

A New Taxon of *Goodyera* (Orchidaceae): *G. x tamnaensis*

Chang Shook Lee, Sung Hee Yeau¹, Kyung Seo Lee² and Nam Sook Lee^{3*}

Institute of Eco Science, Ewha Womans University, Seoul 120-750, Korea

¹*Department of Science Education, Ewha Womans University, Seoul 120-750, Korea*

²*293-109 Yeon-dong, Jeju-si 690-814, Korea*

³*Department of Life Science, Ewha Womans University, Seoul 120-750, Korea*

(Received 28 October 2010 : Accepted 17 November 2010)

신분류군 탐라사철란(난과)

이창숙 · 여성희¹ · 이경서² · 이남숙^{3*}

이화여자대학교 에코과학연구소, ¹이화여자대학교 과학교육과, ²제주도 제주시 연동 293-109, ³이화여자대학교 생명과학과

ABSTRACT: We describe a new taxon of *Goodyera* (Orchidaceae), *G. x tamnaensis* N.S. Lee, K.S. Lee, S.H. Yeau & C.S. Lee, sp. nov., from Jeju Island. This taxon is presumed to be a hybrid between *G. schlechtendaliana* and *G. velutina* based on several morphological characteristics, i.e., leaf venation, a patterned leaf surface and raised leaf epidermal cells, the color of the flower and the bract, the lateral sepal shape, and the hair length. The morphological characteristics and illustrations of the species based on the holotype are provided together with photographs of the habitat.

Keywords: *Goodyera x tamnaensis*, Orchidaceae, new taxon

적 요: 제주도에서 발견된 사철란(난과)속의 신분류군을 정기준표본에 근거한 분류군 기재, 해부도 및 서식지에서의 식물사진을 제시하여 탐라사철란(*Goodyera x tamnaensis* N.S. Lee, K.S. Lee, S.H. Yeau & C.S. Lee, sp. nov.)으로 신종 처리하였다. 탐라사철란은 잎맥, 잎 표면무늬와 잎의 표피세포 형태, 잎, 꽃과 포의 색, 겉꽃받침의 모양, 털의 길이 등 형태적 특징에 의해 사철란과 흰줄사철란(털사철란)의 교배종으로 추정된다.

주요어: 탐라사철란, 난과, 신분류군

The genus *Goodyera* R. Br. (Orchidaceae), comprising 40 species in the world, is characterized by creeping rhizomes, simple stamens, and hairs at the bases of the lips, all of which distinguish it from the related genera (Li, 1978; Satake et al., 1982; Ohwi, 1984). Five taxa of *Goodyera* have been recognized in Korea: *G. schlechtendaliana* Reichb. fil., *G. repens* (L.) R. Brown, *G. velutina* Maxim., *G. biflora* (Lindl.) Hook. f. and *G. maximowicziana* Makino (Lee, 1996; Tae et al. 1997). Recently, *G. rosulacea* Y. Lee was described as a new species based on its distinctive habitat, rosette-formed leaves and short rhizome and molecular phylogenetic study supported this view (Lee et al., 2006). Another taxon, *G. x chejuensis*, was recently reported and it was suggested that this taxon is morphologically intermediate between two species, *G. macrantha* and *G.*

velutina, and is sympatric with them (Kim and Lee, 1997). Its morphological description is similar to *Goodyera x tamnaensis*, but lack of the holotype of *G. x chejuensis* did not allow us to determine its taxonomic identity.

We found several populations of *Goodyera x tamnaensis*, in the forests of Donnekkko valley in Seogwipo, Jeju Island of Korea. Population sizes were typically more than 10 individuals per population and it grows together with other species, such as *G. schlechtendaliana*, *G. velutina*, *G. biflora*, *Quercus myrsinaefolia*, *Q. glauca*, *Dryopteris erythrosora*, *D. pacifica*, and *Mitchella undulata*.

