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Anatomy of the floats of *Utricularia inflexa* Forsk. var. *inflexa* Taylor

Mohd. Farooq and Saeed A. Siddiqui

(Department of Botany, Aligarh Muslim University, Aligarh, India)

FAROOQ, MOHD. and SAEED A. SIDDIQUI (Department of Botany, A.M.U. Aligarh, India.) Anatomy of the floats of *Utricularia inflexa* Forsk. var. *inflexa* Taylor. Bull. Torrey Bot. Club 93: 301–305. 1966.—The anatomy of the floats of *Utricularia inflexa* Forsk. var. *inflexa* Taylor (Syn. *Utricularia stellaris* var. *inflexa*) shows that they are modified branches. Major part of their cortex is occupied by large air spaces. The presence of endodermis and cambium could not be determined. The vascular bundles are mostly restricted on the lower (abaxial) side of the float showing dorsiventrality in their structure. Two young floats, which presumably had endogenous origin, were situated in the cortical air chambers of a mature float.

Floats form a conspicuous part of inflorescences of several aquatic Utricularias. There is a controversy about their morphological nature. They have been considered to be modified leaves by Haines (1922), Rendle (1925), Lloyd (1942), Santapau (1950) and Gleason (1952); leaves with inflated petioles by Chapman (1860) and Fernald (1950) and modified branches by Hooker (1885), Arber (1920), Muenscher (1944) and Hass (1947). Deva (1953) studied the anatomy of the floats of *U. flexuosa* Vahl. and concluded that they are stem-like. The occurrence of floats in *U. flexuosa* is rare, whereas they are the characteristic feature of inflorescences in *U. inflexa* var. *inflexa*. Therefore, the study of the floats of the last named taxon was undertaken.

Material and methods. The floats of *U. inflexa* var. *inflexa* were collected locally and fixed in FAA. It was rather difficult to expel the air from the floats and prevent them from deformation and collapse. The usual methods of dehydration in alcohol xylol series and embedding in paraffin wax were employed. Sections were cut at 12–15 μ. Staining was done with safranin and fast green as well as with crystal violet and erythrosin B. The latter combination proved better.

Observations. A whorl of 4–8 floats is situated about midway along the length of the inflorescence axis. The floats are directed laterally upwards and completely cover the young inflorescence in the beginning. Later, they spread out and assume a horizontal position. However, the middle part of the float develops a slight inward curvature which projects its apex out of the surface of water. Variable numbers of constrictions along the length of the float divide it into distinct segments (Fig. 1). Several filiform appendages resembling the vegetative leaves, develop all around the region of the

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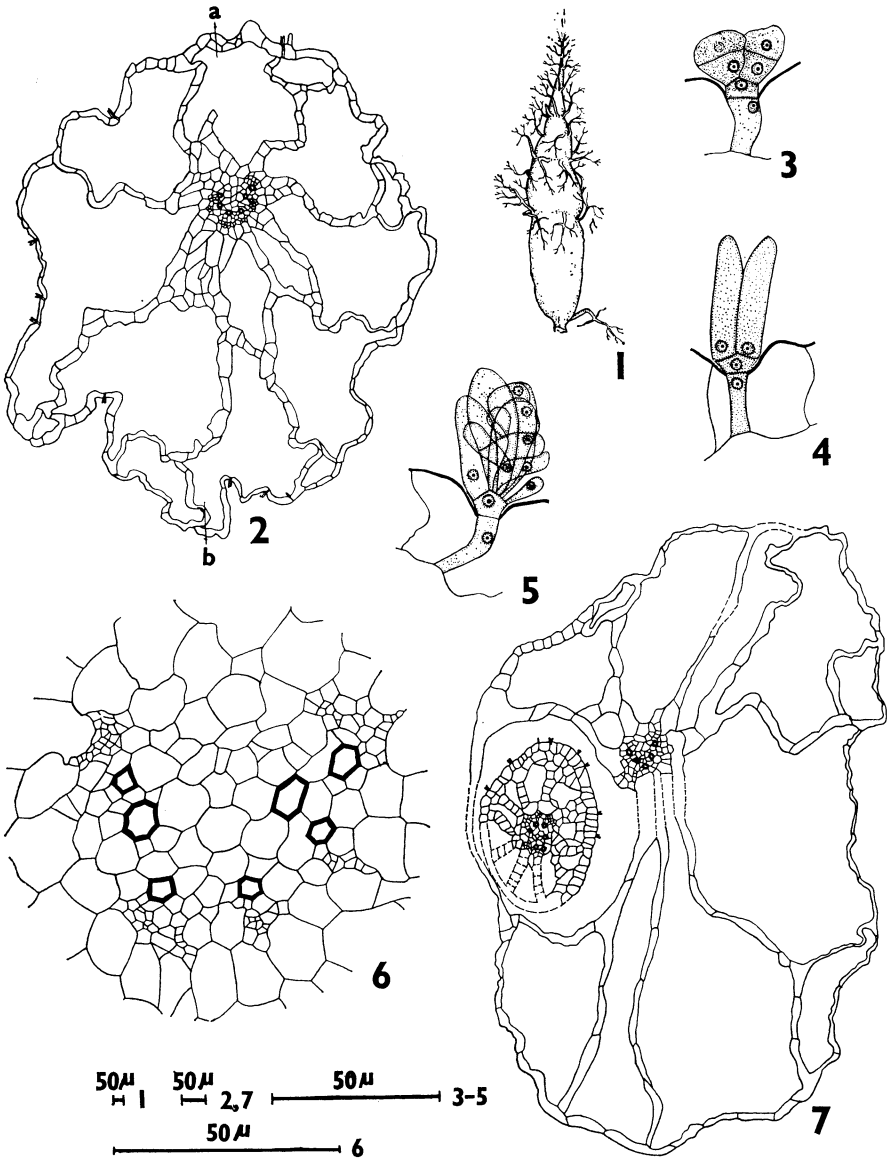

