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TAXONOMIC IMPORTANCE OF TRICHOMES AND DISTRIBUTION IN THE INDIAN TAXA OF BOMBACACEAE

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ABSTRACT

The studies on trichomes morphology camera lucida diagrams were undertaken in four taxa (*Bombax ceiba, Bombax insegne, Ceiba pentendra and Adansoniadigitata*) of family Bombacaceae. During present investigation, total seventeen both non-glandular (15 types) and glandular (2 types) trichomes were observed. Trichomes types and their organographic distribution were found significant taxonomically.

Figures : 22 References : 20 Tables : 03

KEY WORDS : Bombacaceae, Taxonomic significance, Trichome.

Introduction

The term trichome is applied to epidermal outgrowth of diverse form, structure and functions. A number of studies have attested the systematic importance of trichomes not only at generic level but also at species level.

Scientific interest in plant trichomes is based on their structure, organographic distribution, functional and taxonomic significance in delimiting the taxa at various levels.

It has long been recognised that the study of the histology of epidermal appendages of the leaf is an aid to the recognision of species and to their classification. A worker[4] adopted term 'Trichome' from greek meaning a 'hairy covering'.

Trichomes are applied to epidermal outgrowth of diverse form, structure and functions.Trichomes are very common on almost all the angiospermic plant parts in a multitude of forms and size, furnish a rich field for morphogenetic investigation. The presence of a particular type of trichomes can frequently delimit species, genera or family in Taxonomic studies[10]. Trichomes are specialized epidermal cells found as the aerial surface of nearly all plants. They can take many shapes and forms. Trichomes may be either unicellular or multicellular, of a stalk and a glandular head. The shape, size, cellular organization, distribution and type composition on a particular part of a plant are used to establish taxonomic distances between closely related genera and related species.

A number of excellent studies have attested the systematic importance of trichomes not only at generic level but also at species level. Trichomes are excellent criteria for identification on subgeneric and specific level in *Rhododendron*[4].

In recent years, the use of trichomes in taxonomic delimitations has been stressed by many workers. *viz.* compositae[15], oleacecae[7]. Cucurbitaceae[8], Malvaceae[3], Acanthaceae[1], Combretaceae[19], Tiliaceae[17], Saxifragaceae[2] and Bombacaecae[5].

Although trichomes vary in structure within larger and smaller group of plants, they are remarkably uniform and may be used for taxonomic purpose[3]. Other worker emphasized the great need for detail study of trichomes on different organ in various plant groups to establish homology[7].

In view of above studies and taxonomic significance of trichomes structure and their organographic distribution, the present investigation was taken up into consideration.

Two genera and two species were only recorded previously[11] whereas five species belonging to four genera were reported during floristic survey of "Bundelkhand and Baghelkhand" region in family Bombacaceae[12,13].

Material and Methods

In present study, total 4 species belonging to three genera were collected from central India. Hence, these 3 genera were considered for the study of trichomic structure, distribution and taxonomic significance at species level.

Trichomoes were studied in epidermal peels of different plant parts. Mature trichomes were taken into consideration for their type and distribution. Epidermal

peels of both fresh as well as herbarium materials were taken out for trichome study[9]. Both vegetative and floral parts of each species were initially boiled for a minute in 20% glacial acetic acid followed by 5% NaOH. After cooling, the materials were washed in water to free it from alkali.

Trichome structures were studied under the compound microscope and camera Lucida diagrams were drawn. Nomenclature of trichome types were studied[14].

Observation and Discussion

For the family Bombacaceae only four taxa (*Bombax ceiba*,*B.insigne,Ceiba pentendra* and *Adansoniadigitata*) were collected from central India. Earlier workers[16] have made a study of stomatal structure and distribution in the malvales and considered above taxa from Bambacacae. As for trichome structure and their distribution, a little work was done[18,20].

TABLE-1: Total trichome types observed in the family Bombacaceae

S.No.	Trichomes types	Code
1.	Unicellular filiform	A
2.	Unicellular flagellate	B
3.	Unicellular conical	C
4.	Unicellular papillose	I
5.	Bicellular filiform	NI
6.	Bicellular curved	N II
7.	Bicellular aseptate flagellate	N VIII
8.	Uniseriatearrect	OVII
9.	Uniseriate cylindrical	O II
10.	Uniseriate conical	O III
11.	Uniseriate hooked	O IV
12.	Uniseriate filiform	O VI
13.	Uniseriate septate flagellate	O IX
14.	Uniseriate aseptate flagellate	O X
15.	Peltate	P
16.	Bicellular glandular capitates	V
17.	Biseriate glandular capitates	Z

All the four taxa *viz.Bombax ceiba*, *Bombax insigne*, *Ceiba pentandra, Adansoniadigitata* of Bombacaceae considered in present study are poor in trichomes.

