



78. Eupatorium L.

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Subtribe I. Ageratinae

78. *Eupatorium* L.

- Watanabe, K., T. Fukuhara and Y. Fujiwara. 1982. Studies on the Asian *Eupatoria* I. *Eupatorium chinense* var. *simplicifolium* from the Rokko Mountains. Bot. Mag. Tokyo 95: 261–280.
- Murata, G. and H. Koyama. 1982. On *Eupatorium* of Japan. Acta Phytotax. Geobot. 33: 282–301.
- Watanabe, K. and T. Yahara. 1984. Studies on the Asian *Eupatoria* II. Cyto geography of *Eupatorium chinense* subsp. *sachalinense* var. *oppositifolium*. Bot. Mag. Tokyo 97: 87–105.
- Watanabe, K. 1986. The cyto geography of the genus *Eupatorium* (Compositae). Pl. Sp. Biol. 1: 99–116.
- King, R. M. and H. Robinson. 1987. The Genera of the Eupatorieae (Asteraceae). Missouri Botanical Garden.
- Kawahara, T., T. Yahara and K. Watanabe. 1989. Distribution of sexual and agamospermous populations of *Eupatorium* (Compositae) in Asia. Pl. Sp. Biol. 4: 37–46.

Note: In the genus *Eupatorium*, about 2000 species had been included until King and Robinson revised it in a series of taxonomic papers published from 1960s to 1980s. They split the genus *Eupatorium* into a lot of new genera and their system is comprehensively summarized in their monograph published in 1987. In the current concept, the genus *Eupatorium* includes 23 North American, about 25 Asian and an European species.

Among Japanese species of the genus *Eupatorium*, *E. lindleyanum*, *E. glehni*, *E. makinoi* and *E. variabile* include sexual diploids and agamospermous polyploids. These four species are distinct in the diploid level, but the boundaries are unclear in the polyploid level because agamospermous polyploids with intermediate morphology are common. These intermediates are probably of hybrid origin. Among them, the intermediates between *E. lindleyanum* and *E. makinoi* are named as *E. tripartitum*, and the intermediates between *E. variabile* and *E. makinoi* are named as *E. laciniatum*. Because these intermediates reproduce agamospermously and are common in the field, they are treated as species, not as hybrids in the following description.

- A. Stems curved on the base; rhizomes creeping. Leaves opposite, frequently trilobed, lustrous, without gland. Flowers strongly fragrant 1. *E. japonicum*
- A. Stem erect; rhizome erect. Flowers not or slightly fragrant
 - B. Leaves and stems densely hairy
 - C. Leaves ovate to ovate-lanceolate, trifid, triparted, or trisected; apical lobes often further triparted; petioles 2–4 cm long 2. *E. formosanum*
 - C. Leaves linear-lanceolate, simple or trisected, sessile or subsessile
 - D. stems thin, lower than 60 cm 3. *E. lindleyanum*
 - D. stems robust, taller than 60 cm 4. *E. tripartitum*
 - B. Leaves and stems glabrescent or sparsely hairy
 - C. Leaves verticillate, lanceolate, sparsely hairy, simple, glandular; stems sparsely hairy 5. *E. glehni*
 - C. Leaves opposite
 - E. Leaves triparted or trisected
 - F. Leaves narrowly cuneate at base; lobes grossly serrate, linear-lanceolate, acuminate at apex, glandular 6. *E. yakushimense*
 - F. Leaves widely cuneate or rounded at base; lobes finely serrate, oblong-lanceolate, apex acute or obtuse
 - G. Leaves not lustrous, hairy, usually densely glandular, base usually cuneate; petioles usually less than 1 cm long 7. *E. makinoi*
 - G. Leaves lustrous, glabrescent, not or sparsely glandular, base usually rounded; petioles usually more than 1 cm long
 - H. Stems usually less than 80 cm. Leaves not glandular 8. *E. variabile*
 - H. Stems usually more than 80 cm. Leaves sparsely glandular 9. *E. laciniatum*
 - E. Leaves entire
 - F. Leaves not lustrous, hairy, usually densely glandular, base usually cuneate; petioles usually less than 1 cm long 7. *E. makinoi*
 - F. Leaves lustrous, glabrescent, glandular or not glandular, base usually rounded; petioles usually more than 1 cm

