

13. RHODIOLA Linnaeus, Sp. Pl. 2: 1035. 1753.

红景天属 hong jing tian shu

Chamaerhodiola Nakai; *Clemensia* Rose.

Herbs perennial, with some dimorphism. Rhizome a fleshy caudex, thick or slender, apex usually at or slightly above ground level. Caudex leaves present, usually reduced and scalelike, but sometimes with well-developed leaf blade. Flowering stems 1 to many, arising from axils of caudex leaves, annual, simple, leafy; dried remains of old stems sometimes persisting. Stem leaves usually alternate, occasionally verticillate or opposite, simple, fleshy. Inflorescences terminal, a simply or compoundly corymbiform or dichotomous cyme, less often 1-flowered, rarely a helicoid cyme or with additional axillary inflorescences arising from distal leaf axils, usually bracteate and pedunculate. Flowers usually bisexual, sometimes unisexual (when plants dioecious, or gynodioecious in *Rhodiola alsia* subsp. *alsia* and rarely in *R. purpureoviridis* subsp. *phariensis*). Calyx (3 or)4- or 5(or 6)-parted. Petals \pm free, as many as sepals. Stamens in 2 series, usually $2 \times$ as many as petals; antepetalous stamens adnate to basal part of petals; anthers mostly purple before anthesis, later turning yellow, basifixed or less often dorsifixed, 2-loculed. Nectar scales linear, oblong, suborbicular, or quadrangular. Ovary superior; carpels as many as petals. Follicles few to many seeded.

About 90 species: high altitudes and frigid zone of N hemisphere; 55 species (16 endemic) in China.

Sedum carnegiei Raymond-Hamet (Ann. Carnegie Mus. 8: 418–420. 1913), known only from Xizang (near Lhasa Shi), seems to be a possible member of *Rhodiola*, based on the turnip-shaped caudex, stem leaves with a basal spur, specialized flowering stem/lateral inflorescence, and deeply divided calyx and corolla. It differs from other members of that genus in its caudex leaves, which are fleshy and lack the persistent, scalelike base characteristic of other members of *Rhodiola*. The habit is like that of *Rosularia*. The exact generic placement needs further investigation.

Rhodiola multibracteata H. Chuang (Acta Bot. Yunnan. 19: 225. 1997) has been described from Yunnan. No material has been seen by the present authors, and it has not been possible to place it within the following key. In the protologue, it was compared with *R. kirilowii*, from which it was said to differ in having narrower leaves, many bracts, hardly unguiculate male flower petals, and erect follicle beaks. Its relationship to that species needs investigation.

- 1a. Caudex leaves (at least inner ones) with a distinct leaf blade, green.
 - 2a. Caudex leaves conspicuously dimorphic: outer ones scalelike and membranous, inner ones with a distinct leaf blade.
 - 3a. Caudex leaves prominently basally spurred; stem leaves $3.5-4 \times 1-1.3$ mm 4. *R. handelii*
 - 3b. Caudex leaves basally spurless; stem leaves $7-14 \times 1.3-2.2$ mm 5. *R. smithii*
 - 2b. Caudex leaves monomorphic, all with a green leaf blade (sometimes deciduous but leaving a dark brown, persistent petiole).
 - 4a. Caudex leaves sessile, without persistent, scalelike base; stem leaves with distinct basal spur *Sedum carnegiei* (see above)
 - 4b. Caudex leaves distinctly petiolate, petiole to 10 mm, turning dark brown and persisting after leaf blade falls; stem leaves (when present) basally spurless.
 - 5a. Anthers dorsifixed; inflorescences helicoid-cymose 1. *R. hobsonii*
 - 5b. Anthers basifixed; inflorescences corymbiform, sometimes reduced to a single flower or monochasium.
 - 6a. Caudex leaf blade linear-oblong to linear-rhomboid, ca. 1.5 mm wide; petals 2.5–3 mm 2. *R. humilis*
 - 6b. Caudex leaf blade broadly spatulate to obovate, ca. 5 mm wide; petals 5–10 mm 3. *R. primuloides*
- 1b. Caudex leaves without a distinct leaf blade, reduced, usually scalelike and not green.
 - 7a. Inflorescences dense racemes, much longer than wide, with uniformly distributed flowers 8. *R. semenovii*
 - 7b. Inflorescences cymose, sometimes reduced to a single flower, sometimes elongated but then clearly made up of cymes, usually in several discontinuous whorls.
 - 8a. Stem leaves 4–6, in a single whorl; plants less than 5 cm tall.
 - 9a. Flowers bisexual; inflorescences 13–18-flowered, bracteate, pedicels 1.5–2.5 mm; stem leaf blade $2-6 \times 2.5-4$ cm 6. *R. prainii*
 - 9b. Flowers unisexual; inflorescences 1–6-flowered, ebracteate, pedicels 10–13 mm; stem leaf blade $0.8-1.5 \times 0.4-0.7$ cm 7. *R. stapfii*
 - 8b. Stem leaves many, alternate, aggregated or subverticillate, if verticillate then plants more than 10 cm tall, less often 6-verticillate.
 - 10a. Old flowering stems persistent; follicles connate in basal 1/2.
 - 11a. Petals ca. 10 mm, margin entire or sparsely fimbriate 9. *R. dumulosa*

- 11b. Petals less than 6 mm, margin entire.
- 12a. Remnants of old shoots and stems few; flowers somewhat large.
- 13a. Part of caudex producing new stems not enlarged each year.
- 14a. Caudex 0.5–0.7 cm in diam.; flowering stems 1–5, straight; flowers usually 4-merous.
- 15a. Flowering stem leaves linear 24. *R. angusta*
- 15b. Flowering stem leaves lanceolate, oblong, obovate-rhombic, or broadly obovate 17. *R. atuntsuensis*
- 14b. Caudex 1–1.5 cm in diam.; flowering stems numerous, flabellate; flowers usually 5-merous, rarely 4-merous.
- 16a. Petals often red 21. *R. fastigiata*
- 16b. Petals often yellow, especially when sepals yellow or yellowish green.
- 17a. Stem leaves linear, linear-lanceolate, or lanceolate; stamens usually shorter than petals 22. *R. pamiroalaica*
- 17b. Stem leaves elliptic; stamens equaling or longer than petals 23. *R. litwinowii*
- 13b. Part of caudex producing new stems somewhat enlarged each year.
- 18a. Flowering stems often straw-colored when dry; leaves smooth.
- 19a. Plants pubescent 25. *R. himalensis*
- 19b. Plants glabrous 28. *R. tangutica*
- 18b. Flowering stems often purplish red or pink when dry; leaves finely and minutely hairy.
- 20a. Stem leaf margin entire; petals greenish yellow; pedicels densely papillate 27. *R. sherriffii*
- 20b. Stem leaf margin entire or apically dentate; petals deep purple; pedicels smooth.
- 21a. Stem leaves 1.7–2.7 × 0.4–1 cm 25. *R. himalensis*
- 21b. Stem leaves 0.8–1.5 × ca. 0.2 cm 26. *R. alsia*
- 12b. Remnants of old shoots and stems numerous; flowers small.
- 22a. Nectar scales linear to broadly so 10. *R. gelida*
- 22b. Nectar scales suboblong, quadrangular, or suborbicular.
- 23a. Stem leaves elliptic to ovate or ovate-lanceolate.
- 24a. Stem leaves shortly petiolate, margin irregularly crenulate 16. *R. subopposita*
- 24b. Stem leaves sessile, margin entire (coarsely dentate in *R. reticulata*).
- 25a. Flowering stems less than 4 cm 17. *R. atuntsuensis*
- 25b. Flowering stems more than 12 cm.
- 26a. Petals yellow; stem leaf margin coarsely dentate; inflorescences corymbiform-capitate 18. *R. reticulata*
- 26b. Petals purplish red or red; stem leaf margin entire, sometimes mammillate; inflorescences cymose.
- 27a. Plants (6–)15–18 cm tall; stem leaves ovate or ovate-lanceolate; flowers often 4-merous 19. *R. gannanica*
- 27b. Plants to 30 cm tall; stem leaves linear to narrowly ovate; flowers usually 5-merous 20. *R. tibetica*
- 23b. Stem leaves lanceolate to ovate or oblong-obovate, rarely linear to oblong-linear.
- 28a. Caudex base not or only slightly enlarged.
- 29a. Stems 1–2 mm in diam. 15. *R. nobilis*
- 29b. Stems 0.5–1 mm in diam.
- 30a. Flowering stems blackening when old; caudex leaves 6–8 mm wide; sepal apex subobtusely 12. *R. coccinea*
- 30b. Flowering stems grayish when old; caudex leaves 3–5 mm wide; sepal apex acute 14. *R. kashgarica*
- 28b. Caudex base enlarged.
- 31a. Caudex densely clustered; leaves linear-lanceolate 12. *R. coccinea*
- 31b. Caudex slightly or not clustered; leaves linear.
- 32a. Caudex less than 1 cm in diam., persistent old flowering stems and branches usually few; flowers often white, 5-merous; inflorescences ca. 1 cm in diam. 13. *R. kansuensis*
- 32b. Caudex 1–3 cm in diam., persistent old flowering stems and branches usually more than 100; flowers often purplish red, 4-merous; inflorescences 1.2–1.5 cm in diam.
- 33a. Winter bud at apex of rhizome conspicuous; flowering stems 6–9 cm 11. *R. quadrifida*
- 33b. Winter bud at apex of rhizome absent; flowering stems 1–5 cm 12. *R. coccinea*
- 10b. Old flowering stems not persistent; follicles almost free.
- 34a. Flowers usually bisexual.
- 35a. Petals apex awnlike, with a mucro to 1 mm 55. *R. liciae*

- 35b. Petals apex subobtus.
- 36a. Flowering stems leafy at middle or near apex.
- 37a. Flowering stems with leaves in a whorl at middle of stem 54. *R. sexifolia*
- 37b. Flowering stems with leaves grouped near apex of stem.
- 38a. Stem leaves 1–1.5 cm 52. *R. chrysanthemifolia*
- 38b. Stem leaves 2–3 cm 53. *R. ovatisepala*
- 36b. Flowering stems leafy throughout.
- 39a. Stem leaves 2–4 cm, margin divided.
- 40a. Flowering stems ca. 15 cm; stem leaves elliptic to obovate, 5–7 cm; sepals ca. 3 mm 48. *R. sinuata*
- 40b. Flowering stems 8–11 cm; stem leaves oblong, 1–3 cm; sepals ca. 6 mm 49. *R. tieghemii*
- 39b. Stem leaves 1–2.3(–3) cm, margin serrate or dentate.
- 41a. Stem leaf margin with 4 or 5 dentate lobes on each side 50. *R. sacra*
- 41b. Stem leaf margin with 2 to several shallowly incised serrations on each side.
- 42a. Stem leaves 0.2–0.3 cm wide 42. *R. wallichiana*
- 42b. Stem leaves 0.4–1.1 cm wide.
- 43a. Stem leaves elliptic, narrowly ovate, or ovate, margin irregularly and remotely serrate, base shallowly cordate; petal margin entire 38. *R. purpureoviridis*
- 43b. Stem leaves oblong to obovate-oblong, margin with 2 shallowly incised serrations on each side, base attenuate; petal margin apically erose 51. *R. alterna*
- 34b. Flowers usually unisexual (plants hermaphroditic or rarely gynodioecious in *R. purpureoviridis* subsp. *phariensis*).
- 44a. Carpel beak reflexed.
- 45a. Sepals 0.5–1 mm; petals spatulate to oblong-lanceolate 46. *R. yunnanensis*
- 45b. Sepals ca. 3 mm; petals oblong or triangular-ovate 47. *R. forrestii*
- 44b. Carpel beak not reflexed.
- 46a. Carpels ovoid or narrowly so, basally narrowed.
- 47a. Flowers usually bisexual 42. *R. wallichiana*
- 47b. Flowers unisexual.
- 48a. Carpels ovoid, 9–11 mm; stem leaves obtrullate to linear-lanceolate 45. *R. macrocarpa*
- 48b. Carpels narrowly ovoid, 7–9 mm; stem leaves narrowly elliptic to lanceolate or oblanceolate, or widely oblanceolate.
- 49a. Caudex 0.5–1 cm in diam.; stem leaves 0.6–0.8 cm wide; stamens equaling or slightly longer than petals 43. *R. stephanii*
- 49b. Caudex 1–2 cm in diam.; stem leaves 0.3–0.5 cm wide; stamens ca. 1.5 × as long as petals 44. *R. pinnatifida*
- 46b. Carpels oblong or narrowly so, basally thickened.
- 50a. Carpels oblong, ca. 2 × as long as wide.
- 51a. Plants glandular hairy; flowering stems more than 2 per caudex apex 38. *R. purpureoviridis*
- 51b. Plants not glandular hairy; flowering stems 1 or 2 per caudex apex.
- 52a. Flowering stems transversely wrinkled, mostly leafless; caudex elongate and rhizomelike, covered by scree so that only inflorescences are visible above ground 41. *R. atsaensis*
- 52b. Flowering stems smooth or longitudinally ridged, leafy; caudex often erect or almost so, not deeply buried.
- 53a. Caudex subprostrate, ascending, or suberect; stem leaves abaxially ± glaucous; petals of male flowers 5–6 × 1.2–2 mm, those of female flowers 3–4 × 0.9–1.2 mm . 39. *R. discolor*
- 53b. Caudex erect; stem leaves abaxially not glaucous; petals of male flowers 2.8–4 × 1.2–1.6 mm, those of female flowers 1.5–3 × 0.5–0.7 mm 40. *R. bupleuroides*
- 50b. Carpels narrowly oblong, over 3 × as long as wide.
- 54a. Stem leaves linear to oblanceolate, margin entire or remotely dentate.
- 55a. Caudex prostrate, 0.2–0.4 cm in diam.; flowering stems 2–12 cm; sepals 3–4.5 mm, apex obtuse 36. *R. cretinii*
- 55b. Caudex erect, 1.5–2.5 cm in diam.; flowering stems 15–60 cm; sepals 1.5–3 mm, apex acute to acuminate 37. *R. kirilowii*

- 54b. Stem leaves oblong, elliptic, lanceolate, rhombic-ovate, ovate-triangular, or orbicular-cordate, margin crenulate throughout, apically dentate, or sometimes subentire.
 56a. Stem leaves rhombic-ovate to elliptic 29. *R. calliantha*
 56b. Stem leaves not as above.
 57a. Flowering stems not leafy apically; stem leaves short, broadest near base.
 58a. Leaf base cordate, amplexicaul, apex acute; sepals linear, ca. 7 × 1.3 mm; stamens reddish 34. *R. heterodonta*
 58b. Leaf base truncate to subcordate, apex shortly acuminate; sepals triangular-linear, ca. 1.1 × 1.3 mm; stamens yellow 35. *R. junggarica*
 57b. Flowering stems leafy apically; stem leaves long, usually broadest in distal 1/2.
 59a. Flowering stems apically papillate; stem leaf margin serrate 33. *R. serrata*
 59b. Flowering stems smooth; stem leaf margin subentire, apically sometimes dentate.
 60a. Persistent old flowering stems and branches black when dry 32. *R. crenulata*
 60b. Persistent old flowering stems and branches not black when dry.
 61a. Plants 20–30 cm tall; stem leaves elliptic-lanceolate, oblong, or broadly oblong-ovate; sepals ca. 1/3 as long as petals 30. *R. rosea*
 61b. Plants 10–15 cm tall; stem leaves oblong-spatulate, oblong-lanceolate, or oblong-rhombic; sepals ca. 1/2 as long as petals 31. *R. sachalinensis*

1. *Rhodiola hobsonii* (Prain ex Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 118. 1965.