It is not yet to be determined whether *G. x tamnaensis* is the same taxon with *G. x chejuensis* (Kim and Lee, 1997). Nevertheless, Lee et al. (2006) proposed a new species of *Goodyera* based on nuclear ITS and chloroplast DNA sequences and additional

*Author for correspondence: namsook@ewha.ac.kr

molecular phylogenetic analysis of Korean *Goodyera* (NS Lee, unpublished data) strongly suggested that this new species is a hybrid between *G. schlechtendaliana* and *G. velutina*. Therefore, here we suggest that this new taxon can be treated as a new species, *Goodyera* × *tamnaensis* N.S. Lee, K.S. Lee, S.H. Yeau & C.S. Lee, sp. nov. (Orchidaceae). The Korean name ‘Tam-na-sa-chul-nan’ (‘Tam-na’ is the older name of Jeju Island) was given. The voucher specimens are preserved in the Ewha Womans University Herbarium (EWH, Lee N. S. et al., 06082001–06082005).

Taxonomic Treatment

Goodyera × *tamnaensis* N.S. Lee, K.S. Lee, S.H. Yeau & C.S. Lee, sp. nov.

Holotype: KOREA, Jeju-do, Seogwipo-si, Donnekk valley, 20 August 2006, EWH, Lee N.S. et al., 06082001 (EWH);

Isotypes: Lee N.S. et al., 06082002–06082005 (EWH) Fig. 1.

Korean name: 탐라사철란 (Tam-na-sa-chul-nan)

Hoc taxon habet aut proprietas de *G. schlechtendaliana*, aut



HOLOTYPE

Herbarium Dept. of Biology Ewha Womans University Seoul, Korea	
Collection No.	Lee N. S. et al. 06082001 (EWH D-814)
Family Name	Orchidaceae(나비)
Scientific Name	<i>Goodyera</i> × <i>tamnaensis</i>
Loca Name	탐라사철란(Tam-na-sa-chul-nan)
Locality	제주도 돈내곡(Donnekk valley, Jeju-do)
Date	20-Aug-2006
Collector	이남숙, 최영준, 이광서, 함창희, 차관림
Determination	
Remarks	type specimens

Fig. 1. Holotype of *Goodyera* × *tamnaensis* N.S. Lee, K.S. Lee, S.H. Yeau & C.S. Lee (Orchidaceae).

G. velutina, in aliquatum protrudere morbus cella de folia, colore rubere puniceus flos, colore fulvus cum viridis bractea, lanceolatum-ovatus latere sepalum, et inflatus labellum fundus. Insuper, hoc taxon habet medium proprietas de *G. schlechtendaliana* et *G. velutina*, in folia aliquis clarus reticulate signum, constanter latere nervis et capillarum longus.

Herb sperennial. **Roots** short and thick. **Stems** erect, greenish red, long spread under base, pubescent. **Leaves** alternate, 2.0–4.0 cm long, 1.0–2.3 cm width, leaf blade ovate or ovate-lanceolate, apex acute or obtuse, margin smooth, adaxially purplish green, abaxially pubescent along veins; leaf midrib and lateral veins prominent and reticulated within lateral veins, adaxial cell somewhat raised; petiole 1.0–1.5 cm, base sheathed stem. **Inflorescences** erect, 8–10, pubescent; bract 4–6, erect, pale brownish red-purple with green, lanceolate, apex sharply acute, 8 mm long, 2 mm width; **Flowers** light reddish pink, half open dorsal sepal 7–10 mm long, 3.0–3.5 mm width, apex smooth, hairs in abaxial surface; lateral sepal lanceolate, 7–9 mm long, 3.5–4.0 mm width, acute; lateral petal oblanceolate, 7–10 mm

