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# POLLEN MORPHOLOGY OF COMMON SPECIES OF *Sida* L. IN UYO METROPOLIS, AKWA IBOM STATE, NIGERIA AND THE TAXONOMIC IMPLICATIONS

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## ABSTRACT

Pollen morphology of eight species of *Sida* Linn. found in Uyo metropolis was studied by means of light microscope in order to establish the major morphological features. The species were *Sida acuta*, *S. stipulata*, *S. ovata*, *S. corymbosa*, *S. alba*, *S. urens*, *S. scabrida* and *Sida* sp. Matured pollen were collected from anthers of closed buds in order to eliminate contamination. The pollen was cleaned through acetolysis. Detailed morphological studies were carried out at x1000 magnification. The pollen were apolar and more or less circular to elliptic in shape, with the diameter range of 70-110 $\mu$ m. Aperture numbers ranged from 2-16 which arrangement were periporate with pseudocolpi in all the studied species. The pseudocolpi determined the shape of the pollen. The spine bases were swollen. Sculpturing type was echinate, the thickness of exine derived from sexine (2-5 $\mu$ m) and nexine (0.5-1.5 $\mu$ m). Aperture characteristics such as number and diameter, pollen size and spine height were diagnostic.

## INTRODUCTION

*Sida* (Malvaceae) plants are predominantly herbs or shrubs with fibrous stems. Leaves toothed, with stellate hairs and stipules linear to leafy. Flowers are solitary or paired, actinomorphic. Styles are as many as carpels. The species are cosmopolitan, perennial, leafy and flower during the rainy season. Pollen grains are generally stenopalynous. The knowledge of pollen morphology has been used in taxonomic revisions sometimes up to the formation of new taxa e.g. segregation of Trapaceae from Onagraceae or amalgamation of Moraceae and Cannabinaceae into Urticaceae. Bhattacharya *et al.*, (2011).

In his work on the pollen morphology of Egyptian El-Nagger (2004), said that the pollen grains in Malvaceae are usually spheroidal or globular in outline and “colporate” or porate with an echinate sculpture. Pollen exine always consists of sexine and nexine, the latter is usually thinner than the former. Spines are always evenly distributed over the surface of the grain and vary in their lengths, shapes and frequency. In spite of the Malvaceae being a stenopalynous family (Erdtman, 1957), there are high variations in pollen morphological characters such as size, aperture, spine characteristics as well as exine stratification and sculpture which can be used in taxonomy of Malvaceae (El-Nagger, 2004).

The species of *Sida* L. in Nigeria have been identified on the basis of morphological features such as carpel, floral, foliar and stem morphology (Hutchinson and Dalziel, 1958; Aworinde *et al.*, 2012). However, classification becomes uncertain when the carpels are damaged and when the plant is not in flower. There is a dearth of recent information on the status of the genus in Nigeria and little or none for this very predominant weed in Akwa Ibom State. Therefore, this study provides information on the pollen characters of species of *Sida* in Uyo, Akwa Ibom State, Nigeria.



## MATERIALS AND METHOD

Eight species of *Sida L.* were identified from collections made at the University of Uyo (annex, main and town campuses) and Shelter Afrique in Mbiabong, Uyo. Seven were fully identified to the species level while the eighth species could not fit into any of the descriptions in the key by Hutchinson and Dalziel (1958). The collections were identified and authentication at the University of Uyo Herbarium of the Department of Botany and Ecological Studies. Thereafter, the specimens were processed for storage. Opened flowers and flower buds were collected from the plants and stored in 50% alcohol in stock bottles, before the plants were taken to the herbarium.

Materials for the palynological studies were prepared by using the acetolysis method of Nyananyo (1992). The acetolysis mixture was removed by washing with glacial acetic acid distilled water. Recovering of the pollen after each wash was through centrifugation at 2000rpm. Temporary mounts of the acetolysed pollen were prepared using glycerol/alcohol (2:1) mixture. Morphological investigation of the pollen was done at x1000 using an Olympus light microscope. Pollen diameter, aperture characters and exine dimensions were studied. Measurements were done on 10 pollen grains using a calibrated ocular micrometer. Photographs were taken with a Motic micrograph unit at x400 and x1000 magnifications.

## RESULTS

The pollen morphological characteristics of the eight species of *Sida* are summarised in Table 1. The detailed pollen morphological description of each species has also been presented. Photographs are presented in plates 1-8.

