

Taxonomic Studies in the Compositae of Thailand 14. Tribe Eupatorieae

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Abstract The taxonomy of the Eupatorieae in Thailand is revised. Three genera, *Adenostemma*, *Eupatorium* and *Mikania*, are recognized as indigenous in Thailand. *Adenostemma madurense* is recognized as distinct from *A. lavenia* sens. Kerr. *Eupatorium doichangensis* is described as a species new to science and two taxa, *E. wallichii* var. *heterophyllum* and *E. formosanum* var. *quasi-tripartitum*, are reported as new records from Thailand.

Key words: Thai Eupatorieae, *Adenostemma*, *Eupatorium*, *Mikania*, *Ageratina*, *Ageratum*, *Chromolaena*.

At the tribal level, the Eupatorieae have been well delimited and contain more than 160 genera with approximately 2000 species. Almost all genera, except for some pantropical ones, are distributed in the New World. In Thailand, only three genera are indigenous; *Adenostemma* J. R. et G. Forst., *Eupatorium* L. and *Mikania* Willd. Three additional genera, *Ageratina* Spach., *Ageratum* L. and *Chromolaena* DC., are adventive from the New World.

Key to genera.

1. Pappus of few clavate hairs, connate by a basal ring, glandular on thickened upper part. 1. *Adenostemma*
1. Pappus of capillary bristles or lanceolate palae. 2
2. Pappus of lanceolate palae. 2. *Ageratum*
2. Pappus of capillary bristles. 3
3. Scandent herbs or straggling shrubs. 4
4. Heads 4-flowered. 3. *Mikania*
4. Heads 5- or more flowered. 4. *Chromolaena*
3. Erect herbs. 5
5. Heads with 5–10 florets. 5. *Eupatorium*
5. Heads with 30–80 florets. 6. *Ageratina*

1. *Adenostemma* J. R. et G. Forst.

More than 30 species are said to occur in the tropical regions of America, Africa and Asia. In Thailand, 3 species and 2 varieties were recognized in my previous paper (2001) as indigenous taxa.

Key to species.

1. Achenes smooth, black. 1. *A. madurense*
1. Achenes tuberculate, whitish. 2
2. Achenes 3–4 mm long, tubercles variable in size. 2. *A. lavenia*
2. Achenes 1–2 mm long, tubercles nearly same in size. 3. *A. parviflorum*

1. *Adenostemma madurense* DC. in Wight, Contrib. Bot., Ind., 9 (1834); Koyama in Mem. Natn. Sci. Mus., Tokyo, (37): 165 (2001).

Adenostemma lavenia sensu Kerr, not Kuntze, Fl. Siam. Enum., 2 (3): 247 (1936), p.p.

Habitat: rather dry mountain slopes in evergreen forests; 100–400 m in Japan, 900 m in Taiwan, 800–1700 m in Thailand and 900–2100 m in Nepal.

Distribution in Thailand: [N] Chiang Mai, Chiang Rai, Phitsanulok. [NE] Loei. [E] Nakhon Ratchasima. [SW] Ratchaburi. [C] Lop Buri.

Distribution: Japan to Southeast Asia through southern China and westward to Nepal.

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2. **Adenostemma lavenia** (L.) Kuntze, *Revis. Gen. Pl.*, **1**: 304 (1891); Koyama, l. c., (37): 161 (2001).

Adenostemma viscosum sensu Kerr, not Forst., *Fl. Siam. Enum.*, **2** (3): 247 (1936).

Distribution: Japan, Taiwan, S. China, SE. Asia, India and Sri Lanka.

var. **lavenia**

Habitat: wet, grassy places or in water along streams in lowlands and low mountains; 0–1100 m.

Distribution in Thailand: [N] Chiang Mai, Chiang Rai, Mae Hong Son, Tak. [NE] Chan Thaburi. [C] Ayuthia. [SW] Kanchanaburi. [PEN] Phuket, Ranong, Surat Thani.

var. **angustifolium** (C. B. Clarke) Koster; Koyama, l. c., (37): 162 (2001).

Habitat: wet places along streamlets in semi shade; 50–150 m.

Distribution in Thailand: [N] Chiang Mai. [E] Chaiyaphum. [SE] Chanthaburi. [PEN] Phuket, Ranong.

var. **lanceolatum** (Miq.) Koster in *Blumea*, **1**: 474 (1935); Koyama, l. c., (37): 165 (2001).

Habitat: wet places along streamlets; 400–800 m.

Distribution in Thailand: [N] Chiang Mai. [NE] Khongkaen, Sakonnakhon. [E] Chaiyaphum, Thung Kra Mang. [SW] Kanchanaburi. [C] Lopburi.

3. **Adenostemma parviflorum** (Bl.) DC., *Prodr.*, **5**: 111 (1836); Koster in *Blumea*, **1**: 476 (1935); Kerr, *Fl. Siam. Enum.*, **2** (3): 247 (1936).—*Lavenia parviflora* Bl., *Bijdr.*, 906 (1825). Type from Java.