背药红景天 bei yao hong jing tian

Sedum hobsonii Prain ex Raymond-Hamet, Bull. Misc. Inform. Kew 1913: 154. 1913; *S. praegerianum* W. W. Smith.

Caudex erect, robust. Caudex leaves leaflike, long petiolate; leaf blade oblanceolate to oblong, to 1.8 × 0.3 cm, deciduous, apex subacute. Flowering stems 5.5–13.5 cm. Stem leaves alternate, sessile, narrowly oblanceolate to oblong, ca. 10 × 2–4.5 mm, margin entire or sparsely denticulate, apex obtuse. Inflorescences helicoid cymose, 3–10-flowered. Flowers unequally 5-merous. Sepals triangular- to ovate-lanceolate, ca. 5 × 2 mm, apex acute. Petals red, ovate, to 8 × 3 mm, base connate, margin slightly fimbriate toward apex. Stamens 10; antepetalous ones ca. 7.5 mm; antepetalous ones ca. 4 mm; anthers dorsifixed. Nectar scales subspatulate-oblong, ca. 1 × 0.6 mm. Carpels ca. 5.5 mm. Styles ca. 1 mm. Follicles erect, 9–10 mm, base connate. Seeds obovoid, ca. 0.8 mm. Fl. Jul. Forests, thickets, rock crevices; 2600–4100 m. Xizang [Bhutan, Sikkim].

2. *Rhodiola humilis* (J. D. Hooker & Thomson) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 119. 1965.

矮生红景天 ai sheng hong jing tian

Sedum humile J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 99. 1858; *Chamaerhodiola humilis* (J. D. Hooker & Thomson) Nakai; *Rhodiola karpelesae* (Raymond-Hamet) S. H. Fu; *Sedum barnesianum* Praeger; *S. karpelesae* Raymond-Hamet; *S. levii* Raymond-Hamet.

Main root thick. Caudex simple, erect, short. Caudex leaves leaflike; petiole ca. 9 mm, persistent; leaf blade linear-oblanceolate to -rhomboid, ca. 6 × 1.5 mm, deciduous, apex subacute. Flowering stems few, to 2.5 cm. Stem leaves alternate, sessile, linear-elliptic, 4–5 × ca. 1 mm, narrowed at both ends, margin entire. Inflorescences 1- or 2-flowered. Flowers unequally 5-merous. Sepals ovate-oblong, ca. 3 × 1.5 mm, apex obtuse to acute. Petals ovate, 2.5–3 mm, apex attenuate.

Stamens 10; antepetalous ones equaling or slightly shorter than petals; antepetalous ones inserted ca. 1/3 from petal base. Nectar scales suboblong, apex obtuse. Carpels erect. Styles short. Fl. and fr. Sep. Alpine meadows; 3900–4500 m. Qinghai, Xizang [Nepal, Sikkim].

Plants collected in S Qinghai, apparently belonging to this species, formed dense mats to 10 cm wide.

3. *Rhodiola primuloides* (Franchet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 118. 1965.

报春红景天 bao chun hong jing tian

Plants 3–5 cm tall. Caudex branched, thick, ca. 5 mm in diam., densely leafy. Caudex leaves leaflike; leaf blade oblanceolate, obovate, or broadly ovate, slightly contracted near middle, to 10 × 2–5 mm, finely mammillate, base usually widened, margin entire, apex obtuse. Flowering stems much reduced. Inflorescences 1- or 2-flowered; bracts linear, ca. 3 × 1 mm. Flowers unequally 5-merous. Sepals narrowly lanceolate, ovate-lanceolate, or broadly oblong, 2.5–5 × 0.7–1.5 mm, margin ciliolate, apex obtuse. Petals white, ovate, 5–10 × 2.5–5 mm, base narrowed, margin entire or apically erose, apex mucronate. Stamens 10, shorter than petals; antepetalous ones inserted 1.5–2 mm from petal base. Nectar scales broadly spatulate-quadrangular, 0.5–1 mm, apex emarginate. Styles short. Seeds few, oblong-lanceolate, 0.5–1 mm, 1-winged. Fl. Oct.

• Rocks on slopes or in valleys; 2500–4400 m. SE Qinghai, SW Sichuan, S Xizang, W Yunnan.

- 1a. Petal margin apically erose; sepals narrowly lanceolate to ovate-lanceolate 3a. subsp. *primuloides*
 1b. Petal margin entire; sepals broadly oblong 3b. subsp. *kongboensis*

3a. *Rhodiola primuloides* subsp. *primuloides*

报春红景天(原亚种) bao chun hong jing tian (yuan ya zhong)

Sedum primuloides Franchet, J. Bot. (Morot) 10: 287. 1896; *Rhodiola pleurogynantha* (Handel-Mazzetti) S. H. Fu; *S. pleurogynanthum* Handel-Mazzetti; *Sedum primuloides* var. *pleurogynanthum* (Handel-Mazzetti) Fröderström.

Sepals narrowly lanceolate to ovate-lanceolate. Petals 5–10 × 2.5–5 mm, margin apically erose.

• Rocks on slopes; 2500–4400 m. SE Qinghai, SW Sichuan, W Yunnan.

3b. *Rhodiola primuloides* subsp. *kongboensis* H. Ohba, J. Jap. Bot. 53: 329. 1978.

工布红景天 gong bu hong jing tian

Sepals broadly oblong. Petals 7.5–8.5 mm, margin entire. Fl. Oct.

• Rocks in valleys; ca. 2500 m. S Xizang.

4. *Rhodiola handelii* H. Ohba, J. Jap. Bot. 52: 307. 1977.

小株红景天 xiao zhu hong jing tian

Plants to 1.5 cm tall. Caudex branched, 5–10 × 5–10 mm. Caudex leaves leaflike and scalelike; petiole brown, 4–5.5 × 1.5–1.7 mm at base, persistent, base spurred; leaf blade oblong, 1.5–3.5(–4) × 0.8–1.7 mm, apex obtuse. Flowering stem solitary, ascending, 0.9–1.5 cm, glabrous. Stem leaves few, alternate, sessile, spatulate-oblong, 3.5–4 × 1–1.3 mm, base attenuate, margin entire, apex obtuse. Inflorescences 1(–3)-flowered; bracts few, ca. 1.5 × 0.5 mm. Flowers bisexual, 4- or 5-merous, 3–3.5 mm in diam. Sepals ovate-oblong, 3.2–3.7 mm, base conspicuously spurred, spur ca. 0.8 mm, apex rounded. Petals ?white, triangular-ovate to oblong-ovate, 2.5–2.7 × 1.4–1.7 mm, margin entire, apex mucronate. Stamens 8 or 10, slightly shorter than petals; antepetalous ones inserted ca. 0.2 mm from petal base; filaments 2.2–2.5 mm; anthers ?reddish, globose. Nectar scales oblong, 1–1.2 × 0.5–0.7 mm, apex irregularly erose. Carpels erect, 2.2–2.5 mm, 8–10-ovuled. Styles less than 0.5 mm. Follicles not seen. Fl. May.

• Sichuan.

This species is known to the present authors only from the type collection.

5. *Rhodiola smithii* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 122. 1965.

异鳞红景天 yi lin hong jing tian

Sedum smithii Raymond-Hamet, Bot. Jahrb. Syst. 50 (Beibl. 112): 8. 1913; *Rhodiola sangpotibetana* (Fröderström) S. H. Fu; *S. sangpotibetanum* Fröderström.

Caudex simple, erect, thick. Outer caudex leaves scalelike, triangular-suborbicular. Inner caudex leaves leaflike; petiole 0.6–3.5 cm; leaf blade linear to oblong, 1.5–3 × 0.3–0.8 mm, apex long caudate. Flowering stems simple, erect, slender, delicate. Stem leaves alternate, narrowly ovate to ovate-linear, 7–14 × 1.3–2.2 mm, margin entire, apex obtuse. Inflorescences corymbiform, lax. Flowers bisexual, unequally 5-merous. Sepals lanceolate, 2.5–4 × 1–1.8 mm. Petals suboblong, 3.7–6.2 × 1.4–2 mm, abaxially apically keeled, margin entire, apex acute. Stamens 10; antepetalous ones 3–6 mm; antepetalous ones 1.5–3.2 mm, inserted at middle of petals. Nectar scales subquadrangular, 0.5–0.6 × 0.6–0.9 mm, apex emarginate. Carpels basally connate for ca. 1 mm. Styles 1.4–2 mm. Follicles erect, few seeded. Seeds subobovoid-oblong, ca. 1.3 mm. Fl. Jul–Sep, fr. Aug–Dec.

Sandy grasslands, gravelly places on sandy beaches, rock crevices; 4000–5000 m. S Xizang [Sikkim].

6. *Rhodiola prainii* (Raymond-Hamet) H. Ohba, J. Jap. Bot. 51: 386. 1976.

四轮红景天 si lun hong jing tian

Sedum prainii Raymond-Hamet, Bull. Soc. Bot. France 56: 566. 1909; *Rhodiola petiolata* (Fröderström) S. H. Fu; *Sedum petiolatum* Fröderström.

Plants to 8 cm tall. Caudex erect, thick, to 2 cm in diam.; old shoots and stems deciduous. Caudex leaves brown to black-brown and scalelike, subulate, narrowly triangular, or broadly linear. Flowering stem simple, erect, to 8 cm. Stem leaves 4, verticillate; pseudopetiole 1–3 cm; leaf blade oblong-elliptic, ovate, broadly ovate, or reniform-orbicular, (1.5–)2–6 × 2.5–4 cm, glabrous or minutely few mammillate, base abruptly narrowed to long attenuate, margin entire, apex rounded or obtuse. Inflorescences simple or few branched, corymbiform, 1–4 cm in diam., 13–18-flowered; peduncle 15–25 mm; bracts sessile or shortly petiolate, linear-lanceolate, broadly elliptic, ovate, or suborbicular, (4–)5–15 × 3–8 mm. Flowers bisexual, unequally 5-merous; pedicel 1.5–2.5 mm. Sepals narrowly triangular-ovate to suboblong-triangular, 2.5–3.5(–4) mm, base ca. 1.5 mm, apex acute to acuminate, tip obtuse. Petals white, pink, or red, oblong-ovate, ovate, or orbicular, 4–6(–7) × 2–3 mm, margin erose or apically minutely dentate. Stamens 10, shorter than petals. Nectar scales obspatulate-oblong, 0.6–1 mm. Carpels lanceolate to ovoid. Styles slender. Fl. Jul, fr. Sep.

Rocks in broad-leaved forests in valleys, rock crevices at bases of mountains; 2200–4300 m. Xizang [NE India, Nepal, Sikkim].

7. *Rhodiola stapfii* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 122. 1965.

托花红景天 tuo hua hong jing tian

Sedum stapfii Raymond-Hamet, Bull. Misc. Inform. Kew 1913: 156. 1913.

Caudex leaves scalelike, triangular, 7–10 × 2.4–4 mm, base broadened, apex acute. Flowering stems simple, erect, 1.4–3.5 cm. Middle stem leaves 5- or 6-verticillate; pseudopetiole 2–3 mm; leaf blade ovate to ovate-oblong, 8–15 × 4–7 mm, base abruptly narrowed, margin entire, apex subobtusate. Inflorescences umbelliform cymes, 1–6-flowered; peduncle ca. 5 mm, shorter than pedicels; bracts absent. Flowers unisexual, unequally 5-merous; pedicel 1–1.3 cm. Sepals linear-triangular to narrowly triangular, 2.5–3.5 mm, base connate, apex obtuse. Petals red, obovate to oblong, 2.5–3.5 × 1.4–1.7 mm, margin ± erose. Nectar scales subquadrangular, 0.6–0.8 × 0.4–0.6 mm, apex obtuse. Carpels ovoid-lanceolate, base connate for ca. 1 mm. Styles ca. 0.5 mm. Seeds brown, oblong, 0.5–0.8 mm. Fl. Aug–Sep.

Grassland slopes; 2900–5000 m. S Xizang [Bhutan, NE India].

8. *Rhodiola semenovii* (Regel & Herder) Borissova in Komarov, Fl. URSS 9: 28. 1939.

柱花红景天 zhu hua hong jing tian

Umbilicus semenovii Regel & Herder, Bull. Soc. Imp. Naturalistes Moscou 39: 65. 1866; *Clementsia semenovii* (Regel & Herder) Borissova; *Sedum semenovii* (Regel & Herder) Masters; *Umbilicus linearifolius* Franchet; *U. linifolius* Osten-Sacken & Ruprecht.

Caudex branched, short. Caudex leaves scalelike, triangular. Flowering stems numerous, simple, erect, 35–60 cm × 5–6 mm, densely leafy. Stem leaves 3.5–7 × 0.2–0.3 cm, margin entire or sparsely serrate, apex acuminate. Inflorescences cylindrical racemes. Flowers shortly pedicellate or sessile, bisexual, unequally 4- or 5-merous. Sepals linear, ca. 3 mm, apex acuminate. Petals white or red, lanceolate, ca. 7 × 2 mm. Stamens 8 or 10, equaling petals; filaments white; anthers red. Nectar scales subquadrangular, ca. 1 × 1.3 mm. Carpels erect, 0.8–1.2 cm. Follicles red. Seeds ovoid, ca. 1 mm, winged. Fl. Jun–Jul.

Beside water; 1800–2900 m. W Xinjiang [Kazakhstan].

9. *Rhodiola dumulosa* (Franchet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 119. 1965.

