

# Occurrence and characteristics of natural hybridization in *Begonia* in China

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## Abstract

Occurrence and characteristics of natural hybridization in *Begonia* in China Daiké Tian<sup>1,2\*</sup>, Chun Li<sup>1,3</sup>, Yan Xiao<sup>1,2</sup>, Naifeng Fu<sup>1,2</sup>, Yi Tong<sup>1,2</sup>, Ruijuan Wu<sup>1,2</sup> 1 Shanghai Chenshan Plant Science Research Center, Chinese Academy of Sciences; Shanghai Chenshan Botanical Garden, Shanghai 201602 2 Shanghai Key Laboratory of Plant Functional Genomics and Resources, Shanghai 201602 3 Lushan Bureau of Forestry, Lushan, Sichuan 625600 Abstract: Natural hybridization is a very common phenomenon in plants and has continuously been a hot spot in the scientific research of speciation and evolution. As one of the largest genera in plants, *Begonia* has a large number of species. However, very few cases have been reported on its natural hybrids. A systematic investigation of natural hybridization of *Begonia* can not only improve understanding of plant diversity and germplasm resources of this genus, but also be a step towards solving its taxonomical issues. Through a comprehensive field survey and experimental analysis of natural hybridization in Chinese begonias, we found •研究报告• © 生物多样性 Biodiversity Science 第 6 期 田代科等: 中国秋海棠属植物的自然杂交发生及其特点 655 nearly 50 populations of 31 natural hybrids occurred among 29 species, accounting for 15% of currently about 200 accepted species. *Begonia hemsleyana* and *B. longifolia* had the highest cross frequency and crossed with 8 and 7 other species, respectively. *B. palmata* contributed to 16 hybrid populations, the largest number in all individual species. The largest number of hybrids (31 hybrid populations from 20 parental species) occurred in Yunnan (mainly in the southern areas), followed by Taiwan and Guangxi. Hybridization between species was unidirectional in most cases, and the majority of hybrids were F1 individuals, which still rely on parents or hybridization zones and have not been established as a true species. Field observations showed that aphid flies, followed by members of the bee family (Apidae), were the most frequent visitors of *Begonia* flowers, however, further studies are necessary to examine their behavior and the efficiency of pollination. The natural hybrids and their putative parents were identified using integrative methods of morphology, molecular research, and artificial crossing experiments. Genome size (C value) of hybrids was usually equal or close to the average of that of the two parents, with an error less than 10%, which could assist identification of hybrids and parents. In addition, we summarized the five conditions necessary for the occurrence of natural hybridization: overlapping or adjacent distributions, concurrent flowering (at least partially overlapping), efficient pollination media, cross compatibility, and suitable microhabitat and climate conditions for seed germination and seedling growth. Based on these, we also predicted future putative parents of about 40 new natural hybrids and possible hybridization sites. Thus far, although all the known natural *Begonia* hybrids have not established as true species, it may be more appropriate to treat them as a special taxon of speciation and evolution, which should be thoroughly investigated and published referring to protocols for publishing a new taxon in the scientific research. Because the individuals of natural

hybrids in Begonia are always sparsely distributed in small numbers, and hybrids are not harmful to its parents it increases plant diversity and the chances of obtaining a new ornamental cultivar by natural selection. Therefore, the priority of in situ conservation should be given to regions with natural hybrids and species-rich environments. Meanwhile, for the purpose of ex situ conservation, requiring sufficient planting distance between species should be considered in those species with overlapping flowering time to avoid possible natural hybridization due to high cross-compatibility, particularly in native begonias. Key words: Begonia; natural hybridization; occurrence frequency; special taxon; cross direction; pollination