A new record of *Viola inconspicua* (Violaceae) from Korea

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ABSTRACT: Distribution of *Viola inconspicua* is newly discovered in Korea. This species was collected from grassy fields and roadsides in Jeju-si and Seogwipo-si, Jeju Island. *V. inconspicua* shares several characteristics (i.e., purple or pale purple flowers, triangular leaf blades, winged petioles, and a linear-lanceolate stipules) with the related species *V. mandshurica* and *V. yedoensis*. However, *V. inconspicua* can be easily distinguished from other species by the following characteristics: leaf base (cordate vs. truncate to attenuate), and spur (short, 2–4 mm long vs. longer, 5–8 mm long). Here, we describe and illustrate of *V. inconspicua*. In addition, the identification key to allied species, photographs in its habitat, distribution, ecology, and phenology are provided as well. The Korean name for the species is given as ‘Hwa-sal-ip-je-bi-kkot’, considering the shape of its leaves.

Keywords: *Viola inconspicua*, Violaceae, unrecorded species

Viola L. comprises approximately 600 species which are distributed in temperate regions and tropical high mountain regions worldwide (Clausen, 1964; Ballard, 1996; Ballard et al., 1999; Yoo and Jang, 2010; Wahlert et al., 2014). *Viola* is the largest genus among ca. 22 genera in the family Violaceae, and is distinct from the other genera by its herbaceous habit and bilaterally symmetrical flowers with spur (Wahlert et al., 2014). Becker (1925) recognized 14 sections, 28 subsections, and seven series based on the ultrastructure of pistil (Yoo and Jang, 2010). Later, many authors made taxonomic revisions to Becker’s classification system (Clausen, 1927, 1929, 1931, 1964; Gershoy, 1934). However, the infra-generic classification of the genus *Viola* is still controversial and is considered to be needed more detail studies (Ballard, 1996; Fan et al., 2015).

In Korea, 42–64 taxa which belong to three sections are distributed; these are sects. *Dischidium* Rehb., *Chamaemelanium* Ging., and *Nomimum* Ging. (Chung, 1959; Lee, 1969, 2003, Park, 1974; Kim, 1986; Yoo and Jang, 2010; Kim et al. 2019; Lee and Yoo, 2020). In sect. *Nomimum*, Kim (1986) recognized six subsections and eight series (subsects. *Bilobatae*, *Hypocarpae*, *Patellares*, *Plagiostigma*, *Trigonocarpae*, and

Vaginatae, series *Campylostylae*, *Rostratae*, *Verecundae*, *Raddeanae*, *Pinnatae*, *Chinensis*, *Variegatae*, and *Patellares*).

Viola inconspicua Blume, which belongs to sect. *Nomimum*, is distributed in China, Japan and Southeast Asia including India, Indonesia, Malaysia, Myanmar, Philippines, and Vietnam (Chen et al., 2007). This species was first recorded by Blume (1825) from China and Java Island. *Viola inconspicua* is distinct from the other species of the genus *Viola* by having narrowly triangular-lanceolate leaf blade, cordate leaf base, stipules ca. 3/4 adnate to petiole with serrate or sparsely entire margins and acute apex, relatively short (2–4 mm long) spur, globose ovary, and oblong capsule. The distribution of *V. inconspicua* in Korea have been newly media reported by National Institute of Biological Resources (NIBR) before in 2011 and assigned Korean name as Gin-kko-ri- je-bi-kkot (긴꼬리제비꽃), but the formal report with accurate nomenclature and full description of the species with detailed information of distributions has not been made.

During a plant diversity field survey on Jeju Island, an unrecorded species, *Viola inconspicua* was confirmed in the abandoned fields and roadsides in Jeju Island, South Korea.

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Here, we present its specific morphological description, illustrations, a taxonomic key to allied species as well as the photographs of its habit.

Taxonomic Treatment

Viola inconspicua Blume, Bijdr. Fl. Ned. Ind. 2: 58, 1825 (Figs. 1, 2).—TYPE: Indonesia, Java, 1822, C. G. C. Reinwardt 1621 (holotype, L!–L0011491 (photo, <https://plants.jstor.org/search>)).

Viola confusa Champ. ex Benth., Hooker's J. Bot. Kew Gard. Misc. 3: 260, 1851.—TYPE: Hong Kong, without date, collector? 352 (holotype, K!–K000254176 (photo, <https://specimens.kew.org/herbarium>)).

Viola chinensis G. Don, Gen. Hist. 1: 322, 1831.—TYPE: not cited.

