

PECULIARITIES OF ANTHER STRUCTURE IN *CODONOPSIS CLEMATIDEA* (CAMPANULACEAE)

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A comparative analysis of the anther structure of *Codonopsis clematidea* and other species of the Campanulaceae family has revealed similarities in their organization. The microsporangium wall is formed according to the dicotyledonous type and consists of the epidermis, 1–3-layered endothecium, middle layer and cellular tapetum. The formation of tetrahedral tetrads of microspores occurs in a simultaneous pattern, mature pollen grains are 2-celled.

Our study showed that the anthers in *C. clematidea* are formed both with placentoids (type 2, dominates) and without them (type 1). In anthers of the 1st type, as in most flowering plants, the locules in theca form a common septum. The septa in theca are not destroyed and the stomium is not formed. In anthers of the 2nd type, locules in theca do not merge, but exist separately. Septa are not arised, but fibrous thickenings are formed. The latter also appears in almost all cells of the placentoids. The mechanisms of the anther dehiscence are very similar to those of dehiscence of the capsule fruit. Based on this, it was proposed for the first time to distinguish several modes of dehiscence of the anthers. In most flowering plants, the septa in theca destroy. Opening of the anthers turns out to be septicidal and occurs in the stomium.

In the anthers of the 1st type, in the wall of each microsporangium in its middle part, from the outside, the layers that imitate the stomium bend down. The edges of the notch form large cells of the epidermis and endothecium, which outer tangential walls thicken. However, in the center of the notch, the cells remain small and thin-walled. When the cells of the epidermis and endothecium are compressed, small cells are ruptured, and the locules open. Although there are no septa in the anthers of the 2nd type, their opening is closest to that of typical anthers. In anthers with placentoids, a stomium is created, which is as close as possible to the connective. The cells of the epidermis and endothecium in the stomium decrease in size and grow together with small thin-walled cells of the multilayered tissue of the outgrowth of the connective. The number of layers of endothelial cells is reduced from 2–3 to one layer, and there are no fibrous thickenings in them. Before opening the locules, endothecium cells are dehydrated and compressed like a spring as a result of shortening fibrous thickenings. Due to this, the size of the endothelial cells decreases and small thin-walled cells in the stomium are ruptured, while the entire wall of the microsporangium opens outward.

Thus, the anther dehiscence in *Codonopsis* can be either loculicidal (type 1 anther), or aseptical, but with the formation of a stomium, which is as close as possible to the connective, and the formation of fibrous thickenings in the cells of the placentoids (type 2 anther). The second pattern is probably one of the primary opening modes, when the microsporangia in theca were not yet united and there were no septa. Its presence is probably characteristic of *Ostrowskia magnifica*, *Platycodon grandiflorus*, some *Campanula* species, and basal *Paeonia lactiflora* species from Paeoniaceae also.

The diversity of placentoids, their position in the anther and structure are discussed.

Keywords: *Codonopsis clematidea*, Campanulaceae, anther structure, placentoid, anther dehiscence

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