

## 中国唇形科草糙苏属分类学研究杂记\*

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**摘要:** 最近的研究结果表明, 国产糙苏属 (*Phlomis*) 的所有种类 (除了栽培种橙花糙苏 *P. fruticosa* 以外) 以及沙穗属 (*Eremostachys*)、独一味属 (*Lamiophlomis*)、钩萼草属 (*Notochaete*) 均应并入草糙苏属 (*Phlomoides*)。新界定的草糙苏属因其草本习性等特征而与糙苏属易于区别。尽管已有不同作者对国产草糙苏属大部分物种名称进行了新组合, 但仍遗漏了 11 个物种名称。为方便使用, 本文对这 11 个名称进行了新组合, 同时提供了新界定的草糙苏属国产物种名录及检索表, 共 50 种 9 变种。

**关键词:** 糙苏属; 糙苏族; 草糙苏属; 唇形科; 新组合

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## Taxonomic Notes on the Genus *Phlomoides* (Lamiaceae: Lamioideae) from China

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**Abstract:** Recent phylogenetic studies have investigated the tribe Phlomideae and, in particular, the degree of “inclusiveness” of the genus *Phlomoides*. As a result, *Eremostachys*, *Lamiophlomis*, *Notochaete* and all Chinese *Phlomis*, excepted for cultivated *P. fruticosa*, were transferred to the latest redefined *Phlomoides*. The newly circumscribed *Phlomoides* is easily distinguished from *Phlomis* by its herbaceous habit and several other traits. Although the necessary new combinations for the Chinese species have been made elsewhere, unfortunately, eleven names were omitted by previous researchers. Therefore, this paper proposes 11 new nomenclatural combinations in *Phlomoides*, and provides a checklist and a key to all Chinese *Phlomoides*.

**Key words:** *Phlomis*; Tribe Phlomideae; *Phlomoides*; Lamiaceae; New combinations

The genus *Phlomoides* Moench (Phlomideae, Lamioideae, Lamiaceae) is the species-rich genus with about 150–170 species, extending from central Europe to the Russian Far East (Mathiesen *et al.*, 2011; Salmaki *et al.*, 2012a, b). The genus was

separated from *Phlomis* L. by Moench (1794) who placed *Phlomis tuberosa* L. in his monotypic genus *Phlomoides*. However, in the past 200 years, most taxonomists (Bentham, 1832–1836; Boissier, 1879; Briquet, 1895–1897; Wu and Li, 1977) had treated

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*Phlomoidea* as one of two sections within *Phlomis* until it was reinstated as a genus (Adylov *et al.*, 1986; Adylov and Machmedov, 1987; Kamelin and Machmedov, 1990a, b). The reinstated *Phlomoidea* includes some species with the upper corolla lip not laterally compressed and with tuberous lateral roots (Salmaki, 2012a). Meanwhile, some other genera such as *Eremostachys* Bunge, *Notochaete* Benth., *Paraeremostachys* Adylov, Kamelin & Makhm., *Lamiophlomis* Kudô were established or separated from *Phlomis* (Bentham, 1829; Bunge, 1830; Kudô, 1929; Adylov *et al.*, 1986), and all of them were considered closely related to *Phlomis*. Based on pericarp structure, Ryding (2008) agreed that *Phlomoidea* should be treated as a separate genus, including the species from *Lamiophlomis* and *Notochaete*, but he didn't make normal taxonomical treatments.

Pan *et al.* (2009) supported the inclusion of *Lamiophlomis* in *Phlomis* based on their molecular phylogenetic study, however only fourteen species of *Phlomis* were included in their study. Recently, using DNA sequences of the plastid *trnL* intron, *trnL-trnF* spacer and *rps16* intron, *Phlomis* s. l. were split into two lineages, i. e. “*Phlomoidea* group” and “*Phlomis* group”, and therefore Mathiesen *et al.* (2011) recognized two genera, i. e., *Phlomis* s. str. and *Phlomoidea* s. l., and the latter included *Pseud-eremostachys*, *Lamiophlomis* as well as *Notochaete*

*hamosa* Benth. In the following molecular phylogenetic study on the tribe Phlomideae, Salmaki *et al.* (2012b) confirmed the inclusion of the members of *Eremostachys*, and other mono- or oligotypic genera (e. g. *Lamiophlomis*, *Notochaete*, *Paraeremostachys*) in *Phlomoidea*, and some necessary new combinations are proposed therein.

Now, circumscription for *Phlomoidea* has been clear, and the relationships between *Phlomoidea* and *Phlomis* were resolved by molecular data and supported by several morphological characters (Table 1) as well as chromosome numbers (Azizian and Culter, 1982; Astanova, 1984; Brullo *et al.*, 1990; Ghafari, 2006, Fang *et al.*, 2007). According to the current circumscription of *Phlomoidea*, there are forty-nine species and ten varieties in China; of which forty-two species and nine varieties were previously in *Phlomis*, four species and one variety were previously in *Eremostachys*, two were previously in *Notochaete* and one species previously in *Lamiophlomis*. Although the necessary new combinations for most Chinese species have been made elsewhere (e. g. Adylov and Makhmedov, 1987; Matheisen *et al.*, 2011; Salmaki *et al.*, 2012b), eleven recognized taxa are omitted by these authors. In order to aid future systematic work on these taxa, here we propose eleven new combinations, and for the first time, we provide a checklist and a key to all Chinese *Phlomoidea* species in its new definition.

