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THE WINTERACEAE OF THE OLD WORLD
III. NOTES ON THE OVARY OF TAKHTAJANIA

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INTRODUCTION

Very recently Baranova & Leroy (Leroy, 1978) published a new genus *Takhtajania* to accomodate the aberrant *Bubbia perrieri* Capuron. The outstanding characters of this genus are the anomocytic stomatal apparatus (Baranova, 1972; Bongers, 1973) and the unilocular bicarpellate ovary (Leroy, 1977, 1978). During my work on the *Winteraceae*, I also studied the single specimen of *Bubbia perrieri* in existence. The late Capuron told me that he had tried to collect additional specimens but that he had not succeeded in doing so; according to him the type locality was completely deforested. In view of the scarcity of the material it was considered relevant to publish some additional notes without delay.

MATERIAL AND METHODS

I studied three ovaries of the type specimen (*Perrier de la Bâthie 10158*). One was cut longitudinally, slightly outside the plane of symmetry; another was cut transversally and its upper half again longitudinally. These parts were drawn (figs. 2 and 3) and then cleared according to Bailey & Nast (1943) (figs 5 and 6). The third ovary was boiled and then sectioned serially (fig. 4).

OBSERVATIONS

One of the ovaries was taken from a flowerbud of which the closed petals were $5^1/_2$ mm high. The diagram of this flowerbud is drawn in fig. 1. The slightly ruptured calyx showed three putative original apices $\pm$ alternating with the three bracteoles at the base of the pedicel. The petals are all free. The ovary is flattened, has a longitudinal groove on its narrow sides, and the highest stamens are inserted adjoining its broadest sides.

The ovaries do not contain any sclereids, but crystals are densely and evenly distributed throughout except in the stigma. The placentas are located on the apical parts of the broadest sides of the locule with a few pendulous bitegmic ovules with their micropyle towards the wall of the ovary; the placentas continue downwards beyond the insertions of the ovules in a short ridge at about the middle of the broadest sides. The (variable) stigma is amply described and depicted by Leroy (1978).

The vasculature of the ovaries was studied from a reconstruction made from the serial sections as well as from the cleared dissected ovaries.

On each of the narrow sides of the ovary and close to the external grooves runs a main bundle split longitudinally over rather large but irregular stretches; in the undivided parts of this bundle the xylem can be split or united. In cross-

