

L. L. NARAYANA* : **A contribution to the floral anatomy of Balsaminaceae**

L. L. ナラヤナ* : ツリフネソウ科の花部解剖学的研究

There is no published account on the floral anatomy of Balsaminaceae except for the work of Saunders (1937). This paper deals with the floral anatomy of *Hydrocera triflora* W. & A., *Impatiens leschenaultii* Wall., *I. arguta* Hook. f. & T. and *I. levingei* Gamble ex Hook. f.

All the materials have been fixed in F. A. A. Customary methods of dehydration, infiltration and embedding have been followed. Serial transverse sections of flower buds have been cut at a thickness of 8-12 microns. Crystal violet and erythrosin combination has been used for staining the sections.

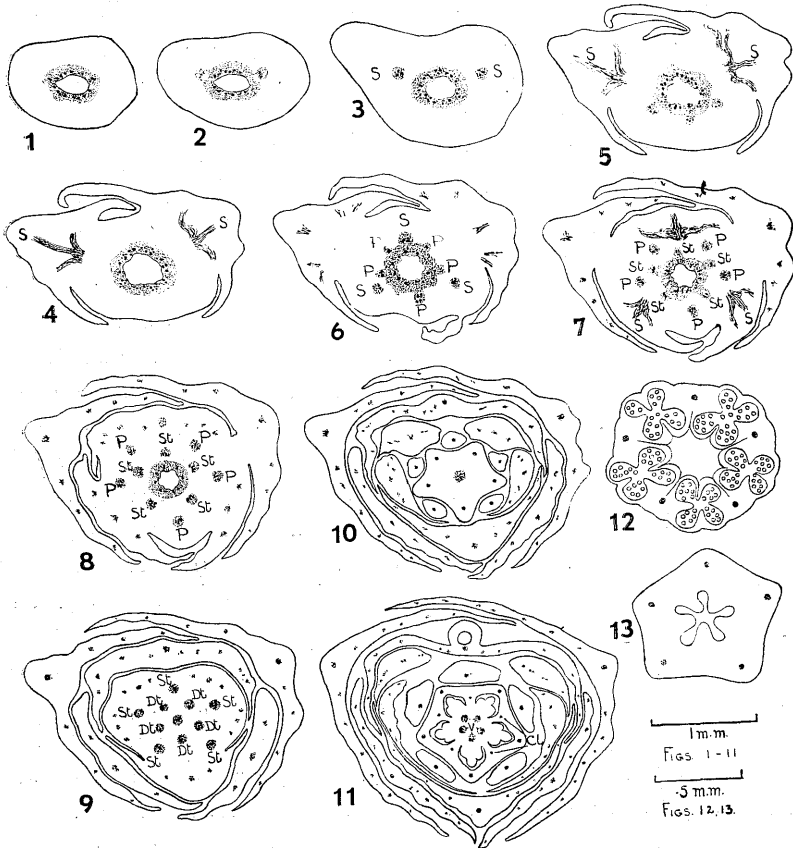
Observations

Flower: The flower is pedicellate, hermaphrodite, zygomorphic, pentamerous, tetracyclic and hypogynous. The calyx is petaloid and shows imbricate aestivation (Figs. 9-11, 18, 19, 25, 33). A spur is developed from the posterior sepal. The cavity of the spur is lined by glandular cells. The lateral sepals in *Impatiens* are smaller than the rest. In *Hydrocera* all the five sepals are free (Figs. 9-11). In *Impatiens* there is adnation between anterolateral sepals and anterior petal. Thus there are only four members in the outer perianth whorl (Figs. 18, 19, 25, 33). Like the sepals, the petals in *Hydrocera* are free and show imbricate aestivation (Figs. 10, 11). In *Impatiens*, except the anterior petal, the other four petals are united forming two pairs (Figs. 18, 19, 25, 33); they become free at the top. Thus, the corolla outwardly shows only four members. The stamens which are five in number, have short, broad filaments which unite to form a tube above (Figs. 11, 19, 21, 25-27, 33). The anthers cohere and cover the pistil. The anther lobes of adjacent stamens fuse to form a common cavity which contains the pollen grains (Fig. 12). The gynoecium is 5-