Table 1 Characteristics of *Phlomoidea* and *Phlomis* (see also Salmaki *et al.* 2012b)

|                                 | <i>Phlomoidea</i>  | <i>Phlomis</i>                             |
|---------------------------------|--|--|
| Numbers of species in China     | 49   | 1  |
| Growth form                     | Tall perennial herbs with woody rhizomes and/or tubers at tip      | Perennial herbs or small shrubs            |
| Petioles                        | 2-5 (-7) cm  | 1.5-5 cm                                   |
| Calyx lobe                      | equal or occasionally 3/2 bilabiate, abruptly narrow to acute apex | equal                                      |
| Posterior lip of corolla        | long, shallowly hooded   | long, hooded, often deeply concave         |
| Indumentum on upper corolla lip | Bearded with simple hairs at margin                                | Hardly bearded with simple hairs at margin |
| Nutlet apex                     | Stellate hairy or sometimes glabrous                               | Glabrous, papillose or stellate hairy      |
| Chromosome number               | $2n=22$  | $2n=12, 14, 20, 22, 40, 42$                |

## 1 New combinations

*Phlomoidea cuneata* (C. Y. Wu) C. L. Xiang & H. Peng, **comb. nov.**

**Basionym:** *Phlomis cuneata* C. Y. Wu, Fl. Reipubl. Popularis Sin. **65** (2): 434, 594 (1977). TYPE: China, Xizang; Cuijila Shan, 6 Sep. 1952, P. C. Tsong 5335 (PE).

**Distribution:** Endemic to Xizang (Tibet), and currently known only from the type locality (Cuijila Shan).

**Note:** The style of this species is equally 2-cleft at apex, which is very rare in genus *Phlomoidea* from China.

*Phlomoidea dentosa* (Franch.) Kamelin & Makhm. var. *glabrescens* (Danguy) C. L. Xiang & H. Peng, **comb. nov.**

**Basionym:** *Phlomis dentosa* Franch. var. *glabrescens* Danguy, Bull. Mus. Natl. Hist. Nat. **17** (5): 345 (1911). TYPE: China, Gansu; Si-Ning-Fou, 2 400 m, 18th Jul. 1908, Anonymous s. n. (P).

**Distribution:** Endemic to China, known from Gansu, Hebei, Inner Mongolia, and Qinghai.

**Note:** Morphological characters distinguished this variety from *Phlomoidea dentosa* var. *dentosa* are that stems sparsely minutely hispid to subglabrous, leave subglabrous, bracts and calyx sparsely bristly and dusty puberulent (vs. plants stellate hairy throughout in variety *dentosa*).

*Phlomoidea mongolica* (Turcz.) Kamelin & Makhm. var. *macrocephala* (C. Y. Wu) C. L. Xiang & H. Peng, **comb. nov.**

**Basionym:** *Phlomis mongolica* Turcz. var. *macrocephala* C. Y. Wu, Fl. Reipubl. Popularis Sin. **65** (2): 444, 595 (1977). TYPE: China, Inner Mongolia; precisely locality unknown, Ju Ud League s. n. (PE).

**Distribution:** Endemic to Inner Mongolia.

**Note:** It's easy to distinguish this variety from variety *mongolica*. Plants of this variety are ca. 15 cm tall, verticillasters solitary, terminal or axillary,

and sometimes inserted at base of stem. In contrast, plants of *Phlomoidea mongolica* var. *mongolica* are 40–70 cm tall, verticillasters numerous, axillary, inserted on apical part of stems.

*Phlomoidea oreophila* (Kar. & Kir.) Adylov. Kamelin & Makhm. var. *evillosa* (C. Y. Wu) C. L. Xiang & H. Peng, **comb. nov.**

**Basionym:** *Phlomis oreophila* Kar. & Kir. var. *evillosa* C. Y. Wu, Fl. Reipubl. Popularis Sin. **65** (2): 437, 594 (1977). TYPE: China, Xinjiang; Fuhai, 2 100 m, 11 Jul. 1957, C. L. Chen 186 (PE).

**Distribution:** Endemic to Xinjiang.

**Note:** This variety with stellate pannose bracts and calyx is easily distinguished from variety *oreophila* because in *Phlomoidea oreophila* var. *oreophila*, bracts densely villous or sometime intermixed with glandular villous hairs, and calyx stellate puberulent, finely villous on veins outside.

*Phlomoidea speciosa* (Rupr.) Adylov, Kamelin & Makhm. var. *viridifolia* (Popov) C. L. Xiang & H. Peng, **comb. nov.**

**Basionym:** *Eremostachys speciosa* Rupr. var. *viridifolia* Popov, Nov. Mem. Moskovsk. Obsc. Isp. Prir. **19**: 100 (1940). SYNETYPES: Kazakhstan, Semirechenskaya Region: 30th Apr. 1916, Gorodetskiy 158 (TASH); Uzbekistan, Fergana Region: Andizhan District, on the way to Kugart Pass, 2 Jun. 1911, Knorring & Minkwitz 266 (TASH); Samarkand Region: Zimmarkh, 16th Jul. 1915, Balabay 9 (TASH).

