



Passiflora (Passifloraceae) in Taiwan

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Most of the eight *Passiflora* species in Taiwan were previously reported as naturalized, except for the new species *Passiflora foetida* var. *tainaniana* (1982: 5) reported by Y.-C. Liu & C.-H. Ou in 1982, and a newly naturalized species, *Passiflora ligularis* Juss. (1805: 113), recently found in central Taiwan. *Passiflora suberosa* L. (1753: 958) has been growing in Taiwan for a long period of time, and according to the description and treatment by Porter-Utley (2014), we used the scientific name *P. suberosa* subsp. *litoralis* (Kunth 1817: 138) K.Port.-Utl. ex M.A.M.Azevedo, Baumbratz, & Gonç.-Estev (2012: 47). A key to the eight *Passiflora* species, photographs, and their scientific name revisions are provided below to aid their identification.

1	Stems with 4 broad acute wings	<i>Passiflora quadrangularis</i>
-	Stems without wings	2
2	Leaves with ocelli	<i>Passiflora biflora</i>
-	Leaves without ocelli	3
3	Petioles without glands; bracts deeply pinnatisect	4
-	Petioles with glands; bracts not pinnatisect, or absent	5
4	Ovary glabrous; fruit orange	<i>Passiflora vesicaria</i>
-	Ovary pubescent; fruit green	<i>Passiflora foetida</i> var. <i>tainaniana</i>
5	Leaf margins serrate	<i>Passiflora edulis</i>
-	Leaf margins entire	6
6	Leaves 3-lobed; flowers without petals	<i>Passiflora suberosa</i> subsp. <i>litoralis</i>
-	Leaves undivided; flowers with petals	7
7	Leaves elliptic	<i>Passiflora laurifolia</i>
-	Leaves cordate	<i>Passiflora ligularis</i>

Passiflora biflora Lam. (1789: 36) (Fig.1 A); Chung *et al.* (2018: 78)

Additional specimens examined:—TAIWAN. New Taipei City: Xindian District, Daxiangshan, October 8, 2017, *P.-H. Chen & A.-C. Chung* 1309, 1310 (TAIF).

Passiflora edulis Sims (1818: 1989) (Fig.1 B); Hayata (1917: 30); Yang (1951: 34); Liu *et al.* (1967: 125); Chen & Hu (1976: 102); Kao (1979: 438); Kao (1993: 839); Liu *et al.* (2000: 227); Wu *et al.* (2010: 153); Chung (2017: 63); The Red List of Vascular Plants of Taiwan (2017: 99)

Additional specimens examined:—TAIWAN. Miaoli: Guanwu, March 31, 1976, *C.-M. Yang s.n.* (PPI); Changhua: Yuanlin, March 29, 1991, *H.-T. Siao s.n.* (PPI); Nantou: Guandaushi, March 29, 1965, *C.-Y. Chiu s.n.* (PPI); Kaohsiung: Baoshan, May 9, 1971, *J.-T. Chang* 368 (PPI); February 12, 1992, *S.-T. Wu* 148 (PPI); Tengchih, May 7, 2000, *S.-Z. Yang* 28871 (PPI); March 17, 2003, *C.-F. Chen & G.-P. Hsieh* 230 (PPI); Pingtung: Bypbinshan, April 1, 2006, *G.-P. Hsieh* 2494 (PPI); Santiman, April 28, 2002, *G.-P. Hsieh* 430 (PPI).

Passiflora foetida* var. *tainaniana Y.-C. Liu & C.-H. Ou (1982: 5) (Fig. 1 C); Chung (2017: 65)

=*Passiflora foetida* var. *ellisonii* Vanderplank (2013: 380)

Type:—TAIWAN. Pingtung: Santiman, February 7, 1971, *F.-Y. Lu & C.-H. Ou* 402 (holotype: NCUF!, isotype: NCUF!).

