



The taxonomic entity and distribution of *Rubus palmatus* var. *palmatus* and *R. palmatus* var. *coptophyllus* (Rosaceae) in Korea

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단풍딸기 및 긴잎단풍딸기의 분류학적 정체성과 한반도 내 분포

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ABSTRACT: *Rubus palmatus* Thunb. var. *palmatus* (Rosaceae) was first discovered in Anmyeon-do and Geoje-do, Korea, and the new Korean name 'Gin-yip-dan-pung-ttal-gi' was given. This taxon can be distinguished from var. *coptophyllus* by having 3-lobed or rarely undivided leaves. We, for the first time, report the distribution of *R. palmatus* var. *coptophyllus* (A. Gray) Kuntze from the island of Geoje-do in Korea and clarified the Korean vernacular name of 'Dan-pung-ttal-gi.' Finally, we designated the lectotype of *R. palmatus* using C. P. Thunberg's specimen (UPS-THUNB. 12282).

Keywords: *Rubus palmatus* Thunb., *R. palmatus* var. *coptophyllus* (A. Gray) Kuntze, Rosaceae, unrecorded taxon, lectotype

적 요: 안면도와 거제도에서 한반도 미기록식물인 장미과 산딸기속의 *Rubus palmatus* Thunb. var. *palmatus* 을 발견하였고, 긴잎단풍딸기로 국명을 새롭게 부여하였다. 단풍딸기(*R. palmatus* var. *coptophyllus* (A. Gray) Kuntze)와는 잎이 3개로 갈라지거나 혹은 거의 갈라지지 않는 특징으로 구별된다. 또한 한반도 분포가 확인된 바 없는 단풍딸기의 거제도 분포를 처음으로 보고하였다. 마지막으로 UPS에 소장된 Thunberg의 표본 (UPS-THUNB. 12282)을 선정기준표본으로 지정하였다.

주요어: 긴잎단풍딸기, 단풍딸기, 장미과, 미기록식물, 선정기준표본

Genus *Rubus* L. comprises of approximately 700 species and shows, with an exception in Antarctica, worldwide distribution patterns (Thompson, 1995). It has been difficult to produce infrageneric classification system, but the most recent global taxonomic treatment of genus includes nearly 430 species in 12 subgenera (Focke, 1910, 1911, 1914). The most recent floristic treatment of Korea (Yang and Pak, 2007) and taxonomic study (Yang, 2005; Yang and Pak, 2007) recognize

20 taxa in genus *Rubus*, 14 of which belong to subgenus *Idaeobatus* Focke, one of two subgenera which occur primarily in eastern Asia.

Rubus palmatus Thunb. from Korea was mentioned by Maximowicz (1872), Forbes and Hemsley (1891), and Palibin (1898). However, in the "Flora Sylvatica Koreana", Nakai (1918) argued that *R. palmatus* along two other species of *Rubus*, i.e., *R. trifidus* Thunb. and *R. humulifolius* C. A. Meyer, do not occur in the Korean Peninsula. However, *R. palmatus*, known to occur on the island of Anmyeon-do, Chungnam Province, has been listed in several modern floristic treatments under the Korean vernacular name of 'Dan-pung-ttal-gi' (e.g., Lee T. B. 1980, 2003; Lee Y. N.

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1996; Lee W. C. 1996, 2008; Yang and Pak, 2007). During the course of taxonomic study of the genus *Rubus* in Korea, significant efforts have been made to determine the taxonomic entity of *R. palmatus* and its distribution in Korea (Yang, 2005). We examined specimens deposited at major herbaria in Korea (CBU, CNU, KNU, KWNU, SKK, SNU and SNUA), but were not able to find any specimens with palmately 3–5 deeply lobed leaves collected from Anmyeon-do. Rather, there are several specimens of this taxon collected from Japan. Therefore, it was uncertain whether the taxon of palmately 3–5 deeply lobed leaves really exists in the Korean Peninsula. In addition, different scientific names have been used for this taxon in various floristic treatments: *R. palmatus* Thunb. by Lee T. B. (1980, 2003), while *R. palmatus* var. *coptophyllus* (A. Gray) Kuntze by Lee W. C. (1996, 2008) and Lee Y. N. (2008). These lead to a taxonomic confusion about the taxonomic identity of this taxon as well as its existence in Korea. In this study, therefore, we determined the taxonomic identity of *R. palmatus* and its distribution in Korea and clarified the Korean vernacular name of ‘Dan-pung-ttal-gi’.