**Distribution:** This variety is recorded from Xinjiang.

**Note:** Variety *viridifolia* is distributed to Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistna, and SW Asia. In addition, because all the Chinese *Eremostachys* species were transferred to *Phlomoidea*, so there is no *Eremostachys* in China henceforth.

*Phlomoidea tatsienensis* (Bureau & Franch.) Kamelin & Makhm. var. *hirticalyx* (Hand.-Mazz.)

C. L. Xiang & H. Peng, **comb. nov.**

**Basionym:** *Phlomis franchetiana* Diels var. *hirticalyx* Hand.-Mazz. Symb. Sin. **7** (4): 921 (1936). TYPE: China, Yunnan; Beyenjing, in silvis, 25 Sept. 1919, S. Ten 1380 (WU).

**Distribution:** Endemic to Yunnan.

**Note:** This variety can be distinguished from variety *tatsienensis* by its densely stellate pubescent bracts and calyx (vs. bracts and calyx are stellate pubescent).

*Phlomoïdes tibetica* (C. Marquand & Airy Shaw) Kamelin & Makhm. var. *wardii* (C. Marquand & Airy Shaw) C. L. Xiang & H. Peng, **comb. nov.**

**Basionym:** *Phlomis tibetica* C. Marquand & Airy Shaw var. *wardii* C. Marquand & Airy Shaw, J. Linn. Soc., Bot. **48** (321): 218–219 (1929). TYPE: China, Xizang; on the edges of cultivated fields, Tumbatse, 3 400 m, 14 Jul. 1924, F. K. Ward 5937 (K).

**Distribution:** Endemic to Xizang.

**Note:** This variety is distinguished from variety *tibetica* by several traits, i. e. leaf blade cordate to broadly oblong, margin coarsely crenate (vs. leaf blade ovate-cordate, margin crenate or coarsely crenate in variety *tibetica*); upper corolla lip densely villous outside (vs. upper corolla lip stellate tomentose outside).

*Phlomoïdes umbrosa* (Turcz.) Kamelin & Makhm. var. *australis* (Hemsl.) C. L. Xiang & H. Peng, **comb. nov.**

**Basionym:** *Phlomis umbrosa* Turcz. var. *australis* Hemsl., J. Linn. Soc., Bot. **26** (175): 306 (1890).

**Distribution:** This variety is recorded from Anhui, Gansu, Guizhou, Hubei, Hunan, Shanxi, Sichuan, and Yunnan. SYNTYPES: China, Hubei; Yichang, Badong, A. Henry 875, 1872, 2442, 4749, 6029, 6179, 6423, 7360 (K).

**Note:** There are 4 varieties under *Phlomoïdes umbrosa*. In this species complex, variety *australis* is most similar to variety *umbrosa*, but differentiated by following traits. In variety *australis*, leaves long peti-

olate, leaf blade membranous, margin crenate-serrate, terminal tooth sometimes very long; bracts soft, linear-lanceolate, slightly shorter than calyx, while in variety *umbrosa*, leaves papery, serrate-dentate or irregularly crenate, terminal tooth not very long; bracts rigid, linear-subulate, mostly longer than calyx.

*Phlomoïdes umbrosa* (Turcz.) Kamelin & Makhm. var. *latibrateata* (Y. Z. Sun) C. L. Xiang & H. Peng, **comb. nov.**

**Basionym:** *Phlomis umbrosa* Turcz. var. *latibrateata* Y. Z. Sun, Acta Phytotax. Sin. **11** (1): 46 (1966). TYPE: China, Henan; Jigong Shan, hillsides, 700–2 000 m, 27 Jul. 1925, A. N. Steward 1584 (NAS).

**Distribution:** Endemic to Henan.

**Note:** In *Phlomoïdes umbrosa* complex, this variety is easily distinguished from other taxa because its bracts are linear-oblong to obovate-oblong, and much shorter than calyx, only  $5-7 \times 1.8-2.5$  cm, while in other taxa, bracts are linear-subulate to linear-lanceolate, longer or rarely slightly shorter than calyx, about  $8-14 \times 1-2$  mm.

*Phlomoïdes umbrosa* (Turcz.) Kamelin & Makhm. var. *ovalifolia* (C. Y. Wu) C. L. Xiang & H. Peng, **comb. nov.**

**Basionym:** *Phlomis umbrosa* Turcz. var. *ovalifolia* C. Y. Wu, Fl. Reipubl. Popularis Sin. **65** (2): 478, 601 (1977). TYPE: China, Anhui; Chuxian, hillsides, 2 Aug. 1951, East-China Station 3132 (PE).

