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COMPARATIVE STUDIES ON STOMATA OF TWO SPECIES OF *CRINUM*

Shahla Firdaus and Kamini Kumar

Laboratory of Cytogenetics, Plant Breeding, Molecular Biology and Biotechnology

Ranchi University, Ranchi, Jharkhand- 834008.

Abstract: *Crinum* belongs to family Amaryllidaceae are large, ornamental plants with umbels of lily-like flowers. They are found in tropical and subtropical regions throughout the world, where, for centuries, they have been traditionally used for treatment of many diseases. The present study is focused on the stomata of *Crinum latifolium* and *Crinum asiaticum*. Stomata are very minute pores and it is present particularly in the leaves through which gases are exchanged. The stomatal index and size of guard cells (average length and width) were determined. The maximum stomatal index was observed in basal portion of abaxial surface (24.01±0.70) and minimum in apical portion of adaxial surface (11.92±0.49) in leaf of *C. latifolium*. In case of *C. asiaticum* the maximum stomatal index was observed in basal portion of abaxial surface (52.43±0.55) and minimum in middle portion (14.44±0.51). Statistical evaluation of the stomata included mean, standard deviation and standard error. Anomocytic type of stomata was revealed in both the species by this investigation.

***Index Terms*- Amaryllidaceae, Stomata, Guard cells, Anomocytic.**

I.INTRODUCTION

Crinum is a flowering plant, a large genus of family Amaryllidaceae. There are 180 species of this plant found in Asia, Australia, Africa and America containing secondary metabolites especially alkaloids (Lewis,2010). *Crinum* species are widely used in indigenous medicine for many diseases; mainly leaf and bulb extracts are of medicinal importance(Win, 2011).

Since past few decades, problems on taxonomic identification of plants had been resolved by using anatomical and morphological features of monocots. After cytology, study on leaf epidermis is an important tool for resolving the taxonomic problems(Srivastava, 1978).

The plant anatomy is helpful in study of habitat quality of plant, since they manifest variability in relation to microclimatic conditions (Barber et al, 2004). Both stomata and stomatal traits (stomatal density, stomatal apparatus and guard cell architecture) respond to environmental and physiological hints (Nadeau and Sack, 2002, Gitz and Bakern,2009). Plant has capability to change in different environmental conditions during transpiration process by adjusting the aperture of the stomatal pores, whereas longer term changes are accomplished due to the changes on the proportion of stomata that develop on the leaf surface (Roeflsema and Hedrich, 2005, Casson and Gray , 2008). As stomatal studies is an important tool in taxonomic identification, therefore the present investigation was

undertaken to explain the taxonomic relationship between the two speciesof *Crinum latifolium* and *Crinum asiaticum*

II. MATERIAL AND METHODS

The fresh leaves of *Crinum latifolium* and *Crinum asiaticum* were immersed in water to prevent desiccation to procure epidermal cells. Peels from apex, middle and base portion of both the adaxial and abaxial surfaces of leaf were obtained with the help of razor. The epidermal peels were stained with 1% aqueous safranin and mounted in 1 drop of glycerine (Boulos and Beakbane, 1971). The stomatal index was calculated using the formula described by Salisbury (1927).

Stomatal Index (I) = $\frac{S}{E+S} \times 100$

Where,

S- No. of stomata per unit area.
E- No. of epidermal cells per unit area.

Length and width of stomata were measured with the help of stage and ocular micrometer.

III. RESULTS AND DISCUSSION

In this investigation, anomocytic type of stomata was observed in both the species and the stomatal distribution was amphistomatic that is the stomata is present on both adaxial and abaxial surfaces of leaf. There are variations in stomatal frequency somewhat from oneleaf to the other or same plant also even in different parts or same leaf(Noggle and Fritz, 1976). Insome plant species the diverse stomatal density is seen on leaf surfaces (Rahman and Oladele,2003). If the Guard cell of stomata is less than 15µm in size, then it is considered as "small" while stomata that is greater than 38 µm is termed as "large" (Pataky ,1997). In the present study, both the species have been recorded with large and small types of stomata. In *C. latifolium,* maximum stomatal index at basal portion(24.01±0.70) of adaxial surface and minimum stomatal index at apex of abaxial surface (11.92±0.49) was recorded and in case of *C. asiaticum,* maximum stomatal index was found at basal portion(52.43 ± 0.55) and minimum at middle portion of adaxial surface(14.44±0.51) of leaf. In *C. latifolium,* longest stomata was found at basal portion of abaxial surface (38.40±1.19µm) and smallest at apical portion of abaxial surface(12.30±0.49 µm) whereas in *C. asiaticum,* longest stomata in apex of adaxial surface(38.40±1.19µm) was observed and smallest in apex of abaxial surface(26.40±1.19 µm). In *C. latifolium,* maximum width was found at apical portion of abaxial surface (24.30±0.66 µm) and minimum (16.50±1.06 µm) at basal portion of adaxial surface and in *C. asiaticum,* it was observed with the same result as recorded in *C. latifolium,* maximum width was found at apical portion of abaxial surface(21.90±0.85 µm) and minimum (12.90±0.43 µm) at basal portion of adaxial surface(Table 1, Figure 1A and 1B, Figure 2A and 2B).