Additional specimens examined:—KINMEN Tunsha, March 26, 2004, *C.-L. Lin 20* (TAIF).—TAIWAN. Taichung: Tiehchenshan, September 25, 2006, *Y.-C. Lin & H.-C. Wu 396* (TNM); Longjing, February 19, 2017, *P.-H. Chen 1192* (TAIF); Tainan: Hsinhua, December 15, 1974, *F.-Y. Lu & C.-H. Ou 2988A* (NCUF); April 27, 1985, *S.-Z. Yang 1063* (PPI); Petiman, October 13, 2002, *G.-P. Hsieh 889* (PPI). Kaohsiung: Soushan, May 10, 1987, *M.-T. Kao 10541* (TAI); Tungshatao, May 20, 1994, *T.-C. Huang 16610* (TAI); April 26, 1994, *T.-C. Huang et al. 16539* (TAI); November 14, 1996, *C.-K. Liao 327* (PPI, TAIF); February 22, 1997, *C.-K. Liao 407* (PPI); Kwaninshan, April 27, 1987, *M.-T. Kao 10559* (TAI); Pingtung: Baoli, November 8, 1983, *S.-Z. Yang 617* (PPI); Chunhsing Bridge-Chiatulu, April 11, 1998, *C.-M. Wang & H.-M. Lin 3074* (TNM); Houbihu, May 31, 2019, *P.-H. Chen & A.-C. Chung 2185* (PPI); Hsinyuan, June 2, 2003, *C.-F. Chen 1573* (PPI); Hsuhai-Hsuhai grassland, January 32, 1996, *C.-M. Wang & H.-M. Lin 2054* (TAIF, TNM); Maopitou, August 9, 1998, *L.-W. Chang 44* (TAIF); Olanpi, *F.-Y. Lu & C.-H. Ou 6364* (NCUF); Peililoushan, December 30, 1999, *C.-M. Wang 4054* (TNM); November 26, 1999, *C.-M. Wang 3988* (TNM); Santiman, 16 Feb 1978, *C.-L. Yeh 785* (PPI); Shanhai, November 6, 1993, *T.-T. Chen et al. 2560* (TAIF); Shiaoliuchiu, April 1, 1979, *H.-N. Yang 2442* (TAI); Shuangliu-Maotzushan, June 11, 2005, *C.-K. Yang 1065* (TNM); Wanlito, April 18, 1985, *M.-T. Kao 10082* (TAI); Taitung: Changpin, April 1, 2004, *G.-P. Hsieh 1253* (PPI); Lutao, May 29, 2004, *G.-P. Hsieh 1411* (PPI); 27 May 2006, *C.-H. Wang & G.-P. Hsieh 7201* (TNM); Hualien: Chihsingtan, 5 September 1996, *C.-K. Liou et al. 544* (TAIF).

Note:—Mature fruits of *P. foetida* var. *tainaniana* were reported to be orange-yellow in color (Liu & Ou, 1982). However, we observed that their color was green in the wild at all times. The other characteristics were identical to those of *P. foetida* var. *ellisonii*, as described by Vanderplank (2013). Svoboda *et al.* (2016, 2018) accepted Vanderplank's name. These two scientific names are valid, however, *P. foetida* var. *tainaniana* was prioritized (published in 1982), compared to *P. foetida* var. *ellisonii* (published in 2016). This variety is distributed along the coast of Western Australia, Pacific islands, Southeast Asia, India, and Africa (Vanderplank 2013).

Passiflora laurifolia L. (1753: 956) (Fig.1 D); Chen & Hu (1976: 103); Chen *et al.* (2016: 34)

Additional specimens examined: TAIWAN. Kaohsiung: Shuanghsi, April 16, 2016, *P.-H. Chen 1053* (PPI); April 21, 2016, *P.-H. Chen 1054* (PPI); 27 May 2016, *P.-H. Chen 1083* (PPI).

Note:—Several synonymies of *P. laurifolia* have been proposed, resulting in controversial opinions. Rome & d' Eeckenbrugge (2018) proposed a new lectotype for this species and provided a more complete description.

Passiflora ligularis Juss. (1805: 113) (Fig.1 E)

Type:—PERU. Huánuco, Tumbo, *J. Dombey 739* (holotype: MNHN-P-P00679002, photograph seen).

Additional specimens examined:—TAIWAN. Chiayi: Zhuqi, Fenqihu, September 16, 2017, *P.-H. Chen & A.-C. Chung 1297* (PPI); Shizilu, January 13, 2020, *P.-H. Chen & A.-C. Chung, 1905* (PPI).

Note:—The species has naturalized at medium altitudes in central Taiwan.

Passiflora quadrangularis L. (1759: 1248) (Fig.1 F); Liu *et al.* (1967: 125); Chen & Hu (1976: 103); Kao (1993: 840)

Additional specimens examined:—TAIWAN. Nantou: Chingshuikou, December 12, 1960, *T.-C. Huang 1870* (TAI); Chingshui to Hsienshih, December 13, 1960, *T. Shimizu 10271* (TAI); Chiayi: Taipo, July 25, 2015, *P.-H. Chen 880* (PPI); Kaohsiung: Kuanhsin, September 13, 1955, *S.-C. Lee et al. s.n.* (TAI); Shuanghsi, September 1997 *S.-C. Lin 51* (PPI); Pingtung: Laiyi, 7 May, 1971, *L.-C. Chang 360* (PPI); Taitung: Pinlan, February 26, 1987, *M.-T. Kao 10427* (TAI).

