Research paper

The Taxonomy of Maianthemum formosanum (Hayata) LaFrankie (Liliaceae)

Chien-Ti Chao¹ and Yen-Hsueh Tseng²,³

【ABSTRACT】Smilacina formosana Hayata was first described at 1920 by Hayata. After that, many authors treated this species as a synonym of S. japonica A. Gray. Recently, type specimen of two species, the original materials and literature cited were reviewed and checked. Therefore, S. formosana Hayata was confirmed different to S. japonica A. Gray. LaFrankie’s concept transferred the genus Smilacina Desf. into Maianthemum Wigg. were accepted. And distribution map, type specimen and photos were provided in this article.

【Key Words】Maianthemum formosanum, plant taxonomy, Liliaceae, Taiwan

INTRODUCTION

The genus Smilacina Desf. comprised about 35 species mainly distributed in eastern and northern Asia, northern America, central America and northern Europe. A total of 19 species has been found in China (Chen and Kawano, 2000). One species was previously recognized in the Flora of Taiwan (Ying, 2000; Boufford et al., 2003).

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In Flora of Taiwan second edition, the species of *Smilacina* was treated as *S. japonica* A. Gray (Ying, 2000; Boufford et al., 2003). According to the type specimen, original materials, literature cited on *Smilacina* (Gray, 1856; Hayata 1908, 1917, 1920; Kawakami 1910; Ohwi, 1953; Yamamoto 1938; Ying, 1969, 2000), the plants in Taiwan should be *S. formosana* Hayata, not *S. japonica* A. Gray were confirmed.

In the past decades, *Maianthemum* Wigg. and *Smilacina* Desf. were two separated genus, and resembled to each other. They were separated based on floral characters. The flowers were trimerous (6 tepals, 6 stamens and 3 carpels) in *Smilacina* and dimerous in *Maianthemum* (4 tepals, 4 stamens and 2 carpels). LaFrankie (1986) suggested the genus *Smilacina* transferred into *Maianthemum* based on morphology and anatomy evidences. Meng et al. (2005, 2008) derived same result from the karyotype and molecular evidences. Chen and Kawano (2000) also followed this concept in Flora of China. In this paper we accepted LaFrankie's concept, transferred the genus *Smilacina* Desf. into *Maianthemum* Wigg.

**TAXONOMIC TREATMENT**


Perennial herbs, monoecious. Rhizome creeping, moniliform or sometimes terete, 2-7 mm in diam., sometimes branched, with many fibrous roots, root with root hairs. Stem erect or arching, 5-30 cm long, simple, pubescent at upper part, nodes close to base covered with scale leave. Leaf deciduous, simple, alternate, ovate to lanceolate, apex attenuate, base attenuate and decurrent, chartaceous, margin entire, undulate, slight pubescent along veins at abaxial surface, 5-10 cm long, 1-5 cm wide, sessile to petiolate, petiole 7-15 mm long, estipule. Inflor-escence terminal, bisexual, raceme to panicle, brevi-pubescent, ca. 5 cm long, 4 cm wide, peduncle ca. 4 cm long, bract absent. Flowers bisexual, fragrance, perianth flattened, segments 6, connect at base, arranged into inconspicuously 2 whors, each 3, white rarely with purplish spots, oblong, apex obtuse, 3 mm long, 1.5 mm wide, pedicels short, ca. 2 mm long, pubescent. Stamens 6, inserted at base of perianth, slight connect to perianth, filament 1-2 mm long, anthers cordate-reniform, ca. 0.5 mm long. Ovary superior, ovate, 1.5 mm long, 3-loculed, glabrous, style 0.5 mm long, stigma capitate, 3-lobed. Fruits berry, globose, 6 mm in diam., spotted when immature, mature red. Seeds numerous. Chromosome number 2n=36

Endemic. Distributed in high altitude mountains, over 3,000 m.

**Specimen examined:**

**Hsinchu:** Wufeng Township, Sheipa National Park: Tapachianshan, ca. 3,400 m, 121 15’ 29” E 24 27’ 47” N, 7 Sep. 1993, C. L. Huang et al. 107 (TNM);

**Taichung:** Hsuehshan Black Forest, 3,200 m, 19 Jun. 1993, S. T. Chiu 1990 (TNM); Nanhuashan, 3,400-3,500 m, 121 22’ 17” E 24 26’ 13” N, 24 Jun. 1994, C. M. Wang W00898 (TNM); Hsuehshan 369 hut, 3,170 m, Sep. 12 2009, C. T. Chao (TCF);

**Nantou:** Hohuanshan, 3,000 m, 121 15’ 44”
E 24° 08’ 03” N, 13 May 2000, C. W. Chen 1495 (TAIF);
CHIAYI: monte Morrison, 13,000 ped. alt., Oct. 1906, T. Kawakami and U. Mori 2384 (Syntype!, TAIF);

NOTES
This species is first described by Hayata at 1908 as Smilacina japonica A. Gray, he assigned 2 specimen of this name, one is Nakahara collected from Mt. Morrison at October 1905, and another one is T. Kawakami and U. Mori collected from Mt. Morrison 13,000 ped. alt. at October 1906 number 2384. Kawakami (1910) and Hayata (1917) followed this concept.

