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## Original Article

*Adonis amurensis* var. *pilosissima* var. nov., a new variety of *Adonis amurensis* (Ranunculaceae) from East AsiaDong Chan Son<sup>a,\*</sup>, Jungsim Lee<sup>a,†</sup>, Kyung Soo Eo<sup>a</sup>, Beom Kyun Park<sup>b</sup>, Kyung Choi<sup>a</sup><sup>a</sup> Division of Forest Biodiversity and Herbarium, Korea National Arboretum, Pocheon, 11186, Republic of Korea<sup>b</sup> Department of Biological Sciences and Biotechnology, Hannam University, Daejeon, 34054, Republic of Korea

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## ABSTRACT

A new variety of *Adonis amurensis* from East Asia, *A. amurensis* var. *pilosissima*, is described and illustrated. The new variety is morphologically related to *A. amurensis* var. *amurensis* and *Adonis pseudoamurensis*, but differs from the former by its densely pilose stem and leaves with abundant short hairs not becoming glabrate in fruiting season, and from the latter by its unbranched stem, precocious leaves, and sepals longer than petals. The conservation status of *A. amurensis* var. *pilosissima* was assessed according to the IUCN Red List criteria. A distribution map for the species and identification key for all 14 *Adonis* taxa from East Asia are also provided.

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## Introduction

The genus *Adonis* L. belongs to the family Ranunculaceae and is composed of perennials and annuals that are included in the tribe Adonideae under the subfamily Ranunculoideae (Fu and Robinson 2001; Nishikawa and Kadota 2006; Ren et al 2009). The genus can be distinguished from the closely related genus *Trollius* L. (Johansson and Jansen 1993; Tamura 1993; Hoot 1995; Ro et al 1997) by its petals without nectaries, fruits achenes, and pollen surface structure (Fu and Robinson 2001; Nishikawa and Kadota 2006; Perveen and Qaiser 2006). There are currently approximately 30 species known, mainly from the northern temperate zone, including Asia, Europe, and North America, as well as some annual plants known to be distributed from Southwest Asia to North Africa, and along the shores of the Mediterranean (Wang 1994a, 1994b; Mabberley 2008). In East Asia (including China, Korea, Japan, and Russian Far East), 13 taxa were recognized (Fu and Robinson 2001; Nishikawa and Kadota 2006; Son and Ko 2013; Son 2015; Son et al 2016), and each species can distinguish by several characters such as the presence or absence of leaves in the

anthesis, the presence or absence of branches in the stem, the development of the scale apex into leaf, the presence or absence of petiole, the shapes of lobule and their apices in leaflets, the number of sepals and petals, the ratio of sepal to petal in length and width, the shapes of achene, and microstructures of the achene surface (Son 2015).

*Adonis amurensis* Regel et Radde, which is found in Northeastern China, Korea, Japan, and Russian Far East was collected in Amur Montes Burejae region and described by Regel et Radde (1861) as a new species. Morphologically, this species is clearly distinguished from other taxa of *Adonis* by unbranched glabrous stem, long leaf petioles branched two or three times, one flower with eight to nine sepals, and sepals longer to that of petals (Gorovoy and Gurzenkov 1969; Poschkurlat 1977; Wang 1980, 1994a; Wang and Liu 1988; Lee et al 2000; Lee et al 2003; Nishikawa and Kadota 2006; Son 2015). However, because of the morphological characters that are shared among objective distinctive characteristics of the taxa within the genus and the diverse morphological variation of *A. amurensis*, it has been difficult to identify taxa and investigate their phylogenetic relationships (Son et al 2016), and hence taxonomic status of *A. amurensis* has been treated in very contrasting ways.

Suda and Adachi (1991) considered that it to be integrated *Adonis pseudoamurensis* W.T. Wang, *Adonis multiflora* Nishikawa et Koji Ito, and *Adonis ramosa* Franch. into *A. amurensis*. This taxonomic status of *A. amurensis* was supported by other taxonomists

