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Toxicopueraria peduncularis (Fabaceae), a new genus and species record for Thailand

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ABSTRACT

Toxicopueraria peduncularis (Graham ex Benth.) A.N.Egan & B.Pan bis is reported for the first time in Thailand. Genus and species descriptions are provided, along with vernacular names, distributional data and specimens examined. This Thailand population is shown to be a distant outlier from the known range for *T. peduncularis* and its closely related sister species, *T. yunnanensis* in Yunnan, Sichuan and Guizhou, China.

KEYWORDS: Fabaceae, *Toxicopueraria*, Leguminosae, *Pueraria*, northern Thailand.

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INTRODUCTION

Toxicopueraria A.N.Egan & B.Pan bis is a small genus of two species in the legume family (Fabaceae, Leguminosae) in Asia which was recently segregated from *Pueraria* DC. based on molecular and morphological evidence (Egan & Pan 2015; Egan *et al*., 2016). Lackey (1977) suggested *T. peduncularis* was misplaced in *Pueraria* because it lacked paraveinal mesophyll, a trait that all *Pueraria sensu stricto* species have, and found that it had a number of differences in seed protein electrophoretic profiles. Lackey also noted differences in bracteole size, calyx shape, and pod morphology. Although van der Maesen (1985) did not believe these morphological differences were enough to separate the species into another genus, he did place *T. peduncularis*, along with three other species, apart from the main section *Pueraria* based on morphological differences including the basifixed (as opposed to medifixed) stipules, flowers four or more per node born on shortened brachyblasts or racemuli, and a vexillum without callosities. Molecular evidence confirmed the morphology-based hypotheses of Lackey (1977) and van der Maesen (1985), placing *Toxicopueraria* as an early diverging, solitary lineage within the Glycininae subtribe of tribe Phaseoleae, diverging from *Pueraria sensu stricto* around 16 million years ago (Egan *et al*., 2016).

Toxicopueraria is known in Thailand from only two collections of *T. peduncularis* (Graham ex Benth.) A.N.Egan & B.Pan bis recently discovered in the BKF and QBG herbaria. The first collection was made in 1999 from an unspecified location within Doi Inthanon National Park, Chom Thong District, Chiang Mai. The second was collected in 2008 along the road to the summit of Doi Inthanon National Park. While one collection is georeferenced, the other does not include precise coordinates. However, based on elevation notes, it is likely the collections were made within 3 kilometers of each other and are from an area near the summit of Doi Inthanon, the highest peak in Thailand, rising to 2565 meters. *Toxicopueraria* grows at high elevations across its native range (Fig. 1). Doi Chiang Dao (2100 m) and other high peaks of the Loi Lar Mountain Range of northern Chiang Mai may provide suitable habitat and possibly host other populations of this species.

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MATERIALS AND METHODS

This synopsis is based on observations in the field and on the examination of 81 collections, two from Thailand, with unicates and duplicates housed at the following herbaria: A, AAU, BKF, BM, C, E, G, K, L, MO, P, QBG, US. All specimens cited have been seen by the authors, unless otherwise annotated as *n.v.*

TREATMENT

Toxicopueraria A.N.Egan & B.Pan bis, Phytotaxa 218(3): 214. 2015. Type species: *Toxicopueraria peduncularis* (Graham ex Benth.) A.N.Egan & B.Pan bis (= *Neustanthus peduncularis* Graham ex Benth.)

Perennial, robust, twining, woody vine climbing over shrubs and trees. *Roots* not tuberous. *Leaves* pinnately trifoliolate with basifixed, lanceolate stipules, persistent to caducous, leaving a raised, irregular stipule scar. *Petioles* striate; terminal leaflet ovate to rhomboid, entire; stipels bristle-like. *Inflorescences* 1 or 2 axillary pseudoracemes, slightly nodose, bearing 4 or more flowers per node, long and pendulous. *Calyx* campanulate; lobes 5, short and blunt with the upper two fused or minutely bifid. *Corolla* large; vexillum apex slightly emarginate, without callosities; base reflexed. *Stamens* monadelphous, the vexillary stamen at first adherent to staminal column, becoming free with age; stamens and style do not touch vexillum in late blooming. *Ovary* elongate, upcurved distally. *Pods* chartaceous, oblong, glabrous, valves not twisting upon dehiscence. *Seeds* orbicular, compressed.

