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Trichomes and Stomatal Study of *Maerua oblongifolia* Foresk. a. rich 2) *Marsdenia volubilis* (Benth. L. f.) and *Sansevieria roxburghiana* L:

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ABSTRACT

Maerua oblongifolia Foresk. a. rich *Marsdenia volubilis* (Benth. L. f.) and *Sansevieria roxburghiana* L. are medicinal plants. These Plants have been used for various types of diseases. 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 trichomes.

Keywords: Trichomes and Stomata, *Maerua oblongifolia* Foresk. a. rich *Marsdenia volubilis* (Benth. L. f.) and *Sansevieria roxburghiana* L.

INTRODUCTION

From the ancient times man has utilized plants as a source of food, shelter as well as for health. The use of plants in medicine ranges from crude preparation of extract. (Maiti R. S. & Singh 2006). Present work intends to utilize this data of trichome and stomata to evaluate and standerdize leaf drugs of some medicinal plant. *Maerua oblongifolia* Foresk. a. rich *Marsdenia volubilis* (Benth. L. f.) and *Sansevieria roxburghiana* L. are medicinal plants. The plant *Maerua oblongifolia* is used to cure piles, leucoderma, asthma and urinary discharges. The plant contains substance of glucidal nature with low toxicity and traces of an alkoid, it stimulates all organs having cholinergic nerve supply and causes of prolonged fall of blood pressure (Chopra, 1965). The root and tender stalks are considered emetic and expectorant. The plant is used in colds and eyes diseases to cause sneezing. (Kirtikar & Basu, 1980). Use of plants by a postoral peoples and their

livestock in Kenya (W. T. W Morgan, 1980). The root used as tonic and stimulant and fruit used in stomach diseases of children (Rathore et. al; 2000). Roots are edible (Maheshwary; 2000). Roots of this plants used in boils and abscesses, eye diseases (Jayvir et,al. 2002). Leaves used as toothache (Mossa et. al; 1987). Antimicrobial activity of toothbrushsticks, (Van – et,al, 2006). The bark is used by masai, medicine men, and the plants toxic properties (WWW.aluka org/action/.). Marsedinia volubilis is very common in treatment for many diseases. The herb vendors use it in treatment of troubles related to digestive system, appetizer. Decoction made from M. volubilis, Kuchla and Bhang. Acoras calamus, fenel, papal dried ginger are also added in above decoction. This solution used for paralysis patients (Traditional medicinal knowledge abovr common herbs in Chhatisgarh, Botanical. Dom site/column_poudhia/publish/Journal/ 866.txt-5 k.). ***Sansevieria roxburghiana*** used as bowstring hempobtained from leaf (Albert, 1951). Fibre development from laef, (Arthur et; al; 1947). Leaf fibres used cordage, bowstring hemp, (Katherine Esau, 1959).

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 pairs 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. Trichomes 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 micro meter. The descriptions of dermatology of selected leaf drugs are as below:

1) ***Maerua oblongifolia*** Foresk. a. rich :-

The Leaf shows-presence of Multicellular uniseriate non glandular trichomes (300 – 620 µ.) ranges. Average length of trichomes is (460 µ. long) trichome present on leaf and stem.

The stomata are anomocytic, amphistomatic. Length and width of upper stomata is 21.45 X 7.425 µ (average) and 19.80 X 6.60 to 23.10 X 8.25 µ (range). The average cell size of guard cells is 24.75 X 11.55µ

and range between 23.10 X 9.90 to 26.40 X 13.20 µ. Subsidiary cells are wavy in outline with average cell size is 29.70 X 23.10µ and range between 26.40 X 19.80 to 33.00 X 26.40 µ.
In surface view the upper epidermal cells (average cell size 47.85 X 28.05µ), range 33.00 X 23.10 to 62.70 X 33.00µ) are slightly bigger in size as compared to lower epidermal cells. The length and width of lower stoma is 19.80 X 5.77 µ (average) and 16.50 X 4.95 to 23.10 X 6.60 µ (range). The average cell size of guard cells is (23.10 X 8.25 µ) and range between (19.80 X 6.60 to 26.40 X 9.90 µ). Subsidiary cells are irregular shape having average cell size, 26.40 X 23.10µ and range between 23.10 X 19.80 to 29.70 X 26.40 µ. The lower epidermal average cell size is 31.55X 23.10 µ, range (13.60 X 19.80 to 49.50 X 26.40 µ).
(Plate No. –1 & 2, Table:1 to7).

