

Foliar epidermal features of the genus *Ctenolepis* hook. f. (Cucurbitaceae) of India

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Abstract

The comparative studies on foliar epidermal features of two uninvestigated species *Ctenolepis cerasiformis* (Stocks) Hook. f. and *C. garcinii* (Burm. f.) Naudin is carried out. The differences were observed in morphology as well as in epidermal anatomy. *Ctenolepis cerasiformis* is found to be hypostomatic whereas *C. garcinii* is amphistomatic. Stomatal index on abaxial side of *C. cerasiformis* is 17.37 ± 0.16 and on abaxial side of *C. garcinii* is 19.07 ± 0.41 while it on adaxial side was 6.72 ± 0.74 . The stomatal index was found higher on abaxial side in *C. garcinii*. The stomata on adaxial side of *Ctenolepis garcinii* are found to be larger (length- 35.43 ± 2.57 and breadth- 22.99 ± 0.70).

Keywords: foliar, epidermal, genus *Ctenolepis*, cucurbitaceae

Introduction

The family Cucurbitaceae is also known as gourd family. The family is represented by 97 genera and 990 species and throughout world (Mabberley, 2017) [22] while in India, it is represented by 31 genera and 94 species (Renner & Pandey, 2013) [28]. There are four species of *Ctenolepis* recorded worldwide among them two have been reported from India (Mabberley, 2017; Renner & Pandey, 2013,) [22, 28]. The Cucurbitaceae is an economically very important and the members of Cucurbitaceae are used variously as food, fodder and in medicines. (Britannica, T., 2021; Esquinas-Alcazar & Gulick, 1983; Prohens & Nuez, 2008; Salehi *et al.*, 2019) [21, 15, 26, 32]. Plants are mostly classified on the basis of limited characters like external morphology which are not available all the time. So, for more understanding the taxonomic characterization, there is a need to study different field characters like anatomical features of leaves and are to be involved in plant taxonomy (Davis & Heywood, 1963) [11]. The epidermal features of leaves are taxonomically significant in Cucurbitaceae (Bates & Robinson, 2019; Inamdar & Gangadhara, 1976; Inamdar, Gangadhara, & Shenoy, 2019) [6, 17, 18]. Leaf epidermal features of the genus *Ctenolepis* has not studied so far from India. Thus, present study is conducted to understand epidermal features of *Ctenolepis* in India and to understand differences of the species based on said characters.

Materials and Methods

The plant material of *Ctenolepis cerasiformis* (Stocks) Hook. f. and *Ctenolepis garcinii* (Burm. f.) Naudin was collected from Madkani, Shahada Tehsil, Nandurbar District of Maharashtra. The species under study have been identified by consulting relevant floras (Cook, 1958; Chakravarty, 1982; Singh, 2001; Patil 2003;) [10, 8, 36, 24]. The fresh as well as fixed material was used for epidermal studies. The plant material was fixed F.A.A. and preserved in 70% alcohol (Dwivwadi & Singh, 1990) [12]. The abaxial side was peeled carefully using a fine forceps and stained with Safranin (1%) (C Ekeke & Agogbua, 2018) [13]. For the epidermal impressions of adaxial side, the leaf surface was

stained with safranin (1%) for 4-5 minutes followed by removal of excess stain by tissue paper. A thin layer of transparent nail polish was applied to the stained surface and allowed it to dry completely. The nail polish peels were carefully obtained with the help of a fine forceps (Khidir & John, 1984; Wu & Zhao, 2017) [21, 37]. The peels were mounted in aqueous glycerine (30%) and observed under compound microscope. The photographs were taken with Optscopes IS-500, 5.1 MP CMOS Microscope Camera.

Observations

The plants are herbaceous climbers. Leaves are palmately lobed. Finely ciliated bracts are present on shoot. The epidermal features are as follow,

Ctenolepis cerasiformis (Stocks) hook. f

Leaves hypostomatic.

Leaf-adaxial (Fig. 1a): Epidermal cells chlorophyllous, sides mostly 5-7, wall curved.