Detailed trichomes structure observed in each considered taxa is as follows:

Taxa- *Bombax ceiba* .

This species shows 5 types of trichomes (Figs.1-5) plate -1

FIG.1 : UNICELLULAR PAPILLOSE

Foot : simple. Body :varyingly , elongated, papillose, wall thin & smooth, lumen wide, content translucent. Distrib, Stem, stipule, pedicle, sepal upper surface.

FIG.2: UNICELLULAR CONICAL

Foot: simple Body: 2- entire elongated, conical; tip pointed; wall thick & smooth; lumen wide; content opaque; Distrib. Petiole

FIG.3: BICELLULAR FILIFORM

Foot: simple Body: 2- celled; lower cell short, broad wider; upper cell long, straight, filiform; lateral wall thick & smooth; cross wall thin; lumen wide; content translucent, Distrib stem, leaves lower & upper surface.

FIG.4: UNISERIATE CYLINDRICAL

Foot: simple Body: Irregularly, cylindrical; multicellular, cells varied in length &size; lateral & cross wall rhick& rugose, lumen wide content yellow, distrib stem, leaves lower & upper surface.

FIG.5: UNISERIATE ARRECT

Foot: simple Body: short; tip rounded; base very wide; lateral wall thick & smooth; cross wall thin; lumen wide; content yellow Distrib petiole.

Taxa – *Bombax insegne*.

This species shows 7 types of trichomes (Figs.6-13) plate-1

FIG.6: UNICELLULAR CONICAL

Foot: simple Body: enlogated, onical, tip rounded' wall thick & smooth; lumen narrow; content translucent; Distrib, stem, stipule, bract, pedicle.

FIG.7: BICELLULAR ASEPTATE FLAGELLATE

Foot: simple Body: differentiated; basal cell rectangular, erect; upper cell long flagellate; tip rounded, lateral wall thick & smooth; cross wall thin; lumen wide; content translucent; Distrib, stem, stipule, bract.

FIG.8: UNISERIATE CYLINDRICAL

Foot: compound. Body: cylindrical; cell vary in size' lateral & cross wall thick; lumen wide; content translucent; Distrib, stem, pedicle.