Erect, perennial herbs from fibrous rhizomes; stems 10–60 cm tall, lower parts sometimes prostrate and rooting, branches often spreading and ending in loose panicle with few or numerous heads. Leaves petiolate, broadly deltoid- or rhomboid-ovate, 4.5–25.5 cm long, 2.5–8.5 cm wide, apex obtuse, base attenuate into the petiole, petiole 1–4 cm long. Heads discoid, subglobose or semiglobose, ca. 5 mm across, peduncles 5–25 mm long, slender, pubescent; involucre subcampanulate, 3.5–4 mm long; phyllaries in 2

series, equal, connate at base, narrowly oblong, apex acute or subobtusely, reflexed after flowering. Flowers October to January, ca. 20 per head; corolla white, 1–1.5 mm long, upper part densely crisp-tomentose. Achenes conical, 2 mm long, obtuse, distinctly warty, whitish. Pappus of 3 or 4 thick spreading setae, ca. 0.4 mm long.

Specimens examined. [N] Chiang Mai: Khum Klong, 15 km NW of Doi Chiang Dao (Larsen et al. 2955 AAU), Doi Suthep (10-1920, Rock 74 US), Doi Chang (10-1979, Shimizu et al. T-20347 KYO), Mae Tho (1-1983, Koyama et al. T-32343 KYO), Doi Inthanon (12-1984, Koyama T-40066 KYO). Chiang Rai: without precise locality, 375 m (Garrett 245 US).

Habitat: grassy fields along stream in evergreen gallery forests; 300–1400 m.

Distribution: Taiwan (1-1932, Kitamura s.n. KYO), Hainan (12-1936, Lau 28302 KYO), Thailand, Sumatra (9-1971, Iwatsuki et al. S-1617 KYO), New Guinea (Lavarack & Ridsdale 31383 SING) and Hawaii (5-1909, Faurie 962 KYO).

2. **Ageratum** L.

About 60 species of *Ageratum* occur in the tropical America. *Ageratum conyzoides* is a pantropical weed.

1. **Ageratum conyzoides** L., *Sp. Pl.*, 839 (1753); Kerr, *Fl. Siam. Enum.*, **2** (3): 247 (1936); Kitam. in *Acta Phytotax. Geobot.*, **23**: 5 (1968). Type from tropical America.

Erect, annual herbs with fibrous rhizomes; stems 7–90 cm tall, branched, lower part sometimes decumbent, often rooting, nodes and younger parts clothed with rather long and partly crispy hairs, upper part branched, branches ending in corymbs with few to many heads. Petiole 1.5–5 cm long. Leaves long petiolate, more or less broadly ovate, deltoid, subrhomboid- or elliptic-ovate, 1–11 cm long, 0.6–6 cm wide, base subcordate, rounded or narrowed, apex acute or obtuse, sometimes acuminate, both surfaces sparingly long hairy, lower surface glandular. Heads discoid, subglobose, 4–5 mm across, peduncles 5–17 mm long; involucre subglobose, 4–5 mm

long, phyllaries many in 3 series, irregularly serrate in upper part, very sparingly hairy or glabrous, apex acuminate, acute, green with a pale or reddish-violet top. Flowers all year, 60–75 per head; corolla infundibuliform, 1–1.5 mm long, white or violet. Achenes lanceolate, 5-angled, 1.5–2 mm long, ca. 0.5 mm wide, acutely angled, glabrous except on very sparingly hairy angles, black. Pappus segments scale-like, 5, deltoid and fringed in lower part, long needle-like apically, slightly longer than corolla. Chromosome number $2n=40$.

Specimens examined. [N] Chiang Mai: Wat Chiang Dao (9-1971, Murata et al. T-14876 BKF, KYO), Bo Luang Tableland (Geesink et al. 5908 KYO; 10-1979, Shimizu et al. T-19117, T-19183 KYO), Pha Mawn to the camp, Doi Inthanon (10-1971, Murata et al. T-15856 BKF, KYO), Mae Pan waterfall (10-1979, Shimizu et al. T-18990 KYO; Koyama 5659* KYO), Wachirathan waterfall (7-1988, Takahashi T-63006 TNS), Pa Mon to Sop Aep (Ogawa & Yoda OCUBE 111-8 KYO), Ban Mae Kon (Matsuoka OCKUBE 22 KYO), Doi Chang (10-1979, Shimizu et al. T-20171, T-20348 KYO), Doi Pui (10-1979, Shimizu et al. T-18671 KYO), Huay Kaew Arboretum (7-1988, Takahashi T-62916 TNS). Chiang Rai: Ban Nong Lu (2-1962, Matsuoka s.n. KYO). Lampang: Pang La to Huai Thak (9-1969, Shimizu et al. T-10723 KYO). Phitsanulok: Phu Miang (10-1967, Shimizu et al. T-11581 KYO, TNS), Thung Salaeng Luang National Park (7-1973, Murata et al. T-17078 BKF, KYO). Tak: Lan Sang National Park (8-1967, Tagawa et al. T-8551 KYO), Ban Musoe (8-1967, Tagawa et al. T-8621 KYO), Mae Sot District (10-1979, Shimizu et al. T-18388, T-18492 KYO). [NE] Loei: Pha Nok Khao (11-1965, Tagawa et al. T-300 KYO, TNS), Phu Luang (12-1965, Tagawa et al. T-1614 KYO), Phu Kradung (11-1965, Tagawa et al. T-353 KYO); 11-1979, Shimizu et al. T-22559, T-23024 KYO). Phetchabun: Lom Sak District (10-1979, Shimizu et al. T-18328 KYO). [E] Nakhon Ratchasima: 15 km S of Pak Chong, 68 km E of Saraburi (7-1963, King 5528, 5530 US). [C] Krung Thep Maha Nakhon:

Bangkok (1899, Zimmermann 70 US). Nakhon Nayok: Khao Yai National Park (10-1979, Shimizu et al. T-19525, T-19718 KYO), 11 km S of Khao Yai Forest Station, 105 km E of Saraburi (7-1963, King 5537 A, US). Saraburi: Khao Yai National Park (10-1979, Shimizu et al. T-18142 KYO, TNS). [SE] Chanthaburi: Pong Namron District (11-1979, Shimizu et al. T-23869 KYO). Chon Buri: Sriracha (11-1979, Shimizu et al. T-23256 KYO). Rayong: Klaeng District (11-1979, Shimizu et al. T-23494 KYO). Trat: Ko Chang (8-1973, Murata et al. T-17533 BKF, KYO). [SW] Kanchanaburi: Muang District (10-1979, Shimizu et al. T-21388 KYO), Srisawat District (10-1979, Shimizu et al. T-21439, T-21632 KYO), Sai Yok District (10-1979, Shimizu et al. T-21717 KYO), Thong Pha Phum District (10-1979, Shimizu et al. T-21859 KYO). Prachuap Khiri Khan: Bang Saphan (8-1967, Shimizu & Nalampoon T-7818 KYO, TNS). Uthaitхани: Larn Suk District (11-1979, Shimizu et al. T-22362 KYO). [PEN] Chumphon: Chumphon (7-1963, King 5589, 5590 US). Nakhon Si Thammarat: Khao Luang (8-1967, Iwatsuki et al. T-8537 KYO, TNS), Wat Khiri Wong (1-1966, Tagawa et al. T-5379 KYO, TNS). Ranong: Kaper District (11-1979, Shimizu et al. T-22266 KYO, TNS; 12-1979, Shimizu et al. T-26306, T-26676, T-27009 KYO, TNS), Muang District (12-1979, Shimizu et al. T-26552 KYO), 24 km W of Chumphon (7-1963, King 5574 US), Ranong (7-1963, King 5577, 5584 US). Songkhla: Rattaphum District (12-1979, Shimizu et al. T-27600 KYO). Trang: Trang District (12-1979, Shimizu et al. T-27577 KYO).

Specimens marked by an asterisk (*) in the list of specimens examined are vouchers for chromosome counts.

Habitat: roadsides or cultivated fields; 100–1500 m.

Distribution: pantropical.

3. *Mikania* Willd.

Key to species.

1. Heads with a linear bract at base, bract half to

three fourths length of involucre, rarely shorter; involucre linear, 5–7 mm long; achenes 2–3 mm long, glandular; pappus bristles 40–45, white to brownish, 4–5 mm long.

. 1. *M. cordata*

1. Heads with a minute elliptic-oblong or lanceolate bract at base, bract ca. half as long as involucre; involucre ovate-oblong to rarely elliptic, 3–4 mm long; achenes ca. 2 mm long, sparingly glandular; pappus bristles 33–36, white, 2–3 mm long. 2. *M. micrantha*

1. ***Mikania cordata*** (Burm. f.) B. L. Robinson in Contrib. Gray Herb., **104**: 65 (1934); Kerr, Fl. Siam. Enum., **2** (3): 250 (1936); Kitam. in Acta Phytotax. Geobot., **23**: 145 (1969).—*Eupatroium cordatum* Burm. f., Fl. Ind., 176, t. 58, fig. 2 (1768). Type from Java.

Climbing or straggling herbs, with both sinistorse and dextrose stems (sometimes on a single individual); stems ribbed, in places shortly hairy. Petiole 1–8 cm long. Leaves long petiolate, deltoid-, cordate- or triangular-ovate, 3–12.5 cm long, 1.5–6 cm wide, base cordate or shortly contracted, apex more or less acuminate and acute, margins entire, undulate, crenate or dentate, slightly mucronate, both surfaces subglabrous or slightly pubescent or densely rusty pilose, lower surface glandular spotted. Inflorescences terminal and axillary, corymbose-panicles with many heads, peduncles 1–10 cm long. Heads discoid, campanulate, ca. 5 mm across; involucre cylindrical, 6–6.5 mm long, phyllaries 4, with a linear bract at base, oblong, 5–7 mm long, ca. 1.4 mm wide, apex acute or obtuse and mucronate, dorsal surface glabrous or subglabrous. Flowers all year, 4 per head; corolla ca. 5 mm long, greenish or yellowish white or white, strongly scented. Achenes linear-oblong, blackish brown or black, glandular, ca. 3 mm long. Pappus of capillary bristles, ca. 5 mm long, white at first, later dirty white or brownish to reddish.

