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COMPARATIVE STUDIES IN STOMATA OF A MEDICINALLY IMPORTANT PLANT *CASSIA ANGUSTIFOLIA* GROWN IN DIFFERENT SOIL TREATMENTS

Kistamma Singanaboina[1]*, Venkateshwar Chinna [1], Suman Kumar Ratnampally [1]

[1]Department of Botany, University College of Science, Osmania University, Hyderabad, Telangana, India.

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For Correspondence:

Kistamma Singanaboina

Department of Botany, University College of Science, Osmania University, Hyderabad, Telangana, India

E-mail:

krishnaveni525@yahoo.com

ABSTRACT

The stomatal diversity (size, shape, types and orientation) in the foliar epidermis has great value in plant systematic studies. The present paper deals with the comparative studies of stomatal structure of *Cassia angustifolia* which were grown in three different soils. Leaf epidermal studies mainly stomatal, costal, leaf clearings and articular preparations were examined with light microscope. The study is based on the type of stomata present in the epidermal surface, stomatal index and costal cell shape, epidermal cell shape in leaves of three different soil treatments. Paracytic type of stomata is present in all three leaves. Anatomical properties of plant parts are sources for taxonomic inferences in different groups of flowering plants. The aim of present study is to use stomatal characters as aid in taxonomy of medicinally useful cassia plants. The study would help in the identification and authentication of these medicinal plants on the basis of stomatogenesis.

INTRODUCTION

The *Cassia angustifolia* is an important medicinal plant belongs to the family Caesalpinaceae. This family consists of 160 genera and some 2,000 species. The genus cassia is one of the genuses of Caesalpinaceae having about 692 species. *Cassia angustifolia* popularly known as senna a valuable olant drug in Ayurvedic and modern system of medicine for the treatment of constipation[1,2,3,4], it is also known as Tinnevelly senna or Arabian senna[5]. The plant is branched erect perennial shrub used medicinally throughout the world[6]. It is a small under shrub up to 1 or 1.5m height with variable branches and with compound pinnate leaves. This species can be distinguished morphologically from its adulterant allied species Cassia obtusifolia, which is a tall shrub up to 2 or 2.5m in height with obtuse or elliptic leaves[7]. Cassia angustifolia having racemose inflorescence. The pods are 3-9cm in size, greenish brown or dark brown in colour.

On the basis of arrangement of epidermal cells, guard cells, more than 25 types of stomata have been recognized[8]. Stace[9] reported 31 different types of stomata among cotyledonous plants. Diversity in stomata types, even on the same surface of an organ indicates the weakness in using stomata as a taxonomic character[10]. In spite of diversity the most frequent stomata type can be used as a taxonomic character[11].

MATERIAL AND METHODS

Plant material source

Cassia angustifolia seeds were procured from the CIMAP, Hyderabad. These seeds were grown in earthen pots in green house of Botanical Garden, Department of Botany, Osmania University Hyderabad. The plants grown in three different soil treatments. In control, the plants are grown in normal soil without any addition, treatment- I plants are grown in soil added with heavy metals in a ration of cadmium 10ppm, chromium 20ppm and nicked 16ppm and finally in treatment-II in addition to the above heavy metals 1% of calcium hydroxide was added to the soil and was grown up to productivity levels. The foliar epidermal peals were taken from the apex, midrib and basal parts of the mature leaves of three different soil treatments. Epidermal peals were stripped and stained with alcohol, saffranin and temporary mount in glycerin. Stomatal frequency counts were done with the help of Leica-450 compound microscope. The number of stomatal frequency was counted in each field. The stomatal frequency was based on average obtained from observations of 3 microscopic fields. Stomatal index-I was calculated by the following formula using the No. of stomata(s) and epidermal cells present in a unit (I=S/S+E).

RESULTS AND DISCUSSION

The results in the investigation were summarized in tables including stomatal count, stomata type, stomatal index, and stomatal complex.