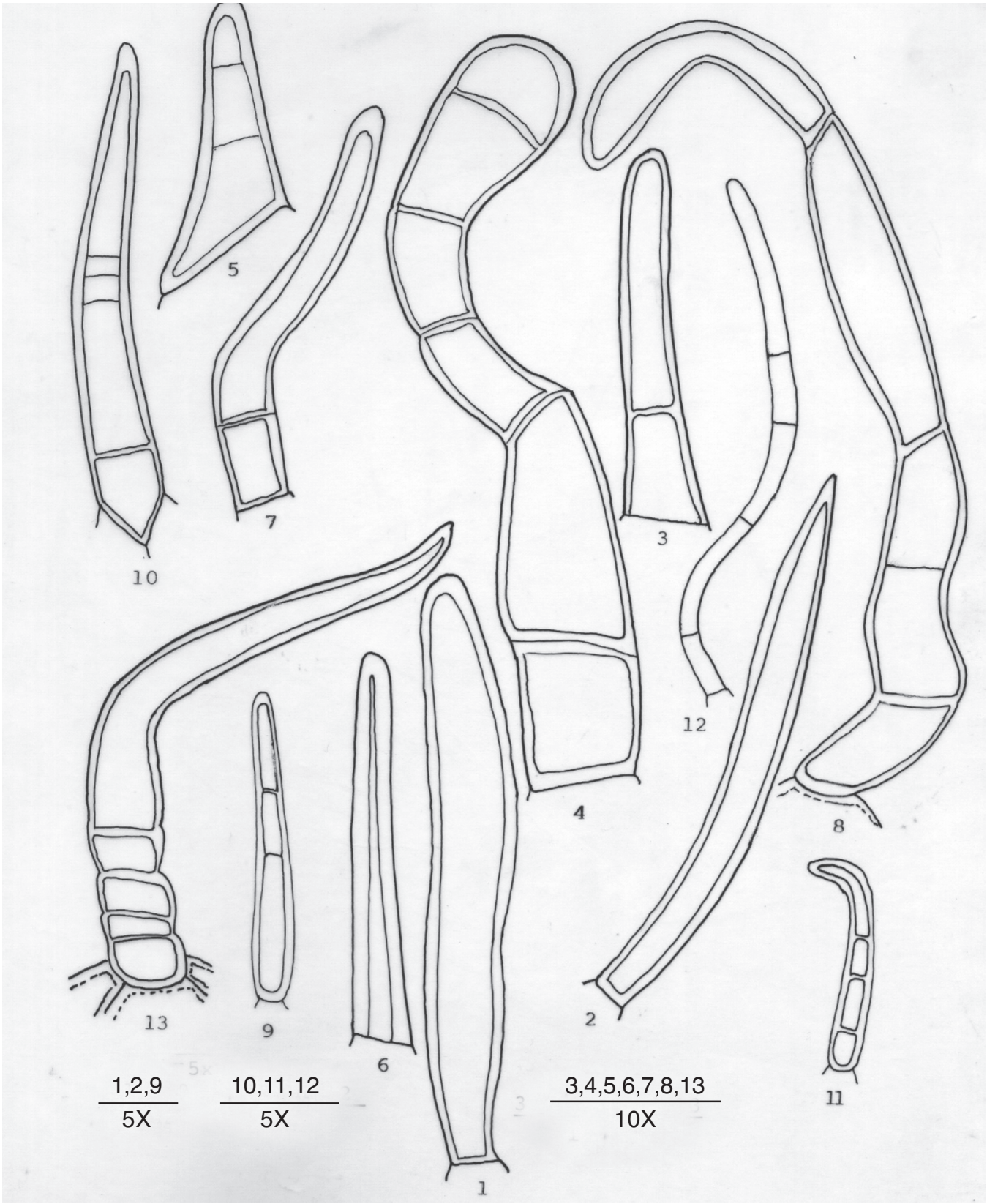

PLATE-1

Bombax ceiba. **(Figs.1-5): 1.Unicellular papillose, 2.Unicellular conical, 3. Bicellular filiform, 4.Uniseriate cylindrical, 5.Uniseriate arrect *Bombax insegne*.(Figs.6-13): 6.Unicellular conical, 7.Bicellular aseptate flagellate, 8.Uniseriate cylindrical, 9.Uniseriate conical, 10.Uniseriate conical, 11.Uniseriatehooked, 12.Uniseriate septate flagellate, 13.Uniseriate aseptate flagellate**

TABLE-2 : Species wise distribution of trichomes in the family bombacaceae

Code	Name of Trichomes	OUT's No.	TAXA				
			Bobax ceiba	*Bombax insigne*	*Ceiba pentandra*	*Adansonia-digitata*	Occurrence %
			1	2	3	4	
A	Unicellular filiform	1.			+		25
B	Unicellular flagellate	2.			+		25
C	Unicellular conical	3.	+	+			50
I	Unicellular papillose	4.	+			+	50
NI	Bicellular filiform	5.	+				25
N II	Bicellular curved	6.			+		25
N VIII	Bicellular aseptate flagellate	7.		+			25
OVII	Uniseriatearrect	8.	+				25
O II	Uniseriate conical	9.	+	+			50
O III	Uniseriate conical	10.		+			25
O IV	Uniseriate hooked	11.		+			25
O VI	Uniseriate filiform	12.			+	+	50
O IX	Uniseriate septate flagellate	13.		+			25
O X	Uniseriate aseptate flagellate	14.		+			25
P	Peltate	15.			+		25
V	Bicellular glandular capitates	16.			+		25
Z	Biseriate glandular capitates	17.			+		25
	Total trichomes types for species		5	7	7	2	

FIG.9: UNISERIATE CONICAL

Foot: simple Body: short, erect, conical: tip pointed; wall thick & smooth; cross wall thin; content translucent; Distrib, petiole.

FIG.-10: UNISERIATE CONICAL

Foot: compound. Body: enongated conical; cells varied

TABLE-3: Organographic distribution of trichomes in the family of bambacaceae

Taxa	Out's No.	Stem	Petiole	Leaf Lamina		Stipule	Bract	Pedicle	Calyx (sepal)		Corolla (Petal)		Stamen	Ovary	Fruit wall
				Upper	Lower				Upper	Lower	Upper	Lower			
Bobax ceiba	1	I, NI, OII	C, OVI I	NI	NI, OII	I		I	I						
Bombax insegne	2	C, NVIII, OII, OX	OIII	OIII, OIV, OX	OIV	C, N VIII	C, N VIII	C, OII	OX						
Ceiba pentandra	3	OVI	NII, P, V	V, Z	B, A, P										
Adansoniadigitata	4	I, OVI	I	I											

in size; tip pointed; lateral wall thick & smooth; cross wall thin; lumen wide; content yellow; Distrib. upper surface.

