THE EUPHORBIACEAE OF TAIWAN

by

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This is a taxonomic study of the family Euphorbiaceae of the island Taiwan. An attempt is made to account for every published binomial pertaining to this family as recorded from Taiwan in all botanical literatures, to trace and cite the sources of all these names and to clarify the often complicated synonymy. The work is mainly based on the specimens kept in the herbarium of Botanical Department, National Taiwan University, and is supplemented by material from the herbarium of Taiwan Forestry Research Institute, specimens of which are cited with the abbreviation "FRI".

As early as in 1906, Matsumura and Hayata in their "Enumeratio Plantarum Formosanarum" (in Journ. Coll Sci. Imp. Univ. Tokyo 22), recorded 24 genera, 68 species and 1 variety of Formosan Euphorbiaceae—including 5 cultivated genera and many cultivated species as well as the genus *Daphniphyllum*. Since that time, many genera and new species have been added to the flora of Taiwan, as a result of successive botanical explorations. Most of the new species are proposed by B. Hayata with a few by R. Kanehira, S. Sasaki, Y. Yamamoto and others. Later on, in 1936, S. Suzuki in Masamune's "Short Flora of Formosa", listed 25 genera, 84 species and 1 variety of euphorbiaceous plants. His list actually contains many synonyms, a few misidentified names and several introduced species.

In the present study, twenty-five genera of Euphorbiaceae are recognized as indigenous in Taiwan. Among which, *Liodendron*, is a genus confined to the Liukius and Taiwan, the other twenty-four genera all occur either in the China-Japanese region, or in the Malaya-Philippine region, or are of more or less wide distribution[1].

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SYSTEMATIC TREATMENT

Euphorbiaceae

Euphorbiaceae J. St. Hil. Exp. Fam. 2:276, 1905, *ex parte*; R. Brown, Gen. Rem. 24, 1814, *ex parte*; Benth. in Benth. & Hook. f. Gen. Pl. 3:239, 1880, *ex parte*; Pax in Engler & Prantl, Pflanzenfam. 3(5):1, 1890, *ex parte*; Pax & Hoffm. in op. cit.

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(1) H. Keng, Notes on the phytogeography of the Euphorbiaceae of Taiwan, in Quart. Journ. Taiwan Mus. vol. VII, Nos. 3 & 4, pp. 267-270, 1954.

2 Aufl. 19 c: 11, 1931.

Tricoccae Linn. Philios. Bot. 32, 1751.

Tithymala Adans. Famil. Pl. 346, 1763.

Euphorbiae A. L. Juss. Gen. Pl. Paris, 384, 1789.

Trewiaceae Lindl. Nat. Syst. Bot. ed. 2, 174, 1836.

Stilaginaceae Lindl. Veg. Kingd. 259, 1853.

Hippomaneae & *Phyllantheae* Agardh, Theor. Syst. Pl. 244, 1858.

Trees, shrubs or herbs, often abounding in milky juice, exceedingly various in habit. Leaves alternate, or opposite. rarely divided or compound, usually with stipules. Inflorescences very varied. Flowers usually small, always unisexuall. Perianth either simple and calyx-like or almost petal-like, usually small or double with 4 or 5 petals alternating with calyx-lobes, or sometimes entirely wanting in one or both sexes. Stamens various. Ovary superior, consisting of 3 or sometimes 2, or more than 3, united or 1-celled, or rarely 2-celled carpels, very rarely reduced to a single one. Styles as many as carpels, free or more or less united, entire or divided, the stigmatic surface usually lining their inner face. Ovules 1 or 2 in each carpel, pendulous from the inner angle of the cells, the funicles usually thickened into a cellular mass. Fruit either capsular, separating into as many 2-valved cocci as carpels, leaving a persistent axis, or more rarely succulent and indehiscent with the endocarp consisting of as many indehiscent nuts or cocci as carpels or cells. Seeds laterally attached at or above the middle, with or without an arillus or caruncle. Embryo straight, with flat cotyledons and a superior radicle in a fleshy albumen.

A very large family, containing about 300 genera and 6000 species, more abundant within the tropics, both in the New and the Old World, gradually diminishing in numbers in more temperate regions, and very few ascending into alpine or cold climates.

Key to the Formosan genera

A. Cells of ovary 2-ovulate.
  B. Calyx-lobes of the male flowers imbricate.
    C. Leaves undivided.
      D. Male flowers in spicate or racemose inflorescence.
        E. Stamens 2-5; drupe small, rugose, usually compressed.·····4. *Antidesma*
        E. Stamens 2, drupe large, smooth, ellipsoid.····· 17. *Liodendron*
      D. Male flowers solitary or in axillary fascicles.
        E. Styles erect or recurved, slender (except in *Glochidion*).
          F. Rudimentary ovary 0; fruit dry, capsular (except in some species of *Phyllanthus*), of 3 or more 2-valved cocci.
            G. Styles terminal, free or united below; disc present, of scales or a ring. ·····22. *Phyllanthus*
            G. Styles long, united in a column, rarely free; disc 0.·····14. *Glochidion*
            G. Styles minute, in the excaveted top of the ovary; male sepals thick, with white margins, imbricate.·····2. *Agyneia*

F. Rudimentary ovary evolute in the male flowers.
G. Fruit dry or fleshy with 3–6 indehiscent cocci; male calyx turbinate or hemispheric, the lobes minute.....6. *Breynia.*
G. Fruit of 6-cocci, epicarp fleshy; male calyx of 5 free sepals.....25. *Securinega.*
E. Styles or stigmas 2–3, dilated; fruit a drupe with 2–4 seeds.....10. *Drypetes*
C. Leaves trifoliate; flowers paniculate; fruit a berry..... 5. *Bischoffia*
B. Calyx-lobes valvate; ovary 2-celled; fruit a drupe.....7. *Bridelia*
A. Cells of ovary 1-ovulate.
B. Flowers not enclosed in a cup-like involucre.
C. Filaments inflexed in bud with the anthers recurved; flowers in short racemes; fruit a capsule..... 9. *Croton*
C. Filaments straight in bud.
D. Calyx of male flowers developed, imbricate or valvate in bud.
E. Sepals of male flowers valvate.
F. Filaments free.
G. Anthers 2-celled.
H. Anther-cells united at their bases only.
I. Anther-cells diverging from the base, not flexuous or vermiform; styles undivided.
J. Trees or shrubs; leaves alternate.....8. *Claoxylon*
J. Herbs; leaves opposite.....21. *Mercurialis*
I. Anther-cells flexuous, vermiform; styles very long, fimbriate..... 1. *Acalypha*
H. Anthers laterally attached by a connective.
I. Stamens 4–10; filaments slender; anther-cells oblong, parallel.....3. *Alchornea.*
I. Stamens numerous.
J. Capsules 2-celled; disc developed in female flowers.···20. *Melanolepis*
J. Capsules 3-celled; disc wanting in female flowers.·····19. *Mallotus*
G. Anthers 4-celled; anther-cells subglobose; stamens 6–10.···18. *Macaranga*
F. Filaments numerous, variously united in bundles.
G. Flowers in axillary spikes; capsules unarmed.....16. *Homonoia*
G. Flowers in terminal panicles; capsules echinate..... 23. *Ricinus*
E. Sepals of male flowers imbricate; fruit smooth, indehiscent.··· 13. *Gelonium*
D. Calyx-lobes minute and open in bud.
E. Male calyx compressed, 2-partite; stamens about 25..... 15. *Homalanthus*
E. Male calyx terete; stamens 3 or 2.
F. Racemes terminal; male calyx 2–3 lobed.....24. *Sapium*
F. Racemes lateral or terminal; male calyx 3-partite.....12. *Exoecaria*
B. Flowers enclosed in a cup-like involucre; male flowers of one pedicellate stamen, numerous, surrounding a single pedicellate female flower.....11. *Euphorbia*

1. *Acalypha* Linnaeus

Acalypha Linnaeus (Coroll. Gen. 19, 1737), Sp. Pl. 1003, 1753; Muell.-Arg. in DC. Prod. 15(2):799, 1866; Benth. & Hook. f., Pl. 3: 311, 1880; Pax in Engler & Prantl, Pflanzenf. 3(5):60, 1890; Pax & Hoffm in Engler, Pflanzenr. 85:12, 1924, in Engler & Prantl, Pflanzenf. 2 Aufl. 19c:134, 1931; Hurusawa in Journ. Fac. Sci. Univ. Tokyo III, 6(6):295, 1954.

Herbs, shrubs or trees. Leaves alternate, toothed or crenate, rarely entire. Flowers minute, in axillary or terminal spikes. Male flowers very minute, with small bracts. Female flowrs at base of male spikes or in separate spikes, often in the axil of large accrescent leafy bracts. Male flowers:sepals 4; stamens often 8, on a convex receptacle, the filaments free, the anther-cells divaricate, flexuous; disc and pistillode 0. Female flowers; sepals 3–5; ovary 3-celled, ovule 1 in each cell; styles filliform, long and laciniate or fimbriate. Capsule very small, of 3 bivalved cocci. Seeds subglobose.

Species 400, tropics and subtropics of both hemispheres.

Key to the Formosan species

A. Male and female flowers on the same spikes;
  B. Bracts of female flowers single;
    C. A herb, 10–20 cm. high; leaves rhomboid-ovate.····· 8. *A. minima.*
    C. A herb, 0.5–1 m. high; leaves lanceolate to ovate.····· 2. *A. australis.*
  B. Bracts of female flowers 1–2; a subshrub; leaves oblong-lanceolate. ·····
    ·····7. *A. Matudai.*
A. Male and female flowers on distinct spikes;
  B. Bracts of female flowers large, concealing the capsules;
    C. Female spikes 5–9 cm. long;
      D. Leaves glabrescent beneath;
        E. Leaves cordate, 11 cm. long; female spikes 5–6 cm. long.·····3. *A. caturus.*
        E. Leaves ovate, 18–23 cm. long; female spikes 7 cm. long.·····4. *A. formosana.*
      D. Leaves densely tomentose beneath, female spikes 9 cm. long.··· 1. *A. akoensis.*
    C. Female spikes 15–20 cm. long.·····6. *A. longi-acuminata.*
  B. Bracts of female flowers minute, the capsules naked;
    C. Leaves rounded-truncate at the base.····· 9. *A. suirenbiensis*
    C. Leaves cordate-truncate at the base.·····5. *A. hontauyuensis.*

1. ***Acalypha akoensis*** Hayata in Journ. Coll. Tokyo 30(1):266, 1911; Pax & Hoffm. in Engler. Pflanzenr. 85: 152, 1924; Masamune, Short Fl. Formos. 117, 1936.

Acalypha grandis Benth. var. *akoensis* (Hayata) Hurusawa in Journ. Fac. Sci.Univ. Tokyo III 6(6):301, 1954.

Taiwan: Sintsu, *Simada 3405*, *Suzuki 12417*; Kaoshung, *S. Suzuki 7133*; *Matuda 1138*; Hunchuen, *Hayata & Sasaki & 14386*, *Kawakami 14385*, FRI.

Hayata states that this species is "Near *A. grandis* Benth. and *A. stipulacea* Klotys., but differs from the former in having leaves which are cuneately cordate at

the base, and from the latter in the bracts of female flowers. The leaves of *A. grandis* are rounded or obtuse, but never cordate at the base."

2. ***Acalypha australis*** Linn. Sp. Pl. 1004, 1753; Muell-Arg. in Linnaea 34:41, 1865; Hayata in Journ. Coll. Sci. Tokyo 20:50, 1904; Pax & Hoffm. in Engl. Pflanzenr. 85:35, 1911.

   Acalypha australis Linn. var. *lanceolata* Hayata in Journ. Coll. Sci. Tokyo 20:51, 1904; Matusm. & Hay. in l. c. 22:365, 1906; Nakai in Tokyo Bot. Mag. 43:442, 1929; Hurusawa in Journ. Fac. Sci. Univ. Tokyo III, 6(6):301, 1954.

   Taiwan: throughout the island. *S. Suzuki 4850, Simidzu 3318, Simada 383, Masamune & Mori 11, 112, Ito 14387, Tyotaro 8315.*

   Distribution: pantropic.

3. ***Acalypha caturus*** Bl. Bijdr. 629, *excl. syn.* Linn., 1825; Muell.-Arg. in DC. Prodr. 15(2):805, 1866; J. J. Sm. in Meded. Dept. Laudbouw 10:510, 1910; Merr. Enum. Philip. Fl. Pl. 2:445, 1923.

   Acalypha kotoensis Hayata, Icon. Pl. Formos. 9:99, 1920; Masamune, Short Fl. Formos. 117, 1936. *syn. nov.*

   Acalypha grandis var. *kotoensis* (Hay.) Hurusawa in l. c. 6(6):301, 1954. *syn. nov.*

   Taiwan: confined to Lanyu or Botel Tobago, *Hosakawa 8061, 8067, 8074, Kano 3591, 3592.*

   Distribusion: Philippines, Sumatra, Java, Borneo to Celebes.

   The reduction was made by Mr. S. Sasaki (through personal communication).

4. ***Acalypha formosana*** Hayata in Journ. Coll. Sci. Tokyo 30:267, 1911; Pax & Hoffm. in Engl. Pflanzenr. 85:150, 1924; Masamune, Short Fl. Formos. 117, 1936.

   Acalypha grandis Benth. var *formosana* (Hay.) Hurusawa in l. c. 6(6):301, 1954.

   Taiwan: Taichung, *Mori 936,* Mt. Randai, *Kawakami & Mori 14401,* FRI Nantau, *Ito 14384, 14398* FRI, Locality unknown, *Sasaki 1410.*

   According to Hayata, this species is "Near *A. grandis* Benth., but differs from it in having very obscurely serrulate leaves and very smaller bracts of female flowers".

5. ***Acalypha hontauyuensis*** H. Keng in Journ. Washington Acad. Sci. 41(6):204, 1951; Hurusawa in Journ. Fac. Sci. Univ. Tokyo III, 6(6):302, 1954.

   Taiwan: Lanyu or Botel Tobago: *Hosokawa 8047, 8165,* Liu, Keng *et al. 187, 528*).

   This species and *A. suirenbiensis* Yamamoto are characterized by the sessile female flower with very minute and nonaccrescent bracts, while in the other species of the genus the female flowers when sessile are generally provided with large and showy bracts, usually enclosing the mature capsules.

6. ***Acalypha longi-acuminata*** Hayata, Icon. Pl. Formos. 9:100, 1920; Masamune, Short Fl. Formos. 117, 1936.

   Acalypha grandis Benth. var. *longi-acuminata* (Hayata) Hurusawa in l. c. 6(6): 301, 1954.

   Taiwan: Kaoshung, *Matsuda 14402 14409,* FRI; Hungchuen, *Ito 14410,* FRI.

7. ***Acalypha Matudai*** Hayata, Icon. Pl. Formos. 9:100, 1920; Masamune, Short Fl. Formos. 117, 1936; Hurusawa in l. c. 6(9): 301, 1954.

Taiwan: Confined to Hungchuen Peninsula. Fansulio, *Matsuda 14414*, FRI, (isotype,); Mt. Buisan, *Matsuda 1139*.

According to Hayata, this species "Somewhat resembles *A. Dalzellii* Hook. f. (in Fl. Brit. Ind. 5:414), but differs from it in the denticulate bracts with much longer male bracts."

8. ***Acalypha minima*** H. Keng sp. nov. (Sect. Pancibracteatae Muell.-Arg.)

Herba annua, ad 10–20 cm. alta; caulis basi lignescens, apice villoso-pubescens. Folia subrhombeo-ovata, 0.5–1.5 cm. longa, 0.3–1 cm. lata, apice acuta, basi cuneata, margine crenata, supra parce setoso-villosa. Inflorescentiae ignoti. Bracteae fructiferae triangulari-ovatae, cordatae, 4.5 mm. longae, 6 mm. latae, virides; margine dentatae, setoso-villosae et glandulis. Capsula 3-sulcata, 3.5 mm. longa, sublaevia.

Taiwan: Liukiu-yu, Kaoshung, *T. Hosokawa 2056*, (Typus), Aug. 3, 1930.

A species characterized by the very small leaves and capsules, the setaceous-villose leaves and fruit-bracts.

9. ***Acalypha suirenbiensis*** Yamamoto in Journ. Soc. Trop. Agric. Formos. 5:178, 1953; Masamune, Short Fl. Formos. 117, 1936.