**Distribution:** This variety is recorded from Anhui and Jiangsu.

**Note:** In *Phlomoïdes umbrosa* complex, this variety is similar to variety *australis* and type variety, but differentiated by leaves ovate, subcuneate to shallowly cordate, stellate pubescent, rarely abaxially stellate tomentulose; calyx densely stellate pubescent outside (vs. leaves circular-ovate to ovate-oblong, sparsely pilose or sometimes abaxially densely

pilose and stellate pilose; calyx stellate puberulent except sometime pilose on veins).

*Phlomis umbrosa* Turcz. var. *stenocalyx* (Diels) C. L. Xiang & H. Peng, **comb. nov.**

**Basionym:** *Phlomis stenocalyx* Diels, Bot. Jahrb. Syst. **29** (3-4): 555 (1900). TYPE: China, Giral-dii 1548 (K).

**Distribution:** This variety is recorded from Gansu and Shaanxi.

**Note:** This variety is easily distinguished from other taxa by its verticillasters conspicuously pedunculate, lax, and flowers pedicellate, calyx *ca.* 8 × 3 cm.

## 2. Checklist of *Phlomis* Moench from China

Now, there is only one species of *Phlomis*, i. e. *P. fruticosa* L. cultivated in China (Shaanxi Province). According to the new definition of *Phlomis*, there are 50 species and 9 varieties in China; of which 40 species and 9 varieties are endemic and marked with asterisk (\*) in following list, and distribution area listed in square bracket.

*Phlomis agraria* (Bunge) Adylov, Kamelin & Makhm. 耕地草糙苏 (新拟) [Xinjiang; Kazakhstan, Mongolia, Russia]

*Phlomis alpina* (Pall.) Adylov, Kamelin & Makhm. 高山草糙苏 (新拟) [Xinjiang; Kazakhstan, Russia]

*Phlomis ambigua* (Popov ex Pazij & Vved.) Adylov, Kamelin & Makhm. \* 沧江草糙苏 (新拟) [Yunnan]

*Phlomis atropurpurea* (Dunn.) Adylov, Kamelin & Makhm. \* 深裂草糙苏 (新拟) [Yunnan]

*Phlomis betonicoides* (Diels) Adylov, Kamelin & Makhm. \* 假秦艽 [Sichuan, Xizang, Yunnan]

*Phlomis chinghoensis* (C. Y. Wu) Kamelin & Makhm. \* 清河草糙苏 (新拟) [Xinjiang]

*Phlomis congesta* (C. Y. Wu) Kamelin & Makhm. \* 乾精菜 [Sichuan, Yunnan]

*Phlomis cuneata* (C. Y. Wu) C. L. Xiang & H. Peng \* 楔叶草糙苏 (新拟) [Xizang]

*Phlomis dentosa* (Franch.) Kamelin & Makhm. \* 尖齿草糙苏 (新拟)

*Phlomis dentosa* var. *dentosa* \* 尖齿草糙苏原变种 [Gansu, Hebei, Inner Mongolia, Qinghai]

*Phlomis dentosa* var. *glabrescens* (Danguy) C. L. Xiang & H. Peng \* 渐光尖齿草糙苏 (新拟) [Sichuan, Xizang]

*Phlomis desertorum* (P. A. Smirn.) Mavrodiev & Sukhor. \* 沙生沙穗 [Xinjiang]

*Phlomis fimbriata* (C. Y. Wu) Kamelin & Makhm. \* 裂唇草糙苏 (新拟) [Yunnan]

*Phlomis forrestii* (Diels) Kamelin & Makhm. \* 苍山草糙苏 (新拟) [Yunnan]

*Phlomis franchetiana* (Diels) Kamelin & Makhm. \* 大理草糙苏 (新拟) [Yunnan]

*Phlomis fulgens* (Bunge) Adylov, Kamelin & Makhm. 光沙穗 [Xinjiang; Kyrgyzstan, SW Asia]

*Phlomis hamosa* (Benth.) Mathiesen 钩萼草 [Yunnan; Bhutan, India; Myanmar, Nepal]

*Phlomis inaequalisepala* (C. Y. Wu) Kamelin & Makhm. \* 斜萼草糙苏 (新拟) [Sichuan]

*Phlomis jeholensis* (Nakai & Kitag.) Kamelin & Makhm. \* 口外草糙苏 (新拟) [Hebei]

*Phlomis kansuensis* (C. Y. Wu) Kamelin & Makhm. \* 甘肃草糙苏 (新拟) [Gansu]

*Phlomis koraiensis* (Nakai) Kamelin & Makhm. 长白草糙苏 (新拟) [Jilin; Korea]

*Phlomis likiangensis* (C. Y. Wu) Kamelin & Makhm. \* 丽江草糙苏 (新拟) [Yunnan]

*Phlomis longiaristata* (C. Y. Wu & H. W. Li) Salmaki \* 长刺钩萼草 [Xizang, Yunnan]

*Phlomis longicalyx* (C. Y. Wu) Kamelin & Makhm. \* 长萼草糙苏 (新拟) [Yunnan]

*Phlomis maximowiczii* (Regel) Kamelin & Makhm. \* 大叶草糙苏 (新拟) [Hebei, Jilin, Liaoning]

*Phlomis medicinalis* (Diels) Kamelin & Makhm. \* 萝卜秦艽 [Sichuan, Xizang]

