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# The Reproductive Structures of Relict *Aristolochia* Species, Endemics of Pan-Japan Sea Area

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Reproductive structure provide for existence of species, because they are connected with propagation, expansion and maintenance of the gene pool. Thus, structure of reproductive organs often reflects to evolutionary transformation of species and, therefore, knowledge of these structures may be useful for understanding of evolution of species, genera and territories that they inhabit.

The *Aristolochia* species, members of one of the most ancient families of angiosperms, are relic elements of Tertiary flora distributed along the Japan Sea Area. There are 4 species of *Aristolochia* genus in Japan (Ohwi, 1965) and 45 species in China (Flora., 2003). In Korea and the southwest of Primorskij Krai of Russia 2 species occurs only. One of them, *A. contorta* Bunge, also occurred in Japan (*A. nipponica* Makino, ko-uma-no-suzu-kusa, maruba-uma-no-suzu-kusa) and other, *A. manshuriensis* Kom. (guan mo tung), also grown in China (Kitagawa, 1979; Flora., 1993; Kharkevich, 1987). Both species are rare and listed in the Red Book of Primorskij Krai (The list., 2002) and *A. manshuriensis* is considered in the Red book of Russia as an endangered species (1988). *A. contorta* is herbal liana and *A. manshuriensis* is woody liana, having medicinal value as cardiotropic remedy used in oriental medicine (Pai-chung et al., 1956). Both species are represented by small isolated populations in Primorye (Kharkevich, 1987).

The reproductive systems of these species are scarce understood. In the present research we report some special characteristics of the reproductive structures of *A. contorta* and *A. manshuriensis*, which may be useful for understanding of their evolutionary history and for conservation managing of these rare species.

Our study objects were flowers of 4 plants *A. contorta* and 8 plants *A. manshuriensis*, growing in Vladivostok Botanical Garden. We used light and electron scan microscopy for the research.

The morphological and anatomical structure of gynaecium and androecium of *A. contorta* and *A. manshuriensis* were studied. The special feature of reproductive structures of *Aristolochia* genus is gynostemium formed by the fusion of filaments, connectives, styles and stigmas. No substantial differences in ovary structure were found between two species. The gynaecium of two species is formed by fusion of 6 carpels. Apex of stigma is oblongish, it covers anthers. Style is open. Two vascular collateral bundles in each carpel are growing away from concentric vascular system located in base style. The ovary is inferior, 6-lobed, cylindrical. Epidermis is tomentose with sparse hairs contained 1-2 cells. Terminal cell of epidermal hairs is sharply hooked at apex. Stomas are anomocytic. The ovary bears numerous ovules on an axial placenta. The ovule sac is Polygonum type. The ovules

are anatropous, bitegmic and crassinucellate. The funiculus has conspicuous swelling. The funicular vascular bundle extends to the chalaza.

The only difference between gynaecium structure two species is the stigma, that is 6-lobed in *A. contorta* 3-lobed and in *A. manshuriensis*. It is noteworthy that reproductive structures of these plants include advanced and protomorphic features.

Androecium of both species is presented six anthers which are located on the periphery of the gynostemium. In each anther there is vascular bundle grown away from concentric vascular system in base of the style. The anthers of *A. contorta* are bilocular, and ones of *A. manshuriensis* are quadrilocular. The pollen grains of both species are spherical and non-aperturate. The equatorial diameter of pollen grain is 23.7  $\mu\text{m}$  in *A. contorta*, one in *A. manshuriensis* is 27.1  $\mu\text{m}$ . Percentage of pollen grains diminution is 24.5 % in *A. contorta*, the same is 3 % in *A. manshuriensis*.

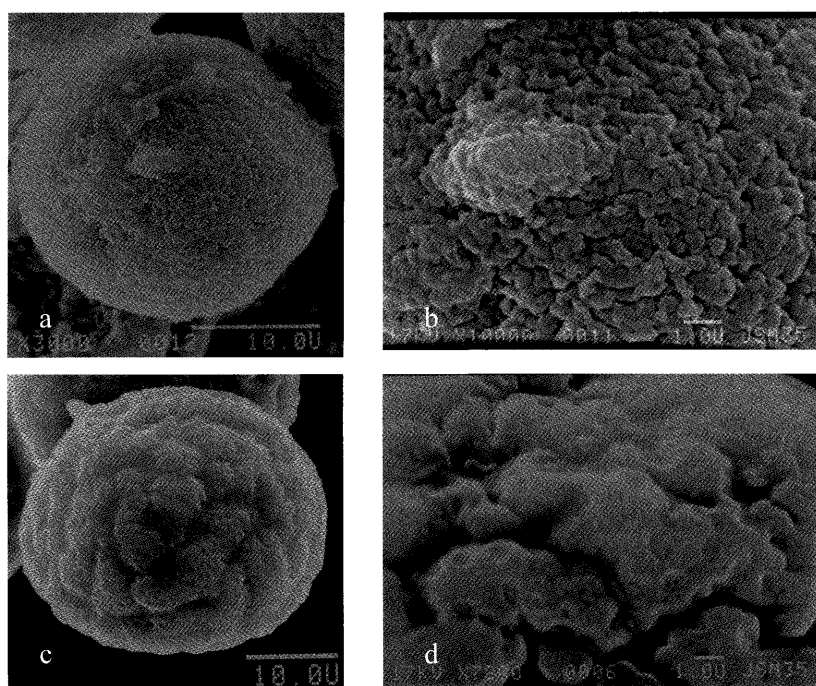


Fig. Pollen grains and their surface of *A. contorta* (a, b) and *A. manshuriensis* (c, d).

Present study is the first step of comparative investigation of *Aristolochia* species growing in the Far Eastern Region for understanding their relationship and for developing conservation strategy of these rare and beautiful lianas.

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