

30. PHLOMIS Linnaeus, Sp. Pl. 2: 584. 1753.

糙苏属 cao su shu

Herbs perennial. Leaves corrugate; floral and stem leaves similar, gradually reduced upward. Verticillasters axillary. Flowers usually sessile. Calyx tubular or tubular-campanulate, throat not oblique; veins 5, 10, or 11, elevated; teeth 5, equal, sinuses between them often expanded into triangular, sometimes emarginate teeth. Corolla yellow, purple, or white, 2-lipped; tube included or slightly exserted, usually villous annulate inside; upper lip straight or galeate, concave or folded/keeled, rarely narrowly falcate, entire or fringed-denticulate, tomentose or villous; lower lip spreading, 3-lobed, middle lobe wider than lateral lobes. Stamens didynamous, anterior 2 longer, ascending to upper lip of corolla; posterior 2 often with appendages at base; anthers close together in pairs, with 2, divaricate, apically confluent cells. Style lobes subulate, posterior usually to 1/2 as long as anterior, rarely equal. Nutlets ovoid, triquetrous, apex obtuse, rarely truncate.

More than 100 species: Africa, Asia, Europe; 43 species in China, particularly diverse in Sichuan and Yunnan.

Adylov, Kamelin, and Makhmedov (Novosti Sist. Vyssh. Rast. 23: 110–114, 1986) and Vvedensky (Conspect. Fl. As. Med. 9: 74–113, 1987) believe that species 2–43 in this account should be transferred to *Phlomoidea* along with 2 Chinese species of *Eremostachys*.

- 1a. Upper lip of corolla laterally compressed, orange pubescent on inside margin; middle lobe of lower lip broadly ovate, lateral lobes smaller, lanceolate 1. *P. fruticosa*
- 1b. Upper lip of corolla galeate, not compressed, densely long barbate on inside margin; lateral lobes of lower lip of corolla only slightly smaller than middle lobe, obtuse.
 - 2a. Style equally 2-cleft at apex 2. *P. cuneata*
 - 2b. Style unequally 2-cleft at apex.
 - 3a. Plants with basal rosette of leaves.
 - 4a. Posterior filaments without appendages at base.
 - 5a. Plants less than 5 cm tall; leaves ovate to lanceolate, stellate hairy 22. *P. pygmaea*
 - 5b. Plants more than 5 cm tall.
 - 6a. Plants glabrous leaf and calyx margin ciliate; corolla purple-black to pink; nutlets glabrous 23. *P. atropurpurea*
 - 6b. Plants uniformly hairy.
 - 7a. Bracts densely brown ciliate; verticillasters close together or separate; nutlets glabrous 18. *P. tibetica*
 - 7b. Bracts densely white villous (except in *P. oreophila* var. *evillosa* with bracts stellate pannose).
 - 8a. Stems retrorse appressed villous; all verticillasters approximate; nutlets stellate puberulent at apex 5. *P. oreophila*
 - 8b. Stems stellate puberulent; at least basal verticillasters separate; nutlets glabrous 6. *P. chinghoensis*
 - 4b. Posterior filaments with appendages at base.
 - 9a. Nutlets hairy.
 - 10a. Floral leaves subverticillate, ovate to broadly triangular-ovate; plants ca. 10 cm tall 14. *P. uniceps*
 - 10b. Floral leaves not arranged as above; plants taller.
 - 11a. Abaxial leaf surface with unbranched hairs or subglabrous.
 - 12a. Leaves cordate, crenate, with unbranched hairs on both surfaces 3. *P. alpina*
 - 12b. 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.
 - 13a. Verticillasters 1, terminal; spines of calyx teeth 4–5.5 mm 12. *P. kansuensis*
 - 13b. Verticillasters 3–10, on upper part of stems and branches; spines of calyx teeth 1.8–2.5 mm 10. *P. tuberosa*
 - 11b. Abaxial leaf surface with stellate hairs.
 - 14a. Leaves with stellate hispid and simple hairs, or with stellate strigose and simple hairs.
 - 15a. Basal leaves lanceolate-oblong to narrowly oblong, adaxially with stellate strigose and simple hairs, abaxially stellate tomentulose 8. *P. younghusbandii*
 - 15b. 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 13. *P. mongolica*
 - 14b. Leaves with simple hairs adaxially.
 - 16a. Bracts lanceolate or narrow lanceolate 15. *P. maximowiczii*
 - 16b. Bracts linear, needlelike, or linear-subulate.
 - 17a. Stems simple or branched; bracts slightly shorter than calyx; calyx densely stellate puberulent outside 11. *P. agraria*
 - 17b. Stems many branched; bracts subequal to calyx; calyx sparsely stellate puberulent to hispid outside 17. *P. medicinalis*
 - 9b. Nutlets glabrous.
 - 18a. Basal leaves early deciduous; stem leaves hastate-ovate, appressed pilose 21. *P. pararotata*
 - 18b. Basal leaves persistent; stem leaves narrowly to broadly ovate.
 - 19a. Basal leaves broadly cordate, ca. 14×12 cm, sparsely strigose and corrugate adaxially 7. *P. koraiensis*
 - 19b. Leaves smaller, triangular, triangular-ovate, cordate-ovate to ovate-lanceolate.
 - 20a. Corolla reddish pink.

- 21a. Stem hairs with unequal arms; leaves narrowly ovate to oblong-lanceolate 9. *P. betonicoides*
 21b. Stem hairs with longer central arms; leaves triangular to triangular-ovate 16. *P. dentosa*
- 20b. Corolla purple-red or dark purple; leaves cordate-ovate.
 22a. Corolla dark purple; leaves broadly ovate to circular-ovate, apex rounded, base cordate, sparsely strigose 20. *P. fimbriata*
 22b. Corolla purple-red; leaves acute to obtuse at apex, shallowly cordate at base.
 23a. Leaves cordate-ovate or ovate-oblong, stellate pilose and with simple hairs on both surfaces or abaxially stellate pubescent 4. *P. pratensis*
 23b. Leaves ovate or triangular-ovate, adaxially densely hispid, abaxially densely stellate pilose 19. *P. milingensis*
- 3b. Plants without basal leaf rosette, only stem leaves present.
 24a. Corolla more than 3 cm.
 25a. Corolla yellow 24. *P. megalantha*
 25b. Corolla dark purple 25. *P. ornata*
- 24b. Corolla less than 3 cm.
 26a. Verticillasters conspicuously pedunculate.
 27a. Posterior filaments without appendages at base.
 28a. Bracts as long as or slightly longer than calyx; stems sparsely retrorse minute hispid, sometimes stellate pubescent at apex 42. *P. umbrosa*
 28b. Bracts ca. 1/2 as long as calyx; stems densely tawny stellate pubescent 43. *P. szechuanensis*
- 27b. Posterior filaments with appendages at base.
 29a. Calyx gray stellate pannose outside; bracts leaflike, linear-lanceolate, rarely lanceolate, 4–13(–22)×1.5–3(–5.5) mm 35. *P. likiangensis*
 29b. Calyx with other types of hairs kind; bracts usually smaller, narrower.
 30a. Verticillasters rather loose, usually 1, rarely 2 at apex of stem or branch; flowers long pedicellate; calyx indehiscent 40. *P. pedunculata*
 30b. Verticillasters rather compact, usually 2–5(–9) at apex of stem or branch; flowers short pedicellate; calyx dehiscent 31. *P. congesta*
- 26b. Verticillasters sessile.
 31a. Bracts ca. 1/2 as long as calyx or absent.
 32a. Calyx ca. 1.5 cm 38. *P. longicalyx*
 32b. Calyx 0.8–1 cm.
 33a. Corolla purple 36. *P. franchetiana*
 33b. Corolla yellow 37. *P. ambigua*
- 31b. Bracts more than 1/2 as long as calyx.
 34a. Leaves cordate to broadly ovate, 11–14×7–13 cm; posterior filaments with reflexed, hooked, long-spurred appendage at base far above pilose annulus of corolla tube inside 28. *P. paohsingensis*
- 34b. Leaves of different shapes.
 35a. Leaves abaxially densely stellate tomentose, triangular to triangular-ovate, irregularly deeply crenate-dentate 39. *P. muliensis*
 35b. Leaves abaxially without hairs as above.
 36a. Posterior filaments with a reflexed slender appendage at base.
 37a. Leaves strigose adaxially and along margin abaxially, with elevated glands abaxially 26. *P. melanantha*
 37b. Leaves sparsely minutely hispid adaxially, abaxially stellate pilose, densely and finely spreading setose along veins 27. *P. forrestii*
- 36b. Posterior filaments with an upwardly curved appendage at base.
 38a. Leaves adaxially sparsely short bristly, abaxially pilose, with simple hairs on both surfaces; stems much branched; posterior filaments with a short spurred appendage far above pilose annulus of corolla tube inside 41. *P. jeholensis*
 38b. Leaves adaxially with simple and/or stellate hairs, abaxially with stellate and simple hairs.
 39a. Calyx indehiscent, veins elevated.
 40a. Stems sparsely retrorse minutely hispid; calyx tube densely stellate puberulent, veins spreading bristly, teeth with an apical spine 2–3 mm 29. *P. setifera*
 40b. Stems stellate pubescent or densely tawny stellate tomentulose; calyx tube stellate pubescent (and spreading hirsute in var. *hirticalyx*) 30. *P. tatsienensis*
- 39b. Calyx irregularly dehiscent, veins not elevated.
 41a. Leaves ± leathery, sparsely strigose or subglabrous, margin ciliate, abaxially subglabrous or stellate strigose and hairs with a long central arm 33. *P. strigosa*
 41b. Leaves herbaceous, adaxially sparsely strigose or stellate pubescent,

- abaxially stellate pubescent or dense stellate pilose.
42a. Stem leaves ovate; bracts linear 32. *P. inaequalisepala*
42b. Stem leaves sagittate-oblong; bracts subulate 34. *P. ruptilis*

1. *Phlomis fruticosa* Linnaeus, Sp. Pl. 2: 584. 1753.

