



Taxonomic reexamination of *Portulaca okinawensis* (Portulacaceae) in the Ryukyu Archipelago of Japan based on molecular and morphological data

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Abstract

We used molecular phylogenetic and morphological data to reexamine the taxonomic status of *Portulaca okinawensis* (= *P. pilosa* subsp. *okinawensis*) endemic to the central Ryukyu islands, southwestern Japan. Our molecular analyses showed that *P. okinawensis* is monophyletic, sister to the clade of *P. psammotropha* and *P. tuberosa* and it is not closely related to *P. pilosa* subsp. *pilosa*. Two subclades, one comprising plants from the Okinawa Islands and the other from the Amami Islands, were recognized. The plants from the Okinawa Islands had more than 20 stamens, orange-yellow narrowly obovate to oblanceolate petals, and reddish-green stems (as the holotype), while the plants from the Amami Islands had less than 20 stamens, lemon-colored obovate petals, and bright-green stems. The molecular and morphological data support a taxonomic treatment of Walker & Tawada (1951) regarding *P. okinawensis* as a separate species, also suggesting that the plants from the Amami and Okinawa islands should be treated as different taxa. A new variety *Portulaca okinawensis* var. *amamiensis* was here described.

Key words: ITS phylogeny, Japan, morphological data, new taxon, *Portulaca pilosa*, Ryukyu Islands

Introduction

Portulacaceae Juss. is a monotypic family including only *Portulaca* Linnaeus (1753: 445) (Nyffeler & Eggli 2010). *Portulaca* includes over 100 species of annuals and perennials and is distributed worldwide (mostly in the tropics and subtropics) with the center of species diversity in South America and Africa (Ocampo & Columbus 2012). The Ryukyu Archipelago (the Ryukyus) is located between the Kyushu Island (Japan) and Taiwan, and comprises about 140 islands (Fig. 1). Three native *Portulaca* species have been reported in the Ryukyus (Walker 1976, Shimabuku 1997): the pantropical *P. oleracea* Linnaeus (1753: 445) from most of the islands, *P. quadrifida* Linnaeus (1767: 328) distributed in tropical Asia and Africa but collected only once in Ikei-jima Island being an islet of the Okinawa Islands, and *P. okinawensis* Walker & Tawada (1951: 138) [= *P. pilosa* Linnaeus (1753:445) subsp. *okinawensis* (Walker & Tawada) Geesink (1969: 298)]. *P. okinawensis* was described by Walker & Tawada (1951) on a specimen collected from Okinawa Island. This taxon rarely occurs on coastal rocky slopes in the Amami Islands and the Okinawa Islands, and is a critically threatened species in a Japanese red list (Japanese Ministry of Environment 2012).

Portulaca okinawensis is considered to be endemic to the central Ryukyus that consisted of the Okinawa and Amami islands (Fig. 1; Hotta 2004, Shinjo & Shinzato 2006). Geesink (1969) recognized *P. okinawensis* as subspecies of *P. pilosa* based on the leaf morphology. *Portulaca pilosa* subsp. *pilosa* is native to South America and widely naturalized in the tropics and subtropics (PIER 2013) including the Ryukyus (Hatusima 1975). The taxonomic concept of Walker & Tawada (1951) was accepted by Momiyama (1982) and Akiyama