A subshrub; branchlets densely pubescent. Leaves chartaceous, ovate, 12–20 cm. long, 8–15 cm. wide, the apex caudate-acuminate, the base obtuse or truncate-rounded, the margins subentire, the lower surface glabrescent, densely hirsute at the axils of secondary veins; petioles 8–15 cm. long, tomentose. Female spikes very slender, axillary, solitary, 20–25 cm. long; peduncles 4–5 cm. Female flowers very remotely arranged on the rachis, sessile, 1-bracteate, the bracts small, ovate, 1 mm. long, densely hirsute on the external surface; sepals 3, ovate, 1 mm. long, concaved; styles 2–5 mm. long, finely branched; ovary depressed-globose, 1.5 mm. wide, 1.4 mm. long, pubescent. Capsules 3-lobed, 4 mm. wide. Seeds ovoid, 2 mm. long, 1 mm. wide.

Taiwan: Taitung, *Yamamoto 813*, (Typus), Whalinkong, *T. Suzuki 19041*, *S. Sasaki 1409*.

Yamamoto's original description is based on a juvenile branch. The description given here is based on Suzuki and Sasaki's collection.

A species characterized by the long slender female spikes with very remotely arranged sessile flowers, and by the densely hirsute hairs at the axils of the secondary veins on the lower surface of the leaves.

2. ***Agyneia*** Linnaeus

Agyneia Linnaeus, Mant. 2:161, Endl. Gen. Pl. 1119, 1840; Benth. & Hook f. Gen. Pl. 3:271, 1880; Pax in Engler & Prantl, Pflaneznf. 3(5):24, 1890; Pax & Hoffm. in Engler, Pflanzenr. 81:213, 1922, in Pflanzenf., 2 Aufl. 19 c:71, 1931.

Agynaia Hassl. in Flora 25:40, 1842.

Annual or perennial glabrous herbs. Leaves small, entire, alternate. Flowers minute,

apetalous. Male flowers in axillary clusters; females larger. Male flowers: sepals 6, gland-dotted, thick, with white edges; disc 6-lobed; stamens 3, central, the filaments connate, pistillode O. Female flowers: sepals acute, not white-edged; ovary ovoid, truncate, the ovules 2 in a cell, the styles very short, sunk in the top of ovary. Capsule splitting into 2-valved cocci.

Species 3 or so, India eastward to Taiwan.

1. ***Agyneia taiwaniana*** H. Keng in Journ. Washington Acad. Sci. 41(6):200, 1951; Hurusawa in Journ. Fac. Sci. Univ. Tokyo III, 6(6):337. 1954.

Agyneia bacciformis A Juss. misapplied by Hayata, Icon. Pl. Formos. 9:93, 1920; Masamune, Short Fl. Formos. 118, 1936.

Taiwan: Aboundant on the west coast of southern part; Tainan, *K. Mori 110*, *K. Mori 530*, *Soma 14420*, FRI, *H. Keng 322*.

A species formerly identified by Dr. Hayata as *A. bacciformis*, which is a species widely distributed over southern China(?), Java, Ceylon, India and Maritius. No authentic Indian specimens have been examined, But when compare with the descriptions of *A. bacciformis* by Hooker (Fl. Brit. India 5:285, 1890) and Pax and Hoffmann (l. c. 213, *f. 18*), this species appears to differ chiefly in the cylindric-obconical ovary and the smaller fruits. The ovary of *A. bacciformis* is broadly ovoid and the fruit is about 6 mm. long and 5 mm. wide. The sizes of the floral parts of both sexes also do not agree in these two species.

3. *Alchornea* Swartz

Alchornea Swartz, Prodr. 98, 1788, Pl. Ind. Occ. 2:1153, *t. 24*, 1880; Muell-Arg. in DC. Prodr. 19(2):899, 1866, *ex parte*; Benth. & Hook. f. Gen. Pl. 3:314, 1880 *ex parte*; Pax in Engler & Prantl, Pflanzenf. 3(5):55, 1890, *ex parte*; in Pflanzenr. 63:220, 1914; Pax & Hoffm. in l. c. 2 Aufl. 19 c.:120, 1931; Hurusawa in Journ. Fac. Sci. Univ. Tokyo III 6(6):302, 1954.

Shrubs or trees, pubescent. Leaves alternate, entire or toothed, stipulate and usually glandular at the base. Flowers in terminal or axillary spikes or racemes, simple or panicled, apetalous. Disc 0. Male flowers: calyx globose, splitting into 2–4 valvate segments; stamens 6–8 or indefinite, the filaments free or connate at base; pistillode 0. Female flowers: sepals 3–6, imbricate; ovary 2- or 3- rarely 4-celled; styles linear often very long, entire or bifid. Capsule of 2 or 3 bivalved cocci, crustaceous. Seeds subglobose.

Species about 50, all tropics, a few in Asia.

1. ***Alchornea trewioides*** (Benth.) Muell-Arg. var. ***formosae*** (Muell.-Arg.) Pax & Hoffm. in Engler, Pflanzenr. 63:248, 1914; H. Keng in Journ. Washington Acad. Sci. 4(16):204, 1951.

Alchornea formosae Muell.-Arg. in Sched.

Alchornea kelungensis Hayata, Icon. Pl. Formos. 9:103, 1920; Kanehira, Formos. Tr. rev. ed. 329, 1936; Masamune, Short Fl. Formos. 118, 1936.

Alchornea liukiuensis Hayata var. *formosae* (Muell.-Arg.) Hurusawa, in l. c. 303,

1954.

Taiwan: Taipeh: *Sasaki 14423*, *Simada 1145*; Keelung, *Matsuda 1144*.

This variety differs from the typical form of the species from the southern China chiefly in the shorter (6–8 mm. long) and usually 2–3 lobed styles. In the typical form, the styles are longer (8–12 mm. long) and entire at the apex.

4. *Antidesma* Linnaeus

Antidesma Linnaeus, Sp. Pl. ed. 1, 1027, 1753; Muell.-Arg. in DC. Prodr. 15(2):247, 1866; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26: 430, 1894; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:27, 1904; Pax. & Hoffm. in Engler, Pflanzenr. 81:107, 1922, in Engler & Prantl, Pflanzenf. 2 Aufl. 19 c:54, 1931; Hurusawa in Journ. Fac. Sci. Univ. Tokyo III, 6(6): 324, 1954.

Trees or shrubs. Leaves entire, alternate. Spikes or racemes terminal, solitary or in panicle. Male flowers very small, calyx-lobes 3–5, slightly imbricate in the bud; stamens 2–5, around or inserted on the disc, the anthers 2-celled, the connectives thickened, the cells globose; disc entire or lobed; rudimentary ovary minute or 0. Female flowers: calyx as in male; ovary 1–2 celled, the stigmas 2–4, bifid, the ovules 2 per cell. Fruit a compressed drupe crowned with persistent stigmas.

Species about 160, mainly tropical Asia, Africa and Australia.

Key to the Formosan species and varieties

A. Rudimentary ovary minute.
  B. Leaves lanceolate; male sepals lanceolate, glabrous. ..... 1. *A. japonicum* var. *acutisepalum*
  B. Leaves obovate-oblong; male sepals rounded-ovate, hirsute. ..... 3. *A. pentandrum* var. *barbatum*

A. Rudimentary ovary 0.
  B. Leaves lanceolate-eeliptic, chartaceous. ..... 2. *A. japonicum* var. *desiflorum*
  B. Leaves obovate, coriaceous. ..... 4. *A. hiiranense*

1. ***Antidesma japonicum*** Sieb. & Zucc. var. ***acutisepalum*** (Hayata) Hurusawa, Iconogr. Pl. Asiae Orient. 4(2):346, 1941, in Journ. Fac. Sci. Univ. Tokyo III, vol. 6(6):326, 1954.

   Antidesma acutisepalum Hayata, Icon. Pl. Formos. 9:97, 1920.

   Antidesma japonicum Sieb. & Zucc. misapplied by Kanehira, Formos. Tr. rev. ed. 1936.

   Taiwan: Known only from the type locality, Yuchi, Nantao, *Hayata 14443* (FRI, isotype).

   The variety, which has been listed as synonym of *A. japonicum* by Kanehira, is characterized by the presence of rudimentary ovary in the male flowers. The acute sepals in the flowers of the isotype examined, are sometimes bifid at the apex.

2. ***Antidesma*** Sieb. & Zucc. var. ***densiflorum*** Hurusawa, l. c. 4(2):347, 1941, and in l. c. 6(6):326, 1954.

   Antidesma japonicum Sieb. & Zucc. misapplied by Henry, List Pl. Formos. 83,

1896; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:27, 1904; Kanehira, Formos. Tr. rev. ed. 331, *f. 285*, 1936, *excl. syn.*

Taiwan: northern part: *T. Suzuki 6823, 14203, 16753, 18409, Fukuyama 19251, Kudo & Sasaki 887, Nurakami 97, Nakamura 2024, Masamune 2112, 2611*; central part: *Kanehira & Sasaki 14459, Kawakami 14456* (FRI).

This variety differs from the typical form of the species of Japan in the much thinner, smaller and narrower leaves and the shorter, rarely branched racemes.

3. ***Antidesma pentandrum*** (Blanco) Merr. var. ***barbatum*** (presl) Merr. in Philip. Journ. Sci. Bot. 9:463, 1914; Pax & Hoffm. in Engler, Pflanzenr. 81:126, 1922.

Antidesma barbatum Presl, Epim. Bot. 233, 1851.

Antidesma kotoensis Kanehira, Formos. Tr. 472, rev. ed. 329, *f. 284*, 1936; Hayata, Icon. Pl. Formos. 10:30, 1921.

Antidesma rotundisepalum Hayata, Icon. Pl. Formos. 9:98, 1920.

Antidesma pentandrum Merr. misapplied by Croizat & Hara in Journ. Jap. Bot. 16:314, 1940, *syn. nov.*

Antidesma pentandrum Merr. var. *rotundisepalum* (Hayata) Hurusawa in Journ. Fac. Sci. Univ. Tokyo III, 6(6):327, 1954, *syn. nov.*

Taiwan: Southern part: Kaoshung, *Sasaki 14463* (FRI) Hungchuen, *Yamada 1145, 14474* (FRI, holotype of *A. kototensis* Kanehira), *Matsuda 1143, Hibino & Suzuki 12481, 12516, Mori 778, 779*, Botel Tobago, *Hosokawa 8163, Kano 8263*; eastern part:Hwaling, *Hosokawa 5026.*

Distribution: N. Philippines.

Croizat & Hara (1940) identify this plant as *A. pentadrum.* This variety, however, is not sharply distinct from the typical from of the species. According to Merrill, it differs chiefly in the adult leaves being nearly glabrous. The distribution of the species is confined to the Philippines, while this variety occurs in both N. Philippines and S. Taiwan.

4. ***Antidesma hiiranense*** Hayata, Icon. Pl. Formos. 9:98, 1920; Masamune, Short Fl. Formos. 118, 1936.

Antidesma japonicum Sieb. & Zucc. misapplied by Kanehira, Formos. Tr. rev. ed. 330, 1936.

Antidesma pentandrum Merr. var. *hiiranense* (Hayata) Hurusawa in l. c. 6(6):328, 1954, *syn. nov.*

Descriptio Additamentum: Racemi ♀ ramosi, bracteae lanceolato-triangulares. Flores ♀ pedicellati, calyx 4-partitus, lobis oblongo-lanceolatis, acutis, 1 mm. longis, 0.4 mm. latis; ovarium glabrum, ovoideum, 1.5 mm. longum, 0.8 mm. latum, stigmata terminalia; discus annularis.

Taiwan: Southern part: Hiiranshan, Hungchuen, *Hayata & Sasaki 14449, 14450* (FRI, isotype), Kuskus, Hungchuen, *Hayata & Sasaki 14451* (FRI); eastern part: Teyokakurai, Dahwu, Taitung, *Tyotaro 3212.*

A species near *A. japonicum*, but differs from it in the much thicker leaves which are obovate, shortly caudate and obtuse at the apex and also in the shape and size

of female floral parts. The added description of the female flowers and racemes presented here are based on Tyotaro's collection.

5. *Bischoffia* Blume

Bischoffia (*Bischofia*) Blume, Bijdr. 1168, 1825; Muell.-Arg. in DC. Prodr. 15(2):478, 1866; Benth. & Hook. f. Gen. Pl. 3:284, 1880; Pax in Engl. & Prantl, Pflanzenfam. 3(5):33, 1890; Pax & Hoffm. in l. c. 2 Aufl. 19 c:78, 1931.

A glabraous tree. Leaves alternate, 3-foliolate; leaflets often crenate. Flowers on axillary or lateral panicled racemes, minute, dioecious. Male flowers scattered or clustered, the female flowers longer pedicellate. Male flowers: sepals 5, concave, obtuse, imbricate, concealing the anthers; stamens 5, the filament short, the anthers large with parallel cells; disc 0, pistillode short, broad. Female flowers: sepals ovate, caducous; staminodes 5, small or 0; ovary exserted, 3-4-celled; styles long, linear, stout, entire; ovules 2 in each cell. Fruit globose, fleshy, with 3-4 cells lined with a 2-valved endocarp. Seeds turgidly oblong.

Species 1, southeastern Asia and the Pacific Islands.

1. ***Bischoffia javanica*** Blume, Bijdr. 1168, 1825; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26:428, 1894; Henry, List Pl. Formos. 83, 1896; Pax & Hoffm. in Engler, Pflanzenr. 81:313, *f. 26*, 1922; Kanehira, Formos. Tr. rev. ed. 331, *f. 286*, *pl. 43*, 1936.

Taiwan: Throughout the island, very common in forests at low and medium altitudes, widely cultivated in gardens and avenues. Northerns part: *Sasaki 14471*, *14473*, *S. Suzuki 8192*; *Nonoka & Mori 8193*; *Masamune & Suzuki 8196*; *Yamamoto 8195*; *Kudo & Suzuki 8198*; Central-southern part: *Kudo & Sasaki 15443*, *Mori 316*; *Hosokawa 1958*; *S. Suzuki 6354*; *Kudo & Suzuki 16043*; Botel Tobago, *Hanada 8201*.

Distribution: India, Malaysia, S. China, Liukiu to Polynesia and Australia.

6. *Breynia* Forster

Breynia Forster, Char. Gen. 146, *t. 73*, 1776; Muell.-Arg. in DC. Prodr. 15(2):438, 1866; Benth. & Hook. f. Gen. Pl. 3:276, 1880; Pax in Engler & Prantl, Pflanzenfam. 3(5):34. 1890; Pax & Hoffm. in l. c. 2 Aufl. 19 c:59, 1931.

Shrubs or small trees. Leaves small, alternate. Flowers minute, solitary or axillary in clusters. Male flowers: calyx turbinate or hemispheric, truncate, the rim often thickened and lobulate; stamens 3, the filaments united into a column, the anthers adnate to the column; pistilloide 0. Female flowers: calyx hemispheric, turbinate or rotate, the lobes short, broad, in fruit often enlarged; ovary globose, truncate or depressed at top, fleshy, 3-celled; ovules 2 in a cell; styles 3, united into a column or sessile, 2-lobed or the stigmas immersed in a depression. Fruit succulent, red, globose or depressed at the top, indehiscent with 3-6 trigonous cocci.

Species about 30, Africa, Asia and Polynesia.

Key to the Formosan species

1. Calyx increasing in size in fruit much widened..... 1. *B. accrescens.*

1. Calyx not or slightly increasing in size in fruit
   2. Gynophore much elongated; fruiting calyx scarcely enlarged.··· 2. *B. formosana.*
   2. Gynophore not elongated; fruiting calyx slightly enlarged.····· 3. *B. officinalis.*

1. ***Breynia accrescens*** Hayata in Journ. Coll. Sci. Tokyo 20:22, *t. lH*, 1904, *excl.* form b; Matsum & Hay. in l. c. 20:341, 1906, *p.p.*; Kaneh., Formos. Tr. rev. ed. 332, 1936, p. p..

   Breynia rhamnoides Muell.-Arg. misapplied by Hayata in Journ. Coll. Sci. Tokyo 20:22, 1904, quoad pl. Formos..

   Taiwan: Tainan, *Yasukawa 1022*; Hunchuen, *Hibino & Suzuki I2708, T. Suzuki 5091*; Botel Tobago, *Hosokawa 8082.*

   Geographically this species seems to be confined to the southern part of this island and Botel Tobago. The description and illustration of Hayata's *Breynia accrencens form b,* which is based on Makino's collection from Tamsui (N. W. of Taipeh, the type locality of *B. offocinalis*), is actually a specimen of *B. officinalis.*

2. ***Breynia formosana*** (Hayata) Hayata, Gen. Ind. Fl. Fromos. 65, 1916; Kanehira, Formos. Tr. rev. ed. 332, 1936.

   Breynia stipitata Muell.-Arg. var. *formosana* Hayata in Journ. Coll. Sci. Tokyo 20:23, *t. 2A & 2B*, 1904.