橙花糙苏 cheng hua cao su

Stems woody, 25–45 cm tall, gray, densely appressed stellate tomentose; branches spreading. Petiole of basal stem leaves 1–2.5 cm; upper stem leaves sessile, ovate, corrugate, with simple and pilose stellate hairs adaxially, densely gray-white stellate tomentose abaxially, base rounded-cuneate, shallowly crenate. Verticillasters 10–15-flowered, 1 or 2 inserted at apex of stems; bracts oblong-lanceolate to linear-lanceolate, 1.0–1.4 cm × 2–4 mm, appressed to flowers, sparsely ciliate inside, stellate tomentose and densely ciliate near margin outside. Calyx 1.5–1.7 cm, densely stellate tomentose and with simple hairs outside; teeth 1.5–2.5 mm, apex subtruncate, with spines ca. 1.5 mm. Corolla orange, densely orange stellate villous outside, ca. 2× as long as calyx, upper lip shorter than lower lip, orange pubescent on inside margin near apex; middle lobe of lower lip broadly ovate, emarginate; lateral lobes lanceolate. Posterior filaments with a long, oblique, reflexed appendage at base and far above hairy annulus of corolla tube inside. Nutlets glabrous.

Cultivated in Shaanxi [Russia; Africa, SW Asia, Europe].

An ornamental plant.

2. *Phlomis cuneata* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 594. 1977.

楔叶糙苏 xie ye cao su

Stems sparsely and minutely hispid, densely so on nodes, branched. Petiole 7–10 mm; leaf blade of apical stem leaves triangular, 7–9.5 × 6–7 cm, adaxially densely short appressed setose, abaxially densely gray stellate villous, base broadly cuneate, margin irregularly crenate-dentate, apex acute. Verticillasters ca. 20-flowered; floral leaves ovate to lanceolate, margin irregularly crenate-dentate, much longer than verticillasters; bracts linear, 1–1.2 cm, ciliate, stellate puberulent. Calyx 1–1.1 cm, gray stellate pilose outside, basally sparsely ciliate on inside, sinus of teeth with a tuft of villous hairs; teeth ca. 2 mm, with aristae 2–3 mm. Corolla ca. 1.2 cm, tube hairy annulate inside, upper lip densely long bearded on margin. Filaments without appendages, glandular grooved between base of anterior and posterior pairs. Ovary glabrous. Style equally 2-cleft at apex. Fl. Sep.

- Forests. Xizang (Tsujila Shan).

3. *Phlomis alpina* Pallas, Acta Acad. Sci. Imp. Petrop. 2: 265. 1783.

高山糙苏 gao shan cao su

Roots ropelike. Stems ± erect, 20–50 cm tall, simple, glabrous or short pilose basally, retrorse villous or stellate hairy at apex. Petiole of basal leaves longer than blade, those of floral leaves shorter; basal leaf blade ovate, 13–15 × 10 cm; upper leaf blades ca. 10 × 3–4 cm, ovate-oblong to linear-lanceolate, sparsely hairy, much longer than verticillasters, margin crenate or entire. Verticillasters many, separate basally, contiguous at apex; bracts narrowly linear, 0.9–1.1 cm, spreading long hairy. Calyx campanulate, pubescent with long hairs; teeth ovate, with spines 2–3 mm. Corolla reddish,

ca. 2× as long as calyx, simple and stellate hairy with unequal arms, glabrous inside; upper lip irregularly dentate, bearded inside on margin; lower lip with oblate middle lobe, lateral lobes oblong-orbicular. Filaments included, with short, spurred appendages at base. Nutlets apex hairy.

Xinjiang [Kazakhstan, Russia].

4. *Phlomis pratensis* Karelin & Kirilow, Bull. Soc. Imp. Naturalistes Moscou 15: 426. 1842.

草原糙苏 cao yuan cao su

Stems villous, also stellate hairy from middle upward. Petioles of basal and lowermost stem leaves 3–22 cm, others 1–3 cm; basal and lower stem leaf blades cordate-ovate to ovate-oblong, 10–17 × 3.5–12 cm, adaxially sparsely pilose, sometimes also stellate pilose, abaxially stellate pilose sometimes mixed with simple hairs, base shallowly cordate, margin crenate, apex acute to obtuse, mid and upper stem leaf blades circular and smaller. Verticillasters short pedunculate to sessile; floral leaves sessile, ovate-oblong, margin dentate to subentire; bracts linear-subulate, 0.8–1.5 cm, stellate pilose or tufted-pilose. Calyx tubular, 1–1.5 cm, thick veined, pilose or stellate pilose outside; teeth emarginate, with 2–3 mm aristae. Corolla purple-red, 1.5–2× as long as calyx, villous outside; tube glabrous at base, obliquely pilose annulate inside; upper lip irregularly serrate, densely bearded inside; middle lobe of lower lip broadly obovate; lateral lobes shorter, ovate. Posterior filaments curved downward, appendage far above annulus; anthers slightly exerted. Nutlets glabrous.

Alpine meadows; 1500–3000 m. Xinjiang [Kazakhstan, Kyrgyzstan].

5. *Phlomis oreophila* Karelin & Kirilow, Bull. Soc. Imp. Naturalistes Moscou 15: 426. 1842.

山地糙苏 shan di cao su

Stems erect, 30–80 cm tall, retrorse appressed villous. Petiole of basal leaves 6–15 cm, others 2–6 cm; basal leaf blade ovate to broadly ovate, 6.5–13 × 5–10 cm, base cordate, margin crenate, apex obtuse; stem leaf blade circular, 6–11 × 3.2–7 cm, adaxially densely strigose, abaxially densely pilose. Verticillasters close together; floral leaves sessile, ovate-lanceolate to lanceolate-linear, 3–6 × 0.4–2 cm, upper ones narrower, subentire, longer than verticillasters; bracts ca. 1.5 cm, filiform, densely villous to stellate pannose, sometimes also glandular villous. Calyx tubular, ca. 1.2 cm, stellate pannose or densely stellate puberulent except for finely villous veins; teeth broadly ovate, apex subulate-acuminate, 1.5–2 mm. Corolla purple, ca. 2× as long as calyx, densely pubescent and villous on upper lip and basal part of tube outside, villous annulate inside; upper lip bearded inside, margin irregularly dentate; lower lip with broadly obovate-cordate middle lobe, lateral lobes broadly ovate. Filaments inserted on corolla throat, villous, without appendages. Nutlets apex stellate puberulent.

Grassy slopes; 2100–3000 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan].

- 1a. Bracts densely villous or sometimes intermixed with

glandular villous hairs; calyx stellate puberulent, finely villous on veins outside 5a. var. *oreophila*
1b. Bracts and calyx stellate pannose 5b. var. *evillosa*

5a. *Phlomis oreophila* var. *oreophila*

山地糙苏 shan di cao su

Bracts densely villous or sometimes intermixed with glandular villous hairs. Calyx stellate puberulent, finely villous on veins outside.

Grassy slopes; 2200–3000 m. Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan].

5b. *Phlomis oreophila* var. *evillosa* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 594. 1977.

无长毛变种 wu chang mao bian zhong

Bracts and calyx stellate pannose.

- Elevated grassy slopes; 2100 m. Xinjiang.

6. *Phlomis chinghoensis* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 594. 1977.

清河糙苏 qing he cao su

Stems 20–50 cm tall, densely stellate puberulent, unbranched. Petiole of basal leaves 6–15 cm, others 3–3.5 cm. Lower stem leaf blade sagittate-ovate, 8–12.5×5–7 cm, other stem leaf blades 5.5–7×2–3 cm, stellate puberulent. Lower verticillasters widely spaced, upper approximate; lower floral leaves short petiolate to subsessile, ovate-oblong to oblong-lanceolate, 4.5–7×2–3 cm, margin crenate; upper floral leaves linear-lanceolate to linear, margin obtusely dentate to subentire, much longer than verticillasters; bracts 7–12 mm, needlelike, densely white villous. Calyx campanulate, ca. 9 mm, white villous at apex and on veins, densely white puberulent outside, minutely hispid on apical half inside; teeth circular-ovate, ca. 2.5 mm, apex spinescent. Corolla ca. 2×as long as calyx, white lanate except for subglabrous tube outside, villous annulate inside; upper lip ca. 8 mm, bearded inside, margin irregularly dentate; lower lip ca. 6×6 mm, middle lobe largest, oblong, lateral lobes ovate. Stamens included; posterior filaments without appendages. Nutlets glabrous. Fl. Aug.

• Mixed *Larix-Pinus* forests, grassy slopes; 2000–2200 m. Xinjiang.

7. *Phlomis koraiensis* Nakai, Bot. Mag. (Tokyo) 31: 106. 1917.

长白糙苏 chang bai cao su

Stems ca. 44 cm tall, ± terete, finely retrorse pilose, densely so on nodes. Petiole of basal leaves 8–11.5 cm, others ca. 2.5 cm; basal leaf blades broadly ovate, ca. 14×12 cm, adaxially corrugate, sparsely strigose, abaxially densely stellate and finely pilose on veins, base deeply cordate, margin crenate, apex obtuse or acute; stem leaf blades cordate, 5.5–8×ca. 5 cm, margin crenate. Verticillasters ca. 8-flowered; floral leaves short petiolate to subsessile, ovate to lanceolate, 2.5–4.5×0.7–2.7 cm, base shallowly cordate to broadly cuneate, margin irregularly dentate-crenate or shallowly serrate, apex obtuse to acuminate; bracts bristlelike, 0.9–1.1 cm, densely stellate puberulent, ciliate. Calyx campanulate, 1.1–1.2 cm, densely stellate puberulent outside; teeth bearded, broad at base, subtruncate or emarginate, apical

spines 2–3 mm. Corolla red-purple, ca. 2.2 cm, densely pubescent on limb, glabrous except on back outside, villous annulate inside; upper lip ca. 9 mm, deeply incised, bearded inside on margin; lower lip ca. 8×7 mm, middle lobe obcordate, ca. 5×6 mm, apex emarginate; lateral lobes ovate, ca. 2.5 mm. Stamens included; filaments villous, appendage long, reflexed at base above villous annulus of tube. Nutlets glabrous.

Alpine meadows; 2200 m. Jilin (Changbai Shan) [Korea].

8. *Phlomis younghusbandii* Mukerjee, Notes Roy. Bot Gard. Edinburgh 19: 307. 1938.

螃蟹甲 pang xie jia

Phlomis kawaguchii Murata.

