

## Occurrence of *Limnocharis flava* (L.) Buch.-Ham. (Alismataceae) in Tripura with notes on its karyotype and epidermal morphology

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### Abstract

*Limnocharis flava* (L.) Buchanon Hamilton (Alismataceae) has been recorded from Tripura for the first time. Its somatic chromosome number  $2n = 20$  with karyotype formula  $A_2+B_2+C_{16}$ . The karyotype analysis reveals the presence of 1 pair of metacentric and 9 pairs of nearly sub-terminal chromosomes. The stomata are of paracytic type. Detailed study of leaf epidermal morphology is also provided.

**Key words:** *Limnocharis flava*; Tripura; Somatic Chromosome; Stomata, Epidermal Morphology.

### INTRODUCTION

*Limnocharis flava* (L.) Buch.-Ham. (Alismataceae) is an emergent aquatic weed and is a native of tropical and subtropical America. Earlier it was reported from India and in other South Asiatic countries like Malaysia and Sri Lanka. Recently, the plant has been collected from the wetlands of Kailasahar subdivision of North Tripura. Earlier, its occurrence from this northeastern state of India was not known.

Cytology plays an important role in biosystematics studies as stated by many authors including Darlington (1937), Huxley (1940), Stebbins (1950, 1971), Sharma (1981, 1985), and Upadhyaya & Sinha (1987). The study of Chromosome has been an important tool in the elucidation of evolutionary and biosystematics' problems. The characteristics of chromosome and their behavior during somatic cell division and gamete formation have provided a great deal of relevant information. and supplementing morphological data in plant taxonomy (De Winter 1969; Judd *et al.* 1999). Pal (1972), Bedi *et al* (1985), Bir & Saggo (1981) and Bir *et al.* (1982) studied cytotaxonomy of families Sterculiaceae, Rubiaceae, Acanthaceae & Lamiaceae and Bignoniaceae, respectively.

On the other hand, Srivastava (1978) described the leaf epidermis as the second most important character source after cytology for solving taxonomic problems. In recent time, leaf epidermal features have received very considerable attention by taxonomists (Stace 1984; Ayensu 1970; Baruah & Nath 1997; Baruah *et al* 1999). Epidermal features are studied from three main perspectives: ontogenetic, phylogenetic and taxonomic (Dehgan 1980; Mbagwu *et al* 2007). The use of epidermal characters such as stomatal types frequency and index and trichome types in classification seems to be increasing rapidly because not only the epidermal characters correlate with gross morphological features in most cases, they are often known to be very valuable at the levels where classical methods of cytology and genetics cannot be applied (Stace 1965).

### MATERIALS AND METHODS

Some plants of *Limnocharis flava* were collected from the wetlands in North Tripura and were grown in the Department of Botany, Tripura University.

For cytological works Sharma & Sharma (1972) was largely followed for cytological preparation and for karyotype analysis. At least 50 metaphase plates were scanned and 5 well scattered metaphase plates were selected for different chromosome measuring through camera lucida drawing.

For epidermal morphology study small square pieces of fresh matured leaves from apical (A), middle (M) and basal (B) regions were treated for epidermal peelings following Chandra *et al* (1996). Peels were dehydrated through alcohol grade, stained with 1 % safranin and mounted in 50 % glycerine. Different quantitative data were analyzed with an average of 15 observations.

## RESULTS AND DISCUSSION

*Limnocharis flava* is a new record for the Indian state of Tripura. It was recorded neither by Deb (1983) in his *Flora of Tripura State* or listed by Bhowmik *et al* (2008) nor any collection from the state is available in any herbarium. Full citation, brief description, phenology etc are provided below for ready reference and easy identification.

***Limnocharis flava*** (L.) Buchanon Hamilton, *Abh. Naturwiss. Verine Bremen* 2: 2. 1868; Biswas & Calder, *Handb, Water and Marsh Plant, India*. 80. 1937; Van Steenis, *Fl. Males.* 1, 5(1): 120. 1954; Bhadur & Raizada, *Indian For.* 94 (8): 641–644. 1968; Dassanayake, *Rev. Handb. Fl. Ceylon*, XIV: 237. 2000. *Alisma flavum* L., *Sp. Pl.* 1: 343. 1753. (Plate I; Figs. 1 - 4)