Table 1: Summary of Pollen Morphological features in species of *Sida*

S/N	Taxa	Pollen Dimensions (µm)		Aperture Characters		Exine Dimensions (µm)		
		Diameter	Pore Size	Shapes of the pseudocolpus	Aper-ture number	Sexine	Sexine with spine	Nexine
1.	<i>Sida acuta</i>	73-83	4-7	Club-shaped	2-12	3-4	8-10	1-1.5
2.	<i>S. alba</i>	70-97	3-7	Triangular-Lanceolate shape	2-10	3-4	8-11	0.8-1
3.	<i>S. corymbosa</i>	75-110	4-7	Club-shaped	2-12	3-5	10-14	0.5-1
4.	<i>S. ovata</i>	78-96	2-8	Club-shaped	2-12	3-4	10-12	0.5-1
5.	<i>S. scabrida</i>	70-95	3-7	Lanceolate shape	2-10	3-4	10-13	1-1.2
6.	<i>S. stipulata</i>	73-98	4-5	Elliptic-triangular	2-16	3-4	8-11	0.8-1
7.	<i>S. urens</i>	69-100	3-7	Ovate shape	2-10	3-4	9-10	0.8-1
8.	<i>Sida sp.</i>	70-97	3-8	Broadly lanceolate shape	2-10	2-4	6-11	1-2

### Pollen Description

#### *Sida acuta* Burm. F. (Plate 1).

The pollen grains were apolar, spheroidal to elliptic in shape and 73-83µm in diameter. Apertures were 2-12 in number and periporate, and lanceolate shaped pseudocolpi were observed. The sexine was echinate with each spine and the swollen base up to 5.5µm long and thicker than the nexine.

#### *Sida alba* Linn. (Plate 2).

The pollen grains were apolar, spheroidal to elliptic in shape and 70-97µm in diameter. Apertures were 2-10 in number and periporate while pseudocolpi were lanceolate and triangular shaped. The sexine was echinate with each spine and the swollen base up to 5.7µm in length and thicker than the nexine.



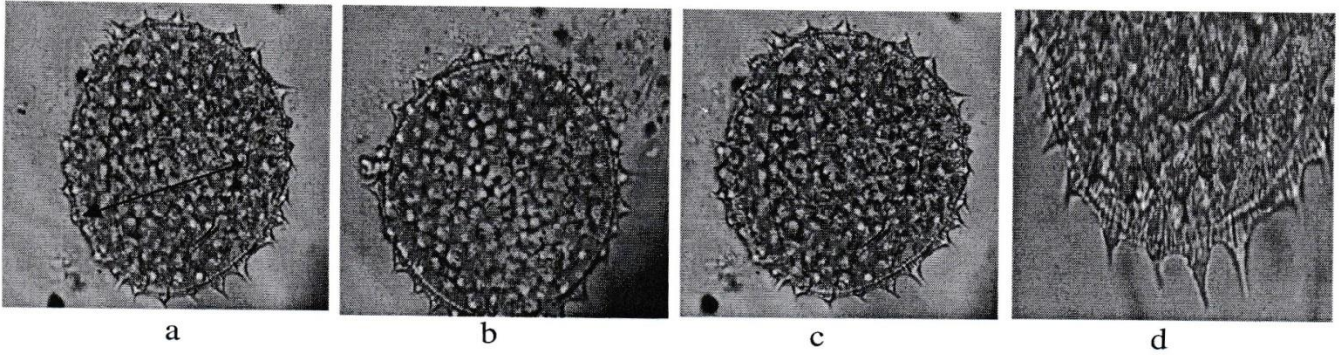


Plate 1: *Sida acuta* Burm. f.(x400) (a) a pseudocolpus- arrowed (b) echinate sculpturing type (c) pores (d) exine(x1000) showing the sexine and nexine

