Available on line www.jocpr.com

Journal of Chemical and Pharmaceutical Research

J. Chem. Pharm. Res., 2010, 2(4):449-455

ISSN No: 0975-7384
CODEN(USA): JCPRC5

Comparative Foliar Epidermal Studies in *Cymbopogon citratus* and *Cymbopogon schoenanthus* In Sudan

[1]Ahlam Salih Eltahir*, [2]Bouran Ibrahim AbuEReish

[1]Department of Botany, Faculty of Science and Technology
Omdurman Islamic University
[2]Department of Botany, Faculty of Science, University of Khartoum

ABSTRACT

Detailed microscopical studies of the leaf epidermis of Cymbopogon citratus and Cymbopogon schoenanthus which are Sudanese folkloric medicines were carried out. It had been found that there are large numbers of hairs of different types: simple, unicellular, glandular and non-glandular hairs scattered in the adaxial and the abaxial surfaces of the leaf. The epidermal cells in surface views are elongated and they are interrupted by stomata of Graminae Cypraceae type with dum-bell shaped guard cells. The cell walls of the epidermal cells of C. citratus are straight where as the cell walls of C. scheonanthus epidermal cells are wavy. Scanning electron microscopy showed that the surfaces of the two species contain large quantities of wax, with larger quantities of wax in C. citratus compared to S. scheonanathus. They are covered with silica depositions and they are longer on C. citratus. The stomata are elongated with raised rim and very long narrow apertures.

Key words: C*ymbopogon citratus schoenanthus* epidermis microscopical

INTRODUCTION

This study is aimed to provide valuable and reliable illustrated anatomical descriptions of the epidermis of the leaves of *Cymbopogon citratus* Dc. Stapf and *Cymbopogon Schoenanthus* (L.)Sprengel,pl.Min.Cog. Pugil Prim 2:15 (1815) Family Poaceae(Graminae) and to outline the differences between them. These plants were selected for their great importance in Sudanese

folkloric medicine and for proper authentication of crude drug material which is standard of safety and quality to be maintained because most of the drugs that are extracted from leaves, barks, roots and rhizomes may be difficult to identify from their macroscopical appearance only; they must be complemented by microscopical characterization [1]. The microscopical features of the medicinal plants were studied for their great values to outline the diagnostic features; thus helping to identify, classify and to distinguish between similar species to avoid adulteration . Following the works of [2] and [3] which today serve as standard references to plant anatomy, the use of vegetative anatomical characters in taxonomy became a routine procedure.

The plants selected for the present study, had been subjected to many studies concerning their chemical constitutents and their activities. The yeild and composition of the essential oils from *Cymbopogon schoenanthus* varied widely at differnet stages of plant development and in plants from different habitats [4]. Exposure to sunlight increased oil contents in the leaves of *Cymbopogon citratus* and the citral contents in the leaves was maximum on the fifth day of drying [5]. The C*ymbopogon citratus* oil possess gram positive and gram negative antibacterial activity [6]. *Cymbopogon proximus (schoenanthus*) is used in Egypt as a renal antispasmodic agent, elemol and beta-eudernal were isolated [7]. The essential oil of *Cymbopogon citratus* leaves was extracted by hydrodistillation in a clevenger apparatus, mean essetnaial oil contents of the blade and sheath were 0.42 and 0.13% respectively, citral contents of the blade and sheath essential oils were 87.28 and 82.39% respectively [8]. The minimum inhibition concentration and minimum lethal concentration values of lemon grass (*Cymbopogon citratus*) oil were higher than those of citral unsaponifiable fraction of the fatty material [9]. The essential oil of *Cymbopogon citratus* leaves exhibited activity against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli* and *Pseudomonas aeruginosa* [10].

Economically , the grasses family are probably of greater importance than any other plant family, fodder for domestic animals, food for man, sugar and molases, cornstarch and by-products. Shelter (bamboo), industrial uses like corn products, news paper prints and other papers, ethyl alcohol and derivatives and as ornamentals [11].

Description of the studied plants:

Cymbopogon citratus Dc. Stapf. Vernacular names: Lemongrass, Citronella grass, seri(Eng) Is a perennial herb, erect, 80 cm. long, short underground stems. Leaves simple, alternate, linear, 5.0-7.0 cm.long. 0.5-1.5cm. wide, sheathed, apex acute, parallel venation, central vein appear more in lower epidermis .Inflorescence spike, highly branched 3.0-6.0 cm. Long . It is cultivated in some places of Sudan. The plant is used in Antitumour formation, tranquilizer, Pebbles and Kidney diseaeses[12]. *Cymbopogon citratus* is used both as a medical herb and in perfumes.

