

THE VALERIANACEAE OF TAIWAN⁽¹⁾

MUH-TSUEN KAO⁽²⁾ and CHARLES E. DEVOL⁽³⁾

Abstract: This revision is an attempt to summarize our knowledge of the Valerianaceae of Taiwan. For each genus and species a full description is given. A total of 3 genera and 8 species are enumerated.

This is a taxonomic study of the family Valerianaceae of Taiwan. For each genus and species of the family found in Taiwan, an analytical key to the genus and species has been prepared, description for each genus and species together with notes on habitat and general distribution has been given. Illustrations have been prepared for each species.

The present work is based on collections made by the author and on the specimens deposited in the Herbarium of the Department of Botany, National Taiwan University (TAI) and the Herbarium of Taiwan Forest Research Institute (TAIF).

This family contains 10 genera and about 400 species, which are mainly distributed in the North Hemisphere, but some are found in South America, and a few in Africa. 3 genera and 8 species are known from Taiwan.

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VALERIANACEAE

Herbs or a few shrubs; leaves radical or cauline and opposite, entire, pinnatifid or pinnate; stipules absent; flowers sessile, cymose, bisexual, sometimes polygamous or unisexual, usually small; bracteate, bracts sometimes fused to form an outer epicalyx; calyx-tube adnate to the ovary, plumose or sometimes coronate; corolla superior, gamopetalous, tubular, infundibuliform or rotate, with a spur at base, segments 3-5, often equal, imbricated in bud; stamens 1-4, rarely 5, on the corolla-tube, alternate with the lobes; ovary inferior, 1-3-celled, cells 1-ovuled, with one locule fertile; style solitary, filiform, slender; stigma 2-3-lobed, or capitate; ovules solitary, pendulous; fruit a cypselate achene; 1-seeded, seed pendulous; embryo straight.

10 genera, with about 400 species, mainly distributed in the North Hemisphere and South America, few in Africa. 3 genera and 8 species in Taiwan.

KEY TO THE GENERA

1. Calyx very small, without hairs..... 2.
2. With a broad wing-like bract attached at base of fruit, without epicalyx....(1). *Patrinia*

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(2) 高木村 Herbarium Assistant, Botany Department, National Taiwan University.

(3) 穆嘉華 Professor of Botany, National Taiwan University.

2. Without broad wing-like bract attached to fruit, ovary surrounded by an epicalyx, which are composed of bract fused at their bases and covered with glandular hairs.....(2). *Triplostegia*
1. Calyx linear, coiled, bearing fine hairs on margins.....(3). *Valeriana*

1. PATRINIA Jussieu

Glabrous to hairy perennial herbs; leaves radical and cauline, opposite, sessile or petiolate, entire, pinnatifid or pinnate, sometimes more divided; cymes corymbosely paniced; bracts narrow, free, sometimes with a large bracteole appressed to the fruit; calyx-limb small or absent; flowers usually yellow, sometimes white; corolla-tube short or long, with sericeous hairs on inside, regularly 5-lobed, segments spreading; stamens 1 to 5; stigma capitate; ovary 3 celled, ovules 1 in each cell; fruit 2 small achene.

About 15 species in East and Central Asia; 4 species in Taiwan.

KEY TO THE SPECIES

1. Leaves glabrous or slightly pubescent
2. Radical leaves deeply pinnatifid; calyx absent.....(3) *P. scabiosaefolia*
2. Radical leaves simple with crenate or dentate margins; calyx minute.....(2) *P. glabrifolia*
1. Leaves with long hairs
2. Corolla yellow; stamens 2-3, lower leaves undivided, not pinnatifid.....(1) *P. formosana*
2. Corolla white; stamens 4, lower leaves deeply pinnatifid.....(4) *P. villosa*

1(1) ***Patrinia formosana*** Kitamura in Acta Phytotax. & Geobot., 6: 18, 1937...Pl. 1.