Passiflora suberosa L. subsp. *litoralis* (Kunth) K.Port.-Utl. ex M.A.M.Azevedo, Baumbratz, & Gonç.-Estev. (2012: 47) (Fig.1 G)

≡*Passiflora litoralis* Kunth (1817: 138)

=*Passiflora suberosa* L. (1753: 958); Yamamoto (1931: 241); Chen & Hu (1976: 103); Kao (1979: 438); Kao (1993: 840); Liu *et al.* (2000: 228); Wu *et al.* (2010: 153); Chung (2017: 66); The Red List of Vascular Plants of Taiwan (2017: 99)

Type:—PERU. Lima: Patibilca, *A.J.A. Bonpland, & F.W.H.A. von Humboldt s.n.* (holotype: MNHN-P-P00307301, photograph seen).

Additional specimens examined:—TAIWAN. Taoyuan: Jiouzuoliao, September 11, 2002, *C.-C. Chen 438* (PPI); Tainan: Xinhua, April 27, 1985, *S.-Z. Yang 1069* (PPI); Pingtung: Baoli, July 6, 1984, *S.-Z. Yang 842* (PPI); Lidingshan, December 12, 2014, *W.-W. Chuk 1* (PPI); Liuchiu Island, November 12, 2006, *T.-Y. Lo 44* (PPI); Pengchishan, November 1, 2009, *S.-Z. Chen 7* (PPI); Siangjiao Bay, February 13, 1960, *C.-E. Chang 2056* (PPI); Tahanshan, April 20, 1986, *S.-Z. Yang 3378* (PPI); September 26, 1999, *S.-M. Ku 70* (PPI); Taitung: Lanyu, August 27, 1985, *C.-E. Chang 17318* (PPI); Lutao, October 22, 2004, *G.-P. Hsieh 1606* (PPI).

