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New record of an alien plant, *Verbena bracteata* (Verbenaceae) in Korea

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ABSTRACT: *Verbena bracteata* Cav. ex Lag. & Rodr. (Verbenaceae), native to North America and an alien plant in China and Japan, was newly found in central and southern areas of Korea. This species can be distinguished from other *Verbena* taxa in Korea by having larger floral bracts and stems that are prostrate or procumbent to decumbent-ascending. *Verbena bracteata* grows in dry and sunny grasslands or along roadsides. A precise description, illustration, photographs, and a key to related taxa are provided.

Keywords: alien plant, new record, North America, *Verbena bracteata*, Verbenaceae

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INTRODUCTION

Verbenaceae J. St.-Hil., including approximately 800 species in about 32 genera (Cardoso et al., 2021), is mainly distributed in tropical and subtropical regions, particularly in southeast Asia, Central and South America, and the West Indies, with few species occurring in the temperate zones (Sanders, 2001; Marx et al., 2010; Olmstead, 2013; Frost et al., 2017). There are approximately nine species of Verbenaceae belonging to five genera in Korea (Im, 2018; Kim, 2018).

Verbena L. was originally described by Linnaeus (1753) with 14 species. Since then, several authors have worked on *Verbena*, and today this genus is represented by ca. 57 to 70 species, which are mainly spread in tropical and subtropical countries of America, some of them growing in Asia, Africa, Australia, and Europe (Perry, 1933; Munir, 2002; O'Leary, 2006; Nesom, 2010a, 2010b, O'Leary et al., 2010; Cardoso et al., 2021; Tunçkol, 2022). The plants are annual and perennial herbs or subshrubs (Marx et al., 2010). Many *Verbena* species possess medicinal uses, and some species are of economic importance (Perry, 1933; Kubica et al., 2020). Recently, morphological data have suggested the infrageneric classification of the genus *Verbena* with three sections: *Verbena*, *Amphepeiros* Nesom, and *Verbenaca* Walpers (Nesom, 2010a). The three sections are recognized within *Verbena*, primarily based on inflorescence structure (Nesom, 2010a). In Korea, three species in the genus *Verbena* are reported; *V. officinalis* L., *V. bonariensis* L., and *V. brasiliensis* Vell. (Kim et al., 2018). Among then, *V. officinalis* is the only native species in Korea (Lee, 1980; Lee, 1996; Im, 2018; Kim, 2018), and the other two species are alien species (Park, 1998; Kil et al., 2001; Kang et al., 2020).

During a plant diversity field survey in Korean Peninsula, an unrecorded alien plant, *Verbena bracteata* Cav. ex Lag. & Rodr. was found in abandoned fields and roadsides in Gyeonggi-do and Gyeongsangnam-do, Korea. *Verbena bracteata* belongs to sect. *Verbena.* The sect. *Verbena* comprises ca. 46 species that are mainly distributed in the New World (Nesom, 2010a). We here formally report the first occurrence of the *Verbena bracteata* in Korea (Figs. 1–3). The Korean name is 'Gin-po-ma-pyeon-cho', based on floral bracts much longer than the calyx. We provide a description, illustrations, a taxonomic key to related taxa as well as habitat details.

