

Revision of some problematic taxa of *Rhododendron* sect. *Tsutsusi* (Ericaceae) from China

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Morphological variation within and among populations of some closely related taxa of *Rhododendron* sect. *Tsutsusi* from China are revised based on literature, specimen examination and field work. *Rhododendron chunii*, *R. guizhongense*, *R. viscidum*, *R. subnerve*, *R. minutiflorum*, *R. viscigemmatum*, and *R. polyraphidodeum* var. *montanum* are reduced to synonymys of *R. fuchsiifolium*. *Rhododendron myrsinifolium* is recognized as a distinct species, differing from *R. fuchsiifolium* in having smaller leaves, branchlets covered with compressed strigose hairs, and a corolla tube without glands on outer surface. The geographic distributions of *R. fuchsiifolium* and *R. myrsinifolium* are also provided.

Key words: nomenclature, *Rhododendron* sect. *Tsutsusi*, taxonomy

Introduction

Rhododendron sect. *Tsutsusi*, with ca. 90 species, is mainly distributed in South China and Japan (Yamazaki 1993, He 1994), although a few species extend to Korea, Burma, India and the Philippines (Chamberlain & Rae 1990). South China is the diversity center of the section (Fang & He 1982, 1983, Tam 1982a, 1982b, 1982c, 1983a, 1983b, Fang 1983a, 1983b, Fang & Li 1984, He 1985, 1987). Quite different taxonomic revisions were made for the whole section or some taxa (Chamberlain & Rae 1990, He 1994, He & Chamberlain 2005, Geng 2005).

Chamberlain and Rae (1990) made the first revision and recognized *R. fuchsiifolium*, *R. chunii*, *R. minutiflorum*, *R. myrsinifolium*, *R. subnerve*, *R. viscidum*, and *R. viscigemmatum* as distinct species. The species were accepted by He (1994) and He and Chamberlain (2005). *Rhododendron polyraphidodeum* var. *montanum* was regarded as a doubtful taxon by Chamberlain and Rae (1990), but it was also maintained as a variety (He 1994, He & Chamberlain 2005). While *R. glandulostylum* W.P. Fang & M.Y. He (*non* Komatsu 1918), was reduced to synonymy with *R. subnerve* by Chamberlain and Rae (1990), Li (1995) considered *R. glandulostylum*

distinct and proposed *R. guizhongense* as its new name. Geng (2005) treated *R. polyraphidodeum* var. *montanum* and *R. viscigemmatum* as synonyms of *R. chunii*, and *R. subnerve* as a synonym of *R. tsoi*. Ching (1974) described the style of *R. tsoi* as glabrous, but the illustration showed pilose styles. We checked the type, and the styles were completely glabrous. The style indumentum indicates that *R. subnerve* is more allied to *R. minutiflorum* than it is to *R. tsoi*.

The above-mentioned taxa are very similar to each another. After comparing the type specimens of these taxa, and also from the original descriptions, we found the diagnostic characters were leaf size, indumentum on leaf surfaces and styles, filament length and indumentum, and lateral veins on lower surfaces. Studying herbarium specimens and field collections, we found that the treatments of *R. fuchsiifolium* and the related taxa in different revisions were highly problematic.

Material and methods

Considering the collection notes on type specimens, we carried out field work in the mountainous regions of South China. Each population contained five to ten individuals, and each individual contained three to five sheets (specimens). *Rhododendron chunii*, *R. guizhongense*, *R. myrsinifolium*, *R. viscidum*, and *R. viscigemmatum* were collected from their respective type localities. Our knowledge of *R. fuchsiifolium*, *R. minutiflorum*, *R. polyraphidodeum* var. *montanum* and *R. subnerve* was gained from examination of herbarium specimens at IBSC, N, NAS, NF, PE and P.