Large perennial herbs; stems terete, erect, up to 150 cm. long, base woody, robust, densely covered with retrorse hairs; upper branches opposite, spreading; leaves simple, undivided, opposite, thin, lower leaves broadly elliptical, 14-23 cm. long, 4.5-8 cm. wide, long petiolate, acuminate or acute at apex, attenuate at base, margins serrate, both surfaces and margins pubescent; lower leaves deciduous at flowering time, upper leaves gradually smaller, elliptical, 4-9 cm. long, shortly petiolate or sessile; margins serrate, both surfaces and margins pubescent; inflorescence terminal or axillary duplicate-corymbose, densely pubescent; bracts narrowly lanceolate or elliptic, 2-5 cm. long, 2 mm. wide, pubescent; calyx minutely 5-lobed; corolla yellow, funnel-shaped, 3 mm. long, segments spreading; stamens usually 2 (rarely 3), inserted at the base of the corolla-tube, filaments linear, about 3 mm. long, sparsely hairy; style linear 3 mm. long; stigma capitate; achenes ovoid, 3-4 mm. long, winged, the wings nearly orbicular, 6.5 mm. in diameter, with nerves distinctly anastomosing.

Distributed in Taiwan and rarely in Japan.

Keelung: Nuan-nuan, S. Suzuki 4494. **Taipei:** Shi-ting, M. T. Kao 4959; Kan-kou, Kao 7924. **I-lan:** Moben, S. Suzuki 6109. **Taoyuan:** Chao-pan-shan, K. Mori s. n. Mar. 24, 1923. **Taichung:** Pa-sien-shan, S. Suzuki s. n. Oct. 21, 1929. **Nantou:** Wu-she, S. Sasaki s. n. Oct. 12, 1930.

This species is similar to *P. villosa*, but differs by having simple leaves, which are not deeply pinnately divided.



Plate 1. *Patrinia formosana* Kitamura (M.T. Kao 7924). 1. habit; 2. flower; 3. bracts; 4. vertical section of flower; 5. stamen; 6. stigma; 7. ovary section; 8. fruit; 9. bracteole; 10. wing; 11. setose hairs.



Plate 2. *Patrinia glabrifolia* Yamamoto & Sasaki (M.T. Kao 6941). 1. habit; 2. flowers; 3. bracts; 4. vertical section of flower; 5. stamens; 6. stigma; 7. ovary section; 8. fruit; 9. bracteole; 10. wing; 11. hairs; 12. multicellular hairs.

First year plants have almost no stem, the leaves are all basal, long petioled, broadly elliptic, winged nearly to base of petiole, margins nearly crenate or slightly serrate at apex, pubescent throughout, these leaves are 14-24 cm. long, 5-8 cm. wide, which are much larger than the stem leaves produced the following season.

1(2) *Patrinia glabrifolia* Yamamoto & Sasaki, in Trans. Nat. Hist. Soc.

Formos., 19: 106, 1929.....Plate 2.

Rhizome thick, long creeping; stems terete, erect, solitary or sparingly branched, 25-60 cm. high, glabrous at base, nodes and upper parts densely covered with white hairs; leaves radical and cauline, short or long petiolate, radical leaves spatulate, cauline leaves oblanceolate or linear-lanceolate, 3-15 cm. long, acuminate at apex, attenuate-decurrent at base, margins dentate or crenate, ciliate, both surface glabrous; inflorescence corymbose-paniculate, densely covered with white hairs; bracts oblong, 2.5-12 mm. long, margins ciliate; bractiole elliptical or obovate, sometimes lobed at apex, distinctly reticulate, 3-5 mm. long, about 5 mm. wide; calyx very small; corolla yellow, about 5 mm. long, regularly 5-lobed, segments spreading; stamens 4, longer than the corolla-tube, 2 stamens with long multicellular-hairs on the filaments; style linear, 2.5 mm. long; stigma capitate; achenes winged, oblong, 3-4 mm. long, 4-nerved on the ventral side, with puberulous hairs.

Distributed in Taiwan.

