Bioscience Discovery, 13(2):61-65, April - 2022

Open Access, Peer Reviewed, Refereed Research Journal

Print & Online available on https://jbsd.in
ISSN: 2229-3469 (Print); ISSN: 2231-024X (Online)

Research Article

Trichomes and Stomatal Study of *Cassia obtusifolia* L. and *Cassia tora* L.

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Article Info

Received: 01-02-2022,
Revised: 22-03-2022,
Accepted: 28-03-2022

Keywords: Trichomes and Stomata, *Cassia obtusifolia* L. and *Cassia tora*.

Abstract

Cassia obtusifolia L. and *Cassia tora* L. are locally called as Chakkramard or tarota. These medicinal plants have been used for various diseases from long time. The Present work intends to utilize this data of trichomes and stomata to evaluate and standardize leaf drugs. The present research includes structure, types 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 trichomes.

INTRODUCTION

Trichomes are outgrowth of epidermal cells (Roy, 2006). In Angiosperms various types of trichomes are found (Metcalfe and Chalk, 1950; Pandey 2002; Roy 2006). Stoma is microspores on the epidermal structure of leaf. Like trichomes stomata are specific for a particular leaf. Different types of stomata found I angiosperms leaves (Roy 2006). K.S. Rao and Y. S. Dave (1980) studied that the paracytic stomata and uniseriate multicellular trichomes are found in the outermost layer of the epicarp. *Cassia obtusifolia* is popularly known as Mata Pasto. It is widely used in local traditional medicine for various diseases. K. Kotresha & Y. N. Seetharam (2000) studied on 19 species of *Cassia* L. around in Karnatka state. These species are either hypostomatic or amphistomatic and possess paracytic, Anisocytic and anomocytic type of stomata. Both adaxial and abaxial epidermal surfaces were characterised by abundant diacytic and anocytic stomata respectively. Epidermal tissue system is also known as dermal tissue system. It is made up of epidermis, cuticle, stomata and various outgrowths of the epidermal cells. Epidermal tissue system of leaves include details of both upper and lower epidermis. The epidermal structure especially type of trichomes and stomata are specific for every leaf (Metcalfe 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). G. L. Shah *et. al*., (1970) studied structure and development of stomata in 19 species of Ceasalpinaceae. In this study they observe parasitic type of stomata in all species except *Ceasalpinia*. The foliar epidermal characters of ten species of Senna Mill found in Bangladesh are investigated.

Anisocytic, anomocytic, paracytic, tetracytic and haxacytic stomata are found across the species. Anisocytic and paracytic stomata are common in all species Ayesa Begum *et. al*. (2014). Comparative (quantitative and qualitative) studies of stomata of selected six medicinally viable species of *Cassia* L. Tripathi S., Mondal A. K. (2012).

Trichomes and Stomatal study:

1) ***Cassia obtusifolia***. Leaflet and stem appear Multicellular, uniseriate and non-glandular type of Trichomes. Trichomes length is 330 - 480 µ (range); average length is - 405 µ.). Trichomes are more prominent on lower surfaces and stem. The stomata are paracytic and amphistomatic, length and width of upper stomata 14.85 X 5.77 µ (average) and 13.20 X 4.95 to 16.50 X 6.60 µ (range). The average cell size of guard cells is (18.15 X 4.95 µ) and range between 16.50 X 3.30 to 19.80 X 6.6 µ. Subsidiary cells for upper and lower epidermis are similar size and shape. These cells are wavy in outline with irregular shape having average cell size 21.45 X 14.24 µ and range between 19.80 X 13.80 to 23.10 X 14.685 µ. The average cell size 39.60 X 36.30µ, range (33.00 X 29.70 to 46.20 X 42.90µ). The length and width of lower stomata is 23.10 X 8.25 µ (average) and 19.80 X 6.60 to 26.40 X 9.90 µ (range). The average cell size of guard cells is (31.35 X 7.425 µ) and range between (26.40 X 6.60 to 36.30 X 8.25 µ). Subsidiary cells are wavy in outline with irregular shape having average cell size 21.45 X 14.85 µ and range between 19.80 X 13.20 to 23.10 X 16.50µ. The upper epidermal average cell size is 41.25 X 26.40 µ, range (33.00 X 19.80 to 49.50 X 33.00 µ). (Plate No. – 1and 2, Tables: 1 to 7).

