



Molecular evidence for the hybrid origin of *Rosa lichiangensis* (Rosaceae)

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Abstract

Natural hybridization was assumed to play a significant role in the diversification of *Rosa*. *Rosa lichiangensis* was suspected to be of hybrid origin based on its intermediate morphological characters between *R. soulieana* and *R. multiflora* var. *cathayensis*. In this study, four chloroplast regions (*ndhC-trnV*, *ndhF-rpl32*, *ndhJ-trnF*, and *psbJ-petA*) and a single copy nuclear marker (*GAPDH*) were used to test the hybrid origin of *R. lichiangensis*. The results from molecular data supported the hybrid origin of *R. lichiangensis* and further identified *R. soulieana* as its maternal progenitor and *R. multiflora* var. *cathayensis* as the paternal progenitor.

Keywords: Chloroplast, nuclear, hybridization, progenitors, wild roses

Introduction

Hybridization between species is an important driving force in plant evolution (Mallet 2007, Paun *et al.* 2009). It can occur between species that may or may not be closely related and often play pivotal roles in the creation of novel species (Linder & Rieseberg 2004). Interspecific hybridizations often complicate phylogenetic reconstruction in many genera, but they also provide interesting subjects to study the process of evolution and speciation.

The genus *Rosa* Linnaeus (1753: 491) comprises 150 to 200 species distributed in the temperate and subtropical regions of the northern hemisphere (Yu *et al.* 1985, Ku & Robertson 2003, Wissemann 2003). Species in this genus are easy to be involved in hybridization events which have contributed substantially to the diversity of *Rosa* (Atienza *et al.* 2005, Schanzer & Vagina 2007, Ugglá & Carlson-Nilsson 2005, Wissemann 2003).

One likely product of interspecific cross in this genus is *Rosa lichiangensis* T.T.Yu & T.C.Ku (1981: 14–15). *Rosa lichiangensis* is only occurred in upland areas (elev. 2500 m to 3000 m) of Lijiang, Yunnan, China. It belongs to *R. sect. Synstylae* Candolle (1813: 137) in traditional classifications of *Rosa* (Yu *et al.* 1985, Ku & Robertson 2003). And it was assigned to *R. sect. Synstylae ser. Multiflorae* T.T.Yu & T.C.Ku (1981: 4), in which species have pectinate or serrate stipules (Yu *et al.* 1985). When *R. lichiangensis* was first documented, it was described to be similar to *R. kwangtungensis* T.T.Yu & H.T.Tsai (1936: 114) except that the latter has white flowers and dense pubescence on abaxial leaf surface. However, *R. lichiangensis* and *R. kwangtungensis* are endemic to Yunnan and Guangdong, respectively. The recent phylogenetic study of Chinese wild roses based on *matK* and *ITS* regions did not reveal the systematic position and evolutionary history of *R. lichiangensis* (Qiu *et al.* 2012).

Rosa lichiangensis is distributed in an area of high diversity of wild roses including species from *R. sects. Rosa* [e.g., *R. macrophylla* Lindley (1820: 35), *R. graciliflora* Rehder & E. H. Wilson (1915: 330) and *R. prattii* Hemsley (1892: 307)], *Pimpinellifoliae* Candolle ex Seringe (1818: 3) [e.g., *R. sericea* Lindley (1820: 105)] and *Synstylae* [e.g., *R. multiflora* Thunberg (1784: 474) var. *multiflora*, *R. multiflora* var. *cathayensis* Rehder & E. H. Wilson (1915: 304), and *R. soulieana* Crépin (1896: 21)]. From our field observations and examination of specimens, we found that leaf morphology of *R. lichiangensis* was similar to the sympatric *R. multiflora* var. *multiflora* / *R. multiflora* var. *cathayensis*, but the leaf size is much smaller, and close to that of the sympatric *R. soulieana* (Fig. 1). Its stipules have glandular serration on the margin, which is intermediate of *R. multiflora* var. *multiflora* / *R. multiflora* var. *cathayensis* (pectinate stipules) and *R. soulieana* (margins entire) (Fig. 1). In addition, *R. lichiangensis* has light pink flowers, or white and light pink flowers mixed in some individuals. The intermediate characters of leaves and flowers point to the