*Phlomis megalantha* (Diels) Kamelin & Makhm. \* 大花草糙苏 (新拟) [Hubei, Shaanxi, Shanxi, Sichuan]

*Phlomis melanantha* (Diels) Kamelin &



Makhm. \*黑毛草糙苏 (新拟) [Sichuan, Yunnan]

*Phlomoïdes milingensis* (C. Y. Wu & H. W. Li) Kamelin & Makhm. \*米林草糙苏 (新拟) [Xizang]

*Phlomoïdes molucelloides* (Bunge) Salmaki 沙穗 [Xinjiang; Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan; SW Asia, Europe]

*Phlomoïdes mongolica* (Turcz.) Kamelin & Makhm. \*串铃草

*Phlomoïdes mongolica* var. *mongolica* \*串铃草原变种 [Gansu, Hebei, Inner Mongolia, Shaanxi, Shanxi]

*Phlomoïdes mongolica* var. *macrocephala* (C. Y. Wu) C. L. Xiang & H. Peng \*大头串铃草 (新拟) [Inner Mongolia]

*Phlomoïdes muliensis* (C. Y. Wu) Kamelin & Makhm. \*木里草糙苏 (新拟) [Sichuan]

*Phlomoïdes multifurcata* Salmaki \*糙苏沙穗 [Xinjiang]

*Phlomoïdes oreophila* (Kar. & Kir.) Adylov. Kamelin & Makhm. 山地草糙苏 (新拟)

*Phlomoïdes oreophila* var. *oreophila* 山地草糙苏原变种 [Xinjiang; Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan]

*Phlomoïdes oreophila* var. *evillosa* (C. Y. Wu) C. L. Xiang & H. Peng \*山地草糙苏无长毛变种 [Xinjiang]

*Phlomoïdes ornata* (C. Y. Wu) Kamelin & Makhm. \*美观草糙苏 (新拟) [Sichuan, Yunnan]

*Phlomoïdes paohsingensis* (C. Y. Wu) Kamelin & Makhm. \*宝兴草糙苏 (新拟) [Sichuan]

*Phlomoïdes pararotata* (Y. Z. Sun) Kamelin & Makhm. \*假轮状草糙苏 (新拟) [Yunnan]

*Phlomoïdes pedunculata* (Y. Z. Sun) Kamelin & Makhm. \*具梗草糙苏 (新拟) [Sichuan]

*Phlomoïdes pratensis* (Kar. & Kir.) Adylov. Kamelin & Makhm. 草原草糙苏 (新拟) [Xinjiang; Kazakhstan, Kyrgyzstan]

*Phlomoïdes pygmaea* (C. Y. Wu) Kamelin & Makhm. \*矮草糙苏 (新拟) [Xizang]

*Phlomoïdes rotata* (Benth. ex Hook. f.) Mathiesen 独一味 [Gansu, Qinghai, Sichuan, Xizang,

Yunnan; Bhutan, India, Nepal]

*Phlomoïdes ruptilis* (C. Y. Wu) Kamelin & Makhm. \*裂萼草糙苏 (新拟) [Yunnan]

*Phlomoïdes setifera* (Bureau & Franch.) Kamelin & Makhm. \*刺毛草糙苏 (新拟) [Sichuan, Xizang, Yunnan]

*Phlomoïdes speciosa* (Rupr.) Adylov, Kamelin & Makhm. var. *viridifolia* (Popov) C. L. Xiang & H. Peng \*绿叶美丽沙穗 [Xinjiang]

*Phlomoïdes strigosa* (C. Y. Wu) Kamelin & Makhm. \*糙毛草糙苏 (新拟) [Yunnan]

*Phlomoïdes szechuanensis* (C. Y. Wu) Kamelin & Makhm. \*柴续断 [Sichuan]

*Phlomoïdes tatsienensis* (Bureau & Franch.) Kamelin & Makhm. \*康定草糙苏 (新拟)

*Phlomoïdes tatsienensis* var. *tatsienensis* \*康定草糙苏原变种 [Sichuan]

*Phlomoïdes tatsienensis* var. *hirticalyx* (Hand.-Mazz.) C. L. Xiang & H. Peng \*毛萼康定草糙苏 (新拟) [Yunnan]

*Phlomoïdes tibetica* (C. Marquand & Airy Shaw) Kamelin & Makhm. \*西藏草糙苏 (新拟)

*Phlomoïdes tibetica* var. *tibetica* \*西藏草糙苏原变种 [Xizang]

*Phlomoïdes tibetica* var. *wardii* (C. Marquand & Airy Shaw) C. L. Xiang & H. Peng \*毛盔西藏草糙苏 (新拟) [Xizang]

*Phlomoïdes tuberosa* (L.) Moench 块根草糙苏 (新拟) [Heilongjiang, Inner Mongolia, Xinjiang; Kazakhstan, Kyrgyzstan, Mongolia, Russia; SW Asia, Europe]

*Phlomoïdes umbrosa* (Turcz.) Kamelin & Makhm. \*草糙苏

*Phlomoïdes umbrosa* var. *umbrosa* \*草糙苏原变种 [Gansu, Guangdong, Guizhou, Hebei, Hubei, Liaoning, Inner Mongolia, Shaanxi, Shandong, Shanxi, Sichuan]

*Phlomoïdes umbrosa* var. *australis* (Hemsl.) C. L. Xiang & H. Peng \*南方草糙苏 (新拟) [Anhui, Gansu, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Yunnan]

*Phlomoïdes umbrosa* var. *latibracteata* (Y. Z.

