

XP
H947
V.63
K2

PHYTOLOGIA

An international journal to expedite botanical and phytoecological publication

Vol. 63

June 1987

No. 2

CONTENTS

LUNDELL, C.L., <i>Studies of American plants – XXII</i>	73
ST. JOHN, H., <i>Enlargement of Delissea (Lobeliaceae). Hawaiian Plant Studies 138</i>	79
KORD, M.A.-A., <i>Effect of foliar fertilization by ammonium sulphate, sodium nitrate, and ammonium nitrate on the morphology of lentil (Lens esculentus)</i>	91
MOLDENKE, H.N., <i>Notes on the genus Clerodendrum (Verbenaceae). XXXVII</i>	102
TURNER, B.L., <i>New species and combinations in Mexican Heterotheca (Asteraceae-Astereae)</i>	127
ST. JOHN, H., & TAKEUCHI, W., <i>Are the distinctions of Delissea valid? Hawaiian Plant Studies 137</i>	129
JONES, A.G., <i>New combinations and status changes in Aster (Asteraceae)</i>	131
MOLDENKE, A.L., <i>Book reviews</i>	134

LIBRARY

JUL 6 1987

Published by Harold N. Moldenke and Alma L. Moldenke
590 Hemlock Avenue N.W.
Corvallis, Oregon 97330-3818
U.S.A.

Price of this number \$3.00; for this volume \$16.00 in advance or \$17.00 after close of the volume; \$5.00 extra to all foreign addresses and domestic dealers; 512 pages constitute a complete volume; claims for numbers lost in the mail must be made immediately after receipt of the next following number for free replacement; back volume prices apply if payment is received after a volume is closed.

STUDIES OF AMERICAN PLANTS — XXII

Cyrus Longworth Lundell

Director, Plant Sciences Laboratory
The University of Texas at Dallas
Richardson, Texas 75083-0688

CELASTRACEAE

EUONYMUS HERNANDEZII Lundell, sp. nov. — Arbor parva, 3 m., omnino glabra; ramuli ramulique graciles, quadrangulares; folia petiolata, petiolo 2–3.2 mm. longo, canaliculato; lamina membranacea, lanceolata, 4–8.5 cm. longa, 1.5–3.4 cm. lata, apice caudato-acuminata, basi acuta, crenulato-serrulata; inflorescentia parva, axillaris, cymosa, 1–2 cm. longa, pauciflora; pedicelli fructiferi, 2–3 mm. longi; flores 4-meri; sepala depresso-rotundata, ad 1.4 mm. lata, 1 mm. longa; capsula parva, tuberculata, depresso-globosa, ad 1 cm. lata; semina arillata.

Mexico: Oaxaca, Municipio Santa Maria Chimalapa, Monte Rico, ca. 18 km. al E de Santa Maria al N del Rio del Corte, alt. 250 m., Oct. 27, 1984, H. Hernandez G. 523 (holotype, LL), arbolito de 3 m. de altura, fruto color rosado, carne color rosa palido, semillas color mandarina. Another collection from this area, Hernandez 123, in young fruit, is referable to this species.

E. Hernandezii appears to be related to E. chiapensis Lundell, a taxon larger in most parts. The capsules of both are compactly tuberculate.

ZINOWIEWIA REVOLUTA Lundell, sp. nov. — Arbor glabra, 10 m. alta; folia ad 12 mm. longe petiolata; lamina chartacea, lanceolata vel oblongo-lanceolata, 3–6.5 cm. longa, 1–2.3 cm. lata, apice acuminata, acumine obtusiusculo vel acuto, basi subacuminata et revoluta; cymae 1–2.5 cm. longae; pedicelli 1.5–2 mm. longi; calyx quinquefidus; petala 5, ovata, parva, ca. 1 mm. longa; filamenta ca. 0.6 mm. longa; antherae minutae; ovarium in discum subimmersum, apice attenuatum.

Costa Rica: Provincia de Heredia, steep pastured slopes and thickets about 1 km. W of Los Cartagos towards Vara Blanca intersection, elev. of about 2040 m., Aug. 3, 1976, R. L. Wilbur 21739 (holotype, LL), tree 10 m. tall.

Zinowiewia revoluta resembles Z. Matudae Lundell of Chiapas in having a pronounced revolute base of leaf blade. It differs in its smaller flowers with pedicels up to 2 mm. long. These are the only species in the genus with leaves revolute at base.

Unfortunately the flowers of the type are diseased, and no samaras are available.

MYRSINACEAE

AURICULARDISIA MORAVIANA Lundell, sp. nov. — Frutex, 1 m.; ramuli crassi, apice adpresso lepidoti; folia petiolata, petiolo ad 1.5 cm. longo, marginato, subtus dense lepidoto; lamina subchartacea vel membranacea, obovato-elliptica, 27–32 cm. longa, 10.5–12 cm. lata, apice subabrupte acuminata, basi attenuata, margine pellucido-punctata, integra, subtus reticulata, minute lepidota; inflorescentia terminalis, squarrosa, late paniculata, ad 15 cm. longa, pyramidalis, minute lepidota; flores corymbosi, 5-meri; pedicelli 4–7 mm. longi; sepala hyalina, asymmetrica; anguste auriculata, suborbicularia, ad 2 mm. longa, 2.3 mm. lata, apice rotundata, parce macropunctata, margine epunctata, subciliolata; fructus subglobosus, ad 4.5 mm. diam.

Costa Rica: Provincia de San Jose, roadside leading from Alto La Palma to Bajo La Hondura with the elevation ranging from 1550 to 1260 m., about 10 km. NE of San Vicente de Moravia, Feb. 24, 1978, R. L. Wilbur 24919 (holotype, Duke), shrub 1 m. tall.

Differing markedly in the size and shape of the sepals, and in having much larger leaves with broad marginate petioles, these features distinguish *Auriculardisia moraviana* from the closely related *Auriculardisia quadrata* Lundell, *Phytologia* 56: 413. 1984. Both taxa have large quadrately branched paniculate inflorescences, and their leaves and inflorescences are yellow-green. The pellucid-punctate leaf margin of *Auriculardisia moraviana* further distinguishes it from *Auriculardisia quadrata*.

AURICULARDISIA SARAPIQUIENSIS Lundell, sp. nov. — Frutex, ad 4 m.; ramuli graciles, apice minute lepidoti; folia chartacea vel subcoriacea, glabra, dense nigropunctata, petiolata, petiolo 8–12 mm. longo, anguste marginato; lamina oblango-lanceolata vel oblanceolata, 8.5–15 cm. longa, 3–4.5 cm. lata, apice subacuminata, basi attenuata, integra, utrinque reticulata; inflorescentia terminalis, paniculata, glabra, subsessilia, ad 7.5 cm. longa et lata; flores 5-meri, glabri, corymbosi; pedicelli 6–10 mm. longi; sepala asymmetrica, suborbicularia, ca. 2 mm. longa et lata, punctata, ciliata et auriculato-fimbriata; corolla pallida, glabra, ca. 8 mm. longa, pallido-punctata; petala basi connata, lanceolata, ca. 6.5–7.5 mm. longa, obtusiuscula; stamina ca. 6.5 mm. longa; filamenta crassa, ca. 1 mm. longa; antherae anguste lanceolatae, ca. 6 mm. longae, attenuatae, dorso lineato-punctatae; ovarium glabrum, punctatum; stylus ca. 5 mm. longus; ovula 20, pluri-seriata.

Costa Rica: Provincia de Heredia, Finca La Selva, the OTS Field Station on the Rio Puerto Viejo just E of its junction with the Rio Sarapiquí, elev. about 100 m., July 20, 1982, B. Hammel & J. Trainer 13262 (holotype, LL), shrub to 4 m. tall, flowers pink, in forest on ridge at SW corner of new property.

Related to *Auriculardisia squamata* Lundell, *Phytologia* 56: 19. 1984, and *Auriculardisia Wilburiana* Lundell, this species has the

same type of inflorescence borne at leafy apex of lateral branchlets. The three differ notably in size and structure of inflorescences and in flower and leaf size. All three are from the same river basin. The anthers of Auriculardisia sarapiquiensis are linear-punctate medially with black glands, a noteworthy feature of this taxon.

AURICULARDISIA SPATHULATA Lundell, sp. nov. — Arbor parva, ca. 6 m. alta; ramuli crassi, adpresse furfuracei; folia ad apices ramorum verticellatim congestis, subcoriacea, supra glabra, subtus parce adpresse lepidota, longipetiolata, petiolo 2–3 cm. longo, crassiusculo; lamina spathulata, 11–15 cm. longa, 3.5–4.5 cm. lata, integra, apice rotundata et retusa, basi attenuata; inflorescentia terminalis, late pyramidalis, paniculata, congesta, ad 25 cm. longa, basi ad 20 cm. lata, basi dense furfuracea, trichoma substipitata; flores 5-meri; pedicelli crassiusculi, 3–4 mm. longi, glabri; sepala parva, subcoriacea, asymmetrica, auriculata, ovata, 1.2–1.3 mm. longa, acuta, nigropunctata, ciliolata; ovarium punctatum; stylus ca. 3 mm. longus.

Costa Rica: Guanacaste Province, pasture adjoining main road and Chomogo Trail above Monte Verde, Chomogo Trail near headwaters of Rio Guacimal, Jan. 8, 1973, D. E. Stone & A. L. Welden 3440 (holotype, Duke), 15–20 ft. tall tree in young fruit.

Auriculardisia spathulata, noteworthy for its distinctive spathulate leaves, is related to Auriculardisia micrantha Lundell, Wrightia 7: 269. 1984.

AURICULARDISIA TARARIAE (Lundell) Lundell, comb. nov.

Ardisia tarariae Lundell, Phytologia 61: 67. 1986. Costa Rica: G. Davidse et al. 28882 (holotype, LL).

AURICULARDISIA TRICHOMATA Lundell, sp. nov. — Arbor parva, 5 m.; ramuli crassi, furfuracei; trichomata parce, elongata et stipitata, inferne recta; folia petiolata, petiolo crassiusculo, late marginato, ad 1.5 cm. longo; lamina subcoriacea, supra glabra, subtus dense adpresse lepidota, trichoma parce, lamina oblonga vel anguste lanceolata, 15–22 cm. longa, ad 5.3 cm. lata, apice subacuminata, basi attenuata, margine integra; inflorescentia terminalis, crassiuscula, late paniculata, ad 25 cm. longa, furfuracea, trichoma stipitata; pedicelli crassi, ad 1 mm. longi, 1.5 mm. diam.; flores capitati vel subspicati, 5-meri; sepala suborbicularia, ad 2 mm. longa, 2.5 mm. lata, asymmetrica, auriculata, subcoriacea, parce nigropunctata, margine erosa; corolla nigropunctata, ad 7 mm. longa; petala lanceolata, basi connata, apice acuta; stamina 4–5 mm. longa, supra basi adnata; filamenta ad 2 mm. longa; antherae lanceolatae, crassiusculae, 2.5–3 mm. longae, apiculatae; stylus ad 6.5 mm. longus; ovula parva, numerosa, pluriseriata.

Costa Rica: Provincia de San Jose, roadside leading from Alto La Palma to Bajo La Hondura with the elevation ranging from 1550 to

1260 m., about 10 km. NE of San Vicente de Moravia, Feb. 24, 1978, R. L. Wilbur 24906 (holotype, Duke), tree 5 m. tall.

Auriculardisia trichomata is remarkable for its indument, a mixture of appressed scales with mostly scattered usually stipitate trichomes. Its petioles are broadly marginate with leaf blade decurrent to base. Its flowers are in small aggregated heads below which they are spicate. Notable are the pedicels which are as thick as the calyx and with diameter greater than length. The depressed suborbicular sepals are rounded. The corolla is tubular at base with the rather slender filaments attached above the base. The petals are acute and asymmetric at apex, with scattered black glands.

The relationship of the taxon appears to be with Auriculardisia rufa (Lundell) Lundell, *Phytologia* 49: 345. 1981, a species of the mountains which has similar but less conspicuous trichomes and thick but much longer pedicels.

AURICULARDISIA WILBURIANA Lundell, sp. nov. — Arbor parva, ad 4 m. alta; ramuli crassiusculi et graciles, apice minute et dense lepidoti; folia chartacea, supra glabra, subtus minute lepidota, dense nigropunctata, petiolata, petiolo crassiusculo, subtus dense lepidoto, 7–12 mm. longo, anguste marginato; lamina lanceolato-elliptica, vel raro obovata, 8–22 cm. longa, 3.5–8 cm. lata, apice subacuminata et obtusiuscula, basi cuneata, margine integra, subtus reticulata; inflorescentia terminalis, pendula, capillaris, laxa, paniculata, ad 16 cm. longa, parce lepidota; flores 5-meri, corymbosi; pedicelli ad 1.7 cm. longi; sepala asymmetrica, ca. 2 mm. longa, suborbicularia, punctata, auriculato-fimbriata; corolla pallida, glabra, ca. 7 mm. longa; petala libera, lanceolato-oblonga, ca. 7 mm. longa, acutiuscula; stamina ca. 6 mm. longa; antherae anguste lanceolatae, attenuatae; filamenta subnulla; ovarium glabrum, punctatum; stylus 4 mm. longus; ovula 16, pluriseriata.

Costa Rica: Provincia de Heredia, Finca La Selva, the OTS Field Station on the Rio Puerto Viejo just E of its junction with the Rio Sarapiquí, Paso Perdidos trail, ca. 3200 m. line (EW), elev. about 100 m., July 16, 1984, B. Jacobs 2917 (holotype, LL; isotypes, Duke), weak trunked tree to 4 m., trunk ca. 3 cm. diam. most of the first 2 m., inflorescences pendant, corolla white, anthers yellow, fruits red.

A remarkable species related to Auriculardisia squamata Lundell, *Phytologia* 56: 19. 1984, the type of which came from the same locality. Both have slender lateral branchlets, borne near the apex of the twig, which have the inflorescences borne at the leafy apex. Auriculardisia Wilburiana has long slender panicles up to 16 cm., with corymbose flowers on slender pedicels up to 1.7 cm. long, and much larger white flowers. In Auriculardisia squamata the panicles are scarcely 3 cm. long, and the flowers are very small. Both taxa have fimbriate asymmetrical sepals wider than long, typical of the genus.

The species is named for Dr. R. L. Wilbur of Duke University as a token of recognition for his insistence on excellence in the preparation of herbarium specimens and his dedication to high standards for herbarium collections.

GRAPHARDISIA MURPHYAE Lundell, sp. nov. — Frutex; ramuli crassiusculi vel graciles, glabri; folia petiolata, petiolo 10—12 mm. longo, anguste marginato, canaliculato; lamina flava, glabra, subcoriacea, lanceolata vel oblanceolata, 11—16 cm. longa, 3.5—5.5 cm. lata, apice acuminata, basi cuneata, pellucido-punctata, integra; inflorescentia glabra, parva, terminalis, paniculata, 3.5—4.5 cm. longa, basi ad 6 cm. lata; pedicelli graciles, 8—11 mm. longi; flores corymbosi, 5-meri; sepala hyalina, elliptica vel ovato-elliptica, 4—5.5 mm. longa, ca. 3.5 mm. lata, lineato-punctata, apice rotundata, basi intus minute glandulosa; corolla ad 7 mm. longa; petala hyalina, basi connata, basi intus minute glandulosa, ovato-elliptica, ca. 6 mm. longa, 4 mm. lata, apice rotundata, lineato-punctata; stamina 3—3.5 mm. longa; filamenta crassa, 1—1.5 mm. longa; antherae lanceolatae, ca. 2.5 mm. longae, poris apicalibus dehiscentes; stylus ca. 4.5 mm. longus.

Costa Rica: Puntarenas, north of La Lucha road to Progreso, disturbed forest, elev. 1200 m., May 23, 1984, H. Murphy 1248 (holotype, Duke), common shrub in understory and forest edge, conspicuous and beautiful, flower rachis white tinged with purple, calyx white, corolla pale purple-white, stamens yellow, pistil pale green.

Closely related to Graphardisia subcoriacea (Lundell) Lundell, *Phytologia* 48: 140. 1981, Graphardisia Murphyae differs notably in having leaves pellucid-punctate, and with petals multilined. In G. subcoriacea the leaves are conspicuously black-punctate and the petals are bilineate with black glands. Both are glandular at base of sepals and corolla within with minute gland-tipped hairs.

ICACOREA PROCTORI (Lundell) Lundell, *Phytologia* 49: 351. 1981. Ardisia Proctori Lundell, *Wrightia* 4: 64, Pl. 162. 1968.

Nicaragua: Dept. Bluefields, primary rain forest, ca. 5 km. NE of Rama, alt. sea-level to 150 m., Rio Escondido, April 4, 1966, George R. Proctor, Gayle C. Jones & Lynden Facey 27313 (holotype, LL), tree 8 m., fruits green.