Materials and Methods

To confirm the distribution of the two varieties of *R. palmatus* in the Korean Peninsula, we examined ca. 3,000 specimens deposited at major herbaria in Korea (i.e., CBU, CNU, KNU, KWNU, SKK, SNU and SNUA). Furthermore, we checked the type of *R. palmatus*, C. P. Thunberg’s specimen (UPS-THUNB. 12282) in Uppsala University Herbarium (UPS) and holotypes (Momiya and Ohba, 1988) of *R. edulis* Koidz. and *R. dulcis* Koidz., which were considered as synonyms of *R. palmatus* in Tokyo University Herbarium (TI). We also ascertained the original descriptions of *R. palmatus* (Thunberg, 1784) and *R. coptophyllus* (Perry, 1857). Lastly, we followed the International Code of Nomenclature (ICN; McNeil et al., 2012) for lectotypification of *R. palmatus*.

Results and Discussion

The taxonomic identity of *R. palmatus*

In the Japanese literature, two taxa, *R. palmatus* var. *palmatus* (ナガバモミジイチゴ) and *R. palmatus* var. *coptophyllus* (モミジイチゴ), can be distinguished based primarily on leaf shape. *Rubus palmatus* var. *palmatus* has 3 clefted or shallowly lobed or even rarely unlobed leaves, whereas *R. palmatus* var. *coptophyllus* has palmately 3–5-lobed

leaves (Ohwi, 1965; Kimura and Murata, 1979; Iwatsuki et al., 2001). Interestingly, Lee T. B. (1980, 2003) used the scientific name of only *R. palmatus* for ‘Dan-pung-ttal-gi’ without recognition of variety of *R. palmatus*, even though the descriptions best fit to the characteristics of *R. palmatus* var. *coptophyllus* which have palmately 3–5-lobed leaves. After conducting thorough field works in Korea, we determined that ‘Dan-pung-ttal-gi’ which was described as having palmately 3–5-lobed leaves in the floristic treatments in Korea, does not occur on Anmyeon-do. Rather, we discovered ‘Dan-pung-ttal-gi’ with palmately 3–5-deeply lobed leaves in Jisepo-ri, Geoje-do, which best fits to the characteristics of *R. palmatus* var. *coptophyllus*. Furthermore, we found *R. palmatus* var. *palmatus* which is characterized by having 3 shallowly lobed or rarely unlobed leaves from the islands of Anmyeon-do and Geoje-do. Thus, we conclude that two varieties of *R. palmatus*, i.e., var. *palmatus* and var. *coptophyllus*, exist in the Korean Peninsula. The former has 3-clefted or shallowly lobed or even rarely unlobed leaves, whereas the latter has palmately 3–5-deeply lobed leaves. The taxon with the Korean common name of ‘Dan-pung-ttal-gi’ refers to *R. palmatus* var. *coptophyllus*. *Rubus palmatus* var. *palmatus* with 3 shallowly lobed or rarely unlobed leaves has never been reported in the Korean flora until now. Therefore, we report *R. palmatus* var. *palmatus* from Anmyeon-do and Geoje-do as unrecorded taxon of Korean flora (Fig. 1). A new Korean vernacular name of ‘Gin-yip-dan-pung-ttal-gi’ is given to *R. palmatus* Thunb. var. *palmatus* to avoid confusion with an existing name. In addition, we report in this study that *R. palmatus* var. *coptophyllus* occurs in Korea, specifically in the island of Geoje-do (Fig. 2) and clarify the Korean vernacular name of ‘Dan-pung-ttal-gi.’ A dichotomous key primarily based on leaf morphology between *R. palmatus* var. *palmatus* and *R. palmatus* var. *coptophyllus* is also provided.

Typification of *R. palmatus*

The Thunberg’s specimen (UPS-THUNB. 12282) contains three fragments and shows variation in leaf shape, ranging from unlobed leaves of “a” and “b” fragments to palmately lobed leaves of “c” fragment. The locality of three fragments was written as “Ki itjigo, e Japonia”. However, this locality information does not specify any particular region in Japan since “Ki itjigo” refers to *Rubus* in Japanese. Later, two fragments of “a” and “b” were annotated as *R. dulcis*, while “c” fragment as *R. coptophyllus* A. Gray by G. Koidzumi in 1925. In addition, the fragments of “a” and “b” were handwritten annotated as *R. microphyllus* Wild., while “c” fragment as *R. palmatus* by an anonymous taxonomist in



Fig. 1. *Rubus palmatus* Thunb. var. *palmatus* (긴잎단풍딸기, Gin-yip-dan-pung-ttal-gi). A. Specimen; B. Habit; C. Fruits