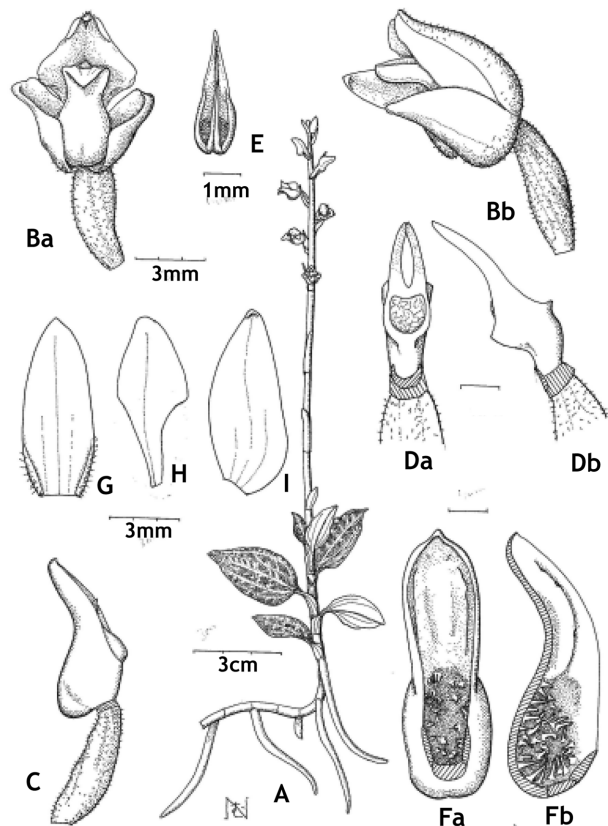


Fig. 2. *Goodyera* × *tamnaensis* N.S. Lee, K.S. Lee, S.H. Yeau & C.S. Lee. A. Habit; Ba. Face view of flower; Bb. Lateral view of flower; C. Lateral view of ovary, lip and anther; Da. Face view of column; Db. Lateral view of column; E. Anther cap; Fa. Face view of lip; Fb. Lateral view of lip (longitudinal section); G. Dorsal sepal; H. Lateral petal; I. Lateral sepal.



Fig. 3. Habit of *Goodyera x tammaensis* N.S. Lee, K.S. Lee, S.H. Yeau & C.S. Lee (Photograph taken by Lee Kyung Seo in Seoho-ri, Jeju-do, 2006. 8. 27).

long, 2.5–3.3 mm width, base flat; lip ovate, 6.0–8.5 mm long, 3–4 mm width, pouched, 6.0–8.5 mm long, 3–4 mm width, inside hairy, apex slightly reflexed; column 5 mm long, rostellum 2.5 mm long, apex acute; ovary 0.5–0.7 cm long. **Fruits** capsule, 8–12 mm long (Figs. 2, 3).

Flowering: Aug. –Sep.

Distribution: Donnekk valley, Seogwipo-si, Jeju-do, Korea.

Habitat: shady forest

Goodyera x tammaensis is sympatric with *G. schlechtendaliana* and *G. velutina* in Donnekk valley of Seogwipo, Jeju Island. *Goodyera schlechtendaliana* has faint leaf midvein, irregular lateral vein, flat adaxial epidermal surface, pale pinkish white flower, greenish bracts, lanceolate and laterally spread sepal, and nearly flattened lip base. *Goodyera velutina* has the prominent leaf midrib, hidden regular lateral vein, and somewhat bulged out or convex adaxial epidermal cell, reddish pink (or white) flower, reddish brown bract, ovate and laterally not spread lateral sepal, and inflated lip base. *Goodyera x tammaensis* shares several morphological characteristics with *G. velutina*, i.e., prominent leaf midrib, regular lateral vein (hidden), bulged out or convex leaf epidermal cell, and inflated lip base. At the same time, *G. x*

tammaensis shows typical characteristics of *G. schlechtendaliana*, i.e., the scape length and irregular reticulate pattern of veins. In addition, *G. x tammaensis* shows morphological intermediacy in several characters between the two putative parents, i.e., flower

Table 1. Diagnostic characters between *G. x tammaensis*, *G. schlechtendaliana* and *G. velutina*.