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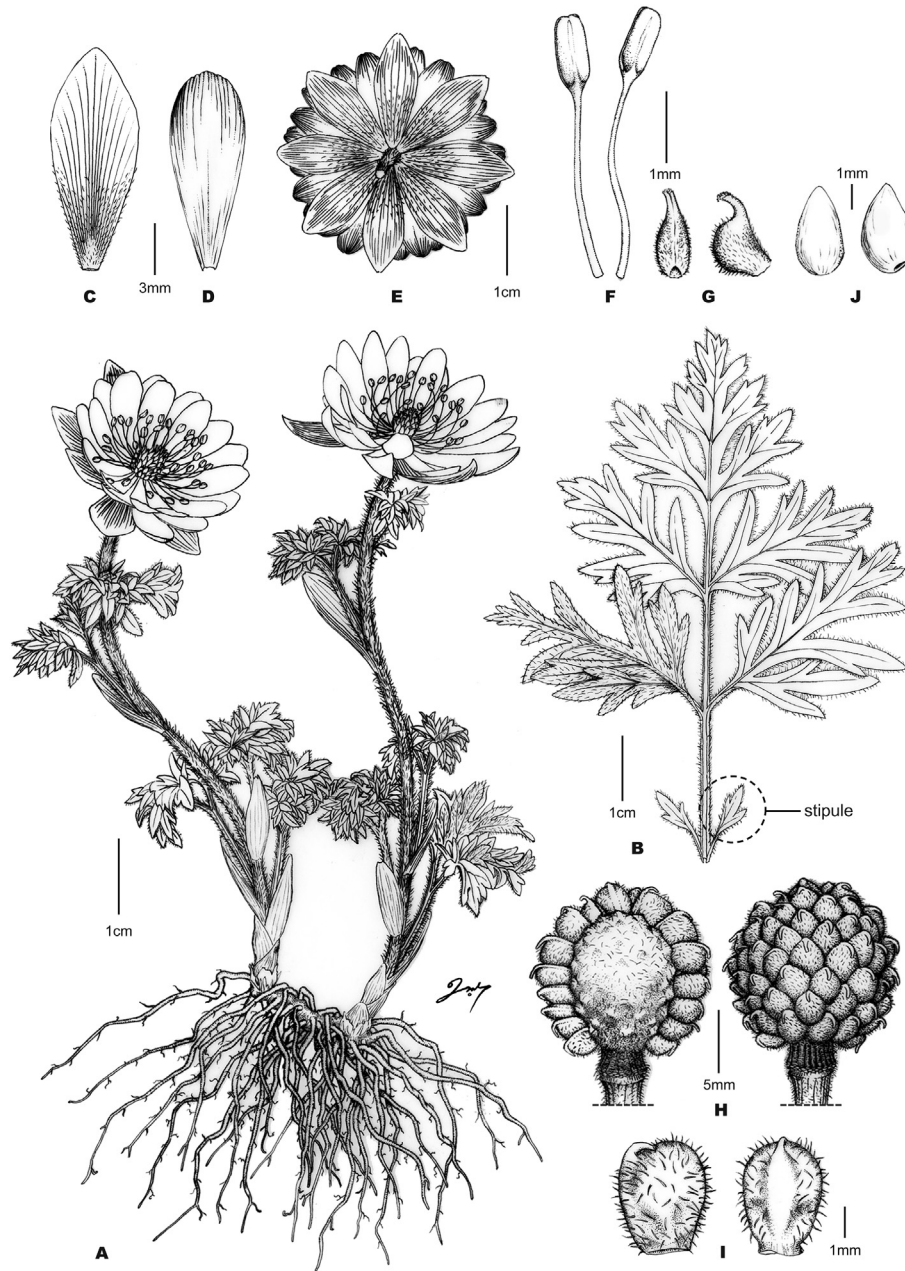
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**Figure 1.** Illustration of *A. amurensis* var. *pilosissima* D.C. Son et J. Lee: A, plant; B, leaves; C, sepal; D, petals; E, flower; F, stamen; G, pistil; H, aggregated achene; I, achene; J, seed. Illustrations by Kyung Soo Eo.

(Suda and Herai 1991; Sohma and Suda 1992; Suda 1995, 1998, 2001). Conversely, Lee et al (2003) and Son and Ko (2012) recognized *A. amurensis*, *A. pseudoamurensis*, *A. multiflora*, and *A. ramosa* as an independent species, respectively, and this conflict opinions have created a confusing scenario.

Regarding the description of *A. amurensis*, Wang (1994a) considered that hairs on leaves of *A. amurensis* are highly variable and probably not good for supporting varieties. However, examining specimens of herbarium to understand variation patterns of *A. amurensis* var. *amurensis* as a whole revealed that some of the cited specimens as *A. amurensis* by Wang (1994a) were misidentified either as *A. ramosa* (exsiccate of Satomi & Togasi 1700 and Maximowicz s.n. are kept at P) or *A. multiflora* (exsiccate of Taquet 4543 is housed at E). Resultingly, Wang (1994a) made the fatal mistake by inaccurately described because cited specimens which

has hair on leaves really belongs to *A. ramosa* (Son 2015; Son et al 2016). Moreover, we have detected that the characters of *A. pseudoamurensis*, *A. multiflora*, and *A. ramosa* have been inaccurately described as those of *A. amurensis* in books and literatures (Lee 1980; Lee 1996; Wang 1994a; Fu and Robinson 2001), and the pictures also have been incorrectly attached (Lee 1980; Lee 1996). These reasons have caused a chaos on identity of *A. amurensis*.

However, according to the recent studies on the genus *Adonis* from East Asia (Lee et al 2003; Nishikawa and Kadota 2006; Kaneko et al 2008; Son and Ko 2011, 2012; Son 2015; Son et al 2016, Son et al 2017), all taxa as mentioned previously should be treated as independent species by morphological, cytological, and molecular evidences, and then the variation patterns of the morphological characters among taxa that have caused confusion in the identification of taxa were confirmed.

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