



Solanum elaeagnifolium Cav. (Solanaceae), an unrecorded naturalized species of Korean flora

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은빛까마중 (*Solanum elaeagnifolium* Cav.), 우리나라 미기록 귀화식물

홍자람 · 주민정 · 홍미향 · 조상진 · 김기중*
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ABSTRACT: We report a naturalized alien species, *Solanum elaeagnifolium* Cav. from Chodo Isl., Samsanmeon, Yeosu, Jeollanam-do province. The native distribution range of the species is the southwestern US and the adjacent region of northern Mexico. The species is related to *S. nigrum* L., but the species can be distinguished from *S. nigrum* by the silver green stellate trichome on the surfaces of plants, the elongated leaf shape, and the size and color of the flowers and fruits. *Solanum elaeagnifolium* Cav. belongs to the *Solanum* subgenus *Leptostemonum*. The species is recorded on the invasive species list in the subtropical or temperate regions of many European, Mediterranean, African, South American, Asian, and Australian countries. Therefore, we also need a careful monitoring and prevention strategy for this new invasive species in Korea.

Keywords: *Solanum elaeagnifolium*, *Solanum* subgenus *Leptostemonum*, native distribution range, invasive species

적 요: 전남 여주시 삼산면 초도에서 우리나라의 미기록 귀화식물 은빛까마중 (*Solanum elaeagnifolium* Cav.) 을 발견하여 보고한다. 이 종의 원산지는 미국남서부와 인접한 멕시코북부이다. 이 식물은 까마중에 근연이지만 식물체 전체가 회백색 성상모로 뒤덮여있고, 길쭉한 잎의 모양, 열매와 꽃의 크기 및 색깔로 쉽게 구분된다. 이 종은 현재 유럽 및 지중해지방국가들, 아프리카, 남미, 아시아 및 호주 등의 아열대 및 온대지방에 널리 퍼져있는 잡초로 분류된다. 따라서 우리나라에서도 앞으로 이 종이 확산되는 것에 대한 대책마련이 필요하다.

주요어: *Solanum elaeagnifolium*, *Solanum* subgenus *Leptostemonum*, 자생지, 침투종

Solanum L. is the largest genus in Solanaceae. It has approximately 1,250 to 1,700 species (Frodin, 2004). *Solanum* is one of the most economically important genus of plants, containing important crop species such as the tomato (*S. lycopersicum* L.), potato (*S. tuberosum* L.), eggplant (*S.*

melongena L.), etc. (Weese and Bohs, 2007). In addition, many weedy and invasive species also recorded in the genus. The infrageneric taxonomy and systematics of *Solanum* are very complicated because of the large numbers of species and the reticulated evolutionary patterns in key characters.

Seven subgenera and more than 60 sections are recognized within *Solanum*. However, most of these subgeneric and sectional limits are poorly defined (D'Arcy, 1991). In contrast, the *Solanum* subgenus *Leptostemonum* (Dunal) Bitter is a relatively well-defined group by small terminal pores at the

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elongated anther tips and by prickles on stems and leaf veins. This subgenus comprises almost one third of the genus (ca. 350-400 spp, Levin et al., 2006). A world-wide species identification key does simply not exist for these large genus or subgenus. Most of the available identification keys are based on limited regions or nations.

Eleven species of *Solanum* have been reported among Korean flora (Hong, 2007; Park, 2009). Nine of them are introduced species. Recently, we discovered an unknown *Solanum* species from a southern island of Korea and identified it by a key from Texas regional flora (Correll and Johnston, 1979). Finally, the voucher specimens were counter compared with specimens from the NYBG. As a result, we confirm the unidentified species is *S. elaeagnifolium* Cav. that is originally distributed in the southwestern US and the adjacent region of northern Mexico

Taxonomic Treatment

***Solanum elaeagnifolium* Cav.** Icones et Descriptiones Plantarum 3:22 (t. 243)

Korean name: Eun-bit-kka-ma-jung (the Korean name means affinity to the common species Kkamajung and the distinctive silver green color of the plants because of the dense stellate hairs over the leaves and stems).

