Diagnostic characters and new populations of *Lycopus lucidus* var. *hirtus* (Lamiaceae)

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큰썩싸리 진단형질 및 신자생지 보고

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ABSTRACT: The natural populations of *Lycopus lucidus* Turcz. ex Benth. var. *hirtus* Regel (Lamiaceae) were found in Gangwon province, Korea. This taxon was mainly distinguished from *L. lucidus* Turcz. ex Benth. var. *lucidus* by having multicellular hairs on the stem and leaves. However, the delimitation of this taxon from the typical plants of this variety (var. *lucidus*) was never assessed and the existence of this taxon was obscure in Korea. So, we provide a detailed morphological description of this taxon, as well as its geographical distribution and habitat.

Keywords: *Lycopus* var. *hirtus*, *Lycopus*, Lamiaceae

적 요: 큰썩싸리 (*Lycopus lucidus* Turcz. ex Benth. var. *hirtus* Regel) 자연집단의 자생지가 강원도 지역에서 발견되었다. 큰썩싸리는 잎과 줄기에 많은 털을 갖는 특징으로 썩싸리(*L. lucidus* var. *lucidus*)와 구분되는 것으로 알려져 있으나, 본 분류군의 분류학적 한계는 연구 보고된 바가 없고, 본 분류군의 한반도 분포 역시 명확히 알려진 바가 없다. 따라서, 본 논문에서는 본 분류군의 상세한 형태학적 기재와 지리학적 분포 및 습성을 제시하였다.

주요어: 큰썩싸리, 썩싸리속, 꿀풀과

The genus *Lycopus* L. is comprised ca. 15 species and distributed mainly in Europe, Asia, and North America (Henderson 1962; Moon and Hong 2006). *Lycopus*, a perennial herb, occurs mostly in low wetland areas and is distinguished by several gross morphological characteristics such as dentate or pinnatifid leaves, flowers in compact, sessile verticillasters in the leaf axils, and a dry, tetrahedral, one-seeded nutlet with corky crests (Henderson, 1962; Moon and Hong, 2006).

Four species of the genus occur in Korea; *Lycopus lucidus* ('Swip-ssa-ri'), *L. maackianus* (Maxim. ex Herder) Makino

('Ae-gi-swip-ssa-ri'), *L. cavaleriei* H. Lévl. ('Gae-swip-ssa-ri'), and *L. uniflorus* Michx. ('Teol-swip-ssa-ri'). *L. lucidus* is restricted in Northeast Asia and most common species in Korea with a high degree of variability (Moon, 2003). *L. lucidus* var. *hirtus* was designated as a variety of *L. lucidus* var. *lucidus* by Regel (1862) firstly, since then Kitagawa (1979) was recognized this taxon as *L. lucidus* Turcz. ex Benth. f. *hirtus* (Regel) Kitagawa. This taxon was different from the typical plants of this variety (var. *lucidus*) by having long hairs on its leaves and stem, and has been known in Russia, China, Taiwan and Japan (Regel, 1862; Huang and Cheng, 1978; Kitagawa, 1979; Li and Hedge, 1994). However, the natural population of *L. lucidus* var. *hirtus* has never been reported in Korea, although Park (1974) and Lee (1996a) briefly mentioned this infraspecific

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taxon. This taxon was first reported by Park (1974) as *L. lucidus* var. *hirtus*, and then Lee (1996a) recognized this taxon as a form according to the taxonomic treatment of Kitagawa (1979). They both indicated this taxon was distributed throughout the country, but they didn't provide any voucher information or photos (Park, 1974; Lee, 1996a). In addition, coeval taxonomists didn't recognize the occurrence of this infraspecific taxon of *L. lucidus* var. *lucidus* in Korea (Chung, 1957; Lee, 1980; Lee, 1996b). Moreover this infraspecies was treated as a synonym of *L. lucidus* var. *lucidus* since the morphological variation was found within the same populations (Moon, 2003; Hong, 2007). In fact, there are no clear taxonomical studies of this infraspecies even the existence in Korea is still in question.

During general field trips in Korea at 2010-2011, one of authors (Kim, Y.-C.) found several natural populations of *L. lucidus* var. *hirtus* and noticed several morphological and habitat features which were clearly distinct from *L. lucidus* var. *lucidus*. So, we report here the occurrence of *L. lucidus* var. *hirtus* in Korea with detailed morphological description and its known geographical distribution as well as habitat for the first time.

Lycopus lucidus Trucz. ex Benth. var. *hirtus* Regel, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 4: 115 (1861). - *L.*

Fig. 1. Voucher specimen of *Lycopus lucidus* var. *hirtus* Regel in Korea.

lucidus for. *hirtus* (Regel) Kitag., Neo-Lineam. Fl. manshur. 546 (1979). Type: Russia, Sungacha River (tributary of the Ussuri River), 1895, R. K. Maack (LE, not seen)

Lycopus lucidus Trucz. ex Benth. var. *formosanus* Hayata, Icon. Pl. Form. 8: 102 (1912); *L. formosanus* (Hayata) Sasaki, Trans. Nat. Hist. Soc. Taiwan 18: 171 (1928). Type: Sekiko, Taiwan, Nakahaba, G. s.n. (TI, not seen).

Korean Name: Keun-swip-ssa-ri 큰썩싸리

Flowering July to August; fruiting August to October.

