International Journal of
Life Sciences
International Peer Reviewed Open Access Refereed Journal

Int. J. of Life Sciences, 2022; 10 (4): 369-373
ISSN:2320-7817(p) | 2320-964X(o)

Research Article Open Access

Trichomes and Stomatal Study of *Crossandra infundibuliformis* and *Clematis heynei*

Chavan Span T

Rashtramata Indira Gandhi College, Jalna, Maharshtra, India.
Email: sopanchavan6567@gmail.com

Manuscript details:

Received: 21.11.2022
Accepted: 21.12.2022
Published: 31.12.2022

Cite this article as:
Anshu Gumber (2022) Trichomes and Stomatal Study of *Crossandra infundibuliformis* and *Clematis heynei*, India., *Int. J. of Life Sciences*, 10 (4): 369-373.

Available online on http://www.ijlsci.in
ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

ABSTRACT

Crossandra infundibuliformis and *Clematis heynei* are medicinal plants. These Plants have been used for various types of diseases. The juice of freshly crushed leaves and stem of *Clematis heynei*, has vesicant properties, *Crossandra infundibuliformis* is used for herbal medicine for the treatment of various ailments. Present work intends to utilize this data of trichomes 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 trichomes, stomata, guard cells, subsidiary cells and epidermal cell are given along with dimensions. Trichomes 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, *Crossandra infundibuliformis* and *Clematis heynei*

INTRODUCTION

The juice of freshly crushed leaves and stem of Clematis heynei, has vesicant properties, (Chopra *et al*., 1940, Behlet *et al*., 1966). *Crossandra infundibuliformis* is used for herbal medicine for the treatment of various ailments. Plants used as medicine by Paliyar Tribes of Shenbagathope in Virudhunagar district, of Tamilnadu India" (Shanmugam *et al*., 2009). Dermatology of leaves includes a study of epidermal 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). 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). Stomata are microscopic pores on the epidermal surface of higher plants formed by a pair of specialized epidermal cell i.e. guar cell, 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). The stomata and trichomes are useful in solving taxonomic problems and Pharmacognosy. They have significance in identification of crude drugs from this taxon.

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 safranine and mounting in glycerine particular leaf epidermis. All drawings were made by using camera Lucida and measurements are taken by using ocular and stage micrometer. The descriptions of dermatology of selected leaf drugs are as below:

***Crossandra infundibuliformis* (l.) Nees.**

Leaf shows- presence of unicellular, uniseriate, nonglandular trichome (130 – 350 µ) range and average 240 µ.Trichomes are more prominent on lower surface.

The stomata are paracytic; amphistomatic with stomata size for upper epidermis is 21.45 X 8.25 µ (average) and range between 19.80 X 6.60 to 23.10 X 9.90 µ; and 23.10 X 8.25 µ (average), and 19.80 X 6.60 to 26.40 X 9.90 µ (range) for lower epidermis.

The average cell size of guard cell is 33.00 X 7.42 µ and range between 29.70 X 6.60 to 36.30 X 8.25 µ for upper epidermis as well as average guard cell size 19.80 X 26.40 µ and range between 26.40 X 6.60 to 36.30 X 8.25 µ for lower epidermis. Subsidiary cells of upper epidermis are slightly bigger than those of lower epidermis. These cells are wavy in outline having average cell size 47.85 X 18.15 µ, and range between 42.90 X 16.50 to 52.80 X 19.80 µ. Subsidiary cells of lower epidermis average cell size are 29.70 X 18.15 µ and range between 26.40 X 16.50 to 33.19.80µ. The cells are irregular shaped with wavy out line.

The upper epidermal cells (average cell size 39.60 X 26.40 µ, range 33.00 X 23.10 to 46.20 X29.70 µ) are slightly smaller in size as compared to lower epidermal cells (average size 44.55 X 18.15 µ, range 33.00 X 16.50 to 56.10 X 19.80 µ). Epidermal cells are wavy in outline.

***Clematis heynei* M.A. Rao.**

Leaf and stem appear Multicellular, uniseriate, non-glandular type of trichomes. Trichomes length is - 570 - 870 µ (range); average length is - 720 µ abundance trichomes present on both surface.