Description: Perennial herbs. Root extensively branched, up to 2 m. Stem round, up to 1.5 m tall, 5-10 mm in diameter, somewhat creeping, a few branched, base lignified, tip soft, new branches with a few scattered brownish prickles. Leaves, stems and calyx are densely pubescent with stellate hairs, giving the plant its typical silver-green appearance. Leaves alternate, green to pale greyish green, petiole 5-25 mm. Leaves lanceolate to linear, 8-10 cm long, 1.0-2.5 cm wide, obtuse or acute, slightly undulate margins. The lower surface of leaf is more silvery than upper surface. The first leaf vein distinct on the lower surface, the second veins 5-9 alternatively pinnate. Inflorescence solitary cyme of 1-7 flowers, with 5-20 mm long pedicel. Flowers actinomorphic, regular. Calyx 5-7 mm long, united up to 2/3 from base, 4-5 lobed with acute tip. Corolla 25-35 mm in diameter, united up to 2/3 from base, 5 lobed with round lip with orbicular tip, generally bright blue to purple but sometimes white. Anther 5, 7-9 mm long, yellow. Pistil 5 mm long, ovary covers by white wooly hairs, style stout, stigma round. Fruit irregularly dehiscent berry, spherical, 10-15 mm in diameter, green (with white patches) and fleshy at first, drying and becoming yellow to orange at maturity. Seed flat and round, 2-3 mm in diameter, 60-120 seeds per fruit (Fig. 1-A and 1-B).

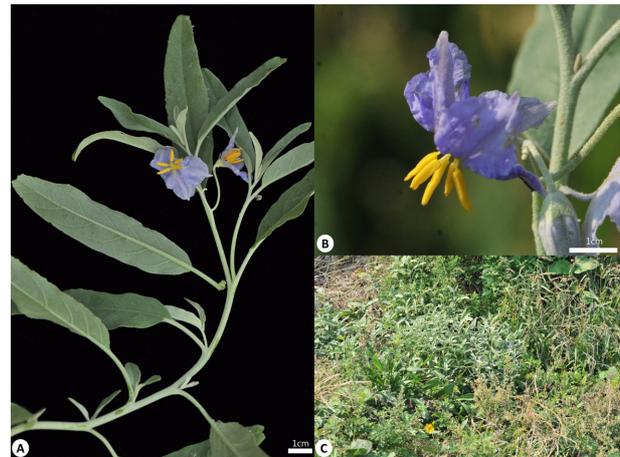


Fig. 1. *Solanum elaeagnifolium* Cav. A) Stem, leaf, and floral morphology of *S. elaeagnifolium*. A) Creeping branch with blue corolla and yellow anthers. B) Detailed flower structure of *S. elaeagnifolium*. Blue corolla are reflexed. The five anthers are equal in size and share a banana shape. C) Habitat of *S. elaeagnifolium* with co-occurring plants from Chodo Isl., Samsan-myeon, Yeosu-si, Jeollanam-do. The silvery leaved plant at center is the *S. elaeagnifolium*.

Voucher specimen: Kim, K.-J. et al. 2012-1627 (4 specimens, KUS); Hong, J. R. et al. 2012-1308 (4 specimens, KUS) (DNA No.: PDBK 2012-1308, PDBK 2012-1627).

Collection site: Jeollanam-do province, Yeosu-si, Samsan-myeon, Chodo-ri

N 34° 34' 45.43", E 127° 14' 42.86". Elevation 45 m.

Habitat: Sunny roadside slope near seaside. The habitat located on the road slope that was covered recently by artificial vegetation.

Plant community: A population consist of 15 individuals of *S. elaeagnifolium*. *S. elaeagnifolium* grew together with a number of common roadside plant species including *Amaranthus mangostanus*, *Artemisia princeps*, *Bidens tripartita*, *Chenopodium album* var. *centrorubrum*, *Commelina communis*, *Coreopsis drummondii*, *Coreopsis tinctoria*, *Echinochloa utilis*, *Emilia flammea*, *Lycopus lucidus*, *Melilotus suaveolens*, *Polygonum hydropiper*, *Polygonum perfoliatum*, *Pueraria lobata*, *Solanum nigrum*, *Zanthoxylum piperitum*, etc. (Fig. 1-C).

Native distribution range: Semi-arid areas of the southwest to central region of the US including Texas, Oklahoma, Missouri, Kansas, Arizona, and Arkansas as well as the adjacent region of northern Mexico (Correll and Johnston, 1979).