Herbs perennial, over 1.0 m tall, rhizomes creeping. Stems square, the angles obtuse, the groove between angles prominent, pubescent, densely pubescent at nodes. Leaves sessile or subsessile, pubescent on both sides; blades 8-15 cm long, 2.5-4.5 cm width, elliptic to narrowly ovate, the apex acute to acuminate, the base cuneate to obtuse, the margin serrate, numerous glandular trichomes on the abaxial side. Inflorescences axillary, in loose verticillate cymes, densely flowered; the bracteoles small, subulate or narrowly triangular, glabrous on both surfaces, the margins serrulate or ciliate. Flowers sessile or nearly so; calyx campanulate, glabrous, 5-toothed, 3-4 mm long, the teeth narrowly triangular, equal, spine-tipped, ciliate margin; corolla campanulate, white, 4-lobed, the tube shorter than or as long as the calyx; stamens 4 (2 fertile and 2 degenerated); anthers 2-celled, parallel. Nutlets obovate, rounded-truncate at apex, broadly cuneate at base, smooth, ca. 2 mm long.

Distribution and habitat: Russia, China, Taiwan, Japan and Korea. In Korea, it has found the east side of Gangwon Province mainly at the coastal lagoon areas such as Hwajinpo, Seonyudam, and Pomaeho (Fig. 2).

Examined specimens: Hwajinpo, Hwapo-Ri, Geojin-Eup, Goseong-Gun, Gangwon Province, Korea, 23 Jul. 2010, Kim and Chae s.n. (KHUS); ibid, 9 Aug. 2010, Kim and Chae VP-KOBG-2K10-0332, 0333, 0346 (KHUS); ibid, 24 Sep. 2010, Kim and Chae s.n. (KHUS); ibid, 20 May 2011, Kim and Chae s.n. (KHUS); Seonyudam, Gonghyeonjin-ri, Jugwang-myeon, Goseong-Gun, ibid, 21 May 2011, Kim and Chae s.n. (KHUS); ibid, Aug. 2012, Yun s.n. (KHUS); Pomaeho, Jeonpomaeri, Hyunnam-myeon, Yangyang-Gun, ibid, 22 Jul. 2011, Kim and Chae VP-KOBG-2K11-2011 (KHUS).

We defined the distinct population of *L. lucidus* var. *hirtus*, which was clearly distinguished by several diagnostic characters from *L. lucidus* var. *lucidus*, so we treated this taxon as a variety of *Lycopus lucidus* var. *lucidus*.

Fig. 2. Known distributional map of *Lycopus lucidus* var. *hirtus* in Korea (HJ- Hwajinpo, SY- Seonyudam, PM- Pomaeho, Gangwon Province).

Not surprisingly, *Lycopus lucidus* var. *hirtus* is morphologically similar with *Lycopus lucidus* var. *lucidus*. Although the hairs on the both sides of leaves and stem of *L. lucidus* var. *hirtus* are main diagnostic character to recognize this species, the density of hairs is variable according to the developmental stage of plants. Hair density can be greater in young leaves, and drop off after anthesis. However, the hairs on the midrib of leaves are always dense throughout the plant life cycle. In addition, *L. lucidus* var. *hirtus* is much taller (over 1 m) and has larger leaves (8-15 cm) with deeply spinose margin while *L. lucidus* var. *lucidus* is 50-100 cm in height with oblong lanceolate leaves (4-8 cm). Park (1974) and Lee (1996a) indicated *L. lucidus* var. *hirtus* as 'Teol-swip-ssa-ri' based on its morphological feature. However, as we already mentioned above, this taxon was treated as a synonym of *L. lucidus* var. *lucidus*, the Korean name "Teol-swip-ssa-ri" was given to *L. uniflorus* according to the priority of names and popularities (Chung, 1957; Lee, 1980; Lee, 1996b; Moon, 2003; Hong, 2007). *L. uniflorus* is characterized by rather short plants 10-35 cm with a fusiform tuber, which is obviously different taxon with *L. lucidus* var. *lucidus*. Therefore 'Keun-swip-ssa-ri' is nominated as a new Korean name of *L. lucidus* var. *hirtus*, although the dense trichomes are the main diagnostic characteristic. It is noteworthy that *L. lucidus* var. *hirtus* is restricted in lagoon areas on Gangwon province, while *L. lucidus* var. *lucidus* is distributed throughout the country.

Fig. 3. SEM micrographs of leaf surface to compare existence of trichomes. A-B. *Lycopus lucidus* var. *lucidus*, C-D. *Lycopus lucidus* var. *hirtus* (A, C; adaxial side, B, D; abaxial side). Arrows indicated the uniseriate multicellular trichomes.

Key of the genus *Lycopus* in Korea

1. Rhizomes short, with a fusiform tuber; calyx teeth acute or subacute, not spine tipped; nutlets longer than calyx *L. uniflorus* 털썩싸리
1. Rhizomes long creeping, without tuber; calyx teeth aristate-acuminate, spine tipped; nutlets shorter than calyx
2. Leaves oblong-obovate to ovate *L. cavaleriei* 개썩싸리
2. Leaves lanceolate to narrowly lanceolate
3. Stems slender, 20-50 cm tall; leaves narrowly lanceolate, serrate *L. maackianus* 애기썩싸리
3. Stems robust, > 50 cm tall; leaves oblong-lanceolate, coarsely dentate-serrate
4. Stems glabrous, 50-100 cm tall; leaves glabrous *L. lucidus* var. *lucidus* 썩싸리
4. Stems pubescent, > 100 cm tall; leaves pubescent *L. lucidus* var. *hirtus* 큰썩싸리

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