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**KEYWORDS:**

**Anamorphosis, Atavism, China, Gynoecium, Whytockia**

## 异叶苣苔属 (苦苣苔科) 雌蕊的畸形发育及其系统意义\*

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### AN ANAMORPHOSIS OF GYNOECIUM IN WHYTOCKIA (GESNERIACEAE), WITH PHYLOGENETIC IMPLICATION\*

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关键词 畸形发育, 返祖现象, 雌蕊, 异叶苣苔属

Key words Anamorphosis, Atavism, Gynoecium, *Whytockia*

The genus *Whytockia* W. W. Smith, mainly characterized by anisophylly, bilocular ovary with axile placentation and ebracteate pair-flowered cymes, is considered as the most primitive representative of the relict tribe Klugieae (Weber, 1982). Obviously, it is an ancient relic of the stock from which the other genera of Klugieae have evolved. But the origin and the ancestral group of its own is left unknown. An anamorphosis in the ontogeny of gynoecium found in *Whytockia* seems significant in explaining the origin of the gynoecium in *Whytockia*.

#### MATERIALS AND METHODS

Buds and flowers at different developmental stages of the two species—*Whytockia hekouensis* Y. Z. Wang and *W. bijensis* Y. Z. Wang in the study were obtained from Hekou of Yunnan and Bijie of Guizhou, and fixed in FAA. The material used for SEM was dehydrated, critical point dried and Au / Pd sputter coated. Serial sections were stained with safranin and fast green.

#### RESULTS AND DISCUSSION

As shown in Plate I: 4, the abnormal young gynoecium in *Whytockia hekouensis* consisted of two opening and unequal carpels which were born at different levels on the receptacle. Two whorls of the bracts surrounded the gynoecium, and also there existed some appendages between the gynoecium and bracts. The two carpels respectively folded adaxially and involutely along their median axis where the enlarged contacts

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formed through the fusion of each two margins of carpels. The lower carpel was arch-shaped as a result of the unequal development while the upper carpel was like a hemi-tube opening upward. The epidermal hairs grew out from inside of the lower carpel. Contrasting sharply with the abnormal gynoecium, the normal gynoecium demonstrated an almost synchronous development, and an early closure and fusion of the two carpels, which had initiated from a pentagonal primordium through the developmental stage of two horse-shoe-shaped carpel flanges (Plate I: 1~3).

As indicated in the results, each carpel in the anamorphosis of the gynoecium in *Whytockia* resembles the early development of a carpel in an apocarpous gynoecium which is homologous with an involute leaf (Fahn, 1982). In addition, the relict characteristics in *Whytockia* are also related to the anamorphosis. The evidences are the carpellary margins being fused in the lower part but free in the middle part of the bilocular ovary (Plate I: 6,7), and the epidermal hairs often observed in the septal surfaces and inner wall of ovary (Plate I: 5). In general, the ventral edges may be viewed as corresponding to the contact region in an involute leaf (Eames, 1961). The carpel in the ancestor of *Whytockia* may have originated directly from a highly involute procarpel in which the contact is along the margins of procarpel in the lower part, but back on the abaxial surface of procarpel in the middle part where the carpellary margins may be free and inside the locule.