Costa Rica: Provincia de Heredia, Finca La Selva, the OTS Field Station on the Rio Puerto Viejo, just E of its junction with the Rio Sarapiquí, elev. about 100 m., Holdridge Trail, 2000 m. line, April 3, 1981, James Folsom 9620 (LL), tree of 8—10 m., peduncle purple-red, fruit purple-black. Same locality, west boundary trail, 2300 m., south, Feb. 16, 1982, Barry Hammel 11165 (LL), tree 15 m. tall, 15 cm. dbh., flowers white, inflorescence branches pink. Provincia de Heredia, Zona Protectora La Selva, 6 km. by road from Rio Peje crossing, 5 km. SSE of Magasay, in primary forest along picada to Rio Peje, at about 390 m., Jan. 24,

1983, G. E. Schatz, M. Grayum 697 (Duke), tree 15 m. tall, corolla white, stamens, tip of pedicel pinkish.

PARATHESIS LONGIPETIOLATA Lundell, sp. nov. — Arbor parva, ca. 5 m. alta; ramuli graciles, minutissime tomentelli; folia longipetiolata, petiolo 2—3.5 cm. longo, canaliculato; lamina chartacea, oblanceolato-oblonga, 9—14 cm. longa, 3—4.5 cm. lata, apice acuminata, basi attenuata, acuta vel acuminata, integra, subtus pallida, reticulata; inflorescentia terminalis, paniculata, ad 12 cm. longa, basi ad 11 cm. lata, minutissime tomentella; flores 5-meri; pedicelli 2—2.3 mm. longi; sepala valvata, parva, ovato-triangularia, ca. 1 mm. longa, acuta, punctata, tomentella; fructus subglobosus, ad 4 mm. diam.

Costa Rica: Provincia de Heredia, Finca La Selva, the OTS Field Station on the Rio Puerto Viejo just E of its junction with the Rio Sarapiquí, old south boundary 200 m. E, elev. about 100 m., July 1, 1981, B. Hammel 10939 (holotype, LL)

In the absence of flowers, the relationship of Parathesis longipetiolata is doubtful. As the name implies, it has long petioles, up to 3.5 cm. long, a distinctive feature which merits recognition. The large terminal panicles, very minute tomentum, short pedicels, small mostly triangular sepals, and leaves drying whitish beneath are characteristics which in combination appear to set the taxon apart from other species of the region.

PARATHESIS OBOVALIFOLIA Lundell, sp. nov. — Arbor, 6 m. alta; ramuli graciles, minutissime tomentelli; folia petiolata, petiolo 1—1.8 cm. longo, canaliculato; lamina subchartacea, discolor, obovalia vel late oblanceolata, 7.5—13 cm. longa, 2.2—6 cm. lata, apice subabrupte subacuminata, basi acuta, margine integra, glabra, nigropunctata; inflorescentia axillaris, longipedunculata, gracilis, 6—7.5 cm. longa, pauciflora, glabrata; flores 5-meri, corymbosi; pedicelli 7—9 mm. longi; sepala valvata, late triangularia, acuminata, ad 2 mm. longa, nigropunctata; fructus subglobosus, ca. 4 mm. diam.

Costa Rica: Prov. Puntarenas, Reserva Biologica Monteverde, sendero brillante, elev. 1500 m., Aug. 25, 1985, William A. Haber & Eric Bello C. 2444 (holotype, LL), arbol ramificado, 6 m. de alto, bajo el bosque, frutos pequenos de 4 mm. de diametro, color rojo.

In mature fruit, this distinctive taxon appears to be glabrous, but the apex of branchlets are minutely tomentose and similar pubescence appears to cover the apex of fruits and base of style. The obovate leaves are dark green above and pale beneath.

VALERIOANTHUS HIRSUTISSIMUS (Lundell) Lundell, comb. nov. Ardisia hirsutissima Lundell, *Phytologia* 61: 64. 1986. Panama: G. de Nevers et al. 6408 (holotype, LL).

ENLARGEMENT OF DELISSEA (LOBELIACEAE)

HAWAIIAN PLANT STUDIES 138

Harold St. John

Bishop Museum, Box 19000A, Honolulu, Hawaii, 96817, USA.

In the accompanying article by St. John and Takeuchi, the result of their field and herbarium studies, with abundant fresh material, establishes that most of the usual generic distinctions between Cyanea and Delissea either do not exist or are variable and useless. The only remaining character is whether the surface of the seed coat is smooth or ridged. In habit and floral details the two are identical. The slight difference in the surface of the seed coat is now judged to be so meager as to be insufficient for a generic distinction.

Until recently the dates of publication of the plates in the Atlas of Gaudichaud's Voyage of the Uranie (1826-1830) were known only as in that span of years. St. John (1985) reported finding Livraisons 1, 5, and 12 with their original wrappers. These each had a date and a printed table of contents listing the ten or eleven plates contained, with the plate numbers and binomials. The plates were not consecutively numbered. For instance, in Livraison 1, the plate numbers were between 14 and 117. One of these, plate 78, was of Delissea undulata, and it showed floral details. Hence, this was a valid publication of the genus Delissea and the species undulata, on Oct. 25, 1826. Two other species were added in the text, published in 1929. Also in 1829 was published the genus Cyanea, but now there are no adequate distinctions to separate Cyanea from Delissea which has priority. Consequently the necessary transfers to Delissea are proposed below.

NEW COMBINATIONS

Delissea aculeatiflora (Rock) comb. nov.

Cyanea aculeatiflora Rock, Indig. Trees Haw. Is. 509, 1913; Mem. Bernice Pauahi Bishop Mus. 7(2): 187-184, pl. 98, 1919.

Delissea acuminata Gaud., var. and forma acuminata; Bot. Voy Uranie 457, 1829.

Lobelia acuminata (Gaud.) Endl., Ann. Wien Mus. Naturgesch. 1: 170, 1826.

Cyanea acuminata (Gaud.) Hillebr., Fl. Haw. Is. 254, 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 269, pl. 152, 1919.

Forma latifolia (Wawra) comb. nov.

Cyanea acuminata (Gaud.) Hillebr., var. acuminata, form latifolia (Wawra) E. Wimm., Engler's Pflanzenr. IV 276b: 73, 1956.

- D. acuminata Gaud., var. latifolia Wawra, Flora 56: 7, 1873,
var. calycina (Hosaka in Hosaka & Deg.) comb. nov.
Cyanea acuminata (Gaud.) Hillebr., var. calycina Hosaka
in Hosaka & Deg., Occas. Papers Bernice Pauahi Bishop
Mus. 14: 29, fig. 2a, 1938.
- Delissea angustifolia (Cham.) Presl, var. angustifolia,
Monogr. Lobel. 47. ;836.
Lobelia angustifolia Cham., Linnaea 8: 219, 1833.
Delissea acuminata Gaud., var. angustifolia (Cham.) A. Gray,
Proc. Am. Acad. Arts 5: 148, 1862.
Cyanea angustifolia (Cham.) Hillebr., Fl. Haw. Is. 253,
1888.
var. Hillebrandii (Rock in Skottsb.) comb. nov.
Cyanea angustifolia (Cham.) Hillebr., var. Hillebrandii
Rock in Skottsb., Acta Horti Gothob. 2: 265, 1926.
var. Isabella (E. Wimm.) comb. nov.
Cyanea angustifolia (Cham.) Hillebr., var. Isabella
E. Wimm., Engler's Pflanzenfam. 276c: 84, 1968.
var. lanaiensis (Rock) comb. nov.
Cyanea angustifolia (Cham.) Hillebr., var. lanaiensis
Rock, Bull. Torr. Bot. Club 44: 235, 1917; Mem. Bernice
Pauahi Bishop Mus. 7(2): 199, pl. 103, 1919.
forma lanaiensis.
forma elliptica (Rock) comb. nov.
Cyanea angustifolia (Cham.) Hillebr., forma elliptica Rock,
Occas. Papers Bernice Pauahi Bishop Mus. 22: 64, 1957.
C. angustifolia (Cham.) Hillebr., var. elliptica (Rock)
E. Wimm., Engler's Pflanzenr. IV 276c: 821, 1968.
- var. racemosa (Hillebr.) comb. nov.
Cyanea angustifolia (Cham.) Hillebr., var. racemosa
Hillebr., Fl. Haw. Is. 253, 1888.
var. tomentella (Hillebr.) comb. nov.
Cyanea angustifolia (Cham.) Hillebr., var. tomentella
Hillebr., Fl. Haw. Is. 253, 1888; Rock. Mem. Bernice
Pauahi Bishop Mus. 7(2): 203, pl. 106, 1919.
forma subpubescens (E. Wimm.) comb. nov.
Cyanea angustifolia (Cham.) Hillebr., var. tomentella
Hillebr., forma subpubescens E. Wimm., Engler's Pflan-
zenr. IV 276b: 71, 1958.
- Delissea arborea H. Mann, Proc. Am. Acad. Arts 7: 180,
1867.
Cyanea arborea (H. Mann) Hillebr., Fl. Haw. Is. 261,
1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2):
165, pl. 83, 86, 1919.
- Delissea argutidentata (E. Wimm.) St. John, Pacif. Sci.
13: 181, 1959.
Cyanea undulata Gaud., var. argutidentata (E. Wimm.) E.
Wimm., Engler's Pflanzenr. IV 276c: Suppl. 817, 1968.
Cyanea argutidentata E. Wimm., Engler's Pflanzenr. IV
276b (1): 75, fig. 21, 1943.

- Delissea asarifolia* (St. John) comb. nov.
Cyanea asarifolia St. John, Bot. Mag. Tokyo 88: 61, 63-64, fig. 2, 1975.
- Delissea asplenifolia* H. Mann, Proc. Am. Acad. Arts 7: 182, 1867.
Cyanea asplenifolia (H. Mann) Hillebr., Fl. Haw. Is. 260 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 267, pl. 150, 1919.
- Delissea atra* (Hillebr.) comb. nov.
Cyanea atra Hillebr., Fl. Haw. Is. 263, 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 177, pl. 90, 1919.
 var. *lobata* (Rock) comb. nov.
Cyanea atra Hillebr., var. *lobata* Rock, Ind. Trees Haw. Is. 511, 1913; Mem. Bernice Pauahi Bishop Mus. 7(2): 178, pl. 91, 1919.
- Delissea Baldwinii* (Forbes & Munro) comb. nov.
Cyanea Baldwinii Forbes & Munro, Occas. Papers Bernice Pauahi Bishop Mus. 7: 43, pl. XII, 1920.
- Delissea bicolor* (St. John) comb. nov.
Cyanea bicolor St. John, Pacif. Sci. 25: 63-65, fig. 12, 1971.
- Delissea Bishopii* (Rock) comb. nov.
Cyanea Bishopii Rock, Indig. Trees Haw. Is. 509, 1913; Bull. Torr. Bot. Club 44: 233, pl. 13, 14, 1917; Mem. Bernice Pauahi Bishop Mus. 7(2): 277, pl. 155, 1919.
- Delissea Bondiana* (Rock) comb. nov.
Cyanea pilosa A. Gray, var. *Bondiana* Rock, Indig. Trees Haw. Is. 508, 1913; Mem. Bernice Pauahi Bishop Mus. 7(2): 275, 1919.
Cyanea Bondiana (Rock) Rock, Occas. Papers Bernice Pauahi Bishop Mus. 23: 72, 1962.
- Delissea Bryanii* (Rock) comb. nov.
Cyanea Bryanii Rock, Occas. Papers Bernice Pauahi Bishop Mus. 22: 47-50, figs. 5-6, 1957.
- Delissea Carlssonii* (Rock) comb. nov.
Cyanea Carlssonii Rock., Occas. Papers Bernice Pauahi Bishop Mus. 22: 60, 62-63, fig. 14, 1957; 23: 70, fig. 3, 1962.
- Delissea Chockii* (Rock) comb. nov.
Cyanea Chockii Occas. Papers Bernice Pauahi Bishop Mus. 22: 58-60, 1957.
- Delissea comata* (Hillebr.) comb. nov.
Cyanea comata Hillebr., Fl. Haw. Is. 256, 1919; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 211, pl. 113, 1919.
- Delissea Copelandii* (Rock) comb. nov.
Cyanea Copelandii Rock, Bull. Torr. Bot. Club 44: 231, pl. 10, 1917; Mem. Bernice Pauahi Bishop Mus. 7(2): 279, pl. 156, 1919.
- Delissea coriacea* A. Gray, var. *coriacea*, Proc. Ann. Acad. Arts 5: 147, 1862.

- Cyanea coriacea (A. Gray) Hillebr., Fl. Haw. Is. 254, 1888; Rock, Bernice Pauahi Bishop Mus. 7(2): 207, pl. 104, 1919.
var. Degeneriana (E. Wimm.) comb. nov.
- Cyanea coriacea (A. Gray) Hillebr., var. Degeneriana E. Wimm., Engler's Pflanzenr. IV 276b: 761, 1953.
var. gratiosa (E. Wimm.) comb. nov.
- Cyanea coriacea (A. Gray) Hillebr., f. gratiosa E. Wimm., Engler's Pflanzenr. IV 276b: 760, 1953.
var. Hardyi (Rock) comb. nov.
- Cyanea Hardyi Rock, Bull. Torr. Bot. Club 44: 236, 1917; Mem. Bernice Pauahi Bishop Mus. 7(2): 209, pl. 111, 1919.
- Cyanea coriacea (A. Gray) Hillebr., var. Hardyi (Rock) E. Wimm., Engler's Pflanzenr. IV 276b: 761, 1953.
var. serratifolia (Rock) comb. nov.
- Cyanea coriacea (A. Gray) Hillebr., var. serratifolia Rock, Occas. Papers Bernice Pauahi Bishop Mus. 22: 65, 1957.
- Delissea coronata (E. Wimm.) comb. nov.
Cyanea coronata E. Wimm., Engler's Pflanzenr. IV 276b: 59, 1956.
- Delissea crispihirta (E. Wimm.) comb. nov.
Cyanea crispohirta E. Wimm., Engler's Pflanzenr. IV 276c: 823, 1968.
- Delissea Degeneriana (E. Wimm.) comb. nov.
Cyanea Degeneriana E. Wimm., Engler's Pflanzenr. IV 276b: 69-70, fig. 18c, 1957.
- Delissea densiflora (Rock) comb. nov.
Cyanea pilosa A. Gray, var. densiflora Rock, Indig. Trees Haw. Is. 508, 1913; Mem. Bernice Pauahi Bishop Mus. 7(2): 273, pl. 154, 1919.
C. densiflora (Rock) Rock, Occas. Papers Bernice Pauahi Bishop Mus. 23: 72, 74, fig. 4, 1962.
- Delissea dentata (E. Wimm.) comb. nov.
Cyanea dentata E. Wimm., Engler's Pflanzenr. IV 276c" 821-822, fig. 6, 1968.
- Delissea Dunbariae (Rock.) comb. nov.
Cyanea Dunbarii Rock, Mem. Bernice Pauai Bishop Mus. 7(2): 265, 267, 1919.
- Delissea fallax Hillebr., Fl. Haw. Is. 251, 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 359, pl. 204, 1919.
- Delissea Fernaldii (Rock) comb. nov.
Cyanea Fernaldii Rock, Bull. Torr. Bot. Club 44: 231, pl. 1917.
- Delissea ferox (Hillebr.) comb. nov.
Cyanea ferox Hillebr., Fl. Haw. Is. 259, 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 239, pl. 131 132, 1919.
var. laevicalyx (Skotts.) comb. nov.
Cyanea ferox Hillebr., var. laevicalyx Skotts. Acta Horti Gothob. 15: 487, 1944.