小丛红景天 xiao cong hong jing tian

Sedum dumulosum Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 9. 1883; *Chamaerhodiola dumulosa* (Franchet) Nakai; *C. wulingensis* Nakai; *Sedum dumulosum* var. *rendleri* (Raymond-Hamet) Fröderström; *S. farreri* Raymond-Hamet; *S. rariflorum* N. E. Brown; *S. rendleri* Raymond-Hamet; *S. talilhsiense* Fröderström; *S. wulingense* (Nakai) Kitagawa. Caudex branched, robust; persistent old flowering stems present as remnants. Flowering stems aggregated apically on caudex, simple, erect or curved, 5–28 cm. Stem leaves alternate, sessile, linear to broadly so, 7–10 × 1–2 mm, margin entire, apex subacute. Inflorescences

cymose, 4–7-flowered. Flowers unequally 5-merous. Sepals linear-lanceolate, ca. 4 × 0.7–0.9 mm, base broad, apex acuminate. Petals erect, white or red, lanceolate-oblong, 8–11 × 2.3–2.8 mm, margin entire or sparsely fimbriate, apex acuminate and long mucronate. Stamens 10, shorter than petals; antesealous ones ca. 7 mm; antepetalous ones ca. 3 mm, inserted ca. 3 mm from petal base. Nectar scales transversely oblong, apex emarginate. Carpels erect, ovoid-oblong, 6–9 mm, base connate for 1–1.5 mm. Seeds oblong, finely mammillate, narrowly winged. Fl. Jun–Jul, fr. Aug. Rocks on slopes; 1600–4100 m. Gansu, Hebei, Hubei, Jilin, Nei Mongol, Qinghai, Shaanxi, Shanxi, Sichuan, Yunnan [Bhutan, Myanmar].

10. *Rhodiola gelida* Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 67. 1841.

长鳞红景天 chang lin hong jing tian

Chamaerhodiola gelida (Schrenk) Nakai; *Rhodiola*

fastigiata (J. D. Hooker & Thomson) S. H. Fu var.

gelida (Schrenk) H. Jacobsen; *Sedum dubium* Paulsen;

S. gelidum (Schrenk) Karelin & Kirilov.

Main root robust. Caudex many branched, 2–7 cm × 5–8 mm; persistent old flowering stems present, blackening. Caudex leaves scalelike. Flowering stems curved, straw-colored when young, 3–5(–10) cm × ca. 1 mm. Stem leaves alternate, ovate-oblong, 8–10 × 2–5 mm, margin serrulate or subentire. Inflorescences compact, 1–1.5 × 1–2 cm, many flowered. Flowers unisexual, unequally 4- or 5-merous. Sepals linear-lanceolate to oblong, ca. 3 mm, apex subobtusate. Petals yellow, oblong to oblanceolate-oblong, ca. 4 × 1.7 mm, apex obtuse and mucronate. Stamens 8(or 10), 4–5 mm; antepetalous ones inserted ca. 1 mm from petal base. Nectar scales linear to narrowly oblong, 1.2–1.8 × 0.4–0.6 mm, apically irregularly few toothed. Carpels oblong, 5–6 mm, base connate for 1.5–2 mm. Styles ± incurved, short. Follicles red. Seeds brown, ovoid, winged at both ends. Fl. Jun–Jul, fr. Aug.

Grassland slopes, rocks; 2800–4200 m. Xinjiang [Mongolia, Russia, Tajikistan].

11. *Rhodiola quadrifida* (Pallas) Schrenk in Fischer & C. A. Meyer, Enum. Pl. Nov. 1: 69. 1841.

四裂红景天 si lie hong jing tian

Sedum quadrifidum Pallas, Reise Russ. Reich. 3: 730.

1776; *Chamaerhodiola quadrifida* (Pallas) Nakai.

Caudex 1–3 cm; persistent old flowering stems present. Winter bud at apex of rhizome conspicuous. Caudex leaves brown, scalelike, triangular, ca. 4 × 4 mm. Flowering stems ± erect, 6–9 cm × 0.5–1 mm. Stem leaves alternate, erect, sessile, linear, subterete, 5–8(–12) × ca. 1 mm, margin entire, apex acute. Inflorescences corymbiform, ca. 1 cm in diam., few flowered. Flowers unisexual, usually 4-merous, equaling or longer than pedicel. Sepals green, linear-lanceolate, ca. 3 mm, apex obtuse. Petals yellow, sometimes reddish at apex,

oblong-obovate, ca. 4 mm, apex obtuse. Stamens 8, equaling or slightly longer than petals. Follicles erect, red when mature, lanceolate, ca. 5 mm, apical beak slightly reflexed or erect. Seeds brown, oblong, ca. 2 mm, winged. Fl. May–Jun.

Alpine regions, stony slopes, rocks; 2300–3700 m. Xinjiang [Kazakstan, Mongolia, Russia].

12. *Rhodiola coccinea* (Royle) Borissova in Komarov, Fl. URSS 9: 41. 1939.

圆丛红景天 *yuan cong hong jing tian*

Main root 10–30 cm or longer. Caudex thick; persistent old flowering stems present. Winter bud at apex of rhizome inconspicuous. Caudex leaves brown, scalelike, orbicular-triangular, ca. 5 × 6–8 mm. Flowering stems erect or curved, 1–5 cm × less than 1 mm or 1.5–2 mm. Stem leaves alternate, sessile, linear-lanceolate to lanceolate, (3–)5–7 × (0.6–)1–1.5 mm, margin entire, apex subobtuse to acute or acuminate to long acuminate. Inflorescences corymbiform, compact, 0.8–1 cm in diam., few flowered. Flowers unisexual, (4 or)5-merous, longer than pedicel. Sepals red, oblong or lanceolate to triangular-oblong, 1.5–4 mm, apex obtuse or acute to acuminate. Petals red or yellow, oblong-ovate to subobovate or lanceolate to broadly oblong, apically constricted, 1.5–4 mm, apex subobtuse to obtuse. Stamens (8–)10, 3–4 cm. Follicles red when mature, ovoid to oblong-ovoid, apical beak reflexed, very short. Seeds brown, oblong, 1–1.5 mm, winged. Fl. Jun–Jul, fr. Jul–Sep.

Alpine regions, stony soils, rocks, rock crevices on slopes; 2200–5300 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang, NW Yunnan [Afghanistan, Bhutan, NW India, Kashmir, Nepal, Sikkim].

- 1a. Flowering stems 1.5–2 mm in diam.; stem leaf apex subobtuse to acute; sepals oblong, apex obtuse; petals oblong-ovate to subobovate, ca. 4 mm 12a. subsp. *coccinea*
- 1b. Flowering stems less than 1 mm in diam.; stem leaf apex acuminate to long acuminate; sepals lanceolate to triangular-oblong, apex acute to acuminate; petals lanceolate to broadly oblong, 1.5–2(–4) mm 12b. subsp. *scabrida*

12a. *Rhodiola coccinea* subsp. *coccinea*

圆丛红景天(原亚种) *yuan cong hong jing tian* (*yuan ya zhong*)

Sedum coccineum Royle, Ill. Bot. Himal. Mts. 1: 223. 1835; *Rhodiola juparensis* (Fröderström) S. H. Fu; *S. juparense* Fröderström; *Sedum quadrifidum* Pallas var. *coccineum* (Royle) J. D. Hooker & Thomson. Flowering stems 1.5–2 mm in diam. Stem leaf apex subobtuse to acute. Sepals oblong, apex obtuse. Petals oblong-ovate to subobovate, ca. 4 mm. Fl. Jun–Jul, fr. Aug.

Alpine regions, stony soils, rocks; 2600–4900 m. Gansu, Qinghai, Sichuan, Xinjiang, Xizang [Afghanistan, Bhutan, NW India, Kashmir, Nepal].

12b. *Rhodiola coccinea* subsp. *scabrida* (Franchet) H. Ohba, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 153. 1982.

粗糙红景天 *cu cao hong jing tian*

Sedum scabridum Franchet, J. Bot. (Morot) 10: 284. 1896; *Chamaerhodiola scabrida* (Franchet) Nakai; *Rhodiola likiangensis* (Fröderström) S. H. Fu; *R. scabrida* (Franchet) S. H. Fu; *Sedum brachystylum* Fröderström; *S. likiangense* Fröderström.

Flowering stems less than 1 mm in diam. Stem leaf apex acuminate to long acuminate. Sepals lanceolate to triangular-oblong, apex acute to acuminate. Petals lanceolate to broadly oblong, 1.5–2(–4) mm. Fr. Jul–Sep.

Rock crevices on slopes; 2200–5300 m. W Sichuan, Xizang, NW Yunnan [Sikkim].

13. *Rhodiola kansuensis* (Fröderström) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 126. 1965.

甘肃红景天 *gan su hong jing tian*

Sedum semenovii (Regel & Herder) Masters var. *kansuense* Fröderström, Oesterr. Bot. Z. 87: 120. 1938.

Main roots brown, straight. Caudex erect, clustered, slightly enlarged; persistent old flowering stems few. Caudex leaves scalelike, suboblong, apex obtuse. Sterile stems 2–3 cm, densely leafy. Flowering stems few, tufted, 7–8 cm. Stem leaves narrowly linear, less than 10 mm. Inflorescences corymbiform, dense. Flowers bisexual, pedicellate or sessile, unequally 5-merous. Sepals linear, ca. 3.8 mm, apex acuminate. Petals oblong, 6–6.5 mm, apex galeate and mucronate. Stamens 10; antepetalous ones ca. 4.5 mm; antepetalous ones ca. 2.2 mm, inserted ca. 2 mm from petal base; anthers ca. 0.8–0.9 mm. Carpels erect. Seeds oblong. Fl. Jun–Jul.

• Rocks on mountain slopes; 2300–3200 m. Gansu (Lanzhou Shi).

14. *Rhodiola kashgarica* Borissova in Komarov, Fl. URSS 9: 476. 1939.

喀什红景天 *ka shi hong jing tian*

Roots gray, slender. Caudex many branched, 5–10 mm in diam.; persistent old flowering stems present. Caudex leaves scalelike, triangular, 3–5 mm wide. Flowering stems numerous, ascending, grayish when old, 3–5(–10) cm × 0.5–1 mm. Stem leaves alternate, subhorizontally spreading, oblong to linear-lanceolate, 3–10 × 1–2 mm, margin entire, apex obtuse. Inflorescences corymbiform or subcapitate, 4–6 × 5–10 mm, few flowered. Flowers unisexual, unequally 4- or 5-merous; pedicel short, slightly elongated in fruit. Sepals linear, 2–3 mm, apex acute. Petals golden yellow, oblong-lanceolate, apically slightly narrowed, 3–4 mm, apex obtuse. Stamens 8 or 10; anthers yellow. Nectar scales subquadrangular to suboblong. Follicles ovoid, 3–4 mm, apical beak recurved, short. Seeds brown, lanceolate, to 1.5 mm. Fl. Jun–Jul.

Rocks; 2600–3200 m. SW Xinjiang (Kashi Shi) [Kazakstan].

15. *Rhodiola nobilis* (Franchet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 120. 1965.

优秀红景天 you xiu hong jing tian

Sedum nobile Franchet, J. Bot. (Morot) 10: 285. 1896; *Chamaerhodiola horrida* (Praeger) Nakai; *C. nobilis* (Franchet) Nakai; *S. horridum* Praeger.

Main root long. Caudex erect, more than 20 cm; persistent old flowering stems present, brown with age. Caudex leaves scalelike. Flowering stems numerous, erect, red-brown when young, 3–4 cm × 1–2 mm, subscabrous, densely leafy. Stem leaves sessile, oblong-lanceolate to -oblanceolate, 7–11 × 1.7–2 mm, adaxially subscabrous, finely mammillate when dry, apex obtuse. Inflorescences 1–4-flowered; bracts leaflike, small. Flowers terminal, shortly pedicellate, unisexual, unequally 4- or 5-merous. Sepals lanceolate-triangular, 2.3–2.5 × 1.3–1.5 mm, apex obtuse. Petals red, suboblong, 4–6 × 1.5–1.7 mm, base slightly narrowed, apex obtuse. Stamens 8–10, ca. 4 mm; antepetalous ones inserted ca. 1 mm from petal base. Nectar scales suborbicular, apex rounded to emarginate. Styles slightly recurved, short. Follicles erect, 1–1.4 cm, base connate for ca. 2 mm. Fl. Jul, fr. Aug–Oct.

Thickets, grassy slopes; 3700–4500 m. NW Yunnan [Myanmar].

16. *Rhodiola subopposita* (Maximowicz) Jacobsen, Natl. Cact. Succ. J. 28: 6. 1973.

对叶红景天 dui ye hong jing tian

Sedum suboppositum Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér. 3, 29: 132. 1883.

Plants greenish. Flowering stems numerous, slender, flexuose, more than 30 cm. Stem leaves subopposite or alternate, divergent, shortly petiolate to subsessile; leaf blade broadly elliptic to ovate, ca. 2 × 1 cm, margin irregularly crenulate, apex obtuse. Inflorescences cymes, ca. 10 mm in diam., to 4 cm in fruit, many flowered, bracteate. Flowers unisexual, unequally 5-merous, ca. 7 mm in diam., equaling pedicel. Sepals oblong. Petals yellow, oblong. Stamens 10, slightly longer than petals. Nectar scales subquadrangular, apex emarginate. Carpels of male flowers rudimentary, ovoid, small. Styles short, apiculate. Follicles ca. 6 mm, apical beak horizontally spreading, short. Seeds winged.

• Rocks in alpine areas; 3800–4100 m. C Gansu (Tianzhu Zhang Zu Zizhixian), NE Qinghai.

17. *Rhodiola atuntsuensis* (Praeger) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 120. 1965.

德钦红景天 de qin hong jing tian

Sedum atuntsuense Praeger, Notes Roy. Bot. Gard. Edinburgh 13: 71. 1921; *Chamaerhodiola atuntsuensis* (Praeger) Nakai; *Rhodiola aporontica* (Fröderström) S. H. Fu; *R. brevipetiolata* (Fröderström) S. H. Fu; *R. concinna* (Praeger) S. H. Fu; *R. nobilis* (Franchet) S. H.

Fu subsp. *atuntsuensis* (Praeger) H. Ohba; *R. venusta* (Praeger) S. H. Fu; *Sedum aporonticum* Fröderström; *S. brevipetiolatum* Fröderström; *S. concinnum* Praeger; *S. venustum* Praeger.

Caudex few branched, erect, 3–5 × 0.5–1.2 cm; persistent old flowering stems present or absent. Caudex leaves scalelike, triangular to triangular-suborbicular, apex acute to acuminate. Flowering stems few to numerous, simple, erect, 2–9 cm. Stem leaves alternate, sessile or shortly petiolate; leaf blade broadly oblong-lanceolate, obovate-lanceolate, oblong-ovate, or subovate, (5–)6–12 × 2.5–4 mm, base connate, margin entire but sometimes undulate, apex rounded, obtuse, or acuminate. Inflorescences subumbellate or corymbiform. Flowers bisexual or unisexual, 5-merous, or 4-merous in male plants. Sepals linear, lanceolate, or broadly oblong, 1.5–6.5 mm, base ca. 1 mm wide and connate for ca. 1 mm, apex obtuse. Petals suberect, yellow or purple at base and yellow toward apex, oblong-linear, oblong, oblong-lanceolate, or obovate, 2.5–4.5 × 1–0.6–2.5 mm, apex obtuse and mucronate. Stamens 8 or 10, subequaling petals; antepetalous ones inserted ca. 0.5 mm from petal base. Nectar scales subelliptic to obliquely quadrangular, apex ± emarginate. Carpels suberect or erect, 2.5–4 mm. Seeds subovoid-oblong, smooth, winged at both ends. Fl. and fr. Aug.