Sun) C. L. Xiang & H. Peng\* 宽苞草糙苏 (新拟) [Henan]

*Phlomoidea umbrosa* var. *ovalifolia* (C. Y. Wu)

C. L. Xiang & H. Peng\* 卵齿草糙苏 (新拟) [Anhui, Jiangsu]

*Phlomoidea umbrosa* var. *stenocalyx* (Diels)

C. L. Xiang & H. Peng\* 狭萼草糙苏 (新拟) [Gansu, Shaanxi]

*Phlomoidea uniceps* (C. Y. Wu) Kamelin &

Makhm.\* 单头草糙苏 (新拟) [Gausu]

*Phlomoidea younghusbandii* (S. M. Mukerjee)

Kamelin & Makhm.\* 螃蟹甲 [Xizang]

### 3. Key to the species of the genus *Phlomoidea* from China

1. Calyx teeth spinescent, hooked at apex ..... 2
1. Calyx teeth not spinescent and hooked at apex ..... 3
  2. Leaf base broadly cuneate to roundish; corolla reddish or yellow; nutlets glabrous ..... *P. hamosa*
  2. Leaf base shallowly cordate; corolla white; nutlets stellate at apex ..... *P. longiarsitata*
  3. Nutlets prominently hairy at apex; calyx teeth truncate, apiculate at apex ..... 4
    4. Calyx funnellform, dilated at apex, especially in fruit, membranous ..... *P. molucelloides*
    4. Calyx tubular or tubular-campanulate, not dilated at apex, not membranous ..... 5
      5. Basal leaves pinnatipartite to bipinnatipartite ..... *P. speciosa*
      5. Basal leaves not pinnatipartite, irregularly shallow serrate or crenate ..... 6
        6. Bracts leaflike, separated at base; leaves irregularly shallow serrate ..... *P. fulgens*
        6. Bracts spinescent, united at base in 3s; leaves crenate ..... 7
          7. Plants sparsely white hairy; calyx teeth with long soft spines ..... *P. multifurcata*
          7. Plants densely white hairy; calyx teeth with robust rigid spines ..... *P. desertorum*
  3. Nutlets slightly hairy or glabrous; calyx characters not as above ..... 8
    8. Upper corolla lip not fringed or incised; leaf venation fan-shaped ..... *P. rotata*
    8. Upper corolla lip always hairy or fringed-incised; leaf venation not fan-shaped ..... 9
      9. Style equally 2-cleft at apex ..... *P. cuneata*
      9. Style unequally 2-cleft at apex ..... 10
        10. Plants with basal rosette of leaves ..... 11
          11. Posterior filaments without appendages at base ..... 12
            12. Plants less than 5 cm tall ..... *P. pygmaea*
            12. Plants more than 5 cm tall ..... 13
              13. Leaf glabrous and calyx margin ciliate ..... *P. atropurpurea*
              13. Plant uniformly hairy ..... 14
                14. Bracts densely brown ciliate ..... *P. tibetica*
                14. Bracts densely white villous ..... 15
                  15. Stems retrorse appressed villous; all verticillasters approximate; nutlets stellate puberulent at apex ..... *P. oreophila*
                  15. Stems stellate puberulent; at least basal verticillasters separate; nutlets glabrous ..... *P. chinghoensis*
      11. Posterior filaments with appendages at base ..... 16
        16. Nutlets hairy ..... 17
          17. Floral leaves subverticillate, ovate to broadly triangular-ovate; plants ca. 10 cm tall ..... *P. uniceps*
          17. Floral leaves not arranged as above; plants taller ..... 18
            18. Abaxial leaf surface with unbranched hairs or subglabrous ..... 19
              19. Leaves cordate, crenate, with unbranched hairs on both surfaces ..... *P. alpina*