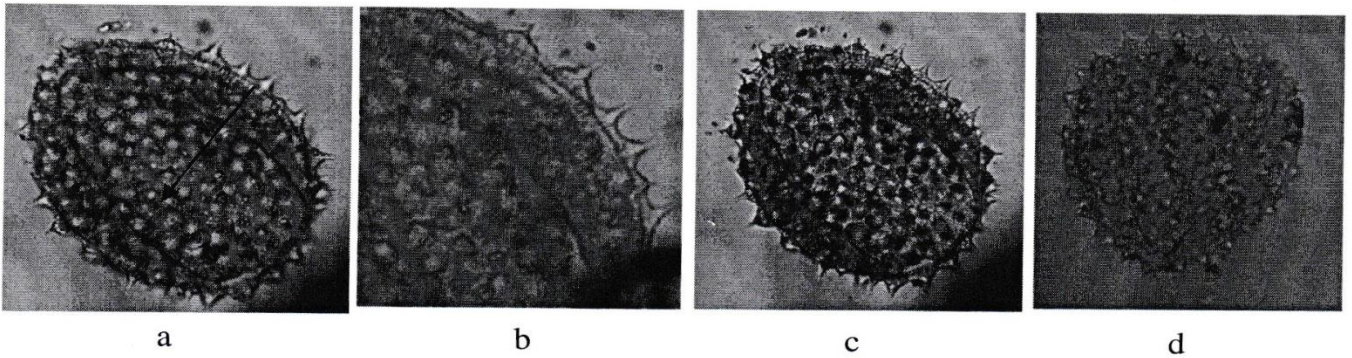


Plate 2: *S. alba* Linn. x400 (a) pseudocolpus with pore arrowed (b) exine echinate, sexine with spines and the nexine below it (x1000) (c) lanceolate shaped pseudocolpus (x400) (d) Triangularly shaped pseudocolpus (x400).

***Sida corymbosa* R. E. Fries (Plate 3)**

The pollen grains were apolar, spheroidal to elliptic in shape and 75-110 $\mu$ m in diameter. Apertures were 2-12 in number and periporate with elliptic (club) shaped pseudocolpi. The sexine was echinate with the spine and the swollen base up to 8.0 $\mu$ m long. It was thicker than the nexine.

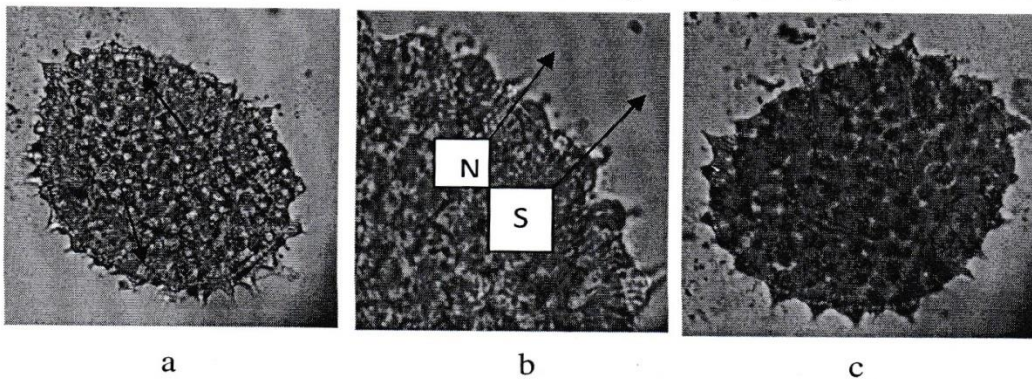


Plate 3: *S. corymbosa* R. E. Fries (a) Elliptic /club shaped pseudocolpi arrowed(x400) (b) Exine (x1000) with sexine-S and nexine-N (c) Echiniate sculpturing type (x400).



***Sida ovata* Forsk fl. (Plate 4).**

The pollen grains were apolar, spheroidal to elliptic in shape and 78-96 $\mu$ m in diameter. Apertures were 2-12 in number and the pores periporate. The pseudocolpi were ovate shaped while the sexine was echinate with the spine and swollen base up to 7.3 $\mu$ m long and thicker than the nexine.

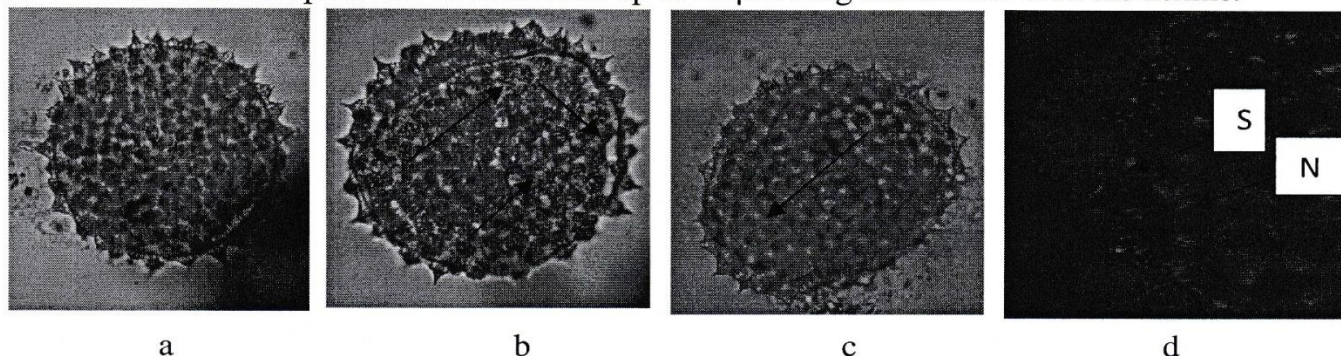


Plate 4: *S. ovata* Forsk fl. x400 (a) echinate sculpture (b) pores arrowed (c) club-shaped pseudocolpus (d) Exine(x1000) with sexine-S and nexine-N

***Sida scabrida* Wight & Arn. (Plate 5).**

The pollen grains were apolar, spheroidal to elliptic in shape and 70-95 $\mu$ m in diameter. Apertures were 2-12 in number and periporate. The pseudocolpi were elliptic-lanceolate in shape. The sexine with the spine and the swollen base were up to 7.4 $\mu$ m long and thicker than the nexine.

