

A REVISION OF GIRONNIERA GAUDICH. (ULMACEAE)

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SUMMARY

Two species remain in the genus : *G. celtidifolia* GAUDICH. and *G. nervosa* PLANCH.; 20 species are reduced to *G. nervosa* PLANCH. and 3 species are reduced to *G. celtidifolia* GAUDICH.

G. cuspidata (BL.) KURZ, *G. lucida* KURZ., *G. reticulata* THW., and *Aphananthe lissophylla* GAGNEP. are reduced as synonyms of *Aphananthe cuspidata* (BL.) PLANCH; and *G. yunnanensis* H.H. HU as *Aphananthe yunnanensis* (H.H. Hu) PHUPHAT.

GIRONNIERA

Gironniera GAUDICH. Bot. Voy. Bonite, t. 85. 1844.—Type species: *G. celtidifolia* GAUDICH. — *Cyclostemon* BL. Bijdr. Fl. Ned. Ind. 597. 1825.—*Galumpita* BL. Mus. Bot. Lugd. Bat. 12 : 73. 1856.—Type species *G. cuspidata* BL.

Trees or shrubs, dioecious. *Leaves* alternate penninerved. *Stipules* longer than the petiole, connate at the base. *Inflorescence* axillary thyrsoïd; male perianth 5-lobed, confluent at the base, with a stamen upon each one; female perianth 4 or 5-lobed, ovary sessile. *Fruits* more or less fleshy, drupaceous; perianth and stigmas persistent, easily breaking off. *Embryo* coiled, mainly consisting of the radicle; cotyledons very small.

Distribution.—From China to Australia.

Ecology.—Altitude from sea level to 1500 m. Flowering and fruiting all the year round.

Remarks.—The genus with great variation in leaves.

KEY TO THE SPECIES

1. Inflorescences and infructescences clustered; fruits 4-5 (-7) by 3.5-4 (-6) mm; the outer stipule subopposite to the leaf, the inner one subaxillary; leaves sharply serrate; anther glabrous 1. *G. celtidifolia*
1. Inflorescences and infructescences thyrsoïd, lax; fruits (5-) 8 (-9) by (6-) 8 mm; stipules lateral; leaves mostly entire or serrulate in the upper part; anther hairy on the back 2. *G. nervosa*

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1. *Gironniera celtidifolia* GAUDICH. Bot. Voy. Bonite, t. 85. 1844; PLANCH. in Ann. Sc. Nat. Ser. iii. 10 : 340. 1848; DC. Prodr. 17 : 207. 1873; MERR. in Philip. Journ. Sc. 2 : 270. 1907.— *G. sibuyanensis* ELMER, Leaflets Philip. Bot. 5 : 1845-6. 1913.— *G. retinervia* MERR. & PERR. in Journ. Arn. Arb. 20 : 325. 1939.— *G. grandifolia* MERR. op. c. 326.

Tree or sometimes shrub-like, 4-20 m high, bark finely irregular $\pm$ deeply grooved, whitish to greenish grey, hairs mainly appressed, some $\pm$ patent, lenticels more or less conspicuous, oblong to orbicular, same color as the bark. *Stipules* boat-shaped, 1.5-4 cm by 3-9 mm, the outer one opposite to slightly opposite (to the leaf), embracing nearly the whole twig, outside appressed with $\pm$ patent hairs, except the covered part glabrous, very long and slender acute, the inner one slightly smaller, thinned out towards the margin, caducous or persistent. *Petioles*, terete, 1-10 by 1-3.5 mm, densely appressed hairy, *Leaves*, chartaceous, elliptic-oblong to oblanceolate, 8-37 by 2-15 cm, glabrous above, scabrous and very finely appressed hairy beneath; midrib, nerves and veins appressedly and densely hairy; base $\pm$ obliquely cuneate to cordate; margin serrate to dentate especially on the upper part, slightly curved; apex caudate, acumen acute; midrib above prominulous to slightly sunken at the base, beneath prominent, rounded; nerves spacing along the midrib (0.8-2.3 cm apart,) 30° - 45° to the midrib, grooved to prominulous above, prominent beneath, slightly arching and joined in the upper part, some intercalary veins slightly developed in old leaves; veins transverse, veinlets prominulous beneath, finely reticulate. *Thyrse* 1-1.3 cm, densely glomerulous, many flowered, hairy, flowers in $\pm$ sessile glomerules, altimate branches spicoid ending in a bare part overtopping the flowers; bracts many, membranous, hairy. *Male flower* perianth 5-lobed, connate at the base, boat-shaped, ovate to oblong-lanceolate 1.5-2 by 1-1.2 mm, acute, membranous, with a thick midrib, outside long hairy, inside glabrous; stamens 5, opposite to the perianth lobes; filament flat, gradually tapering to the apex, $\pm$ 1.5 mm, glabrous; anther dorsifixed, heart-shaped, apiculate, 1-1.2 by 0.5 mm, glabrous, dehiscing longitudinally latero-introrse; pistillode 1-1.4 by 0.1 mm, filiform, slightly narrowed from base to apex, sericeous, surrounded by velutinous hair. *Female flower* half the size of the male flower, 2 at the base of each one. *Infructescences* cymose, 0.8-3 cm (rarely 6 cm), fruits clustered at the base of petiole or around the twig (rarely lax), developed 2 - many; perianth and bracts mostly present, bracts 1-2 at the base of pedicels, boat-shaped, slightly accrescent. *Drupe* broad ovate to orbicular, 4 by 3.5 mm, more or less flattened, minutely appressed hairy, 1-locular, beaked 1-2 mm, stigmas 2, filiform, 0.8-1.5 cm or more, hairy.