Cymbopogon Schoenanthus (L.)Sprengel,pl.Min.Cog. Pugil Prim 2:15 (1815**)** Synonyms: *Andropogon schoenanthus* L., sp. Pl.: (D 461753); sub sp. *proximus(*Hochst. Ex A Rich.) Maire and weiller, Fl. Afr. Nord 1:287(1952); *A. proximus* Hochst. Ex A. Rich . Tent . Fl. Abyll.2:464 (1815); *Cymbopogon proximus* (Hochst. Ex A. Rich.) stapf in F.T.A. 9:271 (1919). Vernacular names: Camel's Hay (Eng.), Maharabe (Ar.) It is a perennial herb, erect, tufted 9cm. long, culms slender,erect,glabrous 3-4 noded. Leaf simple, alternate, linear 5-7 cm. long., 1cm. wide, sheathed apex spiny entire .Inflorescence spikelets highly branched. 5 cm. long. Distributed in Central and Northern Sudan. The plant is used in gout, prostate inflammation, kidnediseases, inhibit kidney shrinkages, anthelmentic and for stomach pains [12]

EXPERIMENTAL SECTION

Methods:

1. **Epidermal tissue system:**

samples were taken from the leaves of the studied plants from identical regions (midrib regions) of the adaxial and abaxial surfaces of each leaf. The epidermis of the fresh leaves was peeled off or scraped with a razor blade. The epidermal peels were mounted in 10% aqueous glycerin and examined. The stomatal index was calculated using the formula (S/E+S)x 100 whereas S: number of stomata in an area and E: number of epidermal cells in the same area [3]

2. **Scanning Electron Microscopy**

For each species abaxial and adaxial leaf lamina surfaces were examined using scanning electron microscopy techniques. Observations were taken at 400 and 4000 magnifications. This work was carried out by carbonal – Illionis- USA in the Electron Microscopy Unit of South Illionis University. The speciments were mounted on circular stubs with double-sided tape, coated with gold to a thickness of 20 to 25nm. and examined on a Cambridge "Stereoscan" MK 11A SEM at an acceleration potential of 10KV. Selected areas were photographed and printed on a CD.

3. Palisade ratios:

Segments of 3-4 mm from each of the studied plant leaves were soaked in equal amounts of chloral hydrate and phenol in test tubes, boiled in a water bath for about 15-20 minutes, mounted in the same reagent and examined. The palisade ratio which is the number of palisade cells beneath one epidermal cell was calculated. Four readings were taken and then the average value was calculated.

4. Powders of the dry plant leaves:

The powders of the dry leaves of the studied plants were cleared in chloral hydrate solution, mounted in 10% aqueous glycerin, covered with a cover-slip and examined to outline the diagnostic features of the plants in powdered conditions.

The prepared slides were examined using (Leitz Dialux 22 EB) microscope. The eye piece lens was (x10) whereas the objective lenses were (x4, x10 and x25). Measurements were carried out for all materials studied using the eye piece micrometer which was calibrated using the stage micrometer. Ten readings were carried out for each parameter and then the mean value was calculated. Drawings were made for the temporary slides using the drawing tube fitted in the microscope.

The prepared slides were photographed using (Leitz Dialux 20) microscope fitted with (Wild PMPS II) camera, using Kodak coloured films 36 ExP. 24 x 36mm ISO 100/21o.

RESULTS AND DISCUSSION

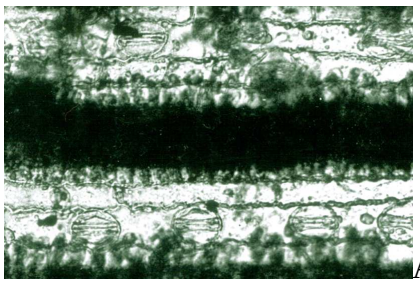
Epidermal surfaces

The epidermal cells of the leaves in surface views are elongated and they are interrupted by stomata of Graminae Cypraceae type with dum-bell shaped guard cells . The cell walls of the epidermal cells of *C. citratus* are straight where as the cell walls of *C. scheonanthus* epidermal cells are wavy (plate 1 and 2). The epidermal hairs are simple, unicellular, multicellular non-glandular hairs . The characters of diagnostic importance in the identification of *C. citratus* were outlined [13] they are the micro hairs, which are sparsely distributed in the adaxial epidermis and prickle hairs present in both abaxial and adaxial epidermis. Calcium oxalate crystals are

found scattered in the section. The structures of the abaxial and adaxial cells are the same with few differences in epidermal cell size, stomatal index, hair lengh and crystal size. [14] reported that the silica and calcium oxalate present in *Graminae* have a protective function.