Specimens examined. [N] Lampang: Ban Tang Chai (10-1925, Winit 1477 BK, BKF). [E] Chaiyaphum: Thung Kamang (Beusekom et al. 4303 BKF, C, KYO, L, MO). [C] Krung Thep Maha Nakhon: Bangkok (1899, Zimmermann 93

MO, US; 3-1922, Smith 334 BK; 1-1920, Kerr 3953 BK; 3-1922, Marcan 705 BK, SING). [SE] Prachinburi: Khao Yai (Larsen 10266 C). [SW] Ratchaburi: upper Pran river (4-1924, Ladell 217 BK). Prachuap Khiri Khan: Kan Kradai (1-1929, Put 2281 BK). [PEN] Nakhon Si Thammarat: Khao Luang (8-1967, Iwatsuki et al. T-14514 BKF, KYO, SING, TNS), Kiriwong, Khao Kai Charng (3-1953, Plerichit 503 BKF, L). Phuket: Takuapa (2-1929, Kerr 17139 BK).

Habitat: mountain slopes in open places or in evergreen jungles; 200–720 m.

Distribution: Taiwan (11-1921, T. Ito 84513 TNS; 4-1927, Saito 8322 TNS; 12-1929, Suzuki 3421 TNS; 12-1939, Inada 35 TNS; 11-1940, Satake & Imazeki s.n. TNS; 7-1964, Tamura & Koyama 23006 KYO, TNS; 7-1985, Peng 8357 TNS; 5-1990, Lin 455 TNS; 9-1994, Shen 157 TNS) and Thailand.

2. ***Mikania micrantha*** Kunth, Nov. Gen. Sp., **4**: 134 (1820); Koster in Nova Guinea, Botany, **24**: 522 (1966); Kitam. in Acta Phytotax. Geobot., **23**: 145 (1969); Holmes, A revision of *Mikania scandens* and relatives (Compositae). Dissertation, Mississippi State Univ., 104 (1975). Type unknown.

Mikania cordata var. *indica* Kitamura in Hara's Fl. East Himalaya, 241 (1966). Type from Nepal: 1200–700 m, Illam-Ranga Pani—holotype in TI.

Climbing or straggling herbs, with both sinistorse and dextrose stems (sometimes in a single individual), stems ribbed, scarcely pubescent. Petiole 1–8 cm long. Leaves long petiolate, cordate-deltoid or subdeltoid, triangular-ovate, 3–12.5 cm long, 1.5–6 cm wide, apex long acuminate and acute, base shortly attenuate, often angularly auriculate, subentire, minutely callose-dentate, lower surface glandular dotted, glabrous or subglabrous. Inflorescences terminal or axillary, panicles with many heads, peduncles 3.5–8 cm long. Heads discoid, broadly campanulate, ca. 4 mm across; involucre cylindrical, ca. 4 mm long, phyllaries 4, with a minute elliptic-oblong or lanceolate bract at base, oblong, 3.5–4 mm long, ca. 1.3 mm wide, apex sharply mucronate

and recurved, dorsal surface short hairy. Flowers all year, 4 per head; corolla 2.5–3 mm long, yellowish white or white, slightly scented. Achenes linear-oblong, blackish brown or black, glandular, ca. 2 mm long. Pappus of capillary bristles, 2.5–3 mm long, white at first, later dirty white or yellowish.

Specimens examined. [PEN] Nakorn Sri Thammarat: Khao Luang National Park (3-1983, Koyama et al. T-34077 BKF, KYO). Narathiwat: Rangae (12-1962, Sangkhachand 939 BKF), Khao Nikkom Laeng (9-1966, Sangkhachand & Nimanong 1362 BKF), Nikom Vang (9-1966, Prayad 362 US), Bacho (11-1961, Sangkhachand 249 BKF; 12-1968, Prayad 1547 US), Sirinthon Research and Nature Study Center (12-1993, Fukuoka & Koyama T-61939 TNS), Rue So (5-1968, Prayad 1361 US). Phangnga: Tapput District (12-1979, Shimizu et al. T-27371 BKF, KYO, TNS). Satun: Satun District (12-1979, Shimizu et al. T-27579 BKF, KYO, TNS). Songkhla: Hat Yai District (12-1979, Shimizu et al. T-27697 BKF, KYO), Nathawi (11-1959, Smitiand 6125 BKF, L). Yala: Bannang Sata (11-1961, Suvarnakoset 1712 BKF).

Habitat: waste areas and edges of evergreen jungles; 20–100 m.

Distribution: Asia: Taiwan (1-1996, Liao 1724 TNS), Hongkong (1-1964, Togashi & Murata 7957 KYO, TNS), Thailand, Malay Peninsula (10-1966, Togashi 6639 KYO, TI, TNS), Singapore (12-1961, Togashi 61121518 KYO, TI, TNS) and Sumatra (8-1988, Nagamasu 3026 TNS; 6-1989, Nakano 90 TNS). S. America: Ecuador (6-1945, Camp E-3563 TNS).

4. *Chromolaena* DC.

Chromolaena is almost totally restricted to Central and South America. Only one species, *Chromolaena odoratum* has been observed to be weedy and widely adventive in mountainous areas of Thailand.

1. *Chromolaena odoratum* (L.) R. M. King et H. Robinson in *Phytologia*, **20**: 204 (1970).—*Eupatorium odoratum* L., *Syst. Nat.*, ed. **10**:

1205 (1759); Kerr, *Fl. Siam. Enum.*, **2** (3): 249 (1936); Kitam. in *Acta Phytotax. Geobot.*, **23**: 135 (1969). Type from tropical America.