Nantou: Ten-tzu to Yin-hai, T. C. Huang, C. F. Hsieh & M. T. Kao 5701; Mt. Nen-ko, H. H. Bartlett 6184. **Hualien:** Nai-taroko, E. Matsuda s. n. Aug. 1918 (Type in TAL.); Mt. Luan, M. T. Kao 6941.

1(3) *Patrinia scabiosaefolia* Fischer ex Treviranus, Ind. Sem. Hort.

Vratisl. App., 5: 2, 1820.....Plate 3.

Perennial herbs; stems terete rather stout, erect, about 5 mm. thick, 60-130 cm. high, glabrous in upper parts, more or less covered with white hairs at base; radical leaves pinnatifid, petiole short or up to 9 cm. long, cauline leaves opposite, distant, clasping at base, pinnately divided, terminal lobe large, elliptical, lateral lobes very small, glabrous or sparingly puberulent on both surfaces, margins dentate, ciliate; inflorescence in compound corymbs, many-flowered, peduncles long, with minute white hairs; bracts narrowly lanceolate, 2-6 mm. long, margins with short hairs at base; bractiole scale-like, opposite, about 1 mm. long; calyx absent; corolla yellow, 2.5-3 mm. long, with long loose hairs inside, regularly 5-lobed, segments spreading; stamens 4, 3.4-5 mm. long, 2 stamens sparsely covered with white hairs nearly base; style linear, 2.5 mm. long; stigma depressed; achene with a small wing, oblong, 3-4 mm. long, more or less flat.

Distributed in Sakhalin, Manchuria, East Siberia, Korea, Japan, Ryukyus and Taiwan.

Hsinchu: Mt. Li-tung, S. Sasaki s. n. Aug. 1913. **Taichung:** Sung-lin, S. Sasaki s. n. July 27, 1922; pai-kou-ta-shan, Mori s. n. Sept. 1, 1903. **Nantou:** Mt. Neng-ko, T. C. Huang, C. F. Hsieh & M. T. Kao 5701, M. T. Kao 5736.

1(4) *Patrinia villosa* (Thunb.) Jussieu ex DC., Prodr., 4: 624, 1930.....Plate 4.

Valeriana villosa Thunberg, Fl. Jap. 32, pl. 6, 1784.

Large perennial herbs; stems erect, up to 100 cm. high, branched above, densely pubescent throughout; leaves opposite, lower leaves deeply pinnatifid into 3 to 5 lobes, terminal lobe much larger than the lateral ones (Pl. 4. fig. 13), long petiolate,



Plate 3. *Patrinia scabiosaeifolia* Fisher ex Treviranus (T. C. Huang, C. F. Hsieh & M. T. Kao 5701). 1. habit; 2. flower; 3. bracts; 4. vertical section of flower; 5. stamens; 6. stigma; 7. ovary section 8. fruit; 9. bracteole; 10. wing; 11. hairs; 12. part of flower inflorescence; 13. part of fruit inflorescence.

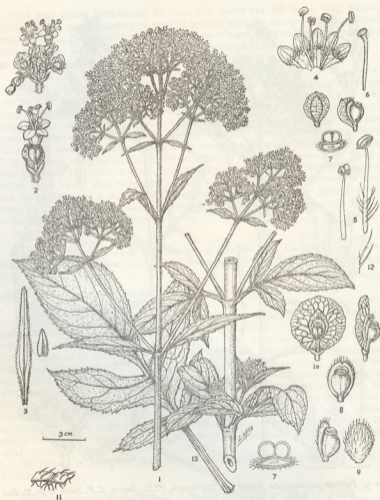


Plate 4. *Patrinia villosa* (Thunb.) Jussieu (W.T. Cheng 1559). 1. habit; 2. flower; 3. bracts; 4. vertical section of flower; 5. stamens; 6. stigma; 7. ovary section; 8. fruit; 9. bracteole; 10. wing; 11. setose hairs; 12. multicellular hairs; 13. lower leaf.