FIG.11: UNISERIATE HOOKED

Foot: simple. Body: short hooked; wall thick & smooth; lumen narrow; content translucent; Distrib. leaves lower & upper surface.

FIG.12: UNISERIATE SEPTATE FLAGELLATE

Foot: simple. Body: hyaline, elongated, flagellate; cells varied in length; wall thin & smooth; lumen wide; content translucent; Distrib. leaves upper surface; sepal upper surface.

FIG.13: UNISERIATE ASEPTATE FLAGELLATE

Foot: compound. Body: differentiated; lower cell small, short; apical cell longest, flagellate; tip pointed; wall thick & rugose; lumen wide; content yellow; Distrib. Stem.

Taxa – *Ceiba pentandra*.

This species shows seven types of trichomes (fig's. 14-20) plate II

FIG.14: UNICELLULAR FLAGELLATE

Foot: simple. Body: hyaline narrow, elongated flagellate; tip pointed; wall thin and smooth; lumen varying; content translucent; Distrib. leave lower surface.

FIG.15: UNICELLULAR FILIFORM

Foot: simple. Body: entire, filiform; tip pointed; wall thin & rugose lumen narrow; content translucent; Distrib. Leaves lower surface.

FIG.16: BICELLULAR CURVED

Foot: simple. Body: 2-celled differentiated; basal cell short, oblong; distal cell very long, curved; tip pointed; lateral wall thick & rugose; cross wall thin; content yellow lumen wide; Distrib petiole.

FIG.17: UNISERIATE FILIFORM

Foot: simple. Body: short filiform; cells isodimetrical; tip pointed; lateral wall thickness, cross wall geniculate; lumen narrow content translucent; Distrib stem.

FIG.18: PELTATE

Foot: compound. Body: multi-cellular; 1-celled, thick, peltate; parallel to epidermis, cells radiate from common center, outer wall entire, radiate wall entire, radial wall thin, content light granulated; Distrib leaves lower surface, petiole.

FIG.19: BICELLULAR GLANDULAR CAPITATE

Foot: compound. Body: differentiate; stalk, 2-cell, short; head 2-celled; large globular, capitate; wall thick & smooth; content granulated translucent:

