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FOLIAR EPIDERMAL AND PHYTOCHEMICAL STUDIES OF THE GRASSES *Cymbopogon citratus* (STAPF.), *Axonopus compressus* (P. BEAUV.) AND *Eragrostis tremula* (S. W. BEAUV) IN EKPOMA, EDO STATE, NIGERIA.

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ABSTRACT
This study presents investigations into the epidermal and phytochemical features of *Eragrostis tremula* (S.W.Beauv.), *Cymbopogon citratus* (Stapf.) and *Axonopus compressus*.(P.Beauv.). Epidermal features of the different species in the three genera showed slight differences for both the adaxial and abaxial parts with respect to prickles, papillae, macro hairs and micro hairs. Long cells, short cells, stomata and silica bodies are almost universally present in all the three species. With respect to their phytochemical characteristic, *Cymbopogon citratus* tested positive for alkaloid, saponin, inulin, cellulose, tannin and lignin; *Eragrostis tremula* tested negative for lignin and positive for cellulose, saponin and alkaloids while *Axonopus compressus* tested negative for lignin, but positive for alkaloid, saponin, inulin, cellulose and tannin respectively. Leaf epidermal studies help to determine patterns of variation in plant species thus helping in our knowledge of such species. It is useful in determining their different morphological, epidermal and phytochemical characteristics thus helping in the assessment of its values in species identification, classification and in establishing a taxonomic relationship between different species being studied.

Keywords: Foliar, epidermal, phytochemical, genera, biosystematics.

INTRODUCTION
Grasses are worldwide in distribution and exhibit great variations in size and shape. Economically, they are the most important flowering plants on earth and provide more than three quarters of the energy and more than half of the protein in food, consumed by humans (Mensah, 1990). They also provide food for wild life and domesticated animals. Grasses belong to the family of flowering plants and plants called Poaceae or Graminae. The family is one of the largest and is economically the most important of all plants that cover the earth. It is divided into about 50 tribes, 660 genera and 10,000 species (Lowe, 1989). In West Africa, there are approximately 147 genera and 615 species (Gill, 1988).

The economic importance of *Eragrostis tremula* includes its use in the improvement of memory (Tolu, 2006). *Cymbopogon citratus* (Lemon grass) is used in aromatherapy due to the strong and sweet aroma present in it. It deodorizes and is an effective antiseptic. It is excellent for tired and aching feet. Lemon grass oil obtained from *Cymbopogon citratus* may be used in the treatment of acne, athlete's foot, excessive oily skin, scabies and stress (Folorunso & Oyetunji, 2007). *Axonopus compressus* is also notable for its use in the treatment of malaria fever among other uses (Busia, 2007).

Several studies have been conducted on other genera and tribes belonging to the family Poaceae using leaf epidermal and anatomical features (Sharma & Salam, 1984; Sharma & Mittal, 1985; Gill & Mensah, 1993; 2001; Kharazian, 2007).

The aim of this study is to determine the patterns of variation in the grasses *Eragrostis tremula (*S.W.Beauv.*)*, *Cymbopogon citratus (*Stapf.*)* and *Axonopus compressus*.(P.Beauv.) in terms of their leaf epidermal and phytochemical characteristic, assess their values in species identification and classification and also use the epidermal studies in establishing a taxonomic relationship between them.

MATERIALS AND METHOD
Fresh and matured leaves of *Eragrostis tremula* were collected along the road in Idumebo street Ekpoma, while leaves of *Cymbopogon citratus* and *Axonopus compressus* were collected at Ileh quarters, Ekpoma, Edo State. They were first boiled in water to restore to their normal shape. The tissue above the epidermis was gradually scraped away with a safety razor blade and during this operation, the leaf was continuously irrigated with commercial Jik. The epidermal peels were then washed in water, stained with 1% safranin solution in 50% alcohol and temporary mounts viewed under the microscope. The terminologies for the epidermal morphology are that of Metcalfe (1960) and Van Cottem (1973).

Phytochemical study: Chemical tests were carried out on the samples for the presence of alkaloids, lignin, saponin, tannins, inulin and cellulose following procedures by Johnson (1940).