Leaf size was measured on available specimens. The statistical data of leaf sizes was obtained from *R. chunii* (six individuals), *R. guizhongense* (seven individuals), *R. viscidum* (eight individuals), *R. subnerve* (one sheet), *R. minutiflorum* (six sheets), *R. viscigemmatum* (five individuals), *R. polyraphidodeum* var. *montanum* (two sheets), *R. fuchsiifolium* (one sheet), and *R. myrsinifolium* (ten individuals). The studied specimens are listed in the Appendix. SPSS and SigmaPlot 8.0 software were used to analyze and illustrate the variation of leaf size, respectively.

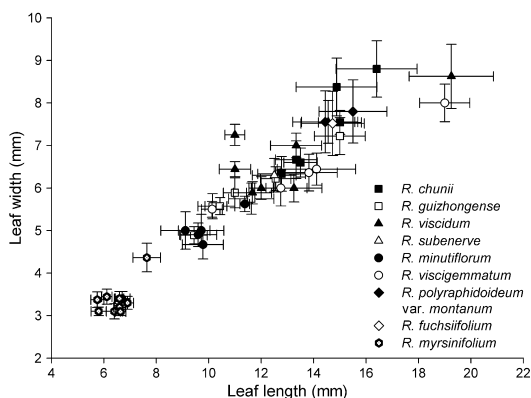


Fig. 1. Leaf-size variation (mean $\pm$ SE) in *Rhododendron fuchsiifolium* and the related taxa.

Results

Variation of diagnostic characters

The morphological characters (Table 1) are variable. No distinguishing differences could be found among *R. fuchsiifolium* and related taxa, but *R. myrsinifolium* differs from the other taxa in the indumentum on the leaf surface.

The leaf size of *R. myrsinifolium* differs from the other taxa (Fig. 1). Furthermore, the indumentum on the branchlets of *R. myrsinifolium* is compressed, while in the other taxa it is spreading.

Based upon the analysis of morphological variation, we reduce *R. chunii*, *R. guizhongense*, *R. viscidum*, *R. subnerve*, *R. minutiflorum*, *R. viscigemmatum*, and *R. polyraphidodeum* var. *montanum* to synonyms of *R. fuchsiifolium*. *Rhododendron myrsinifolium* is recognized as a distinct species.

Taxonomic treatment

Rhododendron fuchsiifolium H. Lévêillé (Fig. 2)

Rep. Spec. Nov. Regni. Veg. 13: 148. 1914 ("*fuchsiifolia*"). — TYPE: China. Guizhou, Pingfa, 20.V.1907 *Cavalerie* 3221 (holotype E; isotype P!).

Rhododendron minutiflorum H.H. Hu, J. Arnold Arb. 12: 155. 1931, *syn. nov.* — TYPE: China. Guangxi, N of Luocheng, 9.VI.1928 *R. C. Ching* 5860 (holotype PE!; isotype IBSC!).

Table 1. Comparison of *Rhododendron fuchsiifolium* and the related taxa.

	Indumentum on leaf surface		Indumentum on style	Filament		Lateral veins on dorsal surface
	Ventral	Dorsal		Length	Indumentum	
<i>R. fuchsiifolium</i>	sparsely strigose	sparsely strigose	piloglandulose on lower half	12–14 mm long, almost equal	slightly pubescent on lower half	4–6-jugate, obvious
<i>R. chunii</i>	sparsely strigose or glabrous	sparsely strigose	pilose and stipitate-glandular on lower half	9–14 mm long, almost equal or unequal	pubescent on lower half	4–5-jugate, obvious or obscure
<i>R. guizhongense</i>	sparsely strigose	sparsely strigose	pilose and stipitate-glandular on lower half	12–14 mm long, unequal	glandular and obscurely pubescent on lower half	obscure
<i>R. minutiflorum</i>	sparsely strigose or glabrous	sparsely strigose	pilose, or pilose and stipitate-glandular on lower half	11–14 mm long, almost equal	pubescent on lower half	4–5-jugate, obvious or obscure
<i>R. polyraphidodeum</i> var. <i>montanum</i>	sparsely strigose	sparsely strigose	pilose on lower half	not seen	not seen	4–5-jugate, obvious or obscure
<i>R. subenerve</i>	sparsely strigose or glabrous	sparsely strigose	pilose and stipitate-glandular on lower half	12–15 mm long, unequal	pubescent on lower half	obscure
<i>R. viscidum</i>	sparsely strigose or glabrous	sparsely strigose or glabrous	pilose and stipitate-glandular on lower half	10–14 mm long, ± equal	pubescent on lower half	4–6-jugate, obvious or obscure
<i>R. viscigemmatum</i>	sparsely strigose	sparsely strigose	pilose at base or on lower half, sometimes also with very sparse glands	12–15 mm long, unequal	slightly pubescent on lower half	3–5-jugate, ± obvious or obscure
<i>R. myrsinifolium</i>	glabrous	glabrous, with gland-like macula	pilose and stipitate-glandular on lower half	11–14 mm long, unequal	glabrous	obscure