Epidermal cell: The shape of foliar epidermis is one of the significant taxonomic characters. Taxonomic studies of a number of families are based on leaf epidermis anatomy[12]. In this investigation, it was found that the epidermal cell shape varies slightly with growth habit. The shrub species posses pentagonal to polygonal shaped epidermal cells.

The *Cassia angustifolia* leaf epidermal cells are similar in adaxial surface and abaxial surface. The shape of epidermal cells is polygonal in shape. Anticlinal wall is straight with dense cytoplasm, the surface of epidermal cells is smooth, transversely oriented. The epidermal cells are arranged in irregularly in two treatments including control.

The stomata are paracytic type; anticlinal wall is curved with dense cytoplasm. The surface of stomata is smooth, variously oriented. Arrangement is irregular in both the sides of leaf in two treatments including control. The costal cells are rectangular in shape, the anticlinal wall is straight and curved. The outer wall is flat with dense cytoplasm. The surface is smooth, parallelly oriented and arranged irregularly on both adaxial and abaxial surface of leaf in two treatments including control. (fig.1,2 and 3). The count for stomatal index were taken from three regions of leaf i.e., at apex, midrib and base. At leaf apex, the abaxial surface has shown maximum stomatal index and stomatal density. At midrib region, abaxial region shown maximum stomatal index. The stomatal density is maximum in adaxial surface. At leaf base region both stomatal index and stomatal density are maximum in abaxial surface.

In the overall leaf observation, the leaf base regions have shown maximum stomatal index and stomatal density. In heavy metal treated plant leaf, the apex region of the adaxial surface has shown maximum stomatal index but stomatal density is maximum on abaxial surface. In midrib region, the abaxial surface shown that the both stomatal index and stomatal density are maximum. At leaf base, the adaxial surface shown both stomatal index and stomatal density are maximum when compared to that on abaxial surface.

In Ca $(OH)_2$ treated plant leaf, the apex region of the abaxial surface shown maximum number of stomatal index and stomatal density than on adaxial surface. In midrib region, the stomatal index and stomatal density are maximum on adaxial surface. Whereas in leaf base region the stomatal index is maximum on adaxial surface and stomatal density is maximum on abaxial surface.

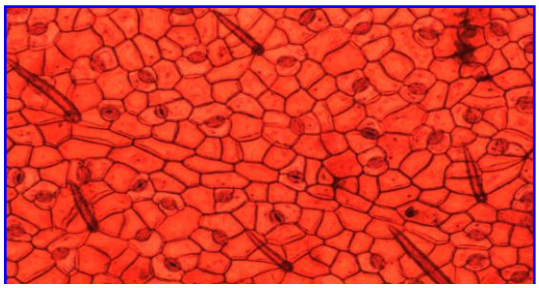

Fig-1Internal structure of Stomata grown in Control

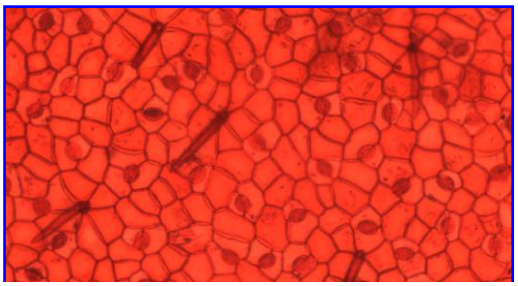

Fig-2 Internal structure of Stomata grown in treatment-I

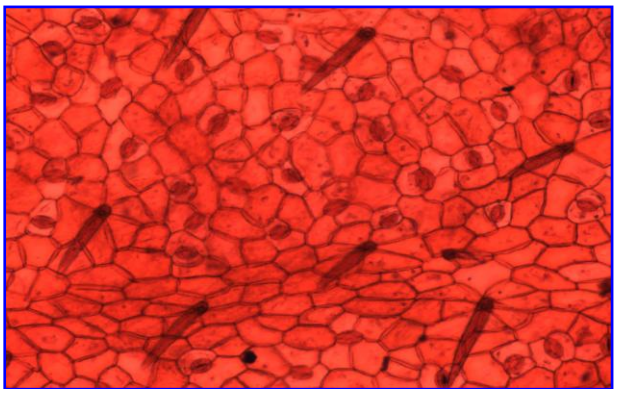

Fig -3 Internal structure of Stomata grown in treatment - II

In all the three treatments, the heavy metal treated plant leaf shown maximum stomatal index at leaf apex region on adaxial surface and stomatal density is maximum at apex region on abaxial surface (table-1). In all treatments shows paracytic type of stomata.