RESULTS
The results of leaf epidermal and phytochemical studies are presented in Tables 1 and 2.

***Cymbopogon citratus* (Stapf)**
Abaxial surface: The anticlinal wall was straight with infrequent dome shaped stoma between the veins; paracytic stomata types were seen. Both micro and macro hairs were absent. Prickle hairs were present mostly with pointed tip and rather elongated, swollen bases; very frequent to numerous and arrange in rows. Long cells are rectangular, conspicuously elongated (many times longer than broad); 5 – 7 rows between the veins; cell wall wavy; papillae not visible. Short cells are present over and between the veins; solitary and sometimes, paired; arranged in rows of 2 – 3 cells.

Adaxial surface: The anticlinal wall was wavy. Its silica body visible, mostly cross shaped. It lacks macro hair but micro hair were visible. The long cells were rectangular, slightly elongated (longer than broad); 8 – 10 rows between the veins; the long cells have thin, wavy walls. The short cells were mostly solitary, sometimes paired and arranged in rows of 4 – 6 cells. The prickle hairs were seen frequent to numerous with pointed tip and elongated swollen bases.

***Axonopus compressus* (SW. Beauv)**
Abaxial surface: It composes of long rectangular cells conspicuously elongated (many times longer than broad); 5 – 6 rows between the veins, cell wall wavy; papillae not seen. The short cells were present over and between the veins; solitary and

sometimes paired, arranged in rows of 2 – 3 cells. Prickle hairs were few. Micro hairs and silica bodies were present often dome shaped with straight anticlinal walls.

Adaxial surface: Macro and Micro hairs were not visible, prickle hairs are visible, frequent to numerous with pointed tip and elongated swollen base. Its anticlinal walls are wavy, silica bodies are visible, often dome shaped mostly cross shaped, long cells are rectangular, slighty elongated (longer than broad), 8 – 10 rows between the veins, the long cells have thin, wavy walls. The short cells were mostly solitary, sometimes paired and arranged in rows of 4 – 6 cells.

TABLE 1. SUMMARY OF LEAF EPIDERMAL FEATURES

Plant species	Surface	LC	SC	PH	MH	ST	MAH	AW	SB
Cymbopogon citratus (Stapf)	AB	+	+	+	-	+	-	S	DS
	AD	+	+	+	+	+	-	W	CS
Axonopus compressus (SW. Beauv)	AB	+	+		+	+	-	S	DS
	AD	+	+	+	-	+	-	W	DS
Eragrostis tremula (P. Beauv)	AB	+	+	-	-	+	-	S	CS
	AD	+	+	-	-	+	-	S	CS

AB	= Abaxial Surface	AD	= Adaxial Surface
LC	= Long Cell	SC	= Short Cell
PH	= Prickle hair	IC	= Intercoastal zone
MH	= Micro hairs	MAH	= Macro hairs
ST	= Stomata	AW	= Anticlinal wall
SB	= Silica body	S	= Straight
W	= Wavy	DS	= Dome Shaped
CS	= Cross Shaped		
Present	= +		
Absent	= -		

TABLE 2. PHYTOCHEMISTRY OF THE SPECIES STUDIED

Species	Inu	Cel	Tan	Sap	Alk	Lig
Cymbopogon citratus	+	+	+	+	+	+
Axonopus compressus	+	+	+	+	+	-
Eragrostis tremula	+	+	+	+	+	-

Inu	= Inulin	Cel	= Cellulose
Tan	= Tannin	Sap	= Saponin
Alk	= Alkaloid	Lig	= Lignin
Present	= +		
Absent	= -		