Table 1: Stomatal Index, Length and Width of stomata in adaxial and abaxial surface of the *C. latifolium* and *C. asiaticum.*

Surface of Leaves	Species	Apex portion of Leaf			Middle portion of Leaf			Base portion of leaf		
		S. I.	Length (µ)	Width (µ)	S. I.	Length (µ)	Width (µ)	S. I.	Length (µ)	Width (µ)
Adaxial Surface	*Crinumlatifolium*	20.98 ± 1.40	29.04 ± 0.57	21.0 ± 0.60	18.96 ± 0.95	34.80 ± 1.29	19.20 ± 1.06	24.01 ± 0.70	26.40 ± 0.83	16.50 ± 1.06
	Crinumasiaticum	21.04 ± 1.21	26.40 ± 1.19	20.40 ± 0.83	14.44 ± 0.51	30.60 ± 0.71	20.10 ± 0.95	52.43 ± 0.55	28.50 ± 0.97	12.90 ± 0.43
Abaxial Surface	*Crinumlatifolium*	11.92 ± 0.49	12.30 ± 0.49	24.30 ± 0.66	23.89 ± 1.65	31.20 ± 0.63	19.20 ± 0.63	21.68 ± 1.48	38.40 ± 1.19	23.10 ± 0.43
	Crinumasiaticum	25.41 ± 1.28	31.50 ± 0.63	21.90 ± 0.83	20.19 ± 0.91	30.00 ± 0.60	15.60 ± 0.93	17.63 ± 1.18	27.90 ± 0.61	13.20 ± 0.46

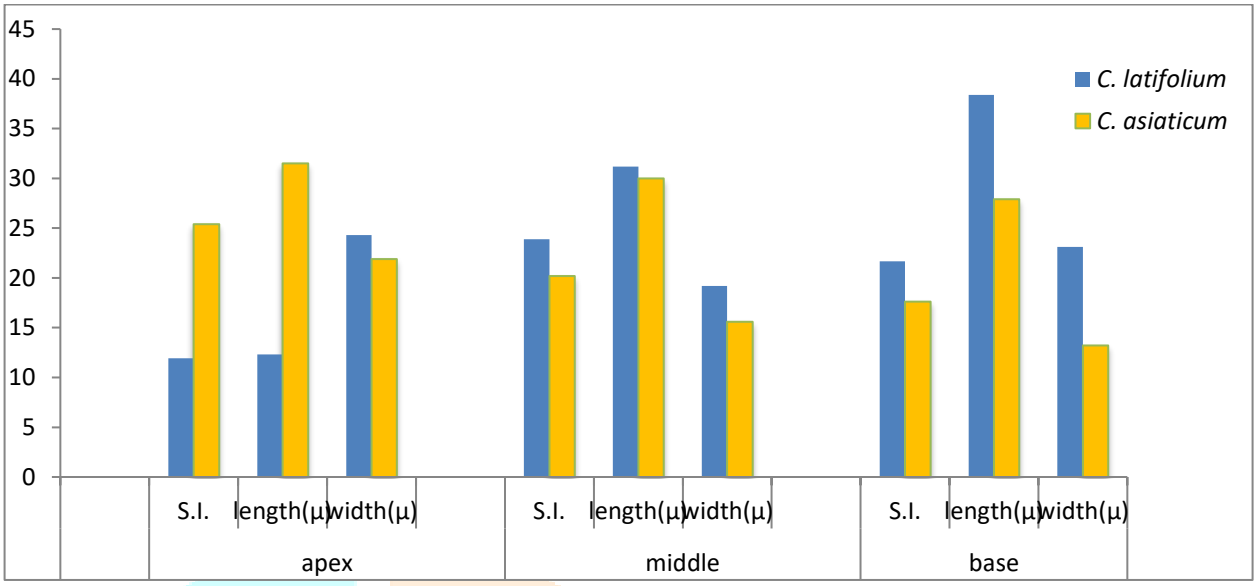

Figure 1:Column graph showing showing comparative stomatal index(SI), length and width of stomata in abaxial surface of *C. latifolium* and *C. asiaticum*