   Taiwan: Taipeh and its vicinity (*S. Suzuki 1200, I201, 1202, 1990*; *S. Suzuki 4629*; *Yamamoto 1032.*

   This species is confined to a small region in the northern part of the island. The only specimen referred to this species, *Yamada 14489* from Kuraru, Hengchuen Penninsula (cf. S. Sasaki, Cat. Govern. Herb. 301, 1930), in the herbarium of the Forestry Research Institute, is actually a specimen of *Securinega virosa* Pax. & Hoff.

3. ***Breynia officinalis*** Hemsley in Journ. Linn. Soc. Bot. 26:428, 1894; Hayata in Journ. Coll. Sci. Tokyo 30(1): 256, 1911; Kanehira, Formos. Tr. rev. ed. 332, 1936.

   Breynia accrescens from *b.* Hayata in in Journ. Coll. Sci. Tokyo 20: 22, *t. 11*, 1904, *syn. nov.*

   Taiwan: Taipeh, *Simada 1146*; *Murakami 104. Kudo 661, Nonaka & Mori 6162*; *Sasaki 14488*, Kaoshung, *Matsuda 1147, Hosokawa 1956.*

7. ***Bridelia*** Willdenow

Bridelia Willd. Sp. Pl. 4:978, 1805; Muell.-Arg. in DC. Prodr. 15(2):493, 1866; Benth. & Hook. Gen. Pl. 3:267, 1880; Pax in Engler & Prantl, Pflanzenfam. 3(5):35, 1890; Jablonszky in Engler, Pflanzenr. 65:54, 1915; Pax & Hoffm. in Engler & Prantl, l. c. 2 Aufl. 19 c:82, 1931.

Shrubs or small trees. Leaves alternate, entire. Flowers small, unisexual, in axillary spicate clusters, bracteate, sessile or very shortly pedicellate. Calyx 5-cleft, the lobes valvate; petals much smaller; disc broad-pulvinate or adnate to the calyx in the male, conical-truncate, membraneous and enclosing the ovary in the female; stamens 5, the filaments connate below with a pistillode on the columnar base, free above, spreading; ovary 2-celled; ovules 2 in a cell; styles 2, forked. Drupe with 1 or 2

one-seeded cocci or pyrenes.

Species 30, tropics of Africa, Asia, and Australia.

Key to the Formosan species

1. Leaves oblong-lanceolate, 7–10 cm. long, the apex acuminate; fruit ovoid, 9–11 mm. long, 7–8 mm. in diameter.····· 1. *B. Balansae*
1. Leaves oblong, 3–6 cm. long, the apex obtuse; fruit ovoid-globose, 5–7 mm. long, 5 mm. in diameter, deeply 2-lobed.·····2. *B. monoica.*

1. ***Bridelia Balansae*** Tutcher in Journ. Linn. Soc. Bot. 37:66, 1905; Jabl. in Engl. Pflanzenr. 65:72, 1915; Croizat & Hara in Journ. Jap. Bot. 16:314, 1940; Hurusawa in Journ. Fac. Sic. Univ. Tokyo III, 6(6):321, 1954.

Bridelia pachinensis Hayata in Matsum. & Hay. in Journ. Coll. Sci. Univ. Tokyo 22:362, 1906, ***nom. nud.***

Bridelia ovata Decaisne misapplied by Hayata in l. c. 30(1):263, 1911; Kanehira, Formos. Tr. rev. ed. 333, *f. 288*, 1936.

Bridelia pubescens Kurz. misapplied by Jablonszky, l. c. 73, 1915, quoad specim. Formosa.

Flores ♂ ad axillas, glomeratus, bracteatis numerosis, aperientes 5–6 mm. diametro aequantes; sepalis coriaceous, triangularo-ovates, demum patulis, intus parce puberulentis, 3 mm. longis, 2. 2 mm. latis, apice acutis; petalis scarioso-chartaceus, ovato-deltoides, 1.5 mm. longis, 1 mm. latis; stamina 5, antherae orbiculariae, 0.6 mm. longae, loculis parallitis; filamentis in medio disco base in columnam connatis, superne liberis, 0.8 mm. longis; rudimentum ovarium ovoidum, 1.5 mm. longum, ad apicem columnae styliforme.

Taiwan: Northern part, *T. Suzuki 7588, 5130, Hayata 14525, Simidzu 2274, 2343, Sasaki 14520*, FRI, *Kawakami & Sasaki 14521*, FRI, *Konishi 14523, FRI, Kanehira &Sasaki 14534, Simada 14526*, FRI, *Kawakami & Mori 14527*, FRI; Southern part, *collector unknown 14258*, FRI, *Yamada 14259*, FRI, *Matsuda 1469.*

Distribution: Indo-china, S. China and Liukiu.

This plant has been misidentified by Hayata and Jablonszky as *B. ovata* and *B. pubescens* respectively. According to Croizat and Hara, *B. pubescens* differs from this species in having leaves pubescent along the nerves beneath, and *B. ovata* differs in having depressed globose fruits with 2 locules and glabrous calyx.

2. ***Bridelia monoica*** (Lour.) Merr. in Philip. Journ. Sci. 13 Bot. 142, 1918, Enum. Philip. Fl. Pl. 2:423, 1923; Kanehira, Formos. Tr. rev. ed. 333, *f. 287*, 1936.

Clutia monica Lour., Fl. Cochinch. 638, 1790.

Bridelia tomentosa Blume, Bijdr. 2:579, 1825; Henry, List Pl. Formos. 82, 1896; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:30, 1904; Matsum. & Hay. in l. c. 22:362, 1906.

Bridelia Kawakamii Hayata in l. c. 362, 1906.

Bridelia monoica Marr. var. *Kawakamii* (Hayata) Hurusawa in Journ. Fac. Sci.

Univ. Tokyo III, 6(6):321, 1954. *syn. nov.*

Taiwan: Southern part: *Kudo & Sasaki 15445, Mori 388, S. Suzuki 7205, Matsuda 1167, Mori 42, Kudo & Suzuki 16044, 15797, Masamune 1623, Matsuda 1148, 1191, Sasaki 14516, Hibino & Suzuki 12544, T. Suzuki 6072.*

Distribution: India, S. China, Philippines to New Guinea.

8. *Claoxylon* Jussieu

Claoxylon Juss. Euphorb. Tent. 43, 1824; Benth. & Hook. f. Gen. Pl. 3:309, 1880 ***ex parte***; Pax in Engl er, Pflanzenr. 63:100, 1914; Pax & Hoffm. in Engler & Prantl, Pflanzenfam. 2 Aufl. 19c:111, 1931.

Claoxylon Sect. ***Gymnoclaoxylon*** & Sect. ***Euclaoxlon*** Muell.-Arg. in DC. Prodr. 15(2): 780, 781, 1866; Pax in Engler, Pflanzenfam. 3(5):48, 1931.

Shrubs or small trees. Leaves alternate, membranaceous, long-petiolate, oblong or ovate, toothed or entire. Flowers small or minute, in axillary or lateral spikes or racemes. Male flowers: Calyx subglobose, of 3–4 valvate segments; petal and disc none; stamens many, on or around a central receptacle, often mixed with glands or long linear scales, the filaments free, the cells divaricate; pistillode 0. Female flowers: calyx as in male; disc none or of 5 petal-like hypogynous scales, alternate with the carpels; ovary 3-celled; ovule 1 in each cell; styles short, entire, fringed. Capsule of three 2-valved cocci. Seeds subglobose, the aril red.

Species about 60, tropical regions of the Old World.

1. ***Claoxylon brachyandrum*** Pax et Hoffm. in Engler, Pflanzenr. 63:115, 1914; Merr. Enum. Philip. Fl. Pl. 2:430, 1923.

   Caloxylou kotoensis Hayata, Icon. Pl. Formos. 9:101, 1920; Kanehira, Formos. Tr. rev. ed. 334, *f. 289*, 1936.

   Claoxylon rubescens Miq. misapplied by Hayata, Gen. Ind. Fl. Formos. 65, 1916.

   Discripto Additamentum: Capsula testaceous-viridis, tridyma, 6 mm. longa, 8 mm. lata, minute hirtuso-pubescenta.

   Taiwan: known only from Hungchuen Peninsula and Botel Tobago. Hungchuen, *Hurukawa 14532*, FRI; Botel Tobago, *Hosokawa 9880, Kano 3591, 3592, Masamune 4081.*

   Distribution: Philippines (Batan Islands to Mindanao).

   The reduction of *C. kotoensis* to the synonym of *C. brachyandrum* was made by Mr. S. Sasaki (through personal communication). The additional description of the fruit is based on *Masamune 4081*, May 10, 1943.

9. *Croton* Linnaeus

Croton Linnaeus (Gen. Pl. ed. 1, 288, 1737), Sp. Pl. ed. 1, 1004, 1753; Muell.-Arg. in DC. Prodr. 15(2):512, 1886; Benth. & Hook. f. Gen. Pl. 3:293, 1880; Pax & Hoffm. in Engler, & Prantl, Pflanzenfam. 2 Aufl. 19c:83, 1931.

Shrubs or trees. Leaves alternate, biglandulate at the base. Flowers small, solitary or clustered in a terminal receme with small bracts. Male flowers: calyx 4–6 lobed,

the lobes imbricate or subvalvate; petals as many; disc-glands as many and opposite to the sepals; stamens indefinite, on hairy receptacle, free, incurved in bud. Female flowers: sepals more ovate than in male; petals smaller or none; vary 2–4 celled; ovules 1 in each cell; styles long and slender. Capsule of three 2-valved cocci. Seeds smooth, the testa crustaceous.

Species very numerous, about 600, tropics of the world.

Key to the Formosan species

1. Leaves silvery scaly beneath; racemes 4–5 cm. long; fruit depressed globose, 0.8–1 cm. wide, 3-lobed..... 1. *C. cascarilloides.*
2. Leaves glabrouse, not silvery beneath; racemes 8–11 cm. long; fruit oblong-ovoid, 1–1.5 cm. wide..... 2. *C. Tiglium.*

1. ***Croton cascarilloides*** Raeush. Nomencl. ed. 3, 280, 1797; Merr. in Trans. Amer. Philos. Soc. n. ser. 24 (pt. 2):234, 1935.

Croton Cumingii Muell.-Arg. in Linnaea 34:101, 1865, in DC. Prodr. 15(2):566, 1866; Ganep. in Lecomte, Fl. Gen, Indo-china 5:264, 1925; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:25, *t. 3B*, 1904; Kanehira, Formos. Tr. rev. ed. 334, 1936.

Taiwan: Throughout the island; very common in the coastal regions of eastern and southern part. Northern part, *Simada 14532, 14533, 14535*, FRI, *Sasaki 14534*, FRI; Central-southern part, *Yasukawa 3764, Yasuikitaro 73, Matsuda 14547*; eastern part, *Simitzu 3763*, Hungchuen, *T. Suzuki 6115, 5961, Kudo & Suzuki 15744, 15798, 16045, Matsuda 1152, Hibino & Suzuki 12512.*

Distribution: Malaysia, S. China to the Philippines.

2. ***Croton Tiglium*** Linn. Spec. Pl. 1:1004, 1753; Hayata in Journ. Coll Sci. Univ. Tokyo 20:36, *t. 3C*, 1904; Suzuki in Masamune, Short Fl. Formos. 119, 1936.

Taiwan: Central-southern part, *Kanehira & Sasaki 15556*; *Mori 5155*; Eastern part, *Kobavasi 14565*, FRI.

A species cultivated and naturalized in Formosa, native of Indo-Malayan.

10. ***Drypetes*** Vahl

Drypetes Vahl, Ecolog. Amer. 3:49, 1810; Muell.-Arg. in DC. Prodr. 15(2): 453, 1866; Benth. & Hook. f. Gen. Pl. 3:278, 1880; Pax in Engler & Prantl, Pflanzenf. 3(5): 25, 180, et in Pflanzenr. 81:229, 1922; Pax & Hoffm. in l. c. 2 Aufl. 19 c:72, 1931.

Cyclostemon Blume, Bijdr. 579, 1829.

Trees, or shrubs. Leaves entire or crenulate, the base often inaequilateral. Flowers axillary, clustered, apetalous, pedicellate, Male flowers: sepals 4–6, broad, imbricate; stamens few or many, inserted around a flattened disc, the filaments free, short; pistillode minute or 0. Female flowers: sepals as in male but disc annular or 0; ovary 2–4-celled; styles long or 0; stigmas dilated, fleshy or connate into a peltate disc. Fruit subglobose or ovoid, indehiscent; pericarp thick, 2-celled. Seed 1 in a cell.

Species about 160, Africa, Indo-Malaysia and Tropical America. Among the following 3 Formosan species, 2 of them are probably endemic. The character of these species are difficult to ascertain without good specimens of both sexes of flowers and fruits.

Key to the Formosan species

A. Leaves chartaceous ..... *D. karapinensis*

A. Leaves coriaceous.

B. Leaves thin coriaceous, oblong-lanceolate, not falcate..... *D. hieranensis*

B. Leaves thick coriaceous, oblong-ovate, strongly falcate..... *D. littoralis*

1. ***Drypetes karapinensis*** (Hayata) Pax in Engler, Pflanzenr. 81:248, 1922; Kaneh. Formos. Tr. rev. ed. 337, 1936.

Cyclostemon karapinensis Hayata, Icon. Pl. Formos. 5:198, 1915.

Taiwan: Mt. Arishan, inter Karapin and Suisyaryo, *Hayata & Sasaki 14577, 14578* (isotype, FRI), Apr. 23, 1914; Mt. Arishan, *Kawakami & Sasaki; 14476;* Taitung, Nt. Toranshan, *Sasaki 14479, 14480.*

2. ***Drypetes hieranensis*** (Hayata) Pax in Engler, Pflanzenr. 81:248, 1922; Kaneh. Formos. Tr. rev. ed. 336, 1936.

Cyclostemon hieranensis Hayata, Icon. Pl. Formos. 6:42, *t. 8,* 1916.

Drypetes karapinensis Pax. var. *hieranensis* (Hayata) Hurusawa in Journ. Fac. Sci. Univ. Tokyo III vol. 6 (6): 334, 1954.

Taiwan: Hungchuen, Hiiranshan, *Sasaki 14570, 14572* (isotype, FRI), Feb. 1912; Botansya, *Sasaki 14561.*

Hayata writes that the species is near *Cyclostemon karapinensis* but differs from it by the much more acuminate and thicker leaves.

3. ***Drypetes littoralis*** (C. B. Robinson) Merr. in Philip. Journ. Sci. 29:380, 1926.

Cyclostemon littoralis C. B. Robinson in Philip. Journ. Sci. (Bot.) 3:198; 1908; Merr., Enum. Philip. Fl. Pl. 2:407, 1923.

Cyclostemon Yamadai Kanehira & Sasaki in Sasaki, Cat. Govern. 303, 1930, *nom. nud.*

Drypetes Yamadai (Kaneh. & Sas.) Kaneh. & Sasaki in Trans. Nat. Hist. Soc. Formos. 21:145, 1931, *nom. seminud.*; Kaneh. Formos. Tr. rev. ed. 339, *f. 293.* 1936, *nom. seminud.*

Drypetes falcata Pax misapplied by H. Keng in Journ. Washington Acad. Sci. 41 (6): 203, 1951.

Taiwan: Kuraru, Hungchuen, *Yamada 14575* (syntype of *D. Yamadai,* FRI), *Konishi 14574* (FRI), *Matuda 112,* Olunbi, Hungchuen, *Hibino & Suzuki 12586, 12702, Kimiya 14575* (FRI), South Cape, *Kudo & Suzuki 15815.*

Distribution: the Philippines.

The identification was made by Mr. S. Sasaki (through personal communication). The original description was based on the flowering specimens. All the specimens cited above are either sterile or in fruiting. However, they agree in all the characters of vegetative parts.

11. *Euphorbia* Linnaeus

Euphorbia (Linnaeus, Gen. Pl. ed. 1, 152, 1737) Linnaeus, Sp. Pl. ed. 1, 450, 1753; Endl., Gen. Pl. 1108, 1836; Boissier in DC. Prodr. 15 (2): 8, 1862; Benth. & Hook. f. Gen.

Pl. 3:258, 1880; Pax in Engler & Prantl, Pflanzenf. 3 (5):103, 1896; Pax & Hoffm. in Engler & Prantl, op. cit. 2 Aufl. 19c: 280, 1931; Hurusawa in Journ. Fac. Sci. Univ. Tokyo III 6 (6): 228, 1954, (sensu amplificato).