- Delissea fissa* H. Mann, Proc. Am. Acad. Arts 7: 182, 1867.
Cyanea fissa (H. Mann) Hillebr., Fl. Haw. Is. 255, 1888;
 Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 225, pl.
 120, 121, 1919.
- Delissea floribunda* (E. Wimm.) comb. nov.
Cyanea floribunda E. Wimm., Engler's Pflanzenr. IV 276b:
 761, 1953.
- Delissea Forbesii* stat. et nom. nov.
Cyanea undulata Forbes, Occas. Papers Bernice Pauahi Bi-
 shop Mus. 5(1): 12-13, one plate, 1912, non *D. undulata*
 Gaud., 1826.
- Delissea Gayana* (Rock) comb. nov.
Cyanea Gayana Rock, Indig. Trees Haw. Is. 510, 1913;
 Mem. Bernice Pauahi Bishop Mus. 7(2): 225, 1919.
 var. *Duvelii* (Rock) comb. nov.
Cyanea Gayana Rock, var. *Duvelii* Rock, Occas. Papers
 Bernice Pauahi Bishop Mus. 22: 50-52, fig. 7, 1957.
 var. *wainihaensis* (Rock) comb. nov.
Cyanea Gayana Rock, var. *wainihaensis* Rock, Occas. Papers
 Bernice Pauahi Bishop Mus. 22: 56, fig. 11, 1957.
- Delissea Gibsonii* (Hillebr.) comb. nov.
Cyanea Gibsonii Hillebr., Fl. Haw. Is. 263, 1888; Rock,
 Mem. Bernice Pauahi Bishop Mus. 7(2): 77, pl. 89, 1919.
- Delissea Giffardii* (Rock) comb. nov.
Cyanea Giffardii Rock, Bull. Torr. Bot. Club 45: 132-135,
 1918; Mem. Bernice Pauahi Bishop Mus. 7(2): 159, pl.
 79, 80, 1919.
- Delissea glabra* (E. Wimm.) comb. nov.
Cyanea Knudsenii Rock, var. *glabra* E. Wimm., Engler's
 Pflanzenr. IV 276b: 75, 1956.
C. glabra E. Wimm.) St. John, Phytologia 48: 143-144,
 fig. 1, 1981.
- Delissea Grimesiana* (Gaud.) comb. nov. var. *Grimesiana*.
Cyanea Grimesiana Gaud., var. *Grimesiana*, Bot. Voy.
 Uranie 457, 1829; Atlas tab. 75, 1826-30; Rock, Mem.
 Bernice Pauahi Bishop Mus. 7(2): 247, pl. 137, 138, 1919.
 var. *Obatae* (St. John) comb. nov.
Cyanea Grimesiana Gaud., var. *Obatae* St. John, Phytologia
 40: 97, 1978.
 var. *cylindrocalyx* (Rock) comb. nov.
Cyanea Grimesiana Gaud., var. *cylindrocalyx* Rock, Bull.
 Torr. Bot. Club 44: 235, pl. 16, 1917; Mem. Bernice Pauahi
 Bishop Mus. 7(2): 251, 1919
 var. *hirsutifolia* (Rock) comb. nov.
- Cyanea Grimesiana* Gaud., var. *hirsutifolia* Rock, Occas.
 Papers Bernice Pauahi Bishop Mus. 22: 53, 1957.
- var. *Lydgadei* (Rock) comb. nov.
Cyanea-Grimesiana Gaud., var. *Lydgatei* Rock, Mem. Bernice
 Pauahi Bishop Mus. 7(2): 251, 1919

- var. mauiensis (Rock) comb. nov.
Cyanea Grimesiana Gaud., var. mauiensis Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 251, 1919.
- var. Munroi (Hosaka in Hosaka & Deg.) comb. nov.
Cyanea Grimesiana Gaud., var. Munroi Hosaka in Hosaka & Deg., Occas Papers Bernice Pauahi Bishop Mus, 14: 30, 1938.
- Delissea haleakalaensis (St. John) comb. nov.
Cyanea haleakalaensis St. John, Pacif. Sci 25: 65-67. fig. 13, 1976.
- Delissea hamatiflora (Rock) comb. nov.
Cyanea hamatiflora Rock, Indig Trees Haw. Is. 510, 1913; Mem. Bernice Pauahi Bishop Mus 7(2): 187, pl. 96. 97. 1919.
- Delissea hirtella H. Mann, var. hirtella, Proc. Am. Acad. Arts 7: 179, 1867.
Cyanea hirtella (H. Mann) Hillebr., Fl. Haw. Is. 255, 1888; Rock (in part), Mem. Bernice Pauahi Bishop Mus. 7(2): 219, 1919.
- var. striata (E. Wimm.) comb. nov.
Cyanea hirtella (H. Mann) Hillebr., var. striata E. Wimm., Engler's Pflanzenr. IV: 276c: 824, 1968,
var. subglabra (E. Wimm.) comb. nov.
Cyanea hirtella (H. Mann) Hillebr., var. subglabra E. Wimm. Engler's Pflanzenr. IV 276c: 829, 1968.
- Delissea holophylla (Hillebr.) comb. nov., var. holophylla
Cyanea holophylla Hillebr., Fl. Haw. Is. 257. 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 259, pl. 146 1919.
- var. obovata (Rock) comb. nov.
Cyanea holophylla Hillebr., var. obovata Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 263, 1919.
- Delissea horrida (Rock) comb. nov.
Cyanea ferox Hillebr., var. horrida Rock, Bull. Torr. Bot. Club 44: 235, 1917; Mem. Bernice Pauahi Bishop Mus. 7(2): 245m 1919.
- Delissea Knudsenii (Rock) comb. nov. var. Knudsenii.
Cyanea Knudsenii Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 213, pl. 114, 1919.
- Delissea konaensis St. John, Phytologia 59: 515-516, fig. 1, 1986.
- Delissea laciniata Hillebr., var. laciniata, Fl. Haw. Is. 349, 1888.
var. parvifolia Rock, Mem. Bernice Pauahi Bishop Mus 7(2): 349, 1919.
- Delissea Larrisonii (Rock) comb. nov.
Cyanea Larrisonii Rock, Bull. Torr. Bot. Club 42: 77. pl. VIII, 1915.
- Delissea leptostegia (A. Gray) comb. nov. var. leptostegia.
Cyanea leptostegia A. Gray, Proc. Amm Acad Arts 5:

- 149, 1862 Rock, Mem. Bernice Pauahi Bishop Mus 7(2); 165, pl. 81, 82, 1919.
 var. *velutina* (Skotts.) comb. nov.
Cyanea leptostgia A. Gray, var. *velutina* Skotts., *Acta Horti Gothob.* 2: 204, 1926.
- Delissea linearifolia* (Rock) comb. nov.
Cyanea linearifolia Rock, Occas Papers Bernice Pauahi Bishop Mus. 22: 60, Fig. 13, 1957.
- Delissea lobata* (H. Mann) comb. nov. var. *lobata*.
Cyanea lobata H. Mann, Proc. Am. Acad Arts 7: 186, 1867; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 247 pl. 136, 1919.
 var. *hamakuae* (Rock) comb. nov.
Cyanea lobata H. Mann, var. *hamakuae* Rock, Mem. Bernice Pauahi Bishop Mus. 7(2) 247, 1919.
- Delissea longipedunculata* (Rock) comb. nov.
Cyanea longipedunculata Rock, Occas. Papers Bernice Pauahi Bishop Mus. 22: 54-56, figs. 9, 10, 1957.
- Delissea longissima* (Rock) comb. nov.
Cyanea scabra Hillebr., var. *longissima* Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 259, pl. 144, 1919; C. longissima (Rock) St. John, *Phytologia* 40: 98, 1978.
- Delissea Mceldownei* (Rock) comb. nov.
Cyanea Mceldownei Rock, Occas. Papers Bernice Pauahi Bishop Mus. 22: 43-44, 1957.
- Delissea macrostegia* (Hillebr.) comb. nov. var. *macrostegia*.
Cyanea macrostegia Hillebr., Fl. Haw. Is. 263, 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 179, pl. 92, 93, 1919.
 var. *parvibracteata* (Rock) comb. nov.
Cyanea macrostegia Hillebr., var. *parvibracteata* Rock, Mem. Bernice Pauahi Bishop Mus., 7(2): 183, pl. 95, 1919.
 var. *viscosa* (Rock) comb. nov.
Cyanea macrostegia Hillebr., var. *viscosa* Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 183, pl. 94, 1919.
- Delissea magnifica* (E. Wimm.) comb. nov.
Cyanea magnifica E. Wimm., Engler's Pflanzenr. IV 276c: 817, 1968.
- Delissea Mannii* Brigham in H. Mann, Proc. Am. Acad. Arts 7: 182, 1867.
Cyanea Mannii (Brigham in H. Mann) Hillebr., Fl. Haw. Is. 253, 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 203, pl. 107, 1919.
- Delissea Mariana* (E. Wimm.) comb. nov.
Cyanea Mariana E. Wimm., Engler's Pflanzenr. IV, 276b, 57, 1956.
- Delissea Marksii* (Rock) comb. nov.
Cyanea Marksii Rock, Occas Papers Bernice Pauahi

- Bishop Mus., 22: 52-54, fig. 8, 1957.
- Delissea megacarpa* (Rock) comb. nov.
- Cyanea pilosa* A. Gray, var. *megacarpa* Rock, Indig Trees Haw. Is. 508, 1913; Mem Bernice Pauahi Bishop Mus. 7(2): 275, 1919.
- C. megacarpa* (Rock) Rock, Occas. Papers Bernice Pauahi Bishop Mus. 23: 73, 75, fig. 5, 1962.
- Delissea membranacea* (Rock) comb. nov.
- Cyanea membranacea* Rock, Occas Papers Bernice Pauahi Bishop Mus. 22: 63, 1957.
- Delissea multispicata* (H. Levl) comb. nov.
- Cyanea multispicata* H. Lévl. Fedde Spec. Nov. Regn. Veg. 10: 10-11, 1911; Rock, Mem Bernice Pauahi Bishop Mus. 7(2): 269, pl. 151, 1919.
- Delissea Nelsonii* (St. John) comb. nov.
- Cyanea Nelsonii* St. John, Pacif. Sci. 30: 37-40, fig. 18, 1976.
- Delissea noli-me-tangere* (Rock) comb. nov.
- Cyanea noli-me-tangere* Rock, Bull. Torr. Bot. Club 44: 229, p. 9, 1917; Mem. Bernice Pauahi Bishop Mus. 7(2): 231, pl. 126, 1919.
- Delissea obtusa* A. Gray, Proc. Am. Acad. Arts 5: 254, 1862.
- Delissea occultans* (St. John) comb. nov.
- Cyanea occultans* St. John, Phytologia 48: 143-144, fig. 1, 1981
- Delissea ovatisepala* (E. Wimm.) comb. nov.
- Cyanea ovatisepala* E. Wimm., Engler's Pflanzenr. IV 276b; 57-58, fig. 19b, 1956.
- Delissea palakea* (C. N. Forbes) comb. nov.
- Cyanea palakea* C. N. Forbes, Occas. Papers Bernice Pauahi Bishop Mus. 6(3): 72-73, one fig. 1916.
- Delissea parviflora* Hillebr., Fl. Haw. Is. 251, 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2) 359, pl. 205, 1919.
- Delissea pilosa* (A. Gray) H. Mann, Proc. Am. Acad. Arts 7: 182, 1867
- Cyanea pilosa* A. Gray, Proc. Am. Acad. Arts 5: 149, 1862; Rock, Mem. Bernice Pauahi Bishop Mus 7(2): 271, pl. 153, 1919.
- Delissea pinnatifida* (Cham.) Presl, Prodr. Lobel 47, 1836.
- Lobelia pinnatifida* Cham., Linnaea 8: 200, 1833.
- Rollandia pinnatifida* (Cham.) G. Don, Gen. Syst. 3: 698, 1834.
- Cyanea pinnatifida* (Cham.) E. Wimm., Engler's Pflanzenr. IV 276b: 63, 1956.
- Delissea platyphylla* A. Gray, Proc. Am. Acad Arts 5: 148, 1862.
- Cyanea platyphylla* (A. Gray) Hillebr., Fl. Haw. Is; 264, 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 233, 235, pl. 127, 1919.

Delissea procera (Hillebr.) comb. nov.

Cyanea procera Hillebr., Fl. Haw. Is. 262, 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 173, pl. 88, 1919.

Delissea profuga (C. N. Forbes) comb. nov.

Cyanea profuga C. N. Forbes, Occas. Papers Bernice Pauahi Bishop Mus. 6(3): 70, one plate, 1916; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 237, pl. 129, 1919.

Delissea pulchra (Rock) comb. nov.

Cyanea pulchra Rock, Occas. Papers Bernice Pauahi Bishop Mus. 22: 58, fig. 12, 1957.

Delissea pycnocarpa Hillebr.) comb. nov.

Cyanea pycnocarpa Hillebr., E. Wimm., Engler's Pflanzenr. IV 276b: 53, fig. 18a, 1956.

D. arborea (H. Mann) Hillebr., var. *pycnocarpa* Hillebr., Fl. Haw. Is. 261, 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 168, 1919.

Delissea quercifolia (Hillebr.) comb. nov., var. *quercifolia*

Cyanea solanacea Hillebr., var. *quercifolia* Hillebr. Fl. Haw. Is. 259, 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 265, pl. 149, 1919.

C. quercifolia (Hillebr.) E. Wimm., Engler's Pflanzenr. IV 276b: 64, 1958.

var. *atropurpurea* (E. Wimm.) comb. nov.

Cyanea quercifolia (Hillebr.) E. Wimm., var. *atropurpurea* E. Wimm., Engler's Pflanzenr. IV 276b: 64, 1956.

Delissea recta Wawra, Flora 56: 30, 1873.

Cyanea recta (Wawra) Hillebr., Fl. Haw. Is. 255, 1888; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 227, pl. 123, 1919.

Delissea regina Wawra, Flora 56: 9, 1875.

Cyanea superba (Cham.) A. Gray, var. *reginae* (Wawra) Hillebr., Fl. Haw. Is. 261, 1888.

C. regina (Wawra) Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 159, pl. 77, 78, 1919.

Delissea Remyi (Rock) comb. nov.

Cyanea Remyi Rock, Bull. Torr. Bot. Club 44: 233, pl. 12, 1917; Mem. Bernice Pauahi Bishop Mus. 7(2): 282, pl. 158, 1919.

Delissea rhytidosperma H. Mann, Proc. Am. Acad. Arts 7:

180, 1867; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 57, pl. 202, 203, 1919.

Delissea rivularis (Rock) E. Wimm., Engler's Pflanzenr. IV 276b: 43, 1956.

Cyanea rivularis Rock, Indig. Trées Haw. Is. 511, 1913; Mem. Bernice Pauahi Bishop Mus. 7(2): 219, pl. 118, 119, 1919;

Delissea Rockii (E. Wimm.) comb. nov.

Cyanea Rockii E. Wimm., Engler's Pflanzenr. IV 276c: 323, fig. 7b, 1968.

Delissea rollandioides (Rock) comb. nov.

Cyanea rollandioides Bull. Torr. Bot. Club 45: 135,

- 1918; Mem. Bernice Pauahi Bishop Mus. 7(2): 237, pl. 130
1919.
- Delissea scabra* (Hillebr.) comb. nov.
Cyanea scabra Hillebr., Fl. Haw. Is. 286, 1888.
var. and forma sinuata (Rock) E. Wimm., Engler's
Pflanzenr. IV 276b: 66, 1958.
- C. scabra Hillebr., var. sinuata Rock, Mem. Bernice Pauahi
Bishop Mus. 7(2): 259, pl. 145, 1919.
- var. variabilis (Rock) comb. nov.
C. scabra Hillebr., var. variabilis Rock, Mem. Bernice
Pauahi Bishop Mus. 7(2): 255, pl. 143, 1919.
- Delissea Shipmanii* (Rock) comb. nov.
Cyanea Shipmanii Rock, Occas Papers Bernice Pauahi
Bishop Mus. 22: 44-47, figs. 3, 4, 1957.
- Delissea sinuata* Hillebr., Fl. Haw. Is. 250, 1888; Rock,
Mem. Bernice Pauahi Bishop Mus. 7(2): 349, pl. 199, 1919.
var. lanaiensis (Rock) comb. nov.
D. sinuata Hillebr., var. lanaiensis Rock, Mem. Bernice
Pauahi Bishop Mus. 7(2): 353, pl. 200, 1919.
- Delissea solanacea* (Hillebr.) comb. nov.
Cyanea solanacea Hillebr., Fl. Haw. Is. 259, 1888; Rock
Mem Bernice Pauahi Bishop Mus. 7(2): 263, pl. 147, 148,
1919.
- Delissea solenocalyx* (Hillebr.) comb. nov.
Cyanea solenocalyx Hillebr., Fl. Haw. Is. 258, 1888;
Rock, Mem. Bernice Pauahi Bishop Mus 7(2): 168, pl.
85, 86, 1919.
Forma glabrata (Rock) Deg., Fl. Haw. fm. 339, fig.
1934.
Cyanea solenocalyx Hillebr., var. glabrata Rock, Mem.
Bernice Pauahi Bishop Mus. 7(2): 171, 1919.
var. latifolia (E. Wimm.) comb. nov.
Cyanea solenocalyx Hillebr., var. latifolia E. Wimm.
Engler's Pflanzenr. IV 276b: 69, 1956.
- Delissea spathulata* (Hillebr.) comb. nov.
Cyanea coriacea Hillebr., var. spathulata Hillebr.,
Fl. Haw. Is. 254, ;888.
C. spathulata (Hillebr.) A. Heller, Minn. Bot. Stud. 1:
989, pl. 65, 1897.
- Delissea stictophylla* (Rock) comb. nov.
Cyanea stictophylla Rock, Indig. Trees Haw. Is. 509,
1913; Mem. Bernice Pauahi Bishop Mus. 7(2): 279, pl. 157,
1919.
var. inermis (Rock) comb. nov.
Cyanea stictophylla Rock, var. inermis Rock, Occas.
Papers Bernice Pauahi Bishop Mus. 22: 63-64, 1957.
- Delissea subcordata* Gaud., Bot. Voy. Uranie 457, 1829;
Atlas pl. 77, 1826-30; Rock, Mem. Bernice Pauahi
Bishop Mus. 7(2): 345, pl. 195, 1919; St. John,
Phytologia 37: 417, 1977.
Var. kauaiensis St. John, Phytologia 37: 418, 1977.