Fig. 2. *Rubus palmatus* Thunb. var. *coptophyllus* (A.Gray) Kuntze (단풍딸기, Dan-pung-ttal-gi). A. Specimen; B. Habit; C. Fruits

unknown period. Therefore, it is highly likely that two fragments, “a” and “b”, belong to the same taxon and represent one specimen (or collection). Until now, type of *R. palmatus* was not designated yet using the Thunberg’s specimen (UPS-THUNB. 12282). When the type consists of a mixture of different taxa, the part that corresponds to the

original description should be designated as the lectotype (Art. 9.14, McNeil et al., 2012). The “a” and “b” fragment of the C. P. Thunberg’s specimen (UPS-THUNB. 12282) that corresponds most nearly with the original description or diagnosis of *R. palmatus* var. *palmatus* was designated as a lectotype (Fig. 3).



Fig. 3. The lectotype of *Rubus palmatus* Thunb. deposited in UPS. (UPS-THUNB. 12282) The “a” and “b” fragments are designated as the lectotype in this study.

Taxonomic treatment

Taxonomy

Rubus palmatus Thunb. in Murray, Syst. Veg. 14: 475, 1784. Type. Japan, *C.P.Thunberg s.n.* [UPS-THUNB. 12282] “a” and “b” fragments (lectotype, designated here, UPS !) (Fig. 3).

A deciduous shrub, 2 m tall. Stem glabrous, green, with stout flat prickles. Leaf simple, alternate; blade ovate to narrowly 3–7 cm long, 3 lobed or clefted, rarely undivided, 2.5–4 cm wide, apex long acute to acuminate, base truncate to shallowly cordate, margins irregularly acute-toothed lobes, fine hairs on nerves on both sides; petiole often prickly, 30–45 mm long; stipules at base of petiole, linear-lanceolate. Inflorescence solitary, nodding; pedicel 5–10 mm long, sparingly soft pubescent, often with prickles. Flowers pentamerous; calyx shallowly campanulate, sepals lanceolate, attenuate-acuminate, 8 mm long, more or less appressed pubescent on both surface;

petals white, ovate, acute, 12–17 mm long, 7–10 mm wide; ovary hairy. Fruit drupeccetum, globose, yellow.

The type specimen of *R. palmatus*, i.e., C. P. Thunberg’s specimen (UPS-THUNB. 12282), contains three fragments (“a”, “b”, and “c”) belonging to two different taxa. G. Koidzumi annotated “a” and “b” fragments as *R. dulcis*, while “c” fragment as *R. coptophyllus*. An anonymous taxonomist recognized them as *R. microphyllus* and *R. palmatus* without any specification for each fragment. This type specimen, therefore, contains parts belonging to more than one taxon. Because *R. dulcis* is a synonym of *R. palmatus* var. *palmatus*, we attempted to designate herein lectotype of *R. palmatus* var. *palmatus*, using “a” and “b” fragments of C. P. Thunberg’s specimen (UPS-THUNB. 12282).

Typification: According to Art. 9.2, 9.11 and 9.14 of ICN (McNeil et al., 2012), we designate herein “a” and “b” fragment of C. P. Thunberg’s specimen (UPS-THUNB. 12282) as lectotype since it corresponds most nearly with the diagnosis of *R. palmatus* var. *palmatus*.

Key to the varieties of *R. palmatus*

1. Leaves ovate, narrowly 3-lobed, rarely undivided
..... var. *palmatus* (Gin-yip-dan-pung-ttal-gi)
1. Leaves ovate, palmately 3–5-lobed
..... var. *coptophyllus* (Dan-pung-ttal-gi)

Var. *palmatus*

Rubus edulis Koidz. Bot. Mag. (Tokyo) 28: 283, 1914. TYPE: Japan. Honshu, Shiga, Prov. Ohmi, Ibukiyama, May 1914, *G. Koidzumi s.n.* (holotype, TI!)

Rubus dulcis Koidz. Bot. Mag. (Tokyo) 28: 284, 1914. TYPE: Japan. Honshu, Yamaguchi, Prov. Suwo Mt. Namerayama, May 1914, *G. Koidzumi s.n.* (lectotype, designated by Y. Momiyama and H. Ohba, 1988, TI!)

Korean name: Gin-yip-dan-pung-ttal-gi (긴잎단풍딸기)

Distribution: Japan, Korea (Anmyeon-do, Geoje-do).