A genus of two species, both in tropical Asia. The type species, *Toxicopueraria peduncularis*, is native in Thailand, and currently only known from Doi Inthanon National Park, Chiang Mai Province. *Toxicopueraria yunnanensis* (Franch.) A.N.Egan & B.Pan bis, is endemic to southwestern China.

Etymology.— *Toxicopueraria* is derived from the latin toxicus ("poisoned"), from the cultural use of pulverized stems and roots as an insecticide and fish poison in Yunnan, China (Perry & Metzger, 1980), and *Pueraria* from a previous generic placement.

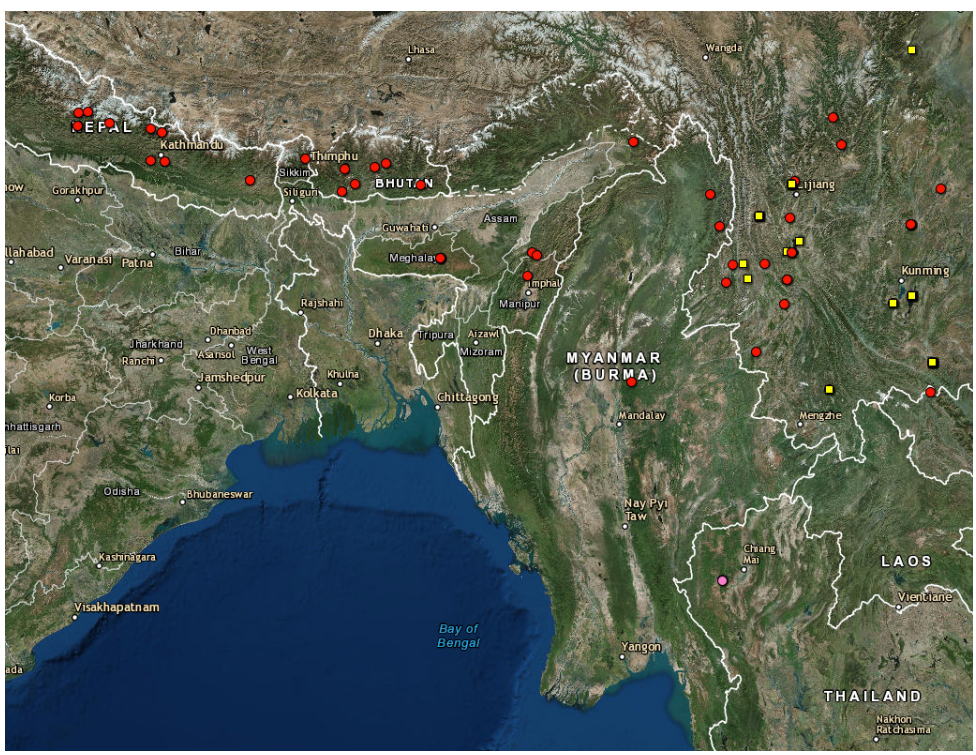

Figure 1. Map of distribution of *Toxicopueraria* throughout Asia. Circles denote *Toxicopueraria peduncularis* with all those outside Thailand in red and the two Thai collections in pink. Squares denote *Toxicopueraria yunnanensis*.

Toxicopueraria peduncularis (Graham ex Benth.) A.N.Egan & B.Pan bis, Phytotaxa 218(3): 215. 2015. — *Neustanthus peduncularis* Graham ex Benth. in Miquel, Pl. Jungh. 2: 235. 1852.— *Pueraria peduncularis* (Graham ex Benth.) Benth. in Bentham, J. Linn. Soc. Bot. London 9: 124. 1867. Type: Nepal, *Wallich 5354* (lectotype [van der Maesen 1985] **K** 001120656**!**; isolectotypes **K** 000264081**!**, **BM** 000958608**!**, **BM** 000521674**!**, **BM** 000958607**!**, **CAL** n.v., **G** 00370586**!**, **G** 00370595**!**). Fig. 2.