Herbs or shrubs, milky. Leaves simple, alternate or opposite. Inflorescence of one female and many male flowers in a small 4- to 5-lobed turbinate or campanulate perianth-like involucre, the lobes with thick glands in the sinuses; glands often with a petal-like white or colored appendages. Male flowers of a pedicellate stamens, the anther-cells globose; no perianth generally. Female flowers a solitary, pedicellate, 3-celled, 3-ovuled ovary; styles 3, free or connate, simple or bifid. Capsule of 3 bivaled cocci, separating from a columella and dehiscing.

Species over 1600, world-wide distribution.

The following 13 Formosan species fall naturally into two groups: species 1-8 belong to Pax & Hoffmann's Section 1, ***Anisophyllum*** (Haw.) Roep., and species 9-13 belong to Section 9, ***Ththymalus*** (Hall.) Boiss. of the same system.

For the first group, Hara (in Journ. Jap. Bot. 14:356, 1935) as well as Hurusawa (op. cit. 6 (6): 271, 1954) following Croizat's opinion effect a great number of new combinations under the generic name ***Chamaesyce*** S. F. Gray *emend.* by Croizat. in Degener. Fl. Hawaii, Dec. 9th, 1936; and for the second group, Hara and Hurusawa adopt ***Galahoeus*** Howorth, as the generic name.

The reason for maintaining *Euphorbia* Linn. (*sensu lato*) as the generic name for this complicated group in the present study is for the simplification in nomenclature.

Key to the species.

A. Leaves stipulate, usually opposite; glands of involucre appendiculate; seeds without caruncle.
  B. Involucres in axillary and subterminal cyme or crowded in the uppermost leaves; herbs or subshrubs, erect or decumbent.
    C. Capsules glabrous····· 1. *E. Atoto*
    C. Capsules hirsute.
      D. Stem hirsute.
        E. Seeds transversely rugose····· 3. *E. hirta*
        E. Seeds smooth····· 6. *E. Tashiroi*
      D. Stem glabrous·····8. *E. Vachellii*
  B. Involucres axillary, solitary or 2-3 in clusters; herbs, decumbent or prostrate.
    C. Appendages of glands broad.
      D. Appendages petaloid, reniform; leaves rounded-ovate, 8 mm. long·····
      ····· 2. *E. garambiensis*
      D. Appendages 2-3-lobed; leaves subcordate-ovate, 2-3 mm. long···4. *E. Makinoi*
    C. Appendages of glands very narrow.
      D. Capsules hispid-ciliate on the keels of the cocci, otherwise glabrous·····
      ····· 5. *E. prostrata*

D. Capsules hirsute····· 7. *E. thymifolia*

A. Leaves exstipulate, alternate; glands of involucres without appendage; seeds carunculate.

B. Involucral glands transversely oblong with rounded margins.

C. Involucral with very entire margins.

D. Terminal inflorescence a triplo-cyme····· 12. *E. shouanensis*

D. Terminal inflorescence not as above.

E. Ovary scattered verrucose····· 9. *E. calonesiaca*

E. Ovary densely and evolutely verrucose····· 10. *E. formosana*

C. Involucral glands with repend margins····· 11. *E. Jolkini*

B. Involucral glands truncate, 2-cornute····· 13. *E. tarokoensis*

1. ***Euphorbia Atoto*** Forster f. Prodr. 207, 1786; Boiss. in DC. Prodr. 15 (2): 12, 1862; Henry, list Pl. Formos. 81, 1896; Matsum & Hayata in Journ. Coll. Sci. Univ. Tokyo 22:367, 1906; Hayata in the same series, 30 (1): 261, 1911; H. Keng in Quart. Journ. Taiwan Mus. 4 (3 & 4): 254, 1951.

Chamaesyce Atoto (Forster f.) Croizat in Degener, Fl. Hawaii Fam. 190, leaflets 4, 1936; Hurusawa in l.c. 6 (6): 275, *f. 33*, 1954.

Taiwan: A long the seashore, more common in the southern part.

Northern part: Soo-oh, *Kawakami 14630* (FRI); southern part: Anpin, *S. Suzuki 2291*, Kaoshiung, *Kawakami, Hayata & Simada 14632* (FRI), Liukiuyu, *Hosokawa 1948, 1949;* eastern part: Taitung, *Yamamoto 2078, 1471;* Botel Tobygo, *Mori 14643* (FRI).

Distributon: India, S. China, Liukiu, Philippines to polynesia and Australia.

2. ***Euphorbia garambiensis*** Hayata, Icon. Pl. Formos. 9:103, 1920; Masamune, Short Fl. Formos. 119, 1936.

Chamaesyce garambiensis (ayata) Hara in Journ. Jap. Bot. 14:355, 1938; Hurusawa in l.c. 6 (6): 291, *f. 40*, 1954.

Perennial, rhizome thickened; branches spread over the ground, 10-15 cm. long, glabrous. Leaves thickened, opposite, obliquely ovate-rounded, 8 mm. long, 6 mm. wide, the apex very obtuse, the base obliquely cordate, the margins integral or obscurely serrulate; petioles sessile or 1 mm. long; stipules inter-petiolate, pointed, 0.5 mm. long. Involucres axillary, semiglobose, 1 mm. long, 2 mm. wide, glabrous; glands 4, broad-rounded, 1 mm. wide, the appendages reniform, 1.5 mm. wide, the margins integral; peduncles 5 mm. long; bracteoles linear-lacerate, 0.5 mm. long. Male flower: anthers didynamous, the connectives produced. Female flower: ovary glabrous; styles forked at the apex.

A species endemic to the southern tip of Taiwan, no authentic specimen has been seen. According to a recent study of Dr. Hurusawa (with a very excellent illustration), it is a species closely allied to *E. Makinoi* Hayata.

3. ***Euphorbia hirta*** Linn. Sp. Pl. 454, 1753; Masamune, Short Fl. Formos. 119, 1936; H. Keng in op. cit. 4 (3 & 4): 254, 1951.

Euphorbia pilulifera Linn. Sp. Pl. 454, 1753; Hayata in Journ. Coll. Sci. Univ.

Tokyo 20:74, 1904; Matsum & Hayata in op. cit. 22:367, 1906.

Chamaesyce hirta (Linn.) Millspaugh, Field Mus. Pub. Bot. 2:303. 1909; Hurusawa in l.c. 277, *f. 34*, 1954.

Taiwan: Throughout the island, a common weed, very abundant in waste places, along roads and trails, in fallow rice paddies.

Northern part: *Kawakami 14651, Simada 14653, Sasakai 14649, Kawakami & Sasaki 14650, Simada 14655, Hiratuka 14652, Suzuki 1182, 1098*; central-southern part: *Kawakami & Sasaki 14657, Hosokawa 1944, 1946*; Hungchuen: *Kudo & Suzuki 15977, Kawakami 14461, Suzuki 1256*, Hoshautau, *Kudo & Mori 1692.*

Distribution: Pantropic.

4. ***Euphorbia Makinoi*** Hayata in Journ. Coll. Sci. Tokyo 30 (1): 262, 1911; Merr. Enum. Philip. Fl. Pl. 2:462, 1923; Masam. Short Fl. Formos. 119, 1936; H. Keng in l.c. 256, 1951.

Euphorbia microphylla Heyne misapplied by Hayata in Journ. Coll. Sic. Univ. Tokyo 20:79, *pl.* 5, *t*, *H.* 1904.

Chamaesyce Makinoi (Hayata) Hara in Journ. Jap. Bot. 14:356, 1938; Hurusawa in l.c. 6 (6):291, 1954.

Taiwan: In northern and southern part, in open dry places at low altitudes, rather scarce. Northern part: Tamsui, *Soma 14653* (FRI), Taipeh, *Sasaki 14680, Nakahara 14681, 14682*; Southern part: Tainan, *Mori 529, Hosokawa 1942.*

Distribution: Philippines (?).

Croizat & Hara (in Journ. Jap. Bot. 16:461, 1940) suggest that there is an affinity between this species and the American species, *Euphorbia serpens* HBK.

5. ***Euphorbia prostrata*** Ait., Hort. Kew 2:136, 1789; Bernard in Icon. Bogor. 4:51, *t. 316*, 1910; Merr. Enum. Philip. Fl. Pl. 2:463, 1923; H. Keng in l.c. 256, 1951.

Euphorbia liukiuensis Hayata misapplied by Sasaki, Cat. Govern. Herb. 305, 1930; Masam. Short Fl. Formos. 119, 1933.

Chamaesyce prostrata (Aiton) Small, Fl. Southeast. U. S. 713, 1903; Hurusawa in l.c. 287, *f. 37*, 1954.

Taiwan: Nearly throughout the island. Northern part: *S. Suzuki 12414, 12257, Masamune & Suzuki 1742, Mori 1739, Simada 1733, 3211, 1736, Sasaki 1741;* southern part: *Simada 14678* (FRI), *Mori 101, Hosokawa 1939, 1941*, eastern part: *S. Suzuki 1277, 1667, 10607*, Prescartores: *Kudo & Mori 3070, Cheng 3071.*

Distribution: Pantropic.

This species is similar in general appearance to *E. thymifolia*, but it may be distinguished from the latter by the longer stalkes of the involucres, the more prominent persistent columella of the cocci, the shorter stipes of the glands and the less hirsute cocci.

6. ***Euphorbia Tashiroi*** Hayata, Icon. Pl. Formos. 9:104, 1920; Masamune, Short Fl.

Formos. 120, 1936; H. Keng in l.c. 255, 1951.

Euphorbia hyperifolia Linn. misapplied by Hayata in Journ. Coll. Sci. Univ. Tokyo 20:75, 1904.

Euphorbia humifusa Willd. misapplied by Hayata, Gen. Ind. Fl. Formos. 66, 1916; Masamune, Short Fl. Formos. 1936.

Chamaesyce Tashiroi (Hayata) Hara in Journ. Jap. Bot. 14:356, 1938.

Chamaesyce hyperifolia (Linn.) Millsp. var. *Tashiroi* (Hayata) Hurusawa in l.c. 285, *f. 36*, 1954.

Taiwan: Nearly throughout the island. Northern part: Tamsui, *Tashiro 22375* (FRI), *Kawakami, Hayata & Simada 14669*, Tuchang, Lootung, *Suzuki 30*; Southern part: Tainan, *Mori 528, 104*, Kaoshung, *Yamada 6025, 14715* (FRI); Botel Tobago, *Sasaki 2691;* eastern part: Seikoo, Taitung, *Yamamoto 2077*.

This is a species with a great deal of variations in the size of cymes, the length of peduncles and internodes of stems, and the shape and size of leaves.

7. ***Euphorbia thymifolia*** Linn. Sp. Pl. 454, 1753; Boiss. in DC. Prodr. 15 (2): 47, 1862; Henry,List Pl. Formos. 81, 1896; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:77, 1904; Matsum. & Hayata, op. cit. 22:368, 1906; Masam. Short Fl. Formos. 120, 1936.

Chamaesyce thymifolia (Linn.) Millsp. Publ. Field Mus. Nat. Hist. Chicago Bot. ser. 2, 412, 1909; Hurusawa in l.c. 286, 1954.

Taiwan: Throughout the island, very common in waste places, along streets, in and about towns. Northern part: *Masamune & Suzuki 84, S. Suzuki 1181, 10070, 12415, 12366, Yamamoto 129, Simidu 2466, Sasaki 1237;* central-southern part: *Kudo & Sasaki 15446, Mori 102, 103, Matuda 1163, Hosokawa 1935, 1136;* Hoshoutau, *Kudo & Mori 185;* eastern part: *Yamamoto 2082, 2091*.

Distribution: Pantropic except Australia.

8. ***Euphorbia Vachelli*** Hook. et Arnott, Bot. Capt. Beechey Voy. part 5, 212, 1836.

Euphorbia serrulata Reinwardt ex Blume, Bijdr. 635, 1826; Henry, List Pl. Formos. 81, 1896; Matsum & Hayata in Journ. Coll. Sci. Univ. Tokyo, 22:367 1906; Hayata in op. cit. 30 (1):261, 1911; H. Keng in l.c. 254, 1951.

Chamaesyce paranaquensis (Blanco) Hara in Journ. Jap. Bot. 14:356, 1938.

Chamaesyce Vachellii (Hook. & Arn.) Hurusawa in Journ. Fac. Sci. Univ. Tokyo III 6 (6): 283, 1954.

Taiwan: Throughout the island, in open grassland at low and medium altitudes. Northern part: *Simada 3152c, S. Suzuki 8506;* central-southern part: *Sasaki 14700* (FRI), *Simada 1498* (FRI), *Mori 106, Simada 740, Suzuki 6754, 7130, Hosokawa 1943;* eastern part: *Kobayasi 14706* (FRI), *Kawakami 14707*.

Distribution: India, S. China, Liukiu, Philippines to Polynesia and Australia.

The name *Euphorbia serrulata* Reinwardt ex Blume (1826), according to Hurusawa, is invalidated because of the earlier *Euphorbia serrulata* Vellozo (1790) (*E. brasiliensis* Lam.) of S. America.

9. ***Euphorbia calonesiaca*** Croizat in Journ. Arnold Arb. 19:97, 1938; Hurusawa in Journ.

Jap. Bot. 16:577, *pl. 27*, 1940; H. Keng in l.c. 258, 1951.

Euphorbia orientalis Linn. misapplied by Hayata in Journ. Coll. Sci. Univ. Tokyo 20:70, 1904; Masamune, Short Fl. Formos. 119, 1936.

Galarhoeus calonesiacus (Croizat) Hara in Journ. Jap. Bot. 14:356, 1938; Hurusawa in l.c. 263, *f. 25*, 1954.

Taiwan: northern part: Takuran, Sinchu, *Y. Simada 1732*, June 1923; Central part: Mouli, Taichung, *T. Suzuki 20048*, June 7, 1940, *Sasaki 14640* (FRI).

10. ***Euphorbia formosana*** Hayata in Journ. Coll. Sci. Univ. Tokyo 30 (1):262, 1911 Icon. Pl. Formos. 9:103, 1919, *excl. syn.*, Yamamoto in Journ. Trop. Soc. Agric. 5:179, 1933; Masamune, Short Fl. Formos. 119, 1936; H. Keng in l.c. 258, 1951.

Euphorbia dendroides Linn. misapplied by Hayata in Journ. Coll. Sic. Univ. Tokyo 20:65, 1904; Matsum. & Hayata, in op. cit. 22:267, 1906.

Euphorbia orientalis Linn. misapplied by Hayata, Gen. Ind. Fl. Formos. 65, 1917, quoad specimens ex Taitung.

Galarhoeus formosanus (Hayata) Hurusawa in l.c. 261, *f. 26*, 1954.

Taiwan: eastern part: Blimbu, Tiatung, *Y. Yamamoto 770*, anno 1928–29, Seikoo, Taitung, *Yamamoto 790*, Apr. 2, 1930, *Yamamoto 2093*, Aug. 3, 1931.

Readily distinguished from *E. calonesiaca* Croizat by the narrower, denser leaves, the smaller umbellate as well as floral leaves, the shorter umbellate branches and internodes, and especieally by the smaller and more deeply sulcate fruits with much denser verucose surface. So far as the available specimens show, ***E. formosana*** seems to be confined to the eastern part of the island, whereas ***E. calonesiaca*** is known only from the western part.

11. ***Euphorbia Jolkini*** Boiss. in DC. Prodr. 15 (2):121, 1862; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:68, 1904; Matsum & Hayata in op. cit. 22:367, 1906; Hurusawa in Journ. Jap. Bot. 16:512, 1940.

Galarhoeus Jolkini (Boiss.) Hara in Journ. Jap. Bot. 11:385; 1935; Hurusawa in l.c. 253, *f. 19*, 1954.

Taiwan: Keelung, *Hayata 14670* (FRI), *Sasaki* 14671 (FRI), Fuqui-jau, Taipeh, *Simada 1159*, *Suzuki 4752*.

Distribution: Japan, Korea and Liukiu.

12. ***Euphorbia shouanensis*** H. Keng in Journ. Washington Acad. Aci. 41:207, 1951, in Quart. Journ. Taiwan Mus. 4 (3 & 4): 257, *pl. 1 & 2*, 1951.

Galarhoeus shouanensis (H Keng) H. Keng in l. c. 257, 1951; Hurusawa in l.c. 6 (6):263, 1954.