both surfaces and margins pubescent, upper leaves shortly petiolate or sessile, undivided, lanceolate or elliptical, coarsely serrate, both surfaces and margins pubescent; inflorescence terminal or in axillary duplicate-corymbs, densely pubescent; lower bracts ciliate, upper bracts glabrous; bracteole ovoid, 1.5 mm. long, densely pubescent calyx minute, 5-lobed; corolla white, about 4 mm. across; regularly 5-lobed, segments spreading, tube short; stamens 4, inserted at the base of the corolla-tube, filaments linear 2.5-3 mm. long, sparsely hairy below; style linear, 2 mm. long; stigma capitate; achenes obovoid, 2-3 mm. long, thick, wing orbicular, 5-6 mm. in diameter, with distinctly anastomosing veinlets.

Hsinechu: Kwan-wu, *T. C. Huang 4236*. **Nantou:** Wu-she, *W. T. Cheng 1558*; Lu-shan, *M. T. Kao 7957*.

This species is similar to *P. formosana*, but differs in having the lower leaves deeply pinnately divided, and having 4, instead of 2 stamens, and with bracts that are glabrous on the upper side.

2. TRIPLOSTEGIA Wall.

Perennial, erect, slender herbs; stems covered with glandular-hairs on the upper parts; leaves opposite, petiolate, toothed or pinnatifid, uppermost distant, small, sessile; inflorescence terminal or axillary cymose; flowers small, sessile or shortly pedicelled, bracts small, narrow-oblong, and 4 epicalyx covered with glandular-hairs; calyx-limb minute, obscurely toothed; corolla-tube pink or purple, funnel-shaped, 5-lobed, segments equal, spreading; stamens 4 inserted at the base of the corolla-tube; style linear, stigma capitate; achene shortly beaked, free within the utricular involucre, 8-ribbed, with white hairs; crowned by the unaltered calyx-limb.

Only one species distributed in Himalayas and Taiwan.

2(1) *Triplostegia glandulifera* Wall. Cat. 436, 1828; DC. Prodr., 4:

642, 1830 Plate 5.

Perennial, erect slender herb, stems cylindrical, 15-26 cm. high, covered with glandular-hairs on the upper parts, and villous or nearly glabrous on the lower parts; leaves opposite, petiolate, toothed or pinnatifid, 5-10 cm. long, both surfaces pubescent upper most distant, small, sessile; inflorescence terminal or axillary, cymose; flowers small, sessile or shortly pedicelled; bracts opposite, narrowly oblong, 2-3.5 mm. long, pubescent; epicalyx 4, about 2.5 mm. long, covered with glandular-hairs and villous on the outside, cirrose at apex; calyx-limb minute, obscurely toothed; corolla-tube pink or purple, funnel-shaped, about 3.5 mm. long, 5-lobed, segments equal, spreading; stamens 4, about 2 mm. long, inserted at the base of the corolla-tube; style linear, about 4 mm. long; stigma capitate; achene shortly beaked, 8-ribbed, with white hairs, crowned by the unaltered calyx-limb.

Distributed in Himalayas and Taiwan.

Taichung: Hsu-shan, *T. Hosokawa 2224*. **Nantou:** Neng-kao, shan, *T. C. Huang. C. F. Hsieh & M. T. Kao 5796*. **Chiayi:** Alishan, *Y. Yamamoto & K. Mori s. n. Nov. 6, 1932*; Mt. Morrison, *T. Suzuki 19358*. **Hualien:** Chung-yang-chien-shan, *T. Suzuki 17607*.