Specimens examined: KOREA. Chungnam: Anmyeondo, Anmyeoneup, Sungeunri Songrim Temple, 5 March 1999, *J. Y. Yang, S. W. Park & J.-H. Park Y968* (KNU); Kyungnam: Geojedo, Dongbumyeon Hakdongri Bonggoksa Temple, 15, May 2010, *W. Lee, J. S. Kim & J. Y. Yang Y1255* (KNU); Geojedo, Dongbumyeon Hakdongri Bonggoksa Temple, 11 April 2013, *H. B. Yang, J. S. Yi, G. E. Son & J. Y. Yang s.n.* (SKK); Geojedo, Dongbumyeon Hakdongri Bonggoksa Temple, 28, May 2015, *W. Lee s.n.* (KNU). JAPAN. Nagasaki, 1862, *R. Oldham K000737790* (K); Tokyo Nishitama-gun, 14

Apr. 1985, *K. T. Lee, K. Oh s.n.* (KWNU); Kyoto, 19 May 1985, *W. Lee & K. Oh 8637* (KWNU); Kyoto, May 19 1985, *W. Lee & K. Oh 8638* (KWNU); Daihisan, 16 June 1985, *W. Lee & K. Oh s.n.* (KWNU); Tajima, Myohken-san Obtaki 450 m, 24 Apr. 1990, *Y. Saiki & K. S. Lee s.n.* (CBU) Miyazaki Pref, Nishi-usaki-Gun, Hinokage Cho, Omochi Valley in the upper stream of Hinokage River, elev. 600 m, 30 May 2004, *S. Noshiro, A. Kagawa, M. Seki, M. Hanzawa, A. Ohsawa, S. Kaneko, S. Suzuki, Y. Kudoh, M. Hasegawa s.n.* (TI).

Note: This taxon shows wide range of variations in the leaf shape and occurs in mountain foothills and roadsides.

Var. *coptophyllus* (A. Gray) Kuntze, Meth. Spec. Beschreib. *Rubus*. 95, 1879.

Rubus coptophyllus A. Gray, Narr. Exped. China Japan [Perry] 2: 311 (1857). Type. Japan. Kanagawa, Yokohama, without date, *S. W. Williams & J. Morrow s.n.* (holotype, GH!)
Korean name: Dan-pung-ttal-gi (단풍딸기)

Leaves ovate to broadly ovate, palmately 3–5-lobed.

Distribution: Japan, Korea (Geoje-do)

Specimens examined: KOREA. Kyungnam: Geojedo, Ilunmyeon Jisepori Seimal Lighthouse, 15, May 2010, *W. Lee, J. S. Kim & J. Y. Yang Y1256* (KNU); Geojedo, Ilunmyeon Jisepori Seimal Lighthouse, 11 April 2013, *H. B. Yang, J. S. Yi, G. E. Son & J. Y. Yang s.n.* (SKK); Geojedo, Ilunmyeon Jisepori Seimal Lighthouse, 28, May 2015, *W. Lee s.n.* (KNU). JAPAN. c fragment *C. P. Thunberg s.n.* (UPS-THUNB. 12282); Tokyo, 14 Apr. 1985, *W. Lee & K. Oh 8641* (KWNU); Tokyo, 14 Apr. 1985 *W. Lee & K. Oh 8642* (KWNU); Ivata Pref. Mt. Coyocan, 4 May 1983, *M. Miedo s.n.* (KNU); Tokyo, 14 Apr. 1985, *W. Lee & K. Oh 8643* (KWNU); Kyoto, 19 May 1985, *W. C. Lee & K. Oh s.n.* (KWNU); Tochigi Pref., Nikko-shi, Unryu-keikoku 1200 m–1400 m., 14 July 1985, *H. T. Im s.n.* (CNU); Fukushima Pref., Yama-gun, Inawasiro-cho, Kabayachi. 900 m–950 m elev., 22 Aug. 1986, *H. T. Im, T. Kawahara s.n.* (CNU); Tokyo Hochioji City Kobiki-cho, 13 Apr. 1987, *T. Kawahara & H. T. Im s.n.* (CNU) Koshikawa Botanical garden Tokyo University, 30 May 1987, *H. T. Im s.n.* (CNU) Honshu, Miyagi Pref. Tamatsukuri-gun Narugo-cho, Onikoube, Nuruyu-zawa, elev. 450 m, 7 May 1987, *T. Kajita s.n.* (TI).

Note: Although this taxon has been listed and known to occur on the island of Anmyeon-do, it was confirmed that the record was based on misidentification in our study. We, for the first time, found this taxon from the island of Geoje-do and reported

it in this study. *Rubus palmatus* var. *coptophyllus* can be easily distinguished from *R. palmatus* var. *palmatus* by having palmately 3–5-deeply lobed leaves.

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