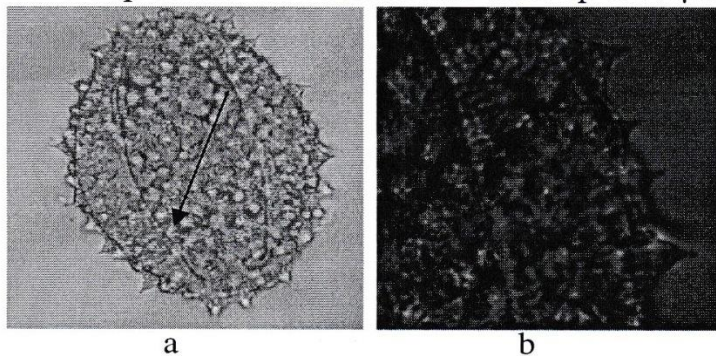


Plate 5 (a) *S. scabrida* Wight & Arn.,(x400) lanceolate –shaped pseudocolpus (b) *S. scabrida* exine (x1000)

***Sida stipulata* Cav. (Plates 6).**

The pollen grains were apolar, spheroidal to elliptic in shape and 73-98 $\mu$ m in diameter. The apertures were 2-16 in number and periporate. The pseudocolpi were lanceolate and triangular shaped. The sexine was echinate with the spine and the swollen base up to 6.7 $\mu$ m long and thicker than the nexine.

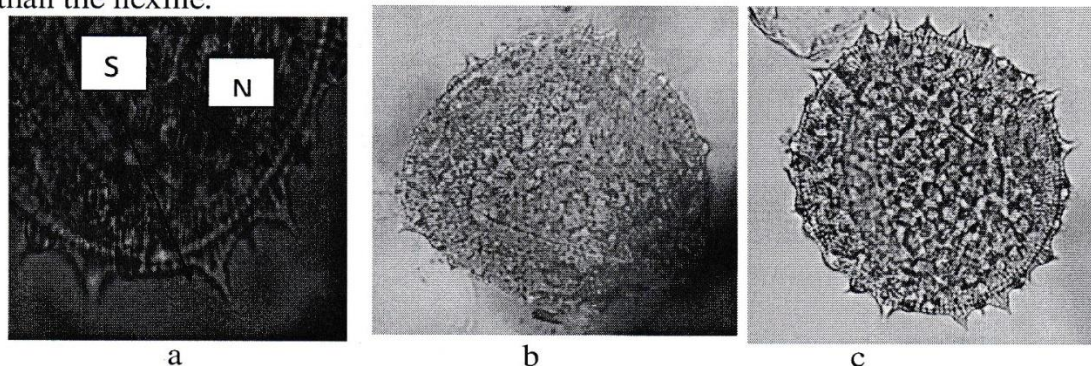




Plate 6: *S. stipulata* Cav. (a) exine (x1000) with nexine-N and sexine-S. (b) Triangle-shaped pseudocolpus(x400) (c) elliptic pseudocolpus (x400).

***Sida urens* Linn. (Plates 7).**

The pollen grains were apolar, spheroidal to elliptic in shape and 69-100 $\mu$ m in diameter. The apertures were 2-10 in number and periporate. The pseudocolpi were elliptic shaped. The sexine was echinate with the spine and swollen base up to 5.4 $\mu$ m long and thicker than the nexine.

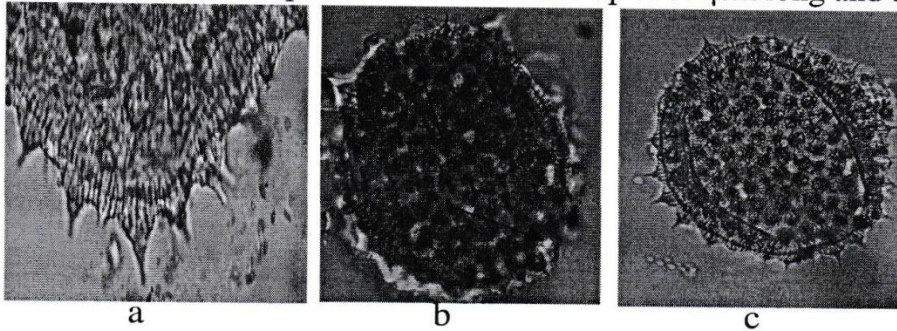


Plate 7: (a) *S. urens* Linn. Exine (x1000) - nexine and sexine (b) Pores arrowed (c) Pseudocolpus- oval shaped (x400).