long

G. Corolla 3–4.5 mm long; pappus 2.5–4.5 mm long; pollen morphologically normal

H. Leaves not glandular 8. *E. variabile*H. Leaves densely glandular 10. *E. luchuense*

G. Corolla 4–6 mm long; pappus 4–5.5 mm long; pollen morphologically irregular

..... 9. *E. laciniatum*

1. *Eupatorium japonicum* Thunb. ex Murray, Syst. Veg. ed. 14: 737 (1784); Murata & H. Koyama, Acta Phytotax. Geobot. 33: 285 (1982).

Eupatorium japonicum Thunb. ex Murray α . *simplicifolia* Makino in Bot. Mag. Tokyo 23: 142 (1909), superfluous name.

Eupatorium chinense L. var. *simplicifolium* (Makino) Kitam. in J. Jap. Bot. 24: 79 (1949), nom. tantum.

Eupatorium fortunei Turcz. in Bull. Soc. Nat. Moscou 24: 150 (1851).

Eupatorium stoeccadosmum Hance in Ann. Sci. Nat. ser. 4: 18 (1862).

Japanese name: Fuji-bakama.

Perennial occurring in moist grassland along river banks, having many creeping rhizomes by which plants propagate vegetatively. Flowering stems curved on the base, 1–2 m tall, glabrescent or sparsely hairy, ending in corymbs with many heads from August to September. Leaves opposite, oblong-lanceolate, 8–13 cm long, usually trilobed, serrate, apex acuminate, base acute, with 5–10 mm long petioles, lustrous, sparsely hairy, without gland. Flowers strongly fragrant; corolla 4–6 mm long, purplish; involucre bracts 7–8 mm; pappus 5–6 mm long; achenes 2.5–3 mm.

Chromosome number: $2n = 40$.

Japan: Honshu, Shikoku and Kyushu.

Distr.: Japan, Korea, China and Vietnam. Cultivated.

Icones: Kitamura et al., Herb. Pl. 1: t. 29 222; Masamune, Ill. Fl. Nippon 6(2): 201 upper, 202 lower; Terasaki, rev. ed.: t. 2936; Satake et al., Herb. Pl. 3: photo. 186 3; Makino, rev. ed.: t. 2951.

Note: This species has often been claimed to be introduced from China. This is because the species is often cultivated in the garden as a member of the seven popular flowers in autumn ("Aki-no-nanakusa") while its natural habitats are rare and not well studied. Recently, the authors confirmed that the species is a member of natural moist grassland flora on river banks in Kanto Dist. Due to urbanization of Kanto Dist., the habitats are now restricted to very small area, and the species is endangered. Some limited number of habitats are known from the other part of Honshu, Shikoku, and Kyushu.

2. *Eupatorium formosanum* Hayata in J. Coll. Sci. Univ. Tokyo 25: 122 (1908).

Eupatorium quasitripartitum Hayata in Icon. Pl. Formos. 8: 44 (1919).

Japanese name: Taiwan-hiyodori, Taiwan-hiyodoribana-modoki.

Weedy perennial common in roadsides of Okinawa and Yaeyama Islands. Flowering stems, 1–1.5 m high, densely hairy, often lignified at base, ending in corymbs with many heads from January to August. Leaves opposite, ovate to ovate-lanceolate, 5–15 cm long, 2.5–10

cm wide, trifid, triparted, or trisected with apical lobes often further triparted, irregularly serrate, apex obtuse or acute, base obtuse or truncate, petiole 2–4 cm long, densely hairy, glandular. Corolla 2.5–3 mm long, white or slightly purplish; involucre bracts 3–4 mm long; pappus 3–4 mm long; achenes 2–2.5 mm long.

Chromosome number: $2n = 20$.

Japan: Ryukyu.

Distr.: Japan, Taiwan and the Philippines.