Stem villose, thickened, erect. Leaves sessile, membranaceous, uninerved, linear--oblong, or linear-lanceolate, 6–7.5 cm. long, 8–10 mm. wide, the apex acute, the base attenuate, 2–5 cm. long. Cyathia in triplo-cymose, terminal. Umbellate leaves of the primary cymes 5, ovate-lanceolate, 2.5 cm. long, 1–1.5 cm. wide, the apex acute; umbellate branches 5, the central ones shorter. Umbellate leaves of the secondary cymes 3, ovate-rounded, 1.5 cm. long, 1 cm. wide, the apex very obtuse; umbellate branches 3. Umbellate leaves of the tertiary cymes 3, subrounded, 8 mm. long, 7

mm. wide. Central fertile cyathia single, naked, the involucre turbinate, 3.5–5 mm. long, 2.5–3 mm. in diameter, the lobes 4 (5 ?), ovate-oblong, glands 4, transversely reinform, sub-stalked; male flowers about 12; female flower: ovary ovoid-globose, exserted, the styles nearly totally free except the very base. Lateral sterile cyathia 3, each concealing in 2 amplexous floral leaves (or bracts), and opposite to the tertiary umbellate leaves, the involucres turbinate, 2 mm. long, 1.5 mm. in diameter, shortly stalked; lobes and glands not very distinct, the rudimentary male flowers numerous, the rudimentary ovry included.

Taiwan: Shashan, Shaouan, Chayee, Alt. 1500 m., in prairie, *T. Suzuki 20910* (type), Nov. 10, 1940.

This species is distinctly characterized by the cyathia in triplo-cymose inflorescence and the involucral structures.

13. ***Euphorbia tarokoensis*** Hayata, Icon. Pl. Formos. 7:34, *pl. 9*, 1918; Hurusawa in Journ. Jap. Bot. 16:461, 1940; H. Keng in l.c. 257, 1951.

Galarhoeus tarokoensis (Hayata) Hara in l.c. 4:356, 1938; Hurusawa in l.c. 6 (6):250, *f. 17*, 1954.

Taiwan: Eastern part: Taroko, Hwaling, *Hayata & Sasaki 14713* (FRI) (isotype), *Kanehira & Sasaki 14714* (FRI), *Suzuki 10429;* Gukutu, Hwaling, *Matuda 1162;* Taitung, *Kobayasi 14712.*

Excluded species

1. *Euphorbia Tirucalli* Linn. Spec. Pl. 452, 1753; Henry, List Pl. Formos. 81, 1896; Owatari in Bot. Mag. Tokyo 9:205, 1897; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:77, 1904; Matusm. & Hayata in op. cit. 22:367, 1906; Kaneh. Formos. Tr. rev. ed. 339, 1936; H. Keng in Quart. Journ. Taiwan Mus. 4 (3 & 4): 259, 1951.

   Introduced and naturalized in a small spot near Kaoshung. A native of Zinzibar, Africa.

2. *Euphorbia peplus* Linn. Sp. Pl. 456, 1753; Hayata, Icon. Pl. Formos. 9:103, 1920; Masamune, Short Fl. Formos. 119, 1936; H. Keng in l.c. 259, 1951.

   A species of Europe and the Near East, undoubtly an introduced one in this island.

12. *Excoecaria* Linnaeus

Excoecaria Linnaeus, Syst. Nat. ed. 10, 1288, 1759; Benth. & Hook. f. Gen. Pl. 3:337, 1880; Pax in Engler & Prantl, Pflanzenfam. 3 (5):95, 1890, in Engler, Pflanzenr. 52:157, 1912; Pax & Hoffm. in l.c. 2 Aufl. 19c:196, 1931; Hurusawa in Journ. Fac. Sci. Univ. Tokyo III 6 (6):311, 1954

Excoecaria Sect. *Euexcoecaria* Muell.-Arg. in Linnaea 32:123, 1863.

Glabrous trees or shrubs with acrid milky latex. Leaves alternate or opposite, entire or subserrate. Flowers minute, in axillary or terminal spike-like racemes or in spikes, apetalous. No disc or pistillode. Male flowers 1–3 in a bract, bibracteolate; sepals 3; stamens free, the anthers with 2 globose cells. Female flowers at the base

of racemes; calyx trifid; ovary 3-celled, the cells 1-ovuled; styles shortly connate, spreading, recurved, entire. Capsules of 3 crustaceous cocci, the valves twisting elastically. Seeds globose.

Species 35, Old World tropics.

Key to the Formosan species.

1. Leaves alternate.
   2. Leaves ovate-elliptic, 3–9 cm. long; spikes unisexual.·····1. *E. Agallocha.*
   2. Leaves obovate-lanceolate, 11–18 cm. long; spikes bi- or uni-sexual.·····
      ····· 3. *E. Kawakamii.*
1. Leaves opposite; spikes bisexual.····· 2. *E. formosana.*

1. ***Excoecaria Agallocha*** Linnaeus, Syst. Nat. ed. 10, 1288, 1789, Sp. Pl. ed. 2, 1451, 1763; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:58, 1904; Matsum. & Hayata in l.c. 22:266, 1906; Pax in Engler, Pflanzenr. 52:165, 1912; Kanehira, Formos. Tr. rev. ed. 339, 1936.

Taiwan: Throughout the island. Keelung: *Tanaka 14732*, (FRI), *Hayata & Sasaki 14733*, (FRI), Kaoshung: *Matsuda 1164, Kudo & Suzuki 2651, 70*; Hung-chuen: *Konishi 14737.*

Distribution: tropical shores in Asia, Australia and Western Polynesia.

2. ***Excoecaria formosana*** (Hayata) Hayata, Icon. Pl. Formos. 3:173, 1913; Pax & Hoffm. in Engler, Pflanzenr. 63:423, 1914.

Excoecaria crenulata Wight. misapplied by Hayata in Journ. Coll. Sci. Univ. Tokyo 20:60, 1904.

Excoecaria crenulata Wight var. *formosana* Hayata in Journ. Coll. Sci. Univ. Tokyo 30 (1):271, 1911.

Excoecaria orientalis Pax & Hoffm. in Engler, Pflanzenr. 52:160, 1912; Sasaki, List Pl. Formos. 262, 1928; Kanehira Formos. Tr. rev. ed. 340, 1936.

Excoecaria cochinchinensis Lour. var. *formosana* (Hayata) Hurusawa in Journ. Fac. Sci. Univ. Tokyo III 6 (6):313, 1954. *syn. nov.*

Taiwan: Southern part: *Simada 14744*, (FRI), *Matuda 1166, Kudo & Suzuki 15881.*

Distribution: Tonkin, Annam.

A species of disjunctive distribution; no authentic Annam specimens has been seen.

3. ***Excoecaria Kawakamii*** Hayata, Icon. Pl. Formos. 3:173, 1913; Pax & Hoffm. in Engler, Pflanzenr. 58 (4): 59, 1919; Kanehira, Formos. Tr. rev. ed. 340, *f. 297*, 1936.

Taiwan: Botel Tobago: *Hosokawa 8144, 8095, 9917, Hanada 3491, Liu, Keng et al. 354*; Hoshautau: *Soma 1165, Kudo & Mori 1786, 1848.*

Hayata writes that this species is "Very near *E. philippinensis* Merr. but differs from it by the quite obutse leaves".

13. *Gelonium* Roxburgh

Gelonium Roxburgh in Willd. Sp. Pl. 4 (2):831, 1805; Muell.-Arg. in DC. Prodr. 15 (2):1126, 1866; Benth. & Hook. f. Gen. Pl. 3:324, 1880; Pax in Engler & Prantl, Pflanzenfam. 3(5):88, 1890; Pax & Hoffm. in Engler, Pflanzenr. 52 (1):14, 1912, in Engler & Prantl, l.c. 2 Aufl. 19c:182, 1931.

Shrubs or small trees. Branches with stipular scars at the nodes. Leaves alternate, rarely opposite, pellucid-punctate, entire or serrate; stipules connate, sheathing. Flowers small, white, in axillary clusters, sessile or peduncled, often leaf-opposed, apetalous. Male flowers: sepals 5, orbicular, imbricate; stamens 10–60, on a convex receptacle, the filaments filiform, the anthers oblong, dorsifixed; pistillode 0. Female flowers: sepals 5 or 6, narrower than in the males; disc cupular; ovary 2- to 4-celled; styles minute, reniform, crescentic or bifid. Fruit globose, 3- to 4-angled or -lobed, more or less fleshy, dehiscing at length. Seeds arillate.

Species about 25, Asiatic and African.

1. ***Gelonium aequoreum*** Hance in Journ. Bot. 37:173, 1866; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26:444, 1894; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:57, 1904; Matsum. & Hayata in Journ. Coll. Sci. Univ. Tokyo 22:366, 1906; Pax & Hoffm. in Engler, Pflanzenr. 52:18, 1912; Kanehira, Formos. Tr. rev. ed. 341, *f. 295*, 1936.

Owataria formosana Matsum. in Tokyo Bot. Mag. 14:1, 1900.

Taiwan: Along the strands of southern part. Kaoshung: *Matuda 1167, 1166*; Liukiuyu: *Hosokawa 1832, 1933*; Hungchuen: *Kudo & Suzuki 15745, 15951, T. Suzuki 5939; Hibino & Suzuki 12710; Kudo & Mori 16016*; Botel Tobago: *Kawakami & Mori 14771*, FRI; Pescadores: *Kudo & Mori 3071*.

This species is, as pointed out by Pax & Hoffmann, doubtfully distinct from *G. glomerulatum*, an Malayan species also ocurring in northern Philippines.

14. *Glochidion* Forster

Glochidion Forster, Char. Gen. 113, *t. 57*, 1776; Hooker f. Fl. Brit. Ind. 5:30, 1887; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26:424; Pax and Hoffm. in Engler, Pflanzenf. 2 Aufl. 19c:56, 1931; Croizat & Hara in Journ. Jap. Bot. 315, 1940.

Phyllanthus Muell.-Arg. in DC. Prodr. 15(2):274, 1866; *p.p.*; Benth. in Benth. & Hook. f. Gen. Pl. 3:272, 1880, et in Benth. & Muell. Fl. Aust. 6:96, 1873, *p.p.*

Trees or shrubs. Leaves alternate. Flowers small, in axillary clusters, apetalous, without disc, scales or glands. Male flowers: sepals 6, rarely 5, in two series, imbricate; stamens 2 to 8, connate in an ellipsoid or oblong column, the anthers linear, the connectives produced into separate points or connate in an umbellate head; pistillode 0 or minute between the anthers. Female flowers: sepals 6, imbricate, or calyx tubular and unequally toothed or cleft; ovary 3- to 15-celled; styles connate in a globose, columnar or conic column, lobed or toothed at tip, rarely free; ovules 2 in a cell. Capsule of 3 or more 2-valved cocci, often with twice as many cells, globose or orbicular, supressed or intruded at tip, cocci crustaceous. Seeds hemisphe-

rical or laterally compressed.

Species about 300, cheifly Asiatic, few in America and Africa.

This genus is treated by Mueller & Bentham as a section of *Phyllanthus*, from which it differs, as proposed by Hooker, in "the total absence of a disc, in habit, and in the singular modification of its styles and stigmas". However, this distinction is not anuniversal one.

Dr. Croizat's veiw is probably a fair one. He says (in Journ. Jap. Bot. 16:648, 1940): "*Glochidion* is a natural aggregate, a good genus in China and a bad genus in New Caladonia and Oceania····· *Glochidion*—be this clear—is a traditional genus, a habit-aggregate and purely as such it is to be accepted or rejected. Mueller-Arg. is just as correct in treating it as a section of *Phyllanthus*, as was Hooker in given to it a full generic status·····"

Key to the Formosan species

1. Branchlets and capsules pubescent;
   2. Capsules 5–7-celled, 8–15 mm. in diameter; leaves tomentose or softly pubescent, never glaucous.
      3. Leaves velvetely tomentose beneath; capsules slightly furrowed.····· 1. *G. dasyphyllum.*
   3. Leaves softly pubescent beneath; capsules more or less deeply lobed.
      4. Leaves smaller, 5 cm. long; capsules 10–15 mm. in diameter.··· 7. *G. puberum.*
      4. Leaves larger, 7–12 cm. long; capsules 8–10 mm. in diameter.··· 6. *G. philippicum.*
   2. Capsules 3–4-celled, 5–7 mm. in diameter; leaves minutely pilose, often glaucous. ·····3. *G. Hayatai.*
1. Branchlets (sometimes slightly pilose in *G. Fortunei*) and capsules glabrous.
   2. Leaves subobovate, smaller; female lowers fascicled; styles cylindric-obovoid.··· 2. *G. Fortunei.*
   2. Leaves larger; female flowers umbellate, pedunculate.
      3. Calyx 5 mm. in diameter; style subconical; leaves generally rounded at the base. ····· 4. *G. hongkongense*
      3. Calyx 3 mm. in diameter; style hemispherical, slightly 6-lobed; leaves often cuneate at the base.····· 5. *G. lanceolatum.*

1. ***Glochidion dasyphyllum*** K. Koch. Hort. Dendr. 85, 1853; Kanehira, Formos. Tr. rev. ed. 343, *f. 297*, 1936; Croizat & Hara in Journ. Jap. Bot. 16:317, 1940.

   Glochidion Arnottianum Muell.-Arg. in Linnaea 32:60, 1863; Henry, List Pl. Formos. 82, 1896, *p.p.;* Hayata, Icon. Pl. Tormos. 9:94, 1920.

   Glochidion moluccanum Muell.-Arg. var. Henry, List Pl. Formos. 82, 1896.

   Glochidion hirsutum Muell.-Arg. misapplied by Hayata in Journ. Coll. Sci. Univ. Tokyo. 20:17, *t, 2D*, 1904.

   Taiwan: Northern part: *Suzuki 19299, 19294, Nakamura 4755, Sasaki 9294*; central part: *Kudo & Sasaki 15116, 15282, 15394; Suzuki 6558*; eastern part: *Hurukawa 14797, 14798* FRI.

Distribution: Southern China and Hongkong.

A species characterized by the huge leaves which are velvately tomentose beneath, and by the villose, umbellate pedunculate female inflorescences.

2. ***Glochidion Fortunei*** Hance in Ann. Sci Nat. ser. 4, 18:228, 1862; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26:424, 1894; Henry, List Pl. Formos. 82, 1896; Hayata in Journ. Coll. Sci. Univ. Tokyo 30 (1):264, 1911, Icon. Pl. Formos. 9:95, 1920; Kanehira, Formos. Tr. rev. ed. 344, *f. 299*, 1936; Croizat & Hara in l.c. 322, 1940.

Taiwan: Throughout the island, very common is thichets, secondary forests and waste land at low altitudes. Northern part: *S. Suzuki 3288, 3637, 4369, 6087, 11662, 12049, 12088, Kudo & Suzuki 4367, Yamamoto, Onuma & Outi 130, 131, Yamamoto 1351, 1352; T. Suzuki 4449, 4450, 5518 7589; Simidzu 2585, Simada 360, Murakami 140, 141, Masamune 106, 1418*; Central-southern part: *Kudo & Sasaki 15243, Matsuda 1172, 1173, 1174, Mori 303, 391, S. Suzuki 11353, 11988, Hosokawa 1929, 1930, Kudo & Mori 15887, T. Suzuki 6164, Sasaki 6165*; Eastern part: *Yamamoto & Mori 272*; locality unknown: *Faurie 8198*.

Distribution: S. China, Liukiu.

This species is identified by B. Hayata as *G. obovatum* Sieb. & Zucc., the latter differs from *G. Fortunei* in having smaller fruits, generally 6–8 mm. in diameter, shorter styles of less than 0.5 mm. long and obovate leaves with long, cuneate base. Croizat & Hara pointed out that specimens from the Liukiu Islands show somewhat intermediate characters between these two species. The interesting thing is that Yamamoto's *no. 131, 130*, two sterile specimens from Agincort, or Pong-chua-yu, a small islet northeast of Taiwan, having leaves also represent an intermediate form between these two species.

2a. ***Glochidion Fortunei*** Hance var. ***longistylum*** H. Keng in Journ. Acad. Washington Sci. 41 (6):200, 1951.

Taiwan: Chisan, Kaoshung, *Yamamoto & Mori 790*.

A variety characterized by the much longer styles.

2b. ***Glochidion Fortunei*** Hance var. ***megacarpum*** H. Keng in l.c. 200, 1951.

Taiwan: Kaoshung-wan, Kaoshung, *Kudo & Suzuki 96*.

A variety characterized by the much larger capsules.

3. ***Glochidion Hayatai*** Croizat & Hara in Journ. Jap. Bot. 16:316, 1940.

Glochidion bicolor Hayata in Journ. Coll. Sci. Univ. Tokyo 20:18, *t. 2E*, 1904, *excl. syn.*

Glochidion hypoleucum Hayata, Icon. Pl. Formos. 9:95, 1920; Yamamoto in Journ. Soc. Trop. Agr. 8:153, 1936; Kanehira, Formos. Tr. rev. ed. 346, *f. 301*, 1936. (*non* Boerlage 1900).

