objectives is desired from government functionaries and conservationists

The task before us can only be accomplished in the face of a collective orientation. This implies that both the government and the citizens must pool resources together in order to conserve and preserve these forest resources which are our collective natural heritage.

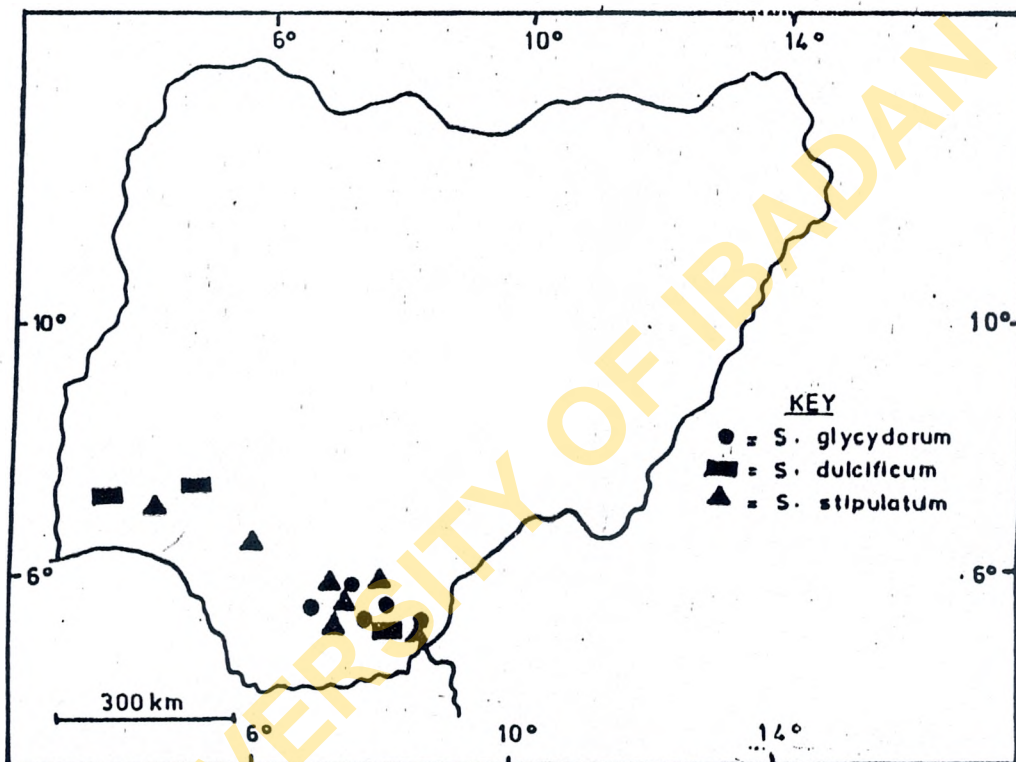


Fig.1 Map showing the distribution of the genus *Synsepalum* in Nigeria

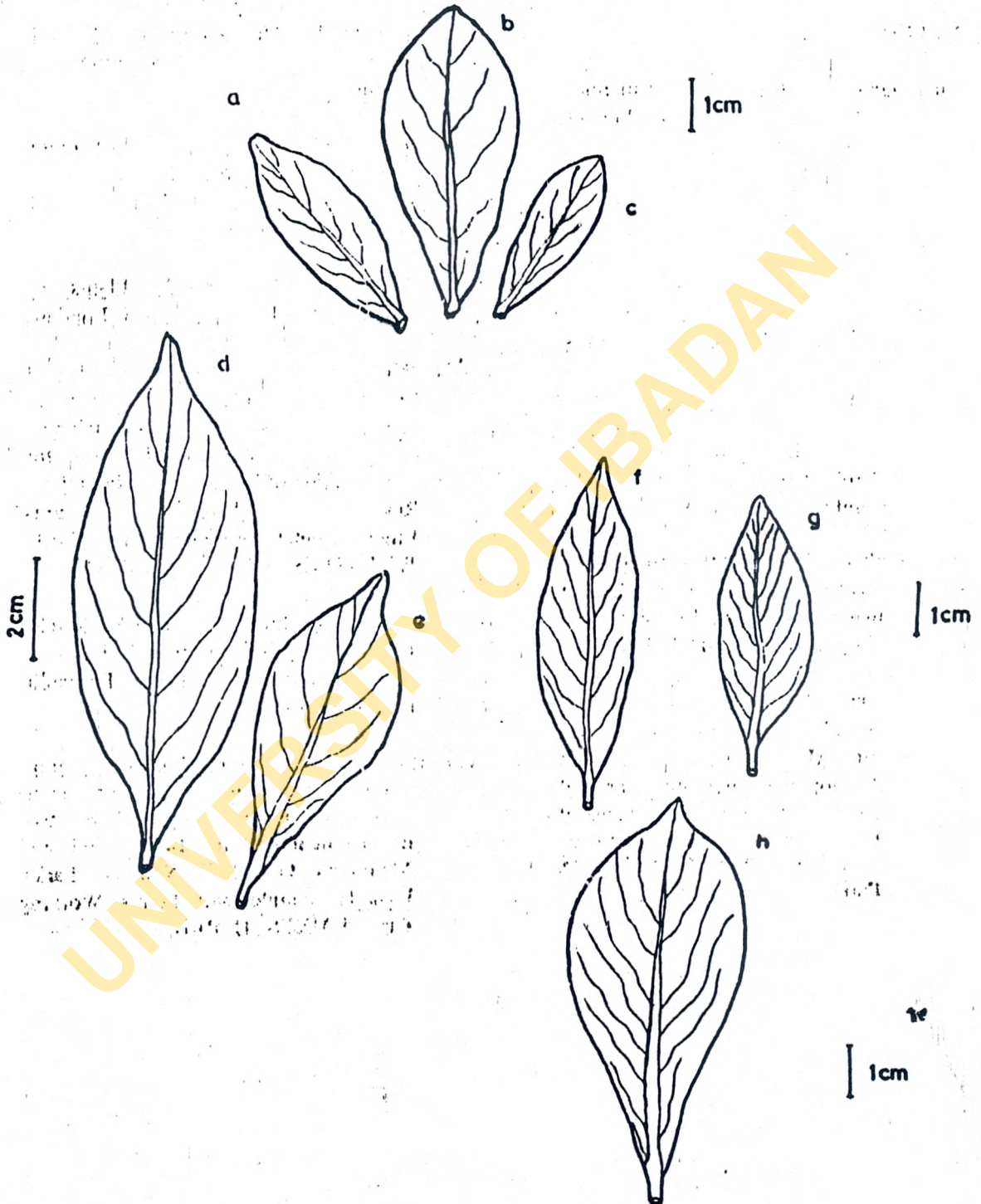


Fig. 2 Leaf shapes in the genus *Synsepalum* in Nigeria. a-c, *S. dulcificum*; d and e, *S. glycydorum*; f-h *S. stipulatum*.

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Table 1. Leaf morphological features of the genus *Synsepalum* in Nigeria

	Leaf shape	Leaf Apex	Leaf Base	Leaf Margin	Leaf		Blade Length	Petiole Length
					Length	Width		
<i>S. dulcificum</i>	Elliptic/ Oblanceolate	Acute/Rounded/ Acuminate Rarely retuse	Cuneate	Entire	7.84±0.54	3.14± 0.27	7.49± 0.51	0.35± 0.05 *
					4.80-11.00	1.50-4.60	4.50-10.30	0.10-0.70
					4.14± 0.32	1.72± 0.17	3.94±0.31	0.20±0.02 **
					2.10-5.60	0.60-2.70	1.90-5.20	0.10-0.40
<i>S. glycydorum</i>	Elliptic/ Oblanceolate	Acuminate	Cuneate	Entire	16.20±1.05	4.82±0.35	14.78±0.90	1.42±0.38
					13.90-19.50	3.70-5.80	13.00-18.00	0.60-2.80
<i>S. stipulatum</i>	Elliptic/ Oblanceolate	Acuminate	Cuneate	Entire	18.19±0.93	4.84±0.27	15.81±0.82	2.38±0.17
					9.80-29.20	2.60-6.90	8.20-25.30	1.10-4.00

All measurements in centimeter (mean ± standard error) / range.

* Mean values for mature terminal leaflets.

** Mean value for subtended leaflets