

Trichomes and Stomatal study of *Barleria cristata* L. and *Barleria prionitis* L.

Chavan Sopan Tukaram

Rashtramata Indira Gandhi Arts Commerce & Science College, Jalna (M. S.) India
Email : sopanchavan6567@gmail.com

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ABSTRACT

Barleria cristata L. and *Barleria prionitis* L. are medicinal plants. These plants have been used in the indigenous system of medicine for a long time. Present work intends to utilize this data of Trichome and stomata to evaluate and standardize leaf drugs. The present research includes structure and dimensional details of upper and lower epidermis of the selected leaf drugs. The epidermal studies are carried out by scraping and peeling out particular epidermis. The Trichome, stomata, guard cells, subsidiary cells and epidermal cell are given along with dimensions. Trichome and stomata studies are useful in solving taxonomic problems and Pharmacognosy. They have significance in identification of crude drugs from these plants. The types of trichomes are specific for a particular taxon. This data can be used to standardize a leaf drug. The studied characters related to trichomes in present work are types and dimensions of trichome.

Keywords: Trichomes and Stomata, *Barleria cristata* L. and *Barleria prionitis* L.

INTRODUCTION

Dermatology of leaves includes a study of epidermal tissue system. Epidermal tissue is also known as dermal tissue system. It is made up of epidermal, cuticle, stomata and trichomes. The epidermal structure especially types trichomes and stomata are specific for every leaf. (Metcalf and Chalk 1950; Smith *et. al.*, 1953; Carlquist, 1961; Eames and Mac Denials, 1992; Pandey, 2002; Roy, 2006). Cuticular studies in some species of *Lepidagathis* and *Barleria* (Khawaja, 1975). Trichomes are outgrowths of epidermal cells (Roy, 2006). In the angiosperms leaves various type of trichomes are found such as – unicellular, bicellular, multicellular, uniseriate, multiseriate, satellite, glandular, non-glandular (Metcalf and Chalk, 1950; Pandey, 2002; Roy, 2006). The stem of *Barleria cristata* consist appeared trichomes with dense hairy nodes; (Harish kumar *et. al.* 2018). The family Acanthaceae is rich in different types of trichomes *Barleria prionitis* has both multicellular eglandular as well as glandular trichomes (Bhogaonkar and Lande, 2012).

Stomata are microscopic pores on the epidermal surface of higher plants formed by a pairs of specialized epidermal cell i.e. guardcell, which control opening and closing of the pore by changing their turgidity and thus regulates the gaseous exchange between plants and environment. Different types of stomata are found in angiosperms leaves (Roy, 2006) they Diacytic stomata and eglandular as well as glandular trichomes which are useful in solving taxonomic problems and Pharmacognosy. They have significance in identification of crude drugs from this taxon (Vyas M. K. *et. al.*, 2016)

Trichomes and Stomata of Plants:

The epidermal structure especially type of trichomes and stomata are specific for every leaf (Metcalf and Chalk 1950; Smith *et. al.*, 1953; Carlquist, 1961; Eames and Mac Denials, 1992; Pandey, 2002; Roy, 2006). Present work includes structure and dimensional details of upper and lower epidermis of the selected leaf drugs. The epidermal studies are carried out by scraping and peeling out particular epidermis. An account of trichomes, stomata, guard cells, subsidiary cells, and epidermal cells is given along with dimensions.

1) Trichomes: The Type of trichomes is specific for a particular taxon. This data can be used to standardize a leaf drug. The studied characters related to trichomes in present work are types and dimensions of trichomes.

2) Stomata: Like trichomes stomata are specific for a particular leaf. The actual number of stomata per sq. mm of leaf preparation may vary for leaves of the same plant

grown in different environment conditions. Stomata number is relatively a constant for particular species of same age and hence it is taken into consideration as a diagnostic character for identification of a leaf drug. The adulteration can also be detected by stomata number. Stomata features used to standardize leaf drug are – Presence or absence of stomata, type of stomata, occurrence of stomata viz. amphistomatic / epistomatic / hypostomatic, type of guard cell, length of stoma, size of guard cell.

3) Subsidiary cells: - The epidermal cells near guard cells are termed as subsidiary cells. It determines type of stoma (Metcalf and Chalk 1950; Roy 2006). Shape, size and number of subsidiary cells can be used for standardization.