- Var. *obtusifolia* Wawra, Flora 56: 7, 1878; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 349, 1919; St. John, Phytologia 37: 415, 1977.
- var. *waialaeensis* St. John, Phytologia 37: 419, 1977.
- var. *waikaneensis* St. John, Phytologia 37: 419, 1977.
- Delissea submuricata* (E. Wimm.) comb. nov.
- Cyanea submuricata* E. Wimm., Engler's Pflanzenr. IV 276b: 760, 1953.
- Delissea superba* (Cham.) comb. nov.
- Lobelia superba* Linnaea 8: 223, 1833.
- Cyanea superba* (Cham.) A. Gray, Proc. Am. Acad. Arts 5: 149, 1862.
- var. *velutina* (Rock) comb. nov.
- Cyanea superba* (Cham.) A. Gray, var. *velutina* Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 157, pl. 76, 1919.
- Delissea sylvestris* (A. Heller) comb. nov.
- Cyanea sylvestris* A. Heller, Minn. Bot. Stud. 1: 909, 1897.
- var. *eriantha* (Skotts.) comb. nov.
- Cyanea eriantha* Skotts., Acta Horti Gothob. 2: 266, 1926.
- C. sylvestris* A. Heller, var. *eriantha* (Skotts.) E. Wimm., Engler's Pflanzenr. IV 276b: 61, 1956.
- Delissea tritomantha* (A. Gray) comb. nov.
- Cyanea tritomantha* A. Gray, Proc. Am. Acad. Arts 5: 149, 1962; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 189, pl. 99, 100, 1919.
- var. *Lydgatei* (Rock) comb. nov.
- C. tritomantha* A. Gray, var. *Lydgatei* Rock Mem. Bernice Pauahi Bishop Mus. 7(2): 193, 1919.
- Delissea truncata* (Rock) comb. nov.
- Cyanea truncata* Rock, Bull. Torr. Bot. Club 44: 234, pl. 15, 1917.
- Rollandia truncata* Rock, Bull. Coll. Haw. Publ., 2: 44, 1913.
- var. *Juddii* (C. N. Forbes) comb. nov.
- C. Juddii* C. N. Forbes, Occass. Papers Bernice Pauahi Bishop Mus. 6(3): 68, one plate 1916.
- C. truncata* Rock, var. *Juddii* (C. N. Forbes) St. John, Occas. Papers Bernice Pauahi Bishop Mus. 15(3): 22, pl. 2, 1939.
- Delissea undulata* Gaud. Bot. Voy. Uranie Atlas pl. 78, Oct. 25, 1826; text, p. 457, 1829; Rock, Mem. Bernice Pauahi Bishop Mus. 7(2): 353, pl. 201, 1919; St. John, Taxon 34: 633-634, 1985.
- Delissea wailauensis* (Rock) comb. nov.
- Cyanea wailauensis* Rock, Bull. Coll. Hawaii Publ. 2: 43, 1913; Mem. Bernice Pauahi Bishop Mus. 7(2): 173, pl. 87, 1919.

LITERATURE CITED

- Gaudichaud, Charles, 1826-1830. Voyage autour du monde entrepris par ordre du Roi, sur les corvettes l'Uranie et La Physicienne. Botanique 1-522; Atlas 1-22, pl. 1-120.
- St. John, Harold, 1985. Earlier Dates of Valid Publication of Some Genera and Species in Gaudichaud's Botany of the Uranie Voyage. Taxon 34: 663-665.

**EFFECT OF FOLIAR FERTILIZATION BY AMMONIUM SULPHATE,
SODIUM NITRATE, AND AMMONIUM NITRATE ON THE
MORPHOLOGY AND METABOLISM OF LENTIL
(LENS ESCULENTUS)**

By

Maimona Abdel-Aziz Kord

Faculty of Science, Cairo University, Botany Department

ABSTRACT

An experiment was initiated to study the effect of ammonium sulphate, sodium nitrate, and ammonium nitrate as a foliar spray on the morphology and metabolism of lentil Lens esculentus. Results showed that the three salts increased all growth criteria, nitrogen, carbohydrate contents and also the yield. The most effective salt was ammonium nitrate at 200 ppm.

Recently, many research workers used foliar spray techniques of fertilizers and specific nutrient solutions instead of other techniques as root soaking and soil irrigation because it is more effective to plants. Also foliar spray is the most important aspect of herbicides which are used widely in agriculture by many methods of application.

Saleh et al. (1980) pointed out that foliar spray of ammonium sulphate increased the number of pod clusters in *P. vulgaris*. Seed yields were increased when fertilizers were applied.

Ranganathan et al. (1981) mentioned that if tea bushes were treated by foliar sprays of amm. sulphate, amm. chloride, sod. sulphate, amm. thiocyanate, amm. fluoride and many other salts, yields were reduced by all treatments except in the case of amm. sulphate.

Many experiments cleared that yield of plants increased if sprayed with ammonium sulphate (Aleshin et al., 1982; Banna et al., 1981; Ulmann, 1977; Yadahalli et al., 1974 and Krausko, 1981).

In addition to yield increase of groundnuts by ammonium sulphate foliar spray, the uptake of P, K and N by seeds increased. (Pardole et al., 1982).

Murdock et al., (1979) cleared that ammonium sulphate foliar sprayed to unhealthy maize plants corrected N-deficiency symptoms and significantly increased grain yield.

Grain protein content increased when wheat plants were treated with ammonium sulphate as a foliar spray (Hassan et al., 1973).

In discussing the effect of nitrate -N as a fertilizer for plants, Slamka (1982) cleared that different types of barley showed an increase

in grain protein content with calcium nitrate applied as a foliar spray.

Tomato plants supplied with calcium nitrate showed yield averages more than those supplied with calcium chloride which had no effect on yield. (Verlodt et al., 1977).

Kos'yanenko (1981) demonstrated that foliar spray of ammonium nitrate at the late tillering stage was most effective in increasing yield of barley.

Ammonium nitrate applied as a foliar spray to wheat decreased the percentage of essential amino acids but markedly increased their total contents. (Pavlova et al. 1981). Norden (1981) discovered that application of less than or equal to 20 kg N/ha as a foliar spray of amm. nitrate caused no cereals crop damage.

A foliar spray of ammonium nitrate applied to soyabean at the pod formation stage accelerated aging and increased seed yield and quality (Konechnaya et al., 1978).

In comparing the effect of the three above mentioned salts Spaldon et al., (1978) gave barley different sources of nitrogen in the form of calcium nitrate, calcium ammonium nitrate or ammonium sulphate. All three salts increased crop yield when applied as foliar spray.

MATERIAL AND METHODS

In this experiment ammonium sulphate, sodium nitrate and ammonium nitrate were chosen. The concentrations of these salts were chosen on the basis of a preliminary investigation studying the effect of a wide range of concentrations on the rate of germination and length of protruding radicle.

Seeds of lentil plant were sown in pots and watered whenever needed. After 15 days from sowing the plants were thinned, leaving only the healthy ones.

45 days after sowing, an initial sample was taken before spraying the plants (10 mls of each pot) with a solution containing 0, 100, 200 or 500 ppm of either ammonium sulphate, sodium nitrate or amm. nitrate. 15 days later, another sample was taken, from each treatment before a second spray, with the same amount of solution. A third spray was carried out, 15 days after, and the third sample was taken. Then the harvest was collected.

Plant samples were taken for analysis as mentioned at the age of 45, 60 and 75 days. In all samples, length, fresh and dry weight of stems and leaves as well as pigmentations were determined. In the mean time, the number of flowers, the number of young fruits as well as dry weight of 100 seeds was obtained. Another samples were taken for nitrogen and carbohydrates estimations.

Pigment Estimation

The procedures reported by Metzner et al. (1975) were followed in this investigation.

Determination of Carbohydrates

The procedures mentioned by Nelson (1944), Naguib (1963), and Said & Naguib (1964) were followed.

Estimation of Nitrogen Compounds

The procedures mentioned by Fawcett and Scot (1960), and Chaney and Marbach (1962) were followed in this investigation for ammonia-N estimation.

Russel method (1944) was used for free amino-N determination.

For determining the amount of peptide-N, the procedure of Lowery et al. (1951) was followed.

RESULTS AND DISCUSSION

Table 1 showed that all stages of growth, spraying with ammonium sulphate, sodium nitrate or ammonium nitrate significantly increased all growth criteria at both concentrations of 100 and 200 ppm. The effect progressively increased with progress of age.

This table illustrated that spraying with 500 ppm solutions of the above mentioned salts significantly decreased all morphological criteria (length, fresh and dry weight of stem, number fresh and dry weight, and area of leaves and the number of flowers per plant).

It is also, clear that ammonium nitrate, at different concentrations, was more effective than the other two salts.

If we compare the concentrations to choose the most suitable one as a foliar spray, it becomes obvious that 200 ppm for the three salts is the most suitable since it significantly increased length, fresh and dry weights of stem, leaf number, fresh and dry weights, and area of leaf.

The table also, showed that foliar spraying with ammonium sulphate or sodium nitrate increased the number of flowers at 100 and 200 ppm, but this phenomenon was reversed at 500 ppm. Spraying with these two salts seemed with little or no effect on the number of falling flowers (See table 1). In the mean time ammonium nitrate significantly increased the number of flowers on the plants, and fresh and dry weights of fruits. It is quite striking that ammonium nitrate completely prevented flower drop at all concentrations.

Figures 1-3 showed that on fresh weight basis, one or several sprays with any of the three salts at 200 ppm significantly increased chlorophyll a and carotene and also chlorophyll b except in the ammonium sulphate - treated plants which showed significant drop in chlorophyll b contents.

100 ppm of the three salts had no significant effect on chlorophyll a, b and carotene. On the other hand the three salts at 500 ppm severely lowered the contents of the pigments.

As mentioned before in the section of material and methods, plants were analysed for their various nitrogen compounds. The results

of the analysis are recorded in table 2. The total soluble nitrogen fraction, which is the sum of ammonia-, amino-, peptide- and other nitrogen fractions, did not show significant increase as a result of any of the treatments at the used concentrations.

In the mean time, the protein and other insoluble fractions showed a slight increase under the same treatments. The table also showed significant increase in the total nitrogen content of plants treated with the three salts at 100 and 200 ppm at all stages.

75 days old plants treated with 500 ppm were the only plants which showed no significant increase in their total nitrogen content, this result is similar to that obtained by Lysenko (1980) who demonstrated that a foliar spray of ammonium nitrate increased the seed protein contents and seed yield. Also Gupta et al., (1974) cleared that foliar spray with ammonium sulphate significantly increased total and soluble nitrogen in stems, leaves and grains of rice.

It is quite obvious from table 3 that lentil plants continued to increase, though not much, their total carbohydrate contents by advance of age.

Samples were allowed to grow for yield then taken for analysis. The results are recorded in table 4. From that table it can be seen that both concentrations 100 and 200 ppm of the three salts caused a significant increase in dry weights and total nitrogen contents, the increase being greater with 200 ppm, 500 ppm had no effect except in the case of sodium nitrate which caused a marked decrease in both dry weight and total nitrogen contents. This is agreement with the results obtained by Banna et al., 1981; Ulmann, 1977 and Krausko, 1981 using peach trees, sugar beet and barley.

All treatments seemed to have no significant effect on carbohydrate contents.

Both number of fruits and weight of seeds per plant were not affected in a manner similar to that of carbohydrate content. Ammonium nitrate only at 200 ppm caused significant increase in fruit number as it clear from table 4.

These results could be explained by the fact that coefficients of utilization by plants of N as NH_4 or NO_3 were similar, but fixation of NH_4 N was higher and its loss was smaller than NO_3 N. The utilization of N was far greater when applied at the time of its highest requirements by plants than when applied before sowing. Also the rates of uptake of N as NH_4 and NO_3 applied as foliar spray were similar, but rates of their assimilation differed markedly.

REFERENCES

- Aleshin, E.P.; Fanyan, G.G. (1982). A late top dressing of rice with nitrogen for accelerating maturation and increasing yield. *Khimiya v sel'skom Khozyaistve.*, 20(6): 21-23.
- Banna, Gh. I. El-; Hassan, A.H.; Naby-Abdel, H.M. (1981). Nutritional stress on peach trees. *Egyptian, Journal of Horticulture*, 1(1): 65-76.

- Chaney, A.L. and Marbach, E.P. (1962). Modified reagents for determination of urea and ammonia. *Clin. Chem.*, 8: 130-132.
- Fawcett, J.K. and Scott, J.E. (1960). A rapid and precise method for the determination of urea. *J. Clin. Path.*, 13: 156-159.
- Gupta, D.K.D.; Basuchaudhri, P. (1974). Effect of molybdenum on the nitrogen metabolism of rice. *Exp. Agric.*, 10(4): 251-255.
- Hassan, N.A.K.; Al-Sabti, A.R. (1973). Studies on soil fertility and fertilizers in Iraq. *Found. of Sci. Res. Baghdad*.
- Konechnaya, V.P.; Kuznetsova, V.S. (1978). Biochemical processes in soyabean plants during desiccation. *Khimiya V. Sel'skom Khozyaistve.*, 16(2): 24-27.
- Krausko, A. (1981). Effect of different nitrogenous fertilizers applied as single or split dressings to malting barley. *Agrochemia.*, 11(8): 234-236.
- Kos'yanenko, A.F. (1981). Effect of nutrition conditions and genotypic properties of barley cultivars on grain yield and quality. *Referativnyi Zhurnal*, 2: 55, 141.
- Lowry, O.H., Rosenbrough, J., Fan, A.C. and Randel, R.J. (1951). Protein measurement with Folin phenol reagent. *J. Biol. Chem.*, 193, 265.
- Lysenko, V.F. (1980). Effect of top dressing of peas with different forms of nitrogen fertilizers on productivity and protein synthesis. *Referativnyi Zhurnal*, 2: 55, 189.
- Metzner, H., Rau, H. and Senger, H. (1975). Untersuchungen zur Synthese von urbarer einzelner pigmenten angel Mutanten von chloella. *Planta*, 65, 186.
- Murdock, L.W.; Lund, Z.F. (1979). Corn response to sulphur on Coastal plain soils. *Sulphur in Agricult.*, 34: 6, 18.
- Naguib, M.I. (1963). Colorimetric estimation of plant polysaccharides. *Zeit. Zucker.*, 16: 15-18.
- Nelson, N. (1944). A photometric adaptation of smogi method for the determination of glucose. *J. Biol. Chem.*, 153, 375.
- Norden, J. (1981). Liquid N fertilizer now also in intensive cereal growing, *DLG-Mitteilungen*. 96(6): 315-316, 318.
- Pardole, V.R.; Deshmukh, V.A. (1982). Effect of nutrient sprays on uptake and yield of groundnut. *Journal of Maharashtra Agric. Univ.*, 7(1): 7-9.
- Pavlova, A.; K'drev. T. (1981). Effect of nitrogen nutrition on protein contents in wheat seeds. III- Changes in contents of bound amino acids. *Referativnyi Zhurnal, Biol.*, 11 G 132.
- Ranganathan, V.; Natesan, S.; Bhat, S.S. (1981). Tolerance of mature tea to certain inorganic ions applied in foliar sprays. *Bull.*, 37: 8-25.

- Russel, J.A. (1944). Colorimetric detection of amino nitrogen. *J. Biol. Chem.*, 156, 467.
- Saleh, H.H.; Foda, S.A. (1980). Effect of herbicides plus fertilization on productivity of beans. *Agric. Res. Rev.*, 58(3): 89-101.
- Said, A. and Naguib, M.I. (1964). Sucrose determination as a means of estimation of the "Draw Back Tax" on the exported Holawa Tehinia. *Bull. Fac. Sci. Cairo Univ.*, 39: 20-21.
- Slamka, E. (1982). The effects of different forms of nitrogen fertilizer on the quality of spring barley. *Acta Fytotechnica.*, 38: 245-262.
- Spaldon, E.; Slamka, E. (1978). The effect of fertilization cultivar, sowing date and post-sowing agrotechniques on the yield of spring barley. *Acta Fytotechnica*, 34: 107-121.
- Ulmann, L. (1977). Effect of various nitrogenous fertilizers on oat yields. *Agrochemia.*, 17(5): 131-133.
- Verloot, H.; Boesman, G. (1977). The influence of the water quality, nitrogenous fertilizers and foliar treatments with calcium chloride on the performance of several mid-season tomato cultivars in Tunisia. *Rijksuniversiteit Gent.*, 42(3/4): 1875-1886.
- Yadahalli, Y.H.; Patil, S.V. (1974). Effect of sources and time of application of nitrogen on growth, yield and quality of tall and dwarf wheats under rain fed conditions. *Mysore J. of Agric. Sc.*, 8(1): 31-39.