— *Pueraria peduncularis* (Graham ex Benth.) Benth. var. *violacea* Fanch. in Franchet, Pl. Delav. 182. 1890. Lectotype [van der Maesen 1985] China, Yunnan, woods near Tapintze, 18 Aug. 1885, *Delavay 1983* (lectotype: **P** 00500995**!**; isolectotypes: **A** 00228287**!**, **A** 00228289**!**, **K** 000264082**!**).

Perennial woody liana, climbing to 10 m long. Leaves and stems densely pubescent with adpressed hairs when young, glabrescent. *Leaves* pinnately trifoliolate; stipules basifixed, linear-acuminate, 4–10 mm × 2 mm, caducous; stipules without small spur-like projections beneath; petiole striate, pubescent to glabrous, 4–13 cm long; terminal leaflets ovate to rhomboid, 5–14(–23) cm × 2–8(–14) cm with apex acuminate; base acute; lateral leaflets smaller, oblique, strigulose on both sides, 5–16 cm × 2–12 cm; base rounded-cuneate; margins entire; apex long-acuminate; veins prominent below, pubescent, in 6 or 7 unequal pairs with basal pair opposite; petiolules 3–7 mm long, pubescent; stipels small, 1–3 mm long, bristle-like, persistent. *Inflorescences* 1 or 2 axillary pendulous pseudoracemes, 10–40(–60) cm long, slightly nodose (with swollen nodes or brachyblasts), (2–)4–7 flowers per node; bracts subtending the nodes 1–3 mm long, caducous; pedicels 8–14 mm, pubescent, slender but thickening in fruit; bracteoles 2 per flower, linear, to 1 mm long, hirsute, caducous. *Calyx* 4–8 mm long, with short, adpressed hairs on the outside, glabrous inside, tube 3–5 mm long, 4- or 5-lobed, gibbous above the base; lobes shorter than the tube, acute to broadly so, the upper two lobes almost or entirely connate, 1–3 mm; lateral lobes triangular, 1–2 mm long; lower lobe narrowly triangular, 1–1.5 mm long. *Corolla* purplish-blue to violet or white suffused with purple or pink at the tips; vexillum orbicular-ovate to obovate, 11–15 mm × 8–10; basal claw 3–4 mm long, auricles inflexed or truncate, without callosities; apex emarginate; wing petals oblong, 8–14(–15) mm × 3–5 mm; keel petals ventrally fused, 7–14 mm × 3–5 mm. *Ovary* elongate, pubescent, 5–8 mm long, ca. 7 ovules; style 2–5 mm long, the terminal 2–3 mm inclined towards the vexillum, glabrous; stigma terminal, globose, pubescent at the base. *Stamens* diadelphous, the vexillary stamen at first adherent to staminal column, becoming free with age, 10–14 mm long, the free part 2–3 mm, upcurved; anthers basidorsifixed, alternately on long and short filaments. *Fruits* [not yet known for Thailand] leguminous pods, flattened-oblong, black, purple-brown, or tan, glabrous, chartaceous, (1–)4–7 seeded, not septate, (3–)5–7 cm × 0.5–1 cm; base cuneate; apex acuminate; style persistent; dehiscent when mature, valves not twisting. *Seeds* compressed-ovoid, 3–4 mm × 2–3 mm, ca. 1.5 mm thick, dark mahogany to black, sometimes with a red streak, minutely punctate; funicle elongate, triangular in shape; aril elongate.

Thailand.— NORTHERN: Chiang Mai [Doi Inthanon National Park, 2270 m, 3 Oct. 1999, *Drechsler & Scholz 25* (**QBG**); road to summit, Doi Inthanon National Park, 1800 m, [latitude and longitude redacted for conservation purposes], 18 Sept. 2008, *Middleton et al. 4487* (**BKF**)] (All known Thailand collections. For other foreign representative collections see appendix).

Distribution.— In Thailand, *Toxicopueraria peduncularis* is only known from the summit area of Doi Inthanon above 1800 meters elevation, an area of less than 3 square kilometers. Elsewhere it is distributed in subalpine forests from Nepal eastward, through Sikkim (India), Bhutan, Arunachal Pradesh, Meghalaya and Nagaland (India), Putao and Pyin Oo Lwin (Myanmar) to the mountains of southwestern China, with outliers in Tonkin, Vietnam and Doi Inthanon, Thailand. Doi Inthanon represents a distant outlier, 800 km southeast from its closest known populations in Pyin Oo Lwin, Myanmar, 900 km south from Yunnan, China and 1000 km southwest from Tonkin, Vietnam (see Fig. 1).

