

Study of stomatal frequency in some species of family Malvaceae in Ranchi District of Jharkhand

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ABSTRACT

Malvaceae a family of herbs, with some shrubs and trees, in which leaves are palmately veined, often lobed, and rich in mucilage. About 85% of traditional medicines are plant derived. Most of the plants are used decorative and also for medicinal purposes. Present study deals with morphotaxonomy. Study of stomata is an important part of taxonomy. Stomata is a pore found in the epidermis of leaves that controls the rate of gas exchange. In the study of stomata, types of stomata and number of stomata done, and stomatal index is calculated of the ethnomedicinal plants of family Malvaceae viz *Malva sylvestris* L., *Sida acuta* Burm.f., *Abutilon indicum* G.Don. These medicinal plants are also used as food, colour and in certain spiritual activities. Plants have been used for medicinal purposes long before prehistoric period. Traditional systems of medicine are widely practiced in Ranchi district of Jharkhand. In tribal villages it is found that these Ethnomedicinal plants are used to cure many diseases viz. smaller injuries, stomachache, fever, gynecological complaints etc.

Key Words - Stomatal index, Malvaceae, Ethnomedicinal

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INTRODUCTION

Malvaceae, the Hibiscus, or mallow, family (order - Malvales) is the family of ornamental and medicinal plants. In almost each and every park, garden and waste places we can have the sight of different species of this family. Malvaceae family encompasses approximately 244 Genera with 4225 species of herbs, shrubs, trees. (Chistenhusz, 2016). Around 22 genera of the family are reported from India. In Taxonomical study Anatomy is a very useful tool for identification of the plants. Epidermal characters can prove to be of importance with respect to identification of a particular plant species. This can also provide reliable information in standardization of an ayurvedic / herbal drug (Chachad and Vaidya, 2016). Leaf epidermal anatomical feature such as stomata, trichomes and other characters are useful anatomical tools. Stomata are minute aperture structure on plants

found typically on leaf epidermis. The stomata were firstly studied (Stresburger, E.,1866), then who recognized (Vesque, 1989) four broad categories of stomata based on the presence and arrangement of accessory cells as well as their mode of development. The main function of stomata is exchange of gases CO₂, water vapour and O₂ to move rapidly out of leaf. The number of stomata on leaf surface varies widely among different species of plants. Generally, the lower epidermis of the leaf has a greater number of stomata than the upper surface. (Gole *et al.*, 2013)

MATERIAL & METHOD

The plant species of *Malva sylvestris* was collected from ICAR Palandu, Ranchi. *Sida acuta* was collected from the road side of Radium Road, Ranchi. *Abutilon indicum* was collected from road side of circular road, Ranchi, Jharkhand. The collected plants were

identified with the help of flora “Botany of Bihar and Orissa Vol I – VII” (Haines, 1921). Study of stomatal index has been carried out on the selected plant species of family Malvaceae in Ranchi District of Jharkhand. The distribution of stomata on the upper and lower surface of the leaves were studied by removing the peels of the leaf with the help of blade after that it was properly cleaned and stained with 1% Safranin and mounted with 5% Glycerin then cover it with the help of cover slip and prepared the slide and observed under the microscope and the type of stomata, its shape and number were recorded. The statistical data performed using ocular micrometer. Then stomatal index was calculated of all the three plants.

$$\text{Stomatal index} = \frac{\text{Number of stomata}}{\text{No. of stomata} + \text{No. epidermal cells}} \times 100$$

S.I = Stomatal index

S = Number of stomata per unit area

E = Number of epidermal cells in the same area

RESULT & DISCUSSION

PLANT – 1 - *Malva sylvestris*

Table 1-Stomatal index on upper surface of the leaf

No. of Observation	No. of stomata per Unit area (S) (40x)	No. of epidermal Cell (E) (40x)	$S.I = \frac{S}{S + E} \times 100$
1.	58	108	31.17 %
2.	54	98	
3.	45	121	
4.	48	102	
5.	42	111	
6.	56	95	
7.	58	120	
8.	44	116	
9.	46	136	
10.	55	110	
Total	506	1117	

Type of stomata on upper surface of the leaf = Anomocytic

Table 2- Stomatal index on lower surface of the leaf

No. of Observation	No. of stomata per Unit area (S) (40x)	No. of epidermal Cell (E) (40x)	$S.I = \frac{S}{S + E} \times 100$
1.	77	120	34.60 %
2.	73	135	
3.	72	140	
4.	68	137	
5.	65	162	
6.	74	148	
7.	78	118	
8.	68	132	
9.	72	142	
10.	78	136	
Total	725	1370	

Type of stomata on lower surface of the leaf = Anomocytic

PLANT – 2 – *Sida acuta*

Table 3-Stomatal index on upper surface of the leaf

No. of Observation	No. of stomata per Unit area (S) (40x)	No. of epidermal Cell (E) (40x)	$S.I = \frac{S}{S + E} \times 100$
1.	28	79	22.90 %
2.	33	98	
3.	30	90	
4.	31	102	
5.	26	96	
6.	27	110	
7.	25	94	
8.	29	99	
9.	32	96	
10.	24	95	
Total	285	959	

Type of stomata on upper surface of the leaf = Anomocytic

Table 2- Stomatal index on lower surface of the leaf

No. of Observation	No. of stomata per Unit area (S) (40x)	No. of epidermal Cell (E) (40x)	$S.I = \frac{S}{S + E} \times 100$
1.	42	138	25.81 %
2.	51	162	
3.	57	154	
4.	53	143	
5.	48	160	
6.	49	135	
7.	52	156	
8.	47	142	
9.	53	138	
10.	56	132	
Total	508	1460	