Taproots fusiform, to 2.5 cm in diam., lateral roots with globose swellings. Rhizomes cylindric, neck with dense, persistent petiole bases. Stems unbranched, 15–20 cm tall, sparsely appressed stellate tomentulose. Petiole of basal leaves 2–5 cm, others 0.4–1.3 cm; basal leaf blades lanceolate-oblong to narrowly oblong, 5–9×2–3.5 cm, base cordate, margin crenate, apex obtuse to rounded; stem leaves ovate-oblong to oblong, 2–3.5×1.2–2 cm, adaxially bullate, sparsely stellate hispid and simple hairy, abaxially sparsely stellate tomentulose, base broadly cuneate, margin crenate. Verticillasters 3–5, many flowered, basally widely spaced; floral leaves short petiolate to subsessile, 1.8–3.5×0.6–1.2 cm, margin dentate to entire; bracts bristlelike, ciliate, stellate puberulent, nearly as long as calyx. Calyx tubular, 9–10×ca. 4 mm, densely stellate and glandular puberulent; teeth circular, ca. 1.3 mm, apex spinescent, spines ca. 1.2 mm. Corolla ca. 1.5 cm, tube glabrous, limb densely villous and villous annulate inside; upper lip ca. 5 mm, bearded inside, dentate; lower lip ca. 8×6.5 mm, middle lobe obcordate, ca. 3.5×3.5 mm, emarginate; lateral lobes ovate, ca. 2.5 mm. Stamen appendage hooked, at base above villous annulus. Nutlets apex granular hairy. Fl. Jul.

- Slopes, fields, thickets; 4300–4600 m. Xizang.

Roots used medicinally for cough and bronchitis.

9. *Phlomis betonicoides* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 241. 1912.

假秦韭 jia qin jiu

Phlomis betonicoides Diels f. *alba* C. Y. Wu.

Roots moniliform. Stems erect, 30–80 cm, densely stellate hispid, unbranched. Petiole of basal leaves 3–15 cm, others (0.3–)1–3 cm; basal leaf blade narrowly ovate to triangular, 7.5–14×5–7.5(–10) cm, adaxially densely stellate strigose or with simple hairs, abaxially stellate and with simple hairs on veins, base rounded to cordate, margin crenate to dentate, apex obtuse to acute; stem leaves 5–9×2–4.5 cm, with similar indumentum. Verticillasters many flowered; floral leaves sessile, 2.5–6×1–2 cm; bracts dark purple, bristlelike, ciliate, nearly as long as calyx. Calyx tubular-campanulate, ca. 1 cm, bristly at apex and on veins, base sparsely puberulent; teeth bristlelike, 1.8–4 mm, rigid, spreading, margin double dentate, densely ciliate. Corolla reddish to white, ca. 1.8 cm, densely stellate hispidulous outside, villous annulate inside; upper lip ca. 8 mm, bearded inside, margin irregularly denticulate; lower lip 6–7 mm, middle lobe largest, obovate-elliptic, lateral lobes subcircular, margin irregularly denticulate. Stamens included; filaments

villous, appendage short spurred at base. Nutlets apex slightly scaly, glabrous at maturity. Fl. Jun-Aug, fr. Sep-Oct.

• Grassy slopes, forested grassland, forests; 2700–3000 m. Sichuan, Xizang, Yunnan.

Roots used as a medicine for colds and diarrhea.

10. *Phlomis tuberosa* Linnaeus Sp. Pl. 2: 586. 1753.

块根糙苏 kuai gen cao su

Phlomidopsis tuberosa (Linnaeus) Link; *Phlomoides tuberosa* (Linnaeus) Moench.

Roots enlarged, tuberous. Stems erect, 40–150 cm tall, subglabrous upward, sparsely pilose basally, sometimes purple-red. Petiole of basal leaves 4–25 cm, others 1.5–3.5 cm; basal leaf blades triangular, 5.5–19×5–13 cm, base deeply cordate, margin coarsely crenate, apex obtuse to acute; blade of mid stem leaves triangular-lanceolate, 5–9.5×2.2–6 cm, adaxially sparsely hispid to subglabrous, abaxially glabrous or sparsely bristly near veins only, base cordate, margin coarsely dentate, rarely undulate. Verticillasters ca. 3–10, widely spaced, many flowered; floral leaves short petiolate to sessile, lanceolate, reduced upward to slightly longer than verticillasters, margin dentate; bracts linear-subulate, ca. 1 cm, ciliate. Calyx tubular-campanulate, 8–10 mm, sparsely bristly near teeth otherwise glabrous outside; teeth semi-circular, 0.5–0.7 mm, apex emarginate, spine 1.8–2.5 mm. Corolla purple-red, 1.2–2 cm, tube glabrous; limb densely stellate tomentose outside, villous annulate inside; upper lip densely bearded inside, margin irregularly denticulate; lower lip ovate, ca. 6×5 mm; middle lobe largest, obcordate; lateral lobes ovate. Posterior filament appendages reflexed, short spurred. Nutlets apex stellate pubescent. Fl. and fr. Jul-Sep.

Wet grasslands, valleys; 1200–2100 m. Heilongjiang, Nei Mongol, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia; SW Asia, Europe].

11. *Phlomis agraria* Bunge, Fl. Altaic. 2: 411. 1830.

耕地糙苏 geng di cao su

Roots thickened, ropelike. Stems erect, 40–60 cm tall, appressed or retrorse hairy, flowering parts glandular hairy. Petiole of basal leaves 5–8 cm, others 2–2.5 cm; leaf blade simple hairy, also stellate abaxially, margin obtusely crenate-dentate; basal blades triangular-cordate, 8–10×4–6 cm, lower stem leaf blades 5.5×3–3.5 cm; upper stem leaves sessile, 1.5×6–8 mm, apex acuminate. Verticillasters 10–12-flowered, shorter than basal floral leaves; bracts linear-subulate, 8–9 mm, spreading hairy, spinescent. Calyx tubular-campanulate, 1–1.2 cm, glandular hairy outside; teeth semicircular to circular, stellate puberulent, apex spinescent-acuminate. Corolla reddish, rarely white, ca. 2×as long as calyx; tube glabrous, hairy below throat and on limb outside; upper lip ovate, densely bearded inside, margin denticulate; lower lip with reniform-cordate middle lobe, lateral lobes ovate. Posterior filament appendages short spurred. Nutlets apex hairy (specimens not seen).

Grasslands, thickets. Xinjiang [Kazakhstan, Mongolia, Russia].

12. *Phlomis kansuensis* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 595. 1977.

甘肃糙苏 gan su cao su

Stems ca. 36 cm tall, sparsely retrorse bristly, densely bristly on nodes and just below flowers. Leaves sparsely bristly. Petiole of basal leaves 1–6 cm, others 0.6–1.1 cm, sparsely retrorse bristly; basal leaf blade ovate-triangular to ovate, 3–5×2.8–3.3 cm, base cordate, margin deeply crenate or dentate, apex rounded to acute; stem leaves 1-paired, blade ovate-lanceolate, ca. 4×2 cm, base broadly cuneate, margin irregularly dentate, apex acute. Verticillasters solitary, apical, many flowered; floral leaves lanceolate, ca. 4.5×1.2 cm, base cuneate, margin irregularly remote dentate, apex acuminate; bracts linear-subulate, 6–10 mm, margin ciliate, spinescent. Calyx tubular-campanulate, ca. 14×6 mm, dusty puberulent outside except for sparsely bristly veins; teeth spines spreading, 4–5.5 mm; sinus teeth tufted hairy, apex puberulent. Corolla reddish, ca. 1.9 cm, pilose; tube glabrous outside, villous annulate inside; upper lip ca. 9 mm, margin denticulate, pilose outside, densely bearded inside; lower lip ca. 7×8 mm, middle lobe largest, broadly obovate; lateral lobes circular-ovate. Stamens included, puberulent; posterior filament appendages reflexed, lingulate. Nutlets sparsely scaly. Fl. Jun.

• Montane steppes; 2600 m. Gansu.

13. *Phlomis mongolica* Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 24(2): 406. 1851.

串铃草 chuan ling cao

Taproots woody, thick, lateral roots globose to fusiform. Stems 15–70 cm tall, few branched, pilose or spreading bristly; nodes densely bristly. Petiole 1–6 cm; basal leaf blades triangular, 4–13.5×2.7–7 cm, adaxially stellate setose and simple hairy or sparsely bristly to subglabrous, abaxially ± pilose or tufted setose, rarely bristly, base cordate, margin crenate, apex obtuse, stem leaves similar but smaller. Verticillasters many flowered, numerous, separate; floral leaves with petiole 6–11 mm, blade triangular to ovate-lanceolate, gradually reduced to shorter than verticillasters; bracts linear-subulate, as long as calyx, rigid, spreading ciliate, spinescent. Calyx tubular, ca. 14×6 mm, dusty puberulent outside except for bristly veins; teeth circular, ca. 1.2 mm, margin pilose, apex emarginate, with spines 2.5–3 mm. Corolla purple, ca. 2.2 cm; tube stellate pubescent above middle, glabrous at base outside, villous annulate inside; upper lip ca. 1 cm, stellate bearded inside, margin fringed; lower lip ca. 1×1 cm, middle lobe largest, circular-obovate, ca. 6×7 mm, apex emarginate; lateral lobes ovate, margin irregularly denticulate. Stamens included, hairy; posterior filament appendages reflexed, short spurred. Nutlets apex hairy. Fl. May-Sep, fr. Jul-Oct.

• Grassy slopes; 800–2200 m. Gansu, Hebei, Nei Mongol, Shaanxi, Shanxi.

- 1a. Plants 40–70 cm tall; verticillasters numerous, axillary, inserted on upper part of stems 13a. var. *mongolica*
- 1b. Plants ca. 15 cm tall; verticillasters solitary, terminal or axillary, sometimes inserted at base of stems 13b. var. *macrocephala*

13a. *Phlomis mongolica* var. *mongolica*

串铃草 chuan ling cao

Plants 40–70 cm tall. Verticillasters numerous, axillary, inserted on apical part of stems.

- Grassy slopes; 800–2200 m. Gansu, Hebei, Nei Mongol, Shaanxi, Shanxi.

Used as an ornamental. Plants are poisonous.

13b. *Phlomis mongolica* var. *macrocephala* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 595. 1977.

大头变种 da tou bian zhong

Plants ca. 15 cm tall. Verticillasters solitary, terminal or axillary, sometimes inserted at base of stem, many flowered, subglobose.

- Grassy slopes. Nei Mongol.

14. *Phlomis uniceps* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 595. 1977.