An emergent aquatic herb. *Rhizome* short stout, 3 -3.5 cm long and 3 -4.2 cm in diameter with numerous fibrous roots. *Leaves* exstipulate, simple, erect, sheathing; *lamina* ovate, 06 – 20 cm x 06.5 - 20.5 cm, entire, repund, glabrous, dorsiventral, four to six pairs of main nerves with numerous secondary nerves perpendicular to the midrib forming dense fine reticulations. *Inflorescences* solitary or aggregated in umbels; scapiflorous. *Flowers* regular, bisexual, 3-merous, bracteate; *sepals* 3 in 1 whorl, free, regular, imbricate, green, obtuse, 1.5 – 2.0 cm X 1 - 1.5 cm, persistent; *petals* like sepals but broadly-ovate, apex rounded, white, 2 - 3 cm X 1 - 2cm, deciduous; *stamens* numerous surrounded by a whorl of staminoides; anthers basifixed, 2-celled, dehiscing by longitudinal slits; *carpels* 15 to 20, free, *ovaries* superior, ovules many, placentation superficial. *Follicles* semicircular, membranous; *Seeds* numerous, minute, horseshoe-shaped.

**Local name:** *Khechair*

**Ecology:** Growing in rice field, among grasses and other marshy herbaceous plants

**Exsiccatus:** Kailasahar, Rangauti, *Bhowmik & Datta 101*, dated. 26.01.2009

**Flowers & Fruits:** June – August

The somatic chromosome number in was found to be constant  $2n = 20$ , in all the 50 metaphase plates observed. The present observation corroborated with the previous findings by Dahl (1940). Chromosomes are very large with distinct clear gradation in size (Table 1) and could be classified into 4 distinct morphological types (Plate I; Figs. 5 &6):

**Type A:** Large (5.295  $\mu\text{m}$ ) with primary and secondary constrictions; one is nearly sub-median and the other is nearly sub-terminal.

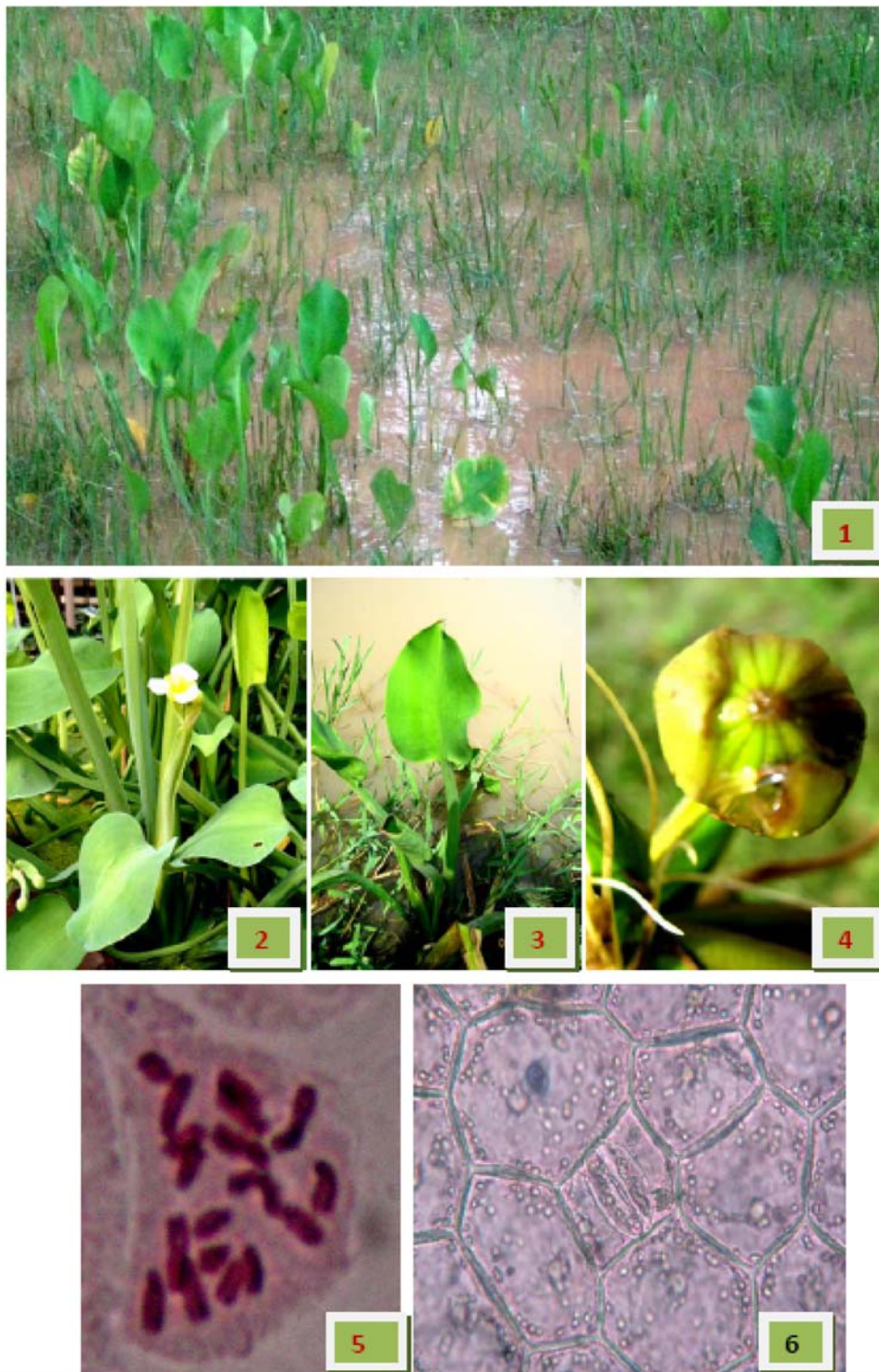
**Type B:** Large, 5.00  $\mu\text{m}$  with median constrictions.