Phenology.— In Thailand flowering is known in September and October, fruit not yet observed; elsewhere in its range flowering is observed from June to October; fruiting from August to December.

Ecology.— Cloud forests at high elevations in Thailand from 1800 to 2270 meters. Elsewhere in its range from (1000–)1750 to 3000 meters. The forest type is described by Chayamarit & Puff (2007) as Upper Montane Rain Forest and is largely

composed of oaks, pines, Theaceae and Ericaceous shrubs. *Toxicopueraria peduncularis* is a climber on these shrubs and trees at breaks in the forest canopy.

Conservation.— *Toxicopueraria peduncularis* in Thailand is assessed here as a species of high concern, being only known from one population occupying less than 3 square kilometers, and with very few other suitable locations available to it. The Global IUCN (2001) Ranking would have this species as Least Concern due to its wide distribution, although in Vietnam it should also be a species of concern. The NatureServe (2016) criteria would rank this species for Thailand as G5 N1 S1.

Vernacular.— No Thai common name is known for *Toxicopueraria peduncularis*. In south-western China it is known as 苦葛 ku ge, *bitter kudzu*, 云南葛藤 *Yunnan ge teng*, *Yunnan kudzu rattan*, and in Meghalaya, India as *ting khla*, *short ting*.

Figure 2. *Toxicopueraria peduncularis*: A. habit; B. young leaf, stipule, and young inflorescence; C. flowers; D. inflorescence. All photos of plants from Yunnan, China. Photos by Ashley N. Egan.

Notes.— The above description is based on the two specimens known from Thailand as well as from numerous other specimens from across the range of *Toxicopueraria*. The character states of the Thai collections fit well within the range of those observed from across the full distribution of *T. peduncularis*.

The closely related taxon, *Toxicopueraria yunnanensis* (Franch.) A.N.Egan & B.Pan bis, originally described by Franchet (1890), was synonymized under *T. peduncularis* by Lackey (1977) and followed by van der Maesen (1985, 1994, 2002), Wu (1995), and Wu & Thulin (2010). They were retained as separate species by Le and Zhu (2009) on the basis of leaf epidermis and seed coat microcharacters, and Egan and Pan (2015) based on floral and vegetation morphology.

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APPENDIX

Specimens examined (110).

Toxicopueraria peduncularis

China.— Guizhou [Weining, 5 Oct. 1930, *Y.Tsiang 9118* (**NY**)]. Sichuan [Mountains S of Muli, Mount Gibboh, 3050 m, Aug. 1928, *Rock 16936* (**US** 1334337); W of the Yalung R., between