单头糙苏 dan tou cao su

Roots thick. Stems ca. 10 cm tall, densely stellate pannose. Petiole 1–6 cm; basal and stem leaf blades ovate-triangular, 3–5×1.3–2.6 cm, adaxially stellate pubescent and simple hairy, abaxially stellate tomentulose, base cordate, margin crenate, apex rounded. Verticillasters apical, solitary, ca. 16-flowered; floral leaves subverticillate, petiole 6–11 mm, densely stellate pannose, blade ovate to broadly cuneate; bracts subulate, 9–10 mm, slightly rigid, densely stellate ciliate, puberulent. Calyx teeth semicircular, apex truncate or emarginate, with spines 1–2 mm, puberulent except for apical pilose tuft inside. Corolla purple, ca. 2.2 cm, tube glabrous basally, stellate tomentulose near throat outside, villous annulate inside, limb densely white stellate tomentulose except for bearded back of upper lip outside; upper lip ca. 8 mm, margin denticulate, bearded inside; lower lip ca. 6×8 mm, middle lobe largest, obcordate, ca. 4×6 mm; lateral lobes ovate, margin irregularly denticulate. Stamens included, glabrous; posterior filament appendages at base far above annulus. Nutlets apex densely stellate tomentose. Fl. Sep.

- Valley grasslands. Gansu (Yongchang Xian).

15. *Phlomis maximowiczii* Regel, Trudy Imp. S. Peterburgsk. Bot. Sada 9: 594. 1886.

大叶糙苏 da ye cao su

Stems erect, 80–100 cm tall, sparsely minute retrorse hispid, branched toward apex. Petiole of lower stem leaves 7–9 cm, others 2–3 cm; basal leaf blades ovate, 9–15×8–10 cm, adaxially sparsely minute hispid, abaxially sparsely stellate pilose, base shallowly cordate, margin serrate or dentate, apex acuminate; upper stem leaves much reduced. Verticillasters many flowered, separate; peduncle 1–2 mm; basal floral leaves subsessile, longer than verticillasters, ovate-lanceolate; upper floral leaves 2–3×1–2 cm, margin entire or dentate, sometimes equal to verticillasters; bracts lanceolate, 9–10 mm, margin ciliate. Calyx tubular, slightly enlarged at apex, 8–10 mm, spreading bristly outside on veins; teeth truncate, puberulent except for apical tuft inside, apex spinescent. Corolla reddish, ca. 2 cm; tube glabrous except for apex white pilose on back outside, villous annulate inside; upper lip ca. 9 mm, margin irregularly denticulate, densely bearded inside, densely lanate and stellate tomentose outside, hairs with a long central arm; lower lip ca. 5×7 mm, pilose outside, middle and lateral lobes ovate. Stamens included; filaments apex villous, posterior filament appendages obliquely spreading, short spurred at base above annulus. Ovary lobes apex pubescent. Fl. Jul-Aug.

- Forest margins, riverbanks. Hebei, Jilin, Liaoning.

Roots used as a febrifuge, to reduce swelling, and for furunculosis. Nutlet oil content is 20–34%.

16. *Phlomis dentosa* Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 123. 1883.

尖齿糙苏 jian chi cao su

Stems erect, to 80 cm tall, stellate pannose, strigose, or hispidulous. Petiole 2.5–10 cm; leaf blade triangular to triangular-ovate, 5.5–10×3–6 cm, adaxially minutely hispid or stellate strigose, rarely stellate pubescent, abaxially densely stellate pubescent, base cordate, margin irregularly crenate, apex rounded. Verticillasters many flowered, numerous; floral leaves short petiolate to subsessile, ovate-triangular to lanceolate, margin remotely dentate, basally much longer than verticillasters; bracts needlelike, 7–10 mm, densely stellate puberulent and stellate ciliolate (hairs with long central arms). Calyx tubular-campanulate, ca. 9×6 mm, densely stellate tomentulose, veins stellate hispidulous outside; teeth ca. 1 mm, margin dentate, apical spines 4–5 mm, marginal teeth apex tufted villous inside. Corolla reddish, ca. 1.6 cm; tube mostly glabrous, apex pubescent outside, villous annulate inside; upper lip ca. 8 mm, reflexed, densely stellate pubescent, villous outside, margin irregularly denticulate; lower lip ca. 6×7 mm, densely stellate pubescent outside, middle lobe broadly obovate, lateral lobes ovate. Stamens exerted; filaments hairy, posterior filament appendages short spurred at base above annulus. Nutlets glabrous. Fl. May-Oct, fr. Sep-Oct.

- Grassy slopes; 0–2500 m. Gansu, Hebei, Nei Mongol, Qinghai.

- 1a. Plants stellate hairy throughout 16a. var. *dentosa*
- 1b. Stems sparsely minutely hispid to subglabrous; leaves subglabrous; bracts and calyx sparsely bristly and dusty puberulent 16b. var. *glabrescens*

16a. *Phlomis dentosa* var. *dentosa*

尖齿糙苏 jian chi cao su

Stems stellately pannose, strigose, or hispidulous. Leaves hispidulous or stellate strigose, rarely stellate pubescent. Bracts stellately puberulent, ciliolate. Calyx densely stellately tomentulose, hispidulous.

- Grassy slopes; 0–2500 m. Gansu, Hebei, Nei Mongol, Qinghai.

16b. *Phlomis dentosa* var. *glabrescens* Danguy, Bull. Mus. Hist. Nat. (Paris) 17: 345. 1911.

渐光变种 jian guang bian zhong

Stems sparsely hispidulous to subglabrous. Leaves subglabrous. Bracts and calyx sparsely setose, dusty puberulent.

- Slopes; 0–1200 m. Gansu, Hebei, Nei Mongol, Qinghai.

17. *Phlomis medicinalis* Diels, Bot. Jahrb. Syst. 29: 554. 1900.

萝卜秦韭 luo bo qin jiu

Phlomis wangii Hu & Tsai.

Herbs perennial. Stems 20–75 cm tall, purple-red, stellate pilose. Petiole of basal leaves 6–23 cm, others 0.8–7 cm; basal leaf blades ovate to ovate-oblong, 4.5–14×4–11 cm, base deeply cordate, margin coarsely crenate, apex rounded; stem leaf blades 5–6×2.5–4 cm, adaxially strigose, abaxially densely stellate pubescent, base ± truncate, margin coarsely dentate, apex acute or obtuse, longer than verticillasters. Verticillasters 1–4, many flowered, widely spaced; bracts linear-subulate, 6–10 mm, spinescent, ciliate, glandular puberulent, outer bracts reflexed, others ± spreading. Calyx tubular-campanulate, ca. 9×5 mm, sparsely stellate puberulent, bristly outside; teeth triangular, ca. 2 mm, margin puberulent, double dentate, tufted villous inside, apical spines 3–5 mm, obliquely reflexed or spreading. Corolla purple-red or reddish, ca. 2 cm, base glabrous; limb densely stellate tomentose, silky outside, villous annulate inside; upper lip ca. 1 cm, margin irregularly denticulate, bearded inside; lower lip spreading, ca. 8×6 mm, red lineate; middle lobe obovate, ca. 5 mm in diam.; lateral lobes small, broadly ovate. Posterior filament appendages reflexed, lingulate, at base above annulus. Nutlets apex scaly. Fl. May–Jul.

- Slopes; 1700–3600 m. Sichuan, Xizang.

18. *Phlomis tibetica* Marquand & Airy Shaw, J. Linn. Soc., Bot. 48: 218. 1929.

西藏糙苏 xi zang cao su

Stems 18–52 cm tall, densely strigose to sparsely puberulent. Petiole of basal leaves 5–15 cm, others 3.5–14 cm; basal leaf blades ovate-cordate, 4.5–7×4–5 cm, adaxially stellate strigose (hairs with unequal arms) or simple hairy, abaxially densely stellate pilose and simple hairy, base cordate, margin crenate to coarsely crenate, apex obtuse; stem leaf blades similar to basal, 6.5–8×6 cm, base shallowly cordate to truncate-cuneate. Verticillasters 1–3 (or 4), many flowered; floral leaves with petiole 0–5 mm, blade ovate-lanceolate to lanceolate, 2–5.5×1–2.7 cm, margin shallowly crenate; bracts subulate, 0.8–1.2 cm, densely purple-brown ciliate. Calyx tubular-campanulate, 1.0–1.2 cm×ca. 7 mm, puberulent and/or stellate puberulent, veins purple-brown setose outside, throat bristly inside; teeth 1–1.5×2–2.8 mm, truncate to emarginate, apical spine 1–1.8 mm. Corolla purple to deep wine red or pink, 1.8–2.2(–3) cm; tube retrorse pilose or subglabrous outside, villous annulate inside; limb densely stellate tomentose outside, upper lip ca. 8 mm, margin denticulate, gray-black or gray barbate inside; lower lip ca. 6×7 mm, middle lobe circular, ca. 3.5 mm in diam., margin irregularly undulate; lateral lobes shorter, semicircular. Filaments without basal appendages. Nutlets glabrous. Fl. Jul.

- Open alpine meadows, streamsides, forests, grassy slopes, cultivated areas; 3400–4500 m. Xizang.

- 1a. Leaves ovate-cordate; upper corolla lip stellate tomentose outside 18a. var. *tibetica*
- 1b. Leaves cordate to broadly oblong; upper corolla lip densely villous outside 18b. var. *wardii*

18a. *Phlomis tibetica* var. *tibetica*

西藏糙苏 xi zang cao su

Leaf blade ovate-cordate, margin crenate or coarsely crenate. Upper corolla lip stellate tomentose outside.

- Open alpine meadows, streamsides, forests; 3900–4500 m. Xizang.

18b. *Phlomis tibetica* var. *wardii* Marquand & Airy Shaw, J. Linn. Soc., Bot. 48: 219. 1929.

毛盔变种 mao kui bian zhong

Leaf blade cordate to broadly oblong, margin coarsely crenate. Upper corolla lip densely villous outside.

- Grassy slopes, cultivated areas; 3400–3600 m. Xizang.

19. *Phlomis milingensis* C. Y. Wu & H. W. Li, Fl. Reipubl. Popularis Sin. 65(2): 595. 1977.