Forests, glacial valleys, granitic rocks, gravelly or limestone areas; 3100–5000 m. W Sichuan (Dawu Xian, Kangding Xian), Xizang, NW Yunnan [Myanmar].

Rhodiola atuntsuensis shows a wide range of variation, especially in leaf shape and flower number. Several allied species are better regarded as extreme variants of this species. The species is functionally dioecious, but the male flowers have large pistils and appear bisexual.

18. *Rhodiola recticaulis* Borissova in Komarov, Fl. URSS 9: 478. 1939.

直茎红景天 zhi jing hong jing tian

Sedum recticaule (Borissova) Wendelbo.

Main root thick, woody. Caudex branched, 3–6 cm in diam., woody, apically leafy; branches ca. 1.5 cm in diam. Caudex leaves brown, scalelike, triangular, ca. 1 × 1 mm, apex obtuse. Flowering stems numerous, erect, 8–15 cm × 1.5–2 mm, slightly sulcate; persistent old flowering stems present. Stem leaves alternate, erect or divergent, sessile, yellowish green, elliptic to elliptic-oblong, 8–10 × 2–3 mm, margin coarsely dentate, apex subacute. Inflorescences corymbiform-capitate, compact, 1.5–2 cm in diam., many flowered, bracteate. Flowers shortly pedicellate, unisexual, unequally 4-merous, small. Sepals red, elliptic, ca. 2 mm, apex obtuse. Petals yellow, oblong-elliptic, ca. 4 mm, apex obtuse. Stamens 8, longer than petals; filaments yellow; anthers globose. Nectar scales subquadrangular, apex entire. Carpels erect. Stigma capitate. Follicles apically

shortly beaked. Seeds brown, oblong, ca. 2 mm. Fl. Jun–Aug, fr. Jul–Sep.

Rock crevices on mountain slopes; 3800–4600 m. Xinjiang (Tian Shan) [Kazakhstan; SW Asia (Iran)].

Typical *Rhodiola reticulata* has flowering stems to 5 mm thick and globose inflorescences. One of the present authors (Ohba) believes that the Chinese plants described here need further investigation, as they may prove to be a different species.

19. *Rhodiola gannanica* K. T. Fu, Acta Bot. Boreal.-Occid. Sin. 11: 170. 1991.

甘南红景天 gan nan hong jing tian

Plants (6–)15–18 cm tall, glabrous. Caudex thick.

Caudex leaves scalelike. Flowering stems erect, 14–16 cm × 1–2 mm, smooth, leafy. Stem leaves alternate, sessile, ovate-lanceolate to ovate, 7–9 × 2.5–3.5 mm, base narrowed, margin mammillate, apex very acute. Inflorescences terminal, cymose, 0.8–1.2 × 1–1.5 cm, 10–15-flowered; bracts ca. 4 mm. Flowers shortly pedicellate, unisexual, female ones 4(or 5)-merous. Sepals triangular-linear, ca. 2 × 1–1.2 mm, apex obtuse. Petals free, purple, oblong, ca. 2.5 × 1–1.2 mm, apex obtuse. Nectar scales subquadrangular, ca. 0.7 × 0.7 mm, apex emarginate to truncate. Carpels usually 4, erect, ovoid-oblong, 3–3.5 mm, apex beaked at maturity. Seeds 10 or 11, narrowly oblong, smooth. Fl. Jun, fr. Jul.

• Rocky slopes, alpine mountain summits; 3500–3900 m. S Gansu (Lintan Xian, Xiahe Xian).

20. *Rhodiola tibetica* (J. D. Hooker & Thomson) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 121. 1965.

西藏红景天 xi zang hong jing tian

Sedum tibeticum J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 96. 1858; *Chamaerhodiola stracheyi* (J. D. Hooker & Thomson) Nakai; *C. tibetica* (J. D. Hooker & Thomson) Nakai; *Sedum quadrifidum* Pallas var. *tibeticum* (J. D. Hooker & Thomson) Fröderström; *S. stracheyi* J. D. Hooker & Thomson; *S. tibeticum* var. *stracheyi* (J. D. Hooker & Thomson) C. B. Clarke. Caudex short to long; persistent old flowering stems few, present as remnants. Flowering stems to 30 cm, basally usually finely papillate. Stem leaves linear to narrowly ovate, 5–9 × 1.5–4 mm, base broadly triangular, margin entire or dentate, apex long acuminate and awn-shaped. Inflorescences corymbiform, compact, 2–2.5 cm in diam., many flowered. Flowers unisexual, unequally 5-merous. Sepals suboblong, ca. 1 mm. Petals purple to red, elliptic-lanceolate, 2–4 mm. Stamens 10, subequaling or somewhat longer than petals. Nectar scales subquadrangular, ca. 0.6 mm, apex emarginate. Carpels erect, lanceolate, 4–5 mm, apex ± recurved. Fl. Jul–Aug, fr. Sep.

Stony slopes on sides of ravines; 4100–5400 m. SW Xizang [Afghanistan, India, Pakistan].

21. *Rhodiola fastigiata* (J. D. Hooker & Thomson) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 122. 1965.

长鞭红景天 chang bian hong jing tian

Sedum fastigiatum J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 98. 1858; *Chamaerhodiola fastigiata* (J. D. Hooker & Thomson) Nakai; *S. quadrifidum* Pallas var. *fastigiatum* (J. D. Hooker & Thomson) Fröderström; *Triplostegia pinifolia* H. Léveillé.

Caudex simple or few branched, more than 50 × 1–1.5 cm; persistent old flowering stems few or absent. Caudex leaves scalelike, triangular. Flowering stems 4–10, arising from caudex apex, 8–20 cm × 1.2–2 mm, densely leafy. Stem leaves alternate, linear-oblong, linear-lanceolate, elliptic, or oblanceolate, 8–12 × 1–4 mm, margin entire but finely mammillate, apex obtuse. Inflorescences corymbiform, dense, ca. 1 × 2 cm. Flowers unisexual, male ones unequally 5-merous. Sepals linear to narrowly triangular, ca. 3 mm, apex obtuse. Petals red, oblong-lanceolate, ca. 5 × 1.3 mm, apex obtuse. Stamens 10, to 5 mm; antepetalous ones inserted ca. 1 mm from petal base. Nectar scales transversely oblong, apex emarginate. Carpels erect, lanceolate. Styles long. Follicles 7–8 mm, apex ± recurved. Fl. Jun–Aug, fr. Sep.

Rocky slopes; 3500–5400 m. Sichuan, Xizang, Yunnan [Bhutan, India, Kashmir, Nepal, Sikkim].

22. *Rhodiola pamiroalaica* Borissova in Komarov, Fl. URSS 9: 477. 1939.

帕米红景天 pa mi hong jing tian

Sedum pamiroalaicum (Borissova) C.-A. Jansson.

Roots robust, thick. Caudex robust, woody, apically leafy; persistent old flowering stems present. Caudex leaves scalelike, triangular, 4–8 × 1.5–6 mm. Flowering stems numerous, ascending, 10–30 cm × ca. 2 mm, basally sulcate. Stem leaves alternate, remote, sessile, linear, linear-lanceolate, or lanceolate, 7–15 × 1.5–2 mm, base broad, margin entire, apex subacute. Inflorescences corymbiform-paniculate, compact, 0.5–1 × 1–2 cm in diam., few to many flowered. Flowers unisexual, unequally 5(or 6)-merous in male plants, equaling pedicels. Sepals greenish yellow, lanceolate to linear, 2–3 mm, apex subobtuse. Petals yellowish green, lanceolate to linear, 4–4.5 mm, apex subobtuse. Stamens 10 or 12, yellow, shorter than petals. Nectar scales cuneate-quadrangular, apex truncate to ± recurved, apical beak filiform. Seeds brown, lanceolate. Fl. Jun–Jul, fr. Jun–Aug.

Valley slopes, rock crevices in ravines; 2400–2800 m. W Xinjiang (Wensu Xian) [Tajikistan].

23. *Rhodiola litwinowii* Borissova in Komarov, Fl. URSS 9: 478. 1939.

黄萼红景天 huang e hong jing tian

Main root thick, ca. 30 cm, apically to 2 cm in diam. Caudex many branched, robust, 3–4 cm.; persistent old flowering stems few. Caudex leaves scalelike, ovate-triangular, 1–1.5 × 1–1.5 cm. Flowering stems

numerous, erect, 10–17 cm, densely leafy. Stem leaves alternate, greenish, usually yellowish green when dry, 10–15 × 3–5 mm, base cuneate, apical margin obtusely dentate, apex obtuse. Inflorescences compact, 1–1.5 × 2–2.5 cm, many flowered, bracteate. Flowers unisexual, unequally 4- or 5-merous; equaling or slightly longer than pedicel. Sepals yellow, lanceolate, ca. 3 mm, apex obtuse. Petals yellow, lanceolate, ca. 4 mm, apex obtuse. Stamens 8 or 10, ca. 4 mm, equaling or longer than petals; filaments and anthers yellow. Nectar scales quadrangular, apex truncate. Follicles to 8 mm, tapered and apically filiform, apical beak 1–1.5 mm. Seeds brown, oblong-lanceolate, 1.5–2 mm. Fl. Jun–Aug, fr. Jul–Sep.

Below 3200 m. Xinjiang [Mongolia, Uzbekistan].

24. *Rhodiola angusta* Nakai, Bot. Mag. (Tokyo) 28: 304. 1914.

长白红景天 *chang bai hong jing tian*

Rhodiola komarovii Borissova; *R. ramosa* Nakai; *Sedum fenzelii* Fröderström; *S. komarovii* (Borissova) Chu; *S. ohbae* J. P. Kozhevnikov.

Main root often simple. Caudex erect, slender, 5–7 mm in diam.; persistent old flowering branches few, present as remnants. Caudex leaves scalelike, triangular.

Flowering stems erect, straw-colored, 3.5–10 cm, densely leafy. Stem leaves alternate, linear, 10–20 × 1–2 mm, base slightly narrowed, margin entire or apically 1- or 2-dentate, apex obtuse. Inflorescences corymbiform, few to many flowered. Flowers unisexual, male ones unequally 4-merous. Sepals linear, 2–4 mm, apex obtuse. Petals yellow, oblong-lanceolate, 4–5 × ca. 1 mm, apex obtuse. Stamens 8, slightly shorter than or equaling petals; antepetalous ones inserted ca. 1.8 mm from petal base. Nectar scales subquadrangular, 0.4–0.5 × 0.5–0.6 mm, apex truncate to emarginate. Carpels erect, lanceolate, ca. 6 mm, apex acuminate. Styles ca. 1.5 mm. Stigma capitate. Follicles erect, purplish red, 7–8 mm, apical beak ± recurved. Seeds lanceolate, winged at both ends. Fl. Jul–Aug, fr. Aug–Sep.

Alpine grasslands, rocks on slopes; 1700–2600 m. Heilongjiang [Korea, Russia].

25. *Rhodiola himalensis* (D. Don) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 121. 1965.

喜马拉雅红景天 *xi ma hong jing tian*

Caudex long; persistent old flowering stems present. Caudex leaves scalelike, triangular. Flowering stems usually reddish, 10–50 cm, with many small, hyaline glands. Stem leaves alternate, loosely imbricate, sessile, narrowly lanceolate, lanceolate, oblanceolate, oblong-oblanceolate, or obovate, 0.7–2.7 × 0.2–1 cm, finely mammillate especially on margin, midvein conspicuous, base rounded, margin entire or apically dentate, apex acute to apiculate. Inflorescences corymbiform. Flowers unisexual, male ones unequally 4- or 5-merous; pedicel slender. Sepals narrowly triangular, 1.5–2 mm, base connate. Petals deep purple,

oblong-lanceolate, 3–4 mm. Stamens 8 or 10, 2–3 mm. Nectar scales oblong, apex emarginate. Carpels suberect or erect, lanceolate, 2–9 mm. Styles recurved, short. Fl. May–Jun, fr. Aug.

Forests, scrub, slopes; 2600–4200 m. S Gansu, Qinghai, NW Sichuan, Xizang, Yunnan [Bhutan, Nepal, Sikkim].

1a. Flowering stems 25–50 cm; stem leaves

1.7–2.7 × 0.4–1 cm; carpels ca. 9 mm

..... 25a. var. *himalensis*

1b. Flowering stems 10–13 cm; stem leaves

0.7–1 × ca. 0.2 cm; carpels ca. 2 mm

..... 25b. var. *taohoensis*

25a. *Rhodiola himalensis* subsp. *himalensis*

喜马拉雅红景天(原亚种) *xi ma hong jing tian* (yuan ya zhong)

Sedum himalense D. Don, Prodr. Fl. Nepal. 212. 1825; *Chamaerhodiola himalensis* (D. Don) Nakai; *S. quadrifidum* Pallas var. *himalense* (D. Don) Fröderström.

Flowering stems 25–50 cm. Stem leaves lanceolate, oblanceolate, oblong-oblanceolate, or obovate, 1.7–2.7 × 0.4–1 cm. Carpels erect, ca. 9 mm.

Forests, scrub, slopes; 3700–4200 m. NW Sichuan, Xizang, Yunnan [Bhutan, Nepal, Sikkim].

25b. *Rhodiola himalensis* subsp. *taohoensis* (S. H. Fu) H. Ohba, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 13: 140. 1982.

洮河红景天 *tao he hong jing tian*

Rhodiola taohoensis S. H. Fu, Acta Phytotax. Sin., Addit. 1: 121. 1965; *Sedum himalense* subsp. *taohoense* (S. H. Fu) J. P. Kozhevnikov.

Flowering stems 10–13 cm. Stem leaves narrowly lanceolate, 0.7–1 × ca. 0.2 cm. Carpels suberect, ca. 2 mm.

• Shaded slopes; 2600–3800 m. S Gansu (Jonê Xian, Lintan Xian), Qinghai.

26. *Rhodiola alsia* (Fröderström) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 121. 1965.