Rhododendron chunii W.P. Fang, Sunyatsenia 7: 1. 1948, *syn. nov.* — TYPE: China. Guangdong, Qujiang, Mount. Longtoushan, 18.IV.1930 *S. P. Ko 50411* (holotype IBSC!; isotype PE!).

Rhododendron glandulostylum W.P. Fang & M.Y. He, Bull. Bot. Res. 2(2): 84, pl. 2. 1982 (*non* Komatsu 1918). — *R. guizhongense* G.Z. Li, Guihaia 15(3): 198. 1995, *syn. nov.* — TYPE: China. Guangxi, Jinxiu, Mount. Dayaoshan, 4.V.1964 *F. N. Wei 809* (holotype IBK!).

Rhododendron polyraphidodeum P.C. Tam var. *mon-*

tanum P.C. Tam, Bull. Bot. Res. 2(4): 85. 1982, *syn. nov.* — TYPE: China. Guangxi, Mount Damingshan, 25.VIII.1951 *C. S. Tsai 5401* (holotype IBSC!).

Rhododendron subenerve P.C. Tam, Guihaia 3(3): 180. 1983, *syn. nov.* — TYPE: China. Guangxi, Guanyang, Baijing, 22.IV.1958 *Z. Z. Chen 52211* (holotype IBSC!).

Rhododendron viscigemmatum P.C. Tam, Guihaia 3(3): 181, fig. 3. 1983, *syn. nov.* — TYPE: China. Guangxi, Hezhou, Mount Guposhan, 9.VII.1958 *Y. K. Li 401515* (holotype IBSC!).