The stomata are anomocytic and hypostomatic. The average cell size of upper cell is 96.20 X 23.10 µ, range (82.50 X 19.80 to 109.90 X 26.40 µ). The length and

width of lower stomata is 31.85 X 11.55 µ (average) and 26.40 X 9.90 to 36.30 X 13.20 µ (range). The average cell size of guard cells is (34.65 X 16.50 µ) and range between (29.70 X 13.20 to 39.60 X 19.80 µ).

Subsidiary cells are wavy in outline with irregular shape having average cell size 105.6 X 26.40 µ and range between 95.70 X 19.80 to 115.50 X 33.00 µ. The lower epidermal average cell size 112.20 X 26.40µ and range (102.30 X 19.80 to 122.10 X 33.00 µ). (Plate No.– 5.3, 5.5, tables: 5.1 to 5.5).
Stomatal number and Index:

Stomatal index is the percentage which the number of stomata forms to the total number of epidermal cells.

***Crossandra infundibuliformis* (L.) Nees:-**
Leaf shows following values of stomata – (leaf have amphistomatic).
i) Stomatal number for upper epidermis: - Average value - 27.7 Range - 25 to 35
ii) Stomatal number for lower epidermis: - Average value - 29.4, Range - 24 to 34
iii) Stomatal index for upper epidermis: - Average value -16.25, Range - 12.50 to 20.00
iv) Stomatal index for lower epidermis: - Average value- 27.82, Range – 20.00 to 30.36.

Clematis heynei M. A. Rao.:-
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 - 8.5 Range – 7 to 10.
iii) Stomatal number for upper epidermis: -
Average value - 6.25 Range – 5.25 to 7.25
iii) Stomatal index for upper epidermis: - Average value - 15.50, Range – 9.50 to 21.50
iv) Stomatal index for lower epidermis: - Average value -25.18, Range – 20.00 to 30.36.
Table No.1, Types of trichomes and stomata

Table 1: Types of trichomes and stomata

Sr. No	Name of the Plant Species	Trichomes Types	Stomata	Stomata
			Type	Presence
1	*Crossandra infundibuliformis*	Unicellular uniseriate hooked	Paracytic	Amphistomatic
2	*Clematis heynei*	Multicellular uniseriate	Anomocytic	Hypostomatic

Table 2: Stomatal 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	*Crossandra infundibuliformis*	21.45	19.80 to 23.10	23.10	19.80 to 26.40
2	*Clematis heynei*	-	-	96.20	82.50 to 109.90

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	
		Range	Average	Range	Range
1	*Crossandra infundibuliformis*	8.25	6.60 to 9.90	8.25	6.60 to 9.90
2	*Clematis heynei*	-	-	11.55	9.90 to 13.20

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 epidermis		Upper epidermis	
		Range	Average	Range	Range
1	*Crossandra infundibuliformis*	33.00	29.70 to 36.30	26.40	26.40 to 36.30
2	*Clematis heynei*	-	-	34.65	29.70 to 39.60

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 epidermis		Upper epidermis	
		Range	Average	Range	Range
1	*Crossandra infundibuliformis*	7.42	6.60 to 8.25	7.42	6.60 to 8.25
2	*Clematis heynei*	-	-	16.50	13.20 to 19.80

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 epidermis		Upper epidermis	
		Average	Range	Average	Range
	Crossandra infundibuliformis	16.25	12.50 to 20.00	27.082	20.00 to 30.76
1	*Clematis heynei*	-	-	25.833	20.00 to 40.00

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 epidermis	Lower epidermis		Upper epidermis	
		Average	Range	Average	Range
1	*Crossandra infundibuliformis*	27.27	25 to 35	29.4	24 to 43
2	*Clematis heynei*	-	-	8.5	07 to 10