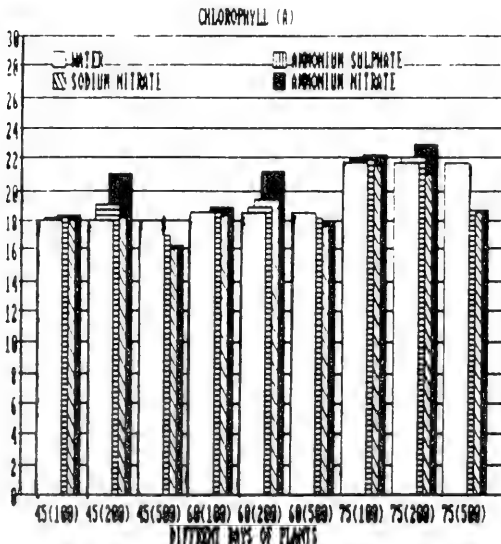


Fig. 1. Effect of foliar spray of different nutrient solutions on chlorophyll a of lentil;

Table 1: Effect of foliar spray of the different nutrient solutions on the morphology of lentil.

Age in days	Salt concentration ppm.	Stem			Leaf			Flowers			Fruits	
		length cm/stem	P. wt. gm/stem	D. wt. gm/stem	No. per plant	F. wt. gm/leaf	D. wt. gm/leaf	Area cm ²	on the plant	Falling	F. wt. gm.	D. wt. gm.
45	00	20.33	1.85	0.295	27	0.61	0.063	8.3	-	-	-	-
	100	Amm. sulphate	22.75**	2.11**	0.339**	34**	0.73**	0.081	10.1*	-	-	-
		Sod. nitrate	21.95**	1.97**	0.329**	29*	0.69*	0.072	9.8*	-	-	-
		Amm. nitrate	25.85**	2.35**	0.451**	37**	0.79**	0.086	11.0**	-	-	-
	200	Amm. sulphate	24.75**	2.15**	0.384**	35**	0.79**	0.089	11.4**	-	-	-
		Sod. nitrate	23.75**	2.08**	0.380**	34**	0.73**	0.083	10.3*	-	-	-
		Amm. nitrate	28.35**	2.96**	0.497**	41**	0.89**	0.119*	14.3**	-	-	-
	500	Amm. sulphate	18.68**	1.89	0.246**	24**	0.51**	0.053	8.0	-	-	-
		Sod. nitrate	18.15**	1.77*	0.200**	22**	0.58**	0.052	8.1	-	-	-
		Amm. nitrate	18.90**	1.97**	0.312*	28	0.57	0.059	9.1	-	-	-
	LSD 5%	0.991	0.078	0.013	1.99	0.067	0.049	1.46	-	-	-	
	1%	1.389	0.109	0.018	2.79	0.094	0.069	2.05	-	-	-	
	00	24.43	1.93	0.301	29	0.69	0.071	9.6	2	-	-	
60	100	Amm. sulphate	26.39**	2.20**	0.309	36**	0.73	0.078	9.9	10**	-	-
		Sod. nitrate	25.74*	2.03*	0.306	35**	0.71	0.076	9.8	8**	-	-
		Amm. nitrate	29.89**	2.44**	0.316	40**	0.80**	0.083	10.1	12**	-	-
	200	Amm. sulphate	28.33**	2.24**	0.321*	37*	0.79**	0.084	10.2	12**	-	-
		Sod. nitrate	27.47**	2.21**	0.316	39**	0.74	0.081	10.0	9**	-	-
		Amm. nitrate	32.91**	3.11**	0.334**	43**	0.89**	0.091	12.3**	14**	-	-
	500	Amm. sulphate	22.71**	2.01	0.299	30	0.69	0.073	9.5	3	-	-
		Sod. nitrate	22.01**	1.92	0.297	29	0.67	0.071	9.3	6	-	-
		Amm. nitrate	23.11*	1.99	0.301	30	0.70	0.075	9.7	7	-	-
		LSD 5%	0.996	0.088	0.018	1.91	0.059	0.042	1.44	1.05	0.76	-
	1%	1.396	0.123	0.025	2.68	0.083	0.059	2.02	1.47	1.06	-	
	00	30.74	2.14	0.371	32	0.73	0.079	10.4	3	-	-	
75	100	Amm. sulphate	32.47**	2.22*	0.397**	36**	0.78*	0.082	10.9	2**	-	-
		Sod. nitrate	31.91**	2.17	0.385*	38**	0.76	0.080	10.7	2*	-	-
		Amm. nitrate	35.83**	2.79**	0.401**	41**	0.80**	0.084	11.2	4**	-	-
	200	Amm. sulphate	34.97**	2.73**	0.403**	38**	0.86**	0.085	11.1	4**	-	-
		Sod. nitrate	33.09**	2.67**	0.398**	41**	0.80**	0.084	10.9	5*	-	-
		Amm. nitrate	38.38**	3.03**	0.434**	45**	0.89**	0.091	12.4**	6**	-	-
	500	Amm. sulphate	28.91**	2.16	0.286**	32	0.74	0.079	10.4	3	-	-
		Sod. nitrate	28.03**	2.09	0.381	31	0.72	0.075	10.2	2**	-	-
		Amm. nitrate	29.37**	2.24**	0.389**	33	0.75	0.080	10.5	3**	-	-
		LSD 5%	0.711	0.063	0.013	1.10	0.042	0.042	1.43	1.25	0.79	0.091
	1%	0.996	0.088	0.018	1.54	0.059	0.059	2.00	1.75	1.11	0.128	

* Results significantly different from control at the 5% level.

** Results significantly different from control at the 1% level.

Table 2: Effect of foliar spray of the different nutrient solutions on the nitrogen content of lentil (mg. N./g. d. wt.).

Age in days	Salt concentrations (ppm)		Nitrogen content			
			soluble	insoluble	Total	
		00	25.26	22.92	48.18	
45	100	Ammonium sulphate	26.93	23.72	50.65**	
		Sodium nitrate	26.41	23.04	49.45*	
		Ammonium nitrate	28.93	24.14	53.07**	
	200	Ammonium sulphate	28.41	24.86	53.27**	
		Sodium nitrate	27.43	24.07	51.50**	
		Ammonium nitrate	30.51	25.24	55.75**	
	500	Ammonium sulphate	24.31	22.85	47.16*	
		Sodium nitrate	24.26	22.41	46.67**	
		Ammonium nitrate	25.01	22.96	47.97	
		LSD	5 %	8.48	6.79	0.985
			1 %	11.89	9.52	1.381
			00	27.32	23.86	51.18
60	100	Ammonium sulphate	28.91	24.26	53.17**	
		Sodium nitrate	28.42	23.98	52.68*	
		Ammonium nitrate	30.97	24.93	55.90**	
	200	Ammonium sulphate	29.21	25.92	55.13**	
		Sodium nitrate	28.32	24.86	53.18**	
		Ammonium nitrate	31.74	26.43	58.17**	
	500	Ammonium sulphate	24.63	23.92	48.55**	
		Sodium nitrate	24.31	23.41	47.72**	
		Ammonium nitrate	25.11	24.01	49.12**	
		LSD	5 %	7.51	6.41	1.139
			1 %	10.53	8.99	1.597
			00	28.37	24.06	52.43
75	100	Ammonium sulphate	29.31	25.12	54.43**	
		Sodium nitrate	29.04	24.83	53.87*	
		Ammonium nitrate	31.06	26.14	57.20**	
	200	Ammonium sulphate	30.31	26.23	56.54**	
		Sodium nitrate	31.47	25.82	57.29**	
		Ammonium nitrate	33.91	27.43	61.34**	
	500	Ammonium sulphate	28.38	24.41	52.79	
		Sodium nitrate	28.27	23.92	52.19	
		Ammonium nitrate	28.94	24.62	53.56	
		LSD	5 %	9.20	9.92	1.413
			1 %	12.90	13.91	1.981

* Results significantly different from control at the 5 % level.

** Results significantly different from control at the 1 % level.

Table 3: Effect of foliar spray of the different nutrient solutions on the carbohydrate content of lentil (mg. glucose / 100 g. d. wt.).

Age days	Salt concentrations	Carbohydrate components						
		T.R.V.	D.R.V.	Sucrose	Poly-saccharide	Total		
100	00	520.90	414.30	106.60	119.80	640.70		
	Ammonium sulphate	530.50	420.40	110.10	122.30	652.80 ^x		
	Sodium nitrate	528.60	418.70	109.90	120.40	649.00		
	Ammonium nitrate	536.90 ^x	424.60	112.30	124.20	661.10 ^{xx}		
45	200	536.30 ^x	423.90	112.40	123.90	660.20 ^{xx}		
	Sodium nitrate	531.30	420.70	110.60	121.70	653.00 ^x		
	Ammonium nitrate	542.50 ^{xx}	428.20	114.30	126.80 ^x	669.30 ^{xx}		
	500	Ammonium sulphate	518.80	413.90	104.90	120.10	638.90	
	Sodium nitrate	516.90	412.60	104.30	119.10	636.00		
	Ammonium nitrate	520.00	414.20	105.80	120.90	640.90		
	L S D 5 %	14.82	13.93	8.51	6.97	9.51		
	1 %	20.78	19.53	11.93	9.77	13.33		
	60	00	528.80	418.90	109.90	123.20	652.00	
		100	Ammonium sulphate	533.30	422.10	111.20	123.80	657.10
		Sodium nitrate	530.60	420.30	110.30	124.60	655.20	
		Ammonium nitrate	538.30	425.90	112.40	126.30	664.60 ^x	
200		Ammonium sulphate	539.00	424.40	114.60	126.30	665.30 ^x	
Sodium nitrate		535.40	423.10	112.30	124.60	660.00		
Ammonium nitrate		548.00 ^x	430.90	117.10	129.30	677.30 ^{xx}		
500		Ammonium sulphate	525.90	416.70	109.20	123.10	649.00	
Sodium nitrate		523.50	416.10	107.40	122.80	646.30		
Ammonium nitrate		527.30	417.20	110.10	123.90	651.20		
L S D 5 %		15.03	14.11	8.73	7.21	9.83		
1 %		21.07	19.78	12.24	10.11	13.78		
75	00	523.60	421.20	111.40	126.90	659.50		
	100	Ammonium sulphate	536.10	422.70	113.40	128.20	664.30	
	Sodium nitrate	534.70	421.90	112.80	127.60	662.30		
	Ammonium nitrate	539.70	424.80	114.90	128.90	668.60 ^{xx}		
	200	Ammonium sulphate	537.00	423.50	114.30	129.40	667.20 ^x	
	Sodium nitrate	537.00	423.30	113.70	128.00	665.00		
	Ammonium nitrate	543.00	426.20	116.80	130.20	673.20 ^{xx}		
	500	Ammonium sulphate	528.50	417.20	111.30	125.40	653.90	
	Sodium nitrate	528.20	417.10	111.10	125.30	653.50		
	Ammonium nitrate	530.40	418.30	112.10	125.90	656.30		
	L S D 5 %	15.91	15.02	9.21	8.12	6.04		
	1 %	22.31	21.06	12.91	11.38	8.46		

^x Results significantly different from control at the 5 % level.

^{xx} Results significantly different from control at the 1 % level.

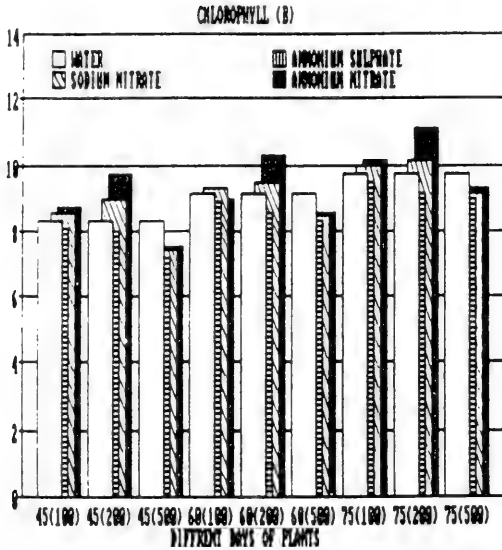


Fig. 2. Effect of foliar spray of the different nutrient solutions on chlorophyll b of lentil;

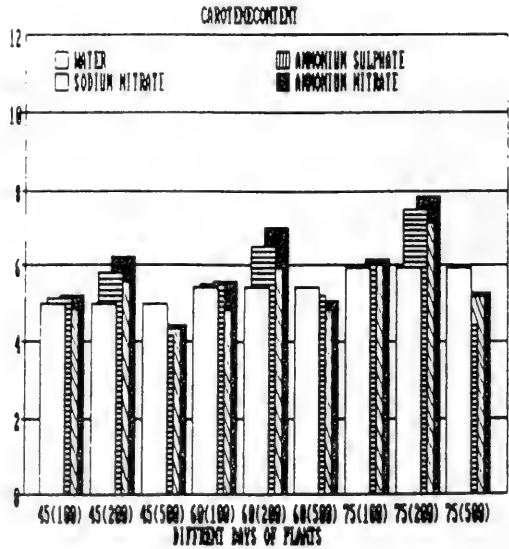


Fig. 3. Effect of foliar spray of the different nutrient solutions on carotene of lentil.

Table 4: Effect of foliar spray of the different nutrient solutions on the yield of lentil.

Salt concentrations ppm	Yield				
	D. Wt. gm/plant	Total N. mg N./g. d. wt.	Total carbohydrate	No./ plant	Fruits mgm seeds/ plant
00	1.98	54.91	661.4	6	582.3
Ammonium sulphate	2.79**	56.28*	663.8	6	586.7
Sodium nitrate	2.47**	55.31	663.2	5	584.2
Ammonium nitrate	3.08**	57.43**	664.9	6	589.3
Ammonium sulphate	2.98**	57.23**	663.9	8	597.6
Sodium nitrate	2.76**	56.97**	663.8	7	593.2
Ammonium nitrate	3.38**	58.42**	666.9	9*	636.7
Ammonium sulphate	1.92	54.32	661.4	5	561.2
Sodium nitrate	1.78**	53.89*	660.8	4	544.9
Ammonium nitrate	1.96	54.63	661.2	5	559.2
LSD at 5 %	0.094	0.985	7.341	2.947	59.00
1 %	0.132	1.381	10.292	4.132	82.72

* Results significantly different from control at the 5 % level.

** Results significantly different from control at the 1 % level.

NOTES ON THE GENUS *CLERODENDRUM* (VERBENACEAE). XXXVII

Harold N. Moldenke

Since March 30, 1985, when I began this series of notes on the genus *Clerodendrum* in Volume 57, Number 2, of the present journal, much information has come to hand. An attempt is made on the following pages to record this information on taxa already covered in the series, before I continue in the alphabetic sequence.

CLERODENDRUM Burm.

Additional & emended bibliography: Perr., Mem. Soc. Linn. Paris 3: 110. 1824; Manetti, Cat. Pl. Caes. Reg. Modic. Suppl. 2: 69. 1845; Miq., Fl. Ind. Bat. 2: 876 (1856) and 2: 1083. 1859; Craib, Contrib. Fl. Siam 165--166. 1912; R. Hay, Gard. Chron., ser. 3, 137: 130 & 154. 1955; Hirata, Host Range Geogr. Distrib. Powd. Mild. 276. 1966; Batista, Maia, & Peres, Univ. Fed. Pernamb. Inst. Micol. Atlas 4: 29--41. 1967; Milne, Living Pl. World 212. 1967; Vivekananthan, Bull. Bot. Surv. India 10: 240--241. 1969; Batista, Maia, & Peres, Biol. Abstr. 50: 6333. 1969; Letouzey, Adansonia, ser. 2, 9: 329. 1969; L. S. Sm., Contrib. Queensl. Herb. 6: [1] & 19--20. 1969; Vivekananthan, Biores. Ind. 5: 4240. 1969; Van Steenis-Kruseman, Fl. Males. Bull. 5: Ind. ii & li. 1970; J. F. Morton, Exot. Pl. 1: 120, 121, & 191 (1971) and 2: 732, 733, 870, & 972. 1971; P. G. Wils., Excerpt. Bot. A.18: 470. 1971; Fogg, Newslet. Arb. Barnes Found. 8: [1]. 1972; Howes, Dict. Useful Pl. 40, 59, 62, 170, 188, & 266. 1974; López-Palacios, Revist. Fac. Farm. Univ. Andes 14: 22. 1974; J. F. Morton, 500 Flow. S. Fla. 54, 55, & 158. 1978; Barrows, Biitropica 8 (2): 132. 1976; Croat, Fl. Barro Colorado 24, 49, 732, & 735. 1978; Fosberg, Sachet, & Oliv., Micronesica 15: 234, 235, & 240. 1979; Kingdon-Ward, Pl. Hunting 291. 1985; Mold., Phytologia 63: 48--63. 1987.

