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 insigne, Ceiba pentandra and Adansoniadigita) 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. Trichomes are excellent criteria for identification on subgeneric and specific level in Rhododendron9.

In recent years, the use of trichomes in taxonomic delimitations has been stressed by many workers. viz. compositae10, oleaceae7, Cucurbitaceae5, Malvaceae7, Acantaceae1, Combretaceae10, Tiliaceae10, Saxifragaceae2 and Bombacaceae5.

Although trichomes vary in structure within larger and smaller group of plants, they are remarkably uniform and may be used for taxonomic purpose5. Other worker emphasized the great need for detail study of trichomes on different organ in various plant groups to establish homology7.

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 previously11 whereas five species belonging to four genera were reported during floristic survey of “Bundelkhand and Baghelkhand” region in family Bombacaceae12,13.

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 pools of different plant parts. Mature trichomes were taken into consideration for their type and distribution. Epidermal
TABLE-1: Total trichome types observed in the family Bombacaceae

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

peels of both fresh as well as herbarium materials were taken out for trichome study. 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.

Observation and Discussion

For the family Bombacaceae only four taxa (Bombax ceiba, Bombax insigne, Ceiba pentandra, Adansonia digitata) were collected from central India. Earlier workers have made a study of stomatal structure and distribution in the malvales and considered above taxa from Bombacaceae. As for trichome structure and their distribution, a little work was done. All the four taxa viz. Bombax ceiba, Bombax insigne, Ceiba pentandra, Adansonia digitata 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**


**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 thick & 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 insigne.**

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

**FIG.6: UNICELLULAR CONICAL**

Foot: simple Body: 2- elongated, conical; tip rounded; wall thick & smooth; lumen narrow; content translucent; Distrib: stem, stipule, bract, pedicel.

**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, pedicel.

**FIG.8: UNISERIATE CYLINDRICAL**

Foot: compound. Body: cylindrical; cell vary in size' lateral & cross wall thick; lumen wide; content translucent; Distrib: stem, pedicel.
PLATE-1

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of Trichomes</th>
<th>OUT's No.</th>
<th>TAXA</th>
<th>Occurrence %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bobax ceiba</td>
<td>Bombax insignie</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>A</td>
<td>Unicellular filiform</td>
<td>1.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Unicellular flagellate</td>
<td>2.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Unicellular conical</td>
<td>3.</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>I</td>
<td>Unicellular papillose</td>
<td>4.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>NI</td>
<td>Bicellular filiform</td>
<td>5.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>N II</td>
<td>Bicellular curved</td>
<td>6.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>N VIII</td>
<td>Bicellular aseptate flagellate</td>
<td>7.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>O VII</td>
<td>Uniseriatearrect</td>
<td>8.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>O II</td>
<td>Uniseriate conical</td>
<td>9.</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>O III</td>
<td>Uniseriate conical</td>
<td>10.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>O IV</td>
<td>Uniseriate hooked</td>
<td>11.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>O VI</td>
<td>Uniseriate filiform</td>
<td>12.</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>O IX</td>
<td>Uniseriate septate flagellate</td>
<td>13.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>O X</td>
<td>Uniseriate aseptate flagellate</td>
<td>14.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>Peltate</td>
<td>15.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>Bicellular glandular capitates</td>
<td>16.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>Biseriate glandular capitates</td>
<td>17.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total trichomes types for species</td>
<td>5</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

FIG.9: UNISERIATE CONICAL
Foot: simple Body: short, erect, conical: tip pointed; wall thick & smooth; cross wall thin; content translucent; 

FIG.10: UNISERIATE CONICAL
Foot: compound. Body: elongated conical; cells varied
### TABLE 3: Organographic distribution of trichomes in the family of Bambacaceae

<table>
<thead>
<tr>
<th>No.</th>
<th>Out’s No.</th>
<th>Fruit wall</th>
<th>Ovary</th>
<th>Stamen</th>
<th>Corolla (Petal)</th>
<th>Calyx (sepal)</th>
<th>Pedicel</th>
<th>Bract</th>
<th>Stipule</th>
<th>Leaf Lamina</th>
<th>Petiole</th>
<th>Stem</th>
<th>Ovary</th>
<th>Fruit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ni, O</td>
<td>C, OVI</td>
<td>OII</td>
<td>Ni, O</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OII, OIV</td>
<td>OII, OVI, OX</td>
<td>OX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ni, P, V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OVI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Taxa**

- **Bougainvillea glabra**
- **Bougainvillea species**
- **Bougainvillea calycinoides**
- **Adansonia digitata**

**Foot:** simple. Body: short hooked; wall thick & smooth; lumen narrow; content translucent; Distrib. leaves lower & 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 (figs. 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 isodimetric; tip pointed; wall thin & smooth; cross wall thick; content granulated 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, capitulate; wall thick & smooth; content granulated translucent:
PLATE 2


*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 bicrate of 2-celled high. Head bicelled globular capitiate; outer wall thick varied; Distrib leaves upper surface.

**TAXA – Adansonia digitata**

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, *Adansonia digitata* 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 occurrence of uniseriate conical, uniseriate hooked, uniseriate septate flagellate and uniseriate asептate flagellate. Whereas *B. ceiba*, another globrous taxa show bicipular 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 filiform, unicellular flagellate bicellular curved peltate bicellular glandular & biseriate glandular capititate. 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.

References