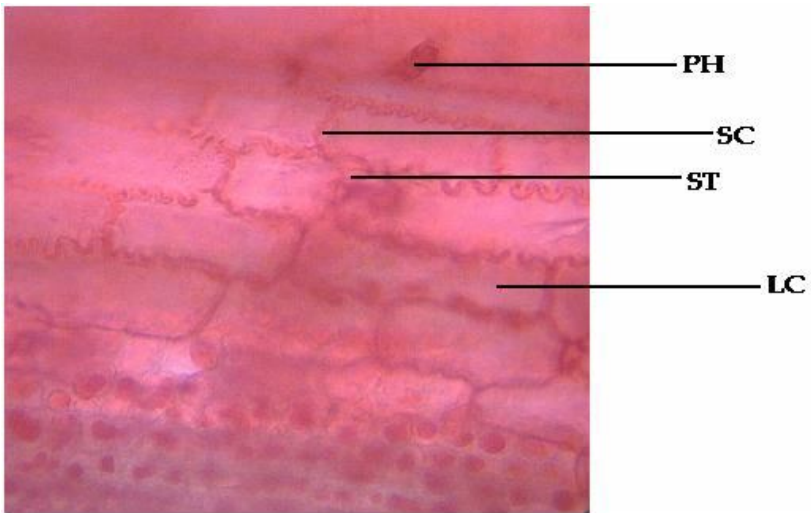

PLATE 1A ABAXIAL SURFACE OF *Cymbopogon citratus*.

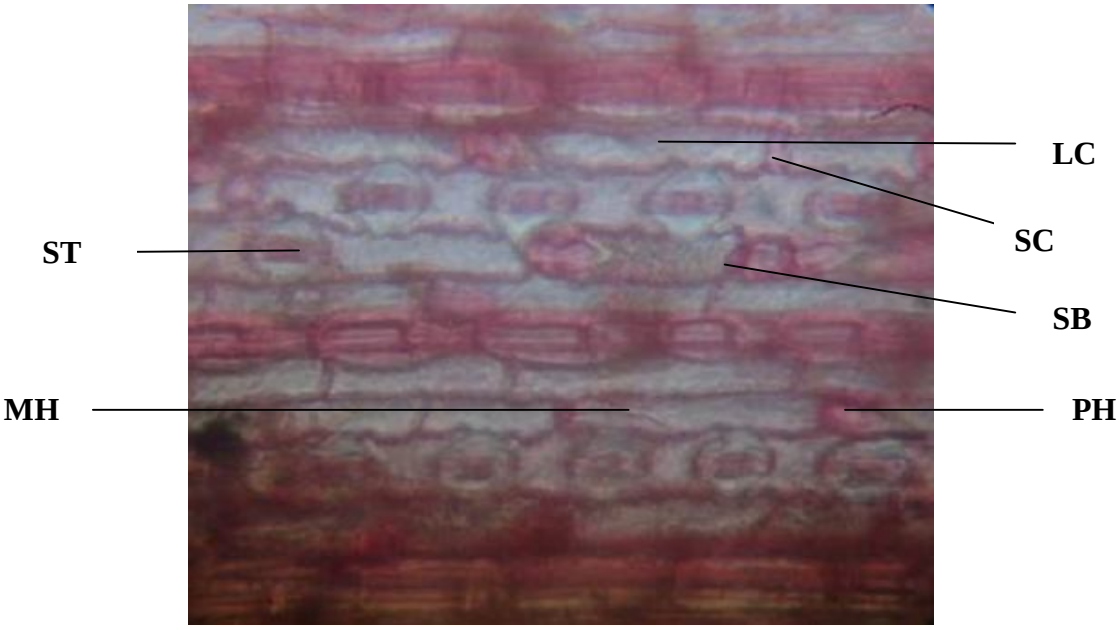

PLATE 1B ADAXIAL SURFACE OF *Cymbopogon citratus*.