Viola patrinii var. *minor* Makino, Bot. Mag. (Tokyo) 6: 50, 1892; *V. minor* (Makino) Makino, Bot. Mag. (Tokyo). 26: 151, 1912.—TYPE: Japan, Kochi, Sakawa, 1885 & 1889?, *T. Makino s.n.* (syntype, MAK); Ehime, Uwazima, 1896, *Z. Umemura s.n.* (syntype, MAK).

Viola oblongosagittata Nakai, Bot. Mag. (Tokyo) 36: 37,

1922; *V. betonicifolia* Sm. var. *oblongosagittata* (Nakai) F. Maek. & T. Hashim. J. Jap. Bot. 43: 162, 1968.—TYPE: Japan, Hachijyo, Nakanogō, without date, *M. Ogata s.n.* (syntype, not located); insula Hahajima et Chichijima, without date, *S. Nishimura s.n.* (syntype, not located).

Viola hunanensis Hand.-Mazz., Symb. Sin. 7: 376, pl. 10, f. 2-3, 1931.—TYPE: China, Hunan, “In der str. St. bei Tschangscha auf Sandstein, an feuchten Rasenplätzen se der Stadt,” 100 m, 30 Mar 1918, *H. R. E. Handel-Mazzetti 11553* (holotype, WU!–WU0029300 (photo, <https://herbarium.univie.ac.at/database/search.php>)).

Viola mandshurica W. Becker subsp. *nagasakiensis* W. Becker, Beih. Bot. Centralbl., Abt. 2 40: 161, 1923; *V. confusa* subsp. *nagasakiensis* (W. Becker) F. Maek. & T. Hashim., J. Jap. Bot. 43: 161, 1968.—TYPE: Japan, Nagasaki, 1862, *R. Oldham 59* (holotype, K!–K000254242 (photo, <https://specimens.kew.org/herbarium>); isotype, GH!–GH00067197 (photo, <https://huh.harvard.edu/pages/digital-resources>)).

Viola primulifolia Lour., Fl. Cochinch. 2: 513, 1790, not L. (1753).—TYPE: not cited.

Korean name: Hwa-sal-ip-je-bi-kkot (화살잎제비꽃).

Fig. 1. Illustrations of *Viola inconspicua* Blume. **A.** Flowering plant. **B.** Flower (frontal view). **C.** Flower (lateral view). **D.** Capsule with sepals and bracteoles. **E.** Petals. **F.** Sepal. **G.** Pistil. **H.** Posterior stamen in abaxial view (left) and adaxial view (right).

Fig. 2. Photographs of *Viola inconspicua* Blume. **A.** Habit. **B.** Flower (frontal view). **C.** Flower (lateral view). **D.** Flower (red arrow indicates stigma). **E.** Bracteole. **F.** Androecium with stigma (red arrow indicates stamens). **G.** Gynoecium (red line indicates pistil). **H.** Capsule with sepals. **I.** Leaves at anthesis (adaxial view). **J.** Leaf at anthesis (abaxial view). **K.** Leaves at fruiting stage (adaxial view).

Herbs perennial, 5–20 cm tall, stemless. Roots yellowish-white or light yellowish-brown, elongate, thick. Rhizomes erect, short, thick. Stolons absent. Leaves enlarging after anthesis, petiolate; petiole 1.5–9.5 cm long, narrowly winged apically, glabrous or rarely shortly pubescent; stipules linear-lanceolate, 0.7–1.2 cm long, margins serrate; blade narrowly triangular-lanceolate at anthesis, narrowly triangular at fruiting, 1.5–4 × 0.5–1 cm at anthesis, 3–9 × 1–4 cm at fruiting, apex acuminate or acute, base cordate, margins crenate-serrate, adaxial surface glabrous or sparsely pubescent along veins, abaxial surface glabrous or sparsely pubescent basally. Inflorescences scapose, flower solitary; pedicels 2.5–9 cm long, mostly glabrous, with 2 bracteoles at middle or above middle; bracteoles linear, 3.5–8.5 mm long. Flowers 1–1.5 cm wide; sepals lanceolate or ovate-lanceolate, 4–6 mm long, apex acute, margins entire, glabrous, appendages short, entire; petals purple, oblong-ovate, 0.9–1.2 cm long, margins serrate or entire, lateral petals pilose at base, lowest petal whitish basally, distinctly purple-veined; spur cylindrical, slender, 2–4 mm long, glabrous; ovary glabrous; style flat at apex, short beaked in front; stigma capitate, slightly margined laterally. Capsules oblong, 5–9 mm long, glabrous. Seeds yellowish brown, ovoid-globose, 1.2–1.5 mm long.