4) Epidermal cells: - Epidermal cells are also a good criterion for standardizing a leaf. Surface view of epidermal cell is different than transverse section view. Features like shape, size, and outline of epidermal cells are utilized for determining genuinely and authenticity of leaf drugs. For dermatology fresh material was used. Trachoma's were studied by scraping leaf with razor blade while stomata, guard cells, subsidiary cells and epidermal cells were studied by peeling out, staining in safranin and mounting in glycerin particular leaf epidermis. All drawings were made by using camera Lucida and measurements are taken by using ocular and stage micrometers. The descriptions of dermatology of selected leaf drugs are as below:

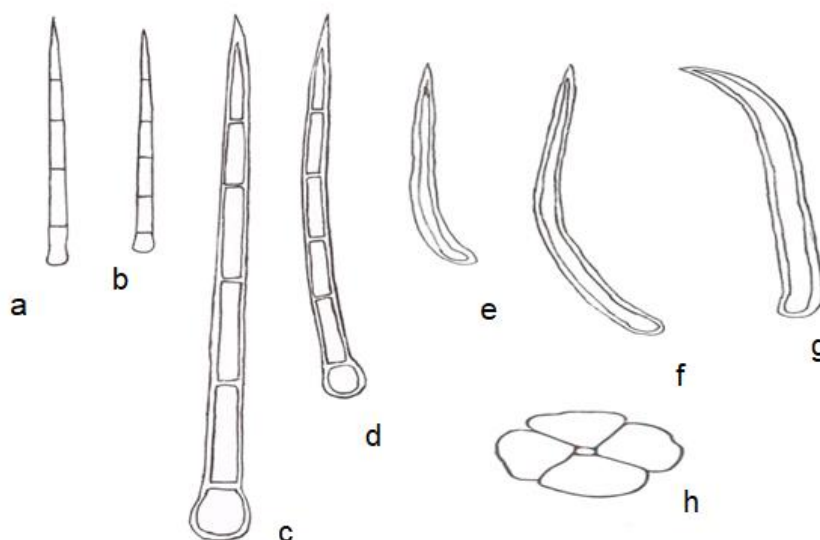
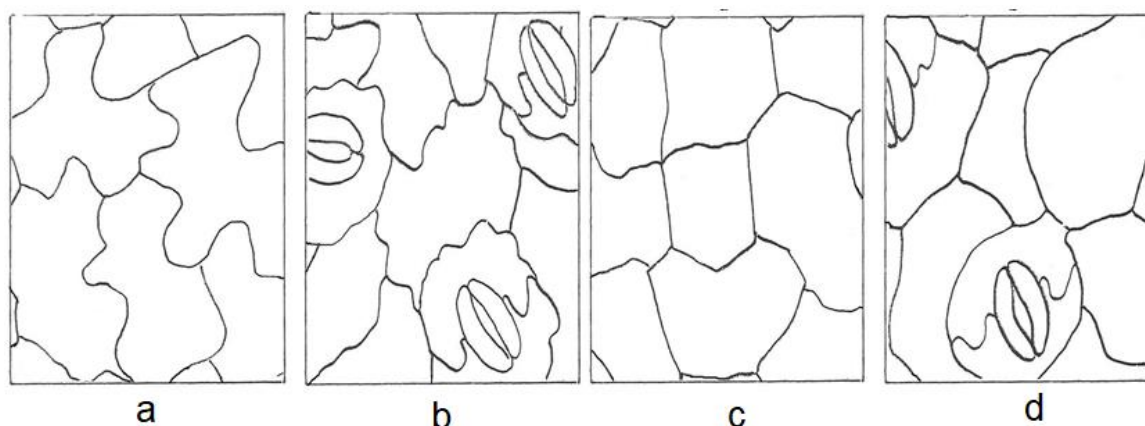


Plate No. 01. Figure: Trichomes of *Barleria cristata* (a, b, c, d) and *Barleria prionitis* (e, f, g, h)



0.1mm

Plate: 02. Figure: Stomata of *Barleria cristata* a) upper b) lower Stomata of *Barleria prionitis* c) lower d) upper

Table 1. Types of trichomes and stomata

SN	Name of the Plant Species	Trichomes Types	Stomata Type	Stomata Presence
1	<i>Barleria cristata</i>	Unicellular multiseriate	Diacytic	Hypostomatic
2	<i>Barleria prionitis</i>	Glandular & unicellular	Diacytic	Hypostomatic

Table 2. Stomatal Length: Average and range are calculated by 02 diagrams: sign indicates absence of stomata as leaf leaflet is hypostomatic

Sr. No.	Name of plants	Upper stomata length		Lower stomata length	
		Average	Range	Average	Range
1	<i>Barleria cristata</i>	-	-	24.75	23.10 to 26.40
2	<i>Barleria prionitis</i>	-	-	23.10	23.10 to 26.40

Table 3: Stomatal width (apices) Average and range are calculated by 02 diagrams: sign indicates absence of stomata as leaf or leaflet is hypostomatic.