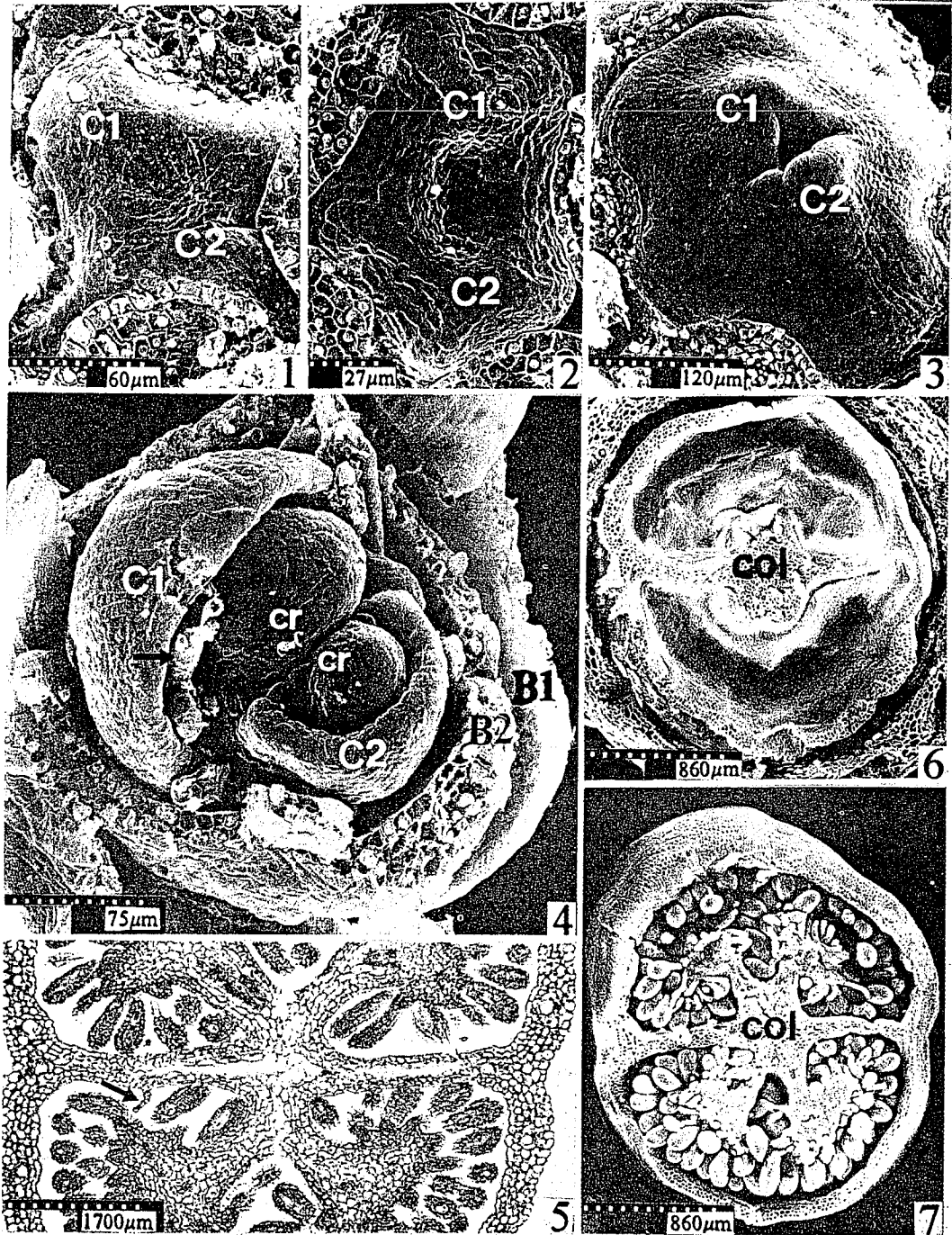
Thus, we can conclude that the anamorphosis of the gynoecium in *Whytockia* is a reversible atavism in which some characteristics have lost in the modern plant of *Whytockia* such as the opening and involute carpels born at different levels on the receptacle, while some have maintained such as the epidermal hairs within the ovary and the free carpellary margins. The bicarpellate syncarpous gynoecium in *Whytockia* may have evolved from the ancestor with two apocarpous gynoecium born alternately on the receptacle and originated directly from a highly involute closure of the procarpel. The phylogenetic condensation of the gynoecial internode, and later the fusion between the two apocarpous gynoecia may have taken place in the origin of the genus *Whytockia*. Moreover, the bracts, appendages and the unequal carpels in the atavism are respectively parallel to the two whorls of perianth, the stamens and the anisophyllous leaves in the normal plant of *Whytockia*. Whether there exists a phylogenetic relation between them still needs further comparative studies in the fields of teratology, ontogeny and evolutionary morphology.

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## Explanation of Plates

- 1~3. The initiation and early development of the normal gynoecium in *W. hekouensis*. 4. The abnormal young gynoecium surrounded by two whorls of bracts and some appendages in *W. hekouensis*. 5. Part of the cross section of ovary in *W. bijeensis*. 6~7. The cross section in the lower and middle part of ovary in *W. hekouensis*.  
 C1, C2: primordia of the two carpels at different developmental stages. cr: contact region of an involute carpel. B1, B2: two whorls of bracts. col: column. →: indicating the epidermal hairs.



See explanation at the end of text

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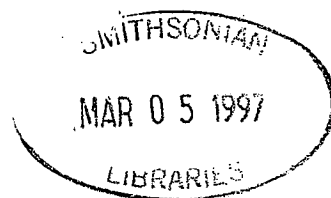
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