CLERODENDRUM ACULEATUM (L.) Schlecht.

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 1, 889. 1821; Sweet, Hort. Brit., ed. 1, 2: 322. 1827; Hiern, Journ. Bot. Brit. 44: Ind. 44. 1906; Roys, Tulane Univ. Mid. Amer. Res. Ser. Publ. 2: [Ethno-bot. Maya] 248, 249, & 319. 1931; Mold. in Pulle, Fl. Surin. 4 (2): 314--315. 1940; Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 61: 164 (1986), 61: 480, 484, & 486 (1987), and 62: 188 & 319. 1987.

A key to help distinguish this species from other Venezuelan species will be found under *C. margaritense* Mold. in the present series of notes [62: 188--189].

The Gaumer 736 & 875, distributed as *C. aculeatum*, actually are *C. ligustrinum* (Jacq.) R. Br., which see.

CLERODENDRUM ACULEATUM var. *GRACILE* Griseb. & Mold.

Additional bibliography: Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 360. 1986.

CLERODENDRUM ACULEATUM var. **GUYANENSE** Mold.

Additional bibliography: Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 360. 1986.

CLERODENDRUM ADENOPHYSUM H. Hallier

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 61: 179 & 187 (1986) and 61: 468. 1987.

CLERODENDRUM AGGREGATUM Gürke

Additional bibliography: Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 360. 1986.

CLERODENDRUM ALATUM Gürke

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49. 1926; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 7, 17, 47, 83--84, & 92--94. 1936; H. N. & A. L. Mold., Pl. Life 2: 59 & 69. 1948; A. W. Hill, Ind. Kew. Suppl. 6, imp. 2, 49. 1959; Mold., Phytologia 61: 164 (1986) and 62: 452, 457, & 470. 1987.

A key to help distinguish this species from other African species of *Cyclonema* will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM ALATUM var. **FLORIBUNDUM** (J. G. Baker) mold.

Additional bibliography: Mold., Phytologia 57: 471--472 (1985) and 62: 452. 1987.

The Allen 368, distributed as *C. alatum* var. *floribundum*, actually is *C. myricoides* (Hochst.) R. Br.

A key to help distinguish this taxon from other African taxa of *Cyclonema* will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM ALBIFLOS H. J. Lam

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 60: 360. 1986.

CLERODENDRUM ALBIFLOS var. **GLABRIOR** (Gibbs) H. J. Lam

Emended synonymy: *Clerodendron lindawianum* var. *glabrior* Gibbs, Contrib. Phytogeog. Fl. Arfak 218--219. 1917.

Additional bibliography: Gibbs, Contrib. Phytogeog. Fl. Arfak 218--219. 1917; Mold., Phytologia 60: 360. 1986.

Gibbs (1917) describes this taxon as "Tota planta manifeste glabrior". He says, further, that it is "A small tree with conspicuous white flowers and black fruit. I cannot separate this plant from Lauterbach's species [*C. lindawianum*], which is evidently very widely distributed. In my specimens the tomentum on peduncles, pedicels and calyx is also much reduced."

CLERODENDRUM ALBOVIOLACEUM Mold.

Additional bibliography: Holmgren & al., Ind. Vasc. Pl. Type Mic-

rof. 441. 1985; Mold., *Phytologia* 60: 360. 1986.

CLERODENDRUM ANAFENSE Britton & P. Wils.

Additional bibliography: A. W. Hill, *Ind. Kew. Suppl.* 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 360 (1986) and 61: 491. 1987.

CLERODENDRUM ANGOLENSE Gürke

Additional & emended bibliography: B. Thomas, *Engl. Bot. Jahrb.* 68: [Gatt. Clerod.] 6, 13, 26, 36, 62--63, & 92--95. 1936; Mold., *Phytologia* 60: 361. 1986.

CLERODENDRUM ANGUSTIFOLIUM (Poir.) Spreng.

Additional synonymy: *Volkameria angustifolia* Lam. ex Steud., *Nom. Bot. Phan.*, ed. 1, 889. 1821.

Additional & emended bibliography: Steud., *Nom. Bot. Phan.*, ed. 1, 889. 1821; Sweet, *Hort. Brit.*, ed. 1, 2: 322. 1827; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 1: 560 (1946), imp. 2, 2: 1219 (1946), imp. 3, 1: 560 (1960), and imp. 3, 2: 1219. 1960; Mold., *Phytologia* 60: 361 & 495. 1986.

CLERODENDRUM ARENARIUM J. G. Baker

Additional bibliography: Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 361 (1986), 61: 475 (1987), and 62: 132 & 142. 1987.

The *Baron 5729*, distributed as *C. arenarium*, actually is *C. laxiflorum* J. G. Baker, which see.

CLERODENDRUM ARENARIUM var. *MACROCALYX* Mold.

Additional bibliography: Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 361. 1986.

CLERODENDRUM AUCUBIFOLIUM Hemsl.

Additional bibliography: Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 361--362. 1986.

CLERODENDRUM AUCUBIFOLIUM var. *GIGANTEUM* Mold.

Additional bibliography: Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 361--362. 1986.

CLERODENDRUM AURANTIACUM J. G. Baker

Additional & emended bibliography: Thiselt.-Dyer, *Ind. Kew. Suppl.* 2: 43 & 44. 1904; Mold., *Phytologia* 57: 490--491 (1985) and 62: 136 & 457. 1987.

Baker (1900) keeps *C. macrostachyum* and *C. aurantiacum* apart as two separate taxa, distinguished as follows:

1. Calyx-lobes orbicular, small:.....*C. aurantiacum*
1a. Calyx-lobes ovate or oblong, large:.....*C. macrostachyum*

If they are to be kept separate, then the latter will need a new name, since Baker's *C. macrostachyum* (1898) is antedated by Thè

C. macrostachyum of Turczaninow (1863).

A key to help distinguish *C. aurantiacum* from the other African species of *Cyclonema* accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM BAKHUIZENI Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 362. 1986.

CLERODENDRUM BARBA-FELIS H. Hallier

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 60: 362 (1986) and 61: 458. 1987.

CLERODENDRUM BARONIANUM Oliv.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 360--366, 462, 463, 465, 466, & 496 (1986), 61: 88, 272, 281, & 395 (1986), 61: 471 & 475 (1987), and 62: 132, 142, 145, 149, 153, 187, 193, 317, 324, 459, 472, & 479. 1987.

CLERODENDRUM BELLUM Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 362. 1986.

CLERODENDRUM BETHUNIANUM Low

Additional bibliography: Warb., Engl. Bot. Jahrb. 13: 428. 1890; Mold., Phytologia 60: 362 (1986), 61: 278, 325, 330, 393, 395--397, & 399 (1986), 62: 143 (1987), and 63: 62. 1987.

The *Villamil 128*, distributed as *C. bethunianum*, actually is *C. paniculatum* L.

CLERODENDRUM BINGAENSE S. Moore

Additional synonymy: *Clerodendron bingaense* S. Moore apud A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49. 1926.

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 60: 362. 1986.

A key to help distinguish this species from others in Section *Siphonocalyx* will be found under *C. mildbraedii* Thomas in the present series of notes [62: 196--198].

CLERODENDRUM BIPINDENSE Gürke

Additional bibliography: Mold., Phytologia 60: 362--363 (1986) and 62: 191. 1987.

CLERODENDRUM BOIVINII Mold.

Additional bibliography: Mold., Phytologia 58: 189 & 202--203. 1985.

CLERODENDRUM BOTRYODES (Hiern) J. G. Baker

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 363 (1986) and 61: 474. 1987.

Keys to help distinguish this species from some other African relatives will be found under *C. laxicosum* DeWild. and *C. mildbraedii* Thomas in the present series of notes [61: 473--474 and 62: 196--198].

CLERODENDRUM BRACHYANTHUM Schau.

Additional bibliography: Mold., Phytologia 61: 164 & 413 (1986) and 62: 139. 1987.

The *Ahern's Collector*, Herb. Philip. For. Bur. 450, distributed as *C. brachyanthum*, actually is *C. macrostegium* Schau., while Ramos, Herb. Philip. Bur. Sci. 27367 and Ramos & Edaño, Herb. Philip. Bur. Sci. 48479 are *C. philippinense* Elm.

CLERODENDRUM BRACTEATUM Wall.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 363 (1986), 61: 101 & 413 (1986), 61: 497 (1987), and 62: 139. 1987.

A key to help distinguish this species from other Indonesian taxa will be found under *C. klemmei* in the present series of notes [61: 410--415].

The *Pételot 797*, distributed as *C. bracteatum*, actually is *C. lindleyi* Decaisne, while *D. J. Anderson s.n.* [Bhama, 10th February '68] is *C. macrostegium* Schau.

CLERODENDRUM BRACTEATUM var. **BÜNNEMEIJERI** Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 363. 1986.

CLERODENDRUM BRACTEATUM var. **SUMATRANUM** Ridl.

Additional bibliography: Mold., Phytologia 60: 363 (1986) and 61: 101. 1986.

CLERODENDRUM BRASSII Beer & Lam

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 363. 1986.

CLERODENDRUM BRAZZAVILLENSE A. Chev.

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 58: 216. 1985.

CLERODENDRUM BREVIFLORUM Ridl.

Additional bibliography: Mold., Phytologia 61: 164 & 411. 1986.

A key to help distinguish this species from other Indonesian taxa will be found under *C. klemmei* Elm. in the present series of notes [61: 410--415].

CLERODENDRUM BROOKEANUM W. W. Sm.

Additional bibliography: H. J. Lam, *Verbenac. Malay. Arch.* 320 & 364. 1919; Mold., *Phytologia* 58: 218 & 279. 1985.

CLERODENDRUM BRUNFELSIFLORUM H. Hallier

Additional & emended bibliography: A. W. Hill, *Ind. Kew. Suppl.* 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., *Phytologia* 58: 280--281 & 349 (1985) and 61: 467. 1987.

CLERODENDRUM BRUNNESCENS Mold.

Additional bibliography: P. Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 363. 1986.

CLERODENDRUM BRUNSVIGIODES J. G. Baker

Additional bibliography: P. Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 363. 1986.

CLERODENDRUM BUCHANANI (Roxb.) Walp.

Additional bibliography: Meeuse, *Blumea* 5: 75--76. 1942; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 1: 560 (1946), imp. 2, 2: 1219 (1946), imp. 3, 1: 560 (1960), and imp. 3, 2: 1219. 1960; Mold., *Phytologia* 61: 164, 182, 187, 272, 391--394, 397, & 414 (1986), 61: 497 (1987), and 63: 55. 1987.

CLERODENDRUM BUCHHOLZII Gürke

Additional bibliography: S. Moore in Baker, Moore, & Rendle, *Journ. Linn. Soc. Lond.* 37: 198. 1905; Mold., *Phytologia* 61: 165 (1986), 61: 473 & 474 (1987), 62: 185 (1987), and 63: 50. 1987.

Keys to help distinguish this species from some of its African relatives will be found under *C. laxicosum* DeWild. and *C. mildbraedii* Thomas in the present series of notes [61: 473--474 and 62: 196--198].

Moore (1905) asserts that *C. buchholzii* is closely related to *C. nuxioides* (S. Moore) Thomas, but the latter species differs in its leafblades being basally narrowed into the petiole "and in several floral details".

The *Vigne* 4256, distributed as *C. buchholzii*, actually is *C. laxicosum* DeWild.

CLERODENDRUM BUCHNERTI Gürke

Additional bibliography: DeWild., *Bull. Jard. Bot. Nat. Belg.* 3: 267. 1911; Mold., *Phytologia* 60: 364. 1986.

CLERODENDRUM BUKOBENSE Gürke

Additional synonymy: *Clerodendron bucobense* Gürke ex Mold., *Résumé* 261 in syn. 1959.

Additional bibliography: Mold., *Phytologia* 60: 364 (1986) and 62: 454 & 457. 1987.

A key to help distinguish this species from the other African taxa of *Cyclonema* as accepted by Thomas (1936) will be found under *C. myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--457].

The *Peter 31361*, distributed as "*C. bucobense*", actually is typical *C. myricoides* (Hochst.) R. Br., which see.

CLERODENDRUM BUNGEI Steud.

Additional synonymy: *Clerodendron foetidissimum* Hort. ex "W. W.", Garden Lond. 42: 563 in syn. 1892.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 2: 322. 1827; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1219. 1895; Meeuse, Blumea 5: 75. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 1219 (1946) and imp. 3, 2: 1219. 1960; P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 61: 165 & 278. 1986; Rehd., Man. Cult. Trees Shrubs, ed. 2, imp. 13, 806. 1986; Mold., Phytologia 61: 493 & 495--497 (1987) and 63: 62. 1987.

Jackson (1895) reduces *Volkameria foetida* Buch.-Ham. to the synonymy of *C. bungei*, but I regard it as a synonym of *Caryopteris foetida* (D. Don) Thellung.

The *Chang & Po 3945* and *Tsang, Tung, & Fung 17672*, distributed as *Clerodendrum bungei*, actually are *C. lindleyi* Decaisne.

CLERODENDRUM BURUANUM Miq.

Additional bibliography: Mold., Phytologia 61: 165, 179, 187, & 414. 1986.

CLERODENDRUM BURUANUM f. *LINDAWIANUM* (Lauterb.) Bakh.

Emended synonymy: *Clerodendron versteegi* Pulle in Lorentz, Nova Guinea, ser. 1, 8: 403. 1910.

Additional & emended bibliography: Pulle in Lorentz, Nova Guinea, ser. 1, 8: 403 (1910) and ser. 1, 8: 687. 1912; Gibbs, Contrib. Phytogeog. Fl. Arfak 218--219. 1917; Kanehira & Hatusima, Bot. Mag. Tokyo 56: 114. 1942; Mold., Alph. List Inv. Names 16, 18, & 21. 1942; Mold., Alph. List Inv. Names Suppl. 1: 6. 1947; H. N. & A. L. Mold., Pl. Life 2: 69. 1948; Mold., Phytologia 61: 165, 187, & 414. 1986.

CLERODENDRUM CABRAE DeWild.

Additional bibliography: Mold., Phytologia 58: 355--356 (1985) and 62: 454. 1987.

A key to help distinguish this species from the other African taxa of *Cyclonema* accepted by Thomas (1936) will be found under *C. myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--457].

CLERODENDRUM CAERULEUM N. E. Br.

Additional bibliography: Mold., Phytologia 58: 356--357 (1985) and 62: 453, 457, 460, & 464. 1987.

A key to help distinguish this species from the other African taxa of *Cyclonema* accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM CAESTIUM Gürke

Additional bibliography: Engl., Bot. Jahrb. 28: 466. 1900; Mold.,

Phytologia 58: 357--358 (1985) and 62: 453. 1987.

A key to help distinguish this species from the other African taxa of *Cyclonema* accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM CALAMITOSUM L.

Additional & emended bibliography: Steud., Nom. Bot. Phan., ed. 1, 203 & 889. 1821; Van Houtte, Fl. Serres, ser. 1, 9: 18. 1853; H. J. Lam, Verbenac. Malay. Arch. 251, 257, 363, & 364. 1919; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 1219 (1946) and imp. 3, 2: 1219. 1960; López-Palacios, Fl. Venez. Verb. 263 & 264. 1977; Mold., Phytologia 61: 165, 406, & 411. 1986.

A key to help distinguish this species from other Indonesian taxa in this genus will be found under *C. klemmei* Elm. in the present series of notes [61: 410--415].

CLERODENDRUM CALCICOLA Britton

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 365--366. 1986.

CLERODENDRUM CANESCENS Wall.

Additional bibliography: Mold., Phytologia 61: 165, 276, & 395 (1986), 61: 497 (1987), 62: 152 (1987), and 63: 62. 1987.

A key to help distinguish this species from other Taiwanese taxa in this genus will be found under *C. intermedium* Cham. in the present series of notes [61: 276].

Additional citations: MAÇAO: Hillebrand s.n. (X).

CLERODENDRUM CAPITATUM (Willd.) Schum. & Thonn.

Additional bibliography: Steud., Nom. Bot. Phan., ed. 1, 889. 1821; S. Moore in Baker, Moore, & Rendle, Journ. Linn. Soc. Lond. Bot. 37: 198 (1905) and 37: 562. 1906; Good & Exell, Journ. Bot. Brit. 68, Suppl. 2: 143. 1930; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 9, 10, 14, 38, 64--66, & 92--94. 1936; Prain, Ind. Kew. Suppl. 5, imp. 1, 62 (1921) and imp. 2, 62. 1960; Seaforth, W. Afr. Journ. Biol. Appl. Chem. 7: 30 & 66. 1967; Gilli, Ann. Naturhist. Mus. Wien 77: 29. 1973; P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 58: 445 (1985), 61: 166 & 412 (1986), and 62: 325. 1987.