Icones: Makino, rev. ed.: t. 2956.

3. *Eupatorium lindleyanum* DC., Prodr. 5: 180 (1936).

var. *lindleyanum*

Eupatorium kirilowii Turcz. in Bull. Soc. Nat. Moscou 7: 153 (1837).

Japanese name: Sawa-hiyodori.

Perennial occurring in open moist places. Flowering stems, 40–100 cm tall, densely hairy, ending in corymbs with many heads from August to October. Leaves opposite, linear, elliptic lanceolate, or elliptic, 6–12 cm long, 0.5–2.5 cm wide, simple and triplinerved, or trisected and apparently verticillate, serrate with obtuse teeth, apex and base obtuse, sessile, densely hairy, glandular. Corolla 3.5–4.5 mm long, purplish; involucre bracts 4–6 mm long; pappus 5–6 mm long; achenes 2.5–3 mm long.

Chromosome number: $2n = 20, 30, 40, 50$.

Japan: Hokkaido, Honshu, Shikoku, Kyushu and Ryukyu.

Distr.: Japan, Korea, China, Taiwan, the Philippines, Indochina and N. India.

Icones: Kitamura et al., Herb. Pl. 1: t. 29 220; Masamune, Ill. Fl. Nippon 6(2): 198, lower; Terasaki, rev. ed.: t. 2933; Satake et al., Herb. Pl. 3: photo. 186 1; Makino, rev. ed.: t. 2957.

Note: Polyploids reproduce agamosperously while diploids reproduce sexually. Agamosperous polyploids are widespread.

var. *yasushii* Tuyama in J. Jap. Bot. 31: 26 (1956).

Japanese Name: Hama-sawa-hiyodori.

Leaves widely elliptic, with long white hairs on the lower surface of veins. Plants grow in open places near coasts.

Japan: C. Honshu (Chiba Pref. and Izu Islands). Endemic.

4. *Eupatorium tripartitum* (Makino) Murata et H. Koyama in Acta Phytotax. Geobot. 33: 295–298 (1982).

Eupatorium tripartitum (Makino) Murata et H. Koyama f. *angustatum* Makino in Bot. Mag. Tokyo 27: 80 (1913).

Japanese name: Mitsuba-hiyodori, Hosoba-no-mitsuba-hiyodori.

Perennial occurring in open moist places. Flowering

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stems, 50–150 cm tall, densely hairy, ending in corymbs with many heads from August to October. Leaves opposite, elliptic, 6–17 cm long, 2–5 cm wide, triparted or trisected and apparently verticillate, serrate, apex acute, base acute or obtuse, petiole short (1–5 mm long), densely hairy, glandular. Corolla 3.5–5 mm long, purplish; involucre bracts 4–6 mm long; pappus 5–6 mm long; achenes 3–5 mm long.

Chromosome number: $2n = 30, 40$.

Japan: Hokkaido, Honshu, Shikoku and Kyushu.

Distr.: Japan, Korea and China.

Icones: Masamune, Ill. Fl. Nippon 6(2): 198, upper (as *E. lindleyanum*).

Note: This polyploid species is all-agamospermous and morphologically intermediate between *E. lindleyanum* and *E. makinoi*. It is considered to be of hybrid origin between these two species both of which include sexual and agamospermous races. Typical plants of *E. tripartitum* differ from *E. lindleyanum* in more robust stems, shortly petiolate leaves, and larger achenes, and differ from *E. makinoi* in densely hairy stems, shorter petioles, and purplish flowers. However, *E. tripartitum* often intergrades with agamospermous races of *E. lindleyanum* and *E. makinoi* and the boundaries among these three are not clear.

5. *Eupatorium glehni* F. Schmidt ex Trautv. in Acta Hort. Peterop. 8: 432 (1883).

Eupatorium japonicum Thunb. ex Murray var. *sachalinense* F. Schmidt in Reis. Amur. Isl. Sachal.: 145 (1868).

Eupatorium sachalinense (F. Schmidt) Makino in Bot. Mag. Tokyo 23: 90 (1909).