Figs. 1–7.—Fig. 1. Diagramatic representation of a float.—Fig. 2. T.s. float. Note the absence of vascular bubdles on the upper side of the float.—Fig. 3. Hair with 4-celled head; the foot and stalk are 1-celled each.—Fig. 4. 4-celled trichome.—Fig. 5. Tufted hair.—Fig. 6. Central cylinder of figure 2 magnified. Note the dissociation of xylem and phloem groups.—Fig. 7. T.s. float showing a young float in the air-chamber of the cortex. (*a* and *b*, upper and lower sides of the float respectively) (Figures 5 & 7 reconstructed).

constrictions. The body of the float narrows down towards its apex and finally diffuses into irregularly arranged capillary segments (Fig. 1).

In transverse section the float exhibits an irregular circular outline. (Fig. 2). The epidermis bears sparsely distributed, multicellular trichomes of two types. There are hairs which have a 4-celled glandular head (Fig. 3). The short, densely cytoplasmic cells of the gland are arranged in two tiers. The stalk and foot of the hair are 1-celled each. The second type of hair is 4-celled with a T-shaped arrangement of its cells (Fig. 4). The two juxtaposed elongated cells constitute the glandular head and the lower two superposed cells form the stalk and foot of the hair. Sometimes, the hairs may possess a tuft of a variable number of elongated cells (Fig. 5).

Large air spaces occupy almost the entire cortex of the float (Fig. 2). Externally these are limited by the epidermis and internally 1-several layers of thin-walled cells usually intervene between the air-spaces and the central cylinder, although sometimes the air-chambers may directly border upon the central stele. Laterally, the air-chambers are separated by one to three-layered cellular partitions. Oblique partitions may cut off small air-chambers in the peripheral region of the cortex. The endodermis is not differentiated.

Five to six vascular bundles constitute the central strand, which in transverse section shows a roughly U-shaped arrangement. It is noteworthy that most of the vascular bundles are situated towards the lower side of the float which in nature is submerged in water, while on the side which is near the surface of water, generally vascular bundles are not differentiated (Figs. 2, 6). The air-chambers are larger on the lower side of the float than on the upper side. Thus, the floats show dorsiventrality in their structure (Schenck, 1887; cited by Solereder, 1908, pp. 594). Xylem is considerably reduced and only feebly lignified. Xylem and phloem groups belonging to individual vascular bundles show stages of dissociation and, therefore, do not present any definite arrangement—a feature which may be attributed to the habitat of the plant. Xylem is situated towards the center and phloem towards the periphery and their collateral arrangement cannot be denied (Fig. 6). However, cambium could not be determined. The pith consists of thin-walled parenchyma. Transverse sections passing through the region of constrictions of the float show longitudinally sectioned vascular traces (probably leaf-traces) which extend outwards through the cellular partitions of the air-chambers and pass out into the filiform appendages. Thus, the anatomy of the float essentially is that of a dicotyledonous stem.