Large, scandent herbs or straggling shrubs; stems shortly pubescent or nearly glabrous, striate, upper part branched, branches sometimes ending in corymbs with many heads. Petiole 0.5–2 cm long, sometimes obscure. Leaves triangulate-oblong, 7.5–10 cm long, 2.5–5 cm wide, base rounded or cuneate, apex obtuse or acute, more or less coarsely serrate-dentate or nearly entire, 3–5 nerved, both surfaces shortly hispidulous, lower surface glandular, lighter colored than upper surface. Heads discoid, tubular, 3–5 mm across; involucre cylindrical, 10–12 mm long, phyllaries in 4 or 5 series, imbricate, 3-nerved, innermost lanceolate, 9–10 mm long, outer ones glandular, finely hairy. Flowers nearly all year, 20–35 per head; corolla light violet, funnel-shaped, ca. 5 mm long. Achenes linear, 5-angled, ca. 5 mm long, ca. 0.4 mm wide, acutely angled, glabrous except on angles, black. Pappus of capillary bristles, sordidly white, ca. 5 mm long. Chromosome number $2n=60$.

Specimens examined. [N] Chiang Mai: Doi Suthep (12-1948, Soradej 302 US; 11-1976, Anderson 3937 MO), Mae Klang waterfall (12-1965, Tagawa et al. T-2223 KYO, TNS; 11-1976, Anderson 3918 MO), Doi Inthanon (M. Tamura s.n.* KYO; T. Koyama et al. 15343 KYO), Ban Mae Kon (Matsuoka OCKUBE 1, 22 KYO), Ping Khong (Yoda OCKUBE 1013 KYO), Pa Mon to Sop Aep (Ogawa & Yoda OCUBE 111-21 KYO). Mae Hong Son: Doi Padeng (10-1979, Shimizu et al. T-20007 KYO). Nan: Pha Sing (12-1957, Walker 7906 KYO, TNS). [NE] Khon Kaen: Pha Nok Khao (11-1965, Tagawa et al. T-297 KYO, TNS). Loei: Phu Luang (12-1965, Tagawa et al. T-1919 KYO, TNS), Phu Kradung National Park (11-1979, Shimizu et al. T-22808 KYO, T-22568 KYO, TNS). Phetchabun: Lom Sak District (10-1979, Shimizu et al. T-18325 KYO, TNS). Ubon Ratchathani: Nachaluay District (12-1982, Koyama et al. T-30767 KYO), Muang District (12-1982, Koyama et al. T-30634 KYO). [C] Ayutthaya: Singburi (1-1930, Put 2616 BK). Krung

Thep Maha Nakhon: Bangkok (1-1959, Surapat 125 US). [SE] Chanthaburi: Laem Sing (2-1916, Collins 565 US), Pong Namron District (11-1979, Shimizu et al. T-237171, T-23878 KYO), Makhan District (12-1979, Shimizu et al. T-26038 KYO). Chon Buri: Sriracha District (11-1979, Shimizu et al. T-23272 KYO). Rayong: Klaeng District (11-1979, Shimizu et al. T-23507 KYO). [SW] Kanchanburi: Tham Tarn National Park (10-1979, Shimizu et al. T-21998 KYO; 11-1979, Shimizu et al. T-22086, T-22154 KYO), Huay Yang Waterfall National Park (8-1982, Shimizu et al. T-28782 KYO, TNS). Uthaitхани: Huay Kha Kaeng Wildlife Sanctuary (11-1979, Shimizu et al. T-22280, T-22359 KYO). [PEN] Nakhon Si Thammarat: Padang Besar (12-1927, Kerr 13574 BK). Phangnga: Phangnga District (12-1979, Shimizu et al. T-27350 KYO, TNS). Phatthalung: Phatthalung District (12-1979, Shimizu et al. T-27739 KYO). Phuket: Thalung (12-1979, Shimizu et al. T-27161 KYO), Ka Too District (12-1979, Shimizu et al. T-27336 KYO). Ranong: Kaper District (12-1979, Shimizu et al. T-26299, T-26520 KYO, T-26820 KYO, TNS), Ranong District (12-1979, Shimizu et al. T-26225 KYO, TNS). Songkhla: Rattaphum District (12-1979, Shimizu et al. T-27624 KYO), Hat Yai District (12-1979, Shimizu et al. T-27699 KYO). Surathani: Khiriratnikhom District (3-1983, Koyama et al. T-33982 KYO).

Specimens marked by an asterisk (*) in the list of specimens examined are vouchers for chromosome counts.

Habitat: roadside thickets and old clearings; 50–1000 m.

Distribution: native of Central and South America; naturalized throughout Thailand.

5. *Eupatorium* L.

Since Hooker's treatment (1881), *Eupatorium cannabinum* L. has been considered by several authors to be a member of the eastern Asian flora, although it was described from Europe. Some specimens collected in the mountains of northern Thailand were determined by Kerr

(1936) as *E. cannabinum*. Those specimens, however, represent a new species, *E. doichangensis*, which is described below. According to information on the labels of specimens, *E. cannabinum* grows in the damp places, while our new species occurs in rather dry places of mountain slopes.