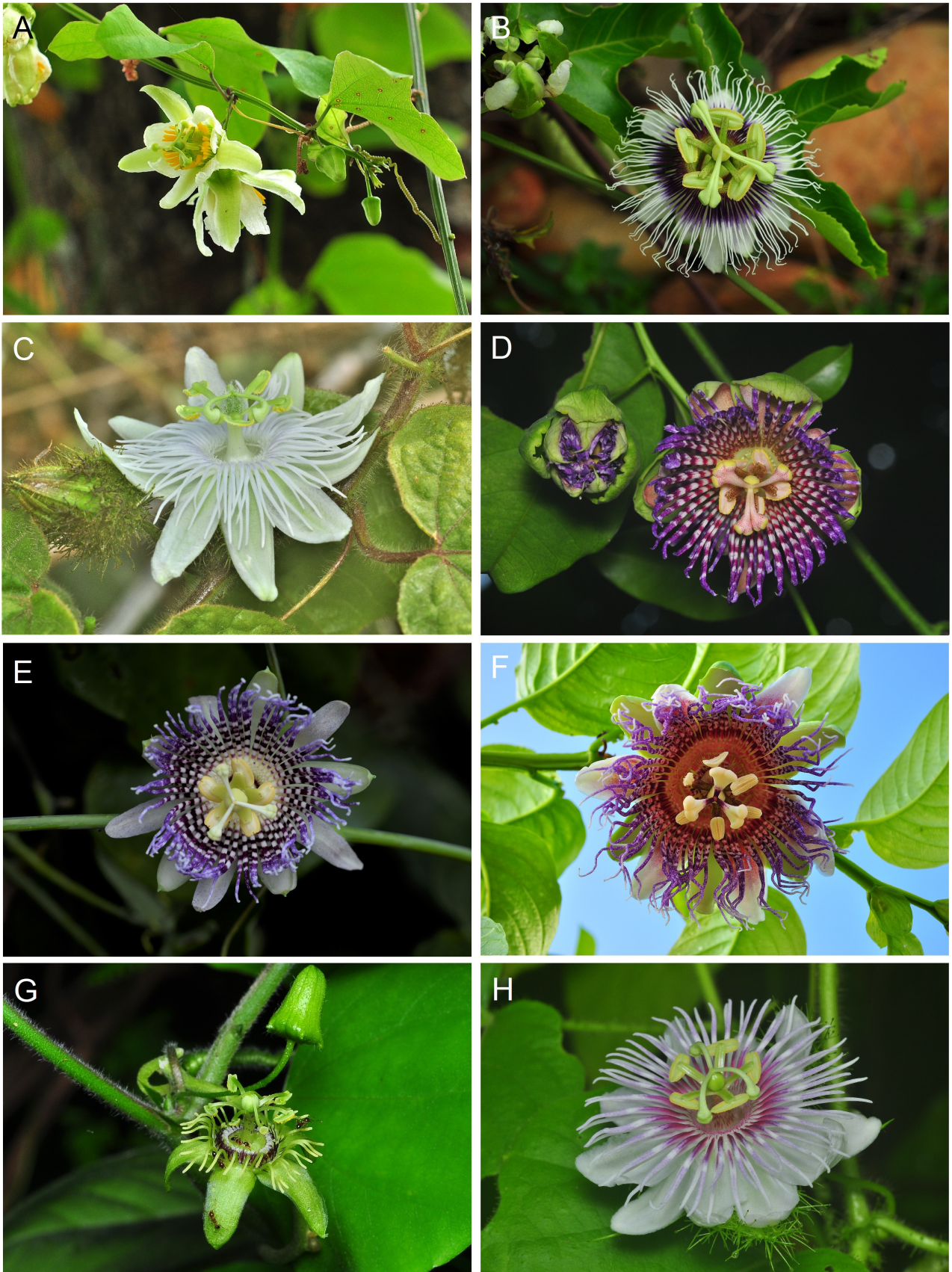


FIGURE 1. *Passiflora* in Taiwan. A. *P. biflora*. B. *P. edulis*. C. *P. foetida* var. *tainaniana*. D. *P. laurifolia*. E. *P. ligularis*. F. *P. quadrangularis*. G. *P. suberosa* subsp. *litoralis*. H. *P. vesicaria*. Photo courtesy of Po-Hao Chen.

Note:—*Passiflora suberosa* was treated by Porter-Utley (2014) as two subspecies, subsp. *suberosa* and subsp. *litoralis*.

In the type subspecies, sepals are white, glabrous; androgynophore 5.0–12.6 mm long; fruits ovoid; in subspecies *litoralis*, sepals are greenish yellow, pubescent; androgynophore 2.1–4.4 (–6.1) mm long; fruits ellipsoid, transversely ellipsoid, or globose (Porter-Utley 2014). The taxon in Taiwan coincides with the latter and should be treated as subsp. *litoralis*, which is widely distributed in the lowlands of Taiwan.

Passiflora vesicaria L. (1759: 20) (Fig. 1 H)

=*Passiflora foetida* L. var. *hispida* (DC. ex Triana & Planch.) Killip ex Gleason (1931: 408); Hsu (1971: 147); Chen & Hu (1976: 103); Kao (1979: 438); Kao (1993: 839); Wu *et al.* (2010: 153); The Red List of Vascular Plants of Taiwan (2017: 99)

=*Passiflora foetida* L. (1753: 959); Liu *et al.* (2000: 228); Chung (2017: 64)

Type:—JAMAICA. Without locality, *P. Browne s.n.* (lectotype: S08–4074, photograph seen).

Additional specimens examined:—TAIWAN. Tainan: Petiman, March 22, 2003, *G.-P. Hsieh 958* (PPI); Kaohsiung: Shihbaluohanshan, July 18, 2010, *J.-G. He 152* (PPI); Pingtung: Baoli, November 8, 1983, *S.-Z. Yang 617* (PPI); Chenan, December 26, 2004, *K.-P. Lo 585* (PPI); Chunri, May 7, 1988, *S.-H. Shih 173* (PPI); Fengkang, March 22, 2003, *G.-P. Hsieh 959* (PPI); Hengchun, April 21, 2018, *P.-H. Chen 1569, 1570* (PPI); Hsinpi, April 10, 2004, *G.-P. Hsieh 1307* (PPI); Liuchiu Island, May 13, 2007, *T.-Y. Lo 87* (PPI); Longluan Lake, April 21, 2018, *P.-H. Chen 1573* (PPI); Neipwu, April 19, 2004, *G.-P. Hsieh 1343* (PPI); NPUST, May 31, 2019, *P.-H. Chen 2181* (PPI); Taimali, December 28, 1994, *C.-M. Wang & H.-M. Lin 1358* (PPI); Wanan, April 25, 2000, *S.-M. Ku 574* (PPI).

Note:—Mature fruit color is a diagnostic characteristic of the genus *Passiflora* (Vanderplank 2013). Mature fruits of *P. ciliata* Dryand, *P. foetida*, and *P. vesicaria* are red, green, and orange-yellow, respectively. Therefore, according to Vanderplank (2013), the name of *P. foetida* var. *hispida* used for a long time in Taiwan would be revised to *P. vesicaria*, which had migrated over the lowlands of Taiwan.

Acknowledgements

We thank Dr. Harlan Svoboda for providing information on the scientific names.

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