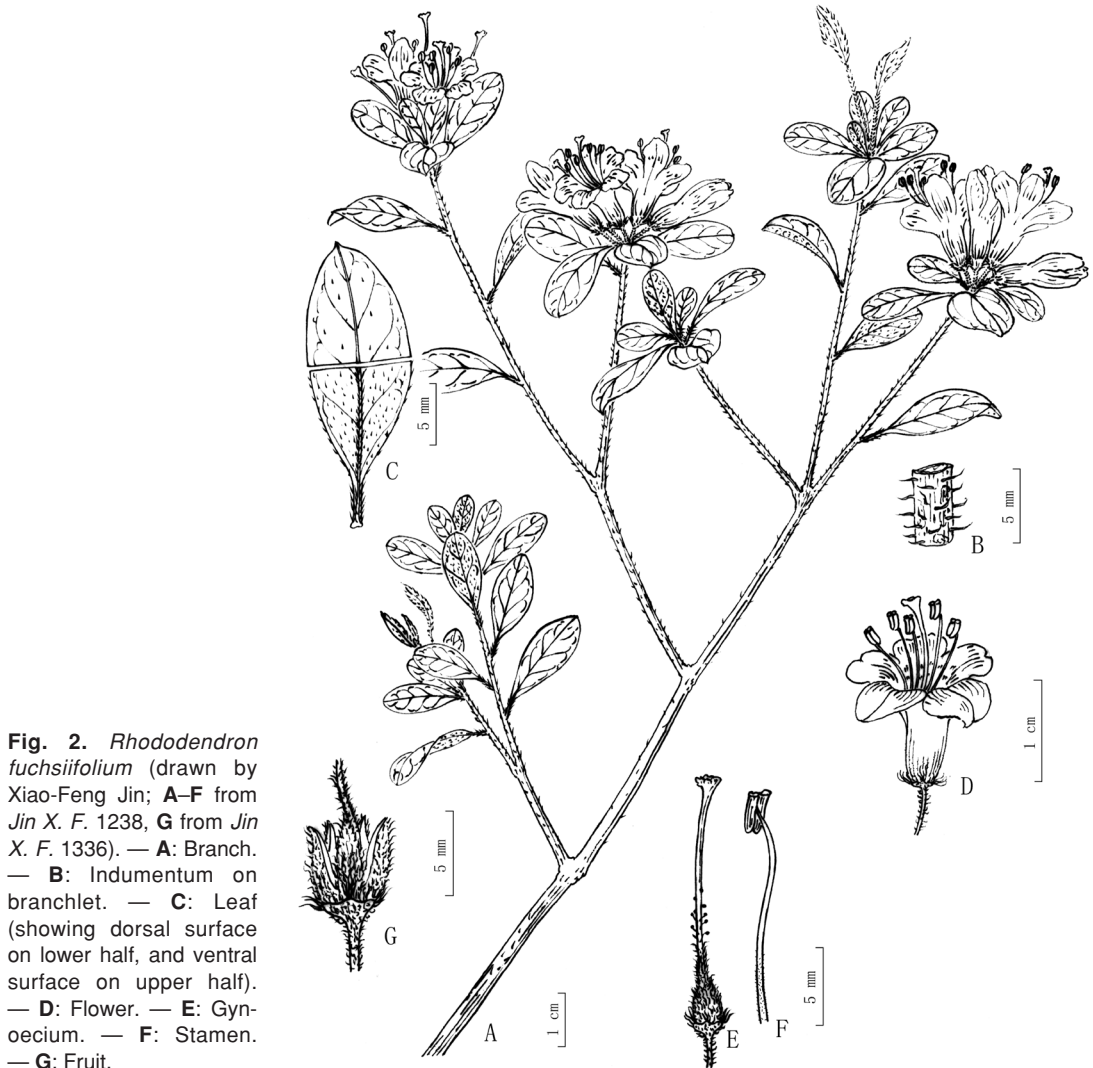


Fig. 2. *Rhododendron fuchsifolium* (drawn by Xiao-Feng Jin; **A–F** from Jin X. F. 1238, **G** from Jin X. F. 1336). — **A**: Branch. — **B**: Indumentum on branchlet. — **C**: Leaf (showing dorsal surface on lower half, and ventral surface on upper half). — **D**: Flower. — **E**: Gynoecium. — **F**: Stamen. — **G**: Fruit.

Rhododendron viscidum C.Z. Guo & Z.H. Liu, Acta Bot. Yunnan. 10(4): 497. 1988, *syn. nov.* — TYPE: China. Hunan, Daoxian, Mount Qianjiadong, Z.R. Xie 83221 (holotype NYA, not seen).

Evergreen shrub. Branchlets spreading-strigose. Leaves thinly coriaceous, frequently aggregated at branchlet apex; lamina obovate or widely elliptic, sometimes almost round, 9–30 mm × 5–15 mm, obtuse and mucronate at apex, cuneate at base, entire, slightly reflexed and ciliate at margin, sparsely strigose, or sometimes glabrous on upper surface, sparsely strigose on lower surface; costa projected on both surfaces, rufous-strigose; lateral veins 3–6-jugate, conspicuous on lower surface, or sometimes obscure; petiole 2–4