Although *Eupatorium formosanum* Hayata was treated by Kitamura (1961) to be a subspecies of *E. cannabinum*, it can be clearly distinguished from *E. cannabinum* as a distinct species by the following character: achenes hirsute, glandular punctate and glandular hairy, leaves with patent hairs 0.3 mm long on both surfaces, petiole more than 1 cm long, often to 3 cm long, rhizomes short and thick with fibrous roots in *E. formosanum*. In *E. cannabinum*, the achenes have only glandular punctate, both surfaces of the leaves have patent hairs 0.6 mm long, the petiole is less than 5 mm long and the rhizomes are shortly creeping with many fibrous roots. There are no plants with those features in eastern Asia and therefore, *E. cannabinum* is not a member of our flora.

Eupatorium capillifolium (Lam.) Small was listed by Kerr (1936) as an adventive in Thailand, but we have not collected it.

With the specimens now available from various localities in Thailand, the following three species, of which two are represented at the varietal level, are recognized as indigenous in Thailand.

Key to the indigenous species.

1. Leaves quasitripartite; petioles more than 10 mm long. 1. *E. formosanum* var. *quasitripartitum*
 1. Leaves undivided or ternate; petioles less than 5 mm long. 2
 2. Leaves not dissected; achenes hirsute, glandular punctate and glandular hairy. 2. *E. doichangensis*
 3. Leaves ternately dissected; achenes glandular punctate and glandular hairy. 3. *E. wallichii* var. *heterophyllum*
1. ***Eupatorium formosanum* Hayata var. *quasitripartitum* (Hayata) Kitamura** in Acta

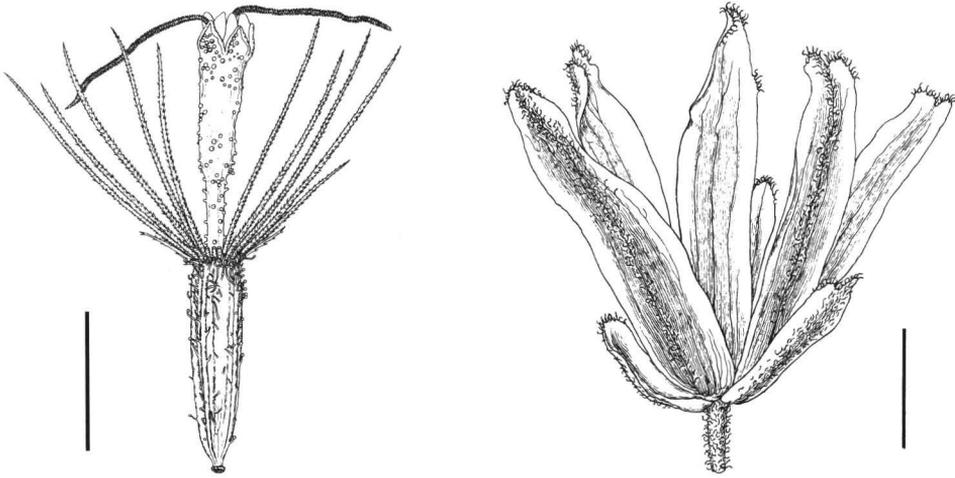


Fig. 2. Floret and involucre of *Eupatorium doichangensis*.

Phytotax. Geobot. **1**: 284 (1932), in Mem. Coll. Sci. Kyoto Univ., Ser. B. **13**: 295 (1937).—*E. quasitripartitum* Hayata, Icon. Pl. Formosan., **8**: 44 (1919). Type from Taiwan.

Erect, perennial herbs; stem much branched at base, branches ending in corymbs with many heads. Leaves of main stem lacking in our specimen; leaves of branches opposite, but alternate on upper portion of branches, simple, obovate to oblong, 1.5–5 cm long, 5–18 mm wide, not dissected, margin crenate, apex acute to acuminate, both surfaces of leaves patent hairy, hairs ca. 0.1–0.2 mm long and glandular punctate, petiole 2.5–7 mm long. Heads discoid, campanulate, ca. 5 mm across; involucre tubular, 4–4.5 mm long, phyllaries in 2 series, imbricate, inner 4 mm long, 1 mm wide, obtuse, outermost bract-like, oblong, 1.3 mm long, 0.7 mm wide, apex ciliate. Flowers November, 5 per head; corolla 3.2–3.5 mm long, slightly glandular punctate throughout. Achenes 5-angled, black, ca. 2.3 mm long, glandular punctate and glandular hairy, but nearly glabrous in our specimens. Pappus of ca. 30 capillary bristles, white, ca. 3.5 mm long.

Specimens examined. [NE] Khon Kaen: Mt. Phanok Khao near Phu Kradung (11-1984, Murata et al. T-50300 KYO).

Habitat: sunny roadsides; 280–450 m in limestone areas.

Distribution: Ryukyu (8-1894, T. Ito s.n. TNS; 3-1973, Koyama et al 183 KYO, TNS), Taiwan (10-1934, S. Suzuki s.n. TNS; 10-1914, Faurie 888 KYO, TNS) and Thailand.

2. ***Eupatorium doichangensis*** H. Koyama sp. nov.

Eupatorium cannabinum sensu Kerr, not L., Fl. Siam. Enum., **2** (3): 248 (1936).

Eupatorium chinense sensu Kitam., not L., in Acta Phytotax. Geobot., **23**: 135 (1969), specimen from Thailand.