**Type C:** Large, 5.00  $\mu\text{m}$  – 4.21  $\mu\text{m}$  with nearly sub-terminal constrictions

**Type D:** Short, 3.375  $\mu\text{m}$  – 2.541  $\mu\text{m}$  with nearly sub-terminal constrictions.

There is 1 pair of metacentric and rest 9 pairs of nearly sub-terminal chromosomes in which one pair had secondary constrictions. The Karyotype formula of this species is  $A_2 + B_2 + C_{16}$ . On the basis of hypothesis of Lewitsky (1931) and Levan (1935), that the primitive types have median or sub-median constrictions, while with the advancement of evolution the chromosome become sub-terminally constricted.

Plate I



**Figs. 1 – 6:** *Limnocharis flava* (L.) Buch.-Ham. 1. Habitat; 2. Flowering plant 3. Leaf; 4: Fruit; 5. Somatic chromosome plate; 6. Stomata with subsidiary cells.

**Table 1.** Karyotype table of *Limnocharis flava* (L.) Buchanan Hamilton  
 [Chr = Chromosome; L = Length; ln = long; st = short; nst = nearly sub-terminal; nsm = nearly sub-median; m = median]

Possible Chr pair	Total L of Chr (µm)	Mean (µm)	L of long arm (µm)	Mean L of ln arm (µm)	L of st arm (µm)	Mean L of st arm (µm)	F%	Nature of Chr	Chr type
11'	5.42 5.17	5.295	2.5 2.5	2.51	2.083,0.833 1.083,0.833	1.958 0.833	36.98, 15.73	nsm nst	A
22'	5.00 5.00	5.00	4.08 4.17	4.125	0.92 0.83	0.875	17.50	nst	C
33'	5.00 5.00	5.00	2.5 2.5	2.5	2.5 2.5	2.5	50	m	B
44'	4.83 4.66	4.749	4.166 4.102	4.119	0.667 0.558	0.612	12.88	nst	C
55'	4.167 4.333	4.25	3.421 3.507	3.463	0.746 0.826	0.786	18.49	nst	C
66'	4.17 4.25	4.21	3.417 3.423	3.382	0.753 0.767	0.76	18.05	nst	C
77'	3.333 3.417	3.375	2.718 2.814	2.766	0.615 0.603	0.609	18.04	nst	C
88'	3.333 3.325	3.329	2.807 2.752	2.779	0.526 0.573	0.549	16.49	nst	C
99'	3.128 3.106	3.117	2.575 2.572	2.573	0.553 0.534	0.543	17.42	nst	C
1010'	2.5 2.583	2.541	1.667 1.750	1.708	0.459 0.436	0.447	17.59	nst	C

The stomata are of paracytic type, found to occur on both surface of lamina. The stomatal frequency on upper surface of lamina is  $192.3303 \pm 16.25$ , whereas on the lower surface is  $188.200 \pm 14.93$ . Stoma on upper epidermis are smaller,  $159.817 \mu\text{m} \pm 12.36$ , whereas on lower surface these are  $179.781 \mu\text{m} \pm 18.21$ . The average size of epidermal cells of upper epidermis is  $2569.056 \mu\text{m}^2 \pm 123.36$  and for lower epidermis is  $3256.211 \mu\text{m}^2 \pm 147.39$ . Epidermal Cell Frequency /per  $\text{mm}^2$  of upper epidermis is  $436.283 \pm 39.26$  whereas for lower epidermis it is  $340.781 \pm 26.87$ . For the stomatal types it is believed that paracytic type is primitive among the angiosperms (Cronquist 1968; Takhtajan 1969) and that in favor of general acceptance of Alismataceae as a primitive taxon.

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