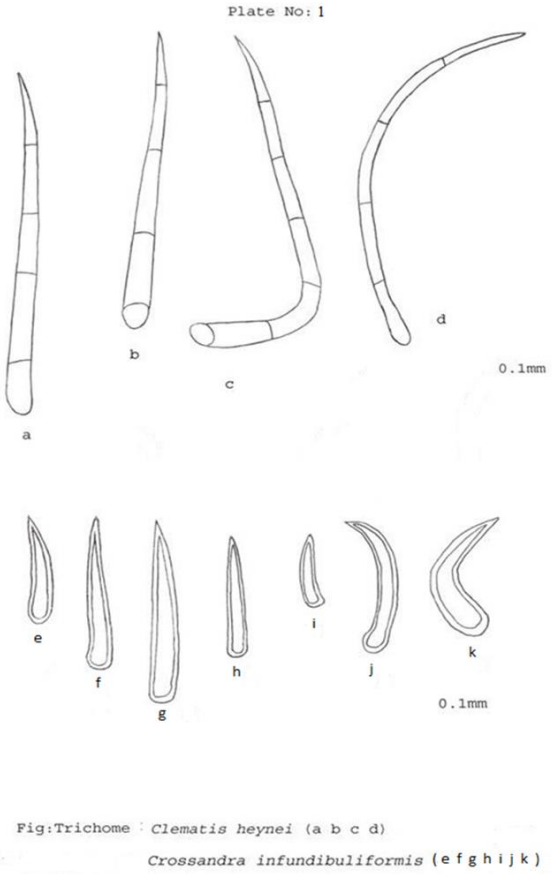

Fig:Trichome *Clematis heynei* (a b c d)
Crossandra infundibuliformis (e f g h i j k)

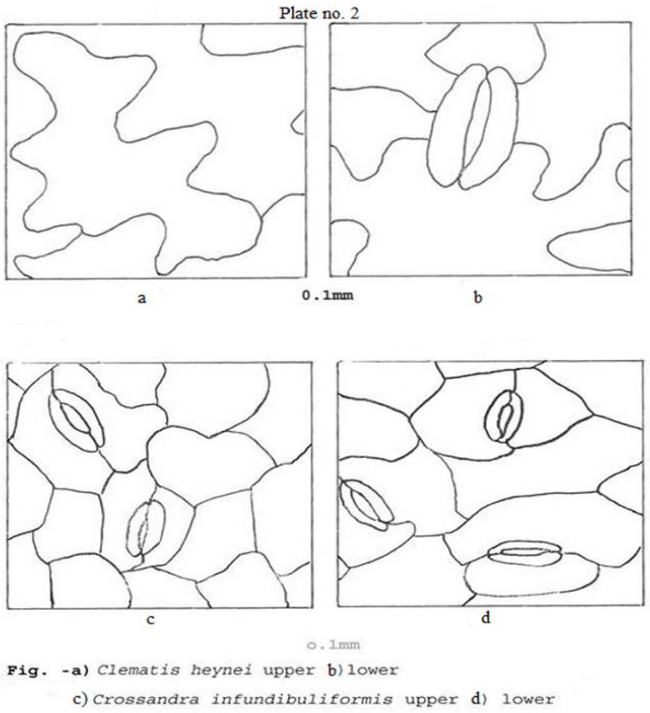

Fig. -a) *Clematis heynei* upper b) lower
c) *Crossandra infundibuliformis* upper d) lower

Conflict of Interest: None of the authors have any conflicts of interest to disclose. All the authors approved the final version of the manuscript.

REFERENCES

Carlquist S (1961) Comparative Plant Anatomy Hold Rinehart and Winston, New York.

Chopra and Badhwar (1940) Behlet et. al., (1966). Web-bodd.cf.ac.uk/Bot Derm Folder/Ranu.htm/146k.

Eames A and Mac Daniels SL (1992) An introduction to plant Anatomy. Tata Mc Graw Hill Publishing com Ltd. Bombay.

Metcalf CR and Chalk L (1950) Anatomy of Dicotyledons, Oxford, Clarendon press, London.

Pandey BP (2002) Plant Anatomy. Mohan Primlani. Oxford and IBH publishing CO. New Delhi

Roy Pijush (2006) Plant anatomy. New Central Book Agency, Pvt. Ltd. Kolkata India.

Shanmugam S, Gayatri N, Sakthivel B, Ramar S and Rajendran K (2009) "*Crossandra infundibuliformis* plants used as medicine by Paliyar Tribes of Shenbagathope in Virudhunagar district, of Tamilnadu India" Ethnobotanical leaflets 13:370-378.

Smith GM, Gilbert EM, Bryan GS, Evans RI and Stauffer JF (1953). A Textbook of General Botany the Macmillan Company, New York.