mm long, densely strigose. Umbel 3–5-flowered; pedicel 3–6 mm long, densely strigose. Calyx very small, densely strigose. Corolla pink, funnelform, 8–12 mm long, 5-lobed; lobes spreading, long-ovate or oblong, 3–5 × 2–4 mm; tube 5–8 mm long, with glands outside. Stamen 5, almost equal in length or unequal; filaments compressed, 9–15 mm long, with whitish pubescence on lower half, or sometimes slightly pubescent; anthers oblong, ca. 2 mm long, poricidal at apex. Ovary ovoid, densely rufous-strigose, 3–4 mm long; style extended from corolla, 9–12 mm long, pilose, or pilose and stipitate-glandular on lower half; stigma capitate. Capsule ovoid, 5–6 mm long, ca. 4 mm in diam., densely strigose.



Fig. 3. *Rhododendron myrsinifolium* (drawn by Xiao-Feng Jin; **A–F** from Ding B. Y. & Chen Y. P. 7445, **G** from Ding B. Y. & Zhang H. S. 7809). — **A**: Branch. — **B**: Indumentum on branchlet. — **C**: Leaf (showing dorsal surface on lower half, and ventral surface on upper half). — **D**: Flower. — **E**: Gynoecium. — **F**: Stamen. — **G**: Fruit.

***Rhododendron myrsinifolium* Ching ex W.P. Fang & M.Y. He (Fig. 3)**

Bull. Bot. Res. 2(2): 88, fig. 6. 1982. — *R. caespitulum* P.C. Tam in Survey Gen. *Rhododendron* S. China, 66 & 110, fig. 26: 13–17. 1983, *nom. superfl.* — TYPE: China. Guangxi, Fangcheng, Naqin, 26.IV.1956 *Hepu Bot. Exped.* 2511 (holotype PE!, isotype IBSC!).

Evergreen shrub. Branchlets compressed-stri-gose. Leaves coriaceous, frequently aggregated at branchlet apex; lamina obovate, 5–8(–11) mm × 3–5(–7) mm, obtuse and mucronate at apex, cuneate at base, entire, reflexed and ciliate at margin, glabrous on both surfaces, and with gland-like macula on lower surface; costa slightly

raised on both surfaces, slightly strigose on lower surface; lateral veins obscure; petiole 1–3 mm long, densely strigose. Umbel 2–4-flowered; pedicel 2–4 mm long, densely strigose. Calyx very small, densely strigose. Corolla pink, funnelform, 12–15 mm long, 5-lobed; lobes spreading, long ovate or oblong, 5–7 × 3–4 mm; tube 5–6 mm long, glabrous on both surfaces. Stamens 5, unequal in length; filaments compressed, 11–14 mm long, glabrous; anthers oblong, ca. 2 mm long, poricidal at apex. Ovary ovoid, densely rufous-strigose, 2–3 mm long; style exserted from corolla, 12–15 mm long, pilose, or pilose and stipitate-glandular on lower half; stigma capitate. Capsule ovoid or ellipsoid, 4–5 mm long, ca. 3 mm in diam., densely strigose.

Distribution

Both *R. fuchsiifolium* and *R. myrsinifolium* are endemic to South China (Fig. 4). *Rhododendron fuchsiifolium* is distributed in northwestern Guangdong, southern Hunan, southeastern Guizhou, and northeastern and southern Guangxi. *Rhododendron myrsinifolium* is known only from its type locality in southern Guangxi.

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References

Chamberlain, D. F. & Rae, S. J. 1990: A revision of *Rhododendron* IV. Subgenus *Tsutsusi*. — *Edinburgh J. Bot.* 47: 89–200.

Ching, R. C. 1974: *Rhododendron*. — In: *Iconographia Cormophytorum Sinicorum*, III: 24–165. Inst. Bot., Chinese Acad. Sci., Sci. Press, Beijing. [In Chinese].

Fang, W. P. 1983a: Studies on the genus *Rhododendron* (IV). — *Bull. Bot. Res.* 3(4): 38–44. [In Chinese with English summary].