Scanning electron microscopy showed that the surfaces of the two species contain large quantities of wax (plate 3 A and B) , with larger quantities of wax in *C. citratus* compared to *C. scheonanathus*. The adaxial surfaces of the two species are denser with wax (with large lumps) small conical hairs are projecting from *C. schoenanthus* , they are covered with silica depositions and they are longer on *C. citratus*. The stomata are elongated with raised rim and very long narrow apertures.

Diagnostic features of the powders of the dry leaves:
The powdered forms of the dry leaves of *C. citratus* and *C. schoenanthus* are brownish green in color with strong characteristic smells. They contain the following features (Fig.1), epidermal cells in surface views including stomata with dum-bell shaped guard cells, crystals of calcium oxalate. Epidermal cells with wavy cell walls in *C. schoenanthus* and straight in *C. citratus*. Oil droplets are found in large quantities, they give positive results with Sudan III stain. Parenchyma cells are also clear in surface views. The powders of the two species can be distinguished by the presence of large epidermal cells with wavy cell walls and large stomata in *C. citratus*. The *C. schoenanthus* powder is distinguished by the presence of large numbers of short conical-shaped epidermal hairs projecting from the epidermal cells.


A


B

Plate: 1

. Epidermal surface views of (A)adaxial and (B)abaxial of *C. citratus*X400


A

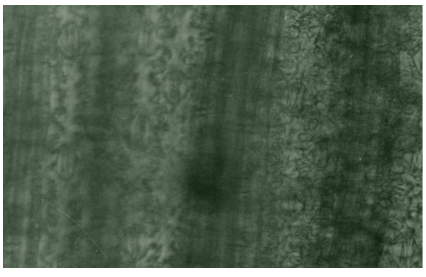

B

Plate: 2

Epidermal surface views of (A)adaxial and (B)abaxial of *C. schoenanthus* X400

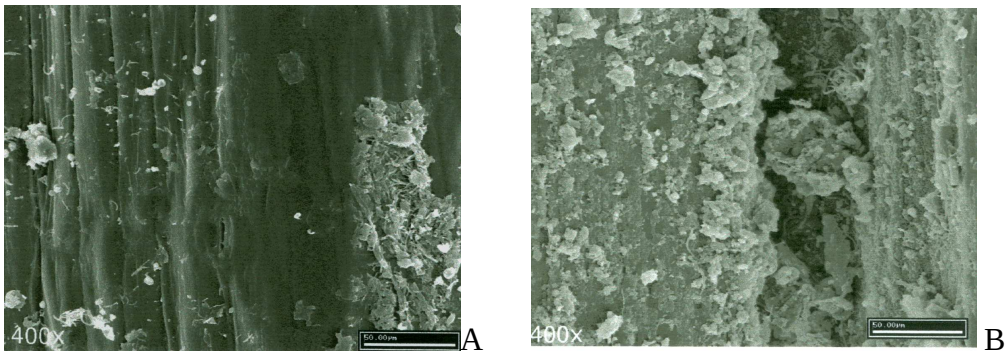


Plate: 3 Scanning electron microscopy of the epidermis of leaf of *C. citratus*
A: abaxial surface B: adaxial surface

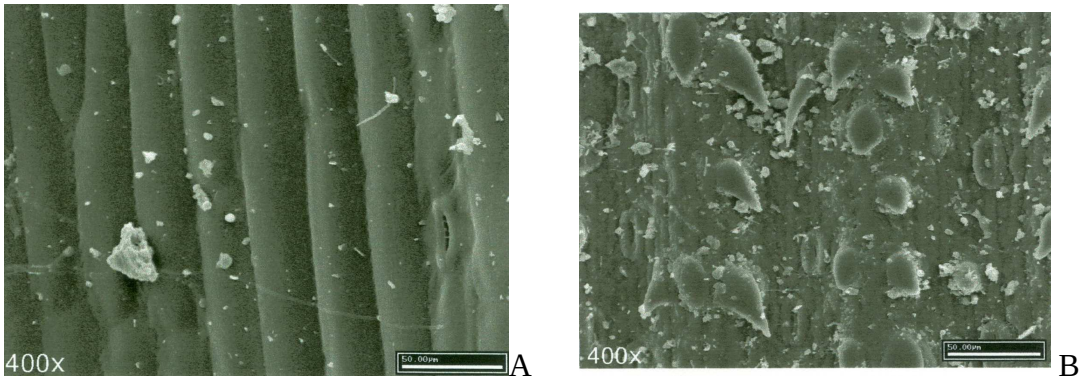


Plate: 4 Scanning electron microscopy of the epidermis of leaf *C. scheonanathus*
A: abaxial surface B: adaxial surface