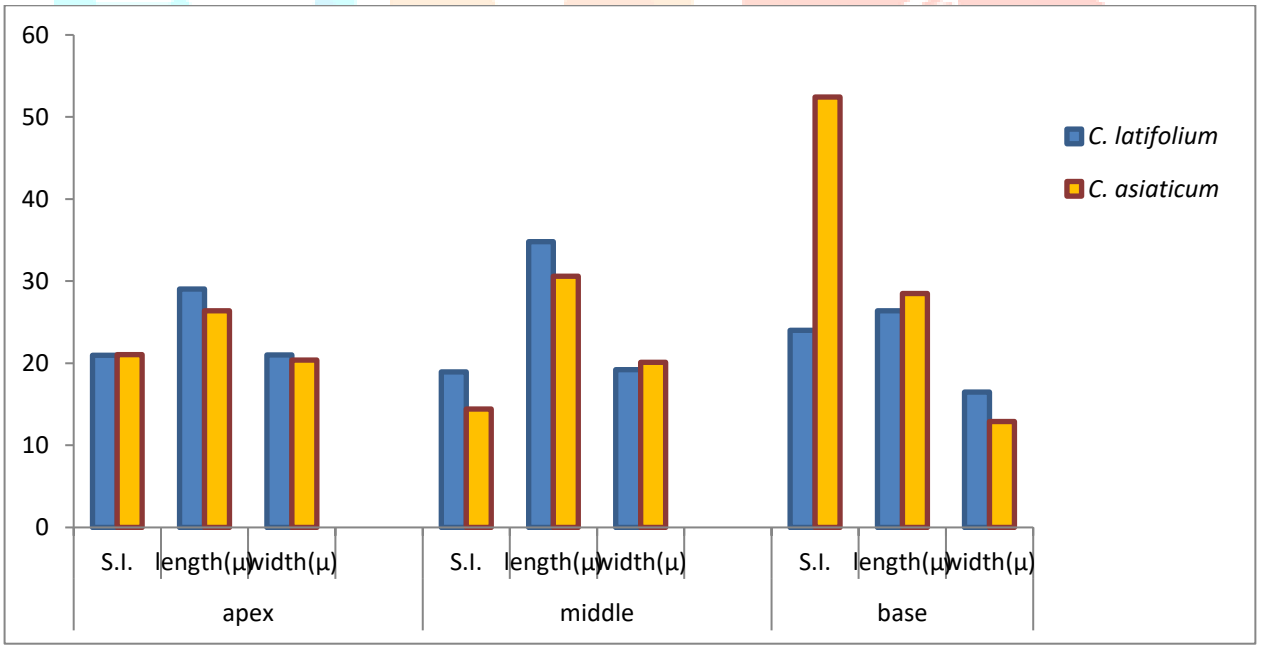

Figure 2:Column graph showing showing comparative stomatal index(SI), length and width of stomata in adaxial surface of *C. latifolium* and *C. asiaticum*

Figure 3:- Photographs of *C. latifolium* and *C. asiaticum*

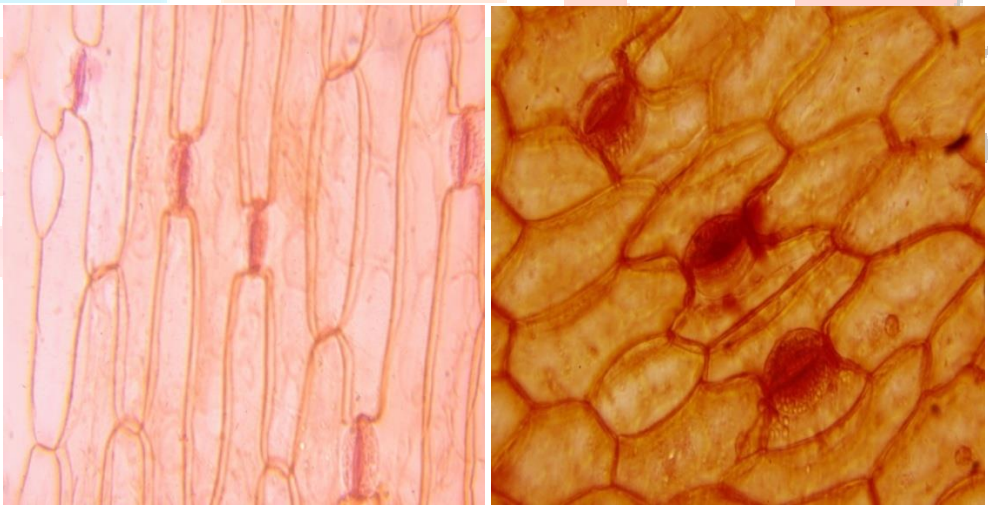

Figure 4:- Photomicrographs of stomata of *C. latifolium* and *C. asiaticum.*

IV. CONCLUSION

On the basis of above findings, it may be concluded that both the plants are closely related according to taxonomic point of view since both have anomocytic stomata and the distribution of stomata is amphistomatic.

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