Biospectra : ISSN: 0973-7057, Vol. 16(1), March, 2021, pp. 81-84
An International Biannual Refereed Journal of Life Sciences

20(PS).
Plant Science

ISSN : 0973-7057

Int. Database Index: 616 www.mjl.clarivate.com

Comparative study of stomatal index of some ethnomedicinal plants of some species of family Malvaceae in Ranchi district of Jharkhand

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Received : 9th January, 2021 ; Revised : 10th February, 2021

Abstract- Present investigation deals with the study of stomata and stomatal index of two plants of family Malvaceae. Stomata are tiny openings present on the epidermis of leaves. We can see stomata under the microscope. Stomata are cell structures in the epidermis of leaves that involved in the exchange of carbon dioxide and water between plants and the atmosphere. Stomata present in leaves either on dorsal surface or ventral surface. The determination of stomatal index in the ethnomedicinal plants of family Malvaceae viz. *Hibiscus rosa-sinensis* L. and *Hibiscus esculentus* L. has been done for taxonomical purposes.

Key words: Stomatal index, Malvaceae, *Hibiscus rosa-sinensis* L. and *Hibiscus esculentus* L.

INTRODUCTION

Stomata are the tiny microscopic pores present on the leaves. Stomata are the main channels for plants to exchange water and gas with the environment within the main photosynthetic organs. These are correlated with physiological activities such as photosynthesis, respiration and transpiration.[1] Stomata are easily affected by external environmental conditions. The micromorphological characteristics of leaves have been commonly used in plant classification.[2] Stomata are important organs in phylogenetic relationship of plants. It helps in plants origin, evolution and classification.[3]

After counting the stomata and epidermal cells, the stomatal index is determined. Stomatal index is the percentage of total number of stomata with total number of epidermal cells around the stomata in a unit area of leaf.

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MATERIAL & METHOD

The collected plants were identified with the help of flora Botany of Bihar and Orissa Vol I-VII.[4] The leaves of *Hibiscus rosa-sinensis* L. were collected from Ratu road, Ranchi in January, 2021 and the leaves of *Hibiscus esculentus* L. were collected from Kanke, Ranchi in February 2021. 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 the safranin then prepared the slide and observed under the microscope. Leaf of *Hibiscus rosa-sinensis* L. stomata were absent on the upper surface and on the lower surface of the leaf Anomocytic stomata were present. On the both surface of

the leaf of *Hibiscus esculentus* L. two types of stomata's were present that is Anisocytic and Paracytic. The number of stomata and epidermal cells were counted. After that stomatal index of each surface of the leaf were calculated using following formula:-

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

S.I = Stomatal index
S = Number of stomata per unit area
E = Number of epidermal cells in the same area

RESULTS & DISCUSSION

PLANT - 1

Hibiscus rosa-sinensis L.

Stomatal index on upper surface = Nil

Table 1: Stomatal index on lower surface

No. of Observation	No. of stomata per Unit area (s) (40x)	No. of epidermal Cell (E) (40x)	S.I = S / S + E ×100
1.	28	56	
2.	21	58	
3.	23	52	
4.	25	46	S.I = 32.81 %
5.	32	43	
6.	24	55	
7.	26	52	
8.	25	48	
9.	21	52	
10.	27	54	
Total	**252**	**516**	

Type of stomata in lower surface = Anomocytic

PLANT - 2

Hibiscus esculentus L.

Table 2: Stomatal index on upper surface

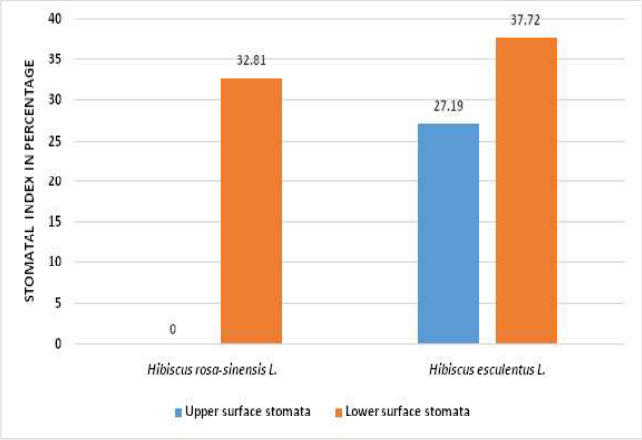
No. of Observation	No. of stomata per Unit area (s) (40x)	No. of epidermal Cell (E) (40x)	S.I = S / S + E ×100
1.	19	45	
2.	15	49	
3.	17	38	
4.	14	41	27.19 %
5.	17	43	
6.	16	46	
7.	15	48	
8.	16	36	
9.	14	47	
10.	18	38	
Total	**161**	**431**	

Type of stomata in upper surface = Anisocytic and Paracytic

Table 3 :Stomatal index on lower surface

No. of Observation	No. of stomata per Unit area (s) (40x)	No. of epidermal Cell (E) (40x)	S.I = S / S + E ×100
1.	26	53	
2.	21	48	
3.	28	45	
4.	34	45	
5.	23	39	37.72 %
6.	27	42	
7.	23	38	
8.	31	55	
9.	28	36	
10	31	48	
Total	**272**	**449**	

Type of stomata in lower surface = Anisocytic and Paracytic



Graph 1. Comparative study of stomatal index on upper and lower surface of the leaf

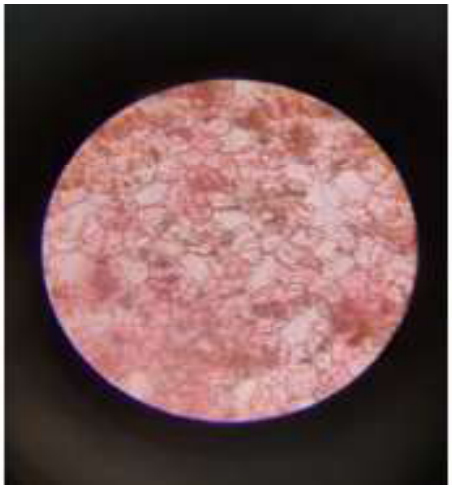


Figure 1: *Hibiscus rosa-sinensis* L. Upper surface of stomata

Figure 2 : *Hibiscus rosa-sinensis* L. Lower surface of stomata

Figure 3 : *Hibiscus esculentus* L. Upper surface of stomata

Figure 4 : *Hibiscus esculentus* L. Lower surface of stomata

The present investigation deals with the type of stomata in investigated plant species and their stomatal index were calculated in *Hibiscus rosa-sinensis* L. on upper surface of leaf stomata was absent and in lower surface Anomocytic type of stomata were found the stomatal index calculated was 32.81%. In *Hibiscus esculentus* L. leaves two types of stomata's Anisocytic and Paracytic were present in both upper and lower surface. In upper surface of leaf, stomatal index calculated was 27.19%. In lower surface of leaf, stomatal index calculated was 37.72%. The highest stomatal index was calculated in lower surface of leaf of *Hibiscus esculentus* L. and the lowest stomatal index was calculated in upper surface of leaf of *Hibiscus esculentus* L. The stomatal indexes of some medicinal plants of Malvaceae family were studied.[5] The stomatal study plays an important role in the classification of plants.

ACKNOWLEDGEMENT

The authors are thankful to the Head of the University Department of Botany, Dr. Jyoti Kumar and University Professor and my supervisor Dr. Kunul Kandir for the encouragement.

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