2) *Marsdenia volubilis* (Benth. L. f.)
Leaf shows Multicellular, uniseriate, glandular type of trichome. Length of trichome is 130 - 340 µ (range) and average length 235µ. Glandular trichomes are sessile with quadricellular head (19.80 to 39.60 µ.) Trichomes present on leaf and stem.
The stomata are paracytic and hypostomatic. The average cell size of lower stomata is 49.50 X 29.70 µ and range, 39.60 X 26.40 to 59.40 X 33.00 µ. The length and width of lower stomata is 33.00 X 5.77 µ (average) and 29.70 X 4.95 to 36.30 X 6.60 µ (range). The average cell size of guard cells is 36.30 X 8.25 µ and range between (19.80 X 6.60 to 26.40 X 9.90 µ). Subsidiary cells are irregular shape having average cell size 46.20 X 26.40 µ and range between 33.00 X 23.10 to 59.70 X 26.40 µ. The lower epidermal average cell size is 52.80 X 33.00 µ. And range between 39.60 X 26.40 to 66.00 X 39.60 µ).
(Plate No. – 1 & 2 Table:1 to7).

3) ***Sansevieria roxburghiana*** L: - Trichomes are absent abaxial & adaxial surface of leaf. The stomata are tetracytic and amphistomatic. Length and width of upper stoma is 51.15 X 18.15 µ (average) and 52.80 X 16.50 to 49.50 X 19.80 µ (range). The average cell size of guard cells is 56.10 X 23.10 µ and range between 52.80 X 19.80 to 59.40 X 26.10 µ. Four subsidiary cells are found in tetracytic type of stomata two are lateral and two are polar in position. The average cell size 57.75 X 22.10 µ and range between 62.70 X 19.80 to 52.80 X 24.40 µ. In surface view the upper epidermal cells (average cell size 59.10 X 23.10 µ, range 56.10 X 19.80 to 62.70 X 26.40 µ).
The length and width of lower stoma is 49.50 X 19.80 µ (average) and 52.80 X 16.50 to 49. 50 X 19.80 µ (range). The average cell size of guard cells is 56.10 X 23.10 µ and range between (52.80 X 19.80 to 59.40 X 26.40 µ). Subsidiary cells are four two polar and two lateral having average cell size, 59.40 X 22.10 µ and range between 52.80 X 19.80 to 66.00 X 24.40 µ. The lower epidermal average cell size 62.70 X 29.70 µ and range, (56.10 X 23.10 to 69.30 36.30µ).
(Plate No. – 1 & 2 , Table:1 to7).

Stomatal number and Index: Stomatal index is the percentage which the number of stomata forms to the total number of epidermal cells.
1) *Maerua oblongifolia* Foresk. a rich **:** Leaf shows following values of stomata - (leaf being amphistomatic values for Stomatal number and Stomatal index are for upper and lower epidermis).
i) Stomatal number for upper epidermis: Average value – 35, Range – 30 to 41.
ii) Stomatal number for lower epidermis: Average value – 44.2, Range – 42 to 56.
iii) Stomatal index for upper epidermis: - Average value – 26.729, Range – 16.66 to 33.33
iv) Stomatal index for lower epidermis: - Average value – 29.678, Range – 25.00 to 35.29
(Plate No. - 2, Table:1 to7).

2) ***Marsdenia volubilis*** **:-** 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 – 35.5; Range – 30 to 41.
ii) Stomatal index for lower epidermis: Average value – 18.569; Range – 16.66 to 29.29
(Plate No. 2, Table:1 to7).