Fang, W. P. 1983b: New taxa of the genus *Rhododendron*

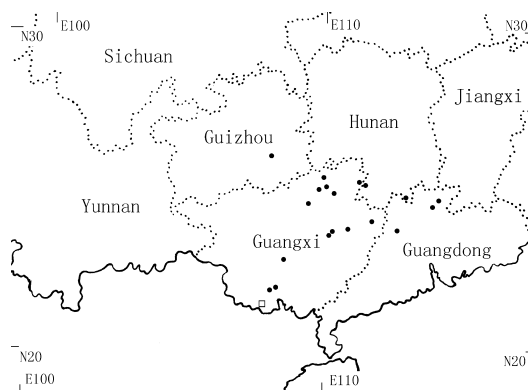


Fig. 4. Geographic distribution of *Rhododendron fuchsiifolium* (●) and *R. myrsinifolium* (□).

from China. — *Acta Phytotax. Sin.* 21: 457–469. [In Chinese with English summary].

Fang, W. P. & He, M. Y. 1982: Studies on the genus *Rhododendron* (I). — *Bull. Bot. Res.* 2(2): 81–103. [In Chinese with English summary].

Fang, W. P. & He, M. Y. 1983: Studies on the genus *Rhododendron* (III). — *Bull. Bot. Res.* 3(1): 1–6. [In Chinese with English summary].

Fang, W. P. & Li, G. Z. 1984: Studies on the genus *Rhododendron* (V). — *Bull. Bot. Res.* 4(1): 1–8. [In Chinese with English summary].

Geng, Y. Y. 2005: New synonymies in the genus *Rhododendron* from China. — *Acta Phytotax. Sin.* 42: 566–570. [In Chinese with English summary].

He, M. Y. 1985: Studies on the genus *Rhododendron* (VI). — *Bull. Bot. Res.* 5(4): 115–119. [In Chinese with English summary].

He, M. Y. 1987: Two new species of *Rhododendron* from China. — *J. Sichuan Univ.* 24(1): 83–87. [In Chinese with English summary].

He, M. Y. 1994: *Rhododendron* subgen. *Tsutsusi*. — In: Hu, L. C. & Fang, M. Y. (eds.), *Flora Reipublicae Popularis Sinicae* 57(2): 369–436. Sci. Press, Beijing. [In Chinese].

He, M. Y. & Chamberlain, D. C. 2005: *Rhododendron* sect. *Tsutsusi*. — In: Wu, C. Y. & Raven, P. H. (eds.), *Flora of China* 14: 433–455. Sci. Press, Beijing & Missouri Bot. Garden Press, St. Louis.

Li, G. Z. 1995: A revision and geographical distribution of the genus *Rhododendron* in Guangxi. — *Guihaia* 15: 193–208. [In Chinese with English summary].

Tam, P. C. 1982a: The new species and varieties of *Rhododendron* from Jiangxi and Hunan Provinces. — *Bull. Bot. Res.* 2(1): 89–102. [In Chinese with English summary].

Tam, P. C. 1982b: Studies on *Rhododendrons* from Guangxi (I). — *Guihaia* 2(2): 69–76. [In Chinese with English summary].

Tam, P. C. 1982c: Notes on *Rhododendron* of eastern and southern China. — *Bull. Bot. Res.* 2(4): 77–98. [In Chi-

- nese with English summary].
 Tam, P. C. 1983a: Studies on *Rhododendrons* from Guangxi (II). — *Guihaia* 3(3): 177–187. [In Chinese with English summary].
 Tam, P. C. 1983b: *A survey of the genus Rhododendron in South China*. — Guangdong Sci. & Tech. Press, Guangzhou. [In Chinese and English].
 Yamazaki, T. 1993: *Rhododendron*. — In: Iwatsuki, K., Yamazaki, T., Boufford, D. E. & Ohba, H. (eds.), *Flora of Japan*, vol. IIIa: 16–44. Kodansha Ltd., Tokyo.

Appendix. Specimens examined.

