

## STUDIES IN THE ORDER PIPERALES

### VI. A Contribution to the Study of Floral Anatomy of *Pothomorphe umbellata* (L.) Miq.<sup>1,2</sup>

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#### INTRODUCTION

MEMBERS included until recently in the genus *Heckeria* Kunth. and earlier in *Piper* are now assigned by Trelease and Yuncker (1950) to a separate genus *Pothomorphe*. The embryology of the genus has attracted considerable attention especially after the much debated publication of Johnson (1902) dealing with the species *Heckeria umbellata*. Maheshwari and Gangulee (1942) after a reinvestigation of this species and Swamy (1945) from an investigation of *H. subpeltata* showed the embryo-sac to be developing after the *Fritillaria*-type and not *Adoxa*-type as was thought by Johnson. Some important embryological differences between *Piper* and *Heckeria* have also been enumerated by Johnson (1902).

Vascular anatomy of the flower of this genus has remained almost untouched all these years. Johnson (1902) made just a casual reference that there are no definite vascular bundles above the base of the fruit and that only scattered tracheids occur, especially in the region just below the stigma. Recently Nozeran (1955) showed that the *umbellate* inflorescence, which is a distinctive feature of this genus, is biparous or uniparous. The present communication deals only with the floral anatomy of one species and is based on paraffin embedded material which was made available to the author by Prof. P. Maheshwari.

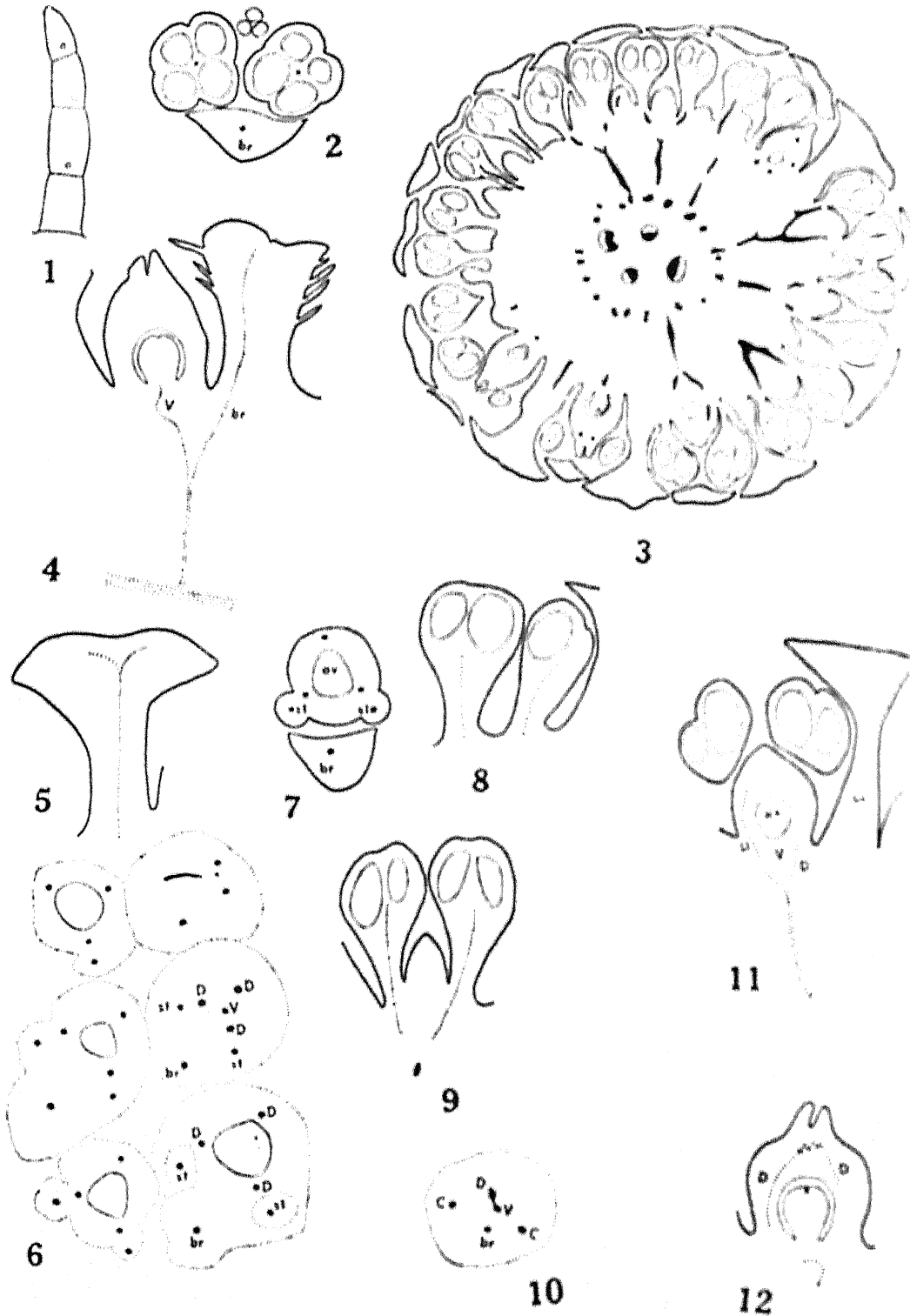
#### OBSERVATIONS

*Pothomorphe umbellata* (L.) Miq. (Syn. *Heckeria umbellata* Kunth. *Piper umbellatum* L.) is a shrub or a large herb often with large peltate leaves. The spikes are many, slender, described as *umbellate* at the end of the axillary