Eupatorium chinense L. subsp. *sachalinense* (F. Schmidt) Kitam. ex Murata in Acta Phytotax. Geobot. 16: 100 (1956).

Eupatorium hakonense Nakai in Bot. Mag. Tokyo 41: 512 (1927).

Eupatorium hakonense Nakai var. *intermedium* Nakai in Bot. Mag. Tokyo 41: 512 (1927).

Japanese name: Yotsuba-hiyodori, Kurumaba-hiyodori, Hosoba-yotsuba-hiyodori, Hakone-hiyodori.

Perennial occurring in open grasslands or half-open forest margins. Flowering stems, 70–180 cm tall, sparsely hairy, ending in corymbs with many heads from July to September. Leaves verticillate with 3–5(–7) leaves at a node, elliptic lanceolate to lanceolate, 7–20 cm long, 1–7 cm wide, simple, serrate, apex acute or acuminate, base acute or obtuse, petiole short (1–5 mm long), sparsely hairy, glandular. Corolla 3.5–5 mm long, purplish; involucre bracts 4–6.5 mm long; pappus 3–6 mm long; achenes 2.5–3 mm long.

Chromosome number: $2n = 20, 30, 38, 40, 50$.

Japan: S. Kuriles, Hokkaido, Honshu and Shikoku.

Distr.: Japan, Sakhalin and the Kuriles.

Icones: Kitamura et al., Herb. Pl. 1: t. 29 225; Terasaki, rev. ed.: t. 2932; Satake et al., Herb. Pl. 3: photo. 187 2; Makino, rev. ed.: t. 2953.

Note: Polyploids reproduce agamospermously while diploids reproduce sexually. Sexual diploids are common

in Hokkaido and northern and central parts of Honshu while agamospermous polyploids are common in western Honshu and Shikoku. Agamospermous races of *E. glehni* intergrade with agamospermous races of *E. makinoi* and the boundary between these two species is often unclear.

6. *Eupatorium yakushimense* Masam. et Kitam. in Acta Phytotax. Geobot. 2: 43 (1933).

Japanese name: Yakushima-hiyodori.

Perennial occurring on moist rock wall along open stream margin. Flowering stems, 30–90 cm tall, glabrescent, ending in corymbs with many heads from August to October. Leaves opposite, 5–15 cm long, deeply triparted with lobes narrow lanceolate to linear, serrate with acute teeth, apex acuminate, base acute or obtuse, petiole 5–20 mm long, lustrous, glabrescent, glandular. Corolla ca. 4 mm long, white or purplish; involucre bracts 4–5 mm long; pappus ca. 5 mm long; achenes 2.5–3 mm long.

Japan: Kyushu (Yakushima). Endemic.

Icones: Masamune, Ill. Fl. Nippon 6(2): 203, upper & lower left.

7. *Eupatorium makinoi* Kawahara et Yahara, nom. nov.

Eupatorium japonicum Thunb. ex Murray var. *dissectum* Makino in Bot. Mag. Tokyo 23: 90 (1909). var. *makinoi*

Eupatorium fortunei Turcz. var. *dissectum* (Makino) Nakai in Bot. Mag. Tokyo 41: 511 (1927), nom. tantum.

Eupatorium laciniatum Kitam. var. *dissectum* (Makino) Kitam. in Acta Phytotax. Geobot. 5: 245 (1936), nom. tantum.

Eupatorium chinense L. var. *dissectum* (Makino) Hara, Enum. Sperm. Jap. 2: 200 (1952), nom. tantum.

Eupatorium japonicum Thunb. ex Murray var. *fragrans* Honda in Bot. Mag. Tokyo 59: 14 (1946).

Japanese name: Hiyodoribana nibai-tai, Kikuba-hiyodori, Nioi-hiyodori.