CLERODENDRUM CAPITATUM var. **RHODESIENSE** Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 58: 439. 1985.

CLERODENDRUM CARNOSULUM J. G. Baker

Additional bibliography: Mold., Phytologia 60: 360 & 366 (1986) and 62: 454. 1987.

A key to help distinguish this species from other African taxa of *Cyclonema* as accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM CARVOPTEROIDES Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 58: 444. 1985.

CLERODENDRUM CAULANTHUM Exell

Additional bibliography: Mold., Phytologia 58: 444--445. 1985.
A key to help distinguish this species from other taxa in Section *Siphonocalyx* will be found under *C. mildbraedii* Thomas in the present series of notes [62: 196--198].

CLERODENDRUM CERAMENSE Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 366. 1986.

CLERODENDRUM CERNUUM Wall. ex Sweet, Hort. Brit., ed. 1, 2: 322. 1827.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 2: 322. 1827; Mold., Phytologia 58: 448. 1986.

CLERODENDRUM CHAMAERIPHES Wernham

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 58: 449. 1986.

A key to help distinguish this species from others in Section *Siphonocalyx* will be found under *C. mildbraedii* Thomas in the present series of notes [62: 196--198].

CLERODENDRUM CHLORISEPALUM Merr.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 58: 451--452. 1985.

CLERODENDRUM CITRINUM Ridl.

Additional bibliography: Mold., Phytologia 58: 452--453 (1985) and 63: 61 & 62. 1987.

The *Holttum* 37385, distributed as *C. citrinum*, seems, instead, to be *C. paniculatum* L.

CLERODENDRUM COCHINCHINENSE Dop

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 366--367 (1986) and 61: 105. 1986.

CLERODENDRUM COLEBROKIANUM Walp.

Additional & emended bibliography: Morr., Ann. Soc. Roy. Agr. Bot. Gand. 1: 19 & 20. 1845; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 560 & 561. 1893; Edwards, Bot. Reg. 30: pl. 19 in textu. 1894; H. J. Lam, Verbenac. Malay. Arch. 271--272, 319, & 363. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 75, 87, 88, 108, 109, viii, & ix. 1921; J. G. Baker in Rendle, Journ. Bot. Brit. 63: Suppl. 81. 1925; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 560 & 561 (1946) and imp. 3, 1: 560 & 561. 1960; Rao &

Jamir, Econ. Bot. 36: 178. 1982; Mold., Phytologia 60: 367 (1986), 61: 90 & 413 (1986), 61: 497 (1987), and 63: 62. 1987.

Morren (1845), in his discussion of red-flowered species of this genus known in Dutch and Belgian gardens, says: "Enfin, le *Clerodendron glandulosum*, distingué par la première fois par le botaniste Colebrooke, se distingué par les feuilles presque arrondies, ovales, tronquées à la base ou un peu cordiformes, un peu poilues, sans lécides et subdentées, la panicule est dense, capitée, les bractées linéaires, lanceolées, plus longues que le calice et portant de chaque côté sur le dos une glande transparente, les divisions du calice quinquefide acuminées, et celle de la corolle oblongues, réfléchies, plus courtes que les étamines, le style très grand. Nous avons tout lieu de croire que c'est ce *Clerodendrum*, originaire des Indes Orientales, qu'on cultivait à Gand sous le nom de *Clerodendrum écailléux*."

Rao & Jamir (1986) describe the plant as an erect shrub "common on cleared forest areas [in Nagaland]" where a decoction of its roots, leaves, and bark is used to treat malarial fevers.

A key to help distinguish this species from other Indonesian taxa will be found under *C. klemmei* Elm. in the present series of notes [61: 410--415].

The *Herb. Fischer s.n.* distributed as *C. colebrokianum* (in the Leningrad herbarium), actually is *C. lindleyi* Decaisne.

CLERODENDRUM COLEBROKTANUM var. FORBESII King & Gamble

Additional & emended bibliography: J. G. Baker in Rendle, Journ. Bot. Brit. 63: Suppl. 81. 1925; Mold., Phytologia 60: 367. 1986.

Baker (1925) cites for this variety *Forbes 1048 & 1786* from Sumatra.

CLERODENDRUM COMANS Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 367. 1986.

CLERODENDRUM CONFUSUM H. Hallier

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 367 (1986) and 61: 179, 181, 394, & 414. 1986.

A key to help distinguish this species from other Indonesian taxa will be found under *C. klemmei* Elm. in the present series of notes [61: 410--415].

CLERODENDRUM CONSORS S. Moore

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49. 1926; B. Thomas, Engl. Bot. Jahrb. 68: [Gatt. Clerod.] 39, 68, 92, & 94. 1936; A. W. Hill, Ind. Kew. Suppl. 6, imp. 2, 49. 1959; Mold., Phytologia 59: 107--109. 1986.

A key to help distinguish this species from others in Section *Siphonocalyx* will be found under *C. mildbraedii* Thomas in the present series of notes [62: 196--198].

CLERODENDRUM CORBISIERI DeWild.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 59: 109--110 & 350 (1986) and 62: 128 & 455. 1987.

A key to help distinguish this species from the other African taxa of *Cyclonema* accepted by Thomas (1936) will be found under *C. myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM CORDIFOLIUM (Hochst.) A. Rich.

Additional bibliography: Mold., Phytologia 60: 367 (1986) and 61: 396. 1986.

CLERODENDRUM COSTARICENSE Standl.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 367. 1986.

CLERODENDRUM COSTATUM R. Br.

Additional bibliography: Nees, Rob. Br. Vermisch. Bot. Schrift. 3 (1): 367. 1827; Mold., Phytologia 59: 113--114 & 123. 1986.

CLERODENDRUM CUBENSE Schau.

Additional bibliography: Mold., Phytologia 60: 367--368 (1986) and 61: 491. 1987.

CLERODENDRUM CUMINGIANUM Schau.

Additional bibliography: Mold., Phytologia 60: 368 (1986), 61: 414 (1986), 61: 468 & 469 (1987), and 62: 133. 1987.

A key to help distinguish this species from other Indonesian taxa of this genus will be found under *C. klemmei* Elm. in the present series of notes [61: 410--415].

The *Ramos & Edaño*, *Philip. Bur. Sci.* 44009, previously cited as *C. cumingianum* by me and so considered by Bakhuizen and Meeuse, seems better regarded as representing the very similar *C. lanuginosum* Blume; the same holds true for *Edaño*, *Philip. Bur. Sci.* 41803.

CLERODENDRUM CUNEIFORME Mold.

Additional synonymy: *Clerodendron myricoides* var. *cuneatum* (Gürke) H. H. W. Pearson in Thiselt.-Dyer, Fl. Cap. 5: 223. 1901. *Clerodendrum myricoides* var. *cuneatum* H. H. W. Pearson ex Compton, Journ. S. Afr. Bot. Suppl. 6: 66. 1966.

Additional bibliography: H. H. W. Pearson in Thiselt.-Dyer, Fl. Cap. 5: 223. 1901; Compton, Journ. S. Afr. Bot. Suppl. 6: 66. 1966; Mold., Phytologia 59: 266 (1986) and 62: 334, 452, 454, 464, & 485. 1987.

A key to help distinguish this species from the other African taxa of *Cyclonema* accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

Pearson (1901) cites *Galpin 601* and *Rehmann 6188* from the Transvaal.

CLERODENDRUM CUNNINGHAMII Benth.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 368 (1986) and 61: 413. 1986.

A key to help distinguish this species from other Indonesian taxa in this genus will be found under *C. klemmei* Elm. in the present series of notes [61: 410--415].

CLERODENDRUM CURRANII Elm.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 59: 123--125 (1986) and 61: 187. 1986.

CLERODENDRUM CYRTOPHYLLUM Turcz.

Additional bibliography: Kaw, Pharmacog. Stud. Crude Drugs 60. 1966; Mold., Phytologia 60: 368 (1986) and 61: 105 & 276. 1986.

A key to help distinguish this species from others in Taiwan will be found under *C. intermedium* Cham. in the present series of notes [61: 276].

CLERODENDRUM DALEI Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 59: 240--241. 1986.

CLERODENDRUM DAUPHINENSE Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 59: 241--242. 1986.

CLERODENDRUM DECARYI Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 368. 1986.

CLERODENDRUM DEFLEXUM Wall.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 368 (1986), 61: 88 & 411 (1986), and 61: 457. 1987.

A key to help distinguish this species from other Thailand taxa in this genus will be found under *C. inerme* (L.) Gaertn., from other Indonesian species under *C. klemmei* Elm., and from other common tropical woody plants under *C. laevifolium* Blume in the present series of notes [61: 88--90; 61: 410--415; 61: 457].

CLERODENDRUM DEKINDTII Gürke

Additional bibliography: Mold., Phytologia 59: 247--250 & 261 (1986) and 62: 455, 460, & 464. 1987.

A key to help distinguish this species from other African taxa of *Cyclonema* accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM DEKINDTII var. *DINTERI* Thomas

Additional bibliography: Mold., *Phytologia* 59: 248--250 & 262 (1986) and 62: 460. 1987.

CLERODENDRUM DEMBIANENSE Chiov.

Additional bibliography: Mold., *Phytologia* 59: 250 (1986) and 62: 455. 1987.

A key to help distinguish this species from the other African taxa in *Cyclonema* accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM DENTICULATUM Mold.

Additional bibliography: P. Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 462. 1986.

CLERODENDRUM DEWITTEI Mold.

Additional bibliography: P. Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 59: 253. 1986.

CLERODENDRUM DINKLAGEI Gürke

Additional bibliography: Mold., *Phytologia* 61: 23 (1986) and 62: 126. 1987.

CLERODENDRUM DISCOLOR (Klotzsch) Vatke

Additional synonymy: *Clerodendron myricoides* ♂ *discolor* Baker ex Lindl., *Gard. Chron.*, ser. 1, 5: 535. 1845. *Cyclonema* sp. Oliv., *Trans. Linn. Soc. Lond.* 29: 133 in syn. 1875. *Cyclonema myricoides* var. *foliis verticillatis*, 3--4-pollicaribus, *cuneato-ellipticis* v. *ovato-lanceolatis*, *acutis*, *marginis integris* v. *supra mediam paucidentato-serratis*, *pagina superiore scabrula* v. *glabrata*, *inferiore fulvo-pubescente* Oliv., *Trans. Linn. Soc. Lond.* 29: 133. 1875.

Additional & emended bibliography: Oliv. in Speke, *Journ. App.*, ed. 1, 644 (1863) and ed. 2, 644. 1864; Oliv., *Trans. Linn. Soc. Lond.* 29: 133. 1875; Oliv. in Speke, *Journ. App.*, ed. 3, 644. 1893; Engl., *Bot. Jahrb.* 28: 466. 1900; Fiori, *Buschi Piante Legn. Eritrea* [Bibl. Agron. Colon. 7:] 324. 1912; B. Thomas, *Engl. Bot. Jahrb.* 68: [Gatt. *Clerod.*] 4, 10, 12, 13, 16, 47, 48, 84--86, 92, 93, & 96. 1936; Gilli, *Ann. Naturhist. Mus. Wien* 77: 29. 1973; P. Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 462 (1986), 61: 335 (1986), and 62: 128, 148, 335, 338, 452, 456, 459, 460, & 470. 1987.

Engler (1900) cites *Goetze 164 & 761* and *Stuhlmann 9249 & 9275*, records the vernacular name "mkalanga", and describes the corollas as "blue".

A key to help distinguish this species from the other taxa from Africa of *Cyclonema* as accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM DISCOLOR var. *CRENATUM* Thomas

Additional bibliography: Mold., *Phytologia* 59: 249, 261--262, & 266 (1986) and 62: 456 & 460. 1987.

A key to help distinguish this taxon from the other African taxa of *Cyclonema* accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM DISCOLOR var. *DÜMMERI* Thomas

Additional bibliography: Mold., *Phytologia* 59: 260--264 (1986) and 62: 456 & 460. 1987.

A key to help distinguish this taxon from the other African taxa of *Cyclonema* accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM DISCOLOR var. *KILIMANDSCHARENSE* Thomas

Additional bibliography: P. Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 59: 261, 263--264, & 266 (1986) and 62: 128, 456, & 460. 1987.

A key to help distinguish this taxon from the other taxa of African *Cyclonema* accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM DISCOLOR var. *MACROCALYX* Mold.

Additional bibliography: P. Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 462. 1986

CLERODENDRUM DISCOLOR var. *OPPOSITIFOLIUM* Thomas

Additional bibliography: Gilli, *Ann. Naturhist. Mus. Wien* 77: 29. 1973; Mold., *Phytologia* 59: 261--268 (1986) and 62: 335, 456, & 464. 1987.

A key to help distinguish this taxon from the other African taxa of *Cyclonema* accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM DISCOLOR var. *PLURIFLORUM* Gürke

Additional & emended bibliography: B. Thomas, *Engl. Bot. Jahrb.* 68: [Gatt. *Clerod.*] 48 & 85--86. 1946; Gilli, *Ann. Naturhist. Mus. Wien* 77: 29. 1973; P. Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 59: 261 & 266--268 (1986) and 62: 456 & 460. 1987.

A key to help distinguish this taxon from the other African taxa of *Cyclonema* accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM DISPARIFOLIUM Blume, *Bijdr. Fl. Ned. Ind.* 14: 809. 1826

[not *Clerodendron disparifolium* Bakh., 1938, nor Hassk., 1921, nor Ridl., 1977].

Additional synonymy: *Clerodendrum laevifolium* Bakh. ex Meeuse, Blumea 5: 74 in syn. 1942 [not *C. laevifolium* Blume, 1826]. *Clerodendron calamitosum* "L., Lam. Verb. 256--257, pro parte" ex Meeuse, Blumea 5: 74 in syn. 1942 [not *Clerodendrum calamitosum* L., 1767]. *Clerodendron disparifolium* Bakh. ex Meeuse, Blumea 5: 71 in syn. 1942.

Additional & emended bibliography: Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 74, 80, 83--84, 110, viii & ix. 1921; J. G. Baker in Rendle, Journ. Bot. Brit. 63: Suppl. 81. 1925; Meeuse, Blumea 5: 74. 1942; P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 462--463 (1986), 61: 88, 290, 406, 411, & 419 (1986), 61: 457, 458, & 461 (1987), and 62: 481--483. 1987.

A key to help distinguish this species from other Thailand taxa in this genus will be found under *C. inerme* (L.) Gaertn. and from other Indonesia species under *C. klemmei* Elm. in the present series of notes [61: 88--90 and 61: 410--415].

Meeuse (1942) keeps *C. eriosiphon* Schau. as distinct from *C. disparifolium* Blume. He comments that "Bakhuizen van den Brink misinterpreted Blume's *Cl. laevifolium* and *Cl. disparifolium*. A study of Blume's specimens in Herb. L.-B. [=Leiden] showed, that *Cl. laevifolium* is a synonym of *C. nutans* Wall., a plant which occurs in Java only in a cultivated state, though Blume apparently erroneously states, that it occurs in primary forests on Mt. Salak and Mt. Gedeh. A study of the type of *C. disparifolium* Bl. reveals, that this is Bakhuizen van den Brink's '*Cl. laevifolium*'. The name *Cl. disparifolium* was used by Bakhuizen van den Brink for a third species, viz., *Cl. eriosiphon* Schau. (which is mentioned by him as a synonym.)"

Baker (1925) cites for *C. disparifolium* Forbes 429 & 593a from Sumatra and records the vernacular names "hareno", "ki-ratjoen", and "tjaritih".

CLERODENDRUM DUSENII Gürke

Additional bibliography: P. Holmgren, Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 463 (1986), 61: 335 (1986), and 62: 191. 1987.

CLERODENDRUM EKMANI Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 59: 337--338. 1986.

CLERODENDRUM ELBERTI H. Hallier

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 60: 463. 1986.

CLERODENDRUM ELMERI Merr.

Additional bibliography: Mold., Phytologia 59: 331 & 343--344. 1986.

CLERODENDRUM EMIRNENSE Bojer

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 463. 1986.

CLERODENDRUM EMIRNENSE var. *DIFFUSUM* Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 463. 1986.

CLERODENDRUM ERECTUM DeWild.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 59: 349--350 (1986) and 62: 128, 453, 455, & 464. 1987.

A key to help distinguish this species from the other African taxa of *Cyclonema* accepted by Thomas (1936) will be found under *Clerodendrum myricoides* (Hochst.) R. Br. in the present series of notes [62: 453--459].

CLERODENDRUM EURYPHYLLUM Mildbr.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 59: 354--355. 1986.

CLERODENDRUM EXCAVATUM DeWild.

