



Scrophularia koraiensis, a new synonym to *Scrophularia kakudensis* (Lamiales: Scrophulariaceae)

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Scrophularia Linnaeus (1753: 619), is one of the largest genera of Scrophulariaceae, includes about 270 extant species, and is predominantly distributed in Holarctic regions of both the Old and New World (Olivencia, 2009; Olivencia & Devesa, 1993). *Scrophularia koraiensis* was first described by Nakai (1909) based on material collected in mount Kum-gang san, Kang-uön, Korea and considered as an endemic medicinal plant of Korea (Han *et al.* 2003). *S. koraiensis* was characterized by having petiole 4 to 7 cm long, blade ovate–lanceolate, 10 to 15 cm long, terminal or axillary cymes, pedicels glandular hairy and ovate capsule (Nakai 1909).

Our phylogeny research of eastern Asian *Scrophularia* based on ITS, *trnL-trnF*, *trnQ-rps16* and *psbA-trnH* showed that *S. koraiensis* from Korea was embedded in *S. kakudensis* branch, and formed a strong clade with individuals of *S. kakudensis* from Korea (KO1), Northeastern of China (XY2), Tochigi (RG1) and Tsukuba in Japan (CC2) (Figure 1, Table1).

Therefore, we examined the type specimens of *S. koraiensis* and *S. kakudensis*, as well as living plants, and found them to be indistinguishable. They are also both medicinal herb and have similar chemical component for treatment of measles, smallpox, chickenpox, and scarlet fever (Yamamoto *et al.* 1993; Lee 2010). *S. kakudensis* exhibit quadrangular, white pilose stem, petiole 4 cm long, leaf blade ovate to narrowly ovate, 5–12cm, peduncle and pedicels glandular hairy, terminal or axillary cymes and broadly ovoid capsule, with an extensive range from Korea, Liaoning Province, China to Japan (Hong *et al.* 1998). Here, we propose *S. koraiensis* as a synonym of *S. kakudensis*.

Formal treatment

Scrophularia kakudensis Franch. (1879: 26). Type:—NIPPON. Etchigo: from Urben Niigata to Kakuda Yama, 13 June 1879, R.P. Faurie (P!).

= *Scrophularia koraiensis* Nakai (1909: 23), *syn. nov.* Type:—KOREA. Kang-uön: Mount Kum-gang San, 18 August 1902, T. Uchiyama (TI!).

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References

- Société Botanique de France (1879) *Bulletin de la Société Botanique de France*, vol. 26. La Société, Paris, pp. 87–88.
Hong, D.Y., Yang H.B. & Jin C.L. (1998) *Scrophularia*. In: Wu, Z.Y. and Raven, P.H. (Eds.) *Flora of China* 18. Missouri Botanical Garden Press, St. Louis, Missouri, USA, and Science Press, Beijing, China, pp. 11–20.

- Lee, G.J., Doh, E.J., Lee, M.Y., Ko, B.S. & Oh, S.E. (2010) Discrimination of three *Scrophularia* plants utilizing ‘*Scrophularia Radix*’ by DNA markers based on internal transcribed spacer (ITS) sequences. *Genes & Genomics* 32: 181–189.
<http://dx.doi.org/10.1007/s13258-009-0886-8>
- Linnaeus, C. (1753) *Species plantarum*. Laurentius Salvius, Stockholm, 619 pp.
- Nakai T. (1909) *Plantae novae Asiaticae*. *The Botanical Magazine* 23: 185–192.
http://dx.doi.org/10.15281/jplantres1887.23.273_185
- Han, K.S., So, S.K., Lee, C.H. & Kim, M.Y. (2003) Taxonomy of the genus *Scrophularia* (Scrophulariaceae) in Korea.
- Olivencia, O.A. (2009) *Scrophularia*. In: Benedí, C., Rico, E., Güemes, J., Herrero, A. (Eds.) *Flora Iberica*, Plantaginaceae to Scrophulariaceae, vol. 13. Real Jardín Botánico, CSIC, Madrid, pp. 97–134.
- Olivencia, O.A., & Devesa, J.A. (1993) Revisión del género *Scrophularia* L. (Scrophulariaceae) en la Península Ibérica e Islas Baleares, Ruizia, 11. Monografías del Real Jardín Botánico, CSIC, Madrid.
- Yamamoto, A., Miyase, T., Ueno, A. & Maeda, T. (1993) Scrophulasaponins II-IV, new saikosaponin homologs from *Scrophularia kakudensis* FRANCH. *Chemical & Pharmaceutical Bulletin* 41 (10): 1780–1783.
<http://dx.doi.org/10.1248/cpb.41.1780>