Distribution.— Philippines, Moluccas, New Guinea, Solomon, Fiji, Australia.

PHILIPPINES : Lyete : *G.E. Edano* 14235, 41758; Luzon : *Coming* 870; *G.E. Edano* 9542; *G.E. Edano & H. Gutierrez* 37752; *Elmer* 7388, 7935, 9182, 13509, 14734, 15299; *M. Lagrimas* 39951; *Sinclair & Edano* 9599; *Yates* 25458; Mindanao : *L. Escritor*; 21493; *D. Mendoza* 42042; *D. Mendoza & P. Convozar* 10475, 10486, 10608; Mindor. : *B.B. Britton* 181; *M. Celestino & A. Castro* 1905; Samar : *A. Castro* 5761; *Edano* 15581; *Sulit* 4334 6049, 14495; Sibuyan : *Elmer* 12077 (isotype : *G. sibuyanensis*).

MOLUCCAS : Halmaheira : *Pleyte* 240, 317; *Beguin* 2015; Morotai : *A. Kostermans* 1037, 1053; Talaud : *H.J. Lam* 3466, 3586.

NEW GUINEA : Morobe District : *A.N. Millar* NGF 14430, 22980; *C. Ridsdale* NGF 31656; *H. Streimann & A. Kairo* NGF 27968; Papua : *Brass* 28237; *C.E. Carr* 16135; *K. Paijmans* 123.

SOLOMON : Bougainville Island : *Kajewski* 1646 ♀ (isotype : *G. retinervia*); *Brass* 2873; New Georgia : *Cowmeadow* BSIP 3185, 3692, 3755; *L. Maenu'u* BSIP 5154; *Whitmore* BSIP 1871, 1919, 4287, 5565; Malaita : *S.F. Kajewski* 2343; *F.S. Walker & C.T. White* BSIP 119; *Lipageto & T.C. Whitmore* BSIP 3474, 3408; San Cristoval Island : *Brass* 2731 (isotype : *G. grandifolia*)

FIJI : *A.C. Smith* 4915, 5421, 6899; *O. Degener & E. Ordonez* 13826, 15107.

AUSTRALIA : *Dr. Reinecke* 359.

Ecology.—On rocks, hillsides and in rain forest. Altitude from sea level to mostly 30-60 (1450) m. Flowering and fruiting all the year round.

Gironniera nervosa PLANCH. Ann. Sc. Nat. Ser. iii. 10 : 338. 1848; KURZ, Prelim. report on For. Pegu App. B : 87. 1875.— *G. parvifolia* PLANCH. 1.c.— *G. subaequalis* PLANCH. op.c. 339.— *Sponia annulata* TEIJSM. & Binn in Nat. Tijds. Ned. Indie 2 : 303. 1851.— *Gironniera rhamnifolia* BL. Mus. Bot. Lugd. Bat. 2 : 74. 1852.— *G. costata* MIQ. in Zoll. Syst. Verz. 88. 1855.— *G. amboinensis* LAUT. in Engl. Jahrb. 50 : 326. 1913.— *G. paucinervia* MERR. in Journ. As. Soc. Straits 77 : 189. 1917.— *G. longifolia* CRAIB in Kew Bull. Misc. Inf. : 371. 1918. *G. blumei* GANDOGGER in Bull. Soc. Bot. France 66 : 288. 1920.— *G. borneensis* GANDOGGER 1.c.— *G. ferruginea* GANDOGGER op.c. 289.— *G. korthalsii* GANDOGGER op.c. 288.— *G. penangiana* GANDOGGER op.c. 289.— *G. sponioides* GANDOGGER 1.c.— *G. sumatrana* GANDOGGER op.c. 288.— *G. zeylanica* GANDOGGER 1.c.— *G. hirta* RIDL. in Journ. As. Soc. Straits 82 : 194. 1920.— *G. molissima* GAGNEP. in Bull. Soc. Bot. France 72 : 805. 1926.— *G. scabrida* (THW.) ALSTON in Trimen, Hand-Book Fl. Ceyl. 6 : 267. 1931. *Helmintospermum scabridum* THW. in Hook.'s Journ. Bot. 6 : 302. 1854.