PLATE 2A ABAXIAL SURFACE OF *Axonopus compressus*

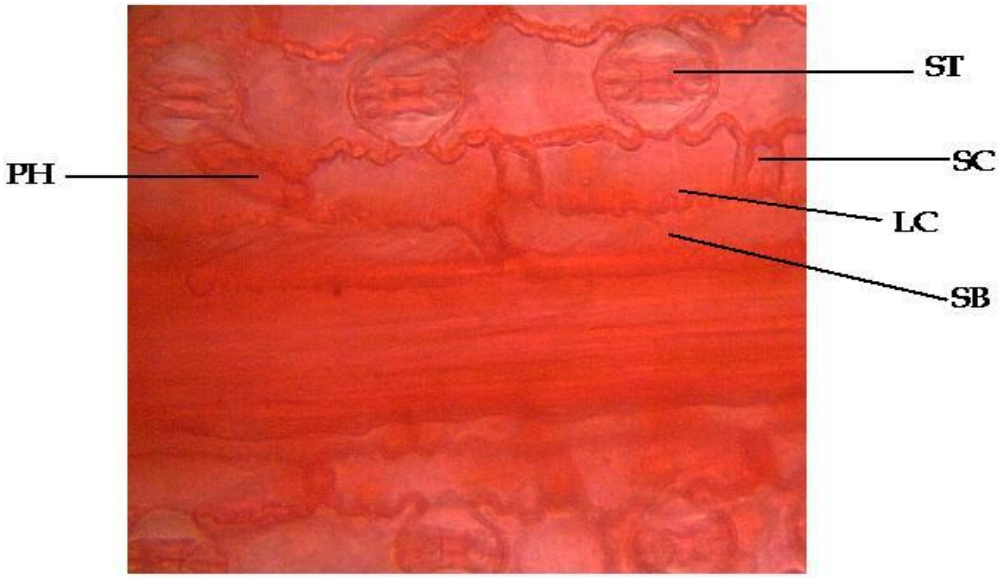

PLATE 2B ADAXIAL SURFACE OF *Axonopus compressus*

***Eragrostis tremula* (P. Beauv)**

Abaxial surface: The macro hairs were not seen, prickle hairs not visible. Stomata are large, infrequent, dome shaped banded between the veins. Paracytic stomata type is seen. Few micro hairs were seen, anticlinal walls straight and silica bodies also present. Long cells were rectangular conspicuously elongated (many times longer than broad) 5 – 8 rows between the veins, cell wall straight, papillae not visible. The short cells were present over and between the veins, solitary and sometimes paired, arranged in rows of 2-3 cells.

Adaxial surface: The anticlinal walls were straight, micro and macro hairs not seen. Silica bodies were seen, stomata large, frequent, dome shaped; banded between the veins; paracytic stomata type seen. Short cells were mostly solitary, sometimes paired and arranged in rows of 4 – 6 cells. The long cells were rectangular, slightly elongated (longer than broad); 8 – 10 rows between the veins; the long cells have thin, straight walls.