Taiwan: Northern part: *Sasaki 14837, Kudo & Suzuki 402, T. Suzuki 7848, simidu 310, Masamune 84, S. Suzuki 6128; Nakamura 4786*; Central-southern part: *Kudo & Sasaki 15242, Hibino & Suzuki 1819, Yamamoto & Mori 2332, Mori 1527, 384, Matsuda 1177*.

Distribution: Japan, Liukiu and S. China.

The specific name of this species is first proposed by Hayata as *G. bicolor*, a combination based on Muell.-Arg.'s *Phyllanthus bicolor*, then transferred to *G. hypoleucum* by Hayata himself, which is homonymous with Boerlage's (1900) species. Croizat & Hara recently rename this species as *G. Hayatai*.

4. ***Glochidion hongkongense*** Muell. Arg. in Linnaea 32:60, 1863; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26:424, 1894; Henry, List Pl. Formos. 82, 1896; Matsum. & Hay. in Journ. Coll. Sci. Univ. Tokyo 22:361, 1906; Hayata, Icon. Pl. Formos. 9:95, 1920; Kanehira, Formos. Tr. rev. ed. 346, *f. 300*, 1936; Croizat & Hara, in l.c. 323, 1940.

Glochidion zylanicum Juss misapplied by Hayata in Journ. Coll. Sci. Univ. Tokyo 20:17, 1904; Matsum & Hay. in l.c. 360, 1906.

Glochidion sphaerostigmum Hayata, Icon. Pl. Formos. 9:96, 1920, *prominor parte.*

Taiwan: Northern part: *Kudo & Suzuki 5281, Matsuda 1175, Simidu 694, 2342, S. Suzuki 11914, Sasaki 1910, 1911*; Central-southern part: *Kudo & Sasaki 15117, 15283, Masamune & Mori 2441, Suzuki 6722.*

Distribution: Japan, Liukiu, S. China and Hongkong.

5. ***Glochidion lanceolatum*** Hayata in Journ. Coll. Sci. Tokyo 20:16, *t. 20*, 1904; Matsum & Hayata, 360, 1906; Kanehira, Formos. Tr. rev. ed. 347, *f. 302*, 1936; Croizat & Hara, in l.c. 324, 1940.

Glochidion kotoense Hayata, Icon. Pl. Formos. 9:96, 1920.

Glochidion sphaerostigmun Hayata, Icon. Pl. Formos. 9:96, 1920, *pro major. parte.*

Taiwan: Northern part: *Sasaki 19230, S. Suzuki 6798, 6799, 12348, Simidu 652, 3296, Simada 1068, Masamune 1523, T. Suzuki 5384, 4320, 4095, 5904, Yamamoto 144.*; Central southern part: *Kudo & Sasaki 15337, Kudo & Suzuki 15950, Mori 390*; Botel Tobago: *Hosokawa 8048 Liu, Keng & al. 475.*

Distribution: Liukiu.

6. ***Glochidion philippicum*** (Cavanilles) C. B. Robison in Philip. Journ. Sci. 4:103, 1909; Yamamoto in Journ. Soc. Trop. Agric. 8:154, 1936; Croizat & Hara in l.c. 319, 1940.

Bridelia philippica Cavanilles, Icon. et Descr. pl. 48, *t. 371*, 1797.

Glochidion formosanum Hayata in Journ. Coll. Sci. Univ. Tokyo 20, *t. 2G*, 1904.

Glochidion album Muell.-Arg. misapplied by Hayata, in Journ. Coll. Sci. Univ. Tokyo 30 (1):264, 1911; Kanehira, Formos. Tr. rev. ed. 342, *f. 296*, 1936.

Taiwan: Central-southern part: *Ueyama 87, Sasaki 14781, Matsuda 1170, 1176, Mori 3229, 3339.*; Hungchuen: *Kudo & Suzuki 15801 15811, 12515, T. Suzuki 5049, Matsuda 1171*; Eastern part: *Yamamoto & Mori 19780, T. Suzuki 19781.*

Distribution: S. China, Philippines and Malaysia.

7. ***Glochidion puberum*** (Linn.) Hutchinson in Sargent, Pl. Wilson. 2:518, 1916; Croizat & Hara in Journ. Jap. Bot,. 16:319, 1940.

Agyneja pubera Linn. Mant. 2:296, 1771.

Glochidion eriocarpum Champion, misapplied by Hayata, Icon. Pl. Formos. 9:95,

1920; Kanehira, Formos. Tr. rev. ed. 344, *f. 298*, 1936.

Taiwan: Taichung and its vicinity: *Yamamoto 6514, 6515, Sasaki 14801, S. Suzuki 6513, T. Suzuki 10796, Kudo & Sasaki 15713, 15509, Ueyama 109.*

Distribution: Southern China.

Croizat and Hara write: "*Glochidion eriocarpum* Champion is readily distinguished from this plant by having branches, leaves, pedicels and fruits velutinous-tomentose with patent hairs, and ovate or ovate-lanceolate leaves roundish at the base."

Species of which no specimens have been studied.

1. ***Glochidion assamicum*** Hook. f. var. ***magnicapsulum*** Croizat & Hara in Journ. Jap. Bot. 16:320, 1940.

The species is distributed in N. E. India, Burma and S. China (Yunnan and Hainan). This variety differs from the species in the larger calyx and larger female flowers. The type specimens are *Henry 117, 415*, all from Bankinsing, Kaoshung.

2. ***Glochidion chademenosocarpum*** Hayata, Icon. Pl. Formos. 9:94, 1920.

Hayata writes that this species is near *G. Fortunei*, but differs from it in the much densely clustered and perfectly sessile female flowers.

The type specimen is from Tainan, "inter Rono et Kosenpo". The original description of the female flowers is very probably based on that of *G. Fortunei* in its younger stage.

3. ***Glochidion Kusukusense*** Hayata, Icon. Pl. Formos. 9:96, 1920.

Hayata writes that this "is near *G. Wrightii* Benth., but differs from it in not very oblique leaves and in the much longer pedicels of male flowers."

The type locality is Kusukusu, Kaoshung. Croizat and Hara (l.c. 325) suggest that this species is very probably referable to *G. lanceolatum.*

4. ***Glochidion suishaensis*** Hayata, Icon. Pl. Formos. 9:97, 1920.

Hayata writes that this species is near *G. Fortunei*, but distinguishable from it in the much larger oblong leaves, and in the larger capsules. The type locality is Sui-sha, Taichung. Specimens named as this species in this herbarium and in the Herbarium of the Forestry Reaserch Institute are actually *G. hongkongense.*

Excluded species.

1. *Glochidion longipedicellatum* Yamamoto in Journ. Soc. Trop. Agric. 5:178, 1933.

The type specimen (collected from Chisan, Kaoshung, by S. Sasaki,) being examined, it is nothing more than one of *Phyllanthus indicus*, Muell.-Arg.

15. ***Homalanthus*** Juss.

Homalanthus (*Omalanthus*) Juss., Euphorb. Gen. Tent. 50, *f. 16*, 1824; Benth. & Hook. f. Gen. Pl. 3:331, 1880; Pax in Engler & Prantl, Pflanzenfam. 3 (5):95, 1890; Pax & Hoffm. in l.c. 2 Aufl. 19c:188, 1931.

Carumbium Sect. *Eucarumbium* Muell.-Arg. in DC. Prodr. 15 (2):1143, 1866.

Trees or shrubs. Leaves alternate, entire, broad and thin. Flowers small, peltatous,

in terminal racemes. Males many in a bract, numerous at the top of raceme; female 1 in bract, few at the base of the raceme. Male flowers: calyx of 2 adpressed sepals; disc 0; stamens 6–50, the filaments very short, the anthers exsert, divaricate, 2-valved at the top. Female flowers: calyx terete, 2–3 lobed; ovary 2–3 celled; styles linear, diverging, entire. Capsule bilobed, fleshy, indehiscent. Seeds ovoid with a fleshy aril.

Species about 30, Malay Peninsula and Islands, Polynesia and Australia.

1. ***Homalanthus fastuosus*** F.-Vill. Novis. App. 196, 1880; Vidal, Synopsis Atlas 39, *t. 84, f. H.*, Rev. Pl. Vas. Filip. 247, 1886; Merr. in Philip. Journ. Sci. Bot. 3:417 1908, 5:357, 1910; Pax in Engler, Pflanzener. 52:45, 1912; Merr. Enum. Philip. Fl. Pl. 2:459, 1923.

   Homalanthus rotundifolius Merr. misapplied by Sasaki, List Pl. Formos. 264, 1928; Yamamoto in Journ. Soc. Trop. Agric. 5:179, 1933; Kanehira, Formos. Tr. rev. ed. 348, *f. 303*, 1936.

   Taiwan: Botel Tobago: *Sasaki 14868, Hosokawa 9867, Kano 8678, Masamune 4158, Hanada 8697.*

   Distribution: Philippines.

   The reidentification was made by Mr. S. Sasaki (through personal communication).

16. ***Homonoia*** Loureiro

Homonoia Lour. Fl. Cochinch. 636, 1790; Muell. Arg. in DC. Prodr. 15 (2):1022, 1866; Benth. & Hook. f. Gen. Pl. 3:322, 1860; Pax in Engler, Pflanzenfam. 3 (5):71, 1890; Pax & Hoffm. in Engler, Pflanzenr. 68:114, 1919, in l.c. 2 Aufl. 19c: 149, 1931.

Shrubs. Leaves alternate, narrow-linear. Flowers in axillary spikes, apetalous, small. Male flowers: calyx globose, splitting into 3 segments; stamens numerous, in a dense globose head of branched filaments, the anthers divaricate; disc 0; pistillode 0. Female flowers: sepals 5–8, narrow, unequal, imbricate; disc 0; ovary 3-celled, the cells 1-ovuled; styles spreading, entire, papillose. Capsule small, of 3 smooth 2-valved cocci. Seeds ovoid.

Species 3, Indo-Malayan.

1. ***Homonoia riparia*** Lour. Fl. Cochinch. 637, 1790; Muell.-Arg. in DC. Prodr. 15 (2):1023, 1866; Henry, List. Pl. Formos. 84, 1896; Hayata in Journ. Coll. Sci. Univ. Tokyo, 20:54, 1904; Matsum & Hay. in l.c. 22:365, 1906; Pax & Hoffm. in Engler, Pflanzenr. 68:114, *f. 27*, 1917; Kanehira, Formos. Tr. rev. ed. 349, *f. 304*, 1936.

   Taiwan: Tainan: *Sasaki 14869*, FRI; Koashung: *Simada 14871*; Hungchuen: *Tanaka 14876, Matsuda 1178, Kudo & Sasaki 15952*; Taitung: *Kawakami & Mori 14879*, FRI.

   Distribution: India, Indo-china, S. China and Malaysia.

17. ***Liodendron*** H. Keng

Liodendron H. Keng in Journ. Washing. Acad. Sci. 41 (6):201, 1951, in Quart. Journ. Taiwan Mus. 7 (3 & 4):268, 1954.

Trees or shrubs. Leaves alternate, crenulate-serrulate, membranaceous or thin

coriaceous. Flowers axillary, dioecious, apetalous, disc wanting; male flowers in racemes or spikes, shortly pedicellate; female flowers solitary, long pedicellate. Male flowers: calyx 4–6–parted, the segments unequal, imbricate; stamens 2, the filaments compressed, the anthers globose-ellipsoid, erect, extrorse, longitudinally dehiscent; rudimentary ovary wanting. Female flowers; calyx 5–parted, the segments narrow; ovary oblong-ovoid, 3–celled, 2 ovules in each cell, the styles 3–branched at the upper portion, then bifid at the apex, papillose. Drupes oblong-ovoid, the endocarp very hard, nearly bony, 1–celled, 1–seed. Seeds oblong-ovoid; testa crustaceous; endosperm fleshy; embryo straight, the cotyledons broad.

Species 2, the type species, *L. Matsumurae* (Koidz.) H. Keng, occurs in the Liukiu Islands, the other, *L. formosanum* (Kaneh. & Sasaki) H. Keng, in Taiwan.

The genus *Liodendron* was formerly included in *Putranjiva* Wallich. As originally proposed by the present writer, it contains three species, namely, *L. formosanum* (Kaneh. & Sasaki) H. Keng from Taiwan, *L. Matsumurae* (Koidz.) H. Keng from the Liukiu Islands, and *L. integerrimum* (Koidz.) H. Keng from the Bonin Islands.

The last combination was made mainly on the basis of Koidzumi's original description. Later on, in the spring of 1953, the present writer, while visiting the herbarium of the Arnold Arboretum of Harvard University, U. S. A., made a thorough study of the specimens referred to this species in their collection. Two specimens from Bonin, *E. H. Wilson a* and *b*, April 24, 1917, labelled "*Putranjiva integerrima* Koidz." also bear Dr. E. D. Merrill's notation: "This is a *Cyclostemon*". Following this lead, the characters of this species were re-examined. It is found that the male flowers are not in short spikes, the disc of the flowers of both sexes are conspicuous, and the 3 thick and fleshy styles are short and completely distinct. These characters show that the species is referrable neither to *Liodendron* or *Putranjiva*, but should be included in *Drypetes*. A combination was accordingly made as *Drypetes integerrima* (Koidz.) H. Keng in Quart. Journ. Taiwan Mus. 7 (3 & 4):268, 1954.

About the same time, in his extensive treatment on the Euphorbiaceae (1954), Dr. Hurusawa combines *Putranjiva* and *Liodendron* as a subgenus of *Drypetes*. In this he also effects the combination *Drypetes integerrima* (Koidz.) Hurusawa (This has a priority of 2 months over the present writer's combination). The genus *Drypetes* is considered by him to be of very broad nature. His concept may be outlined as follows:

Genus ***Drypetes*** Vahl, *sensu* Hurusawa

1. subgenus ***Cyclostemon*** (*Drypetes* Vahl, *sensu* Pax & Hoffm.)
2. subgenus ***Putranjiva,*** with two sections:
   a. section ***Roxbougianae*** (*putranjiva* Wallich)
   b. section ***Matsumurae*** (*Liodendron* H. Keng)

According to Hurusawa's concept, the genus *Drypetes* included such widely varied species with male flowers in axillary clusters and others with spicate-racemose inflorescences, and species with prominent discs in the male and female flowers as well

as species where these discs are absent. Such a generic concept is not only radically different from those generally accepted by workers in this highly developed and specialized family Euphorbiaceae, but will be also considered quite unusual in most other families of flowering plants.

According to the system of classification of the Euphorbiaceae by Pax and Hoffmann (1931), the tribe *Phyllantheae* consists of 17 subtribes. The genera combined by Hurusawa fall into three of the subtribes, *Antidesminae* (including *Antidesma* and 19 other genera), *Glochidiinae* (including *Putranjiva* and 4 other genera) and *Drypetinae* (including *Drypetes* and 5 other genera). The three subtribes of Pax and Hoffmann may be summarized in the following key:

I. Blütenstände ährig, traubig oder rispig (vgl. *Phyllanthus*).·····
····· la. *Antidesminae*

II. Blüten in achselständigen Büscheln oder Knäueln (vgl. *Phyllanthus*).

1. Diskus fehlend, selten vorhanden (*Glochidion*).·····1b. *Glochidiinae*
2. Diskus zentral.····· 1c. *Drypetinae*

In a previous paper, the present writer (1951) has already discussed fully the relationship of *Liodendron* with *Putranjiva* on the one hand and with Antidesminae on the other.

1. ***Liodendron formosanum*** (Kaneh. & Sasaki) H. Keng in Journ. Washington Acad. Sci. 41 (6):202, 1951

Putranjiva formosana Kaneh. & Sasaki in Sasaki, Cat. Goven. Herb. Formos. 312, 1930; Simada in Trans. Nat. Hist. Soc. Formos. 24:83, 1934; Suzuki in Masamune, Short Fl. Formos. 122, 1936.

Drypetes formosana (Kaneh. & Sasaki) Kaneh. Formos. Tr. rev. ed. *f. 929*, 1936.

Small tree, the branches slender, terete, glabrous, the branchlets sulcate, obscurely pubescent. Leaves elliptic to oblong-ovate, 5–8 cm. long, 3–5 cm. wide, the apex acuminate, the base obliquely acute, membranaceous at first, later coriaceous, the margins entire to crenulate-serrulate; petioles 7 mm long. Male inflorescence spicate-racemose, axillary, 6–8 mm. long, velutinous; bracts 2–3–flowered. Male flowers in bud elliptical, shortly pedicellate, 1 mm. long; sepals 4–6, unequal, hispid, imbricate; stamens 2. Mature female flowers not seen. Drupe ovoid-ellipsoid, 10–13 mm. long, 7–8 mm. across, appressed white-pubescent, 1–locular, 1–seeded.