Current distribution range: Europe: Southern Europe and Mediterranean countries. Africa: Mediterranean countries and Tanzania to South Africa. Asia: India, China, and Taiwan.

South America: Argentina, Brazil, Chile, Paraguay, and Uruguay. Oceania: Australia (EMPPPO, 2007).

Invasiveness: *S. elaeagnifolium* has been introduced from North America to Africa, Asia, Australia, Europe, and South America where it is an invasive weed of croplands and pastures, mostly in cultivated land, disturbed areas, and overgrazed areas with low rainfall (EMPPPO, 2007). The species is especially considered to be a notorious weed in the pastures in Australia and South Africa because cattle do not eat *S. elaeagnifolium* as the species contains high concentrations of Solasodine, a kind of steroid alkaloid. Its invasiveness is aggravated by high seed production and an extensive root system that promotes vegetative multiplication and renders conventional control methods very difficult. The plant is officially declared as a noxious weed in several countries (EMPPPO, 2007).

Identification characteristics: *S. elaeagnifolium* belongs to subgenus *Leptostemonum* section *Melongenae* Dunal. *Solanum* subgenus *Leptostemonum* is a relatively well-defined group by small terminal pores at the elongated anther tips and by prickles on the stems and leaf veins. Prickles on the stem and leaf veins are notable characters for the subgenus. Four introduced species including *S. sisymbriifolium* Lam. *S. rostratum* Dunal, *S. melongenae* L., and *S. carolinense* L., are recognized from this subgenus in Korean flora. These four species also share the distinctive prickles on the stem or leaf veins. In contrast, *S. elaeagnifolium* frequently does not have prickles on the plants. Therefore, it is difficult to assign it to a subgenus. The species is somewhat remotely related to *S. nigrum* L. and *S. americanum* Mill. in terms of its overall appearances (Hong, 2007). However, *S. elaeagnifolium* can be distinguished from *S. nigrum* and *S. americanum* by the silver-green color appearances of entire plant because of the dense coverage of stellate trichomes over the whole plant. In addition, the leaves are thicker than those of *S. nigrum* and *S. americanum*. Furthermore the size of flowers and fruits are much larger than those of *S. nigrum* and *S. americanum* (see identification key below).

S. elaeagnifolium is hard to distinguish from *S. campechiense* L. in its native distribution range, but it differs in terms of density of stellate hairs (Correll and Johnston, 1979). *S. elaeagnifolium* has not been registered as an introduced species in Japanese flora, but the closely related species, *S. glaucophyllum* Desf., has been registered. *S. glaucophyllum* has a series of characteristics that distinguish it from *S. elaeagnifolium* such as attenuated leaf base, more elongated leaves, longer pedicel, and un-reflexed corolla (Shimizu et al., 2001). Some hybrid species were also reported between *S.*

elaegnifolium and native *Solanum* species from South America (Wassermann et al., 1988). The white flower form of *S. elaeagnifolium* is recognized as *S. elaeagnifolium* Cav. for. *albiflorum* Cockil (Correll and Johnston, 1979). However, the author never encountered the white flower form in Korea. Here we provide a key to the *Solanum* subgenus *Leptostemonum* in Korea.

Key to the species of *Solanum* subgenus *Leptostemonum* in Korea

1. Leaves compound
 2. Leaves secondary pinnate; five anthers equal in length; fruit partially enclosed by spiny calyx
..... *S. sisymbriifolium*
 2. Leaves primarily pinnate; one anther longer than others; fruit completely enclosed by heavily spiny calyx
..... *S. rostratum*
1. Leaves simple
 3. Plants silver color; leaves oblong to linear; leaf margin entire *S. elaeagnifolium*
 3. Plants green color; leaves oval or ovate or oblong; leaf margin entire or undulate or incised
 4. Leaf margins usually entire or undulate; stem purplish; soft prickles sometimes on stems, peduncle and calyx; fruit round to cylindrical, size and color variable
..... *S. melongenae*
 4. Leaf margins incised; stem greenish; hard and sharp prickles always on leaf veins, stems, peduncle and calyx; fruit round, 13-16 mm in diameter, yellow to orange colors *S. carolinense*

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