It is noteworthy that in one fully developed float, which had been sectioned transversely, two young floats were found situated at different levels in the air-chamber of the cortex. These also were sectioned transversely (Fig. 7), showing that they were lying along the long axis of the mother float. Their external morphology as well as their anatomy are similar to a great extent to that of any other float. The young floats had their origin near

the region of the constrictions of the mother float, where the vascular traces pass outwards, suggesting that their vascular supply had connection with one of the leaf traces. Thus, presumably the young floats had endogenous origin.

Discussion. There are differences in the structure of the trichomes borne on the floats of *U. flexuosa* and the species described here. The head of the tufted hairs in *U. flexuosa* (Deva, 1953) consists of short cells, whereas in *U. inflexa* var. *inflexa* they are appreciably elongated. According to Deva (1953) the trichomes on the float of *U. flexuosa* have a 2-celled stalk. Probably, he did not differentiate between the foot and stalk of the trichomes, because his figures 2–5 clearly show that what he calls the 2-celled stalk actually includes the 1-celled foot also.

The floats in *U. inflexa* var. *inflexa* are modified branches is evinced by the presence of collateral vascular bundles in the central strand. Xylem is situated towards the center and phloem towards the periphery. This is in accordance with the findings of Deva (1953) on the floats in *U. flexuosa.* The presence of feebly lignified and reduced xylem, dissociation of xylem and phloem groups of individual vascular bundles, and the presence of large air spaces are the features attributable to the aquatic habit of the taxon. Dorsiventrality in the floating stems of *U. vulgaris* and *U. minor* has been recorded earlier by Schenck (1884). However, Deva (1953) failed to observe it in the floats of *U. flexuosa,* although his figure 6 shows the absence of vascular bundles on one side of the float.

The exogenous origin of foliar and floral buds appears to be undisputed (*see* Esau, 1953, pp. 110). However, Thompson (1943–44) studied in detail the origin of inflorescences of *Ceratonia siliqua* Linn. and found endogenous initiation of adventitious buds. Probably this is an isolated record in the literature. Therefore, occasional endogenous origin of floats (modified stems) in the species is significant.

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Studies of *Cephalosporium* species from India—II

R. S. Sukapure and M. J. Thirumalachar

Hindustan Antibiotics Research Centre, Pimpri
Poona, India

SUKAPURE, R. S. and THIRUMALACHAR, M. J. (Hindustan Antibiotics Research Centre, Pimpri, Poona, India). Studies on *Cephalosporium* species from India-II. Bull. Torrey Botanical Club. 93: 305–311. 1966.—Based on morphological and cultural studies, descriptions of two new species of *Cephalosporium*; viz. *C. candidum* and *C. purpurascens*, and three new varieties viz. *C. acremonium* var. *funiculosum*, *C. curtipes* var. *uredinicola* and *C. candidum* var. *arachnoides* are given in the present paper. *C. acremonium* var. *uniseptatum* Massee previously described from Jamaica is a new record for India. *C. curtipes* var. *uredinicola* parasites the uredia of rusts.

In continuation of our studies on *Cephalosporium* species from India (Sukapure and Thirumalachar, 1963) further isolations were made from different soil samples and studied. An account of these is presented in this paper which includes two new species and three new varieties. Type cultures are deposited in American Type Culture Collection, U.S.A.; Centraalbureau voor Schimmelcultures, Baarn, Netherlands; Commonwealth Mycological Institute, Kew, England; and Herb. Crypt. Ind. Orient, New Delhi, India.

I. *Cephalosporium acremonium* Cda. var. *uniseptatum* Massee. (Sacc. Syll. Fung. 10: 523)

This fungus was first described from Jamaica by Massee as being parasitic on *Heterosporium colocasiae* Jacq. This variety differs from *C. acremonium* in having spores which are one-septate and nearly twice as long. In the present studies the fungus was isolated from the rhizosphere of *Antirrhinum majus* growing at Pimpri, Poona.

On potato-dextrose and glucose-yeast agar at 24°C the fungus grows fast, attaining a diameter of 35 mm in 8 days. The aerial mycelium is well developed and gives a velvety appearance to the colony. At first the mycelial