Mutirong and Wandzanron Pass (Muli-Chiu-Lung-Hsien border), 3400 m, July 1929, *Rock 17425* (**US** 1334832); near Fengyuch 1800 m, Oct. 1914, *Schneider 2587* (**K**)]. Yunnan [Mountains of Ludu, NW of Li-Kiang [Yulong Shan], W of the Yangtze [Jinsha R.], 3080 m, Aug. 1929, *Rock 18508* (**US** 1510917); West Yunnan, Mar. 1933, *McLaren's Chinese Collectors B88* (**K**); Ta long tan, 17 Sept. 1888, *Delavay s.n.* (**P** 03065971 (pp)); Ta long tan, 24 Oct. 1888, *Delavay s.n.* (**P** 03065969); woods near Tapin-tze, 18 Aug. 1883, *Delavay 1983* (**A** 00228287, **A** 00228289 (ex P)); above Chaong-che-teou, near Tapintze, 20 July 1888, *Delavay 3588* (**US** 2497726); Pien Kio, 11 Nov. 1887, *Delavay s.n.* (**K**, **P** 02961691, **P** 02961687); Pe yen tsin, 17 June [c.1916], *Siméon Ten s.n.* (**C** x2); beyond Chieu Chan, between Likiang [Yulong Shan] and Talifu [Dali], 13–18 Sept. 1922, *Rock 6563* (**US** 1213612); Tali (Dali) Range [Cangshan], Aug. 1929, *Forrest 28071* (**E**); eastern flank of Tali Range [Cangshan], 6700–7500 ft [2000–2300 m], 25 40 N, June 1906, *Forrest 4259* (**E**); Dali [Cangshan], Sept. 1983, *Sino-British Expedition to Cangshan 1981 161* (**A** 0019565); Ad viam Yunnanfu-Dali (Talifu) [between Kunming & Dali], 1850–2150 m, 6 Sept. 1914, *Handel-Mazzetti 4873* (**K**, **US** 1529696); Ad viam Yunnanfu-Dali (Talifu) [between Kunming & Dali], 1850–2150 m, 4 Nov. 1915, *Handel-Mazzetti 4873* (**US** 1529696); W of Talifu, Mekong [Lancang] watershed, en route to Youngchang and Teng yuch [Tengchong], 5800 ft [1750 m], Sept.–Oct. 1922, *Rock 6663* (**US** 1213613); Feng Yuch Talifu road, south end of the Yeung chang fu Valley, 6000–9000 ft [1875–2750 m], 25 05 N, Sept. 1905, *Forrest 1058* (**E** 00619470); Tengchong, Jietou Xiang, Shaba Cun, Tiantaishan, W side of Gaoligong Shan, 2130 m, [25 24 13 N 98 43 4 E], 28 Oct. 1998, *Li et al. 11098* (**A** 00195964, **E** 00245319); Tengchong Xian, Dongshan Xiang, Qingcaitang, on the old road from Tengchong to Baoshan between Tengchong and Longchuan Jiang, 2000 m, [25 01 10 N 98 34 43 E], 2 Nov. 1998, *Li et al. 11311* (**A** 00195962, E00208274); *Forrest 6949* (**K**); *Forrest 9143* (**E** 0120979); Tong-tchouan [Dongchuan], 2600 m, June 1911, *Maire s.n.* (**P** 02961721); Tong-tchouan [Dongchuan], 2700 m, June 1911, *Maire s.n.* (**P** 03065956); Tchong-chan [Dongchuan], 6 Feb. 1905, *Ducloux 399* (**NY**); Tchong-chan [Dongchuan], 6 Sept. 1909, *Ducloux 3763* (**P** 0296184); Shekuai Town, Lugongshan to Jiulong village, Dongchuan, 2800 m, 26 July 2008, *Peng 8155* (**K**); Yao-Chou, 13 Apr. 1936, *McLaren's Chinese Collectors 223F* (**C**); Yo lin chan fries Tong mig, 1910, *Ducloux 7384* (**P** 02961734); Yun-nan-sen, *Maire 2307* (**US** 719093); des mont a Tien-sin 2800 m, July 1911, *Maire s.n.* (**P** 03065947); Kengma [Gengma], Chuichayko, 2450 m, 10 Aug. 1938, *Yu 17302* (**A**); Shunning, Tehseling [Fengqing], 2100 m, 11 Sept. 1938, *Yu 17619* (**E** 00619473); Miening, Poshang, 2500 m, 7 Oct. 1938, *Yu 17929* (**E** 00619474); Mengzi [Mengzi], *Henry 9177* (**US** 456805); Mengzi [Mengzi], 5500 ft [1675 m], *Henry 9177D* (**K**, **NY**); Mengzi [Mengzi], N Mts, 8500 ft, *Henry 9177B* (**US** 455053); Ta Lei sten summit, Meng-tsze, *Henry 9177B* (**US** 456806); Menzte [Mengzi], Nov. 23, *Henry 9177E* (**NY**); Feng Chen Sen Mt, 7000 ft [2150 m], *Henry 9177E* (**E** 00619476, **K**, **MO**, **NY**, **US**); Szimao [Simao], W Mts, 5000 ft [1525 m], *Henry 12483* (**A** 00195976, **NY**)].