米林糙苏 mi lin cao su

Rhizomes oblique, rooting at nodes. Stems erect, 15–40 cm tall, minutely retrorse hispid. Petiole of basal leaves to 7 cm, others 1–4.5 cm; basal leaf blades triangular-ovate, 5.5–7×4–5.5 cm, base cordate, margin crenate, apex obtuse to acute; stem leaves ovate to triangular-ovate, ca. 7.5×6 mm, adaxially hispid, abaxially stellate pilose, base shallowly cordate, margin coarsely crenate, apex acute. Verticillasters 1 or 2, ca. 10-flowered, widely spaced; floral leaves petiole 0–4 mm, blade 2.5–4×1.5–2.5 cm; bracts linear-subulate, ca. 8 mm, purple-brown ciliate, spinescent. Calyx tubular, ca. 1.3×5 mm, 10-veined, glabrous except for purple-brown ciliate veins outside, throat bristly; teeth ca. 2.5×2 mm, subtruncate or emarginate, apical spine ca. 1.5 mm. Corolla purple-red, (2–)2.5–2.8(–3) cm; tube 1.5–1.8 cm, ca. 7 mm wide at throat, apex pilose outside, pilose annulate inside; upper lip subcircular, ca. 1 cm in diam., margin denticulate, gray villous outside, gray barbate inside; lower lip ca. 8×8 mm, pilose outside, glabrous inside; middle lobe ca. 3.5 mm in diam.; lateral lobes shorter, semicircular. Filaments pilose at middle, posterior 2 with a basal, hooked, reflexed appendage. Nutlets glabrous. Fl. Jul.

- *Picea* forests, thickets; 3400–4400 m. Xizang.

20. *Phlomis fimbriata* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 596. 1977.

裂唇糙苏 lie chun cao su

Stems 20–30 cm tall. Petiole 4.5–14 cm, basal ones persistent, minutely retrorse hispid or puberulent; basal and stem leaf blades broadly ovate to circular-ovate, 2.5–10×2.5–7.5 cm, sparsely strigose, base cordate, margin crenate, apex rounded. Verticillasters 1 or 2, (2–)7–9-flowered; floral leaves subsessile, ovate-oblong, 2–6×0.7–2.7 cm; bracts few, subulate, 5–8 mm, ciliate at apex, rarely along entire margin. Calyx tubular-campanulate, ca. 1.4 cm×7 mm, sparsely minutely hispid outside; teeth obliquely triangular, ca. 1.5 mm, margin puberulent, double toothed, apex emarginate, short spinescent, tufted setose inside. Corolla dark purple, ca. 2.6 cm; tube ca. 1.6 cm, puberulent on back outside, pilose annulate, apex sparsely puberulent inside; upper lip ca. 1×1.5 cm, densely pilose outside, margin denticulate, densely bearded inside; lower lip ca. 7×8 mm, puberulent outside; middle lobe oblate, ca. 5×7 mm, margin denticulate; lateral lobes subcircular, ca. 3 mm in diam., margin denticulate. Stamens included; filaments finely pilose, posterior 2 with a slightly reflexed basal appendage. Nutlets glabrous. Fl. Aug.

- Grassy slopes; 3500 m. Yunnan.

21. *Phlomis pararotata* Sun ex C. H. Hu, Acta Phytotax. Sin. 11: 44. 1966.

假轮状糙苏 jia lun zhuang cao su

Stems more than 35 cm tall, unbranched, pilose. Basal leaves early deciduous; petiole of stem leaves 1–9 cm; stem leaf blades hastate-ovate, 4.5–11×5.3–11 cm, appressed pilose, base cordate, margin irregularly crenate, apex rounded. Verticillasters 1 (or 2), many flowered; floral leaves sessile, ovate, 4–7×2.2–7 cm, base rounded, apex acute; bracts few, linear-subulate, 6–12 mm, densely ciliate. Calyx tubular-campanulate, 1.1–1.2 cm×6–7 mm, puberulent, veins sparsely minutely hispid outside; teeth double toothed at margin, puberulent, apex emarginate, with spines ca. 0.7 mm. Corolla red, ca. 1.8 cm; tube ca. 1.1 cm, glabrous except for puberulent back outside, pilose annulate inside; upper lip ca. 9 mm, densely appressed pubescent outside, margin denticulate, bearded inside, lower lip ca. 8.5×7 mm, puberulent outside; middle lobe obovate, ca. 5×4 mm, margin denticulate; lateral lobes ovate, ca. 3×2.5 mm. Stamens included; posterior filaments with a slender basal appendage. Nutlets glabrous. Fl. Aug, fr. Sep.

- Hills; 4000 m. Yunnan.

22. *Phlomis pygmaea* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 596. 1977.

矮糙苏 ai cao su

Roots thick, woody. Stems tufted, basal petioles persistent, ca. 5 cm tall, densely gray stellate pannose. Petiole 0.8–2.5 cm; basal and stem leaf blades ovate to lanceolate, 2–4×1.4–2.5 cm, appressed gray stellate pubescent, gray dusty hairy, base rounded to broadly cuneate, margin crenate, apex rounded. Floral leaves subsessile to short petiolate, ovate-lanceolate to spatulate, 1–1.2 cm×5 mm. Calyx tubular-campanulate, ca. 6.5×4 mm, white dusty hairy, veins sparsely villous outside; teeth semicircular, ca. 1 mm, spinescent, margin pilose. Corolla purple, ca. 1.3 cm; tube ca. 8 mm, appressed gray pubescent near throat outside, pilose annulate inside; upper lip ca. 6 mm, densely appressed pubescent outside, bearded inside, margin denticulate; lower lip ca. 6×6 mm, appressed pubescent outside; middle lobe obcordate, ca. 2.5×3.5 mm; lateral lobes triangular-ovate. Stamens included; filaments without basal appendages. Nutlets glabrous. Fl. Jul.

- Terraces; 5000 m. Xizang.

23. *Phlomis atropurpurea* Dunn, Notes Roy. Bot. Gard. Edinburgh 8: 169. 1913.

深裂糙苏 shen lie cao su

Roots thick. Stems 20–60 cm tall, subglabrous or retrorse pilose toward apex. Petiole (1–)2–28 cm; basal and stem leaf blades ovate, rarely ovate-oblong to oblong-lanceolate, 2.5–11×1.5–8 cm, base cordate, margin crenate, apex obtuse. Verticillasters (1 or 2)–4, many flowered; floral leaves sessile or short petiolate, 1.5–4×0.4–2.2 cm, margin serrate or subentire, slightly shorter to longer than verticillasters; bracts linear-subulate, 3–10×to 2 mm, sparsely ciliate to subglabrous. Calyx tubular-campanulate, ca. 10×6 mm, veins sparsely bristly outside; teeth triangular, margin double toothed, apex emarginate, spinescent, tufted setose inside, spines 2–2.5 mm. Corolla purple with purple-black upper lip, rarely purplish to white, 1.7–1.8(–2) cm; tube 1–1.2 cm, appressed puberulent near throat outside, pilose annulate inside; upper lip 6–8 mm, densely appressed white pubescent outside, margin irregularly denticulate, white barbate inside; lower lip ca. 7×9 mm, puberulent outside; middle lobe oblong, ca. 6×5 mm; lateral lobes small, ovate. Stamens

included; filaments without appendages at base. Nutlets glabrous.

- Marshy meadows; 2800–3900 m. Yunnan (Zhongdian Xian, Lijiang Xian).

24. *Phlomis megalantha* Diels, Bot. Jahrb. Syst. 36, Beibl. 82: 95. 1905.

大花糙苏 da hua cao su

Taproots woody, with numerous, rigid, woody lateral roots. Stems 15–45 cm tall, sparsely retrorse minute hispid. Petiole 1.5–10 cm; stem leaf blades circular-ovate to ovate-oblong, 5–17.5×4.2–11 cm, adaxially corrugate, appressed ciliolate, abaxially pilose on veins, base cordate to subtruncate, margin deeply crenate, apex acute or obtuse, rarely acuminate. Verticillasters 1 or 2, few to many flowered, sometimes ± approximate; floral leaves longer than verticillasters; bracts linear-subulate, (6–)10–15(–20)×2(–4) mm, densely ciliate. Calyx tubular-campanulate, 1.8–2.8×ca. 8 mm, veins pilose outside; teeth double toothed at margin, puberulent, apex emarginate, tufted-pilose inside, spines ca. 2 mm. Corolla yellowish to white, 3.7–5 cm; tube apex pubescent, basally glabrous outside, without hairy annulus inside; upper lip 1.2–1.4 cm, base truncate, margin denticulate, densely pubescent outside, bearded inside; lower lip ca. 1.7×1.3 cm, pubescent outside; middle lobe circular-ovate, ca. 9×7 mm, margin irregularly undulate; lateral lobes triangular. Filaments long hairy, without basal appendages. Nutlets glabrous. Fl. Jun-Jul, fr. Aug-Nov.

- *Abies* forests, thickets, grassy slopes; 2400–4200 m. Hubei, Shaanxi, Shanxi, Sichuan.

25. *Phlomis ornata* C. Y. Wu, Fl. Yunnan. 1: 610. 1977.

美观糙苏 mei guan cao su

Taproots thick, with numerous woody lateral roots. Rhizomes woody, slender. Stems tufted, 40–60 cm tall, unbranched, erect or ascending, sparsely bristly. Petiole 2.5–21 cm, basal ones persistent; stem leaf blades broadly ovate, 9–15.5×6.5–12.2 cm, adaxially sparsely setose, abaxially densely setose, occasionally intermixed with a few stellate hairs, base cordate, margin mucronate dentate-crenate, apex acute to acuminate. Verticillasters 1 or 2, many flowered; floral leaves longer than verticillasters, with petiole 1–1.5 cm, blade 6–10×3–5 cm, margin serrate, apex short acuminate; bracts subulate, 6–13 mm, ± spinescent, densely bristly. Calyx tubular, 2–2.5×ca. 0.9 cm, purplish, glandular puberulent or stellate puberulent, veins hispid outside; teeth double toothed at margin, puberulent, apex emarginate, tufted hairy inside, spines 3–4 mm. Corolla dark purple, to 4.7 cm, tube to 3.3 cm, white or purplish tomentulose on back outside, otherwise glabrous; limb densely white or purplish tomentulose outside, glabrous inside; upper lip to 1.6 cm, margin denticulate, apical half bearded inside; lower lip to 1.7×1.6 cm, middle lobe oblate, ca. 7×9 mm, constricted at base, margin denticulate, concave; lateral lobes ovate. Filaments long hairy, without appendages. Nutlets glabrous. Fl. Jun-Sep, fr. Jul-Nov.