西川红景天 *xi chuan hong jing tian*

Caudex erect, long; persistent old flowering stems present. Flowering stems erect, pale red when dry, 15–20 cm, or 10–15 cm in female plants. Stem leaves alternate; leaf blade lanceolate to oblanceolate or oblong, 8–15 × ca. 2 mm, sparsely papillate, margin entire or usually apically few dentate, apex acute, finely papillate in female plants. Inflorescences cymose, 1.5–2 × 1.5–2 cm, slightly smaller in female plants. Flowers shortly pedicellate, bisexual or female (plants hermaphroditic or gynodioecious), unequally 5-merous, female ones 4-merous. Sepals reddish when dry, triangular-lanceolate, 2.4–3.5 mm, apex obtuse. Petals reddish when dry, oblong, 5–6 mm, apex obtuse, or

slightly narrowed and shortly apiculate in female flowers. Stamens 10, to 7 mm; antepetalous ones inserted ca. 1 mm from petal base. Nectar scales subtransversely rectangular, or square in female flowers, apex \pm emarginate. Carpels erect, suboblong, 5.6–6 mm. Follicles many seeded. Seeds subovoid, winged at both ends. Fl. Jul, fr. Aug.

• *Rhododendron* forests, rocky slopes; 3400–4800 m. NW Sichuan, Xizang, Yunnan.

1a. Flowers bisexual or female (plants gynodioecious), 7–10 mm wide; flowering stems 2–6, to 20 cm 26a. subsp. *alsia*

1b. Flowers always bisexual (plants hermaphroditic), 5–7 mm wide; flowering stems many, fastigiate, 20–25 cm 26b. subsp. *kawaguchii*

26a. *Rhodiola alsia* subsp. *alsia*

西川红景天(原变种) xi chuan hong jing tian (yuan bian zhong)

Sedum alsium Fröderström, Acta Horti Gothob. 15: 8. 1942; *Rhodiola staminea* (Paulsen) S. H. Fu; *Sedum doratocarpum* Fröderström; *S. stamineum* Paulsen. Flowering stems 2–6, to 20 cm. Flowers bisexual or female (plants gynodioecious), 7–10 mm wide. Sepals 2.2–2.6 mm, or 2.6–3.5 mm in female flowers.

• *Rhododendron* forests, rocky slopes; 3400–4800 m. NW Sichuan, Xizang, Yunnan.

26b. *Rhodiola alsia* subsp. *kawaguchii* H. Ohba, Acta Phytotax. Geobot. 32: 192. 1981.

河口红景天 he kuo hong jing tian

Flowering stems many, fastigiate, 20–25 cm. Flowers always bisexual (plants hermaphroditic), 5–7 mm wide. Sepals 2.4–2.6 mm.

• Rocky slopes; 4400–4600 m. Xizang.

27. *Rhodiola sherriffii* H. Ohba, J. Jap. Bot. 53: 258. 1978.

小杯红景天 xiao bei hong jing tian

Sedum sherriffii (H. Ohba) J. P. Kozhevnikov.

Caudex prostrate, apically ascending, terete, 1–2.5 cm in diam. Caudex leaves somewhat dusky when dry, scalelike, triangular-ovate. Flowering stems simple, flabellately fasciated, usually reddish, 10–30 cm \times (1.5–)2–4(–6) mm, smooth, deciduous each year. Stem leaves alternate, ascending, oblanceolate to narrowly oblong, 1–3 \times 0.2–0.7 cm, adaxially densely mammillate, abaxially mammillate along midvein, base attenuate, margin entire, apex acute. Inflorescences compound cymes; male inflorescences 40–100-flowered; female inflorescences 10–20-flowered. Flowers unisexual, male ones unequally 5-merous; pedicel 2–8 mm, densely mammillate. Petals free, greenish yellow, usually reddish apically, narrowly oblong-ob lanceolate, 4–6 \times 1–1.5 mm, apex rounded. Stamens 10, longer than petals; antepetalous ones

inserted 0.2–0.8 mm from petal base. Nectar scales oblong, apex emarginate. Carpels almost free, 6–12 mm. Styles short. Follicles ca. 8-seeded. Seeds ellipsoid, winged.

Thickets, grassy slopes, moist places, rocks; 4000–5000 m. Xizang [Bhutan, Sikkim].

28. *Rhodiola tangutica* (Maximowicz) S. H. Fu, Bull. Bot. Res., Harbin 6(4): 158. 1986.

唐古红景天 tang gu hong jing tian

Sedum algidum (Ledebour) Fischer & C. A. Meyer var. *tanguticum* Maximowicz, Bull. Acad. Imp. Sci. Saint-Petersbourg, Sér. 3, 29: 126. 1883; *Rhodiola algida* Ledebour var. *tangutica* (Maximowicz) S. H. Fu.

Plants glabrous. Caudex robust, long; persistent old flowering stems sometimes present, few. Caudex leaves sessile, scalelike, triangular. Flowering stems straw-colored (or at least dusky) when dry and 10–17(–30) cm in male plants, brown and 15–30 cm in female plants.

Leaf blade linear, 8–15 \times 0.5–2 mm, apex obtusely acuminate. Inflorescences corymbiform to obconical, compact, to 5 \times 5 cm in female plants, bracteate.

Flowers unequally 5-merous. Sepals linear-oblong, 2.5–3 \times 0.5–0.6 mm in male flowers, 3–3.5 \times 0.5–0.7 mm in female flowers, apex obtuse. Petals pinkish when dry, oblong-lanceolate, ca. 4.5 \times 1.2 mm, apex obtusely acuminate. Stamens 10; antepetalous ones ca. 2.5 mm, inserted ca. 1.5 mm from petal base. Nectar scales quadrate, apex emarginate. Follicles erect, narrowly lanceolate, to 10 mm, apical beak erect or \pm recurved, short. Fl. May–Aug, fr. Aug.

• Rock crevices in alpine areas, beside water; 2100–4700 m. Gansu, Qinghai, Sichuan.

This species is used medicinally.

29. *Rhodiola calliantha* (H. Ohba) H. Ohba, J. Jap. Bot. 51: 386. 1976.

美花红景天 mei hua hong jing tian

Sedum callianthum H. Ohba, J. Jap. Bot. 49: 325. 1974.

Caudex terete, ca. 1.5 cm in diam. Caudex leaves brownish, scalelike, triangular to ovate-triangular. Flowering stems straw-colored when dry, 12–18 \times 1.5 cm. Stem leaves subopposite or alternate; petiole ca. 2 mm; leaf blade rhombic-ovate or narrowly so or elliptic or narrowly so, 4–5.5 \times 1–2.2 cm, base attenuate, margin apically roughly serrate-crenate, apex acute. Inflorescences terminal, compound corymbs; peduncle 0.5–1.5 cm; bracts few, resembling stem leaves but smaller. Flowers unisexual, male ones unequally 5-merous; pedicel 1.5–2.5 mm. Sepals triangular to ovate-triangular, 1.2–0.6 mm, apex obtuse. Petals pinkish to purple, narrowly obovate, 3–4.5 \times 0.8–1.5 mm, margin entire or erose toward apex, apex obtuse. Stamens 10; antepetalous ones 1–1.5 mm, inserted ca. 0.5 mm from petal base. Nectar scales suboblong, apex rounded-truncate. Carpels erect, lanceolate, ca. 1.5 mm. Fl. Jun.

Rocks on shady slopes; ca. 3600 m. S Xizang (Gyirong Xian) [Nepal].

30. *Rhodiola rosea* Linnaeus, Sp. Pl. 2: 1035. 1753.

红景天 hong jing tian

Roots erect, robust. Caudex short. Caudex leaves scalelike. Flowering stems 10–30 cm. Stem leaves remote, sessile, oblong, elliptic-oblongate, or obovate, 0.7–3.5 × 0.5–1.8 cm, base subamplexicaul, margin entire, apically few dentate, or serrate, apex acute to acuminate. Inflorescences corymbiform or capitate, compact, ca. 2 × 3–6 cm, many flowered. Flowers unisexual, male ones unequally 4-merous. Sepals lanceolate-linear, ca. 1 mm, apex obtuse. Petals greenish yellow or yellow, linear-oblongate to oblong, ca. 3 mm, apex obtuse. Stamens 8, longer than petals. Nectar scales oblong, apically slightly narrowed, 1–1.5 × ca. 0.6 mm, apex emarginate. Carpels of female flowers erect. Styles recurved. Follicles lanceolate to linear-lanceolate, 6–8 mm, apical beak ca. 1 mm. Seeds lanceolate, ca. 2 mm, winged at one end. Fl. Apr–Aug, fr. Jul–Sep.

Forested, grassy, or rocky slopes; 1800–2700 m. C Gansu, Hebei, Jilin, Shanxi, Xinjiang [Japan, Kazakstan, Korea, Mongolia, Russia; Europe, North America].

- 1a. Leaves to 3.5 cm, margin entire or apically few dentate; flowering stems 20–30 cm; inflorescences corymbiform; petals greenish yellow 30a. var. *rosea*
1b. Leaves 0.7–1.2 cm, margin serrate; flowering stems 10–16 cm; inflorescences capitate; petals yellow 30b. var. *microphylla*

30a. *Rhodiola rosea* var. *rosea*

红景天(原变种) hong jing tian (yuan bian zhong)
Sedum roseum (Linnaeus) Scopoli, Fl. Carniol. ed. 2, 1: 326. 1771; *Rhodiola elongata* (Ledebour) Fischer & C. A. Meyer; *R. rosea* var. *elongata* (Ledebour) H. Jacobsen; *R. telephioides* (Maximowicz) S. H. Fu; *Sedum caerulans* H. Léveillé & Vaniot; *S. elongatum* Ledebour; *S. rhodiola* de Candolle; *Sedum suboppositum* Maximowicz var. *telephioides* Maximowicz.

Flowering stems 20–30 cm. Leaves oblong to elliptic-oblongate, to 3.5 cm, margin entire or apically few dentate. Inflorescences corymbiform. Petals greenish yellow. Fl. Apr–Jun, fr. Jul–Sep.

Forested, grassy, or rocky slopes; 1800–2700 m. Hebei, Jilin, Shanxi, Xinjiang [Japan, Kazakstan, Korea, Mongolia, Russia; Europe, North America].

Plants misidentified in FRPS as *Rhodiola atropurpurea* (Turczaninow) Trautvetter & C. A. Meyer belong to this variety.

30b. *Rhodiola rosea* var. *microphylla* (Fröderström) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 124. 1965.

小叶红景天 xiao ye hong jing tian

Sedum roseum (Linnaeus) Scopoli var. *microphyllum* Fröderström, Oesterr. Bot. Z. 87: 120. 1938.

Flowering stems 10–16 cm. Leaves obovate to oblong, 0.7–1.2 cm, margin serrate. Inflorescences capitate. Petals yellow. Fl. Jul–Aug.

• C Gansu (Wuwei Xian).

31. *Rhodiola sachalinensis* Borissova in Komarov, Fl. URSS 9: 473. 1939.

库页红景天 ku ye hong jing tian

Sedum sachalinense (Borissova) Voroschilov.

Roots usually erect, rarely prostrate, robust. Caudex short, thick. Caudex leaves dusky, scalelike, membranous. Flowering stems 6–30 cm. Stem leaves basally remote but apically denser, spatulate, oblong-rhombic, or -lanceolate, 0.7–4 × 0.4–0.9 cm, base cuneate, margin basally subentire but apically roughly dentate, apex acute to acuminate. Inflorescences cymes, compact, 1.5–2.5 cm in diam., many flowered, basally leafy. Flowers unisexual, 4(or 5)-merous. Sepals lanceolate-linear, 1–3 mm. Petals yellowish, linear-oblongate to oblong, 2–6 mm, apex obtuse. Stamens of male flowers 8, longer than petals; anthers yellow. Nectar scales 4, oblong, 1–1.5 × ca. 0.6 mm, apex emarginate. Carpels of female flowers 4. Styles recurved. Follicles erect, lanceolate to linear-lanceolate, 6–8 mm, apical beak ca. 1 mm. Seeds oblong to lanceolate, ca. 2 × 0.6 mm. Fl. Apr–Jun, fr. Jul–Sep.

Forested slopes, gravel slopes, alpine tundra; 1600–2500 m. Heilongjiang, Jilin [Japan, Korea, Russia].

32. *Rhodiola crenulata* (J. D. Hooker & Thomson) H. Ohba, J. Jap. Bot. 51: 386. 1976.

大花红景天 da hua hong jing tian

Sedum crenulatum J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 96. 1858; *Rhodiola euryphylla* (Fröderström) S. H. Fu; *R. megalophylla* (Fröderström) S. H. Fu; *R. rotundata* (Hemsley) S. H. Fu; *Sedum bupleuroides* Wallich ex J. D. Hooker & Thomson var. *rotundatum* (Hemsley) Fröderström; *S. euryphyllum* Fröderström; *S. megalanthum* Fröderström; *S. megalophyllum* Fröderström; *S. rotundatum* Hemsley; *S. rotundatum* Hemsley var. *oblongatum* C. Marquand & Airy Shaw.

Caudex few branched, short, 5–20 cm; persistent old flowering stems and branches few, black when dry. Caudex leaves scalelike, oblongate, 1–2 cm, apex subacute. Sterile branches erect, 4–17 cm, apically densely leafy; leaves broadly obovate, 1–3 cm. Flowering stems numerous, erect or flabellate, straw-colored to red, 5–20 cm; leaves shortly pseudopetiolate; leaf blade elliptic-oblong to suborbicular, 1.2–3 × 1–2.2 cm, margin entire and undulate to crenate, apex obtuse to mucronate. Inflorescences corymbiform, ca. 2 × 2–3 cm, many flowered, bracteate. Flowers shortly to long pedicellate, unisexual, large, male ones unequally 5-merous. Sepals narrowly triangular, lanceolate, or

oblong, 2–3.5 mm, apex obtuse to subobtusate. Petals red to purplish red, oblanceolate, (5–)6–7.5 × 1–1.5 mm, base long unguulate, apex obtuse. Stamens 10, equaling petals; antepetalous ones inserted ca. 2.5 mm from petal base. Nectar scales subquadrangular, quadrangular, or oblong, apex emarginate. Carpels lanceolate to oblong, 3–3.5(–6) mm, sterile. Styles short. Female flowers similar but stamens absent and carpels equaling petals. Follicles erect, red when dry, 8–10 mm. Seeds obovoid to ovoid, 1.5–2 mm, winged at both ends. Fl. Jun–Sep.

Thickets, grassland slopes, schist on mountain slopes, rocky places, rock crevices; 2800–5600 m. Qinghai, Sichuan, Xizang, Yunnan [Bhutan, Nepal, Sikkim].

33. *Rhodiola serrata* H. Ohba, J. Jap. Bot. 52: 263. 1977.

齿叶红景天 *chi ye hong jing tian*

Sedum serratum (H. Ohba) J. P. Kozhevnikov.