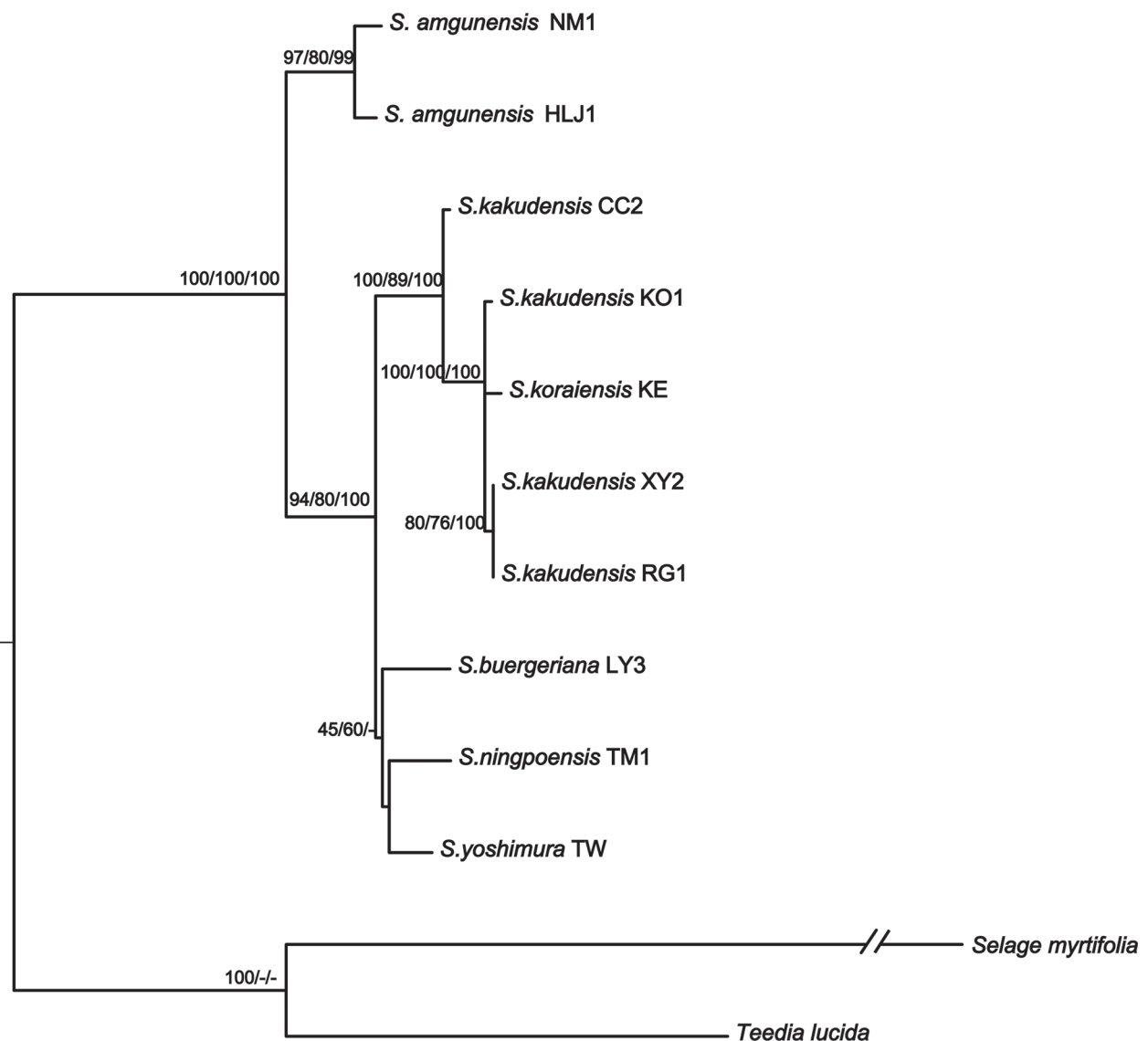


FIGURE 1. Phylogram of the best maximum likelihood tree. Statistical support (maximum likelihood bootstrap value ≥ 45 / maximum parsimony bootstrap value ≥ 50 / Bayesian posterior probability ≥ 0.80) are indicated on the branches.