Eupatorium lindleyanum sensu Kitam., not DC., in Acta Phytotax. Geobot., **23**: 135 (1969), specimen from Thailand.

Haec species *Eupatorio cannabio* et *Eupatorio chinensi* affinis est, sed ab *Eupatorio cannabio* et *Eupatorio chinensi* follis elliptico- vel oblongo-rhomboides non pinnatilobatis, achenis hirtus et glandulosus, et capitulis minoribus facile distinguitur.

Erect, perennial herbs; stems to 200 cm tall, ca. 1.5 cm in diameter at base, much branched in upper part, branches ending in large corymbs with many heads, densely hairy and glandular. Petiole 3–15 mm long. Leaves opposite, not dissected, elliptic- or oblong-rhomboid, 10–13 cm long, 4–6 cm wide, margin crenate, apex acute or obtuse, base acute, both surfaces densely hairy and glandular punctate. Heads discoid, broadly



Fig. 1. Holotype specimen of *Eupatorium doichangensis* H. Koyama, sp. nov.



b



a

Fig. 3. Two new records from Thailand. a: *Eupatorium formosanum* var. *quasitripartitum*. b: *Eupatorium wallichii* var. *heterophyllum*.

campanulate, 6–8 mm across; involucre campanulate, 4–5 mm long, phyllaries in 2 series, inner series of 5 phyllaries, 3 nearly equal and longer, outer phyllaries 6, gradually shorter, outermost phyllaries bract-like, oblong, 1 mm long. Flowers October to January, 5 per head; corolla 3.5–5 mm long, whitish. Achenes 5-angled, black, 3–5 mm long, hirsute, glandular punctate and glandular hairy. Pappus of capillary bristles, 4–5 mm long, dirty white.

Eupatorium doichangensis is similar to *E. cannabinum* and *E. chinense*, but differs from them in having leaves elliptic- or oblong-rhomboid and crenate, the achenes hirsute, glandular punctate and glandular hairy, and smaller involucre.

Type collection. Thailand [N] Chiang Mai: Southwestern part of Doi Chang, Mae Taeng Distr. (24 October, 1979, Shimizu, Toyokuni, Koyama, Yahara & Santisuk T-20640—holotype in KYO, isotype in TNS).

Additional specimens examined. [N] Chiang Mai: Southwestern part of Doi Chang, Mae Taeng Distr. (10-1979, Shimizu et al. T-20655, T-20686, T-20754 KYO), Doi Maeya, Mae Taeng Distr. (1-1983, Koyama et al. T-32803, T-32812 KYO), Doi Chiang Dao (11-1922, Kerr 6510 BK; 7-1955, Bunchuai 285 BKF, TNS; 10-1979, Shimizu et al. T-20836, T-201026 KYO); Western part of Doi Chiang Dao (11-1984, Koyama et al. T-39698 BKF, KYO, TNS), West of Doi Chiang Dao ((12-1957, Tuyama 59279 TI), Me Teng (10-1922, Kerr 6471 BK), South of Doi Chiang Dao (11-1984, Koyama et al. T-39773 KYO, TNS), West of Pai, Pai Distr. (10-1979, Shimizu et al. T-20098 KYO), Doi Suthep (10-1921, B. Hayata s.n. TI; 9-1967, Iwatsuki et al. T-9427 BKF, KYO; 10-1958, Sorensen et al. 5501 BKF, C).

Habitat: bamboo thickets and edges of evergreen forests mixed with pine and oak trees or pine and dipterocarp trees on open slopes; 700–1400 m.

Distribution: endemic to Thailand.

3. ***Eupatorium wallichii*** DC. var. ***heterophyllum*** (DC.) Diels in Notes Roy. Bot. Gard. Edinburgh, 7: 360 (1912); Hand.-Mazz., Symb.

Sin., 7: 1098 (1936).—*E. heterophyllum* DC., Prodr., 5: 180 (1836). Type unknown.

Erect, perennial herbs; stems 40–70 cm tall, branched in upper part, branches ending in corymbs with few to many heads. Petiole 2–3 mm long. Leaves opposite, ternately divided on main stem, terminal leaflet lanceolate, 6 cm long, 1.7 mm wide, lateral leaflet lanceolate, 4 cm long, 1 cm wide, undivided on branches; blade oblong, 4.5 cm long, 1.2 cm wide, both surfaces patent hairy and glandular punctate, hairs 0.2–0.5 mm long. Heads discoid, campanulate, ca. 6 mm across; involucre tubular, 6–7 mm long, phyllaries in 2 series, imbricate, phyllaries of inner series 5, lanceolate, 6 mm long, 1.5 mm wide, nearly equal, apex obtuse, outer phyllaries 6, outermost bract-like, 2 mm long, 0.8 mm wide. Flowers September, 5 per head; corolla 5 mm long, glandular punctate throughout. Achenes 5-angled, black, 2.8 mm long, glandular punctate and glandular hairy. Pappus of capillary bristles in 1 or partially 2 series, bristles 35–50, dirty white, 5 mm long.

Specimens examined. Thailand [NE] Loei: Anodart pond (RS-19), alt. 1240 m, Phu Kradung (6 September, 1988, H. Koyama T-61579 KYO, TNS).

Habitat: moist grassy fields near stream; 1240 m.