Rhododendron fuchsiifolium

Anonymous 8073 (IBSC), 8961 (IBSC), 25077 (IBSC); *Cavalerie & Fortunat* 1719 (P); *Chen T. C.* (*Chen D. Z.*) 369 (IBSC); *Chen Z. Z.* 51036 (IBSC, PE), 51122 (IBSC, PE), 52367 (IBSC); *Chin H. C.* 21255 (IBSC); *Chun N. K.* (*Chen N. Q.*) 43020 (IBSC, PE); *Chun S. H.* (*Chen S. Q.*) 14689 (IBSC, NAS, PE); *Dayaoshan Exped.* 12169 (IBSC); *Ding B. Y. & Chen Y. P.* 7526 (HZU), 7527 (HZU), 7528 (HZU), 7529 (HZU), 7530 (HZU), 7531 (HZU), 7532 (HZU); *Ding B. Y. & Zhang H. S.* 7779 (HZU), 7780 (HZU), 7781 (HZU), 7782 (HZU); *Guangfu For. Exped.* 00230 (IBSC, PE); *Huang M. X.* 111420 (IBSC), 112057 (IBSC); *Huang S. Z.* (*Huang X. C.*) 3674 (IBSC); *Jin S. H. & Xu J.* QJ-001 (HZU), QJ-004 (HZU), QJ-005 (HZU), QJ-007 (HZU), QJ-010 (HZU), QJ-012 (HZU); *Jin X. F.* 0936 (HZU), 1143 (HZU), 1238 (HZU), 1239 (HZU), 1240 (HZU), 1241 (HZU), 1242 (HZU), 1243 (HZU), 1249 (HZU), 1270 (HZU), 1271 (HZU), 1272 (HZU), 1332 (HZU), 1333 (HZU), 1334 (HZU), 1335 (HZU), 1336 (HZU), 1337 (HZU), 1338 (HZU), 1339 (HZU); *Ko S. P.* (*Kao X. P.*) 50357 (IBSC, NAS), 50398 (IBSC), 50411 (PE); *Lee C. T.* (*Li Z. T.*) 603523 (PE); *Lee C. T. & Chen Y. S.* 600642 (IBSC), 600502 (PE); *Li G. Z.* 16840 (IBK, PE), 16827 (IBK, PE); *Liu Y. G.* 02572 (IBSC); *Lü Q. H.* 369657 (IBSC), 2537 (NAS, PE); *Nanling Exped.* 1927 (IBSC); *Peking Exped.* 892289 (PE), 894046 (PE), 895107 (PE); *Qin H. F. & Yu S. L.* 700705 (IBSC, NAS), 70333 (NF); *Sin S. S.* (*Xin S. Z.*) 259 (IBSC), 372 (IBSC), 20206 (IBSC), 21255 (IBSC), 23086 (IBSC); *Tsai C. S.* (*Cai C. X.*) 5134 (IBSC); *Tsang W. T.* (*Zeng H. D.*) 28489 (IBSC); *Wang C.* (*Huang Z.*) 39467 (IBSC), 40260 (IBSC); *Wang H.* 1001 (HZU), 1002 (HZU), 1003 (HZU), 1005 (HZU), 1006 (HZU); *Xu J. & Li H. B.* 020 (HZU), 021 (HZU), 022 (HZU), 024 (HZU), 025 (HZU), 026 (HZU), 027 (HZU); *Yue-73 Exped.* 748 (IBSC), 755 (IBSC)

Rhododendron myrsinifolium

Ding B. Y. & Chen Y. P. 7445 (HZU), 7446 (HZU), 7447 (HZU), 7448 (HZU), 7449 (HZU), 7451 (HZU), 7452 (HZU), 7453 (HZU), 7454 (HZU), 7455 (HZU); *Ding B. Y. & Zhang H. S.* 7805 (HZU), 7806 (HZU), 7807 (HZU), 7808 (HZU), 7809 (HZU), 7810 (HZU), 7811 (HZU)