Perennial occurring in shaded or half-open places of forest understories or forest margins. Flowering stems, 10–100 cm tall, sparsely hairy, ending in corymbs with a few to many heads from July to September. Leaves opposite, obovate to lanceolate, 4–13 cm long, 1–4 cm wide, simple or deeply dissected, serrate, apex acute, base obtuse, petiole 3–20 mm long, sparsely hairy, glandular. Corolla 2.5–4 mm long, purplish; involucre bracts 3–5 mm long; pappus 2.5–4.5 mm long; achenes 2.5–3 mm long.

Chromosome number: $2n = 20$.

Japan: Honshu (Shizuoka Pref., Kii Peninsula, Chugoku Dist.), Shikoku and Kyushu.

Distr.: Japan and China.

Icones: Satake et al., Herb. Pl. 3: photo. 187 1.

Note: This species has been included in *E. chinense* because *E. makinoi* intergrades with *E. chinense* in China. However, the intermediates are all agamospermous. Sexual populations of *E. chinense* found in the southeastern part of China are morphologically distinct from sexual populations of *E. makinoi* in Japan. The

intermediates are regarded as hybrid derivatives between two species.

var. *oppositifolium* (Koidz.) Kawahara et Yahara, comb. nov.

Eupatorium sachalinense (F. Schmidt) Makino var. *oppositifolium* Koidz., Fl. Symb. Or.-Asiat.: 17 (1930).

Eupatorium chinense L. var. *oppositifolium* Murata et H. Koyama in Acta Phytotax. Geobot. 33: 293 (1982).

Eupatorium japonicum auct. non Thunb. ex Murray: Franch. et Sav., Enum. Pl. Jap. 1: 219 (1875), p. p.; Kitam. in Acta Phytotax. Geobot. 1: 285 (1932), p. p.; Mem. Coll. Sci. Kyoto Univ. ser. B. 13: 284 (1937).

Eupatorium japonicum Thunb. ex Murray α. *simplicifolium* Makino in Bot. Mag. Tokyo 23: 142 (1909), superfluous name.

Eupatorium fortunei Turcz. var. *simplicifolium* (Nakai) in Bot. Mag. Tokyo 41: 511 (1927).

Eupatorium chinense L. var. *simplicifolium* (Nakai) Hara in Enum. Sperm. Jap. 2: 200 (1952).

Eupatorium fortunei Turcz. var. *eglandulosum* Honda in Bot. Mag. Tokyo 45: 3 (1932).

Eupatorium japonicum Thunb. ex Murray var. *eglandulosum* (Honda) Kitam. in Mem. Coll. Sci. Kyoto Univ. ser. B. 13: 286 (1937).

Japanese name: Hiyodoribana baisū-tai, Ō-hiyodoribana.

Japan: Hokkaido, Honshu, Shikoku and Kyushu.

Distr.: Japan, Korea and China.

Icones: Kitamura et al., Herb. Pl. 1: t. 29 223; Masamune, Ill. Fl. Nippon 6(2): 199, 200, upper, as var. *angustatum*; Terasaki, rev. ed.: t. 2934; Makino, rev. ed.: t. 2952.

Note: Agamospermous polyploids of *E. makinoi* are morphologically distinct from the sexual diploids and are treated here as var. *oppositifolium*. Var. *oppositifolium* differs from var. *makinoi* in higher stems (50–150 cm tall), larger leaves (7–17 cm × 2–5 cm), larger corolla (3.5–5 mm), and longer pappus (4–5.5 mm). Var. *oppositifolium* occurs in open or half-open places along forest margins, along road sides or in grasslands while var. *makinoi* prefers more shaded places in or along forests. *E. makinoi* var. *oppositifolium* intergrades with agamospermous races of *E. lindleyanum*, *E. glehni* and *E. variabile*.

8. *Eupatorium variabile* Makino in Bot. Mag. Tokyo 24: 59 (1910); Murata & H. Koyama in Acta Phytotax. Geobot. 33: 287 (1982).

Japanese name: Yama-hiyodori.

