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Study of Morphological and Anatomical Structure of Some Vegetative and Reproductive Organs in the Medical Plant *Polygonum bistorta* L.

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Introduction

The generic knotweed *Polygonum* is of the knotweed *Polygonaceae* family with 420 identified species (Rechinger & Schiman-Czeika, 1968). Different names have been suggested for *Polygonum bistorta* L., including *Bistorta officinalis*, *Polygonum bistortoide*, *Bistorta bistortoide* and *Bistorta major*. The knotweed family is identified by heterostyly, and mostly by distyly. The pollen of different species of the generic knotweed is prolate to spherical and tricolporate. According to the library studies, there is no published research on this species in Iran. Therefore, in the present study, some of the vegetative and generative structures have been taken into consideration.

Material and Methods

To study the anatomical and morphological structure, we collected samples from Hamedan Province (the path from Ganjnameh to Mount Alvand). The hand-cut of the generative organs was provided using double staining (Carmen Zaji and methyl green). To analyze the microtomy incision, the buds were stabilized in FAA (ethanol 70%, formalin 10%, and acetic acid 5%) for 48 hours and then stained with hematoxylin and eosin (Chehregani, 2010). The selected samples were photographed using an optical microscope with different magnifications. To study the features of the pollen, we put the pollen from the anther on the special bases of the electronic microscope SEM for 500 seconds in a coater. Being covered with gold, it was photographed and studied.

Result and Discussion

Polygonum bistorta is an old plant, with rhizomes and underground stems, the inflorescence in this species is knotted, long styled, medium styled, and short styled. The flowers have mostly three stigmas and are heterostyled. The structure of the root includes epidermis, skin parenchyma, endoderm, and vascular bundles, which are pentamerous and move towards the center of the xylem, and the pith is mainly filled with this tissue. The structure of the stem with vascular bundles are collaterally located on its surface and the vascular bundles are surrounded by supporting fibers. The parenchymal or mesophyll of the leaf tissue has palisade parenchyma in both sides. The central vein is square. The vegetative meristem is prominent. The pollen is spherical to oval and is tricolporate. During differentiation in the ovarian tissue, the embryonic sac is formed, which in turn produces embryonic egg (2nc), cotyledon embryo, and endosperm egg (3nc) after double fertilization. During the development, the egg is turned into the seed and the ovary into the achene, whose exocarp possesses elongated lignin cells and is seen as brownish.

Tan and Liao's study in 2010 on the anatomical structure of the vegetative organs of *Polygonum multiflorum* demonstrated that the anatomical structure of the root, stem, and the leaf of this plant is normally dicotyledonous. Although the root and stem is reported to have the usual structure of dicotyledons, the structure of the leaf, and especially the main vein, is different from that of the usual leaf of the dicotyledons. Furthermore, the study of different species has reported the existence of single-row unicellular cover trichome. In a research on one-year-old *Polygonum* L., the investigation of the stem illustrated that the cross section of the stem is circular and has one-layered epidermis. The vascular bundles are surrounded by the sclerenchyma fibers, the fact which is line with Keshavarzi's study (Keshavarzi et al., 2012). At the same time, the existence of supporting tissues in the stem demonstrates its resistance to difficult environmental conditions. Studying the stem of different species of this generic, Bokaee et al. have reported the existence of palisade and porous parenchyma in the stem skin. In the present study, all the skin parenchyma is porous. The calcium oxalate observed in some species in Bokaee's research (2015) has not been seen in the considered species. In 2012, Keshavarzi et al. reported that calcium oxalate exists in most species, but not in *P. polycenomides*, which is line with the results of the present research. Moreover, regarding some different features of the species being studied, as mentioned in some reports (Mozaffarian, 2012), this kind of Polygonum is separate and belongs to a different generic (*Bistorta*).

Conclusions

The resulting information leads to identification of characteristics that can be obtained in other basic studies, such as more accurate plant classification and understanding of evolutionary relationships in *Polygonacese.*

Keywords: Developmental structure, Generative meristems, Bistorta, SEM.

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Declaration of conflict of interest

The authors declare that they have no conflicts of interest.