Gironniera nervosa Planch.—A. twig with infructescences; B. perianth C. and D. stamen; E. and F. pistillode; G. fruit; H. seed; I. embryo; J. male flower.

Tree 7-30 m high. Twigs slightly flattened, branches, later on terete, 1.5-5 mm in diam., greenish to brownish grey, more or less densely appressed hairy, gradually glabrescent, lenticels inconspicuous. *Stipules*, embracing the whole twig, 0.4-3 cm by 1-8 mm, confluent at the base, boat-shaped, thinned out towards the margin, outside appressed hairy, inside glabrous. *Petiole* 1.5-12 mm by 0.5-3 mm, appressed hairy, rounded to slightly grooved above. *Leaves* broad-elliptic, oblanceolate to lanceolate to broad ovate, 1.5-24 by 2-12 cm, chartaceous to stiff coriaceous, above glabrous or nearly so, beneath scabrous to densely softly hairy; base subequal to oblique, cuneate to sub-cordate, $\pm$ attenuate; margin entire to sparsely serrate in the upper part, flattened to recurved; apex tapering to $\pm$ abruptly acuminate, acumen blunt, acute or mucronate; midrib above $\pm$ appressed hairy, prominulous or slightly sunken towards the base, beneath prominent, rounded, more hairy than above; nerves spacing along midrib (0.5-2.8 cm apart) 30° - 70° to the midrib, slightly curved, intercalary veins slightly developed, veins transversed, above inconspicuous, beneath prominulous to prominent. *Male inflorescences* thyrsoïd 0.4-7 cm, sometimes solitary, axis laxly to densely appressed hairy; glomerules few to many, $\pm$ sessile, 1-3 flowered, bracts caducous. *Male flower* perianth 5 lobed, connate at the base, lobes ovate to semiorbicular, 1-2.5 by 1-2 mm, acute to obtuse, thinned out towards the margin, outside more or less appressed hairy, inside glabrous. *Stamens* 5, opposite to the perianth lobes; filaments 0.7-1.5 mm, flattened, glabrous; anthers basifixed, versatile, 1-1.5 mm, heart-shaped, apiculate, outside appressed hairy, dehiscing longitudinally latero-intorse. Pistillode woolly. *Female inflorescences* spike-like, 1-1.5 cm, axis densely appressed hairy, 2-10-flowered, $\pm$ sessile, each flower supported by 2 or 3 bracts, bracts lanceolate, 1.5-3 by 0.4-0.8 mm, boat-shaped, apex acute, outside appressed hairy. *Female flower* perianth 4-lobed, imbricate, connate at the base, lobes 1.5-2 by 1-1.8 mm, ovate to orbicular, apex acute, thinned out towards the margin, outside appressed hairy, inside glabrous; ovary superior, sessile, 1 by 0.5 mm, cylindrical, sericeous; stigmas 2, $\pm$ 1.5 by 0.2 mm (enlarge in fruits), flattened outside sericeous, inside glabrous, caducous. *Infructescences* solitary, cymose or thyrses, 1.5-9.5 cm, compact to lax, 1- many developed fruits, perianth persistent, 4 or 5 lobed, slightly accrescent. *Drupe* more or less flattened, with marginal ribs, $\pm$ beaked, minutely appressed hairy, 1-locular, stigmas 2, easily breaking off. Seed 1, pendulous. *Embryo* : coiled, 5 by 4 mm, radicle long and coiled, more than 10 times longer than cotyledons; cotyledons 2, 1-1.5 by 1 mm, thin, leaf-like.

D i s t r i b u t i o n .— India, Ceylon, Burma, China, Hong Kong, Indo-China, Thailand, Philippines, Malay Peninsula, Singapore, Indonesia and New Guinea.