Bhutan.— Trongsa [Chendebi, 7500 ft [2275 m], 30 June 1938, *Gould 707* (**K** 000264117)]. Trashigang [13 km S of Riserboo, N of Samdrup Jongkhar, 2200 m, [27 05 N 91 25 E], 25 June 1979, *Grierson & Long 2260* (**E** 00615451)]. Chhukha [between Jumudag and Chasilakha, 1950 m, [26 57 N 89 33 E], 21 Feb. 1982, *Grierson & Long 3105* (**E** 00615450, **K**); Bomte La, 7000–8000 ft [2150–2450 m], 14 July 1938, *Kingdon Ward 13917* (**BM**). Bumthang [Yutola Pass, between Bumthang and Trongsa, 9500 ft [2900 m], 4 Aug. 1945, *Ludlow et al. 17007* (**BM** 001118631). Thimphu [Traslu-dio dgong, Thimbu Chu [River]. 8000 ft [2450 m], 18 Oct. 1949, *Ludlow et al. 17541* (**BM** 001118632). Dagana [Dotena Timpu, 8000 ft [2450 m], 31 July 1914, *Cooper 2507* (**E** 00619436)].

Nepal.— Western [Lete, S of Tukucha, Kali Gandaki, 8000 ft [2450 m], 16 Sept. 1954, *Stainton et al. 7874* (**E** 00615453); Myagdi District, 1820–2360 m, [28 33–37 N 83 23 E], 10 Sept. 1996, *Mikage et al. 9685303* (**BM**); S of Annapurna, above Siklis, 2670 m, [28 07 N 84 06 E], 28 Aug. 1976, *Troth 998* (**US** 2827988)]. Central [near Lumsum, 9000 ft [2750 m], 10 Sept. 1954, *Stainton et al. 4322* (**E**00619431); near Lumsum, 9000 ft [2750 m], 17 July 1954, *Stainton 3525* (**BM**); Satsaekhola, S of Ganesh Himal., 8500 ft [2600 m], [28 15 N 85 05 E], 4 Oct. 1967, *Stainton 6001* (**BM** 001118633); Langtang Valley, Kanging, 2300–2800 m, 11 July 1970, *Kanai & Shakya s.n.* (**E**); Shimbhanjyang [Sim

Bhanjyang], 8200 ft [2500 m], 25 Aug. 1960, *Maka & Rajbhaudari 38* (**US** 2581913); Mt Phulchoki-Godawari, 2390 m 14 Nov. 1995, *Mikage et al. 9558372* (**E** 00236465); Tinjure Danda, 7500 ft [2275 m], [27.10'N 87.29'E], 6 Sept. 1967, *Williams & Stainton 8392* (**K**); 1927, *Wigram 80* (**E** 00619525)].

India.— Sikkim [between Choongthang [Chungthang] & Lamteng [Lachung], Sept. 1903, *Prain s.n.* (**E** 00619493); Meghalaya: Shillong, 6000 ft [1825 m], 30 Oct. 1890, *Collett s.n.* (**US** 262961); Shillong Peak, 6000 ft [1825 m], 8 Sept. 1949, *Kingdon Ward 18838* (**NY**); Shillong, 6000 ft [1825 m], 10 Aug. 1885, *Clarke 38695* (**US** 803449); Khasia, 5000–7000 ft [1525–2150 m], 1859, *Hooker & Thomson s.n.* (**P** 02961729); Myrung, Khasia, 5000 ft [1525 m], 12 Sept. 1886, *Clarke 44759A* (**K**)]. Nagaland [Khonoma, Naga Hills, 6000 ft [1825 m], 10 Oct. 1935, *Bor 6610* (**K**); Japvo ridge, 7250 ft [2200 m], 11 Nov. 1949, *Kingdon Ward 19021* (**BM**); Kigwema, 5800 ft [1750 m], 28 Oct. 1885, *Clarke 41773A* (**K**)]. Arunachal Pradesh [Lohit Valley, before Jan. 1929, *Kingdon Ward 8720* (**K**)]. East Bengal [before 1861, *Griffith 1731* (**P** 02961730)].

Myanmar.— Kachin State [Hpimau, 8200 ft [2500 m], 3 Sept. 1919, *R.A. 1284* (**E** 00120992); North Triangle (Hkinlum) [Khawbude], 4000 ft [1225 m], 22 Sept. 1953, *Kingdon Ward 21355* (**E**); Laktang, 5000–6000 ft [1525–1825 m], 19 Oct. 1912, *Kingdon Ward 3711* (**E** 00120969); Kachin Hills, [1911], *Toppins 6097* (**K**)]. Shan State [Kabaing to Kyat Pyin, Ruby Mines Distr., 3000 ft [3450 ft / 1050 m], 21 Oct. 1912, *Lace 5993* (**E** 00619433, **E** 00619437)].