***Sida* sp. (Plates 8).**

The pollen grains were apolar, spheroidal to elliptic in shape and 70-89 $\mu$ m in diameter. The apertures were 2-10 in number and periporate. The pseudocolpi were broadly lanceolate. The sexine was echinate with the spine and swollen base up to 5.3 $\mu$ m long and thicker than the nexine.

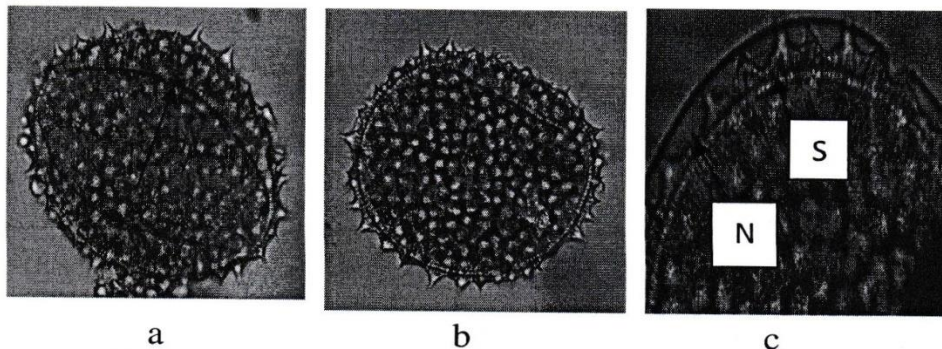


Plate 8 (a) *Sida* sp.(x400) broadly lanceolate pseudocolpus (b) *Sida* sp. Echininate sculpture type (c) Exine(x1000) with nexine-N and sexine-S.

## DISCUSSION

The pollen grains of Malvaceae are considered to be among the largest of all angiosperms (Christensen, 1986a). Pollen size among the studied taxa of *Sida* ranged from 69-110 $\mu$ m in diameter. Aperture type was periporate with pseudocolpus which is of great interest and perhaps of diagnostic value in the occurrence of varying shapes in all the species. The term pseudocolpus is preferred in this case because it renders shape to the pollen and it is apparently not a site of emergence of pollen tube as stated by Bhattacharya *et al.*, (2011) and Kremp (1968). The triangular configuration as seen in *S. alba* (Plate 2d) and *S. stipulata* (Plate 6b) is different from a regular colpus which is boat shaped as seen in *S. alba* (Plate 2), *S. scabrida* (Plate 5a) and *Sida* sp. (Plate 7a). This feature was also observed in some species of *Sida* by El-Naggar and Sawady (2008), although it was referred to as a colpus and the aperture arrangement as zonoporate.



The number of apertures observed in this work, varied from species to species but generally ranged from 2-16 and pollen size ranged from 69-110 $\mu$ m (Table 1). This observed range of number of apertures agrees with the findings of El-Naggar and Sawady (2008) and Christensen (1986b). However, Elnaggar and Sawady (2008) had a range of 50-57.5  $\mu$ m for pollen sizes in three of the *Sida* species they worked on. These differences in size may be due to differences in pollen preparation and preservation methods as reported by Erdtman (1960) and Nyananyo (1992).

Based on pore diameter, pollen diameter, number of aperture and nexine thickness *S. acuta*, *S. scabrida* and *Sida* sp. are more similar to each other than to the other five species examined in this work. It is possible that one or the other species could be the parent of the unknown *Sida* species. *S. corymbosa* on the other hand, had the largest pollen diameter (75-110 $\mu$ m), the thickest (3-5 $\mu$ m) sexine and the longest (10-14 $\mu$ m) spine.

### CONCLUSION

Pollen grains of the species of *Sida* examined in this work were all spheroidal to elliptic in shape, echinate, periporate with a pseudocolpus. The exine consisted of thicker sexine than the nexine in all cases. The aperture number and size, pollen size and spine length varied among the species and were therefore useful in delimiting the species. *S. acuta* and *S. scabrida* were found to share more pollen attributes with the unknown *Sida* sp. than the five other species.

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