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peduncle. The sessile flowers are subtended by peltate bracts covered by long multicellular hairs (Fig. 1). Each flower has two stamens with



FIGS. 1-12

tetralocular anthers (Fig. 2), a tricarpeal gynæceum ending in three sessile stigmas and containing a single bitegmic ovule.

*Floral Anatomy.*—The axis of the spike has two rings of bundles, an outer with 15–20 and an inner with 4–6 (Fig. 3). A single bundle departs from the inflorescence axis supply. This diverges out horizontally to the periphery of the cortex where it gives out one branch to the bract (Fig. 4). The bract trace directly enters the organ and undergoes some branching in the shield of the peltate bract (Fig. 5). The remaining bundle reaches the base of the flower where it splits up into three branches. Two of these are antero-lateral and the third one posterior. The former splits up tangentially into two each (Figs. 6, 7). The outer of these daughter bundles are the staminal traces. Each staminal trace runs undivided within the filament of the stamen (Figs. 8, 9) and reaches the connective. On the other hand, the inner two bundles traverse the ovary wall on the antero-lateral sides. The posterior bundle, however, sends off a branch towards the chalaza (Figs. 10, 11) which is completely utilised in supplying the single ovule. The remaining outer bundle then runs in the ovary wall on the posterior side. Thus a transverse section of the ovary wall shows three bundles traversing equidistantly from one another (Figs. 6, 7). They fuse together in the upper part of the ovary just below the stigmas and finally disappear (Fig. 12). A transverse section of the flower passing through the upper regions of the ovary clearly shows the three stigmas and tetralocular anthers (Fig. 2). There is no trace of any perianth.

#### DISCUSSION AND CONCLUSIONS

It will be recalled that the floral vascular supply trifurcates at the base of the flower giving rise to three bundles. Of these the two anterior-lateral ones give off a branch each for the two stamens and the third posterior one sends off a branch inward that is completely utilised in supplying the single ovule. This last bundle has to be regarded as the ventral strand which is used up in furnishing a single ovular trace. The three bundles now traversing the ovary wall fuse below the stigmas and are, therefore, considered as the carpellary dorsals.

The presence of three dorsals and three stigmas in *Pothomorphe umbellata* indicate that there are three carpels in the gynæceum. The position of the carpels which can be found out from the position of the three dorsals—two anterior-lateral and one posterior—is similar to that in *Piper*. The single ovule appears to belong to one of the carpels and is regarded as lateral on account of the course of the ventral strand.

It is thus clear that *Pothomorphe umbellata* resembles very closely, the allied genus *Piper* in floral anatomy, number and position of carpels and stamens.

#### SUMMARY

The floral anatomy of *Pothomorphe umbellata* is described. The bract trace and the floral trace arise conjoint. At the base of the flower the floral trace branches into three compound bundles which bifurcate into a total of six bundles. Two of these are obviously the stamen traces, another is the ventral (or placental) strand which supplies the ovular trace. The remaining three bundles have been interpreted as dorsal bundles of the carpels and hence the gynæceum has been interpreted as tricarpellary. As the ovule receives its supply from one side and not from the base it is considered to be lateral rather than basal.

#### ACKNOWLEDGEMENTS

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#### EXPLANATION OF FIGURES

Figs. 1-12. Fig. 1. A single trichome. Fig. 2. Cross-section of a flower showing bract, two tetralocular anthers and three stigmas. Fig. 3. Transverse section of inflorescence showing vascular supply to flowers and bracts. Fig. 4. Flower in L.S. showing the course of vascular supply. Fig. 5. Shows the branching of the bract bundle within its shield. Fig. 6. Tangential section of inflorescence, showing flowers cut transversely and vascular supplies to the flowers. Fig. 7. Transverse section of a flower showing the separation of the stamen traces from the carpellary dorsals. Figs. 8 and 9. Show vascular supply to the stamens. Fig. 10. A part of the tangential section of the inflorescence showing separation of ventral strand from the carpellary dorsal. Fig. 11. A flower in longitudinal section showing the ventral strand and carpellary dorsals. Fig. 12. Ovary in longitudinal section showing the formation of a ring of vascular tissue below the stigmas.

Fig. 3, × 30, rest of the figures, × 60.