Leaf-abaxial (Fig. 1b): Stomata anomocytic, orientation random, distribution diffuse, S. I. 17.37 % and stomata size, length $32.09 \mu\text{m}$ and breadth $20.78 \mu\text{m}$. Subsidiaries 4-5, mostly CF-type, walls undulate, sinuses U-shaped, sides 5-6. Guard cells chlorophyllous, elliptical, pore wide, outer wall thin and inner wall thick. Epidermal cells chlorophyllous, sides mostly 4-6, walls undulate, sinuses U-shaped.

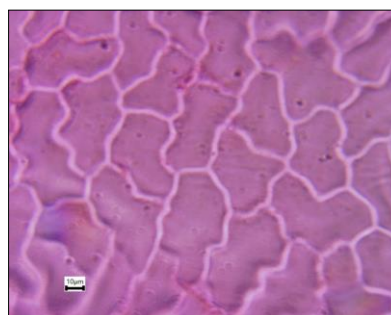


Fig 1a: *Ctenolepis cerasiformis*- Adaxial Side

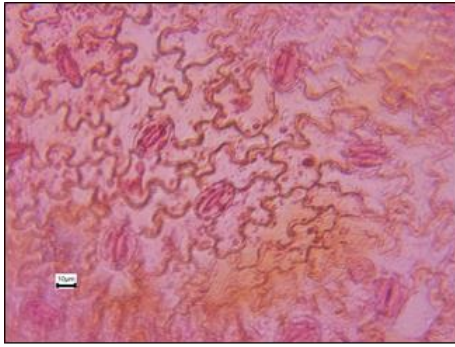


Fig 1b: *Ctenolepis cerasiformis*- Abaxial Side

Ctenolepis garcinii (Burm. f.) naudin

Leaves amphistomatic.

Leaf-adaxial (Fig. 2a): Stomata anomocytic, orientation random among the epidermal cells, distribution diffuse, stomatal index 6.72% and stomata size, length 35.43 μ m and breadth 22.99 μ m. Subsidiaries mostly 4, mostly F-type, wall curved, sides 5-6, guard cells chlorophyllous, elliptical, outer wall thin and inner wall thick, pore elongated. Epidermal cells chlorophyllous, sides 6-7, walls curved.

Leaf- abaxial (Fig. 2b): Stomata anomocytic, orientation random, distribution diffuse, S. I. 19.07% and stomata size, length 30.12 μ m and breadth 21.59 μ m. Subsidiaries 3-5, mostly CF-type, walls undulate, sinuses U-shaped, sides 4-6. Guard cells chlorophyllous, elliptical, outer wall thin and inner wall thick, pore wide, outer wall thick. Epidermal cells chlorophyllous, sides mostly 6-7, walls undulate, sinuses U-shaped.