Toxicopueraria yunnanensis

China.— Sichuan [S of Ning yuan fu, Lushan, 17 Apr. 1914, *Schneider 924* (**A** 00198569)]. Yunnan [On Mt Long Shan [Yulong Shan], in the Jangtziu leud, 10000 ft [3050 m], [27 20 N], Aug. 1913, *Forrest 10811* (**E** 00619467, **K**); [duplicate of 1912–1913 [10811], 10000 ft [3050 m], Aug. 1917, *Forrest 15840* (**K**, **US** 1860115); Hung Hsien bridge Mt Yun Hsien, 1933, *McLaren's Chinese Collectors L62A* (**E** 00619478); Lichiang Range [Yulong Shan], 1933, *McLaren's Chinese Collectors 62* (**BM** 001118642); Lichiang Range [Yulong Shan], 1933, *McLaren's Chinese Collectors l62C* (**BM** 001118646); Ta long tan, 24 Oct. 1888, *Delavay 3567* (**A** 00228288, **US** 2497725); woods near Tapin-tze, 18 Aug. 1885, *Delavay 1983* (**A** image 1701); woods near Tapin-tze, 28 Apr. 1883, *Delavay 606* (**P** 02961051); Tapin-tze, 16 Aug. 1888, *Delavay s.n.* (**P** 02961693, **P** 03065982); Tapin-tze, 23.vii.1889, *Delavay s.n.* (**K**, **P** 02961024, **P** 03065971 (pp), **P** 03065973, **P** 03065974); Pe yen tsin, [c.1916], *Siméon Ten s.n.* (**C**); Pe yen tsin, 20 Apr. 1916, *Siméon Ten 77* (**A** 00196681, **E** 00619475); Cha-fang-tzi, Yang-zi [Jinsha] valley, 5500 ft [1675 m], [25 N 100 05 E], 6 May 1921, *Kingdon Ward 3813* (**E** 00619432); Xiashanhe, above Yang-bi [Cangshan], 1850 m, 2 May 1981, *Sino-British Expedition to Cangshan 1981 25* (**A** 00195968, **E** 00615454, **K**); Shweli-Salwin [Nujiang/Salween R.] Divide, 8000 ft [2450 m], [25 25 N 98 58 E], May 1924, *Forrest 24130* (**E** 00120984); Slopes of Mt Shweli Valley, 7000–8000 ft [2150–2450 m], [25 06 N 99 E], Apr. 1931, *Forrest 29517* (**E** 00120983); Chi Tou Mt, before Mar. 1933, *McLaren's Chinese Collectors 162* (**A**); in the vicinity of Yun-nan-sen, before xi 1906, *Maire 1981* (**BM** 001118647, **K**, **US** 719085); in the vicinity of Yun-nan-sen, before xi 1906, *Maire 1982* (**BM** 001118648); environs de Yun nan sen, 8 May 1904, *Ducloux 2301* (**P** 02961736); environs de Yun nan sen, 18 Aug. 1905, *Ducloux 3772* (**P** 02961737, **US** 1270384); *Ducloux 2301* (**K**); *Ducloux 2301* (**BM** 001118649); Leang Wong Mt [Liangwang Shan], just south of Kunming city], Apr. 1936, *McLaren's Chinese Collectors U 7A* (**A** 00196973, **C**); Mengzi, 5000 ft [1525 m], before 1898, *Henry 10628* (**A** 00198567, **E** 00619471, **K**, **MO** 23369, **NY**, **US**); [Mengzi], 11 Apr. *Henry 10628* (**NY**); [Mengzi], 5 May, *Henry 10628* (**US** 457966); Mengzi, before 1898, *Henry 10628B* (**E** 006199472); Mengzi, 5000 ft [1525 m], 29 June, *Henry 10628C* (**US** 457967, **US** 455052); Mengtsz [Mengzi], 12 May 1895, *Hancock 275* (**K**); Simao, N mts, 4500 ft [1375 m], before 1901, *Henry 10628D* (**K**)].