- *Abies* forests, grasslands; 3000–3700 m. Sichuan, Yunnan.

26. *Phlomis melanantha* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 242. 1912.

黑毛糙苏 hei mao cao su

Phlomis melanantha Diels var. *angustifolia* C. Y. Wu.

Roots woody, thick. Stems 60–90 cm tall, subglabrous. Petiole 1.2–6 cm; stem leaf blades broadly ovate to ovate-oblong, 4.5–12×(1.9–)2.5–9.5 cm, reduced upward, adaxially strigose, abaxially with scattered elevated glands, base cordate, margin serrate-dentate to dentate, sometimes crenate, apex acute to long acuminate. Verticillasters numerous, many flowered; floral leaves similar to stem leaves; bracts rigid, subulate, 1–1.2 cm, spinescent, sparsely ciliate. Calyx purple, ca. 12×6 mm, dusty puberulent, sometimes veins very sparsely bristly outside; teeth double toothed at margin, puberulent, apex emarginate, tufted hairy inside, spines 2–3 mm. Corolla purple-red, limb dark purple or reddish, ca. 2.2 cm, silky pilose outside; tube ca. 1.4 cm, glabrous outside, pilose on posterior, pilose annulate inside; upper lip ca. 8 mm, margin irregularly dentate, bearded inside; lower lip ca. 6×9 mm, middle lobe oblate, ca. 4×6 mm; lateral lobes ovate. Posterior filaments each with a slender reflexed basal appendage. Nutlets glabrous. Fl. Jun–Sep, fr. Jul–Oct.

• *Picea* forests, mixed forests, grasslands; 3000–3300 m. Sichuan, Yunnan.

27. *Phlomis forrestii* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 241. 1912.

苍山糙苏 *cang shan cao su*

Phlomis forrestii Diels var. *taronensis* C. Y. Wu.

Taproots thick, succulent. Stems 30–90 cm tall, stellate pilose. Petiole 2.5–15 cm; stem leaf blades ovate to elliptic, 10–19.5×4–14.5 cm, adaxially sparsely minutely hispid, abaxially stellate pilose, veins spreading minutely hispid, base cordate, margin crenate or serrate-crenate, apex acute to acuminate. Verticillasters many flowered; floral leaves similar to stem leaves; bracts subulate, herbaceous, 5–12×ca. 1.5 cm, ciliate. Calyx tubular-campanulate, ca. (7–)12×6 mm, stellate puberulent outside, veins spreading bristly; teeth double toothed, densely puberulent at margin, apex emarginate, tufted pilose inside, spines ca. 2 mm. Corolla purplish, 2–2.3 cm; tube 1.1–1.2 cm, minutely tomentose near throat outside, pilose annulate inside; upper lip ca. 8 mm, margin denticulate, bearded inside; lower lip ca. 1.2×1.1 cm, middle lobe ovate, ca. 8×7 mm, margin irregularly undulate. Filaments long hairy, posterior 2 with a slender reflexed appendage at base. Nutlets black, globose, glabrous. Fl. Aug, fr. Sep.

• *Pinus* and *Abies* forests; 2700–4000 m. Yunnan.

28. *Phlomis paohsingensis* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 598. 1977.

宝兴糙苏 *bao xing cao su*

Roots woody, robust. Stems 0.9–1.2 m tall, basally glabrous, apex minutely retrorse hispid, brownish. Petiole 4–10 cm; stem leaf blades cordate, 11–14×7–13 cm, adaxially spreading bristly, abaxially stellate pilose, base cordate to round, margin dentate to deeply crenate, apex acute to caudate-acuminate. Verticillasters apical, many flowered; floral leaves with petiole 0–10 mm, blade 4.5–7×1.2–2.8 cm, base cuneate, margin dentate, apex long acuminate; bracts subulate, 6–10 mm, ciliate, puberulent. Calyx tubular, ca. 1.4×7 cm, dusty puberulent outside, veins bristly; teeth semicircular, margin puberulent, apex tufted hairy inside, spines ca. 2 mm. Corolla purplish; tube ca. 1.1 cm, glabrous except for silky pilose back outside, pilose annulate inside;

upper lip ca. 8 mm, margin fringed-denticulate, densely silky pilose outside, long barbate inside; lower lip brown with dark purple spots, ca. 8×8 mm, silky pilose, glabrous near margin; middle lobe ovate, ca. 5×4 mm; lateral lobes ovate. Stamens included; filaments long hairy, posterior 2 with a hooked reflexed basal appendage. Nutlets glabrous. Fl. Jul.

• Thickets on slopes; 3100 m. Sichuan (Baoping Xian).

29. *Phlomis setifera* Bureau & Franchet, J. Bot. (Morot) 5: 149. 1891.

刺毛糙苏 *ci mao cao su*

Stems 30–50 cm tall, sparsely retrorse minutely hispid. Petiole persistent, 4.5–13 cm; stem leaf blades triangular-ovate, 14–19×7.5–11.5 cm, adaxially stellate hispidulous (hairs with long central arms), abaxially stellate pubescent, with scattered elevated glands, base obliquely cordate, margin dentate, apex acuminate. Verticillasters 1 or 2, 10–18-flowered; floral leaves with petiole ca. 8 mm, blade ca. 6.5×3 cm, base shallowly cordate, apex long acuminate; bracts linear-subulate, 4–6 mm, bristly glandular puberulent. Calyx campanulate, ca. 10×5.5 mm, densely stellate puberulent outside, veins spreading bristly; teeth semicircular, 1–1.5 mm, margin hirsute, apical spines rigid, 2–3 mm. Corolla yellow-white, ca. 1.4 cm; tube ca. 7 mm, glabrous except for partly pubescent back outside, pilose annulate inside; upper lip ca. 7 mm, margin denticulate to subentire, white villous outside; lower lip ca. 6×8 mm, margin pubescent; middle lobe obovate, ca. 5×4 mm, apex slightly undulate; lateral lobes ovate. Stamens included; filaments long hairy, posterior 2 with a long, reflexed, apically hooked basal appendage. Nutlets glabrous. Fl. Jul–Sep.

• *Abies* forests; 3600–3900 m. Sichuan, Xizang, Yunnan.

30. *Phlomis tatsienensis* Bureau & Franchet, J. Bot. (Morot) 5: 149. 1891.

康定糙苏 *kang ding cao su*

Roots thick. Stems 30–100 cm tall, stellate pubescent or densely yellow stellate tomentulose. Petiole 1–13 cm; stem leaf blades ovate, 5–23×2.5–17 cm, adaxially stellate hispidulous, abaxially stellate pilose or tawny stellate tomentulose, base cordate to rounded, margin crenate to serrate, apex acute to long acuminate. Verticillasters numerous, 6–14-flowered; floral leaves with petiole 3–5 mm, blade 1–3×0.5–1.3 cm, margin serrate, upper floral leaves shorter than to as long as verticillasters; bracts few, linear, herbaceous, 3–6 mm, stellate pubescent. Calyx tubular-campanulate, ca. 8×5 mm, stellate pubescent outside; teeth double toothed, puberulent at margin, apex subtruncate or emarginate, tufted hairy, spines ca. 1.5 mm. Corolla white with purplish lower lip, ca. 1.3 cm; tube ca. 7 mm, glabrous outside, white tomentose near throat, pilose annulate inside; upper lip ca. 5 mm, margin denticulate, white tomentose outside, bearded inside; lower lip ca. 6×7 mm, white tomentose except for margin outside, ovate lobed; middle lobe ca. 4.5×3.5 mm. Stamens included; filaments hairy, posterior 2 with a long, upwardly curved, short-spurred basal appendage. Nutlets glabrous. Fl. May–Jul, fr. Jul–Aug.

• Grassy slopes, forests; 2500–3400 m. Sichuan, Yunnan.

- 1a. Bracts and calyx stellate pubescent only 30a. var. *tatsienensis*
- 1b. Bracts and calyx densely stellate pubescent, spreading hirsute 30b. var. *hirticalyx*

30a. *Phlomis tatsienensis* var. *tatsienensis*

康定糙苏 kang ding cao su

Phlomis souliei H. Léveillé.

Bracts and calyx stellate pubescent.

- Grassy slopes, forests; 2500–3400 m. Sichuan.

30b. *Phlomis tatsienensis* var. *hirticalyx* (Handel-Mazzetti) C. Y. Wu, Fl. Yunnan. 1: 612. 1977.

毛萼变种 mao e bian zhong

Phlomis franchetiana Handel-Mazzetti var. *hirticalyx* Handel-Mazzetti, Symb. Sin. 7: 921. 1936.

Bracts and calyx densely stellate pubescent, patently hirsute.

- Grassy slopes, forests; 2700–3000 m. Yunnan.

31. *Phlomis congesta* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 598. 1977.

乾精菜 qian jing cai

Stems 30–80 cm tall, much branched, densely stellate pubescent near apex, otherwise glabrous, shiny. Petiole 1.5–7 cm; stem leaf blade ovate-oblong to ovate-lanceolate, 4.5–12.5×3.2–9 cm, adaxially subglabrous or sparsely stellate pubescent and minutely hispid, abaxially glabrous to stellate pubescent, base cordate to cuneate, margin coarsely dentate, apex acute to long acuminate. Verticillasters many flowered, conspicuously pedunculate; floral leaves reduced toward stem apex, always longer than verticillasters; bracts linear-lanceolate, rarely subulate, (3–)6–11 cm, stellate puberulent. Calyx tubular, ca. 12×5 mm, splitting longitudinally, outside densely stellate puberulent, sometimes also stellate pilose with central arms of hairs very long; teeth circular, margin double toothed, apex tufted pilose inside, spines 1–1.5 mm. Corolla white, ca. 1.8 cm, glabrous outside, densely silky tomentose on upper lip, pilose on lower lip and back of tube; upper lip ca. 7 mm, margin denticulate, long barbate inside; lower lip 7–9×6–8 mm, middle lobe obovate, ca. 6×5 mm, margin undulate; lateral lobes ovate. Stamens included; filaments hairy, posterior 2 with a hooked reflexed basal appendage. Nutlets glabrous. Fl. Jul–Aug, fr. Sep.

- Forest margins, grassy slopes; 1900–3300 m. Sichuan, Yunnan.