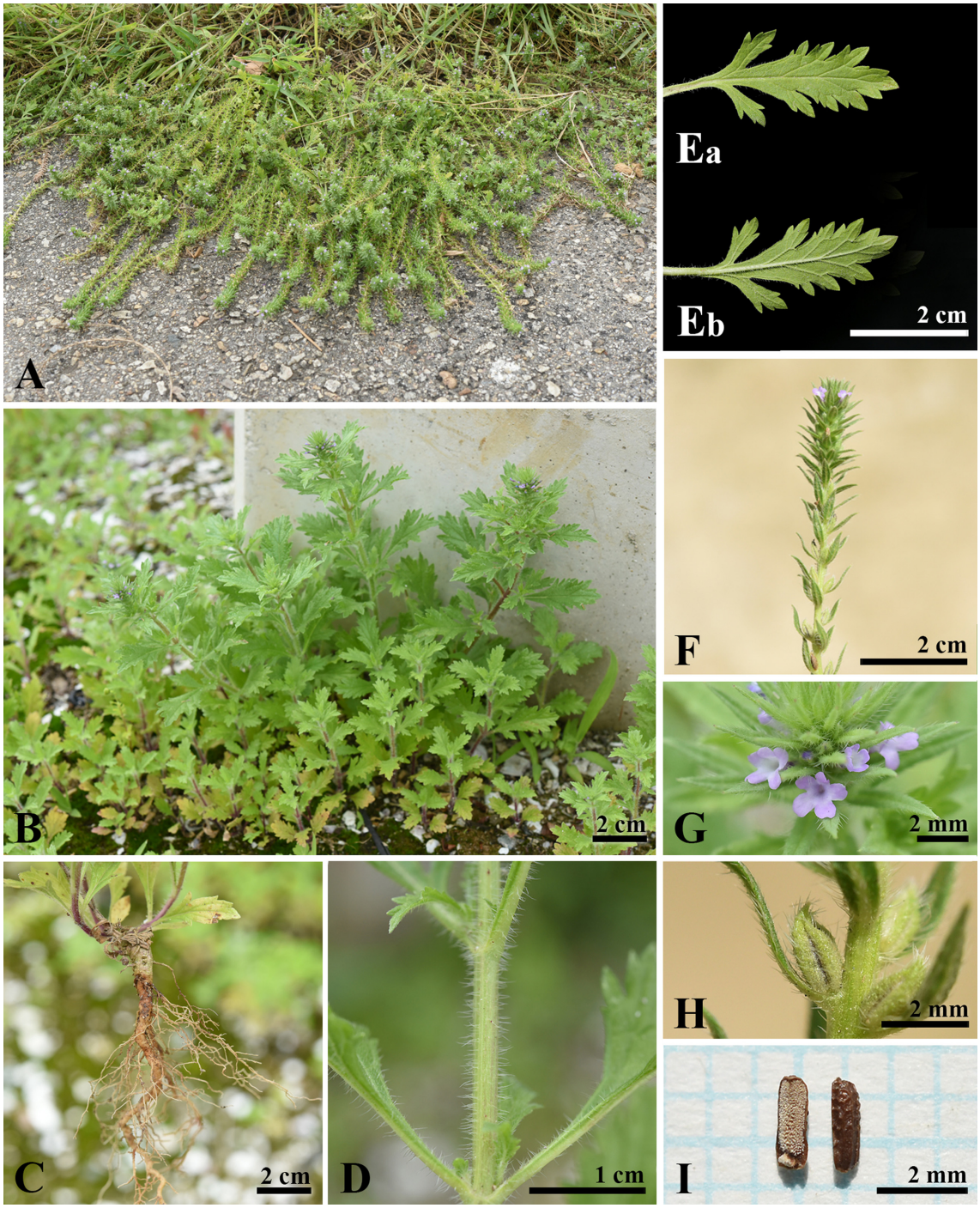

Fig. 1. Photographs of *Verbena bracteata* Cav. ex Lag. & Rodr. **A.** Habitat. **B.** Habit. **C.** Root. **D.** Stem. **E.** Leaves (a, adaxial view; b, abaxial view). **F.** Spike. **G.** Flower. **H.** Schizocarp. **I.** Mericarps (abaxial and adaxial views).

TAXONOMIC TREATMENT

Verbena bracteata Cav. ex Lag. & Rodr., Anales Ci. Nat. 4: 260, 1801.—TYPE: cult. in SPAIN. without date and collector (holotype: MA, photo!).

Verbena bracteosa Michx., Fl. Bor.-Amer 2: 13, 1803; *Zappania bracteosa* (Michx.) Poir., in Lamarck, Encycl. 8: 843, 1808.—TYPE: USA. Tennessee, without date, *Michaux s.n.* (isotype: P, photo!).

Verbena bracteosa var. *brevibracteata* A. Gray, Sin. Fl. N. Amer. 2: 336, 1878.—TYPE: USA. Texas, 1849, *Wright 454* (lectotype: GH, photo!).