2) ***Cassia tora*** **L.-** Leaflet as well as stem appears Multicellular, uniseriate, non-glandular type of Trichomes. Its length is - 450 - 660 µ. (Range); average length is - 555 µ. Trichomes are more prominent on lower surface as well as on stem. The stomata are paracytic and amphistomatic, length and width of upper stomata 26.40 X 5.77 µ (average) and (23.10 X 4.95 to 29.70 X 6.60 µ) (range). The average cell size of guard cells is (23.10 X 5.77 µ) and range between 19.80 X 4.95 to 26.40 X 6.60 µ. Subsidiary cells for upper and lower epidermis are similar size and shape. These cells are wavy in outline with irregular shape having average cell size 52.80 X 19.80 µ and range between 49.50 X 16.50 to 56.10 X 23.10 µ. The average cell size 39.60 X 24.75 µ, range (33.00 X 19.80 to 46.20 X 29.70 µ). The length and width of lower stomata is 23.10 X 4.12 µ (average) and 19.80 X 3.30 to 26.40X 4.95 µ (range). The average cell size of guard cells is 26.40 X 6.6 µ and range between (23.10 X 4.95 to 29.70 X 8.26 µ). Subsidiary cells are wavy in outline with irregular shape having average cell size 36.30 X 18.15 µ and range between 33.00 X 16.60 to 39.60 X 19.80 µ. The lower epidermal average cell size is 39.60 X 26.40 µ, range (33.00 X 19.80 to 46.20 X 33.00 µ). (Plate No. – 1and 2, Tables: 1 to 7).

Stomatal numbers and index:

Cassia obtusifolia **L.:** - Leaflets shows following values of stomata - (leaflets being amphistomatic values for Stomatal number and Stomatal index are for upper and lower epidermis).

i) Stomatal number for upper epidermis: - Average value – 50.8, Range – 47 to 55.
ii) Stomatal number for lower epidermis: - Average value – 54.1, Range – 48 to 57.
iii) Stomatal index for upper epidermis: - Average value –26.25, Range – 18.75 to 31.25
iv) Stomatal index for lower epidermis: - Average value – 23.688, Range – 18.75 to 26.66

Cassia tora **L**.:- Leaflets shows following values of stomata - (leaflets being amphistomatic values for Stomatal number and Stomatal index are for upper and lower epidermis).

i) Stomatal number for upper epidermis: - Average value – 48.4 Range – 46 to 52.
ii) Stomatal number for lower epidermis: - Average value – 53.6 Range – 48 to 58.
iii) Stomatal index for upper epidermis: - Average value – 33 96 8, Range - 23.70 to 41.66
iv) Stomatal index for lower epidermis: - Average value – 32.97 Range – 25.00 to 41.66.

Table No. 01. Types of trichomes and stomata of *Cassia obtusifolia* and *Cassia tora*

Sr. No.	Name of the Plant Species	Trichomes Types	Stomata types	Stomata presence
1	*Cassia obtusifolia*	Multicellular uniseriate	Paracytic	Amphistomatic
2	*Cassia tora*	Multicellular uniseriate	Paracytic	Amphistomatic

Table No. 02. **Stomatal Length of *Cassia obtusifolia* and *Cassia tora***

Sr.No.	Name of plants	Upper stomata length		Lower stomata length	
		Average	Range	Average	Range
1	*Cassia obtusifolia*	14.85	3.20 to 16.50	21.45	19.80 to 23.50
2	*Cassia tora*	26.40	3.10 to 29.70	23.10	19.80 to 26.40

Average and range are calculated by 02 diagrams – sign indicates absence of stomata as leaf leaflet is hypostomatic.