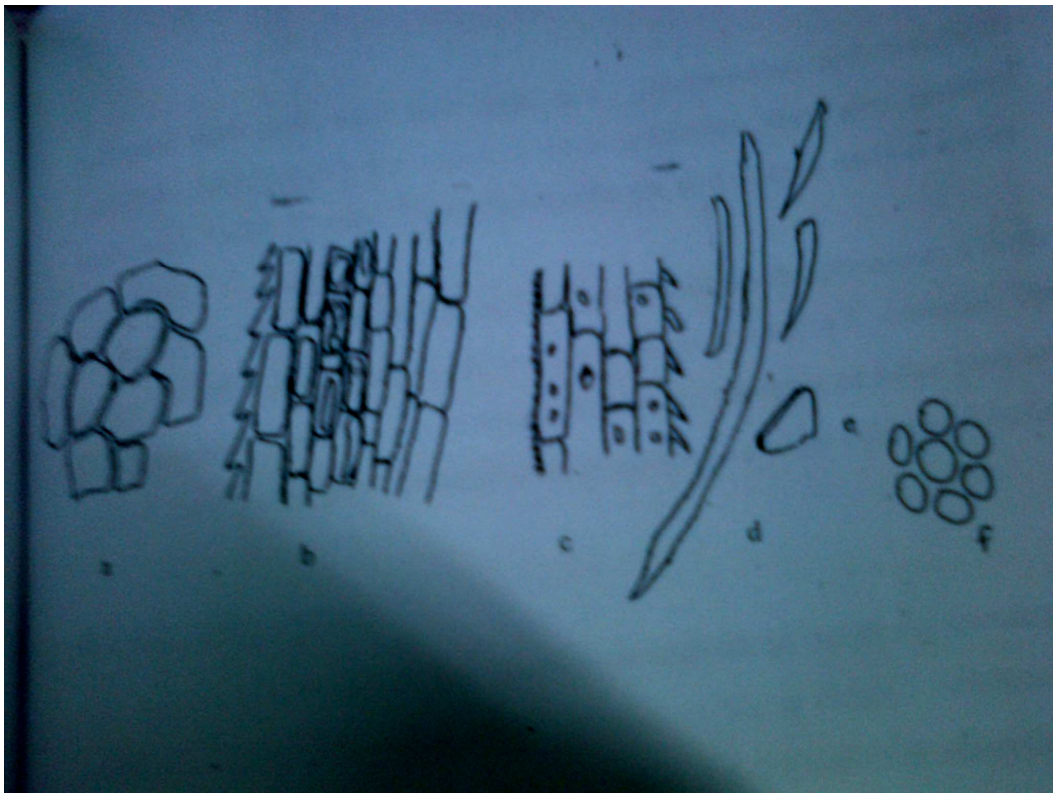


Fig: 1. diagnostic features of the powder of the dry leaves (100) of *C. citratus*
a. ,b. and c. different types of epidermal cellsin surface view. D. epidermal hairs e. cacium oxalate crystals f. oil droplets.