19. Leaves triangular to ovate, cordate at base, irregularly coarsely crenate, adaxially sparsely hispid or glabrous, abaxially glabrous or hispid on veins, or hispid on both surfaces ..... 20
20. Verticillaster 1, terminal ..... *P. kansuensis*
20. Verticillaster 4s 3–10, on upper part of stems and branches ..... *P. tubrosa*
18. Abaxial leaf surface with stellate hairs ..... 21
21. Leaves with stellate hispid and simple hairs, or with stellate strigose and simple hairs ..... 22
22. Basal leaves lanceolate-oblong to narrowly oblong, adaxially with stellate strigose and simple hairs, abaxially stellate tomentulose ..... *P. younghusbandii*
22. Basal leaves ovate-triangular to triangular-lanceolate, adaxially stellate hispid with long central arms and simple hairs, or sparsely hispid to subglabrous, abaxially sparsely to densely stellate pilose ..... *P. mongolica*
21. Leaves with simple hairs adaxially ..... 23
23. Bracts lanceolate or narrow lanceolate ..... *P. maximowiczii*
23. Bracts linear, needlelike, or linear-subulate ..... 24
24. Stems simple or branched; bracts slightly shorter than calyx; calyx densely stellate puberulent outside ..... *P. agraria*
24. Stems many branched; bracts subequal to calyx, calyx sparsely stellate puberulent to hispid outside ..... *P. medicinalis*
16. Nutlets glabrous ..... 25
25. Basal leaves early deciduous; stem leaves hastate-ovate ..... *P. parrotata*
25. Basal leaves persistent; stem leaves narrowly to broadly ovate ..... 26
26. Basal leaves broadly cordate, sparsely strigose and corrugate adaxially ... *P. koraiensis*
26. Leaves triangular-ovate, cordate to ovate-lanceolate ..... 27
27. Corolla reddish pink ..... 28
28. Stem hairs with unequal arms; leaves narrowly ovate to oblong-lanceolate ..... *P. betonicoides*
28. Stem hairs with longer central arms; leaves triangular to triangular-ovate ..... *P. dentosa*
27. Corolla purple-red or dark purple ..... 29
29. Corolla dark purple; Leaves broadly ovate to circular-ovate, apex rounded, base cordate, sparsely strigose ..... *P. fimbriata*
29. Corolla purple-red; leaves acute to obtuse at apex, shallowly cordate at base ..... 30
30. Leaves cordate-ovate or ovate-oblong, stellate pilose and with simple hairs on both surfaces or abaxially stellate pubescent ..... *P. pratensis*
30. Leaves ovate or triangular-ovate, adaxially densely hispid, abaxially densely stellate pilose ..... *P. milingensis*
10. Plants without basal leaf rosette, only stem leaves present ..... 31
31. Corolla more than 3 cm ..... 32
32. Corolla yellow ..... *P. megalantha*
32. Corolla dark purple ..... *P. ornata*
31. Corolla less than 3 cm ..... 33
33. Verticillasters conspicuously pedunculate ..... 34
34. Posterior filaments without appendages at base ..... 35



35. Bracts ca. 1/2 as long as calyx; stems densely tawny stellate pubescent  
..... *P. szechuanensis*
35. Bracts as long as or slightly longer than calyx; stems sparsely retrorse minute hispid,  
sometimes stellate pubescent at apex ..... *P. umbrosa*
34. Posterior filaments with appendages at base ..... 36
36. Calyx gray stellate pannose outside, bracts leaflike, linear-lanceolate, rarely lanceolate  
..... *P. likiangensis*
36. Calyx with other types of hairs kind; bracts usually smaller, narrower ..... 37
37. Verticillasters rather loose, usually 1, rarely 2 at apes of stem or branch; flowers long  
pedicellate; calyx indehiscent ..... *P. pedunculata*
37. Verticillasters rather compact, usually 2–5 (–9) at apex of stem or branch; flowers  
short pedicellate; calyx dehiscent ..... *P. congesta*
33. Verticillasters sessile ..... 38
38. Bracts ca. 1/2 as long as calyx or absent ..... 39
39. Calyx ca. 1.5 cm ..... *P. longicalyx*
39. Calyx 0.8–1 cm ..... 40
40. Corolla purple ..... *P. franchetiana*
40. Corolla yellow ..... *P. ambigua*
38. Bracts more than 1/2 as long as calyx ..... 41
41. Leaves cordate to broadly ovate ..... *P. paohsienensis*
41. Leaves of different shapes ..... 42
42. Leaves abaxially densely stellate tomentose ..... *P. muliensis*
42. Leaves abaxially without hairs as above ..... 43
43. Posterior filaments with a reflexed slender appendage at base ..... 44
44. Leaves strigose adaxially and along margin abaxially, with elevated glands  
..... *P. melanantha*
44. Leaves sparsely minutely hispid adaxially, abaxially stellate pilose, densely  
and finely spreading setose along veins ..... *P. forrestii*
43. Posterior filaments with an upwardly curved appendage at base ..... 45
45. Leaves adaxially sparsely short bristly, abaxially pilose, with simple hairs on  
both surfaces ..... *P. jeholensis*
45. Leaves adaxially with simple and/or stellate hairs, abaxially with stellate and  
simple hairs ..... 46
46. Calyx indehiscent, veins elevated ..... 47
47. Stems sparsely retrorse minutely hispid; calyx tube densely stellate  
puberulent, veins spreading bristly ..... *P. setifera*
47. Stems stellate pubescent or densely tawny stellate tomentulose; calyx  
tube stellate pubescent ..... *P. tatsienensis*
46. Calyx irregularly dehiscent, veins not elevated ..... 48
48. Leaves leathery more or less, sparsely strigose or subglabrous, margin  
ciliolate, abaxially subglabrous or stellate strigose and hairs with a  
long central arm ..... *P. strigosa*
48. Leaves herbaceous, adaxially sparsely strigose or stellate pubescent,  
abaxially stellate pubescent or dense stellate pilose ..... 49
49. Stem leaves ovate; bracts linear ..... *P. inaequalisepala*
49. Stem leaves sagittate-oblong; bracts subulate ..... *P. ruptilis*