3. VALERIANA Linn.

Pubescent or glabrous herbs; stems erect or stoloniferous, terete or angular; leaves opposite, pinnate or pinnatifid, often decurrent, entire, crenate or toothed;

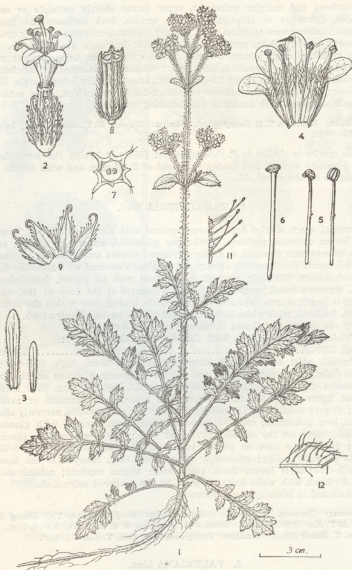


Plate 5. *Triptostegia glandulifera* Wall. (T. C. Huang, C. F. Hsieh & M. T. Kao 5803). 1. habit; 2. flower; 3. bracts; 4. vertical section of flower; 5. stigma; 6. fruit; 7. ovary section; 8. bracteole; 9. glandular hairs; 10. glandular hairs; 11. glandular hairs; 12. setose hairs.



Plate 6. *Valeriana fouriei* Briquet (T. C. Huang, C. F. Hsieh & M. T. Kao 5781). 1. habit; 2. flower; 3. bracts; 4. vertical section of flower; 5. stamens; 6. stigma; 7. ovary section; 8. fruit; 9. plumose bristle; 10. hairs; 14. enlarge stem; 15. petal.

inflorescence terminal cymes, corymbosely paniced; bracts opposite, small, oblong or linear, persistent; calyx-limb in flower obscure, unrolling in fruit into 5-15 plumose bristles; flowers bisexual or unisexual; corolla funnel-shaped, subcampanulate, or rotate, the tube gibbous or straight, lobes 5, spreading, pink or white; stamens 3, rarely 4; stigma 2-3-fid or subentire; ovary inferior, 1-ovuled; fruits oblong-lanceolate, compressed, planoconvex, 3-nerved) on the back, 1-nerved on the face.

About 200 species in moist temperate regions, 3 species in Taiwan.

KEY TO THE SPECIES

1. Stamens 3; terminal leaflets ovate or oblong..... 2.
 2. Stems angular; stigma trifid..... (1) *V. fauriei*
 2. Stems terete; stigma forked..... (2) *V. flaccidissima*
 1. Stamens 4; terminal leaflets oblanceolate..... (3) *V. kawakamii*

3(1) *Valeriana fauriei* Briquet, in Ann. Conserv. Jard. Bot.

Genève 17: 327, 1914 Plate 6.
Valeriana officinalis Thunb., Fl. Jap. 31, 1784, non Linn.

Rhizome short; stems erect, acutely angled, 30-80 cm. high, densely or sparsely covered with white hairs; radical leaves long or short petiolate trifoliate or pinnate into 5-7 segments, ovate, oblong-lanceolate to oblanceolate, 2-5 cm. long, 7-15 mm. wide, sessile, coarsely toothed with minute white hairs on both surfaces and margins; inflorescence terminal cymes, densely many-flowered; bracts opposite, membranaceous, lower bracts 1-2 cm. long, linear, dilated upwards ending in sharp tip, clasping at base, margins entire, base ciliate; upper bracts much shorter than lower bracts, 3-6 mm. long, ciliate, on upper dilated margins; flowers subsessile; calyx-limb obscure in flowers, unrolling in fruit, into about 10 plumose bristles, corolla tubular-campanulate, 6.5 mm. long, sparsely hairy inside, base narrowed and slightly oblique, lobes 5, oblong; stamens 3, inserted on corolla tube, filaments linear, 4-5.5 mm. long, base broadened; style 7.5 mm. long; stigma trifid; fruits oblong-lanceolate, compressed, plano-convex, 3 mm. long, densely covered with white hairs. Distributed in Sakhalin, south Kuriles, Manchuria, Korea, Japan and Taiwan.