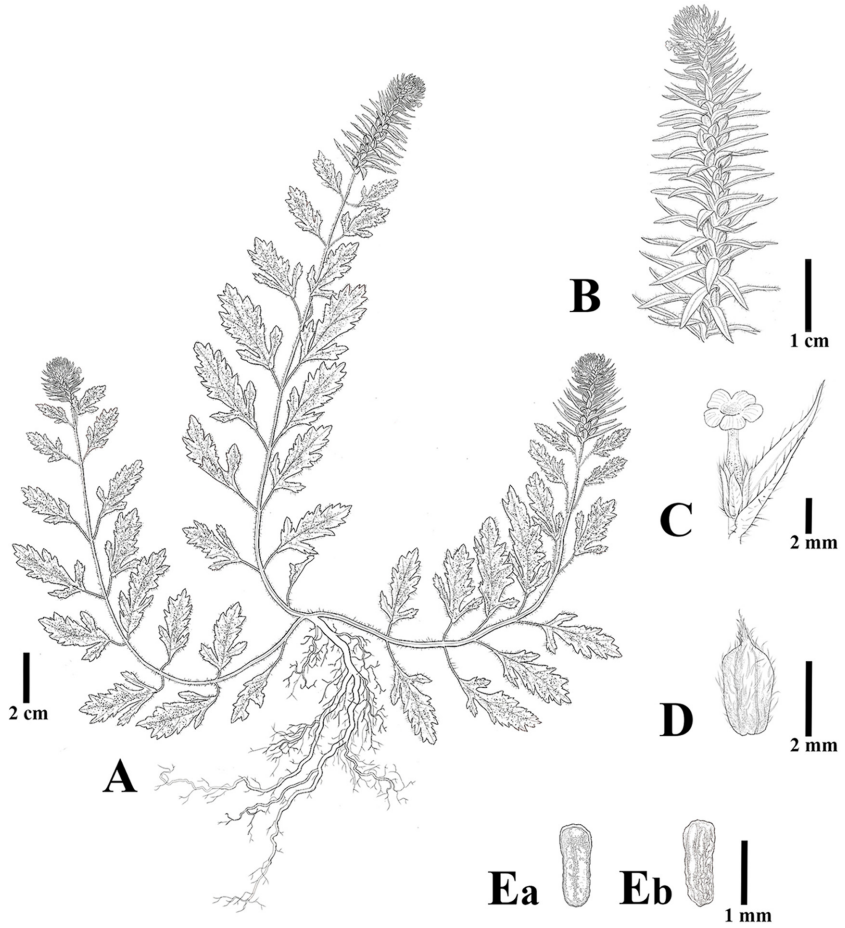

Fig. 2. Illustrations of *Verbena bracteata* Cav. ex Lag. & Rodr. **A.** Habit. **B.** Spike. **C.** Flower with calyx and bract. **D.** Schizocarp. **E.** Mericarps (a, abaxial view; b, adaxial view).

Verbena rudis Greene, Pittonia 4: 152, 1899.—TYPE: USA. Colorado, 18 Jun 1899, *Baker 564* (holotype: G, photo!).

Verbena bracteosa var. *albiflora* Cockerell, in F. P. Daniels, Fl. Boulder 204, 1911.

Verbena imbricata Wooton & Standl., Contr. U. S. Natl. Herb. 16: 166, 1913.—TYPE: USA. New Mexico, 8 Aug 1904, *Wooton 2831* (holotype: US; isotype: US, photo!).

Korean name: Gin-po-ma-pyeon-cho (긴포마편초).

Herbs, annual or biennial, 10−30 cm tall. Stems several, prostrate or procumbent to decumbent-ascending, rarely erect, diffusely branched, quadrangular, coarsely hirsute. Leaves opposite, thick membranaceous; petiole 0.3−1.5 cm long, winged or widely margined, hirsute, upper leaves subsessile; blade lanceolate to ovate-lanceolate or oblanceolate, 1−5 cm long, pinnately incised or usually 3-lobed, lateral lobes narrow or divaricate, middle lobes cuneate-obovate, incisely toothed or cleft, narrowed into a short margined petiole, hirsute on both surfaces. Inflorescences terminal, usually solitary, spikes, slender, 2–20 cm long, bracts linear-lanceolate, acute-acuminate, entire; 8−15 mm long, 2–4 times as long as the calyx, hirsute. Flowers zygomorphic; calyx 3–4 mm long, 5-lobed, hirsute; corolla pale blue to purplish-blue, narrowly funnelform to somewhat trumpet-shaped, 4–6 mm long, 5-lobed, glabrous, tube relatively slender, limb 2–3 mm in diam.; stamens 4, didynamous; filaments short, anthers yellow, 0.2 mm long; pistil 1, ovary superior, 2 carpels, 4-lobed; style short. Fruit schizocarps, oblong, 2–2.5 mm long.

Flowering: June to August.

Fruiting: August to October.

Distribution and habitat: *Verbena bracteata* is native to North America, whereas this species is non-native in China, Japan, and Korea (Shimizu, 2003; Mito and Uesugi, 2004; Wang et al., 2005). Two populations, each containing ca. 300 to 1,000 individuals, are found in open habitats, dry and sunny grasslands, or roadsides on lowlands. It grows together with herbaceous plants such as *Humulus japonicas* Siebold & Zucc., *Phytolacca americana* L., *Portulaca oleracea* L.,

Fig. 3. Distribution of *Verbena bracteata* Cav. ex Lag. & Rodr. in Korea.

Persicaria lapathifolia (L.) Delarbre, *Polygonum aviculare* L., *Lepidium densiflorum* Schrad., *Potentilla supina* L., *Oenothera biennis* L., *Euphorbia hypericifolia* L., *Euphorbia maculata* L., *Oxalis dillenii* Jacq., *Metaplexis japonica* (Thunb.) Makino, *Ipomoea lacunosa* L., *Plantago lanceolata* L., *Veronica arvensis* L., *Artemisia indica* Willd., *Aster pilosus* Willd., *Bidens frondosa* L., *Bidens pilosa* L., *Conyza canadensis* (L.) Cronquist, *Conyza sumatrensis* (Retz.) E. Walker, *Erigeron annuus* (L.) Pers., *Lactuca indica* L., *Lactuca scariola* L., *Sonchus asper* (L.) Hill, *Tragopogon dubius* Scop., *Commelina communis* L., *Digitaria ciliaris* (Retz.) Koeler, *Elymus ciliaris* (Trin.) Tzvelev, *Eragrostis minor* Host, *Festuca arundinacea* Schreb., *Poa annua* L., and *Setaria viridis* (L.) P. Beauv.