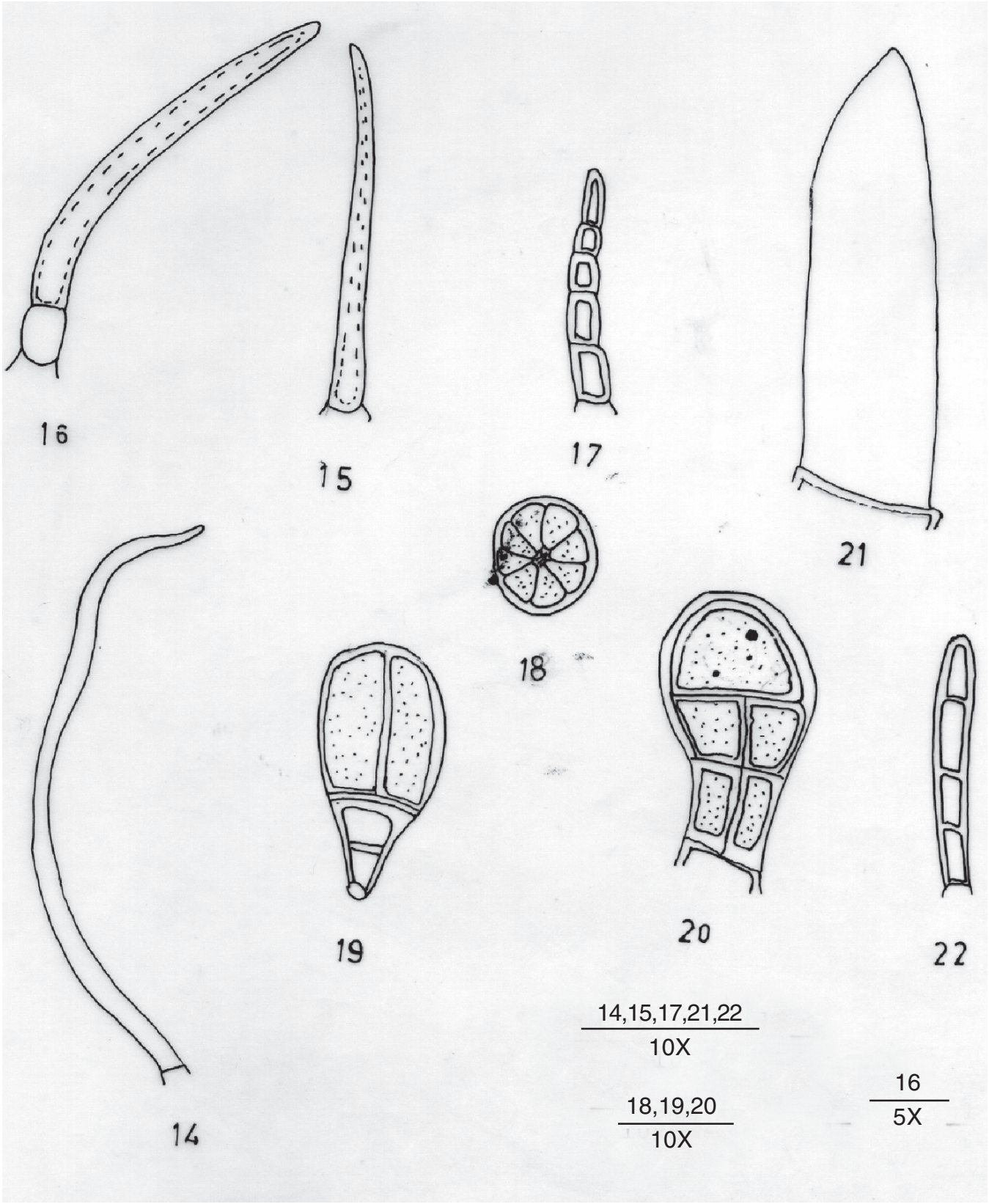

PLATE 2

***Ceiba pentandra*. (Figs.14-20). 14.Unicellular flagellate, 15.Unicellular filiform, 16.Bicellularcurved, 17.Uniseriate filiform, 18.Peltate, 19.Bicellular glandular capitate, 20.Biseriate glandular capitate.**

***Adansoniadigitate.* (Figs.21-22) 21.Unicellular papillose, 22. Uniseriate filiform.**

Distrib., leaves upper surface, petiole.

FIG.20: BISRIATE GLANDULAR CAPITATE

Foot: compound. Body: differentiate; stalk biscrate of 2-celled high; Head bicelled globular capitate; outer wall thick varied; Distrib leaves upper surface.

TAXA – Adansoniadigitata

This species shows two types of trichomes (Figs. 21-22) plate-2

FIG.21: UNICELLULAR PAPILLOSE

Foot: simple. Body: cylindrical, papillose; wall thin & smooth; lumen wide; content translucent; Distrib. stem, petiole, leaves upper surface, pedicle.

FIG.22: UNISERIATE FILIFORM

Foot: simple. Body: erect, filiform; tip rounded; wall thick & smooth, lumen narrow; content yellow; Distrib. Stem.

During present investigation, total seventeen, both non-glandular (15 types) and glandular (2 types) trichomes have been observed, interestingly these forms could be observed only from young parts under scare distribution Table-1.

Further, species wise as well as organographic distribution of recorded trichomes type is given in Tables-2 and 3.

Though, *Adansoniadigetata* is noted glabrous. But very scare occurrence of unicellular papillose on stem, petiole, leaf and rare occurrence of uniseriate filiform on stem is noted in this taxa.

Both the species of *Bombax* appeared quite distinct from each other. *Bombax insegne* bearing seven type of trichomes can be delimited from rest with restricted ocurance of uniseriate conical, uniseriate hooked, uniseriate septate flagellate and uniseriate aseptate flagellate. Whereas *B.ceiba*, another globrous taxa show bicellular filiform and uniseriatearrect trichome as taxonomic marker.

Ceiba pentandra stand quite identical in having six characteristics trichomes not found in rest of three taxa. They are unicellular flliform, unicellular glagellate bicellular curbed peltate bicellular glandular & biseriate glandular catritate. Moreover glandular type is only recorded from these taxa of Bombacaceae (Tables-1 and 2).

In view of limited trichome type and scare distribution, not only taxa but entire family significantly differ from rest of the families of order malvales.

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