Table No. 03, Stomatal width (apices) of *Cassia obtusifolia* and *Cassia tora*

Sr.No.	Name of plants	Upper stomata length		Lower stomata length	
		Average	Range	Average	Range
1	*Cassia obtusifolia*	5.77	4.95 to 6.60	5.77	4.95 to 6.60
2	*Cassia tora*	5.77	4.95 to 6.60	4.12	3.30 to 4.95

Average and range are calculated by 02 diagrams – sign indicates absence of stomata as leaf or leaflet is hypostomatic.

Table No. 4. Guard cell Length of *Cassia obtusifolia* and *Cassia tora*

Sr.No.	Name of plants	Upper stomatal length		Lower stomatal length	
		Average	Range	Average	Range
1	*Cassia obtusifolia*	18.15	16.50 to 19.80	19.80	16.50 to 23.10
2	*Cassia tora*	23.10	19.80 to 26.40	26.40	23.10 to 29.76

Average and range are calculated by 02 diagrams – sign indicates absence of stomata as leaf or leaflet is hypostomatic.

Table No.05, **Guard cell width of *Cassia obtusifolia* and *Cassia tora***

Sr.No.	Name of plants	Upper stomatal length		Lower stomatal length	
		Average	Range	Average	Range
1	*Cassia obtusifolia*	4.95	3.30 to 6.60	5.77	4.95 to 6.60
2	*Cassia tora*	5.77	4.95 to 6.60	6.60	4.95 to 8.25

Average and range are calculated by 02 diagrams – sign indicates absence of stomata as leaf or leaflet is hypostomatic

Table No. 06. Stomatal Index of *Cassia obtusifolia* and *Cassia tora*

Sr.No.	Name of plants	Upper stomatal length		Lower stomatal length	
		Average	Range	Average	Range
1	*Cassia obtusifolia*	26.273	18.75 to 1.25	23.688	18.75 to 26.66
2	*Cassia tora*	32.97	23.77 to 41.66	33.678	25.00 to 41.06

Average and range are calculated by 02 diagrams – sign indicates absence of stomata as, leaf or leaflet is hypostomatic.

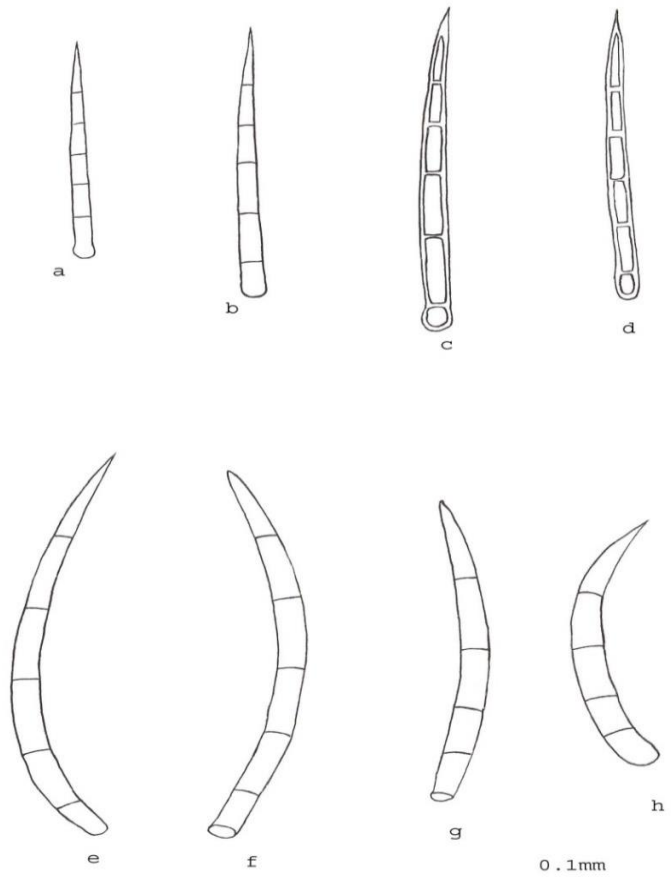
Table No. 07. **Stomatal Number of *Cassia obtusifolia* and *Cassia tora***