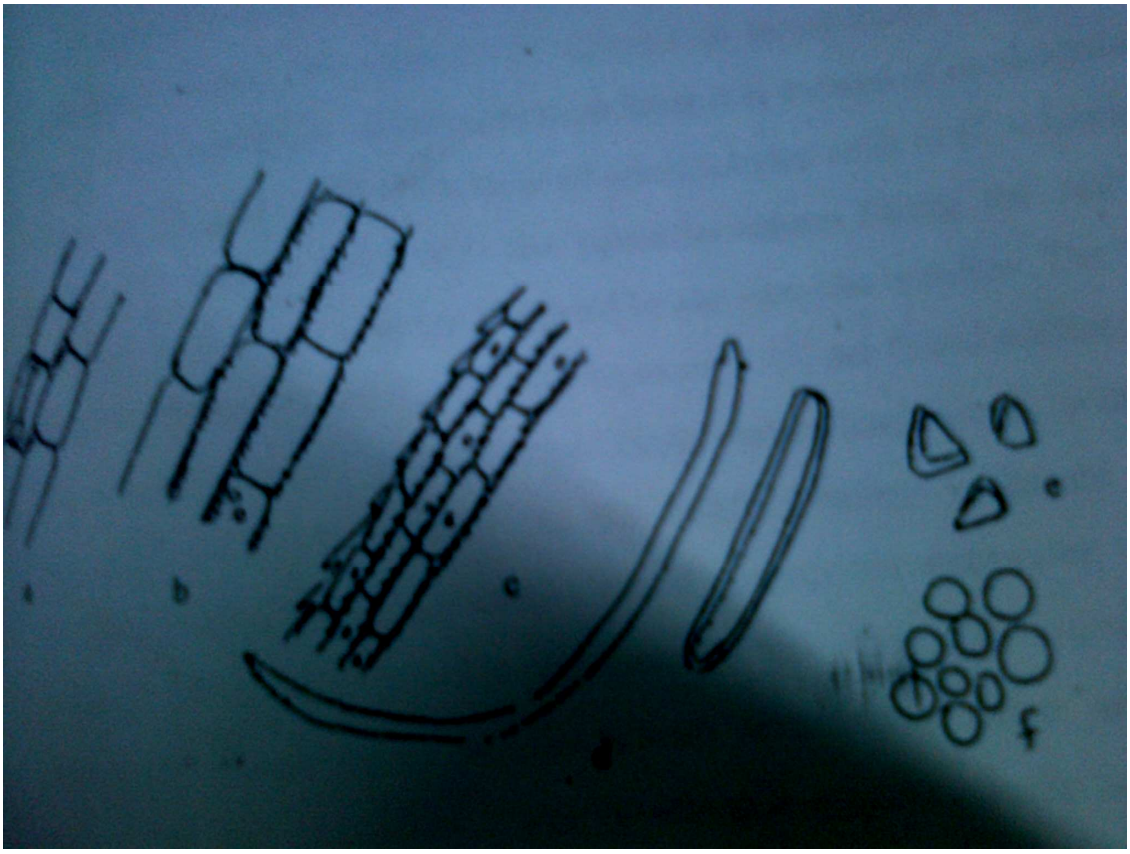


Fig: 2. diagnostic features of the powder of the dry leaves (100) of *C. schoenanchus* .
a. ,b. and c. different types of epidermal cellsin surface view. D. epidermal hairs e. cacium oxalate crystals f. oil droplets.

REFERENCES

[1] Cutler, D.F. Applied Plant Anatomy. Ist edition Longman LTD, London , **1978**
[2] Metcalfe C. R. and Chalk, L. Anatomy of the Dicotyledons. Leaves, stems and wood in relation to taxonomy with notes on economic uses, Oxford. Clarendon press, **1950**.
[3] Metacalfe C. R. and Chalk L. Anatomy of the Dictyledons Vol. I second edition , Clarendon press, Oxford, **1979**
[4] Banthorpe, D. V. ; Duprey, R. Y. H. ; Hassan, M. ; Jones, J. F. and Madawi, B. M. *Planta Medica*, **1976**, 29 (1) 10-19.
[5] Hussein, A. S. M. ; Yankov, L. K.. *Fitoterapia*, **1984** 55(6). 368-9.
[6] El Tayeb, M. E. Studies of some aromatic plants growing in the Sudan. M. Sc Thesis. Pharmary. University of Khartoum,**1985**.
[7] Elgamal, H. H. and Wolff, P. *Planta Medica*, **1987**. 53:3, 293-294.
[8] Ming, L. C.; Figueirdo, R. O.; Machado, S. R. ; Andrade, R. Mc.; Craker, L. E. ; Nolan, L. and Shelty, k. 27-30 *Acta-Horticulturae*, **1996**. No 426, 555-559.
[9] Wannissorn, B. ; Jarkasem, S. and Soontorntanasart, T. *Phytotherapy-research*, **1996**. 10:7. 551-554.
[10] El Kamali, H.H. ; Ahmed, A. H.; Mohammed, A. S.; Yahia. A. A. M.; El Tayeb, I. And Ali, A. A., *Fitoterapia*, **1998**. 69(1)
[11] Lawrence G. M. Taxonomy of Vascular Plants, Oxford BH Publishing Co. New Delhi, **1951**

[12] ElGhazali .G.E.B. ; El tohami, M. S. , El Egami, A. A. B..,Abdalla W. S.and Mohamed, M.G.. Medicinal plants of the Sudan. Medicinal plants of Northern Kordofan , Omdurman Islamic University press. Omdurman **1997**
[13] Folorunso A. E., O. A. Oyetunji. *Not. Bot. Hort. Agrobot. Cluj,* **2007** Volume 35, Issue 2.
[14] Thomas, M. ; Ranson, S. L. and Richardon, *J. A. Plant Physiology*, 5th edition, Longman Group LTD London, **1973**.