CEYLON : C.P. 716 (Syn-type : *Helmintospermum scabridum*)

BURMA. Hukong : R.S. Hole 49; Jhaung Yin : Bald 12277; Katha : J.H. Lace 5342.

CHINA. Yunnan : A. Henry 12417; Kwangtung : W.Y. Chun 6235; C. Ford 171; Hainan : C.C.C. 8094; H. Y. Liang 64906; Hong Kong: Chilford 361; Hance 1208; Harland s.n..

INDO-CHINA. Tonkin : Balansa 2464, 2465, 2466, 2467; Bon 3357; Petelot 4898; W.T. Tsang 27166, 29072, 29966; Annam : Bon 8424; Clemens 3830; Poilane 1005, 1160, 7435, 10131, 10400; Saigon : Poilane 1005 (Holo-type : *G. mollissima*), 8200.

THAILAND. Northern. Nan : Kerr 2439 A (Holo-type : *G. longifolia*), 5036, 5052; Smitinand 13014; Northeastern. Loei : Shimizu, Hutoh & Chaiglom 8922; Tagawa, Iwatsuki & Fukuoka 1179; Eastern. Nakhon Ratchasima: Kerr 9467, 9888, 9912; Put 3577; Southeastern. Chanthaburi : Kerr 17694, 17987; Lakshnakara 546; Nai Noe 68; Put 891; Sakol 294; Rayong : Put 2737; Krat : Kerr 17694; Put 2869; Southwestern: Kanchanaburi : Kerr 10359; Prayad 818; Peninsular. Phangnga : Kerr 17223; Krabi : Kerr 18604; Phuket : Kerr 17429; Trang : Kerr 19183; Luang Vanpruk 822; Satun : Kerr 13984; Pattani : Kerr 7803; Lakshnakara 598; Yala : Kerr 7599; Narathiwat : Prayad 385.

PHILIPPINES : Mamos & Pascasio 34486; Sulit 6407.

MALAY PENINSULA. Kedah : Burkill 3347; Perak : Dr. King's collectors 6340, 8294; Kochummen 2463; Ramli Zainuddin 99766; Sow & Motan 71477; Whitmore 0629, 0799, 3051; Ulu Bubong SF 10389; Ulu Kal SF 10898; Kelantan : Cockburn FRI 7050, 7107, 7192, 7261, 7421; Pahang: Chew Wee Lek 27; Kiah 31741; Mohgan 99570, 99586; Shah 229, 233; Whitmore 3171, 3524, 3577, 3780; Zahir Yusoff 99105, 99110; Selangor: Hardial & Sidek 433; K.M. Kochummen 94033; Rahim Ismail 100109; Sow & Motan 94507; Whitmore FRI 0326; Malacca : Maingay 1469; Johor : Chew Wee Lek 720; Kadim & Noor K. 413; Khing 49791; Kochummen 2187; Lindong & A. Santiago 71530; Simpai Like & Relsah 4018; Penang Hardial & Samsuri 174.

SINGAPORE : Chew Wee Lek 36; Chew & Kiah 101; Hardial & Samsuri 321; Dr. King's collector 1211; Ridley s.n.; Sinclair s.n..

SUMATRA : Bartlett 6973, 7049; Beccari 494, 700, 932; Buwalda 6277, 6428, 6887; Dumas 1510, 1511, 1622, 1638; Endert 173; Forbes 2820; de Haan 730; Ismael 24; Jacobs 4643; Korthals s.n.; Kostermans & Anta 59, 117, 207; Krukoff 4011; Lambach 1321; Meijer 3375, 3378, 4189, 4300; Sadau 49201; Soepadmo 148, 1975; van Steenis 9252; Yates 1853, 2563.

BORNEO : *Anderson* 4026; *Ashton* 664, 16434; *Boschproef-station* 12034, 13378, 14101; *Bujang* 12766; *Buntar* 25839, 25872; *Clemens* 26680, 27342, 30569, 32741; *Daud & Tachum* 35706; *Endert* 3076, 3546, 3547, 3830; *Ilias Paie S.* 24934, 27210; *Jugah* 15799, 23692; *Kanis & Kuripin* 53965; *Koklin* 3021; *Korthals s.n.*; *Kostermans* 4167, 4256, 6351, 6880, 7079, 10183, 10333, 21100; *Kuripin* 44742; *Lajangah* 32275; *Madani SAN* 33237, 35100, 35104, 35180, 36765, 36862; *S. Madius* 49278; *Matusop* 7424; *Mikil* 28087, 30174; *Mitsura Hotta* 12939; *Mujin* 33827; *Pingkum* 8828; *van Steenis* 1172; *Wood & Charington* 17040.