32. *Phlomis inaequalisepala* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 598. 1977.

斜萼糙苏 xie e cao su

Stems 70–80 cm tall, subglabrous, shiny toward base, densely pilose toward apex. Leaves herbaceous; petiole 3.5–5 cm; upper stem leaf blades ovate, 10–14×6.5–9 cm, adaxially sparsely strigose, abaxially stellate pubescent, base shallowly cordate, margin coarsely serrate, apex caudate-acuminate. Verticillasters 3–5, many flowered; floral leaves similar to stem leaves, with petiole 5–10 mm, blade 1.5–7×1–4 cm; bracts linear, herbaceous, 4–7 mm, sparsely pilose, glandular puberulent. Calyx tubular, ca. 10×4.5 mm, sparsely pilose and glandular puberulent outside, splitting longitudinally; teeth circular, apex tufted hairy inside, spine ca. 1 mm. Corolla ca. 1.8 cm, tube ca. 1 cm, glabrous outside, gray pubescent on back near throat, pilose annulate inside; upper lip ca. 8 mm, gray pubescent outside, margin denticulate, bearded inside; lower lip ca. 6×8 mm, gray pubescent outside; middle lobe

largest, obovate; lateral lobes ovate. Filaments hairy, posterior 2 with a hooked, reflexed basal appendage. Nutlets glabrous. Fl. Jul.

- Grassy slopes; 2400 m. Sichuan.

33. *Phlomis strigosa* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 599. 1977.

糙毛糙苏 cao mao cao su

Stems 55–100 cm tall, strongly grooved, shiny, tawny stellate strigose near apex and sometimes on nodes. Petiole 1–5.2 cm; stem leaf blades ovate, 7–14×4–11 cm, adaxially sparsely strigose or subglabrous, abaxially subglabrous or veins stellate strigose with central arms of hairs very long, base cordate, margin crenate-serrate, ciliolate, apex caudate-acuminate. Verticillasters 1–3, many flowered; floral leaves with petiole 3–10 mm, blade 1.5–5.8×0.7–3 cm; bracts linear-lanceolate to subulate, 5–8 mm, stellate, margin stellate ciliate. Calyx tubular-campanulate, ca. 9×5.5 mm, splitting irregularly, densely stellate outside; teeth circular, apex tufted hairy inside, spine ca. 1.8 mm. Corolla white, ca. 2 cm; tube ca. 1 cm, glabrous outside, apex densely pilose on back, pilose annulate inside; upper lip ca. 1 cm, margin fringed, densely lanate outside, bearded inside; lower lip ca. 8×7 mm, densely pilose except on margin outside, middle lobe obovate, lateral lobes ovate. Filaments hairy, posterior 2 with a long, upwardly curved basal appendage. Nutlets glabrous. Fl. Jul.

- Alpine meadows, sparse forests; 2300–2500 m. Yunnan.

34. *Phlomis rutilis* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 599. 1977.

裂萼糙苏 lie e cao su

Stems much branched, striate, densely stellate pilose. Petiole 0.8–7.5 cm; upper stem leaf blades sagittate-oblong, 9–17×5–8.5 cm, adaxially sparsely stellate pubescent and hairs with longer central arms, abaxially densely gray stellate pilose, base sagittate-cordate, margin coarsely crenate-serrate, apex acute. Verticillasters 3–5, many flowered, widely spaced; peduncle obscure; floral leaves with petiole 1–5 mm, blade longer than verticillasters, (2.5–)3–6×1.2–4 cm; bracts subulate, 3–8 mm, herbaceous, with stellate hairs. Calyx tubular, ca. 11×4 mm, conspicuously veined, with stellate hairs, yellow-brown near margin when dry, splitting longitudinally; teeth semicircular, apical spine 1–2 mm. Corolla yellow, ca. 1.8 cm; tube ca. 1 cm, glabrous outside, apex pilose on back, pilose annulate inside; upper lip ca. 8 mm, margin subentire or denticulate, densely stellate lanate outside, bearded inside; lower lip ca. 8×8 mm, densely stellate lanate except on margin outside, middle lobe obovate, lateral lobes ovate. Stamens included; filaments hairy, posterior 2 with a long, upwardly curved basal appendage. Nutlets glabrous. Fl. Sep.

- Grassy slopes; 3200–3500 m. Yunnan.

35. *Phlomis likiangensis* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 599. 1977.

丽江糙苏 li jiang cao su

Roots thick. Stems 0.6–1.5 m tall, robust, striate, apex densely stellate tomentulose, basally sparsely stellate pilose. Petiole 7–13 cm; stem leaf blades cordate to ovate, 7–18×6–15 cm, adaxially sparsely stellate pubescent and simple hairy, abaxially densely stellate pubescent, base cordate to rounded, margin dentate, apex acute or caudate-acuminate.

Verticillasters 2–10-flowered; peduncle 1–3 mm; floral leaves petiole 0.5–5.5 cm, longer than verticillasters; bracts leaflike, linear-lanceolate, 4–13(–22)×1.5–3(–5.5) mm. Calyx tubular, ca. 13×5 mm, gray stellate pannose outside; teeth 1.5–2.5 mm, apex gray pannose, tufted pilose inside, spine ca. 2.5 mm. Corolla white or yellow, ca. 2.1 cm, white lanate except for glabrous tube outside, pilose annulate inside; upper lip ca. 1 cm, margin fringed, bearded inside; lower lip ca. 8×10 mm; lobes ovate, middle lobe ca. 6×4 mm, lateral lobes smaller. Stamens included; filaments hairy, posterior 2 with a hooked, reflexed basal appendage. Nutlets glabrous. Fl. Jul.

- Dry grasslands; 3500 m. Yunnan (Lijiang Xian).

36. *Phlomis franchetiana* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 242. 1912.

大理糙苏 da li cao su

Phlomis franchetiana var. *aristata* C. Y. Wu; *P. franchetiana* var. *leptophylla* C. Y. Wu.

Stems 60–90 cm tall, much branched, densely tawny stellate pubescent. Petiole 0.5–9 cm; stem leaf blades broadly ovate to oblong, 3.5–18×1.7–11.5 cm, reduced apically, adaxially slightly corrugate, stellate hispidulous, abaxially densely stellate pilose, base strongly cordate, margin crenate-serrate to crenate or subentire, apex acuminate. Verticillasters numerous, 4–14-flowered; floral leaves with petiole 2–5 mm, blade 1.5–4×0.7–2.3 cm, longer than verticillasters; bracts 1–1.5 mm. Calyx tubular, ca. 10×5 mm, stellate pubescent outside; teeth ca. 1 mm, apex tufted hairy inside, spine 3–4 mm. Corolla purple to white, ca. 1.4 cm, silky-tomentulose except for glabrous tube outside, pilose annulate; upper lip ca. 6 mm, margin denticulate, bearded inside; lower lip ca. 6×8 mm, lobes ovate, middle lobe ca. 4×3.5 mm. Stamens included; filaments long hairy, posterior 2 with an upwardly curved, short-spurred basal appendage. Nutlets glabrous. Fl. Jun-Sep, fr. Oct.

- Grassy slopes; 1900–2500 m. Yunnan.

37. *Phlomis ambigua* Handel-Mazzetti, Symb. Sin. 7: 920. 1936.

沧江糙苏 cang jiang cao su

Roots robust. Stems robust, ca. 7 mm in diam. at base, stellate strigose, glabrous toward base. Petiole ca. 1/2 as long as blade, densely tufted pubescent; mid stem leaf blades ovate, to 16×7 cm, adaxially sparsely minute hispid, densely so on veins, abaxially densely tufted pubescent, base truncate to shallowly oblique cordate, margin mucronate-crenate, apex acute to rounded. Verticillasters compact, 5–8-flowered, widely spaced; floral leaves short petiolate, upper ones circular, ca. 1 cm in diam; bracts lanceolate, 1–2 mm, appressed stellate pilose, spinelike. Flowers sessile or very short pedicellate. Calyx narrowly funnelform, 8–9 mm, stellate tomentose, 11-veined; teeth broadly circular, apical spine 0.5–1 mm. Corolla yellowish, reddish on upper lip, 1.5–1.8 cm, silky-pilose outside; upper lip 6–7 mm, bearded inside, apex 2-lobed; lower lip lobes entire, lateral lobes slightly narrower and shorter than middle lobe.

- Thickets; 1900 m. Yunnan.

38. *Phlomis longicalyx* C. Y. Wu, Fl. Yunnan. 1: 617. 1977.

长萼糙苏 chang e cao su

Stems shiny, very sparsely stellate pubescent, much branched. Stem leaf blades ovate, 13–15×9–11 cm, adaxially

sparsely hispidulous, stellate and hairs with longer central arms, abaxially sparsely stellate pubescent, base shallowly oblique cordate, margin dentate, apex caudate-acuminate. Verticillasters numerous, 4–16-flowered, widely spaced; peduncle 2–5 mm; rachis distinctly branched; bracts needlelike, 2–6(–10) mm. Calyx tubular, ca. 1.5×6 mm, dusty stellate puberulent outside, veins sparsely bristly; lobes double toothed, spines 3–4 mm, marginal teeth tufted hairy inside. Corolla ca. 2.5 cm; tube ca. 1.7 cm, glabrous except for sparsely villous back outside, pilose annulate inside; upper lip ca. 8 mm, margin denticulate, very densely villous outside, bearded inside; lower lip densely villous except for glabrous margin outside, ca. 8×8 mm; lobes ovate, middle lobe ca. 5×3 mm. Stamens included; filaments hairy, posterior 2 with a slender, short-spurred basal appendage. Nutlets glabrous. Fr. Oct.

- Bamboo forests; 3700 m. Yunnan.

39. *Phlomis muliensis* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 599. 1977.

木里糙苏 mu li cao su

Stems 60–100 cm tall, reddish green, densely yellow stellate tomentose. Petiole 1–11.5 cm; stem leaf blades triangular-ovate, adaxially yellow-green, densely stellate, abaxially densely stellate tomentose, base cordate to cuneate, margin irregularly crenate to dentate, apex obtuse to acute. Verticillasters usually 2, 8–10-flowered; bracts needlelike, herbaceous, ca. 6 mm, densely stellate tomentose and setose, hairs with very long central arms. Calyx tubular-campanulate, ca. 7×5 mm, stellate tomentose outside, veins stellate setose; lobes double toothed, tufted hairy inside, spines ca. 2 mm. Corolla white, ca. 1.4 cm, tube hairy annulate inside; upper lip ca. 7 mm, margin denticulate, densely white lanate outside, bearded inside; lower lip ca. 6×5 mm, white lanate except for glabrous margin; middle lobe obovate-orbicular, ca. 3×3 mm; lateral lobes ovate. Stamens included; filaments hairy at middle, posterior 2 with a short-spurred basal appendage. Nutlets glabrous. Fl. Oct.