Sr.No.	Name of plants	Upper stomatal length		Lower stomatal length	
		Average	Range	Average	Range
1	*Cassia obtusifolia*	50.8	47 to 55	54.1	48 to 58
2	*Cassia tora*	48.4	46 to 52	53.6	48 to 58

Average and range are calculated by 02 diagrams – Sign indicates absence of stomata as leaf or leaflet is hypostomatic.

1

Plate No. 1



Trichome: *Cassia obtusifolia* (a b c d), *Cassia tora* (e f g h)

Plate No. 2

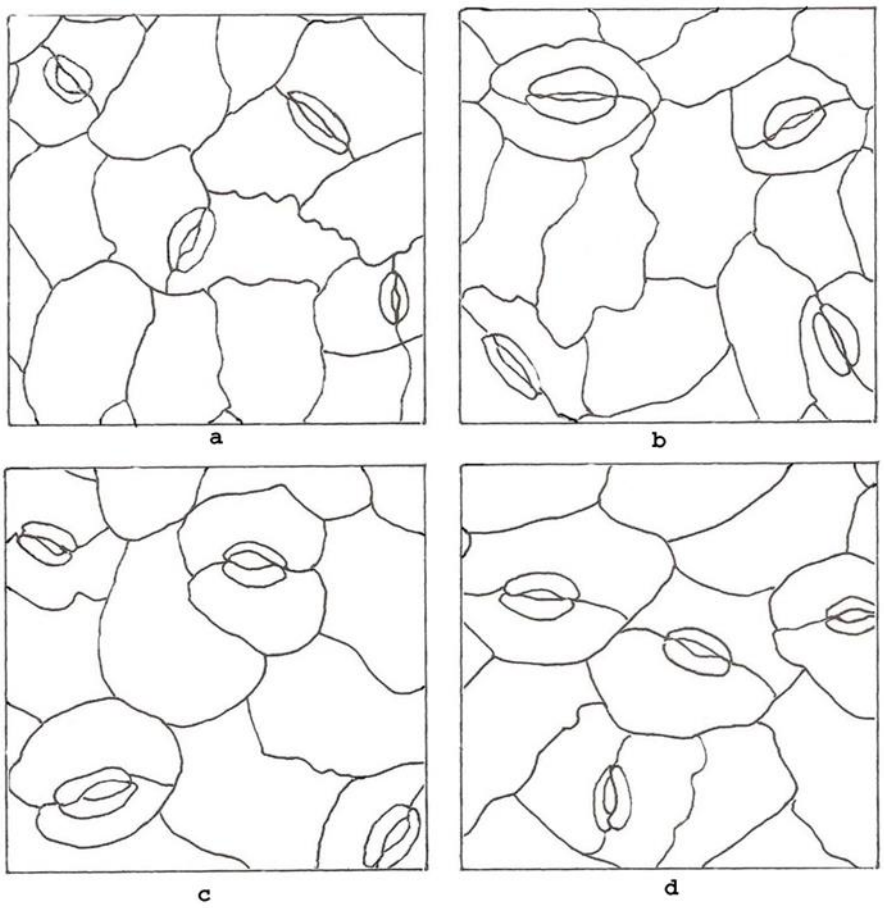


Fig- a)Stomata *Cassia obtusifolia* upper b)Lower, c)*Cassia tora* upper d)lower

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