Hayata (1920) described a new species S. formosana Hayata to replace the name he used formerly. Masamune (1930) transferred S. formosana Hayata to genus Tovaria Necker ex Baker as a new combination T. formosana (Hayata) Masamune. However, Tovaria was formerly used by Ruiz & Pavon in 1794 as a genus of Tovariaceae, earlier than Necker ex Baker. Therefore T. formosana (Hayata) Masamune was illegal.

Yamamoto (1938) described a new species S. nokomonicola Yamam. by morphological evidence. According to the original description, this species was smaller than S. formosana Hayata and had a smaller inflorescence. After checked the type specimen and original publications of S. formosana Hayata and S. nokomonicola Yamam., there was no conspicuously difference between two species, support S. nokomonicola Yamam. as a synonym of S. formosana Hayata by Ying (Ying, 1969, 2000; Boufford et al., 2003).

In Flora of Taiwan second edition, S. formosana Hayata had been treated into S. japonica A. Gray. Recently, the taxon found in Taiwan was different from S. japonica A. Gray at several characters, and closed to the description of S. formosana Hayata. Several literatures in east Asia were reviewed (Chen et al., 1780; Chen and Kawano, 2000; Ohwi, 1953), the species in Taiwan is different from S. japonica A. Gray were confirmed. LaFrackie’s concept were accepted, so the name will be M. formosanum (Hayata) LaFrankie for Taiwan species.

M. formosanum (Hayata) LaFrankie is similar to M. japonicum (A. Gray) LaFrankie. The major differences between these two species are the rhizome thickness (2-7 mm vs. 7-10 mm), stem height (5-30 cm vs. 30-60 cm) and style length (0.5 mm vs. 0.5-1 mm) (Table 1).

<table>
<thead>
<tr>
<th></th>
<th>M. formosanum</th>
<th>M. japonicum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhizome</td>
<td>2-7 mm in diam.</td>
<td>7-10 mm in diam.</td>
</tr>
<tr>
<td>Length of Stem</td>
<td>5-30 cm</td>
<td>30-60 cm</td>
</tr>
<tr>
<td>Leaves</td>
<td>ovate to lanceolate</td>
<td>ovate to oblong</td>
</tr>
<tr>
<td>Flowers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of Pedicels</td>
<td>ca. 2 mm</td>
<td>2-6 mm</td>
</tr>
<tr>
<td>Length of Filaments</td>
<td>1-2 mm</td>
<td>2-2.5 mm</td>
</tr>
<tr>
<td>Length of Style</td>
<td>ca. 0.5 mm</td>
<td>ca. 0.5-1 mm</td>
</tr>
<tr>
<td>Stigma</td>
<td>capitrate 3-lobed</td>
<td>subentire to entire</td>
</tr>
</tbody>
</table>
Distribution and habitat
This species is endemic to Taiwan, found in high mountain altitude over 3,000 m. Often grows at trails side or open grassland of *Yushania niitakayamensis* (IIayata) Keng or *Miscanthus sinensis* Anders., sometimes grows at bottom or margin of *Abies kawakamii* (Hayata) Ito, often associate with *Ainsliaea latifolia* (D. Don) Sch. Bip. subsp. *henryi* (Diels.) H. Koyama, *Arenaria subpilosaa* (Hayata) Ohwi and *Aletris formosana* Hayata (Fig.1).

![Figure 1. Distribution map of *Maianthemum formosanum* (Hayata) LaFrankie.](image)

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LITERATURE CITED


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Figure 2. *Maianthemum formosanum* (Hayata) LaFrankie. A. Habitat (open grassland) B. Habitat (under *Abies kawakamii* (Hayata) Ito forest) C. Habit D. Rhizome E. Leaf adaxial surface F. Leaf abaxial surface G. Inflorescence H. Flower I. Ovary J. Anther K. Fruit.
Figure 3. Type specimen of *Smilacina formosana* Hayata (syntype, TAIF!).

Figure 4. Type specimen of *Smilacina japonica* A. Gray., get from website of Smithsonian National Museum of Natural History (NMNH).