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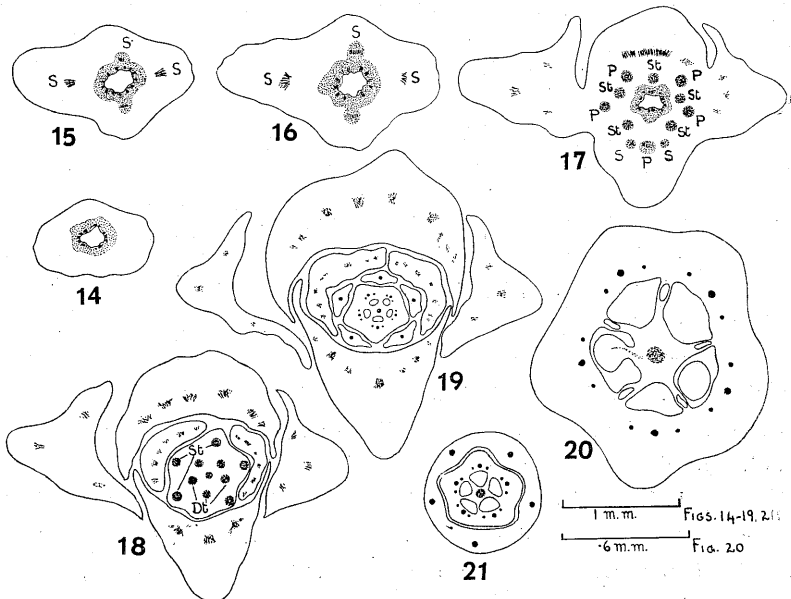
carpellary, syncarpous, 5-locular with three ovules in each loculus in *Hydrocera* and several ovules in *Impatiens* (Figs. 11, 19-21, 25-27, 33-35). The raphe is dorsal. The ovary becomes unilocular above (Figs. 13, 28, 36) and terminates in five stigmatic lobes.

Floral anatomy: The pedicel in *Hydrocera triflora*, *I. leschenaultii* and *I. arguta* shows a closed ring of vascular tissue (Figs. 1, 14) while in *I. levingei* it shows a ring of discrete bundles (Fig. 29). In all the taxa the traces for the posterolateral sepals are demarcated first (Figs. 2-5, 15, 16,

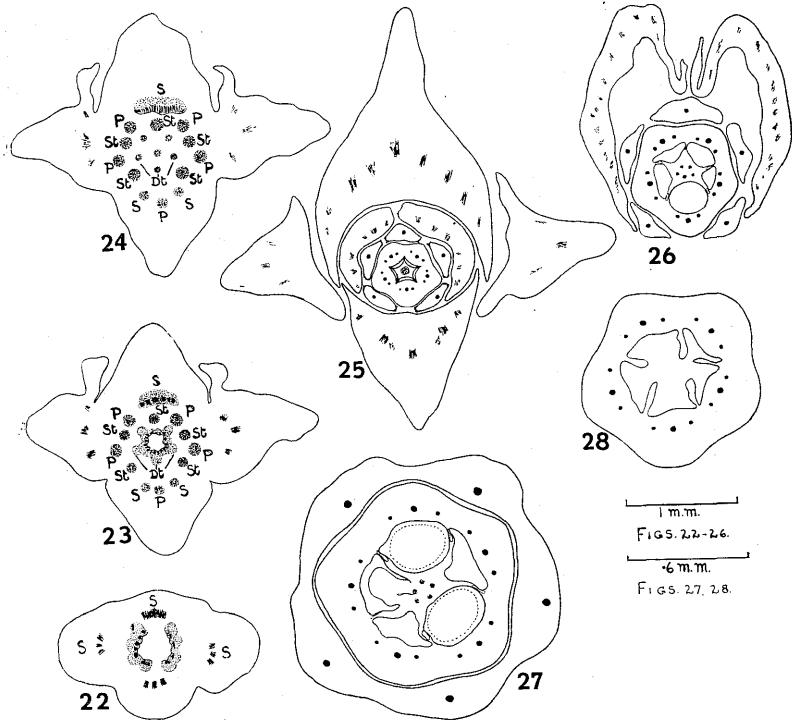


Figs. 1-13. Serial transverse sections of flower buds of *Hydrocera triflora*. S: Sepal midrib. P: Petal midrib. St: Staminal trace. Dt: Dorsal carpellary trace. V: Ventral bundle. Cl: Common median lateral bundles.

22, 30). In *Hydrocera* the traces for the lateral sepals are followed by four traces, two for the anterolateral sepals, one for the posterior sepal and one for the anterior petal (Figs. 4-6). Then follow the traces for the remaining four petals (Figs. 6, 7). In *Impatiens* after the divergence of the traces for the posterolateral sepals, two traces, one on the posterior side and the other on the anterior side are organized (Figs. 16, 22, 30). The posterior trace supplies the posterior spurred sepal. The trace on the anterior side splits into three bundles, of which the median bundle represents the midrib of the anterior petal and the lateral bundles represent the midribs of the anterolateral sepals (Figs. 17, 23, 24, 31, 32). Thus, the perianth part on the anterior side is a composite structure formed by the adnation of two sepals and a petal. Each sepal trace divides radially to give rise to two lateral bundles (Figs. 4-7, 17-19, 22-25, 30-33). Next the traces for the remaining four petals and five stamens arise in two successive alternating whorls (Figs. 8, 17, 23, 24, 31, 32). The four petals unite in pairs and each part receives two traces (Figs. 17-19, 24, 25, 31-33). The five staminal



Figs. 14-21. Serial transverse sections of flower buds of *Impatiens leschenaultii*.