Flowering: March to April.

Fruiting: April to May.

Distribution: Korea, China, India, Indonesia, Japan, Malaysia,

Myanmar, New Guinea, Philippines, Taiwan, and Vietnam.

Specimens examined: KOREA. Jejudo: Jeju-si, Hangyeong-myeon, Cheongsu-ri, 33°17'24.9"N, 126°14'51.1"E, 6 Apr 2020, Jin-Seok Kim kjs20001, kjs20002, kjs20003, kjs20004, kjs20005 (KB); 7 Apr 2020, Jin-Seok Kim kjs20006, kjs20007, kjs20008, kjs20009 (KB); 13 Apr 2020, Jin-Seok Kim kjs20014 (KB); Yeon-dong, 33°29'03.2"N, 126°29'47.4"E, 7 Apr 2020, Jin-Seok Kim kjs20012, kjs20013 (KB); Seogwipo-si, Namwon-eup, Harye-ri, 33°17'29.4"N, 126°36'33.9"E, 13 Apr 2020, Jin-Seok Kim kjs20015 (KB); Topyeong-dong, 33°17'15.3"N, 126°34'58.6"E, 7 Apr 2020, Jin-Seok Kim kjs20010, kjs20011 (KB).

VIETNAM. Lamdong: Da lat, 11°53'07"N, 108°27'59"E, 11 Mar 2015, Du Won Kim and Van Dung Luong, s.n. (KB [2 sheets]).

Habitats: Four populations, each containing ca. 100 individuals, are found in open habitat, grassy fields and roadsides on lowlands. This species was found under the vine trees, *Clematis apiifolia* DC. and *Paederia foetida* L., together with other herbaceous plants such as *Cerastium fontanum* Baumg. subsp. *hallaisanense* (Nakai) J. S. Kim, *Sagina japonica* (Sw.) Ohwi, *Anagallis arvensis* L., *Duchesnea indica* (Andr.) Focke, *Vicia hirsuta* (L.) Gray, *V. sativa* L. subsp. *nigra* (L.) Ehrh., *Oxalis corniculata* L., *Lamium amplexicaule* L., *Galium spurium* L., *Artemisia indica* Willd., *Hypochaeris radicata* L., and *Poa annua* L.

A key to *V. inconspicua* and related species in Korea, modified from Kim et al. (2019) and Lee and Yoo (2020)

1. Leaves narrowly triangular-lanceolate, oblong-lanceolate or broadly triangular.
 2. Flowers purple or pale purple.
 3. Petiole glabrous; lateral petals pilose at base.
 4. Roots dark brown; spur more than 5 mm long *V. mandshurica* 제비꽃
 4. Roots yellowish brown; spur less than 5 mm long *V. inconspicua* 화살잎제비꽃
 3. Petiole pubescent; lateral petals glabrous *V. yedoensis* 호제비꽃
 2. Flowers white.
 5. Roots yellowish brown; leaves oblong-lanceolate at anthesis, narrowly triangular-lanceolate at fruiting stage.
 6. Margins of petiole wings pubescent; upper petal purple veined *V. betonicifolia* var. *albescens* 흰들제비꽃
 6. Margins of petiole wings glabrous; upper petal not purple veined *V. patrinii* 흰제비꽃
 5. Roots white or pale brown; leaves narrowly triangular-lanceolate at anthesis, broadly triangular at fruiting stage. *V. lactiflora* 흰젖제비꽃
1. Leaves ovate, ovate-ellipsoid, triangular-ovate, oblong or orbicular.
 7. Flowers purple or pale purple.
 8. Ovary and capsule pubescent *V. phalacrocarpa* 털제비꽃
 8. Ovary and capsule glabrous.
 9. Petiole pubescent.
 10. Leaves both surface, petiole and pedicels pubescent.
 11. Scape 3-branched *V. ramiflora* 가지제비꽃
 11. Scape simple *V. seoulensis* 서울제비꽃

10. Leaves both surface glabrous, petiole and pedicels puberulent *V. hirtipes* 흰털제비꽃
 9. Petiole glabrous *V. japonica* 왜제비꽃
 7. Flowers white.
 12. Leaf margin serrate *V. albida* var. *albida* 태백제비꽃
 12. Leaf margin irregularly lobed or incised *V. albida* var. *takahashii* 단풍제비꽃

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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