- Grassy slopes; 2500 m. Sichuan.

40. *Phlomis pedunculata* Sun ex C. H. Hu, Acta Phytotax. Sin. 11: 45. 1966.

具梗糙苏 ju geng cao su

Lateral roots fusiform. Rhizome woody. Stems erect, 50–80 cm tall, slender, mostly glabrous, stellate puberulent apically and on nodes. Petiole 1–7 mm; stem leaf blades elliptic to ovate-lanceolate, 7–12.5×(3–)5–6.5(–8) cm, adaxially simple hairy or stellate hispid and hairs with very long central arms, abaxially very sparsely stellate pubescent, base slightly unequally rounded to shallowly cordate, margin coarsely dentate, apex acuminate. Verticillasters (6–)8–14(–34)-flowered; floral leaves with petiole less than 1 cm, blade 2–4.5×1–3 cm; bracts 2–15×1–2(–5) mm, sparsely stellate ciliate, margin pubescent. Pedicel to 2 mm. Calyx tubular, ca. 1.1×5.5 mm, densely stellate tomentulose outside; lobes double toothed, spines slightly hooked, 2.5–3 mm; teeth triangular, tufted hairy inside. Corolla white or purplish, ca. 1.9 cm; tube ca. 1.1 cm, glabrous except for pubescent outside of apex back, pilose annulate inside; upper lip obovate, ca. 8×7.5 mm, margin denticulate, densely silky villous outside, bearded inside; lower lip ca. 8×9 mm, middle lobe obovate ca. 6×4 mm; lateral lobes ovate to oblong, ca. 4 mm. Stamens

included; filaments hairy, posterior 2 with a hooked basal appendage. Nutlets glabrous. Fl. Jul-Aug, fr. Aug-Oct.

- Thickets, grassy slopes; 1300–3200 m. Sichuan.

41. *Phlomis jeholensis* Nakai & Kitagawa, Rep. First Sci. Exped. Manch. IV, 1: 48. 1934.

口外糙苏 kou wai cao su

Stems ca. 75 cm tall, spreading bristly, much branched toward apex. Petiole 0.3–4 cm; stem leaf blades ovate, 2–12×1.2–7.5 cm, spreading bristly, adaxially minutely hispid, abaxially pilose, base shallowly cordate to rounded, margin coarsely dentate-serrate, apex acuminate to acute. Verticillasters numerous, 6–16-flowered; floral leaves subsessile, 2.1–13×1–8 cm, spreading bristly; bracts linear-subulate, rigid, 0.9–1.5 cm, subequal to calyx, densely spreading bristly. Calyx tubular, ca. 11×6 mm, subglabrous outside, veins sparsely spreading bristly; lobes double toothed, spines rigid, ca. 1.5 mm; teeth broadly triangular, tufted hairy inside. Corolla white, ca. 1.9 cm; tube ca. 1.1 cm, glabrous outside, pilose annulate inside; upper lip ca. 8 mm, margin denticulate, densely silky-tomentose outside, bearded inside; lower lip ca. 7×8 mm, middle lobe obovate, ca. 5×3.5 mm; lateral lobes ovate. Stamens included; posterior filaments with a short-spurred appendage. Fl. Aug-Sep.

- Hillsides, wet areas. Hebei.

42. *Phlomis umbrosa* Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 13: 76. 1840.

糙苏 cao su

Roots to 30×1 cm, lateral ones succulent. Stems 0.5–1.5 m, sparsely retrorse hispidulous, sometimes stellate pubescent toward apex, purplish red, much branched. Petiole 1–12 cm, densely minutely hispid; leaf blade circular-ovate to ovate-oblong, 5.2–12×2.5–12 cm, pilose and/or stellate, base cordate to rounded, margin serrate-dentate to irregularly crenate, apex acute to acuminate. Verticillasters numerous, 4–8-flowered, pedunculate; floral leaves with petiole 2–3 mm, blade 1–3.5×0.6–2 cm, margin coarsely serrate-dentate; bracts purple-red. Calyx tubular, ca. 8–10×3–3.5 mm, densely stellate hairy outside, veins sometimes sparsely pilose; lobes double toothed, spines ca. 1.5 mm; teeth small, tufted hairy inside. Corolla reddish to purple-red, rarely white with red spots on lower lip, ca. 1.7 cm; tube ca. 1 cm, glabrous except for pubescent back outside, pilose annulate on basal 1/3 inside; upper lip ca. 7 mm, margin irregularly denticulate, silky-villous outside, bearded inside; lower lip ca. 5×6 mm, densely silky-villous except for glabrous margin outside, glabrous inside; lobes ovate to subcircular, middle 1 largest. Stamens included; filaments glabrous, without basal appendages. Nutlets glabrous. Fl. Jun-Sep, fr. Sep.

- Forests, grassy slopes, streamsides, thickets, wet areas; 700–3200 m. Anhui, Gansu, Guangdong, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan.

- 1a. Bracts linear-oblong to obovate-oblong, much shorter than calyx, 5–7×1.8–2.5 mm 42d. var. *latibracteata*
- 1b. Bracts linear-subulate to linear-lanceolate, longer or rarely slightly shorter than calyx, 8–14×1–2 mm.
 - 2a. Verticillasters conspicuously pedunculate, lax; flowers pedicellate; calyx ca. 8×3 mm

- 2b. Verticillasters inconspicuously pedunculate, compact; flowers sessile or subsessile; calyx ca. 10×3.5 mm. 42c. var. *stenocalyx*

- 3a. Leaves ovate, subcuneate to shallowly cordate, stellate pubescent, rarely abaxially stellate tomentulose; calyx densely stellate pubescent outside 42e. var. *ovalifolia*

- 3b. Leaves circular-ovate to ovate-oblong, sparsely pilose or sometimes abaxially densely pilose and stellate pilose; calyx stellate puberulent except sometimes pilose on veins.
 - 4a. Leaves membranous, crenate-serrate, terminal tooth sometimes very long; bracts soft, linear-lanceolate, slightly shorter than calyx 42b. var. *australis*
 - 4b. Leaves papery, serrate-dentate or irregularly crenate, terminal tooth not very long; bracts rigid, linear-subulate, mostly longer than calyx 42a. var. *umbrosa*

42a. *Phlomis umbrosa* var. *umbrosa*

糙苏 cao su

Leaf blade papery, orbicular-ovate to ovate-oblong, sparsely pilose or sometimes abaxially densely pilose and stellate pilose, margin serrate-dentate or irregularly crenate, terminal tooth not very long. Verticillasters inconspicuously pedunculate, compact; bracts rigid, linear-subulate, mostly longer than calyx. Flowers sessile or subsessile. Calyx ca. 10×3.5 mm, stellate puberulent except sometimes pilose on veins.

- Sparse forests, grassy slopes; 2000–3200 m. Gansu, Guangdong, Guizhou, Hebei, Hubei, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi, Sichuan.

Used medicinally.

42b. *Phlomis umbrosa* var. *australis* Hemsley, J. Linn. Soc., Bot. 26: 306. 1890.

南方变种 nan fang bian zhong

Leaves long petiolate; leaf blade membranous, margin crenate-serrate, terminal tooth sometimes very long. Bracts soft, linear-lanceolate, slightly shorter than calyx.

- Hillsides, grasslands, streamsides, thickets; 1600–3200 m. Anhui, Gansu, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Yunnan.

Used medicinally.

42c. *Phlomis umbrosa* var. *stenocalyx* (Diels) C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 477. 1977.

狭萼变种 xia e bian zhong

Phlomis stenocalyx Diels, Bot. Jahrb. Syst. 29: 555. 1900.

Leaves papery. Verticillasters conspicuously pedunculate, loose; bracts very slender. Flowers pedicellate. Calyx ca. 8×3 mm.

- Hillsides, grassland, wet areas, forests; 800–1500 m. Gansu, Shaanxi.

42d. *Phlomis umbrosa* var. *latibracteata* Sun ex C. H. Hu, Acta Phytotax. Sin. 11: 46. 1966.

宽苞变种 kuan bao bian zhong

Bracts linear-oblong to obovate-oblong, shorter than calyx, 5–7×1.8–2.5 mm, entire.

- Hillsides, forests; 700–2000 m. Henan.

42e. *Phlomis umbrosa* var. *ovalifolia* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 601. 1977.

卵齿变种 luan chi bian zhong

Leaf blade ovate, base subcuneate to shallowly cordate, stellate pubescent, abaxially rarely stellate tomentulose. Calyx densely stellate pubescent, teeth longer.

- Hillsides, forests. Anhui, Jiangsu.

43. *Phlomis szechuanensis* C. Y. Wu, Fl. Reipubl. Popularis Sin. 65(2): 601. 1977.

柴续断 chai xu duan

Stems finely striate, densely tawny stellate pubescent, much branched. Petiole 2–5 cm; upper stem leaf blades ovate, 6.5–11×3–8 cm, adaxially densely stellate pubescent, very sparsely stellate strigose, hairs with longer central arms, abaxially densely stellate pilose, base broadly truncate-cuneate, margin serrate, apex acute. Verticillasters 2–5, many flowered, conspicuously pedunculate; upper floral leaves almost as long as verticillasters; bracts linear, 3–7(–9) mm, herbaceous. Calyx tubular, ca. 11×3 mm, densely stellate pubescent; lobes double toothed, spines ca. 1.2 mm, teeth tufted hairy inside. Corolla white, ca. 2 cm; tube ca. 1.3 cm, apex silky-villous outside, pilose annulate inside; upper lip ca. 6.5 mm, margin fringed, very densely silky-villous outside, bearded inside; lower lip ca. 6×6 mm, silky-villous except for margin outside, middle lobe obovate, lateral lobes ovate. Filaments hairy, without basal appendages. Nutlets glabrous. Fl. Aug.

- Grasslands; 2000 m. Sichuan (Qingchuan Xian).