Perennial occurring in open or half-open places along margins of evergreen forests. Flowering stems, 40–120 cm tall; glabrescent, ending in corymbs with a few to many heads from September to November. Leaves opposite, obovate to elliptic lanceolate, 4–8 cm long, 2.5–5 cm wide, trinerved, simple or deeply dissected with lobes rounded at apex, serrate with obtuse teeth, apex acute, truncate, base rounded or cordate, petiole 4–20 mm long, nearly glabrous, lustrous above, without glands beneath. Corolla 3–4 mm long, white; involucre bracts 3–5 mm long; pappus 3–4.5 mm long; achenes 2.5–3 mm long.

Chromosome number: $2n = 20$.

Japan: Honshu (Wakayama Pref.), Shikoku (Tokushima and Kochi Pref.), Kyushu, Yakushima and Amami Islands. Endemic.

Icones: Kitamura et al., Herb. Pl. 1: t. 29 221; Masamune, Ill. Fl. Nippon 6(2): 201, lower; Satake et al., Herb. Pl. 3: photo. 186 2; Makino, rev. ed.: t. 2954.

9. *Eupatorium laciniatum* Kitam. in Acta Phytotax. Geobot. 5: 245 (1934); Murata & H. Koyama in Acta Phytotax. Geobot. 33: 299 (1982).

Japanese name: Sakeba-hiyodori.

Perennial occurring in open or half-open places along margins of evergreen forests. Flowering stems, 50–150 cm tall, glabrescent, ending in corymbs with many heads from September to November. Leaves opposite, obovate to elliptic lanceolate, 7–17 cm long, 2.5–5 cm wide, trinerved, shallowly or deeply dissected with lobes obtuse or rounded at apex, serrate, apex acute, truncate, base rounded or cordate, petiole 3–20 mm long, glabrescent or sparsely hairy, lustrous above, with no, a few, or many glands beneath. Corolla 3.5–5 mm long, white; involucre bracts 4–6 mm long; pappus 4–5.5 mm long; achenes 2.5–3 mm long.

Japan: Honshu (western parts), Shikoku and Kyushu. Endemic.

Icones: Satake et al., Herb. Pl. 3: photo. 186 4.

Note: This species is all-agamospermous and morphologically intermediate between *E. variabile* and *E. makinoi*. It is considered to be of hybrid origin between these two species. Typical plants of *E. laciniatum* differ from *E. variabile* in more robust stems, glandular leaves, larger corolla, and longer pappus, and differ from *E. makinoi* in lustrous, thicker leaves with longer petioles. However, *E. laciniatum* often intergrades with agamospermous races of *E. makinoi* and *E. variabile*.

10. *Eupatorium luchuense* Nakai in Bot. Mag. Tokyo 30: 147 (1916).

Eupatorium luchuense var. *kiirunense* Kitam. in Mem. Coll. Sci. Kyoto Univ. ser. B. 13: 292 (1937).

Japanese name: Shima-fujibakama, Kirun-fujibakama.

Perennial occurring in open places, often on rock walls. Flowering stems, 50–120 cm tall, glabrescent, ending in corymbs with many heads from January to August. Leaves opposite, obovate to elliptic lanceolate, 8–10 cm long, 5–7 cm wide, trinerved, simple, serrate with obtuse teeth, apex acute, base truncate or cordate, petiole 3–8 cm long, nearly glabrous, lustrous above, glandular beneath. Corolla 3–4 mm long, white; involucre bracts 4–5 mm long; pappus ca. 5 mm long; achenes 2.5–3 mm long.

Chromosome number: $2n = 20$.

Japan: Ryukyu. Endemic.

Icones: Terasaki, rev. ed.: t. 2937; Makino, rev. ed.: t. 2955.

Natural hybrids

1. *Eupatorium* × *tawadae* Kitam. in J. Jap. Bot. 11: 167 (1935).

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Japanese name: Sawa-shima-fujibakama.

Presumption: *E. lindleyanum* × *E. luchuense*.

2. *Eupatorium* × *arakianum* Murata et H. Koyama in
Acta Phytotax. Geobot. 33: 300 (1982).

Presumption: *E. lindleyanum* × *E. japonicum*.

3. *Eupatorium lindleyanum* × *E. variabile* Murata et
H. Koyama in Acta Phytotax. Geobot. 33: 301 (1982).