Table: Stomatal Index Percentage and Stomatal Density/Cm² in *Cassia angustifolia* leaf

S.NO	TREATMENTS	HABIT	SURFACE OF LEAF	STOMATAL INDEX			STOMATAL DENSITY		Cm²
				APEX	L.MIDRIB	L.BASE	APEX	L.MIDRIB	L.BASE
1	Normal	Shrub	Adaxial	18.16	19.45	21.26	328.29	371.87	338.46
			Abaxial	18.6	22.14	22.42	348.62	351.53	367.51
2	Heavy metal	Shrub	Adaxial	79.84	16.28	32.59	347.17	236.77	467.74
			Abaxial	30.95	21.53	24.72	490.98	338.46	358.79
3	$Ca(OH)_2$	Shrub	Adaxial	22.17	20.89	22.45	358.79	351.53	352.98
			Abaxial	34.17	20.83	20.19	479.36	405.28	384.94

CONCLUSION

Stomatal index is one of the useful tools in order to distinguish species. It was found that stomatal index has low value on abaxial surface of leaf in apex region in normal leaf. In all the regions of leaf and treatments of plant leaf share more or less equal number of stomata which shows they are closely related, from the study it can be concluded that there is no relation between the stomatal size and growth habit, presence of stomata, stomatal type,

stomatal index, stomatal density. However, the stomatal feature may prove to be a little taxonomic value unless the development of different stomatal types were studied .a greater number of information on taxa will be helpful to understand the taxonomic value of stomata type and distribution.

REFERENCES

1. Atal C.K., Kapoor B.M.,"Cultivation and utilization of medicinal plants", Jodhpur,India.rrl, 1982; 8.
2. Das P.N., S.S., Purohit., A. K Sharma., T . Kumar. "A hand book of medicinal plants", Jodhpur , India, Agrobios, 2003; 118.
3. Martindale. "The extra Pharmacopia 27th ed. London", The pharmaceutical press, 1997; 1342-1343.
4. Sharma R., "Agro- Techniques of medicinal plants", Delhi Daya publishing House, 2004; 176-77.
5. Khan M. A., Ahmad M., Zafar M., Sultana S., Shaheen S., Leghari M. K Jan G., Ahmad F., Nazir. A. "Medico-botanicaland chemical standardization of Pharmacutically important plant of tricholepis" 2011.
6. Anonymous, "The wealth of India II-Raw Materials". New Delhi Publication and information Directorate ,CSIR, 1992; PP.354-363.
7. Srivastava M., Srivastava S., Khatoon S., Rawat A.K.S., Mehrotra S., Puhpangadan P., "Pharmacognastical evalution of *Cassia angustifolia* seeds" Pharmaceut. Bio, 2006; 144(3):202-207
8. Metcalfe,CR and Chalk., "Anatomy of the Dicotyledons"Claendon press, Oxford, 1979.
9. Stace C.A., "The taxonomic importance of the leaf surface in Heywood VH and moore DM(Eds)", Current concept in plant Toxonamy, Acadamic press, London, 1984; pp-67-94.
10. Pant D. D., P. F. Kidwai, "on the Diversity in the development and organization of stomata in phyla nudiflora Michx" Current sci., 1964; Vol.33,pp.653-654.
11. Gopal B. V., Mishra A. K., "A New Technique for plant Epidermal Studies", Kenya science & Tech (B), 1980; Vol.1, pp.99-100.
12. Bhatia R. C., "Foliar epidermal Studies of Heliotropium Supinum L.Foliar", Geo Bot. Phytotaxon , 1984; vol.19,pp.381-385.