Figs. 22-28. Serial transverse sections of flower buds of *Impatiens arguta*.

traces enter the bases of the flattened filaments. After the demarcation of the staminal traces five dorsal carpellary traces are organized along the petal radii (Figs. 9, 10, 17, 18, 24, 33). Each dorsal carpellary trace divides to form two lateral branches (Figs. 19, 21, 25-28, 34-36). In *Hydrocera* the lateral traces of adjacent carpels fuse to form the common median lateral bundles (Fig. 11). After the demarcation of the dorsal carpellary traces the main stele forms a central core of vascular tissue (Figs. 10, 18, 19, 24, 25, 34, 35). From this five fused ventral bundles are organized in *Hydrocera triflora* and *I. arguta* and they lie opposite the loculi (Figs. 11, 26, 27). These are completely utilized in the ovular supply. In *I. leschenaultii* and *I. levingei* no ventral bundles are organized. The ovular traces arise from the central core of tissue (Figs. 20, 35), which becomes used up in the

ovular supply. The ovary becomes unilocular towards the top due to incomplete fusion of the septa in the middle (Figs. 13, 28, 36). In *I. leschenaultii* and *I. arguta* the septa show small cavities at the base (Figs. 20, 27). Only the dorsal bundles extend into the stigmatic lobes while the lateral bundles fade away towards the top of the ovary.

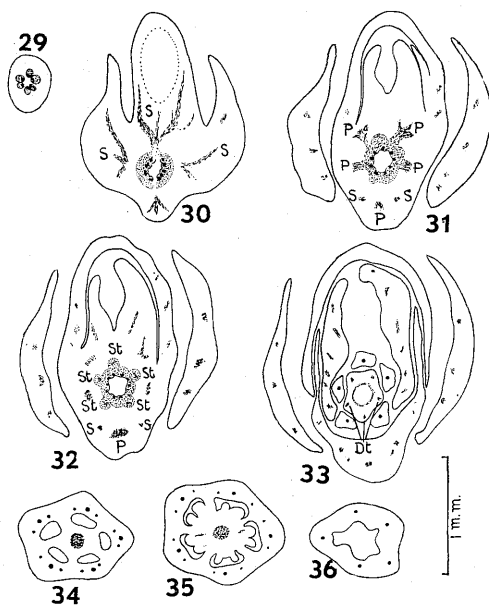
Discussion

A study of the floral anatomy of Balsaminaceae shows that the basic plan of the flower is pentamerous with a tendency towards connation and adnation of floral parts as well as their traces.

The genus *Hydrocera* is relatively more primitive than *Impatiens*. The flower is nearly regular except for the development of a spur on the posterior sepal. The perianth is polyphyllous and pentamerous. The traces for the perianth arise independently.

In *Impatiens* the perianth though basically pentamerous appears tetramerous due to adnation of parts. The anterior perianth part is a composite structure formed by the adnation of two anterolateral sepals and anterior petal. There is also adnation in their traces. The remaining four petals are united in pairs, but their traces are free.

The haplostemonous condition in Balsaminaceae seems to have been brought by the suppression of the antipetalous staminal whorl. Though the stamens are connate at the top, their traces arise independently. A tendency towards suppression of the antipetalous staminal whorl has been



Figs. 29-36. Serial transverse sections of flower buds of *Impatiens levingei*.

reported in Oxalidaceae (Narayana, 1966), Geraniaceae (Saunders, 1937), Linaceae (Narayana, 1964; Narayana and Rao, 1966) and Meliaceae (Narayana, 1958).

The carpels in *Impatiens* are 3-traced and in *Hydrocera*, 5-traced. In the latter, median lateral bundles of adjacent carpels unite to form common median lateral bundles. Judging from the position of the ventral bundles the placentation in *Hydrocera* and *I. arguita* can be described as axile (Puri, 1952). In the *I. leschenaultii* and *I. levingei* no distinct ventral bundles are organized; the ovular traces arise from the central core of vascular tissue.

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ツリフネソウ科の *Hydrocera triflora* およびツリフネソウ属 (*Impatiens*) の 3 種について、花序の構造に関して、外部形態を参照しながら、主として維管束の走行型について比較研究した。ツリフネソウ属の 3 種の間にも走行型に差異があるが、全般的に見ると、*Hydrocera* の方が放射相称に近い構造を持ち、より原始的である。*Hydrocera* はインド、東南アジア産の 1 種で代表される。