Characters	<i>G. schlechtendaliana</i>	<i>G. x tammaensis</i>	<i>G. velutina</i>
Leaf midrib	faint	prominent	prominent
lateral vein	irregular	regular	hidden (regular)
reticulate pattern	irregular	irregular or regular	none
adaxial cell	flat	raised	raised
Scape length (cm)	10–20	10–20	8–15
Hair length (mm)	0.2–0.4	0.07–0.1	0.05
Bract color	green	pale greenish brown	reddish brown
Flower color	pale pinkish white	light reddish pink	reddish pink (or white)
lateral sepal	lanceolate, spread	ovate-lanceolate, not spread	ovate, not spread
lip base	nearly flattened	inflated	inflated
ovary (cm)	0.8–1.0	0.5–0.7	0.5–0.8

color (light reddish pink), bract color (pale greenish brown), hair length (medium), lateral sepal shape (lanceolate to ovate), and leaf venation pattern (intermingled) (Table 1).

Seven species of *Goodyera* in Korea can be distinguished by the following key.

Key of the genus *Goodyera* in Korea

1. Inflorescence less than 3 cm in length, flowers bloom in whole sides of inflorescence.
 2. Leaf distinct reticulate vein; flowers 2.5–3.0 cm in length *G. biflora* 붉은사철란
 2. Leaf faint reticulate vein; flowers less than 2 cm in length *G. maximowicziana* 섬사철란
1. Inflorescence more than 7 cm in length, flowers bloom in one side of inflorescence.
 2. Inside of lip base not hairy, callus present.
 3. Leaves from roots 3–6 on scape, lip ovate-oblong, lateral sepal ovate-oblong, pubescent in whole abaxial surface, rostellum less than 1 mm *G. repens* 애기사철란
 3. Leaves from roots 4–8 rosette, cover the ground, lip oblong-oblong, lateral sepal broad lanceolate, pubescent in the lower half of abaxial surface, rostellum more than 1 mm *G. rosulacea* 로젯사철란
 2. Inside of lip base hairy, callus absent.
 3. Leaves not reticulate patterned *G. velutina* 흰줄사철란(털사철란)
 3. Leaves irregular or regular reticulate patterned.
 4. Lateral leaf vein irregular; base of lip flat; lateral sepals spread, lanceolate *G. schlechtendaliana* 사철란
 4. Lateral leaf vein regular; base of lip inflate; lateral sepals not spread, ovate-lanceolate *G. × tamnaensis* 탐라사철란

Acknowledgement

This research was supported by the Core Environmental Technology Development Project for Next Generation (Project No. 052-091-079).

Literature Cited

- Kim, S. N. and K. S. Lee. 1997. Orchids of Korea. Gyohaksa, Seoul (In Korean).
- Lee C. S., S. M. Eum and N. S. Lee. 2006. Taxonomic status of *Goodyera rosulacea* Y. Lee: Molecular evidence based on ITS and *trnL* sequences. Korean J. Pl. Taxon. 36: 189-207 (in Korean).
- Lee, Y. 1996. Flora of Korea. Gyohaksa, Seoul (In Korean).
- Lee, Y. 2004. I. New Taxa of Korean Flora. Bulletin of Koran Plant Research 4: 2-4 (in Korean).
- Li, H. L. 1978. Flora of Taiwan. vol. 5. Epoch Pub. Co., Taipei, Taiwan. Pp. 1006-1019.
- Ohwi, J. 1984. Flora of Japan. Smithsonian Inst, Washington DC.
- Satake, Y. J., S. Ohwi, S. Kitamura, S. Watari and T. Tominari. 1982. Wild Flowers of Japan Monoco. [1]. Heibonsha, Tokyo.
- Tae, K. H., E. H. Lee and S. C. Ko. 1997. A systematic study of the genus *Goodyera* in Korea by morphological and cytological characters. Korean J. Pl. Taxon. 27: 89-116 (in Korean).