Taiwan: Sinchashek, Sinchu, *Kanehira & Sasaki 27130* (syntype of *Putranjiva formosana* Kaneh. & Sasaki); *Sasaki 7292;* Chukong, Sinchu, *Sasaki 7291;* Komo, Sinchu, *Kudo & Sasaki 140* (type of male inflorescence).

The following specimens are sterile, the size of the leaves being larger than the normal forms, and they are probably taken from the lower branches or basal sprouts: Sizangan, Taipeh, *Masamune & Suzuki 2393;* Kizan, *Nonaka & Kudo 2391;* Hoshautau, *Kudo & Mori 1784*; Botel Tobago, *Hosokawa 3186*

18. *Macaranga* Thouin

Macaranga Thou., Gen. Nov. Madagasc. 26, 1806; Muell.-Arg. in DC. Prodr. 15 (2):987, 1866; Benth. & Hook. f. Gen. Pl. 3:320, 1880; Pax in Engler & Prantl, Pflanzenfam. 3 (5):59, 1890, in Engler, Pflanzenr. 63:298, 1914; Pax & Hoffm. in Engler & Prantl, l.c. 2 Aufl. 19c:128, 1931.

Small trees or shrubs. Leaves alternate, usually large and often peltate, entire or lobed. Flowers in axillary racemes or branched panicles, apetalous. Male flowers many in clusters, minute; calyx globose or obovoid, the lobes 3–4, valvate; stamens few, 1 or more, the filaments flexuous, the anthers 3–4-celled, the cells more or less bivalved; pistillode 0. Female flowers one or few in a large or small often toothed bract; calyx 2–4-lobed or -toothed; ovary 1–6-celled, the cells 1-ovuled; styles entire. Capsule small, of 1–5 bi alved cocci, naked or spiny, usually glandular or viscid waxy. Seeds globose.

Species about 240, tropical of the Old World.

Key to the Formosan species

1. Leaves not peltate; stamens 7–9; capsules unarmed.····· 1. *M. sinensis.*
1. Leaves peltate; stamens 4–6; capsules echinate.····· 2. *M. Tanarius.*

1. ***Macaranga sinensis*** (Baill) Muell.-Arg. in DC. Prodr. 15 (2):1001, 1866; Pax & Hoffm. in Engler, Pflanzenr. 63 (iv, 147–vii):351, 1914; Merr. in Philip. Journ. Sci. 60 (1):30, 1936.

Adenoceras sinensis Baill., Étud. Gén. Euphorb. 430, 1858, *nomen nudum.*

Macaranga dipterocarpifolia Merr. in Journ, Sci. Philip. 1, suppl. 205, 1908, and 5:357, 1910, Enum. Philip. Fl. Pl. 2:441, 1923; Hayata, Icon. Pl. Formos. 3:173, 1913; Pax & Hoffm. in Engler, Pflanzenr. 63 (iv, 147–vii):338, 1914; Kaneh. Formos. Tr. rev. ed. 350, *f. 305*, 1936.

Paniculae ♀ 10–14 cm. longae, ramosae, dense glandulosus. Bracteae lineario-lanceolatae, 8–10 mm. longae, acuminatae, granuloso-glandulosae. Flores ♀ 2–3 mm. diametientes; calyx 2 mm. latus, pelviformis, breviter dentatus, deind in lobos 2–3 irregulariter fissus; ovarium 2-loculare, subglobosum, 1.8–3 mm. latum, dense granuloso-glandulosum, laeve; styli 2 mm. longi, basi in columnam connati, plumosi. Capsula dicocca, laevis, 5–6 mm. lata, dense granuloso-gladulosa.

Taiwan: Botel Tobago: *Kano 8680, 8681, Masamune 3884*; Hoshaotau: *Kudo & Mori 3355, 3356.*

Distribution: Philippines (Luzon).

2. ***Macaranga Tanarius*** (Linn.) Muell.-Arg. in DC. Prodr. 15 (2):997, 1866; Henry, List Pl. Formos. 84, 1896; Hayata in Journ. Coll. Sci. Tokyo 20 (3):48, 1904; Matsum & Hayata in Journ. Coll. Sci. Univ. Tokyo 22:364, 1906; Kanehira, Formos. Tr. rev. ed. 351, *f. 306*, 1936.

Ricinus tanarius Linn. in Stockm. Herb. Amb. 14, 1754.

Taiwan: Nearly throughout the island, very common in thickets and secondary forests at low altitude, widely cultivated. Northern part: *Fukuyama 213, Simidu*

2920, Sasaki 14892, 14889; Southern part: *Mori 304, Hosokawa 1925, 1924, Matsuda 1181, Kudo & Suzuki 15746, Suzuki 6014*; Botel Tobago: *Hosokawa 9860, Hanada 7675.*

Distribution: Indo-China, Malaysia, S. China, Liukiu, Philippines and Australia.

19. ***Mallotus*** Loureiro

Mallotus Lour., Fl. Cochinch. 635, 1790; Muell.-Arg. in Linnaea 34:184, 1865, in DC. Prodr. 15 (2):956, 1866, *ex parte*, Benth. & Hook. f. Gen. Pl. 3:319, 1880, *ex parte;* Pax in Engler & Prantl, Pflanzenfam. 3 (5):53, 1890, *ex parte*, in Engler, Pflanzenr. 63:145, 1914; Pax & Hoffm. in Engler & Prantl, l.c. 2 Aufl. 19c:113, 1931.

Small trees or shrubs. Leaves opposite or alternate, entire, toothed or 2-lobed, sometimes peltate, often gland-dotted. Flowers small or minute, in axillary or terminal, simple or panicled spikes or racemes. Petals and disc usually none. Male flowers clustered; female flower solitary in the bracts. Male flowers: calyx globose or ovoid, 3-5-fid; stamens 20-30 or more, crowded on a convex or flat receptacle, the filaments free, the anthers dorsifixed, globose or oblong, parallel, separated by a wide connective; pistillode 0. Female flowers: calyx spathaceous or 3- to 6-lobed; ovary 2-4-celled; styles free or connate below, entire, plumose or papillose. Capsule of 2 or 3, rarely of 4 bivalved cocci, smooth, tubercled or echinate. Seeds ovoid, oblong or globose.

Species 100, all in tropical Asia, but 2 in Africa.

Key to the Formosan species.

1. Leaves alternate.
   2. Ovary echinate.
      3. Leaves granulate-glandular, not white beneath; inflorescence a raceme. ..... 1. *M. japonicus.*
      3. Leaves densely white or rusty stellate-tomentose beneath; inflorescence paniculate. ..... 2. *M. paniculatus.*
   2. Ovary unarmed.
      3. Ovary 3-celled. ..... 3. *M. philippensis*
      3. Ovary 2-celled. ..... 4. *M. rependus.*
1. Leaves opposite or alternate, granulate-glandular beneath; ovary hairy and echinate. ..... 5. *M. tiliaefolius.*

1. ***Mallotus japonicus*** (Thunb.) Muell.-Arg. in Linnaea 34:189, 1865; Henry, List Pl. Formos. 84, 1896; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:44, 1904; Matusm. & Hayata in l.c. 22:364, 1906; Kanehira, Formos. Tr. rev. ed. 351, *f. 307*, 1936.

Croton japonicum Thunb. Fl. Jap. 270, *t. 28, 29*, 1784.

Taiwan: Northern part: *Suzuki 707, 4367, 7644, Sasaki 14907, Inoue 14910*; central part: *Mori 4927, Masamune & Mori 2019, Horiuchi 4928*; eastern part: *Suzuki 1460*; Botel Tobago: *Hanada 4929, Liu, Keng & al. 346.*

Distribution: S. China and Japan.

2. ***Mallotus paniculatus*** (Lam.) Muell.-Arg. in Linnaea 34:189, 1865; Hayata in Journ. Coll. Sci. Univ. Tokyo 30 (1):271, 1911; Kanehira, Formos. Tr. rev. ed. 351, *f. 308*, 1936.

Croton paniculatus Lam. Encycl. 2:207, 1786.

Mallotus cochinchinensis Lour. Fl. Cochinch. 635, 1790; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:45, 1904.

Mallotus formosanus Hayata in l.c. 30 (1):269, 1911.

Mallotus paniculatus Muell.-Arg. var. *formosanus* Hurusawa in l.c.: 307, 1954.

Taiwan: northern part: *Suzuki 4923, 4924, Sato 176, Suzuki 1167, 6234, Masamune 437*; Central-southern part: *Kudo & Sasaki 15118, Yamamoto 4925, Moriuti 4926, Sasaki 14929, Kudo & Suzuki 15953, Matsuda 1183, Kamikoti 47*; Eastern part: *Suzuki 1654*.

Distribution: Malaysia, Burma, S. China, Liukiu to tropical Australia.

3. ***Mallotus philippensis*** (Lam.) Muell.-Arg. in Linnaea 34:196, 1865; Henry, List Pl. Formos. 1896; Matsum. & Hayata in Journ. Coll. Sci. Univ. Tokyo 22:364, 1906; Kanehira, Formos. Tr. rev. ed. 352, *f. 109*, 1936.

Croton philippensis Lam. Encycl. 2:206, 1786.

Taiwan: Northern part: *Sasaki 14941, Suzuki 4847, 4936, Masamune 750, 790, Simada 14942*; central-southern part: *Kudo & Sasaki 15449, 15813, Matsuda 1185, Yamada 1186*; eastern part: *Hurukawa 14944, Tamazato 14946*.

Distribution: India, Malaysia, S. China, Liukiu, Philippines to N. Australia.

4. ***Mallotus repandus*** (Willd.) Muell.-Arg. in Linneae 34:197, 1865, in DC. Prodr. 15 (2):981, 1866; Matsum. & Hayata in Journ. Coll. Sci. Univ. Tokyo 22:364, 1906; Kanehira, Formos. Tr. rev. ed. 353, 1936.

Croton repandus Willd. in Neusschrift. Natu. Freund 4:206, 1803

Taiwan: Northern part: *Suzuki 4930, 4931, 7584, Sasaki 4932, Yamamoto 4933*; central-southern part: *Suzuki 4934, Matsuda 1187, Kudo & Suzuki 16149, Fukuyama 686*; eastern part: *Kikuti 14960*.

Distribution: Indo-Malaya, S. China, Philippines and N. Australia.

5. ***Mallotus tiliaefolius*** (Blume) Muell.-Arg. in Linnaea 34:190, 1865, in DC. Prodr. 15 (2):969, 1866; Pax & Hoffm. in Engler, Pflanzenr. 63:148, *f.* 22, 1914, Kanehira, l.c. 353, 1936.

Rottlera tiliaefolia Blume, Bijdr. 607, 1825.

Mallotus playfairii Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26: 441, 1894; Henry, List Pl. Formos. 84, 1896; Hayata, in Journ. Coll. Sci. Univ. Tokyo 20:41, *t. 3F*, 1904; Matsum. & Hayata in l.c. 22:364, 1906.

Taiwan: Kaoshung: *Kikuto 14965* FRI; Hungchuen: *Matsuda 14966, Hurukawa 14946* FRI.

Distribution: Philippines to Sumatra, New Guinea, N. Australia and Samoa.

20. ***Melanolepis*** Reichenbach f. & Zoll.

Melanolepis Reich. f. & Zoll. in Verh. Naruurk. Ver. Nederl. Ind. 1:22, 1856, in Linnaea

28:324, 1856; Pax in Engler, Pflanzenr. 63:142, 1914; Pax & Hoffm. in Engler & Prantl, Pflanzenfam. 2 Aufl. 19c:113, 1931.

Mallotus Sect. *Melanolepis* Muell.-Arg. in Linnaea 34:184, 1865, in DC. Prodr. 15 (2):975, 1866, *ex parte*; Pax in Engler & Prantl, l.c. 3 (5):53, 1890.

A tree. Leaves alternate, large, broad, palminerved. Flowers in panicles or racemes. Male flowers 3–5 in a bract. Female flower solitary in a bract. Male flowers: calyx globose, splitting into 3 or 5 lobes; disc 0; stamens 200 to 250, free on a convex, stellate-hairy receptacle, the anthers dorsifixed, oblong, emarginate at tip, the connective-appendages subglobose, purple; pistillode 0. Female flowers: sepals 5; disc annular, crenate; ovary 2- rarely 3-celled; styles free, divaricate, papillose. Capsule 2- rarely 3-lobed, splitting into 2 bivalved cocci. Seed subglobose, foveolate; aril purple.

A monotypic genus.

1. ***Melanolepis multiglandulosa*** (Reinw.) Reich. f. & Zoll. in Linnaea 28:324, 1865; Merr. Enum. Philip. Fl. Pl. 2:431, 1923; Kaneh. Formos. Tr. rev. ed. 354, *f. 310*, 1936.

Croton multiglandulosus Reinw. ex Blume, Cat. Gew. Buitenz. 105, 1823.

Mallotus moluccanus Muell.-Arg. in Linnaea 34:1865, in DC. Prodr. 15 (2):958, 1866; Henry, List Pl. Formos. 84, 1896; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:40, 1904.

Melanolepis molucana Pax in Pflanzenr. 63:142, 1914, non *Croton molucanus* Linn.

Taiwan: Northern part: *Sasaki 4977*, *Suzuki 4976*, *Nonaka & Mori 4978*; Central-southern part: *Suzuki 4979*, *Matsuda 1184*, *Mori 307*, *Hosokawa 1964*; Hungchuen: *Sasaki 4980*, *Hibino & Suzuki 12514*; eastern part: *Suzuki 1346*; Botel Tobago: *Kawakami & Sasaki 14987*; Hoshautau: *Kudo & Mori* 1785.

Distribution: Indo-China, Malay Islands to Melanesia.

21. ***Mercurialis*** Linnaeus

Mercurialis (Tournef. Inst. 534, *t. 308*, 1700; Linn. Gen. Pl. ed. 1, 307, 1737) Linn. Spec. Pl. ed. 1, 1035, 1753; Muell.-Arg. in DC. Prodr. 15 (2):1866; Benth. & Hook. Gen. Pl. 3:309, 1880; Pax in Engler & Prantl, Pflanzenfam. 3 (5):49, 1890; Pax & Hoffm. in l.c. 2 Aufl. 19c:128, 1931, in Engler, Pflanzenr. 63:271, 1914.

Herbs, glabrous or pilose. Leaves opposite, petiolate, dentate and bistipulate. Flowers dioecious, rarely monoecious, apetalous; male flowers in spikes, sessile or subsessile; female flowers in axillary fascicles or in spicate inflorescence. Male flowers: calyx 3-partitate, membranaceous; stamens 8–20, the filaments free, the anther-cells globose or ovoid, divaricate or subpendulous, longitudinally dehiscent; rudimentary ovary and disc absent. Female flowers: sepals 3, imbricate; ovary 2-celled; styles free or connate at the base, erect or divaricate; ovules 1 in each cell; glands 2. Capsules 2-lobed, in 2 valved cocci. Seeds ovoid or globose.

Species 8, mainly in the Mediterranean Region, few in central Europe and 1 in eastern Asia.

1. ***Mercurialis leiocarpa*** Seib. & Zucc. var. ***transmorrisonensis*** (Hayata) H. Keng in Journ. Washington Acad. Sci. 61 (4):204, 1951.

Mercurialis leiocarpa Sieb. & Zucc. misapplied by Hayata in Journ. Coll. Sci. Univ. Tokyo 25 (19):194, 1908; S. Suzuki in Sylvia 4:143, 1933, in Masamune, Short Fl. Formos. 122, 1936; Hurusawa in Journ. Fac. Sci. Univ. Tokyo III, 6 (6):302, 1954.

Mercurialis transmorrisonensis Hayata, Icon. Pl. Formos. 5:199, *f. 75*, 1915.

Taiwan: througout the island, more common in the central mountainous regions. Mt. Kanin, *Fukuyama 34*, Mt. Taipein, *S. Suzuki 3838, 3839*, Mt. Tentana, *Simada 14992* FRI, Mt. Arisan, *Simada 796*; Mt. Dabusan, *Sasaki 2144*, *Matsuda 1500*, Ariko, *Matsuda 1199*, Pintung, *Hosokawa 5408*, Taroko, *S. Suzuki 9684*, Mt. Nokosan, *Fukuyama 4682*.

The species proper is distributed in Indo-China, Siam, S. China (Hunnan, Yunnan) and Japan. The number of stamens in the normal form is 16–20 (cf. Muell.-Arg. or 14–20, cf. Pax), whereas in this variety it is only about 10. Furthermore, the filaments of this variety are usually 2–3-connate at the base, showing the tendency to monadelphy.