Caudex thick. Caudex leaves scalelike. Flowering stems solitary or few, straw-colored, 28–60 cm, apically mammillate. Stem leaves alternate, sessile, narrowly oblong, oblong, or linear-oblanceolate, 6–13 × 1.6–3.5 cm, base somewhat auriculate, margin serrulate, apex acute. Inflorescences terminal, compoundly cymose, large, more than 300-flowered; peduncle mammillate; bracts few, sessile, oblanceolate to narrowly lanceolate, 2.5–4 × ca. 1 cm, margin serrate. Flowers unisexual, male ones unequally 5- or 6-merous, female ones 4- or 5-merous; pedicel 1.5–2 mm. Sepals narrowly oblong in male flowers, subulate in female ones, ca. 1 mm. Petals oblanceolate to linear-oblanceolate and 2–3 mm in male flowers, linear and 2–2.5 mm in female ones. Stamens 10 or 12, 2.7–3 mm. Ovary ca. 2 mm. Nectar scales oblong, apex emarginate. Carpels erect, 4.2–7 mm, base subconnate, apex tapered. Styles recurved. Fl. Aug.

Forested slopes, field borders, beside trails near field borders; 3300–3800 m. S Xizang (Gyaca Xian) [India].

34. *Rhodiola heterodonta* (J. D. Hooker & Thomson) Borissova in Komarov, Fl. URSS 9: 32. 1939.

异齿红景天 *yi chi hong jing tian*

Sedum heterodontum J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 95. 1858; *S. roseum* (Linnaeus) Scopoli var. *heterodontum* (J. D. Hooker & Thomson) Fedtschenko ex Fröderström.

Roots vertical, stout. Caudex branched. Caudex leaves scalelike. Flowering stems erect, 30–40 cm × 4–5 mm. Stem leaves alternate, sessile, triangular-ovate, 1.5–2 × ca. 1.4 cm, base cordate and amplexicaul, margin coarsely serrate, apex acute. Inflorescences corymbiform, compact, 1–1.5 × 1.5–2 cm, ebracteate. Flowers shortly pedicellate, unisexual, male ones unequally 4-merous. Sepals linear, ca. 3 mm, apex obtuse. Petals greenish yellow, linear, to 7 × 1.3 mm, apex subobtusate. Stamens 8, reddish, much longer than petals. Nectar scales linear, apex shallowly concave.

Carpels lanceolate, ca. 6 mm. Styles short. Follicles erect, linear-oblong, apical beak curved, short. Seeds brown, ellipsoid. Fl. May–Jun, fr. Jul.

Slopes, sides of ravines, glacial rocks; 2800–4700 m. Xinjiang, Xizang [Afghanistan, India, Mongolia, Pakistan, Tajikistan; SW Asia (Iran)].

35. *Rhodiola junggarica* C. Y. Yang & N. R. Cui, Acta Phytotax. Sin. 20: 321. 1982.

准噶尔红景天 *zhun ga er hong jing tian*

Main root robust. Caudex thick, 4–5(–10) cm. Caudex leaves brown, scalelike, ovate-triangular, membranous. Flowering stems 1–4, 5–11 cm. Stem leaves alternate, yellowish green, ovate-triangular, 5–10 × 4–5 mm, base truncate to subcordate, margin coarsely obtuse-serrate, apex shortly acuminate. Inflorescences capitately corymbiform, dense, ca. 1 × 1–2 cm, basally leafy. Flowers unisexual, male ones unequally 4-merous; pedicel 2–3 mm. Sepals reddish, triangular-linear, shorter than petals. Petals red, sometimes yellow at base, elliptic, ca. 2 mm, apex obtuse. Stamens 8, ca. 4 mm; filaments and anthers yellow. Nectar scales oblong, apex retuse. Fl. Jun.

• Subalpine and alpine meadows; 2500–2700 m. W Xinjiang (Wenquan Xian).

36. *Rhodiola cretinii* (Raymond-Hamet) H. Ohba, J. Jap. Bot. 51: 386. 1976.

根出红景天 *gen chu hong jing tian*

Caudex prostrate, 2–4 mm in diam. Caudex leaves scalelike, small, apex obtuse. Flowering stems few, ascending to suberect, 2–12 cm. Stem leaves somewhat crowded, linear, narrowly elliptic, linear-obovate, elliptic-oblong, or spatulate, 7–10 × 1.5–2.5 mm, base decurrent or long attenuate and shortly spurred, margin entire or shallowly 3–5-crenate, apex rounded, obtuse, or acute. Inflorescences corymbiform, dense, ca. 1 cm in diam., bracteate. Flowers unisexual, unequally 5-merous in male plants, rarely 4- or 6-merous. Sepals linear to subulate, 3–4.5 mm, apex obtuse. Petals green to yellowish white, linear-oblanceolate, linear-spatulate, narrowly elliptic, or linear-obovate, 3.5–6 × 1–1.5 mm, apex obtuse. Stamens 10; antepetalous ones 5–7 mm; antepetalous ones 4–6 mm, inserted ca. 1.5 mm from petal base. Nectar scales oblong, apex emarginate. Carpels erect, narrowly ellipsoid, 5–7 mm. Seeds numerous. Fl. Jun–Aug.

3700–4400 m. Xizang, NW Yunnan [Bhutan, NE India, Nepal, Sikkim].

- 1a. Flowers 5-merous; petals narrowly elliptic to linear-obovate; leaves linear, narrowly elliptic, or linear-obovate, apex obtuse or acute; flowering stems to 12 cm 36a. subsp. *cretinii*
- 1b. Flowers often 4-merous; petals linear-oblanceolate to linear-spatulate; leaves elliptic-oblong to spatulate, apex

rounded; flowering stems 2–5 cm
..... 36b. subsp. *sinoalpina*

36a. *Rhodiola cretinii* subsp. *cretinii*

根出红景天(原亚种) *gen chu hong jing tian (yuan ya zhong)*

Sedum cretinii Raymond-Hamet, J. Bot. 54(Suppl. 1): 16. 1916; *Chamaerhodiola cretinii* (Raymond-Hamet) Nakai; *Rhodiola crassipes* var. *cretinii* (Raymond-Hamet) H. Jacobsen; *Sedum crassipes* Wallich ex J. D. Hooker & Thomson var. *cretinii* (Raymond-Hamet) Fröderström; *S. wallichianum* Hooker var. *cretinii* (Raymond-Hamet) Hara.

Flowering stems to 12 cm. Leaves linear, narrowly elliptic, or linear-obovate, base long attenuate and shortly spurred, margin entire or shallowly 3–5-crenate, apex obtuse to acute. Flowers 5-merous. Petals narrowly elliptic to linear-obovate.

3700–4100 m. Xizang [Bhutan, NE India, Nepal, Sikkim].

36b. *Rhodiola cretinii* subsp. *sinoalpina* (Fröderström) H. Ohba, J. Jap. Bot. 52: 265. 1977.

高山红景天 *gao shan hong jing tian*

Sedum roseum (Linnaeus) Scopoli var. *sinoalpinum* Fröderström in Handel-Mazzetti, Symb. Sin. 7: 406. 1931; *Rhodiola sinoalpina* (Fröderström) S. H. Fu.

Flowering stems 2–5 cm. Leaves elliptic-oblong to spatulate, base decurrent, margin entire, apex rounded. Flowers often 4-merous. Petals linear-oblong to linear-spatulate.

• 4300–4400 m. NW Yunnan.

37. *Rhodiola kirilowii* (Regel) Maximowicz, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9: 422. 1859.

狭叶红景天 *xia ye hong jing tian*

Sedum kirilowii Regel in Regel & Tiling, Fl. Ajan. 92. in adnot, no. 114. 1858; *Rhodiola kirilowii* var. *latifolia* S. H. Fu; *R. linearifolia* Borissova; *R. longicaulis* (Praeger) S. H. Fu; *R. macrolepis* (Franchet) S. H. Fu; *R. robusta* (Praeger) S. H. Fu; *Sedum kirilowii* var. *altum* Fröderström; *S. kirilowii* var. *linifolium* Regel & Schmalhausen; *S. kirilowii* var. *rubrum* Praeger; *S. longicaule* Praeger; *S. macrolepis* Franchet; *S. robustum* Praeger.

Roots erect, thick. Caudex 1.5–2.5 cm in diam. Caudex leaves scalelike, lanceolate, ovate, or triangular.

Flowering stems few, (10–)15–60(–90) cm. 4–6 mm, densely leafy. Stem leaves alternate or subverticillate, sessile, linear to linear-lanceolate, (1.5–)4–6 × 0.2–1.5 cm, margin sparsely serrulate, sometimes entire, rarely shallowly serrate. Flowers unisexual, sometimes bisexual, male ones unequally 4- or 5-merous. Sepals linear, oblong, or triangular, 1.5–3 mm, apex acute to acuminate. Petals green, greenish yellow, or red, linear-lanceolate, oblanceolate, oblong-lanceolate, broadly oblong, or obovate, 3–4 × ca. 0.8 mm. Stamens 8 or 10, 2–2.5(–5) mm, equaling or slightly longer than petals; filaments and anthers yellow. Nectar scales oblong,

spatulate-subquadrangular, subquadrangular, or ovate, apex obtuse to emarginate. Carpels erect. Follicles lanceolate, 7–8 mm, apical beak recurved, short. Seeds oblong-lanceolate, ca. 1.5 mm. Fl. May–Sep.

Forest margins, grassy slopes, often in partial shade; 2000–5600 m. Gansu, Hebei, Qinghai, Shaanxi, Shanxi, Sichuan, Xinjiang, Xizang, Yunnan [Kazakhstan, Myanmar].

38. *Rhodiola purpureoviridis* (Praeger) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 125. 1965.

紫绿红景天 *zi lu hong jing tian*

Caudex branched, erect, to 2 cm in diam. Caudex leaves scalelike, triangular to subtriangular. Flowering stems few, erect, (10–)12–40 cm, densely glandular hairy.

Stem leaves numerous, alternate, sessile, narrowly oblong-lanceolate-elliptic, narrowly ovate, or ovate, 1–6 × 0.3–1 cm, glabrous or abaxially glandular hairy, midvein conspicuous, base rounded or subcordate, margin remotely dentate and often revolute, apex rounded, obtuse, or subacute. Inflorescences corymbiform-umbellate, many flowered, bracteate.

Flowers bisexual or unisexual (plants hermaphroditic, dioecious, or rarely gynodioecious), male ones unequally 5-merous; pedicel long, glandular. Sepals linear-lanceolate, 1–2.5 mm. Petals greenish or reddish, linear-oblong to narrowly obovate, 3–4 mm. Stamens 10, 2.5–3.5 mm; filaments purple; anthers globose. Nectar scales oblong-cuneate, apex emarginate. Carpels erect, lanceolate, 2–3 mm. Follicles ca. 6 mm, apical beak recurved. Fl. Jul–Aug.

• Forests or forest margins, grassland near streams, stony places on grassy slopes; 2500–4100 m. W Sichuan, S Xizang, NW Yunnan.

1a. Stem leaves narrowly oblong-lanceolate, 2.5–6 × 0.3–1 cm, abaxially glandular hairy, base rounded; flowering stems 15–40 cm; flowers unisexual (plants dioecious); petals greenish, linear-oblong to 38a. subsp. *purpureoviridis*

1b. Stem leaves elliptic, narrowly ovate, or ovate, 1–2 × 0.4–0.7 cm, glabrous, base subcordate; flowering stems (10–)12–20(–22) cm; flowers bisexual or rarely female (plants hermaphroditic or rarely gynodioecious); petals reddish, narrowly obovate 38b. subsp. *phariensis*

38a. *Rhodiola purpureoviridis* subsp. *purpureoviridis*

紫绿红景天(原亚种) *zi lu hong jing tian (yuan ya zhong)*

Sedum purpureoviride Praeger, J. Bot. 55: 39. 1917; *S. bupleuroides* Wallich ex J. D. Hooker & Thomson var. *purpureoviride* (Praeger) Fröderström.

Flowering stems 15–40 cm. Stem leaves narrowly oblong-lanceolate, 2.5–6 × 0.3–1 cm, abaxially glandular hairy, base rounded, apex subacute. Flowers unisexual (plants dioecious). Petals greenish.

• Forests or forest margins, grassland near streams, stony places on grassy slopes; 2500–4100 m. W Sichuan, NW Yunnan.

38b. *Rhodiola purpureoviridis* subsp. *phariensis* (H. Ohba) H. Ohba, J. Jap. Bot. 61: 206. 1986.

帕里红景天 pa li hong jing tian

Sedum phariense H. Ohba, J. Jap. Bot. 48: 328. 1973;
Rhodiola phariensis (H. Ohba) S. H. Fu.

Flowering stems (10–)12–20(–22) cm. Stem leaves elliptic, narrowly ovate, or ovate, 1–2 × 0.4–0.7 cm, glabrous, base subcordate, apex rounded, obtuse, or subacute. Flowers bisexual or rarely female (plants hermaphroditic or rarely gynodioecious). Petals reddish, narrowly obovate.

• S Xizang (Yadong Xian).

39. *Rhodiola discolor* (Franchet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 124. 1965.

异色红景天 yi se hong jing tian

Sedum discolor Franchet, J. Bot. (Morot) 10: 285. 1896;
S. bupleuroides Wallich ex J. D. Hooker & Thomson
var. *discolor* (Franchet) Fröderström.

Caudex subprostrate, ascending, or suberect, 3–5 mm in diam. Caudex leaves scalelike, narrowly triangular. Flowering stems 1 to few, simple, erect, 12–40 cm. Stem leaves alternate; petiole ca. 1 mm; leaf blade adaxially green, abaxially ± glaucescent, linear-lanceolate, oblong-lanceolate, ovate-lanceolate, or ovate, 9–25 × 3–5(–7) mm, base auriculate to rounded, margin obscurely dentate to subentire and usually revolute, apex acute to acuminate. Inflorescences corymbiform, 3–5 × 5–10 cm; bracts leaflike, small. Flowers shortly pedicellate, unisexual, unequally 4- or 5-merous. Sepals narrowly triangular, 1–2.5 × 0.5–1 mm. Petals purplish red, oblong to oblong-obovate, 5–6 mm in male flowers, 3–4 × 1–1.3 mm in female ones. Stamens of male flowers 8–10; antesealous ones ca. 2 mm; antepetalous ones ca. 1.5 mm. Nectar scales oblong-quadrangular, apex emarginate. Carpels erect, ca. 2 mm. Follicles 3–4 mm. Fl. Jun–Jul, fr. Jul–Aug.

Forests, grassy slopes, rocky cliffs; 2800–4300 m. W Sichuan, SE Xizang, NW Yunnan [Nepal, Sikkim].

40. *Rhodiola bupleuroides* (Wallich ex J. D. Hooker & Thomson) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 124. 1965.