I-lan: Nan-hu-ta-shan, *T. Suzuki 15461*. Taichung: Hsueh-shan, *S. Suzuki 5397*. Nantou: Mt. Neng-kao, *Huang, Hsieh & Kao 5781*; Wu-she, *C. C. Chuang & Kao 4237*. Chiayi: Mt. Morrison, *S. Suzuki s. n.* Oct. 11, 1927. Pingtung: *E. Matuda s. n.* Jan. 4, 1920. Hualien: Chou-yan-Chian-shan, *N. Fukuyama & T. Suzuki 15129*.

3(2) *Valeriana flaccidissima* Maximowicz in Bull. Acad. St.—Petersb.,

12: 228, 1867 Plate 7.

Valeriana nokozenensis Yamamoto, Suppl. Icon. Formos. 5: 31, 1932, *syn. nov.*

Herbs, bad-smelling when dry; rhizome short; stems erect and terete, stoloniferous at base, becoming grooved when dried, minutely hairy especially on nodes; leaves opposite, both radical and cauline membranaceous, petiolate, 5-7 cm. long, pinnatifid to pinnate, terminal leaflets ovate, margins irregularly dentate, upper cauline leaves smaller, sparsely and minutely hairy on both surfaces and margins; inflorescence terminal cymes, densely flowered; bracts opposite, linear, 2-7 mm. long; calyx-limb in flower obscure, unrolling in fruit into 5-15 plumose bristles; corolla white, infundibuliform, 1.5-2 mm. long, glabrous, lobes 5, spreading; stamens 3, inserted on neck of corolla tube, filament linear about 1 mm. long; style linear about 0.5 mm. long; stigma forked; achenes ellipsoidal 2-2.5 mm. long, ribbed.



Plate 7. *Valeriana floccidissima* Maxim. (M.T. Kao 7234). 1. habit; 2. flower; 3. bract; 4. vertical section of flower; 5. stamen; 6. stigma; 7. ovary section; 8. fruit; 9. plumose bristle; 10. glandular hairs.



Plate 8. *Valeriana kawakamii* Hay. (S. Sasaki s. n. Sept. 24, 1924). 1. habit; 2. flower; 3. bract; 4. vertical section of flower; 5. stamen; 6. stigma; 7. ovary section; 8. fruit; 9. plumose bristle; 10. hairs; 11. lower leaf; 12. part of flower inflorescence.

Distributed in Japan and Taiwan.

I-lan: Mt. Tai-ping-shan, *S. Sasabi s. n.* Apr. 25, 1930; Nan-hu-ta-shan, *Kao 5239*. **Minoli:** Ta-pa-chian-shan, *T. Hosokawa 2441*. **Taichung:** Hsu-shan, *T. Hosokawa 2326*. **Nantou:** Chi-ti to Yan-shan, *Kao 7234*; Neng-kao shan, *Huang, Hsieh & Kao 5759*.

3(3) Valeriana kawakamii Hayata Icon. Pl. Formos. 5: 82, 1915.....Plate 8.

Stems terete, erect, 10-40 cm. high, stoloniferous at base; leaves opposite pinnately compound, 1.5-7 cm. long, petiolate; lateral leaflets elliptical, lower pairs gradually smaller, terminal leaflets oblanceolate, 0.5-2 cm. long, 3-6 mm. wide, dentate, minutely hairy on both surfaces and margins, to subglabrous; inflorescence many flowered terminal cymes; bracts opposite, linear, about 4 mm. long, apex obtuse, base ciliate, clasping; flowers sessile; calyx-limb obscure in flower, unrolling in fruit, 5 mm. long; corolla white, funnel-form, lobes 5, spreading; stamens 4, inserted near top of corolla tube; filaments linear about 3 mm. long; style 2.5 mm. long; fruits oblong-ovoid, compressed, plano-convex, 3 mm. long.

Distributed in Taiwan.

Taichung: Ta-hsueh-shan, *S. Sasaki s. n.* July. 22, 1932. **Nantou:** Ten-tzu, *T. C. Huang, C. F. Hsieh & M. T. Kao 5840*. **Chiayi:** Mt. Morrison, *S. Sasaki s. n.* Sept. 1, 1934.

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