22. ***Phyllanthus*** Linnaeus

Phyllanthus Linnaeus, Gen. Pl. ed. 1, 282, 1737; Spec. Pl. ed. 1, 981, 1753; Muell.-Arg. in DC. Prodr. 15 (2):275, 1866; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26:420, 1894; Pax & Hoffm. in Engler & Prantl, Pflanzenfam. 2 Aufl. 19c:61, 1931.

Shrubs, rarely trees or herbs. Leaves membranaceous, alternate, entire, distichous. Flowers small, in axillary clusters, apetalous. Male flowers: sepals 4–6, imbricate in 2 series; stamens 3 to 6, the filaments free or united; pistillose 0; disc various. Female flowers: sepals as in male; ovary 3- or 4-celled; ovules 2 in a cell; styles free or connate, usually bifid. Fruit of 3 or more crustaceous cocci, rarely bony 2-valved cocci. Seeds trigonous.

Species about 500, in all tropical and subtropical regions.

Key to the Formosan species

A. Herbs, occasionally woody at the base; fruit dry, of 3 or more 2-valved cocci; stamens 3.
  B. Filaments totally connate or free at the upper potion.
    C. Sepals 5, capsule smooth ..... 2. *P. Niruri*
    C. Sepals 6, capsule echinate ..... 7. *P. Urinaria*
  B. Filaments free or connate at the base; sepals 6; capsules smooth or echinate ... . 5. *P. simplex*

A. Shrubs; fruit with epicarp fleshy or a berry; stamens 5.
  B. Styles erect, in a loose column ..... 6. *P. takaoensis.*
  B. Styles more or less spreading.
    C. Flowers small, 2-3 mm. in diameter; fruit 8–16-seeded. ..... 4. *P. reticulatus*

C. Flowers somewhat larger; fruit 4-seeded····· 3. *P. oligosperma*

A. trees; fruit a dry capsule of 3 2-valved cocci; stamens 4····· 1. *P. indicus.*

1. ***Phyllanthus indicus*** (Dalz.) Muell.-Arg. in Linnaea 32:52, 1863; Merr., Enum. Philip. Fl. Pl. 2:393; Kaneh. Formos. Tr. rev. ed. 355, *f. 311*, 1936; H. Keng in Journ. Washington Acad. Sci. 41 (6):200, 1951.

Prosorus indicus Dalz. in Hook. Kew Journ. Bot. 4:346, 1852.

Glochidion longipedicellatum Yamamoto in Journ. Soc. Trop. Agric. 5:178, 1933.

Taiwan: Lootung, Taipeh, *Yosimuda 27138;* Sanlin-chun, Kaoshung, *Sasaki 27137.*

Distribution: India, Ceylon, Java to the Philippines.

This species probably an introduced one.

2. ***Phyllanthus Niruri*** Linn. Sp. Pl. 981, 1753; Thunb. Fl. Jap. 56, 1784; Henry, List. Pl. Formos. 82, 1896; Masamune, Short Fl. Formos. 122, 1936.

Taiwan: Tainan, *Mori 107;* Kaoshung, *Hosokawa 1961;* Hungchuen, *Hibono & Suzuki 12576;* Ho-shau-tau, *Kudo & Mori 1691, 1783.*

A common weed, pantropic, but probably introduced in the tropical America.

3. ***Phyllanthus oligospermus*** Hayata, Icon. Pl. Formos. 9:93, 1920; Kanehira, Formos. Tr. rev. ed. 356, 1936.

Taiwan: Takokan, Sinchu, *Simada 15024* (FRI, isotype); *Soma 15026* (FRI).

Hayata writes that this species is "Near *P. reticulatus*, but differs from it in the much larger flowers and also in the characters of fruits and seeds."

4. ***Phyllanthus reticulatus*** Poir. in Lam. Encycl. 5:298, 1804; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26:422, 1894; Henry, List Pl. Formos. 82, 1896; Kaneh, Formos. Tr. rev. ed. 357, *f. 312*, 1936.

Taiwan: Taichun, *Kudo & Sasaki 15284; Ueyama 88*, Tainan, *Mori 177*, Kaoshung, *Mori 13*, Hungchuen, *Kudo & Suzuki 18954, 15814, 15747; Suzuki 5975, Kudo & Mori 5976, Sasaki 7328;* Ho-shau-tau, *Kudo & Mori 1694, 1782.*

Distribution: Tropical Africa, India, China and the Malay Islands.

5. ***Phyllanthus simplex*** Retzius, Observ. Bot. 5:29, 1789; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26:423, 1894; Masamune, Short Fl. Formos. 122, 1936.

Taiwan: Taipeh, *S. Suzuki 3422, Simada 38;* Kaoshung, *Hosokawa 1963, Matuda 1193.*

Distribution: India to Southern China, Malaysia and Polynesia.

6. ***Phyllanthus takaoensis*** Hayata, Icon. Pl. Formos. 9:94, 1920; Kaneh. Formos. Tr. rev. ed. 357, 1936.

Descriptio Additamentum: Flores ♀ axillares, solitaris; sepalis 5, subrotundatus, 1.2 mm. diametrientes, extus leviter pubescentis; ovarium trigono-globosum, breviter pubescens, 0.8 mm. longum, 6-8-loculate; styli 6-8, erecti, liberi, bifidi, columna stylaris 0.3 mm. longa, glandulae in urceolum, connatae, 5-lobatum. Capsula subglobosa, leviter 6-8-sulcata, 3-4 mm. lata.

Taiwan: Kaoshung (or Takao) and its vicinity, *Kudo & Suzuki 97, Simada 16032* (FRI); *Hayata 22376* (FRI); Liukiu-yu, *Hosokawa 1954, 1955 & 1957.*

Of this species the styles are loosely clustered in a column, and the fruit is composed of 6–8 2–valved cocci, characters very much alike those of *Glochidion*, yet the fleshy epicarp and the presence of discs, separate it from the species of the latter genus.

The added description of the female flower and the fruit are based on *Kudo & Suzuki 97*, collected from the type locality, Takao.

7. ***Phyllanthus Urinaria*** Linn., Sp. Pl. 982, 1753; Henry, List Pl. Formos. 82, 1896; Croizat in Journ. Jap. Bot. 16:657, 1940.

Taiwan: Northern part: *S. Suzuki 6053, 11704, 12260, 12291; Simidu 3329, Fukuyama 210, T. Suzuki 21372;* Central-southern part: *Kudo & Sasaki 15119, 15120, 15448, 15551; Matsuda 1190, Mori 108, 109, Hibino & Suzuki 11568.*

Distribution: A pantropic weed, probably introduced in the New World.

Croizat writes that in this species, "The angled stem, the echinate capsule, the sessile flowers immediately separate it from *P. Niruri*, *P. simplex*, etc., with which it is often being confused in herbarium."

23. ***Ricinus*** Linnaeus

Ricinus (Tournef. Inst. 532, 1719) Linn., Gen. Pl. ed. 1, 295, 1737; Muell.-Arg. in DC. Prodr. 15 (2):1016, 1880; Bentham & Hook. f. Gen. Pl. 3:321, 1880; Pax in Engler, Pflanzenf. 3 (5):70, 1890; Pax & Hoffm. in Engler, Pflanzenr. 68:119, 1919, in Engler & Prantl, l.c. 2 Aufl. 19c:149, 1931.

A coarse, erect, branched herb, or perennial and shrubby. Leaves large, alternate, orbicular-ovate, peltate, palmately lobed. Flowers apetalous, monoecious, in axillary, subpaniculate racemes, the lower ones male, in scattered fascicles, the upper ones female, crowded. Male flowers: calyx thin, splitting into 3 to 5 segments; stamens very numerous, the filaments variously connate in branching clusters. Female flowers: calyx spathe-like, caducous; ovary 3–celled; styles short or long, spreading, entire or 2–fid. Capsule of three 2–valved 1–seeded cocci.

A monotypic genus.

1. ***Ricinus communis*** Linnaeus, Sp. Pl. 1007, 1753; Henry, List Pl. Formos. 265, 1896; Hayata in Journ. Coll. Sci. Tokyo 30:52, 1904; Masamune, Short Fl. Formos. 121, 1936.

Taiwan: Northern part: *Sasaki 15048, Simada 15051, 15052, Matsuda 15059, Kawakami & Sasaki 15050, 15053, Sasaki 15054;* central-southern part: *Mori 15055, Sasaki 15056, Matsuda 15057, Hosokawa 1960;* eastern part: *Kobayasi 15058, Kudo & Mori 1850, Simada 15061.*

Distribution: Probably a native of Africa, now in all tropical, subtropical and many temperate countries, wild or cultivated.

24. ***Sapium*** P. Brown

Sapium P. Brown, Hist. Jamaic. 338, 1756; Benth. & Hook. f. Gen. Pl. 3:334, 1880; Pax in Englex & Prantl, Pflanzenf. 3 (5):97, 1890; Pax & Hoffm. in Engler, Pflanzenr. 52:199, 1912, in Engler & Prantl, l.c. 2 Aufl. 19c:198, 1931.

Exoecaria Muell.-Arg. in DC. Prodr. 15 (2):1201, 1866, *ex parte.*

Trees or shrubs. Leaves alternate, entire or serrate. Flowers in terminal simple or panicled spikes or racemes, apetalous, small. Male flowers in upper part of spike, serveral in a bract; female flowers in lower part or in separate spikes, one to a bract. No disc or pistillode. Male flowers: calyx shortly 2- or 3- lobed, toothed or split to base into 2 or 3 valvate sepals; stamens 2 or 3, free, the anther-cells ovoid, contiguous. Female flowers: calyx trifid; ovary 2- or 3-celled, the cells 1-ovuled; styles free or connate at the base, entire. Capsule pulpy or crustaceous or woody. Seeds globose.

Species about 100, all in tropics.

Key to the Formosan species

A. Leaves ovate-oblong; racemes 4–5 cm. long····· 1. *S. discolor*

A. Leaves rhomboid-ovate; racemes 7–12 cm. long····· 2. *S. sebiferum*

1. ***Sapium discolor*** Muell.-Arg. in Linnaea 32:121, 1863; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26:445, 1894; Matsum & Hayata in Journ. Coll. Sci. Univ. Tokyo 22:366; 1906; Kanehira, Formos. Tr. rev. ed. 357, *f. 313*, 1936.

Taiwan: Nearly throughout the island, in fields, thickets and secondary forests at low altitudes; northern part: *Yamamoto 2919, S. Suzuki 1184, Kenehira 15066;* central-southern part: *Kudo & Sasaki 15121, Suzuki 2805, Matsuda 1197, Yamamoto & Mori 767;* Hungchuen, *Kudo & Suzuki 15949, Matsuda 1196.*

Distribution: Malaysia, S. China.

2. ***Sapium sebiferum*** (Linn.) Roxburgh, Fl. Ind. 3:693, 1832; Henry, List Pl. Formos. 85, 1896; Hayata in Journ. Coll. Sci. Tokyo 20:61, 1904; Kanehira, Formos. Tr. rev. ed. 358, *f. 314*, 1936.

Croton sebiferus Linn. Sp. Pl. 1004, 1753.

Triadica sebifera (Linn.) Small, Manu. Southeast. Fl. 789, 1933; Hurusawa in Journ. Fac. Sci. Univ. Tokyo III, vol 6 (6):315, 1954.

Taiwan: Throughout the island, in villages, road sides and lower slopes. Probalby introduced from mainland China. Northern part: *Sasaki 15077, Kawakami 15080, Suzuki 15082, Simada 15081, Masamune 689;* central-southern part: *Matsuda 1198, 15083, Mori 320;* eastern part: *Kobayasi 15084, 15085; Yamamoto 8540, 8541.*

Distribution: S. China.

25. ***Securinega*** Jussieu

Securinega Jussieu, Gen. Pl. 388. 1789; Muell.-Arg. in DC. Prodr. 15 (2):446, 1866, *p.p.;* Benth. & Hook. f., Gen. Pl. 3:275, 1880, *p.p.*, Pax in Engler & Prantl, Pflanzenf. 3 (5):18, 1890; Pax & Hoffm. in l.c. 2 Aufl. 19c:60, 1931.

Flueggea Willd., Sp. Pl. 4:757, 1805, *p.p.;* Benth. & Hook. f., Gen. Pl. 3:276, 1880, *p.p.;* Pax in Engler & Prantl, Pflanzenf. 3 (5):18, 1890, *p.p.*

Shrubs. Leaves alternate, entire. Flowers dioecious, in axillary clusters. Male flowers: sepals 5; stamens 5 or 4, exserted, alternating with as many glands; pistillode large, with recurved tips. Female flowers: perianth as of the males; disc annular;

ovary 3-celled, with 2 ovules in each cell; styles 3, recurved and bifid. Fruit dry or scarcely succulent, the pericarp thin, irregularly separating into cocci. Seeds triangular, with the inner edge straight, the back semicircular; testa crustaceous, with a ventral cavity between the inner and outer coatings.

Species about 20, Old World Tropics.

Flueggea and *Securinega* were formerly two distinct genus; Pax and Hoffmann have reduced the former to the latter. Here this conecept is accepted.

Key to the Formosan species

A. Pistillodes cylindric, 1 mm. long, shortly 2-fid; capsules dry, deeply 3-lobed····· ····· 1. *S. suffruticosa*

A. Pistillodes linear, the upper free portion 1 mm. long; capsules dimorphic ····· ····· 2. *S. virosa*

1. ***Securinega suffruticosa*** (Pallas) Rehder in Journ. Arnold Arb. 13:338, 1932; Hurusawa in Journ. Fac. Sci. Univ. Tokyo III, vol. 6 (6):329, 1954.

Pharnaceum suffruticosum Pallas, Reise Russ. Reich. 3:716, 1776.

Securinega ramiflora Muell.-Arg. in DC. Prod. 15 (2):449, 1866; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 2:26, 426, 1894; Rehder in Journ. Arnold Arb. 7:191, 1926, 8:152, 1927; Masamune, Short Fl. Formos. 122, 1936.

Securinega fluggeoides Muell.-Arg. in DC. Prodr. 15 (2):450, 1866; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:4, *t. 1A*, 1904.

Taiwan: Island Keelung, *Masamune, Suzuki & Mori s.n.*, Mt. Yushan, *Sasaki s. n.*, Tarokotaishan, Hwalingong, *Sasaki s.n.*, Mt. Buwai, alt. 3000 m., *Suzuki 11272, 21273.*

Distribution: Siberia, Japan, Korea, Liukiu Islands and Mainland China.

Rehder (1926) reduces *S. fluggeoides* to the synonymy of *S. ramiflora* and gives the following notes: "I am unable to find suffucient differences between *S. ramiflora* Muell.-Arg. and *S. fluggeoides* Muell.-Arg. to treat them as distinct species, though they are differences in habit, color of branches and shape and texture of leaves, which may be used for the distinction of geographical varieties."

2. ***Securinega virosa*** (Willd.) Pax & Hoffm. in Engler & Prantl, Pflanzenf. 2 Aufl. 19c:60, *f. 27D*, 1931; Masamune, Short Fl. Formos. 122, 1936.

Phyllanthus virosus Roxb. ex Willd., Sp. Pl. 4:578, 1805.

Flueggea virosa (Roxb.) Baill. Etud. Gen. Euphorb. 593, 1858; Merr. Enum. Philip. Fl. Pl. 2:390, 1923; Kaneh. Formos. Tr. rev. ed. 341, 1936.

Flueggea microcarpa Blume, Bijdr. 580, 1825; Hayata in Journ. Coll. Sci. Univ. Tokyo 20:8, 1904; Matsum. & Hayata in l.c. 22:359, 1906.

Taiwan: Northern part: *S. Suzuki 1911, T. Suzuki 6942, Masamune & Suzuki 1332, Kawakami & Simada 14753, Simidu 2401, Sasaki 14754;* central-southern part: T. *Suzuki 13307, Kudo & Sasaki 15552, Matsuda 1199, 1917, S. Suzuki 1519 Sasaki 1217, Mori 387;* Botel Tobago, *Hosokawa 8171.*

Distribution: Tropical Africa, India, China, Malaysia, Philippines to Australia.

This Formosan plant very probably represent a variety of *S. virosa*. The male flowers, as compared with Pax & Hoffmann's illustration (in Engler & Prantl, Pflanzenfam. 2 Aufl. 19c:60, *F. 27D*, 1931), are distinguished by the elliptic-orbicular sepals and the 3 deflexed and folded free portion of the pistillodes; while in Pax and Hoffmann's illustration, the sepals are oblong-lanceolate and the free portions of the pistillodes are erect.