紫胡红景天 cai hu hong jing tian

Sedum bupleuroides Wallich ex J. D. Hooker & Thomson, J. Proc. Linn. Soc., Bot. 2: 98. 1858;
Rhodiola bhutanica (Praeger) S. H. Fu; *R. hookeri* S. H. Fu; *Sedum bhutanense* Praeger; *S. bhutanicum* Praeger; *S. cooperi* Praeger (1919), not Clemenceau (1868); *S. gorisii* Raymond-Hamet.

Caudex erect, dusky, obconical, to 10 × 3 cm. Caudex leaves brown-black, scalelike. Flowering stems 1 or 2, (1–)5–60(–100) cm. Stem leaves alternate, abaxially

greenish, narrowly to broadly elliptic, narrowly to broadly ovate, oblong-ovate, obovate, or suborbicular, 0.3–6(–9) × 0.4–2.2(–4.5) cm, base cordate to shortly or long attenuate, margin entire or sparsely serrate, apex rounded, obtuse, acute, or mucronate. Inflorescences terminal, corymbiform, 7–100-flowered; bracts leaflike. Flowers unisexual, male ones unequally 5-merous. Sepals purplish red, narrowly oblong, oblong-ovate, or narrowly triangular, 1–5 × 0.3–1.2 mm, apex rounded to obtuse. Petals dark purplish red, obovate or narrowly so, 2.8–4 × 1.2–1.6 mm in male flowers, 1.5–3 × 0.5–0.7 mm in female ones. Stamens 10, equaling or slightly shorter than petals. Nectar scales oblong or narrowly or transversely so, apex emarginate. Carpels of female flowers erect, broadest at base, 3–5 × as long as petals, apex recurved. Follicles 4–5(–10) mm. Seeds 10–16. Fl. Jun–Aug, fr. Aug–Sep. Thickets, grassy places, rock crevices on slopes; 2400–5700 m. W Sichuan, Xizang, NW Yunnan [Bhutan, Myanmar, Nepal, Sikkim].

41. *Rhodiola atsaensis* (Fröderström) H. Ohba, J. Jap. Bot. 51: 386. 1976.

柴胡红景天 chai hu hong jing tian

Sedum atsaense Fröderström, Ark. Bot. 30A(9): 4. 1943. Caudex mostly simple, prostrate; persistent old flowering stems absent. Winter bud 8–10 mm, apex acute. Caudex leaves scalelike, triangular-ovate, 6–9 mm, apex subacute. Sterile stems apically densely leafy. Flowering stems 1 or 2, pale, to 6 cm, transversely wrinkled when dried, mostly leafless. Stem leaves alternate, sessile, oblanceolate, much reduced except immediately below inflorescences, 6–8 mm, base slightly narrowed, apex subobtuse. Inflorescences corymbiform-umbellate, to 4 × 4 cm; bracts leaflike, 4–10 mm. Flowers unisexual, 4-merous; pedicel 2–4 mm. Sepals broadly lanceolate, ca. 4 mm, apex obtuse. Petals reddish, drying pale, broadly oblanceolate, ca. 4.5 mm, apex obtuse. Stamens 8, slightly shorter than or equaling petals. Nectar scales rectangular, apex emarginate. Carpels ovoid; ca. 4 mm. Styles short. Follicles not seen. Fl. Jul–Aug.

Scree slopes; 4500–4900 m. Xizang [India].

The available herbarium material suggests that this is a typical plant of loose scree slopes, on which loose stones cover the caudex and flowering stems (except the inflorescences) and pull them downhill.

42. *Rhodiola wallichiana* (Hooker) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 125. 1965.

粗茎红景天 cu jing hong jing tian

Caudex prostrate, slender, ca. 1 cm in diam.; persistent old flowering stems absent. Flowering stems 3–5, 17–40 cm. Stem leaves numerous, sessile, lanceolate to linear-oblanceolate, 1.2–3 × 0.2–0.3 cm, attenuate on both ends, margin apically 1–3-serrate. Inflorescences terminal, corymbiform, 1.5–2.5 cm in diam., bracteate. Flowers bisexual, rarely unisexual, unequally 5-merous. Sepals linear, 3–8 mm, apex obtuse. Petals reddish, greenish, green, or yellowish white, linear-oblanceolate

or obovate-elliptic, 5–10 × ca. 2 mm, apex obtuse. Stamens 10, 0.8–1.2 cm. Nectar scales subspatulate-quadrangular or subquadrangular, apex slightly dilated, emarginate. Carpels erect, ovoid. Follicles lanceolate, 1–1.5 cm, base narrow. Seeds winged. Fl. Aug–Sep, fr. Oct.

Forests, rocks on slopes; 2500–3800 m. W Sichuan, SE Xizang, W Yunnan [Bhutan, N India, Myanmar, Nepal, Sikkim].

- 1a. Flowering stems 17–25 cm; stem leaves 1.2–1.6 cm; petals reddish, greenish, or yellowish white, obovate-elliptic; nectar scales subspatulate-quadrangular 42a. var. *wallichiana*
1b. Flowering stems ca. 40 cm; stem leaves ca. 3 cm; petals green, linear-oblong-lanceolate; nectar scales subquadrangular 42b. var. *cholaensis*

42a. *Rhodiola wallichiana* var. *wallichiana*

粗茎红景天(原变种) cu jing hong jing tian (yuan bian zhong)

Sedum wallichianum Hooker, Icon. Pl. 7: t. 604. 1844; *Chamaerhodiola crassipes* (J. D. Hooker & Thomson) Nakai; *Rhodiola crassipes* (J. D. Hooker & Thomson) Borissova; *S. crassipes* Wallich ex J. D. Hooker & Thomson.

Flowering stems 17–25 cm. Stem leaves 1.2–1.6 cm. Petals reddish, greenish, or yellowish white, obovate-elliptic. Nectar scales subspatulate-quadrangular.

Forests, rocks on slopes; 2500–3800 m. SE Xizang, NW Yunnan [Bhutan, N India, Myanmar, Nepal, Sikkim].

42b. *Rhodiola wallichiana* var. *cholaensis* (Praeger) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 125. 1965.

大株粗茎红景天 da zhu cu jing hong jing tian

Sedum crassipes J. D. Hooker & Thomson var. *cholaense* Praeger, J. Bot. 57: 50. 1919.

Flowering stems ca. 40 cm. Stem leaves ca. 3 cm. Petals green, linear-lanceolate. Nectar scales subquadrangular.

About 3500 m. W Sichuan, SW Yunnan [Sikkim].

43. *Rhodiola stephanii* (Chamisso) Trautvetter & C. A. Meyer in Middendorff, Reise Sibir. 1(2): 39. 1856.

兴安红景天 xing an hong jing tian

Sedum stephanii Chamisso, Linnaea 6: 549. 1831; *Chamaerhodiola stephanii* (Chamisso) Nakai; *S. crassipes* Wallich ex J. D. Hooker & Thomson var. *stephanii* (Chamisso) Fröderström.

Roots branched, thick. Caudex few branched, short, 5–10 mm in diam. Flowering stems few, 10–20 cm × 2.5–5 mm. Stem leaves pale green, linear-lanceolate to lanceolate, 3–5 × 0.6–0.8 cm, base cuneate, margin apically roughly and deeply serrate, apex acuminate. Inflorescences compact, 2–3 cm in diam., bracteate. Flowers shortly pedicellate, unisexual, male ones

unequally 4- or 5-merous. Sepals linear, 3–4 mm. Petals yellowish to yellowish white, linear-lanceolate, 5–6 mm, apex obtuse. Stamens 8 or 10, equaling or slightly longer than petals; filaments pale; anthers yellowish, sometimes reddish. Nectar scales subquadrangular. Carpels narrowly ovoid. Styles erect, long. Stigma wide. Follicles erect, oblong-lanceolate, 7–10 mm, apical beak ca. 1 mm. Seeds brown, obovoid. Fl. Jun–Aug, fr. Jul–Aug.

N Nei Mongol (Hulun Buir Meng) [Russia].

44. *Rhodiola pinnatifida* Borissova in Komarov, Fl. URSS 9: 475. 1939.

羽裂红景天 yu lie hong jing tian

Sedum pinnatifidum (Borissova) J. P. Kozhevnikov. Main root few branched, thick, fusiform. Caudex 1–1.5 × 1–2 cm. Caudex leaves scalelike, oblong-triangular, 4–5 × ca. 3 mm, apex acute. Flowering stems few, erect, 10–20 cm × 3–4 mm, densely leafy. Stem leaves alternate, subopposite, or nearly 3-verticillate, linear-lanceolate to lanceolate, 2–3.5 × 0.3–0.5 cm, base attenuate, apex acute. Inflorescences corymbiform-umbellate, compact, 1.5–2 × 2.5–3 cm, many flowered. Flowers unisexual, unequally 4-merous in male plants, shorter than pedicel. Sepals yellowish green, lanceolate, ca. 4 mm, apex subacute. Petals yellow, lanceolate to oblong-lanceolate, ca. 6 mm, apex subobtusate. Stamens 8, ca. 9 mm, ca. 1.5 × as long as petals; filaments yellow; anthers greenish yellow, globose. Nectar scales ca. 1 × 0.5 mm. Follicles oblong-lanceolate, to 8 mm, apical beak 1–2 mm. Seeds brown, oblong, to 2 mm. Fl. Jun–Aug, fr. Jul–Aug.

About 2200 m. N Xinjiang (Altay Shan) [Mongolia, Russia].

Rhodiola pinnatifida falls within the range of variation of *R. stephanii* and is therefore difficult to separate from the latter species. Further study is needed to determine whether or not the two are conspecific.

45. *Rhodiola macrocarpa* (Praeger) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 125. 1965.

大果红景天 da guo hong jing tian

Sedum macrocarpum Praeger, Notes Roy. Bot. Gard. Edinburgh 13: 88. 1921; *Chamaerhodiola eurycarpa* (Fröderström) Nakai; *Rhodiola eurycarpa* (Fröderström) S. H. Fu; *Sedum eurycarpum* Fröderström; *S. progressum* Diels.

Caudex 0.5–2.5 cm in diam. Caudex leaves scalelike, long triangular. Flowering stems few to numerous, erect, 10–30 cm, apically finely mammillate. Stem leaves subverticillate, basal ones shorter, margin entire, apical ones sessile, linear-oblong-lanceolate to oblanceolate, 2–5 × 1–1.5 cm, base attenuate, margin irregularly serrate or lobed. Inflorescences corymbiform, 2–4 × 3–7 cm, bracteate. Flowers unisexual, male ones unequally 5-merous; pedicel mammillate. Sepals linear to narrowly so, 4–5 mm. Petals greenish yellow to purplish red, linear to linear-oblong-lanceolate, 5–6 mm. Stamens 10, yellow, 6–8 mm. Nectar scales subquadrangular to quadrangular, apex emarginate. Carpels of female flowers purple, oblong-ovoid to obliquely ovoid, 6–10 mm, adaxially gibbous, base attenuate. Styles erect,

short. Seeds lanceolate-ovoid to ovoid, winged at both ends. Fl. Jun–Jul, fr. Aug–Sep.

Rocks on slopes; 2900–4300 m. Gansu, Qinghai, Shaanxi, Sichuan, SE Xizang, NW Yunnan [Myanmar].

46. *Rhodiola yunnanensis* (Franchet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 126. 1965.

云南红景天 *yun nan hong jing tian*

Sedum yunnanense Franchet, J. Bot. (Morot) 10: 286. 1896; *Rhodiola henryi* (Diels) S. H. Fu; *R. papillocarpa* (Fröderström) S. H. Fu; *R. rotundifolia* (Fröderström) S. H. Fu; *R. sinica* (Diels) Jacobsen; *Sedum henryi* Diels; *S. sinicum* Diels; *S. valerianoides* Diels; *S. yunnanense* var. *henryi* (Diels) Raymond-Hamet; *S. yunnanense* var. *oxyphyllum* Fröderström; *S. yunnanense* var. *papillocarpum* Fröderström; *S. yunnanense* var. *rotundifolium* Fröderström; *S. yunnanense* var. *valerianoides* (Diels) Raymond-Hamet.

Caudex simple or few branched, long, 0.7–2 cm in diam. Caudex leaves scalelike, lanceolate, ovate-triangular, or triangular. Flowering stems solitary or few, erect, 20–100 cm, glabrous. Stem leaves 3-verticillate, rarely opposite, sessile, abaxially pale green, ovate-lanceolate, elliptic, oblong, ovate-oblong, broadly ovate, or orbicular, (1–)4–7(–10) × (0.6–)2–4(–8) cm, base rounded-cuneate, margin remotely serrate, sublobate, or rarely entire, apex obtuse to acute. Inflorescences cymose-paniculate, (3–)5–15 × 2–8 cm; branches verticillate. Flowers numerous, unisexual, unequally 4- or 5-merous in male plants, small. Sepals linear-lanceolate to lanceolate, 0.5–1 mm. Petals of male flowers greenish yellow to yellow, spatulate to oblong-lanceolate, ca. 1.5 mm; those of female flowers purple, linear, ca. 1.2 mm. Stamens 8, shorter than petals. Nectar scales spatulate-quadrate or cuneate-quadrate in male flowers, suborbicular in female ones. Carpels divergent, ovoid, 1.5–3 mm. Follicles stellate, 3–3.2 mm, base connate for ca. 1 mm. Seeds lanceolate, ca. 2 × 0.4 mm, winged. Fl. May–Jul, fr. Jun–Aug.

• Forests on slopes; 1000–4000 m. Gansu, Guizhou, Henan, Hubei, Shaanxi, Sichuan, Xizang, Yunnan.

This species is used medicinally.

47. *Rhodiola forrestii* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 126. 1965.

长圆红景天 *chang yuan hong jing tian*

Sedum yunnanense Franchet var. *forrestii* Raymond-Hamet, Notes Roy. Bot. Gard. Edinburgh 5: 117. 1912; *S. yunnanense* var. *muliense* Fröderström; *S. yunnanense* var. *oblanceolatum* Fröderström; *S. yunnanense* var. *strictum* Fröderström.

Caudex erect or inclining, ca. 1.5 cm in diam. Caudex leaves scalelike, narrowly triangular-lanceolate. Flowering stems erect, 20–40 cm. Proximal stem leaves

3- or 4-verticillate or opposite, sessile, ± lanceolate- to ovate-oblong, linear-oblong distally on stem, 2–5 × 0.6–1 cm, margin remotely and coarsely dentate, pinnately lobate, or subentire. Inflorescences terminal cymose panicles or axillary cymes. Flowers unisexual, male ones unequally 5-merous. Sepals ca. 3 mm, base connate for ca. 1 mm. Petals oblong and 3–3.5 mm in male flowers, triangular-ovate and ca. 1.1 mm in female ones. Stamens 10; antesealous ones as long or slightly longer than petals; antepetalous ones slightly shorter than petals. Nectar scales broadly cuneate, apex rounded to emarginate. Carpels oblong-ovoid, ca. 3 mm. Styles recurved, short. Fl. Jun–Jul, fr. Aug.