Sr. No.	Name of plants	Upper stomata length		Lower stomata length	
		Average	Range	Average	Range
1	<i>Barleria cristata</i>	-	-	9.7	8.25 to 9.90
2	<i>Barleria prionitis</i>	-	-	8.25	6.60 to 9.60

Table 4: Guard cell Length. Average and range are calculated by 02 diagrams: sign indicates absence of stomata as leaf or leaflet is hypostomatic

Sr. No.	Name of plants	Upper stomata length		Lower stomata length	
		Average	Range	Average	Range
1	<i>Barleria cristata</i>	-	-	29.70	26.40 to 33.80
2	<i>Barleria prionitis</i>	-	-	29.70	26.40 to 33.80

Table 5: Guard cell width: Average and range are calculated by 02 diagrams: sign indicates absence of stomata as leaf or leaflet is hypostomatic.

Sr. No.	Name of plants	Upper stomata length		Lower stomata length	
		Average	Range	Average	Range
1	<i>Barleria cristata</i>	-	-	7.42	6.60 to 8.25
2	<i>Barleria prionitis</i>	-	-	7.42	6.60 to 8.25

Table 6: Stomatal Index: Average and range are calculated by 02 diagrams: sign indicates absence of stomata as leaf or leaflet is hypostomatic.

Sr. No.	Name of plants	Upper stomata length		Lower stomata length	
		Average	Range	Average	Range
1	<i>Barleria cristata</i>	-	-	30.68	25.000 to 41.66
2	<i>Barleria prionitis</i>	-	-	23.82	18.18 to 33.33

Table 7: Stomatal Number: Average and range are calculated by 02 diagrams: sign indicates absence of stomata as leaf or leaflet is hypostomatic

Sr. No.	Name of plants	Upper stomata length		Lower stomata length	
		Average	Range	Average	Range
1	<i>Barleria cristata</i>	-	-	51.9	43 to 61
2	<i>Barleria prionitis</i>	-	-	55.7	47 to 63

Trichomes and Stomatal study:-**1) *Barleria cristata* L.**

Leaves have presence of unicellular, non-glandular (380 – 850 μ . long), and average length of trichomes is 615 μ . Trichomes occur on abaxial surface of leaf, petiole and stem. The stomata are diacytic, hypostomatic, with stomata length 24.75 X 9.07 μ (average) and 23.10 X 8.25 to 26.40 X 9.90 μ (range). The average size of guard cell is 29.70 X 7.42 μ and range is between 26.40 X 6.60 to 33.00 X 8.25 μ . Subsidiary cells are wavy in outline with average cell size 55.85 X 16.50 μ and range between 49.50 X 13.20 to 62.20 X 19.80 μ . In surface view the upper epidermal cells average size is 77.55 X 44.55 μ , and range between (56.10 X 23.10 to 99.00 X 66.00 μ) are slightly smaller in size as compared to lower epidermal cells (average size 96.20 X 21.45 μ , range (82.50 X 13.20 to 109.90 X 29.70 μ). Epidermal cells are wavy in outline with irregular shape (Plate No.1 & 2, Table: 1 to 7).

2) *Barleria prionitis* L.:-

Leaves shows presence of glandular and unicellular trichomes 350 to 550 μ (range); and average length of trichomes is 465 μ on both surfaces but more common on lower epidermis. Glandular trichomes are sessile with quadricellular head. (26.40 to 52.80 μ diameter).

The stomata are diacytic, hypostomatic, the average size of stomata is 23.10 X 8.25 μ (average) and 19.80 X 6.60 to 26.40 x 9.60 μ (range). The average cell size of guard cells is 29.70 X 7.425 μ and range between 26.40 X 6.60 to 33.00 X 8.25 μ . Subsidiary cells are wavy in outline with average cell size 49.50 X 26.40 μ and range between 46.20 X 23.10 to 52.80 X 29.70 μ . In surface view the upper epidermal cells (average cell size 69.30 X 36 μ , range (66.33 X to 72.60 X 39.60 μ) are slightly bigger in size as compared to lower epidermal cells (average size 56.10 X 36.30 μ and range,(49.50 X 33.00 to 62.70 X 39.60 μ). Epidermal cells are wavy in outline. (Plate No.1 & 2, & Table: 1 to 7).

1) *Barleria cristata* L.:

Leaf shows following values of stomata- (leaflet being hypostomatic values for Stomatal number and Stomatal index are for lower epidermis only).

i))Stomatal number for lower epidermis: -

Average value – 52

Range – 43 to 61

ii) Stomatal index for lower epidermis: - Average value – 30.689

Range – 25.00 to 41.66

(Plate No.1 & 2, & Table: 1 to 7).

2) *Barleria prionitis* L.:- Leaf shows following values of stomata - (leaf being hypostomatic values for Stomatal number and Stomatal index are for lower epidermis only).

i)Stomatal number for lower epidermis: -

Average value – 55.7

Range – 47 to 63.

ii) Stomatal index for lower epidermis: -

Average value – 23.8422

Range – 18.18 – 33.33

(Plate No.1 & 2, Table: 1 to 7).

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