JAVA : *Backer* 7121, 9961, 25513; *Bakhuizen van den Brink* 270, 6378; *Koorders* 9435, 9437, 9438, 12579, 13240, 37300; *van Steenis* 15; *Teysm. & Binn. s.n.* (Holo-type : *Sponia annulata*); *Zollinger* 1413, 3053 (Syn-type : *G. costata*).

CELEBES : *Eyma* 4088; *Mantri Boschweren* 1825, 1844, 1847, 1848, 1922, 1924, 1928, 1929, 2359; *Neth. Ind. For. Service* 21100, 26014, 31821.

MOLUCCAS : *Boschproef-station* 15913; *Hulstijn* 330; *Kostermans* 1227; *Neth. Ind. For. Serv.* 22826, 23141, 23152.

NEW GUINEA : *Brass* 7433, 8174, 9008; *Iwanggin* 5224, 5788, 5834, 5850, 9237, 10034, 10157; *Kalkman* 3414, 3680; *Koster* 1126, 1134, 4429, 4458, 4475, 7060, 7077; *Kostermans* 329, 343; *van Leeuwen* 10236; *Moll* 11739, 12794, 12836, 12971, 12973; *Neth. Ind. For. Serv.* 30380, 30729, 30844, 30853, 30858, 30812, 30868, 30873, 30980; *Riekerk* 2387; *van Royen* 3078, 4032, 4726; *van Royen & Sleumer* 6201, 6215, 6364, 6556; *Schram* 1761, 1726, 2702, 6085, 9186, 10555, 10724; *Vink* 11370, 15365; *Westerhuis* 5474; *White & Gray* 10413; *Zippius* 189 (Iso-type : *G. rhamnifolia*).

Ecology.— In evergreen forest, primary forest, secondary forest, rain forest, lowland forest, hillside, limestone, sandy clay soil. Altitude from sea level to mostly 60-1200 (-1500) m. Fruits all the year round.

Remark.— Kurz (Prel.Rep.For.Pegu App. B: 87. 1875) reduces *G. subaequalis* as a variety of *G. nervosa*.

A C K N O W L E D G E M E N T S

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Rahim Ismail 100109 (2); Ramli Zainuddin 99766 (2); Reinecke 359 (1); Ridley (July 1894) (2); Ridsdale NGF 31656 (1); Riekerk 2387 (2); van Royen 3078 (2), 4032 (2), 4726 (2); van Royen & Sleumer 6201 (2), 6215 (2), 6364 (2), 6566 (2).

Sadau 49201 (2); Sakol 294 (2); Schram 1761 (2), 1726 (2), 2702 (2), 6085 (2), 9186 (2), 10555 (2), 10724 (2); Shah 229 (2), 233 (2); Shimizu, Hutoh & Chaiglom 8922 (2); Simpai Like & Relsah 4018 (2); Sinclair (without number) (2); Smith 4915 (1), 5421 (1), 6899 (1); Smitinand 13014 (2); Soepadmo 148 (2), 1975 (2); Saw & Motan 71477 (2), 94507 (2); van Steenis 15 (2), 1172 (2), 9252 (2); Streimann & Kairo NGF 27968 (1); Sulit 4334 (1), 6049 (1), 6407 (2), 14495 (1).

Tagawa, Iwatsuki & Fukuoka 1179 (2); Teysm. & Benn. (Holo type : *Sponia annulata*) (2); Tsang 27166 (2), 29072 (2), 29966 (2).

Ulu Bubong 10389 (2); Ulu Kal 10898 (2).

Vanpruk 822 (2); Vink 11370 (2), 15365 (2).

Walker & White BSIP 119 (1); Westerhuis 5474 (2); White & Gray 10413 (2); Whitmore BSIP 0326 (2), 0629 (2), 0799 (2), 1871 (1), 1919 (1), 3051 (2), 3171 (2), 3524 (2), 3577 (2), 3780 (2), 4287 (1), 5565 (1); Wood & Charington 17040 (2).

Yates 1853 (2), 2563 (2), 25458 (1).

Zahir Yusoff 99105 (2), 99110 (2); Zippius 189 (Iso-type : *G. rhamnifolia* Bl.) (2); Zollinger 1413 (2), 3053 (Syn-type : *G. costata* Miq.) (2).