• Slopes; 2900–4000 m. W Sichuan, NW Yunnan.

48. *Rhodiola sinuata* (Royle ex Edgeworth) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

裂叶红景天 *lie ye hong jing tian*

Sedum sinuatum Royle ex Edgeworth, Trans. Linn. Soc. London 20: 47. 1846; *S. linearifolium* Royle var. *sinuatum* (Edgeworth) Raymond-Hamet.

Roots long. Caudex leaves scalelike. Flowering stems erect or creeping, ca. 15 cm, glabrous or finely mammillate, leafy. Stem leaves alternate, elliptic to obovate, 5–7 × 2–4 cm, base attenuate, margin pinnately parted or divided; segments 2 or 3, linear, 1.5–3 mm wide. Inflorescences corymbiform, compact, ca. 1.5 × 2.5 cm. Flowers bisexual, unequally 5-merous; pedicel finely mammillate or absent. Sepals narrowly triangular-linear, ca. 3 mm. Petals greenish white, elliptic, ca. 6 × 2 mm, margin entire, apex subobtuse. Stamens 10; antesealous ones ca. 5 mm; antepetalous ones ca. 4 mm, inserted ca. 1 mm from petal base. Nectar scales subquadrate, apex somewhat broadly truncate to subretuse. Carpels narrowly lanceolate, ca. 3.5 mm. Styles short. Follicles erect, ca. 6 mm. Seeds brown, ovoid-oblong, winged at both ends. Fl. Aug, fr. Oct.

Rock crevices on slopes, scree slopes; 3200–4300 m. Xizang, NW Yunnan (Zhongdian Xian) [India, Nepal, Pakistan].

49. *Rhodiola tieghemii* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

巴塘红景天 *ba tang hong jing tian*

Sedum tieghemii Raymond-Hamet, Bull. Soc. Bot. France 55: 711. 1908; *S. linearifolium* Royle var. *tieghemii* (Raymond-Hamet) Raymond-Hamet.

Caudex short, fleshy. Flowering stems simple, erect, 8–11 cm, glabrous, apically finely mammillate. Stem leaves alternate, evenly distributed; petiole 1.5–2 cm; leaf blade oblong, 1–3 × 0.5–2.5 cm, base abruptly narrowed, margin deeply crenate to pinnatifid and finely mammillate, apex obtuse. Inflorescences corymbiform, compact; bracts linear, 8–11 mm. Flowers bisexual, unequally 5-merous; pedicel short,

finely mammillate. Sepals triangular-linear, ca. 6 mm, base ca. 1.5 mm wide, margin sometimes finely mammillate. Petals narrowly oblong to elliptic, 5.5–8.5 × 2.5–4.3 mm, margin apically erose, apex obtuse. Stamens 10; antesealous ones ca. 6 mm; antepetalous ones 2.5–3 mm, inserted ca. 2 mm from petal base. Nectar scales quadrangular, ca. 0.4 × 0.5 mm, apex emarginate. Carpels erect, narrowly lanceolate, ca. 6.5 mm. Styles ca. 1.5 mm. Fl. Sep.

• W Sichuan (Batang Xian), E Xizang.

50. *Rhodiola sacra* (Prain ex Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

圣地红景天 sheng di hong jing tian

Main root branched, thick. Caudex short. Caudex leaves scalelike, lanceolate-triangular. Flowering stems few or numerous, simple, erect, straw-colored, 8–16 cm, finely mammillate with age. Stem leaves alternate, evenly distributed, shortly petiolate; leaf blade obovate-oblong to obovate, 8–11 × 4–6 mm, glabrous or sparsely villous, base cuneate, margin with 4 or 5 dentate lobes on each side, apex obtuse to acute. Inflorescences corymbiform, few flowered. Flowers bisexual, unequally 5-merous. Sepals narrowly lanceolate-triangular, 3.5–5 × ca. 1.2 mm. Petals white, narrowly oblong, 10–11 × 1.2–2 mm, margin entire or somewhat erose. Stamens 10, ca. 10 mm; filaments yellowish; anthers purple. Nectar scales subquadrangular, base somewhat narrowed, apex slightly dilated, rounded to subretuse. Carpels narrowly lanceolate, ca. 5.5 mm. Follicles erect, ca. 6 mm. Seeds brown, oblong-lanceolate. Fl. Aug–Sep, fr. Sep.

Grassland slopes, rock crevices on slopes; 2700–5000 m. SE Qinghai, Xizang [Nepal].

1a. Flowering stems few; leaves glabrous 50a. var. *sacra*

1b. Flowering stems numerous; leaves sparsely villous 50b. var. *tsuiana*

50a. *Rhodiola sacra* var. *sacra*

圣地红景天(原变种) sheng di hong jing tian (yuan bian zhong)

Sedum sacrum Prain ex Raymond-Hamet, Acta Horti Gothob. 2: 395. 1926; *Rhodiola chrysanthemifolia* (H. Léveillé) S. H. Fu subsp. *sacra* (Prain ex Raymond-Hamet) H. Ohba; *S. linearifolium* Royle var. *sacrum* (Prain ex Raymond-Hamet) Raymond-Hamet.

Flowering stems few. Leaves glabrous. Fl. Aug, fr. Sep. Rock crevices on slopes; 2700–4600 m. Xizang [Nepal].

50b. *Rhodiola sacra* var. *tsuiana* (S. H. Fu) S. H. Fu, Bull. Bot. Lab. N. E. Forest. Inst., Harbin 1980(6): 75. 1980.

长毛圣地红景天 chang mao sheng di hong jing tian
Rhodiola tsuiana S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

Flowering stems numerous. Leaves sparsely villous. Fl. Aug–Sep.

• Grassland slopes; 3600–5000 m. SE Qinghai, E and S Xizang (Lhasa Shi, Qamdo Xian).

51. *Rhodiola alterna* S. H. Fu, Acta Phytotax. Sin. 17(3): 128. 1979.

互生红景天 hu sheng hong jing tian

Caudex terete, 0.7–1.5 cm in diam. Caudex leaves brown, scalelike, triangular. Flowering stems simple, erect to ascending, 9.5–14(–21) cm. Stem leaves alternate, sessile, oblong, obovate-oblong, or obovate, gradually smaller toward base on stem, 1.5–2.2 × 0.8–1.1 cm, base attenuate and spurless, margin with 2 shallowly incised serrations on each side, mammillate when dry, apex obtuse. Inflorescences corymbiform, somewhat compact, 10–15-flowered; bracts spatulate to oblanceolate, 6–8 × ca. 1 mm. Flowers bisexual, unequally 5-merous. Sepals linear-lanceolate, 4–5 × ca. 1 mm. Petals reddish or white, oblong-ovate, 6–7 × ca. 4 mm, margin basally entire and apically erose, apex acuminate. Stamens 10, shorter than petals; antesealous ones to 6 mm; antepetalous ones to 3 mm, inserted ca. 2 mm from petal base. Nectar scales suboblong, ca. 0.4 × 0.6 mm, apex emarginate. Carpels erect, lanceolate, ca. 6 mm, base subconnate. Styles ca. 1 mm. Fl. Aug–Sep.

• Forests, forest margins, rock crevices in scrub or on sunny slopes, moss-covered rocks, riversides; 3800–4600 m. NE Xizang.

52. *Rhodiola chrysanthemifolia* (H. Léveillé) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

菊叶红景天 ju ye hong jing tian

Sedum chrysanthemifolium H. Léveillé, Repert. Spec. Nov. Regni Veg. 12: 283. 1913; *Rhodiola dielsiana* (W. Limpricht) S. H. Fu; *Sedum dielsianum* W. Limpricht; *S. linearifolium* Royle var. *balfourii* (Raymond-Hamet) Raymond-Hamet; *S. linearifolium* var. *dielsianum* (W. Limpricht) Raymond-Hamet; *S. linearifolium* var. *forrestii* (Raymond-Hamet) Raymond-Hamet; *S. trifidum* J. D. Hooker & Thomson var. *balfourii* Raymond-Hamet; *S. trifidum* var. *forrestii* Raymond-Hamet.

Main root branched, thick. Caudex long, 6–7 mm in diam. Caudex leaves scalelike, triangular, ca. 4 × 4 mm. Flowering stems 4–10 cm, finely mammillate. Stem leaves aggregated toward stem apex; petiole 5–8 mm; leaf blade oblong, ovate-oblong, or ovate, 1–1.5 × 0.8–1.3 cm, base cuneate, margin pinnately lobed, apex obtuse. Inflorescences corymbiform, compact; bracts orbicular-spatulate, ca. 1 cm. Flowers bisexual, unequally 5-merous. Sepals linear, triangular-linear, or narrowly triangular-ovate, ca. 4 × 0.6–1 mm. Petals oblong-ovate, 7–9 × 1.5–3 mm, margin entire or apically erose. Stamens 10; antesealous ones ca. 6 mm; antepetalous ones ca. 4 mm, inserted ca. 2 mm from petal base. Nectar scales suboblong, ca. 1 × 0.5 mm, apex emarginate. Styles ca. 2 mm. Follicles erect, lanceolate, 7–8 mm. Fl. Aug, fr. Sep–Oct.

• Grasslands, rocks, rock crevices; 3200–4200 m. SW Sichuan, NW Yunnan.

53. *Rhodiola ovatisepala* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

卵萼红景天 *luan e hong jing tian*

Caudex prostrate and underground basally, ascending or erect in middle part, slender. Caudex leaves scalelike, triangular. Flowering stems simple, ascending to suberect, 5–25 cm. Stem leaves aggregated toward stem apex; petiole ca. 1.5 cm; leaf blade oblong to elliptic, 3–5 × 1.1–2.5 cm, base attenuate and decurrent, margin 3- or 4-lobed or -cleft; segments sometimes with 1 obtuse serration at margin. Inflorescences dichasia, compact, ca. 2 × 2 cm. Flowers bisexual, unequally 5-merous. Sepals linear or ovate-triangular, ca. 1 mm or (4–)6–8 mm, apex rounded. Petals greenish white, narrowly oblong-ovate, ca. 5 × 1.5 mm, margin entire. Stamens 10, slightly shorter than or equaling petals. Nectar scales oblong, apex truncate to emarginate. Carpels erect, 4–5 mm. Styles ca. 1 mm. Fl. Jun–Sep, fr. Sep–Oct.

Forested slopes, moss-covered tree trunks, rocks, rocky cliffs; 2700–4200 m. S Xizang, NW Yunnan [Bhutan, Myanmar, Nepal, Sikkim].

1a. Sepals ovate-triangular, ca. 1 mm 53a. var. *ovatisepala*
1b. Sepals linear, (4–)6–8 mm 53b. var. *chingii*

53a. *Rhodiola ovatisepala* var. *ovatisepala*

卵萼红景天(原变种) *luan e hong jing tian* (*yuan bian zhong*)

Sedum linearifolium Royle var. *ovatisepalum*

Raymond-Hamet, Acta Horti Gothob. 2: 394. 1926; *S. ovatisepalum* (Raymond-Hamet) H. Ohba.

Sepals ovate-triangular, ca. 1 mm. Fl. Jul–Sep.

Moss-covered tree trunks, rocks; 2700–4200 m. S Xizang (Cona Xian) [Bhutan, Myanmar, Nepal, Sikkim].

53b. *Rhodiola ovatisepala* var. *chingii* S. H. Fu, Acta Phytotax. Sin., Addit. 1: 127. 1965.

线萼红景天 *xian e hong jing tian*

Sepals linear, (4–)6–8 mm. Fl. Jun–Aug, fr. Sep–Oct.

• Forested slopes, rocky cliffs; 3000–3900 m. SE Xizang, NW Yunnan.

54. *Rhodiola sexifolia* S. H. Fu, Acta Phytotax. Sin., Addit. 1: 123. 1965.

六叶红景天 *liu ye hong jing tian*

Flowering stems ascending, ca. 18 cm, minutely mammillate. Stem leaves 6-verticillate, sessile, elliptic-oblong, ca. 4 × 2.5 cm, finely to minutely mammillate, base cuneate, margin pinnately lobed; lobes entire or remotely dentate at margin, apex obtuse. Inflorescences corymbiform, dense, ca. 3 × 3–5 cm; bracts narrowly oblanceolate-linear, ca. 6 × 1.2 mm, minutely mammillate. Flowers bisexual, unequally 5-merous. Sepals linear, ca. 3.5 × 1–1.3 mm. Petals lanceolate, 6.3–7 × ca. 2 mm, apex subacute. Stamens 10, slightly shorter than petals; antepetalous ones inserted ca. 2 mm from petal base; anthers globose. Nectar scales obovate, ca. 0.5 mm. Styles long. Follicles erect, free almost to base, narrowly lanceolate, ca. 5.2 mm. Seeds ellipsoid, ca. 1 mm, striate.

• Rocks in *Picea* forests, slopes; 3500–4100 m. E Xizang (Qamdo Xian).

55. *Rhodiola liciae* (Raymond-Hamet) S. H. Fu, Acta Phytotax. Sin., Addit. 1: 128. 1965.

昆明红景天 *kun ming hong jing tian*

Sedum liciae Raymond-Hamet, Bull. Soc. Bot. France 56: 569. 1909.

Main root somewhat thick. Caudex prostrate, short, fleshy. Caudex leaves scalelike, triangular-ovate, ca. 2 mm. Flowering stems simple, erect, 6.5–13 cm. Stem leaves alternate; petiole 4–14 mm; leaf blade rhombic to rhombic-spatulate, 0.7–2 × 0.5–2 cm, base tapered. Inflorescences corymbiform, compact, 1–2 × 1–2 cm; bracts sessile, 3–10 mm, basal ones ovate, margin crenate, apical ones obovate-linear, margin entire. Flowers bisexual, shortly pedicellate, unequally 5-merous. Sepals ovate-triangular, 4–6 × 1.2–2 mm. Petals white, ovate-lanceolate, 8–11 × 2.5–3 mm, apex mucronate, mucro awnlike, to 1 mm. Stamens 10; antepetalous ones 6–7 mm; antepetalous ones 4–5 mm, inserted slightly below middle of petal. Nectar scales oblong-quadrangular, apex emarginate. Carpels ovoid-oblong, ca. 6 mm. Styles ca. 2 mm. Follicles erect. Seeds numerous, obovoid-oblong, winged at both ends. Fl. Sep, fr. Oct–Nov.

• Rocks on slopes; ca. 2400 m. Yunnan (Kunming Shi).