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## References:

- Adylov TA, Kamelin RV, Makhmedov AM, 1986. Zametki semeistve *Lamiaceae* 1 (Notes on Lamiaceae 1) [J]. *Novosti Sistematiki Vysshikh Rastenii*, **23**: 110—114
- Adylov TA, Makhmedov AM, 1987. *Phlomoidea* Moench [A]. In: Adylov TA (ed.), *Conspectus florum Asiae Mediae* [M]. Tashkent: Izdatel'stvo Akademii Nauk SSSR, **9**: 82—107
- Astanova SB, 1984. Chromosome numbers in the species of the families Alliaceae, Asteraceae, Caryophyllaceae, Ebenaceae, Linaceae, Oleaceae, Lamiaceae from Tadjikistan [J]. *Botaničnyi Žurnal (Moscow & Leningrad)*, **69**: 1563—1564
- Azizian D, Cutler DF, 1982. Anatomical, cytological and phytochemical studies on *Phlomis* L. and *Eremostachys* Bunge (Labiatae) [J]. *Botanical Journal of the Linnean Society*, **85**: 249—281
- Benthams G, 1829. *Notochaete* [J]. *Edwards's Botanical Register*, **15**: pl. 1289
- Benthams G, 1832—1836. *Labiatarum Genera et Species* [M]. London: James Ridgway & Sons
- Boissier E, 1879. *Flora orientalis*, Vol. 4, pt. 1 [M]. Geneva, Basel, Leiden: H. Georg
- Briquet J, 1895—1897. Labiatae. *Eremostachys* Bunge, *Phlomis* L [A]. In: Engler A, Prantl K (eds.), *Die natürlichen Pflanzenfamilien* [M]. Leipzig: Engelmann, **4** (3a, 134): 246—249
- Brunello S, Guglielmo A, Pavone P *et al.*, 1990. Chromosome counts of flowering plants from N. Cyrenaica [J]. *Candollea*, **45**: 65—74
- Bunge A, 1830. *Eremostachys* Bunge [A]. In: Ledebour CF, Meyer CA, Bunge A (eds.), *Flora Altaica* [M]. Berlin: G. Reimer, **2**: 414—416
- Fang LQ (房丽琴), Pang YZ (潘跃芝), Gong X (龚洵), 2007. A karyomorphological study in the monotypic genus *Lamiophlomis* and five species in *Phlomis* (Lamiaceae) [J]. *Acta Phytotaxonomica Sinica* (植物分类学报), **45**: 627—632
- Ghaffari SM, 2006. New or rare chromosome counts of some angiosperm species from Iran [J]. *Iranian Journal of Botany*, **11**: 185—192
- Kamelin RV, Makhmedov AM, 1990a. The system of the genus *Phlomoidea* (Lamiaceae) [J]. *Botaničnyi Žurnal (Moscow & Leningrad)*, **75**: 241—250
- Kamelin RV, Makhmedov AM, 1990b. A new system of the genus *Phlomis* (Lamiaceae) [J]. *Botaničnyi Žurnal (Moscow & Leningrad)*, **75**: 1163—1167
- Kudō Y, 1929. Labiatarum Sino-Japonicarum prodormus [A]. *Memoirs of the Faculty of Science and Agriculture, Taihoku Imperial University*, **2**: 1—332
- Mathiesen C, Scheen AC, Lindqvist C, 2011. Phylogeny and biogeography of the lamioid genus *Phlomis* (Lamiaceae) [J]. *Kew Bulletin*, **66**: 83—99
- Moench C, 1794. *Methodus Plantarum Horti Botanici et Argi Marburgensis, A Stamini Sicuti Describendi* [M]. Marburg: Officina Nova Libraria Academiae
- Pan YZ, Fang LQ, Hao G *et al.*, 2009. Systematic positions of *Lamiophlomis* and *Paraphlomis* (Lamiaceae) based on nuclear and chloroplast sequences [J]. *Journal of Systematics and Evolution*, **47**: 535—542
- Ryding O, 2008. Pericarp structure and phylogeny of the *Phlomis* group (Lamiaceae subfam. Lamioideae) [J]. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie*, **127**: 299—316
- Salmaki Y, Zarres S, Heubl G, 2012a. The genus *Phlomoidea* Moench (Lamiaceae; Lamioideae; Phlomoideae) in Iran: an updated synopsis [J]. *Iranian Journal of Botany*, **18**: 207—219
- Salmaki Y, Zarres S, Ryding O *et al.*, 2012b. Phylogeny of the tribe Phlomoideae (Lamioideae; Lamiaceae) with special focus on *Eremostachys* and *Phlomoidea*: new insights from nuclear and chloroplast sequences [J]. *Taxon*, **61** (1): 161—179
- Wu CY (吴征镒), Li HW (李锡文), 1977. *Phlomis* L. [A]. In: Wu CY (吴征镒) (ed.), *Flora Reipublicae Popularis Sinica* [M]. Beijing: Science Press, **65** (2): 428—478