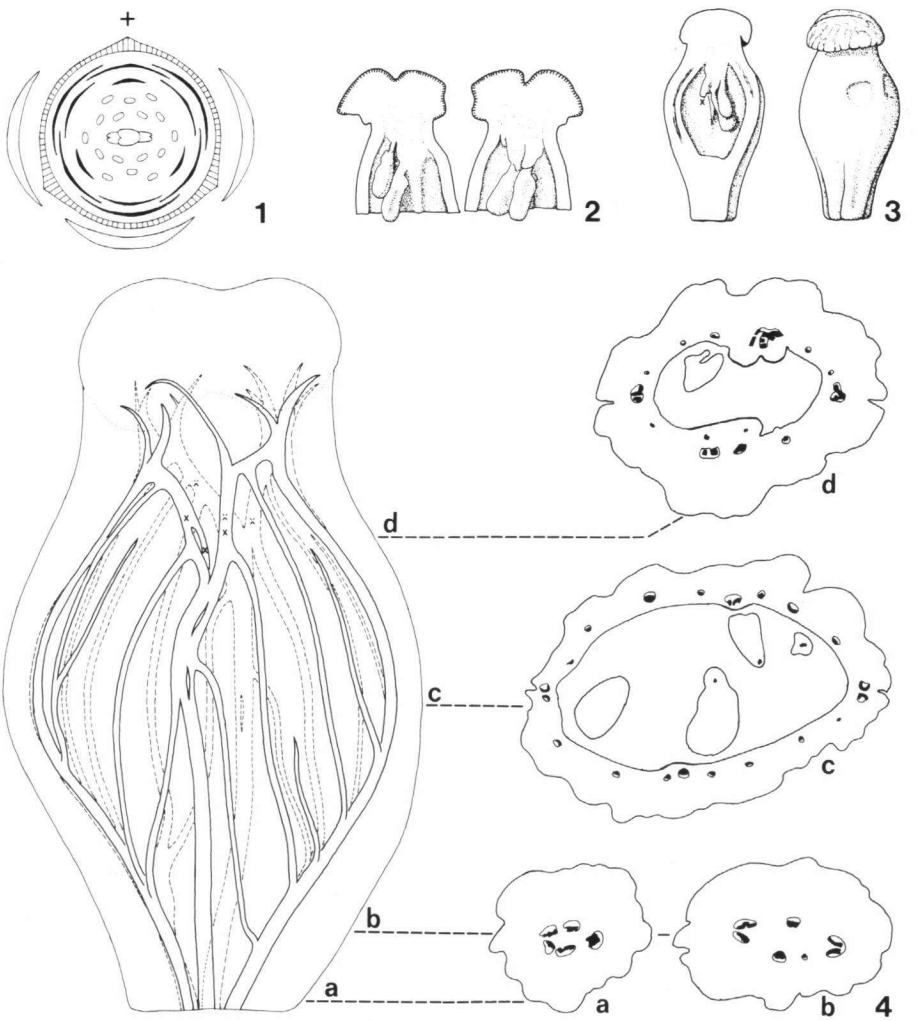

Fig. 1—4. *Takhtajania perrieri* (Capuron) Baranova & Leroy. — Fig. 1. Diagram of flowerbud (see text). — Fig. 2. Longitudinally sectioned apical part of ovary (X 10). — Fig. 3. Larger part of an ovary cut longitudinally slightly outside the plane of symmetry, seen from both sides; outside with two impressions by anthers; x: scar of ovule (X 10). — Fig. 4. Reconstruction of vasculature (xylem only) of serially sectioned ovary; some cross-sections at indicated levels; *broken lines*: system of opposite side; x: insertions of ovule traces.

section the xylem components are together (free or united) V-shaped, pointing towards the external groove and the 'legs' often curving outwards, or the xylem components are crescent-shaped. Distally and before entering the stigmatic region, the xylem flares out into irregular flat structures which are free from each other, or also united into a V, or connected by short cross-traces, and which always give off some short branches distally.