Specimens examined: KOREA. Gyeonggi-do: Incheon-si, Bupyeong-gu, San-gok-dong, 3 Aug 2021, *Jung-Hyun Kim KIMJH21108*, *KIMJH21109*, *KIMJH21110*, *KIMJH21111*, *KIMJH21112* (KB), *Jin Hee Park, Jung-Hyun Kim & Kyu Tae Cho Park et al. 20210803-1-1 (NNIBRVP99285)*, *Park et al. 20210803-1-2 (NNIBRVP99286)*, *Park et al. 20210803-1-3 (NNIBRVP99287)*, *Park et al. 20210803-1-4 (NNIBRVP99288)*, *Park et al. 20210803-1-5 (NNIBRVP99289)*, *Park et al. 20210803-2-1 (NNIBRVP99290)*, *Park et al. 20210803-2-2 (NNIBRVP99291)*, *Park et al. 20210803-2-3 (NNIBRVP99292)*, *Park et al. 20210803-2-4 (NNIBRVP99293)*, *Park et al. 20210803-2-5 (NNIBRVP99294)*, *Park et al. 20210803-2-6 (NNIBRVP99295)*, *Park et al. 20210803-2-7 (NNIBRVP99296)*, *Park et al. 20210803-2-8 (NNIBRVP99297)*, *Park et al. 20210803-2-9 (NNIBRVP99298)*, *Park et al. 20210803-2-10 (NNIBRVP99299)*, *Park et al. 20210803-2-11(NNIBRVP99300)*, *Park et al. 20210803-2-12 (NNIBRVP99301)*, *Park et al. 20210803-2-13 (NNIBRVP99302)*, *Park et al. 20210803-2-14 (NNIBRVP99303)*, *Park et al. 20210803-2-15 (NNIBRVP99304)*, *Park et al. 20210803-3-1 (NNIBRVP99305)*, *Park et al. 20210803-3-2 (NNIBRVP99306)*, *Park et al. 20210803-3-3 (NNIBRVP99307)*, *Park et al. 20210803-3-4 (NNIBRVP99308)*, *Park et al. 20210803-3-5 (NNIBRVP99309)* (NNH); same locality, 5 Oct 2021, *Jin Hee Park & Kyu Tae Cho Park JH & Cho KT 20211005-1-1 (NNIBRVP99310)*, *Park JH & Cho KT 20211005-1-2 (NNIBRVP99311)*, *Park JH & Cho KT 20211005-1-3 (NNIBRVP99312)*, *Park JH & Cho KT 20211005-2-1 (NNIBRVP99313)*, *Park JH & Cho KT 20211005-2-2 (NNIBRVP99314)*, *Park JH & Cho KT 20211005-2-3 (NNIBRVP99315)*, *Park JH & Cho KT 20211005-3-1 (NNIBRVP99316)*, *Park JH & Cho KT 20211005-3-2 (NNIBRVP99317)*, *Park JH & Cho KT 20211005-4-1 (NNIBRVP99318)*, *Park JH & Cho KT 20211005-4-2 (NNIBRVP99319)* (NNH). Gyeongsangnam-do: Tongyeong-si, Dosan-myeon, Doseon-ri, 10 Aug 2019, *Hyun Sik Kim & Sang Deog Shim KIMJH19233*, *KIMJH19234* (KB); same locality, 17 Jun 2021, *Jung-Hyun Kim & Seog woo Kwon KIMJH21102*, *KIMJH21103*, *KIMJH21104*, *KIMJH21105*, *KIMJH21106*, *KIMJH21107* (KB); same locality, 22 Jun 2022, *Jung-Hyun Kim KIMJH22048*, *KIMJH22049*, *KIMJH22050* (KB).

A key to *Verbena* and related taxa in Korea

1. Stem prostrate or procumbent to decumbent-ascending; bracts much longer than the calyx ····· ····· ***V. bracteata* 긴포마편초**
1. Stem erect; bracts shorter than or about equaling to calyx.
   2. Spikes lax; leaves irregularly pinnatifid ····· ····· *V. officinalis* 마편초
   2. Spikes dense; leaves serrate-dentate.
      3. Leaves broad linear or linear spatulate ····· ····· *V. bonariensis* 버들마편초
      3. Leaves ellipse or linear ellipse ····· ····· *V. brasiliensis* 브라질마편초

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

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