3) ***Sansevieria roxburghiana*** L.**:** Leaf shows following values of stomata - (leaf being amphistomatic values for Stomatal number and Stomatal index are for upper and lower epidermis).
i) Stomatal number for upper epidermis: Average value – 4.4, Range – 3 to 6.
i) Stomatal number for lower epidermis: Average value – 4.3, Range – 3 to 6
iii) Stomatal index for upper epidermis: Average value – 25.023' Range – 20.00 to 33.33
ii) Stomatal index for lower epidermis: Average value – 28.333; Range – 20.00 to 40.00

Table 1: Types of trichomes and stomata

Sr. No.	Name of the Plant Species	Trichomes Types	Stomata type	Stomata presence
1	*Maerua oblongifolia*	Multicellular uniseriate	Anomocytic	Amphistomatic
2	*Marsdenia volubilis*	Multicellular uniseriate	Paracytic	Hypostomatic
3	*Sansevieria roxburghiana*	Trichome absent	Tetracytic	Amphistomatic

Table 2: Stomatal Length

Average and range are calculated by 03 diagrams: – sign indicates absence of stomata Average and range are calculated by 03 diagrams: – sign indicates absence of stomata as leaf leaflet is hypostomatic.

Sr. No	Name of plant species	Upper stomata length		Lower stomatal length	
		Average	Range	Average	Range
1	*Maerua oblongifolia*	21.45	19.80 to 23.10	19.80	16.50 to 23.10
2	*Marsdenia volubilis*	---	---	49.50	39.60 to 59.40
3	*Sansevieria roxburghiana*	51.15	52.80 to 49.50	49.50	49.50 to 52.80

Table 3 : Stomatal width (apices), as leaf or leaflet is hypostomatic.

Sr. No.	Name of plant species	Upper stomata length		Lower stomatal length	
		Average	Range	Average	Range
1	*Maerua oblongifolia*	7.42	6.60 to 8.25	5.77	4.95 to 6.60
2	*Marsdenia volubilis*	--	--	5.77	4.96 to 6.60
3	*Sansevieria roxburghiana*	18.5	16.50 to 19.80	19.80	16.50 to 23.10

Table 4: Guard cell Length.

Average and range are calculated by 03 diagrams: – sign indicates absence of stomata as, leaf or leaflet is hypostomatic.

Sr. No.	Name of plant species	Upper stomata length		Lower stomatal length	
		Average	Range	Average	Range
1	*Maerua oblongifolia*	24.75	23.10 to 26.40	23.10	19.80 to 26.40
2	*Marsdenia volubilis*	---	----	36.30	33.00 to 39.60
3	*Sansevieria roxburghiana*	56.10	52.80 to 59.40	56.10	52.80 to 59.40

Table 5: Guard cell width

Average and range are calculated by 09 diagrams: – sign indicates absence of stomata, as leaf or leaflet is hypostomatic.

Sr. No.	Name of plant species	Upper stomata length		Lower stomatal length	
		Average	Range	Average	Range
1	*Maerua oblongifolia*	11.55	4.95 to 6.60	5.77	4.95 to 6.60
2	*Marsdenia volubilis*	---	---	8.25	6.60 to 9.90
3	*Sansevieria roxburghiana*	23.10	19.80 to 26.10	24.75	19.80 to 29.70

Table 6: Stomatal Index

Average and range are calculated by 03 diagrams: – sign indicates absence of stomata as leaf or leaflet is hypostomatic.

Sr. No.	Name of plant species	Upper stomata length		Lower stomatal length	
		Average	Range	Average	Range
1	*Maerua oblongifolia*	26.729	16.66 to 33.33	29.678	25.00 to 35.29
2	*Marsdenia volubilis*	--	--	18.569	16.66 to 29.27
3	*Sansevieria roxburghiana*	25.023	20.00 to 33.33	28.333	20.00 to 40.00

Table7: Stomatal Number

Average and range are calculated by 03 diagrams: – sign indicates absence of stomata as leaf or leaflet is hypostomatic.