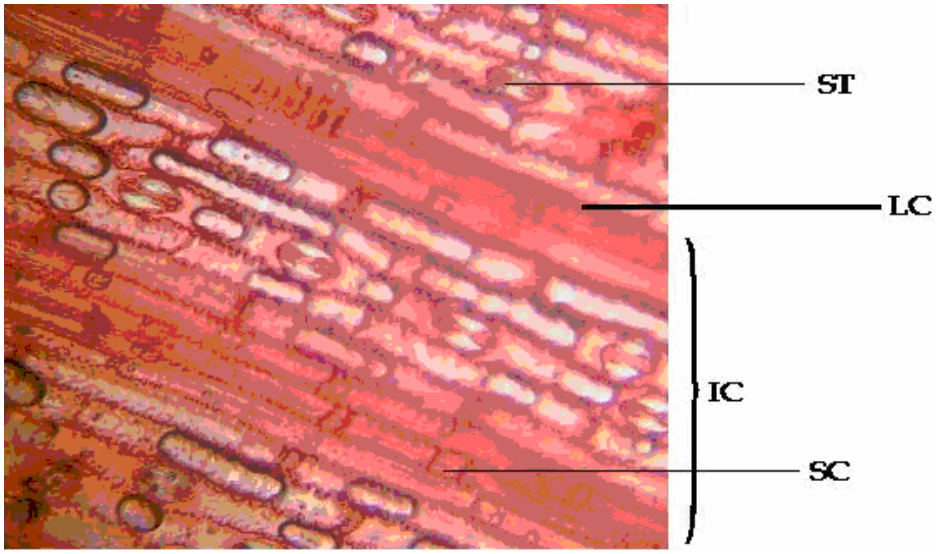

PLATE 3A ABAXIAL SURFACE OF *Eragrostis tremula*

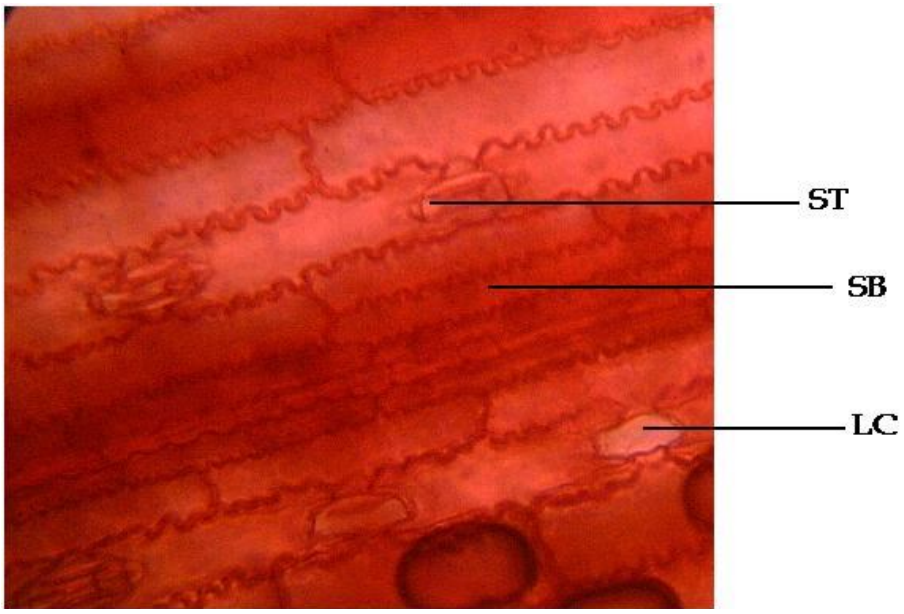

PLATE 3B ADAXIAL SURFACE OF *Eragrostis tremula*

DISCUSSION

The leaf epidermal layers of *C. citratus, A. compressus* and *E. tremula* showed significant degrees of variations in terms of the anatomical characters found in them.

The anticlinal walls for both the adaxial and abaxial parts were straight and wavy respectively. The character of diagnostic importance in the identification of *C. citratus* is micro-hairs, which were sparsely distributed in the adaxial epidermis. This character along with the fact that *C. citratus* is aromatic clearly separates it from the other two genera. In addition, abundance of stomata was observed on the adaxial epidermis of this plant and was found to be sparsely distributed on the abaxial epidermis; this could be as a result of respiratory activities which occurred more frequently in the adaxial part compared to the abaxial portion.

The epidermal features of *E. tremula* observed in this study shows similarities with that of Sharma & Mittal (1985) which reported variability of hair both on the leaf sheath and margin of the leaf blade. Micro hairs however were absent from its adaxial parts.

In *A. compressus*, prickle hairs were present in both the abaxial and adaxial parts, the anticlinal walls for both abaxial and adaxial parts were straight and wavy respectively, micro hairs were absent from its adaxial parts. Silica bodies, long cells, short cells and stomata were present in all the three genera studied but were found to be most abundant for both the abaxial and adaxial parts in *A. compressus* and *E. tremula*. This could probably be the reason why *A. compressus* and *E. tremula* can survive longer periods of drought for their high moisture retaining ability.

Macro-hairs were present in the costal and intercostals zones of the three species. The reason for this could probably be due to the presence or absence of hairs on the leaf margins of the grasses studied. Stomata were restricted to the intercostals zones for both

the abaxial and adaxial surfaces. The stomata are typically grass-like with two subsidiary cells (amphistomatic) for the three genera.

Leaf epidermal studies have proved to be very important in providing information of taxonomic importance. The study and identification of characters such as macro-hairs, prickles, micro-hairs, distribution of stomata, nature of long cells, silica bodies and surface view of the leaves afford us the opportunity to classify and identify grasses into their various tribes and genus and thus adds to our knowledge on the biosystematics of grass species.

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