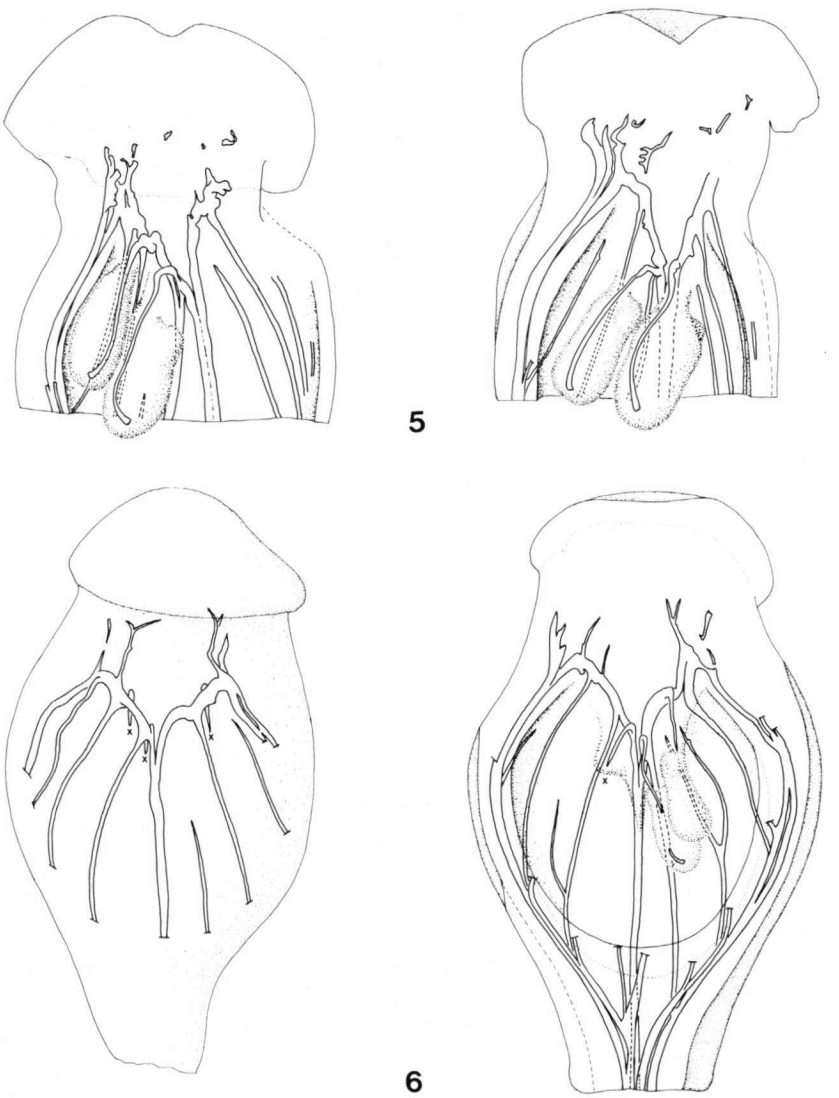

Fig. 5 & 6. *Takhtajania perrieri*. — Fig. 5. Cleared apical parts of ovary (see fig. 2). — Fig. 6. Cleared parts of ovary (see also fig. 3) viewed from the same direction; x: insertions of ovules. — (all X 25).

An other main bundle is found at approximately the middle of each of the wider sides of the ovary. These bundles divide apically into two branches, each connecting the main bundle with the flaring apical parts of the main bundles at the narrow sides.

Smaller branches of the main bundles at the narrow sides run to the main bundles at the broadest sides and to the connecting bundles, and some end blindly. The connecting bundles sometimes give off some short branches towards the apical region. All ovule insertions observed are on the connecting bundles, mostly on the lower parts of the latter, that is, closer to the main bundles at the broadest sides than to the main bundles at the narrow sides.

DISCUSSION

Leroy (1977, 1978) considers the ovary of *Takhtajania* to consist of two carpels because of the shape of the stigma, deviating from that in all other *Winteraceae*, and because of the form of the placenta. To these arguments may be added the presence of two planes of symmetry in the ovary of *Takhtajania*, whereas all other *Winteraceae*, except the plurilocular *Zygogynum*, have only one plane of symmetry.

In the other genera of the *Winteraceae* the placenta descends towards the ventral side of the carpel, or, if the stigma and the appertaining cleft of the carpel are strictly apical, also slightly towards the dorsal side. In *Takhtajania* the placenta lies over the connecting bundles and continues over a short distance below the ovule insertions as a ridge overlying the main bundle at the broadest side of the ovary. When considered in relation to the dimensions of the locule: in the other *Winteraceae* the placentas descend on the narrow sides of the locule, in *Takhtajania* on the broadest sides.

Bailey & Nast (1943) found that in the *Winteraceae* the ovules are vascularized by short branches from both the dorsal and the ventral bundles and from their anastomoses. However, Tucker (1975) reported for *Drimys winteri* and *D. lanceolata* an ovular supply exclusively by the ventral bundles. In *Takhtajania* the ovular supply is exclusively by one system and by comparison this suggests that the connecting bundles are homologous with the ventral bundles in *Drimys*. The position of the placentas described above is in accordance with such a homology. The main bundle at the broadest side is then to be considered as representing the fused sterile parts of two ventral bundles belonging to two connate carpels.

Such an interpretation requires also a reconsideration of the homology of the main bundles at the narrow, grooved sides of the ovary. Leroy (1978) considers the grooves of the ovary to be caused by the slightly infolded lateral sides of the adjoining carpels. However, a dorsal groove is present in the definitely unicarpellate structures in *Drimys lanceolata* (Vink, 1970). This species also possesses a double dorsal trace (Tucker & Gifford, 1964, 1966). Although in *Takhtajania* the longitudinal division of the bundles is incomplete, the combination of an external groove with a double bundle is a striking feature, suggesting an interpretation of the narrow grooved sides of the *Takhtajania* ovary as homologous with the dorsal side of free or solitary carpels in other *Winteraceae*.

The orientation of the ovary in relation to the axes of the flower (one obser-

vation only) cannot contribute to the interpretation of the ovary, as in other *Winteraceae* this orientation is highly variable.

As already pointed out earlier (Vink, 1970) in *Drimys* the carpels continue the arrangement of the stamens, that is, the lowest carpels take positions which could have been expected to be filled by stamens if more stamens would have been initiated. I found the same situation in *Bubbia*. In the one flowerbud of *Takhtajania* I dissected (fig. 1) the grooved sides of the ovary take these positions. This is another indication that the grooved sides of the ovary of *Takhtajania* are comparable with the dorsal side of free carpels.

CONCLUSION

Leroy's conclusion that the ovary of *Takhtajania* is to be interpreted as a bicarpellate unilocular structure is confirmed. However, I consider the grooved narrow sides of this ovary to be homologous with the dorsal side of free carpels in other *Winteraceae*.

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