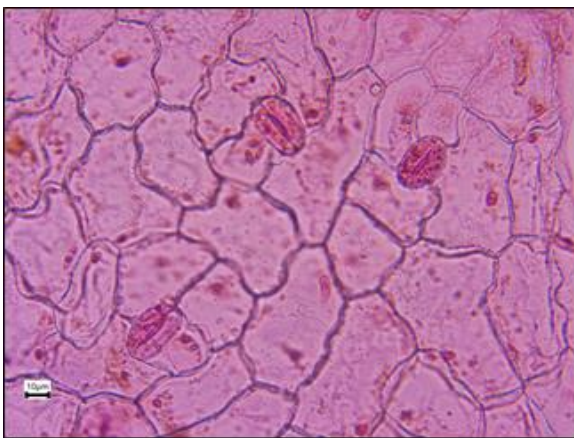


Fig 2a: *Ctenolepis garcinii*- Adaxial Side

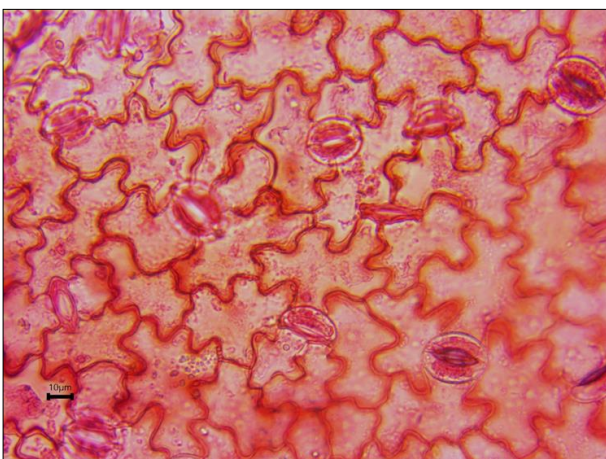


Fig 2b: *Ctenolepis garcinii*- Abaxial Side

Observation

Table 1

Sr. No.	Botanical name of plant	Leaf surface	Stomatal index (%)	Size (μ m)	
				Length	Breadth
1	<i>Ctenolepis cerasiformis</i>	Abaxial	17.37 \pm 0.16	32.09 \pm 1.16	20.78 \pm 1.39
		Adaxial	0	0	0
2	<i>Ctenolepis garcinii</i>	Abaxial	19.07 \pm 0.41	30.12 \pm 1.55	21.59 \pm 4.20
		Adaxial	6.72 \pm 0.74	35.43 \pm 2.57	22.99 \pm 0.70

Discussion

The leaves in Cucurbitaceae members are hypostomatic or amphistomatic and mostly anomocytic along with paracytic, aniasocytic, paracytic and diacytic (Abdulrahman, Oyedotun, & Oladele, 2011^[1]; Adebooye, Hunsche, Noga, & Lankes, 2012^[2]; Agogbua, Ekeke, & Okoli, 2015^[3]; F. Ajuru & Chimamkpa, 2018^[4]; M. G. Ajuru & Okoli, 2013^[5]; Chowdhury, Chowdhury, & Chowdhury, 2018^[9]; C Ekeke & Agogbua, 2018^[13]; Chimezie Ekeke, Ogazie, & Agbagwa, 2019^[14]; Gill & Karatela, 1982^[16]; Jibril & Jakada, 2015^[19]; Kadiri, Utubor, & Ogundipe, 2013^[20]; Metcalfe & Chalk, 1950^[23]; Poyraz & Derdovski, 2016^[25]; Ramayya & Rajagopal, 1980^[27]; Roberts, Obute, & Okoli, 2012^[29]; Rus *et al.*, 2015^[30]; Sá, Cadena, Padilha, Alves, & andau, 2018^[31]; Shekhawat & Manokari, 2018^[33]; Shethi, Begum, & Rashid, 2017^[34]; Shethi, Doty, Liza, & Rashid, 2018^[35]). In present work we found that the leaves of *Ctenolepis garcinii* are amphistomatic while the leaves of *C. cerasiformis* are hypostomatic. Stomatal Index on abaxial side is considerably higher than the adaxial side in both species studied. Stomatal Index in *C. garcinii* (19.07 \pm 0.41) was found highest than *C. cerasiformis* (17.37 \pm 0.16) to the abaxial side. The stomatal index in the members of Cucurbitaceae is higher in general (Abdulrahman *et al.*, 2011^[1]; Agogbua *et al.*, 2015^[3]; F. Ajuru & Chimamkpa, 2018^[4]; Chowdhury *et al.*, 2018^[9]; Chimezie Ekeke *et al.*, 2019; Inamdar & Gangadhara, 1976^[17]; Inamdar *et al.*, 2019^[18]; Jibril & Jakada, 2015^[19]; Kadiri *et al.*, 2013^[20]; Shekhawat & Manokari, 2018^[33]). The size of stomata on adaxial side of *C. garcinii* was found to be largest and lowest stomatal size was observed on abaxial side of it. The subsidiaries on abaxial side are 4-5 and 3-5 and CF type in *C. cearasiformis* and *C. garcinii* respectively. The subsidiaries on adaxial side are mostly 4 and of F-type in *C. garcinii* (Ramayya & Rajagopal, 1980)^[27]. The morphological features like number of subsidiary cells, type, sides and shape of subsidiaries and surround epidermal cells of stomata in both species are variable. The stomatal index and size is also found variable. This distinctiveness of epidermal features in these two species can be taxonomically useful to treat them as two species.

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