Distribution: Nepal (Gandaki Zone, 8-1983, Namba et al. N-1193 KYO), Sikkim (temp, 6-11000 ped, J.D.H. s.n. A), India (East Bengal: Griffith 3112 NY; Khasia: temp., 4-6000 ped, J.D.H. & T.T. s.n. NY; Griffith 243 A; Khasi Hills: 8-1949, Kingdon-Ward 18720 NY), Yunnan (Kunming Shi, 8-1982, Koyama et al. 130 KYO; Lunan Xian, 8-1984, Sino-Amer. Bot. Exped. 1557 KYO; Zhongdian Co., 9-1993, Konta & Koyama 2779 TNS) and Thailand.

4. ***Eupatorium capillifolium*** (Lam.) Small in Mem. Torrey Bot. Club, 5: 311 (1894); Kerr, Fl. Siam. Enum., 2 (3): 248 (1936); Kitam. in Fl. E. Himalaya, 339 (1966).—*Artemisia capillifolia* Lam., Encycl. Meth., B., 1: 267 (1783). Type from North America.

Stems erect, 50–200 cm tall, upper part pu-

berulent, branched and ending in an elongate panicle with numerous heads. Leaves numerous, narrow, delicate, glandular punctate, glabrous, the lowest ones opposite, the others alternate, mostly 2–10 cm long, often with axillary fascicles or with short, sterile, leafy axillary branches, the main ones pinnately divided into a few filiform segments, ca. 0.5 (–1) mm wide, those of inflorescence mostly simple. Heads discoid, broadly campanulate, ca. 4 mm across; involucre campanulate, 2.5–3 mm long, phyllaries in 2 series, those of inner series much longer than those of outer series, usually mucronate or abruptly acuminate. Flowers (season not known) 3–6 per head; corolla white or ochroleucous. Achenes 5-angled, 1–1.5 mm long, glabrous, sometimes with a few glands. Pappus of ca. 23 capillary bristles, dirty white, ca. 2 mm long.

Specimens examined. [SE] Chantaburi: Ma Kharn, Ban Arng (R. F. D. collector G 167 BKF), Suwanyang, Chaokungpeh, Ban Arng (Premrasami 3 BKF).

Habitat: open waste lands; 200 m.

Distribution: native of North America, now introduced into Thailand.

6. *Ageratina* Spach.

Ageratina is almost entirely restricted to the western parts of the Americas. Only one species, *Ageratina adenophora* has become weedy and widely adventive at higher elevations in the mountains of Northern Thailand.

1. *Ageratina adenophora* (Spreng.) R. M. King et H. Robinson in *Phytologia*, **19**: 211 (1970).—*Eupatorium adenophorum* Spreng., *Syst. Veget.*, **3**: 420 (1826). Type from America.

Erect herbs, often woody at base, dark purple; stem, branches (including those of inflorescence), petioles and phyllaries with glandular hairs, upper part branched, branches ending in dense corymbs. Petiole 1.5–3.5 cm long. Leaves ovate or ovate-rhomboid, serrate, base shortly tapering, apex acuminate, rather acute, lower surface glabrous except nerves, younger leaves pubescent, 4–10 cm long, 3.5–6.5 cm wide. Heads

discoid, subglobose, 8–10 mm across, peduncles 2–10 mm long; involucre subglobose, ca. 5 mm long, phyllaries in 3 series, imbricate, elliptic-lanceolate, acute, stipitate hairy. Flowers October to January, 75–80 per head; corolla white, funnel shaped, ca. 3 mm long. Achenes oblong, 5-angled, ca. 1.5 mm long, ca. 0.3 mm wide, acutely angled, black, glabrous. Pappus of ca. 10 capillary bristles, sordidly white, ca. 3 mm long.

Specimens examined. [N] Chiang Mai: Doi Inthanon (10-1979, Shimizu et al. T-18843 BKF, KYO; 1-1983, Koyama et al. T-32075 BKF, KYO; 8-1988, Koyama T-61089 KYO, TNS; T. Koyama et al. 15360 BKF, KYO), Pha Sam Tao (Smitinand 8787 BKF), Pha Hom Pok (Smitinand 4371 BKF).

Habitat: weedy in old clearings; 1300–2500 m.

Distribution: Nepal (6-1967, Hara et al. 3759 TNS; 4-1980, M. Nuno s.n. TNS; 5-1993, Kawasaki 721 TNS), Taiwan (1-1991, Yen 4616 TNS); widely adventive in many tropical and subtropical parts of the World.

Acknowledgement

Specimens examined are kept in the Harvard University Herbaria (A), Smithsonian Institution (US), U.S.A., Aarhus University (AAU), Denmark, Kyoto University (KYO), University of Tokyo (TI), Japan, in the Museum of Natural History at Copenhagen (C), Denmark, at Leiden (L), Netherlands, at Bangkok (BK, BKF), Thailand, in the Botanical Garden of Missouri (MO) and New York (NY), U.S.A. and Singapore (SING). Several type specimens in addition to general collections from Southeast Asia were very helpful in obtain the delimitation of each species. I wish to express my hearty thanks to the directors and the curators of the herbaria mentioned for their kind aid, and also to give my sincere gratitude to Dr. David E. Boufford for his linguistic corrections and to Mr. Tetsuya Kawasaki for his drawing.

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