Type of stomata on lower surface of the leaf = Anomocytic

Plant – 3 – *Abutilon indicum*

Table 5-Stomatal index on upper surface of the leaf

No. of Observation	No. of stomata per Unit area (S) (40x)	No. of epidermal Cell (E) (40x)	$S.I = \frac{S}{S+E} \times 100$
1.	4	78	5.54 %
2.	5	82	
3.	4	75	
4.	5	80	
5.	3	76	
6.	4	84	
7.	5	88	
8.	4	82	
9.	6	79	
10.	7	77	
Total	47	801	

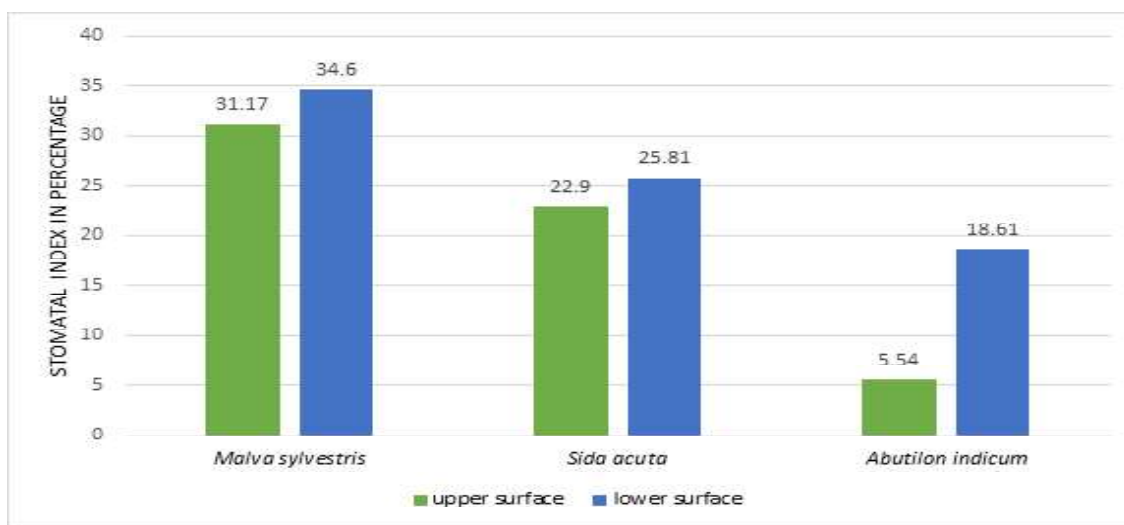
Type of stomata on upper surface of the leaf = Anomocytic and Diacytic

Table 6- Stomatal index on lower surface of the leaf

No. of Observation	No. of stomata per Unit area (S) (40x)	No. of epidermal Cell (E) (40x)	$S.I = \frac{S}{S+E} \times 100$
1.	24	73	18.61 %
2.	19	67	
3.	14	78	
4.	11	86	
5.	16	76	
6.	22	72	
7.	15	81	
8.	21	75	
9.	18	84	
10.	15	73	
Total	175	765	

Type of stomata on lower surface of the leaf = Anomocytic and Diacytic

Fig. 1: Graph showing stomatal frequency on both upper and lower surface of the leaf of some species of family Malvaceae



Photograph of some species of family Malvaceae



(Fig. 2) *Malva sylvestris*



(Fig. 3) *Sida acuta*

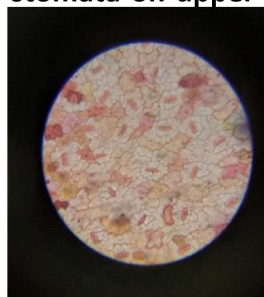


(Fig. 4) *Abutilon indicum*

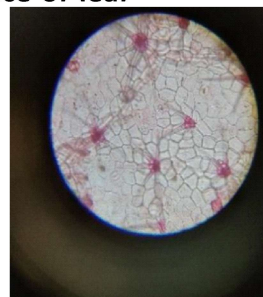
Photographs of stomata on upper surface of leaf



(Fig.5) *Malva sylvestris*



(Fig.6) *Sida acuta*



(Fig.7) *Abutilon indicum*

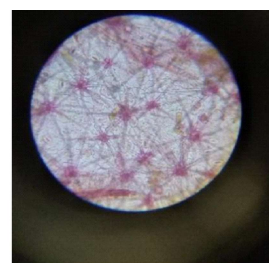
Photographs of stomata on lower surface of leaf



(Fig.8) *Malva sylvestris*



(Fig.9) *Sida acuta*



(Fig.10) *Abutilon indicum*

The present investigation shows that the stomatal index on upper surface of leaf were calculated in plant of *Malva sylvestris* was 31.17 % and Anomocytic type of stomata were present. The stomatal index on lower surface of the leaf of *Malva sylvestris* was 34.60 % and Anomocytic stomata were present. In *Sida acuta*, stomatal index on upper surface of the leaf was 22.90 % and in lower surface of the leaf of *Sida acuta* was 25.81 %, Anisocytic type of stomata were present in both upper and lower surface of the leaf. In plant *Abutilon indicum* stomatal index on upper surface of the leaf was 5.54 % and in lower surface of the leaf was 18.61 %. The result of the study shows that lower surface of all the plants stomata were more in number and higher stomatal index. So, the gaseous exchange was higher from lower surface of the leaves.

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