



A new *Polygonatum* (Asparagaceae) endemic to the Trường Sơn of southern Vietnam

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Abstract

A new species of *Polygonatum*, *P. annamense* based on evidence from herbarium studies, molecular data, and cultivated material is described and illustrated from upper elevations of the southern Annamite ecoregion where it occurs disjunctly in both the Central Highlands and the Đà Lạt Plateau, Vietnam. It is compared to the morphologically similar *P. punctatum* with which it has been confused, and its relationship to *P. mengtzensense*, *P. punctatum*, and *P. urceolatum* is discussed.

Key words: Annamites, endemic, Sino-Himalaya

Introduction

Recent collections of a *Polygonatum* Miller (1754: without pagination) (Asparagaceae, Reveal & Chase 2011) by the International Botanical Expedition of the US National Geographic Society (see below) and a living collection (BSWJ9752) from the Central Highlands of Vietnam support the recognition of an undescribed species based on morphological comparisons to *P. mengtzensense* Wang & Tang (1936: 84) from northern Vietnam (see also Floden 2014), *P. punctatum* Royle ex Kunth (1850: 142) from the Himalaya, and *P. urceolatum* (Shaw 2009: 174) Floden (2014: 112) from northeast Vietnam and adjacent China.

What few collections that exist of *Polygonatum annamense* have remained in a broad morphologically and phytogeographically discontinuous circumscription of *P. punctatum*. This species occurs only in upper elevation cloud forests in a small region of the Annamite ecoregion that includes the Central Highlands and the Đà Lạt Plateau which restricts its available habitat due to the limited area that reaches elevations above 1400 meters. Due to this reduced area of suitable habitat, its presumed rarity, and the limited floristic inventory in Vietnam (and neighboring Laos) it is unsurprising that this novel species has only recently been revealed. Newman *et al.* (2007) reported that there are approximately 14 collections per 100 km² for Vietnam (adjacent Laos is reported at three per 100 km²). In fact, *P. annamense* has been reported as *P. punctatum* from Kon Tum Province (Le Trong *et al.* 1999) though the actual distribution of *P. punctatum* is confined to the Himalayan Mountains (Sino-Himalayan floristic region) (Floden 2014).

Polygonatum is a genus of 60 or more species that are circumboreal in distribution with its center of diversity concentrated in southwest China, the Sino-Himalayan region, and a secondary center of diversity in northeast China, the Koreas and Japan (Tamura 1990). Infrageneric classification of the genus is currently based on phyllotaxy (alternate, opposite, or verticillate), filament shape, and cytology (Tamura 1990, 1991, 1993). Filament shape is mostly correlated to the base chromosome number, although limited molecular work has not supported these morphologically defined groups as monophyletic (Tamura *et al.* 1997; Wu *et al.* 2000). Nonetheless, delimitation between closely related species is best facilitated by the distribution and type of epidermal features of the filaments (Tamura 1990, 1991, 1993).

Two species endemic to the Sino-Himalayan region are unique in being opposite or alternate leaved, evergreen, having a base chromosome number of $x = 15$, red fruit, and an epiphytic habitat. *Polygonatum oppositifolium* (Wallich 1820: 380) Royle (1839: 380) has opposite leaves and not discussed further, whereas *P. punctatum* has leaves that are spirally alternate, opposite, or terminally verticillate. Based on observations of specimens and field observations, and confirmed by molecular data (A. Floden, in preparation), it is part of a clade containing *P. punctatum* and several Indochinese species isolated at high elevations distributed disjunctly in Thailand, northern and southern Vietnam, and southwest China. Latitudinal distribution of the genus ranges from the north of Russia where several taxa occur south into Indochina where *P. annamense* is the southernmost distributed species in the genus.

TABLE 1. Comparison of the relevant morphological characters that distinguish *Polygonatum annamense*, *P. mengtzensense*, *P. punctatum*, and *P. urceolatum*. Morphological data measured from both specimens and cultivated material. All measurements are in millimeters.

species	<i>P. annamense</i>	<i>P. punctatum</i>	<i>P. mengtzensense</i>	<i>P. urceolatum</i>
stem	terete	sulcate, ridges papillose	terete	sulcate, ridges smooth
phyllotaxy	alternate, opposite, and whorled	alternate, opposite, terminally whorled	alternate	alternate
inflorescence	erect or horizontal	horizontal	pendent	deflexed
infructescence	erect	erect	pendent to erect	pendent to erect
peduncle	smooth	ridged	smooth or papillose	smooth
perigone length	10–12	7–10	7–10	10–12
perigone shape	cylindric	urceolate	urceolate	urceolate
perigone color	white	white, pink maculate	greenish-white, greenish and red maculate	white-green
tepal length	3–4	1.5–2	2–2.5	2–2.5
filament insertion	middle	distal of middle	proximal of middle	proximal of middle
filament surface	smooth	smooth	papillose	rugulose
filament gibbosity	smooth	papillose	papillose	papillose
filament length	0.8–1.1	1.1–1.5	0.8–1.4	0.8–1
ovary	2.8–3.1, ovoid	3–3.5, obovoid	1.8–2.5, obovoid	2–2.5
style	2.5–2.8	2–2.5	1.3–2	1.5–2

The description of this new species endemic to the Central Highlands of Vietnam increases the number of species to four in this group of *Polygonatum*. All the species of this group are distributed from the Himalaya south and east into floristically Sino-Himalayan zones as defined by elevation in otherwise Sino-Japanese or Malayan floristic regions (Averyanov *et al.* 2003). *Polygonatum annamense* represents an additional Sino-Himalayan floristic element of the Ngoc Linh Mountain area and the Đà Lạt Plateau. Both are areas of elevated floral endemism and also an intersection of the Sino-Himalayan and Malayan floristic provinces, the former found mostly at upper elevations (Sterling & Hurley 2005, Le *et al.* 1999).

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