Sr. No.	Name of plant species	Upper stomata length		Lower stomatal length	
		Average	Range	Average	Range
1	*Maerua oblongifolia*	35.00	30 to 41	44.2	42 to 56
2	*Marsdenia volubilis*	--	--	35.8	30 to 41
3	*Sansevieria roxburghiana*	4.4	03 to 06	4.3	03 to 60

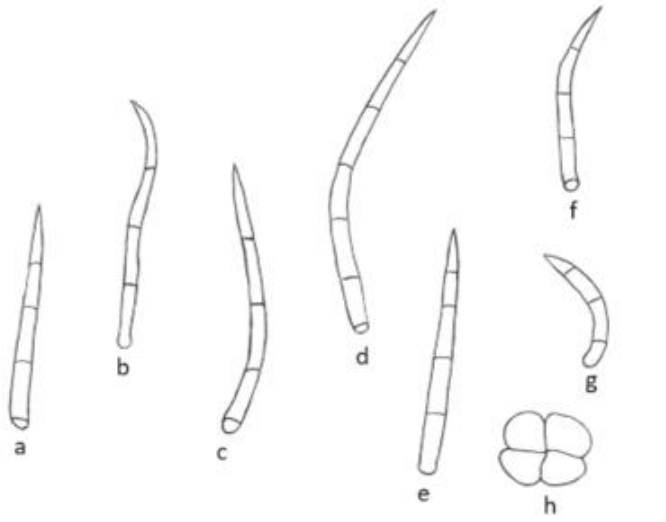

Fig:Trichome 0.1mm

Maerua Oblongifolia (a, b, c), Marsdenia volubilis (d, e, f, g, h)

Photoplate 1

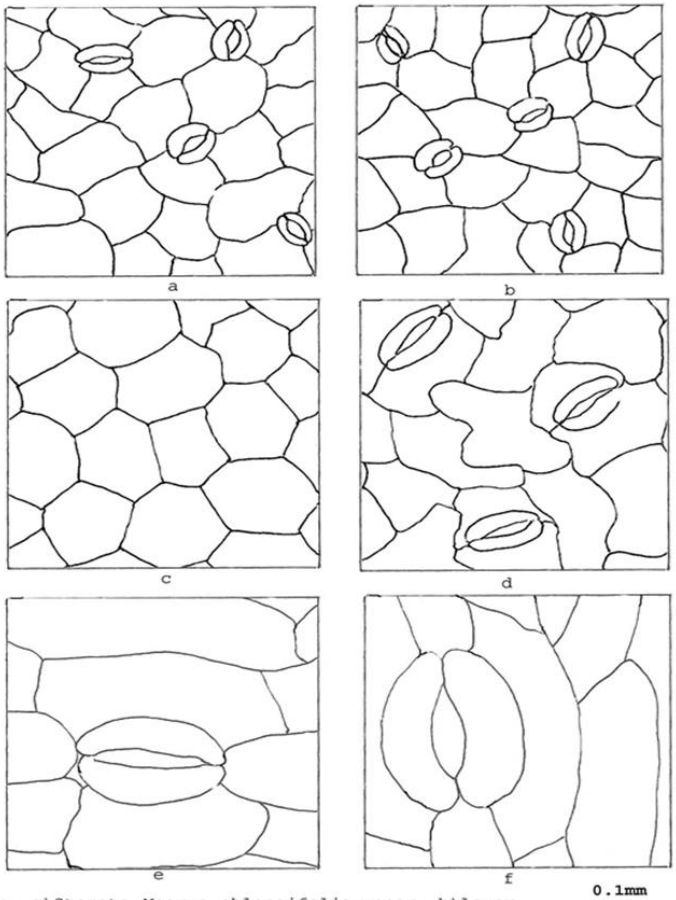

Fig. a)Stomata *Maerua oblongifolia* upper, b)lower c)*Marsdenia volubilis* upper d) lower, e) *Sansevieria roxburghiana* upper f) lower.

Photoplate 2

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