Emended synonymy: *Clerodendron excavatum* var. *rotundatum* DeWild., Ann. Mus. Congo Belg. Bot., ser. 5, 3: 133 & 134, pl. 11, fig. 4. 1909. *Clerodendron grandiflorum* Gürke ex H. N. & A. L. Mold. in Dassan. & Fosb., Rev. Handb. Fl. Ceyl. 4: 418 in syn. sphalm. 1983. *Clerodendron excavatum* var. *rotundum* DeWild. apud Mold., Phytologia 59: 355 sphalm. 1986.

Additional bibliography: Prain, Ind. Kew. Suppl. 4, imp. 1, 50 (1913) and imp. 2, 50. 1958; Mold., Phytologia 60: 463--464 (1986) and 62: 136 & 139. 1987.

Emended illustrations: DeWild., Ann. Mus. Congo Belg. Bot., ser. 5, 3: 43, pl. 11, fig. 4. 1909.

CLERODENDRUM FASCICULATUM Thomas

Additional bibliography: Mold., Phytologia 59: 408--409. 1986.

A key to help distinguish this species from others in Section *Siphonocalyx* will be found under *C. mildbraedii* Thomas in the present series of notes [62: 196--198].

CLERODENDRUM FASTIGIATUM (Hunter) H. J. Lam

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 60: 464. 1986.

CLERODENDRUM FAULKNERI Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 468 (1986) and 62: 460. 1987.

CLERODENDRUM FILIPES Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type

Microf. 441. 1985; Mold., *Phytologia* 60: 464. 1986.

CLERODENDRUM FINETII Dop

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., *Phytologia* 60: 464. 1986.

CLERODENDRUM FISCHERI Gürke

Additional bibliography: Mold., *Phytologia* 59: 412--415 (1986) and 62: 325. 1987.

CLERODENDRUM FISCHERI var. *ROBUSTUM* (Klotzsch) Thomas

Additional & emended bibliography: Klotzsch in Peters, *Naturwiss. Reise Mossamb.* 6 Bot. 1: 259--260. 1861; Mold., *Phytologia* 59: 414--415 (1986) and 62: 325. 1987.

CLERODENDRUM FISTULOSUM Becc.

Additional & emended bibliography: Lour., *Fl. Cochinch.*, ed. 1, imp. 2, 2: 388. 1967; Airy Shaw in Willis, *Dict. Flow. Pl.*, ed. 8. 261. 1973; Mitchell & Rook, *Bot. Dermat.* 714. 1979; Mold., *Phytologia* 59: 415--418 (1986) and 61: 412. 1986.

A key to help distinguish this species from other Indonesian taxa in this genus will be found under *C. klemmei* Elm. in the present series of notes [61: 410--415].

CLERODENDRUM FLORIBUNDUM R. Br.

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 7: 51. 1929; P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., *Phytologia* 61: 23, 99, 100, & 105. 1986.

CLERODENDRUM FLORIBUNDUM var. *ANGUSTIFOLIUM* Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., *Phytologia* 59: 425, 463, & 499. 1986.

CLERODENDRUM FLORIBUNDUM var. *ATTENUATUM* (R. Br.) Mold.

Additional bibliography: Mold., *Phytologia* 59: 424--426 (1986) and 61: 99. 1986.

CLERODENDRUM FLORIBUNDUM var. *CORIACEUM* (R. Br.) Mold.

Additional bibliography: Mold., *Phytologia* 59: 424 & 426--427 (1986) and 61: 99. 1986.

CLERODENDRUM FLORIBUNDUM var. *LATIFOLIUM* F. Muell.

Additional synonymy: *Clerodendron ovalifolium* Bakh. apud A. W. Hill, Ind. Kew. Suppl. 7: 51. 1929 [not A. Gray, 1862, nor *Clerodendrum ovalifolium* (A. Juss.) Bakh., 1965].

Additional bibliography: Mold., *Phytologia* 60: 464 (1986) and 61: 99 & 100. 1986

CLERODENDRUM FORTUNATUM L.

Emended synonymy: *Clerodendron oxysepalum* Miq., *Journ. Bot. Neerl.*

1: 114--115. 1861.

Additional & emended bibliography: Lour., Fl. Cochinch., ed. 1, imp. 1, 2: 388. 1796; Sweet, Hort. Brit., ed. 1, 2: 322. 1827; Paxt., Mag. Bot. 11: [169]. 1844; C. Muell. in Walp., Ann. Bot. Syst. 5: 712. 1860; Miq., Journ. Bot. Néerl. 1: 114--115. 1861; Lemaire, Illust. Hort. 10: pl. 358. 1863; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 74, 75, 84, 108--110, viii, & ix. 1921; Stapf, Ind. Lond. 2: 238 & 239. 1930; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 561 (1946) and imp. 2, 2: 1219 (1946), imp. 3, 1: 561 (1960), and imp. 3, 2: 1219. 1960; Mold., Phytologia 61: 23, 26, 99, 397, 411, & 412 (1986), 61: 479 & 484--486 (1987), and 62: 204 & 310--312. 1987.

Miquel's original (1861) description of *C. oxysepalum* is "Ramuli obtusetetragoni cum petiolis foliisque subtus praesertim in nervis puberi, folia opposita modice petiolata e basi acutiusculâ elliptico-oblonga sublanceaolata acuta vel subapiculata integerrima chartacea, subtus costulis utrinque 6 patule erectis tenuibus venosis, circiter quadripollicaria; pedunculi axillares petiolo paullo longiores bis trifidi cymoso-sub-10-flori oubescentes subbracteati; calycis 5-partiti lobi triangulari-ovati acuminati (colorati?), praesertim sursum puberi subciliolati, fere semipollicares; corollae tubus calycem parum excedens, limbi lobi obovati obtusi; genitalia exserta, filamentis arcuato-recurvis. -- Cet arbuste croît en abondance dans les forêts, portant des fleurs d'un rouge blanchâtre."

A key to help distinguish *C. fortunatum* from other Indonesian taxa of this genus will be found under *C. klemmei* Elm. in the present series of notes [61: 410--415].

CLERODENDRUM FRUTECTORUM S. Moore.

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 59: 472--474. 1986.

CLERODENDRUM FUGITANS Wernham

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 59: 474. 1986.

CLERODENDRUM FUSCUM Gürke

Emended synonymy: *Clerodendron macrocalyx* DeWild., Bull. Jard. Bot. Brux. 7: 172. 1920 [not *C. macrocalyx* H. J. Lam. 1919].

Additional bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 59: 475--479. 1986.

CLERODENDRUM GARRETTIANUM Craib

Additional bibliography: Mold., Phytologia 60: 465 (1986), 61: 89 (1986), 61: 458 (1987), and 62: 482. 1987.

A key to help distinguish this species from other Thailand taxa in this genus will be found under *C. inerme* (L.) Gaertn. in the present series of notes [61: 88--90].

CLERODENDRUM GAUDICHAUDII Dop

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 59: 482--483 (1986) and 60: 142. 1986.

CLERODENDRUM GEOFFRAYI Dop

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; Mold., Phytologia 59: 483--484 (1986) and 60: 147. 1986.

CLERODENDRUM GIBBOSUM Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 465. 1986.

CLERODENDRUM GLABRATUM Gürke

Additional bibliography: Mold., Phytologia 60: 465 (1986) and 62: 329. 1987.

CLERODENDRUM GLABRUM E. Mey.

Additional bibliography: Gilli, Ann. Naturhist. Mus. Wien 77: 29. 1973; Mold., Phytologia 60: 465 (1986), 61: 25 (1986), and 61: 473. 1987.

A key to help distinguish this species from others found in Hawaii will be found under *C. indicum* (L.) Kuntze in the present series of notes [61: 24--25].

CLERODENDRUM GLABRUM var. *MINUTIFLORUM* (J. G. Baker) Fosberg

Additional bibliography: Mold., Known Geogr. Distrib. Verbenac., ed. 1, 53 & 90. 1942; Mold., Phytologia 60: 465. 1986.

CLERODENDRUM GLABRUM var. *VAGUM* (Hiern) Mold.

Emended synonymy: *Clerodendron rehmannii* Gürke. Engl. Bot. Jahrb. 28: 294. 1900. *Clerodendron rehmannii* Gürke ex Mold., Known Geogr. Distrib. Verbenac., ed. 1, 48, 49, 51, 52, & 91. 1942.

Additional & emended bibliography: Gürke in Engl., Bot. Jahrb. 28: 294. 1900; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 48--52, 72, & 89--91 (1942) and ed. 2, 115--121, 159, 181, & 183. 1949; Mold., Résumé 141, 144--146, 148--150, 152, 153, 216, 263, 267, 268, 272, 273, 450, & 452. 1959; Mold., Fifth Summ. 1: 228, 235, 239, 240, 242, 247, 249, 251, 253, 254, 256, 359, 444, 445, 452, 454, 461, 462, 464, & 465 (1971) and 2: 622, 866, 870, & 970. 1971; Mold., Phytol. Mem. 2: 218, 225, 229, 230, 232, 237, 238, 240, 242, 243, 245, 349, 350, 388, 391, 537, & 540. 1980; Mold., Phytologia 60: 56--61. 1986.

Gürke (1900), in describing *C. rehmannii*, says: "Die Art steht dem *Cl. ovale* Klotzsch ganz nahe; im wesentlichen unterscheidet sie sich nur durch die stärkere Behaarung, die ihr allerdings ein sehr charakteristisches Aussehen verleiht. Bei *Cl. ovale* sind die Blätter ganz kahl, und die jüngeren Zweige sowie die Verzweigungen des Blütenstandes sind nur schwach behaart, während bei *Cl. Rehmannii* besonders die Blätter auf der Unterseite weich, beinahe sammetartig behaart sind und die Zweige, Blattstiele und die Verzweigungen der

Trugdolden viel stärkere Behaarung als bei jener Art zeigen."

CLERODENDRUM GLANDULOSUM Lindl.

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 561 (1893), imp. 2, 1: 561 (1946), and imp. 3, 1: 561. 1960; Mold., Phytologia 60: 61--62 (1986) and 61: 394. 1986.

CLERODENDRUM GODEFROYI Kuntze

Additional bibliography: Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 464 & 465. 1986.

Craib (1914) says that *C. lloydianum* Craib can easily be distinguished from this species by its larger leaves which are 15--30 cm. long and 5--8.5 cm. wide.

CLERODENDRUM GODEFROYI var. **INSULARE** Dop

Additional bibliography: Mold., Phytologia 60: 66--67 (1986) and 62: 81. 1987.

CLERODENDRUM GOSSWEILERI Exell

Additional bibliography: Mold., Phytologia 60: 67--68. 1986.

A key to help distinguish this species from others in Section *Siphonocalyx* will be found under *C. mildbraedii* Thomas in the present series of notes [62: 196--198].

CLERODENDRUM GRANDIFLORUM (Hook.) Schau.

Additional bibliography: Mold., Phytologia 61: 23 (1986), 61: 491 & 497 (1987), and 62: 136 & 475. 1987.

CLERODENDRUM GREVEI Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 132--133. 1986.

CLERODENDRUM GRIFFITHIANUM C. B. Clarke

Additional bibliography: Lévillé, Fl. Kouy-Tchéou 442. 1915; Mold., Phytologia 60: 133--136, 150, 181, 363, 367, & 496 (1986), 61: 88, 385, & 406 (1986), 61: 465 & 471 (1987), 62: 135 (1987), and 63: 62. 1987.

CLERODENDRUM GUERKEI J. G. Baker

Additional bibliography: S. Moore, Journ. Bot. Brit. 45: 92. 1907; Mold., Phytologia 60: 136--138 & 274. 1986.

CLERODENDRUM HAEMATOLASTIUM H. Hallier

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49. 1959; P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 138--140 (1986) and 61: 406. 1986.

The corollas are said to have been "cream"-color on *Clemens* 10087.

Additional citations: GREATER SUNDA ISLANDS: Sabah: M. S. Clemens 10087 (Ca--214989, Ld--photo, Ph).

CLERODENDRUM HAHNIANUM Dop

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49, 1959; Mold., Phytologia 60: 140--143, 365--367, & 496 (1986), 61: 88, 395, & 401 (1986), 61: 464 & 476 (1987), 62: 81 & 127 (1987), and 63: 62. 1987.

CLERODENDRUM HARMANDIANUM Dop

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49, 1959; Mold., Phytologia 60: 144--145. 1986.

CLERODENDRUM HASTATO-OBLONGUM C. B. Clarke

Additional bibliography: Mold., Phytologia 60: 142 & 146--147. 1986.

CLERODENDRUM HASTATUM (Roxb.) Wall.

Additional bibliography: Mold., Phytologia 60: 134, 136, & 147--151 (1986), 61: 412 (1986), and 63: 51. 1987.

A key to help distinguish this species from other Indonesian taxa in this genus will be found under *C. klemmei* Elm. in the present series of notes [61: 410--415].

CLERODENDRUM HENDERSONII Mold.

Additional bibliography: P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 60: 151--152. 1986.

CLERODENDRUM HENRYI P'ei

Additional bibliography: Mold., Phytologia 60: 180--182 & 365--368 (1986), 61: 88, 330, & 332 (1986), 62: 86 & 151 (1987), and 63: 62. 1987.

CLERODENDRUM HETEROPHYLLUM (Vent.) R. Br.

Additional & emended bibliography: Sweet, Hort. Brit., ed. 1, 2: 322. 1827; Balf. f., Journ. Linn. Soc. Lond. Bot. 16: 19. 1877; P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 465--466 (1986), 61: 105, 418, & 419 (1986), and 61: 482, 483, & 486. 1987.

CLERODENDRUM HETEROPHYLLUM f. **ANGUSTIFOLIUM** Mold.

Additional bibliography: Steud., Nom. Bot. Phan., ed. 1, 889. 1821; P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 441. 1985; Mold., Phytologia 60: 465--466 (1986) and 61: 105. 1986.

CLERODENDRUM HETTAE H. Hallier

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 6, imp. 1, 49 (1926) and imp. 2, 49, 1959; Mold., Phytologia 60: 189--190 (1986) and 61: 415. 1986.

A key to help distinguish this species from other Indonesian taxa in this genus will be found under *C. klemmei* Elm. in the present series of notes [61: 410--415].

CLERODENDRUM HEXANGULATUM Thomas

Additional bibliography: Mold., *Phytologia* 60: 190--191. 1986.

A key to help distinguish this species from others in Section *Siphonocalyx* will be found under *C. mildbraedii* Thomas in the present series of notes [62: 196--198].

CLERODENDRUM HILDEBRANDTII Vatke

Additional bibliography: Engl., *Bot. Jahrb.* 28: 465. 1900; Mold., *Phytologia* 60: 191--194. 1986.

Engler (1900) cites *Goetze* 77 from Tanzania, records the vernacular name, "kebabu", and describes the species as "Ein 12--15 m hoher Baum mit breite Krone und hartem Holz, welches zu Tumbi bearbeitet wird." *Goetze* encountered the plant in sandy laterite soil.

CLERODENDRUM HIRCINUM Schau.

Additional bibliography: Mold., *Phytologia* 60: 194--197 & 466. 1986.

CLERODENDRUM HISPIDUM M. R. Henderson

Additional bibliography: P. Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 442. 1985; Mold., *Phytologia* 60: 197--199 (1986) and 61: 465. 1987.

CLERODENDRUM HUBERTI Mold.

Additional bibliography: P. Holmgren & al., *Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 267--268. 1986.

CLERODENDRUM HUMILE Chiov.

Additional bibliography: Mold., *Phytologia* 60: 268--269 & 364. 1986.

CLERODENDRUM IMPENSUM Thomas

Additional bibliography: P. Holmgren & al., *Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 269--270. 1986.

CLERODENDRUM IMPENSUM var. *BUCHNEROIDES* Thomas

Additional bibliography: P. Holmgren & al., *Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 269--270. 1986.

CLERODENDRUM INAEQUIPETIOLATUM Good

Additional bibliography: Mold., *Phytologia* 60: 270--271, 364, & 463 (186), 61: 334 (1986), and 62: 191. 1987.

CLERODENDRUM INCISUM Klotzsch

Additional bibliography: "W. W.", *Garden Lond.* 42: 563. 1892; Meuse, *Blumea* 5: 74. 1942; Bruggeman, *Trop. Pl. pl.* 232. 1957; P. Holmgren & al., *Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 271--281 (1986) and 61: 23, 26, & 410. 1986.

Additional illustrations: Bruggeman, *Trop. Pl. pl.* 232. 1957.

A key to help distinguish this species from other Indonesian wild and cultivated taxa in this genus will be found under *C. klemmei* Elm. in the present series of notes [61: 410--415].

López-Palacios (1977) lists this species as cultivated in Venezuela, citing *Aristeguieta 6163*, but it is probable that this collection will prove to be its var. *macrosiphon* (Hook. f.) J. G. Baker.

CLERODENDRUM INCISUM var. *AFZELII* Mold.

Additional bibliography: Mold., *Phytologia* 60: 276. 1986.

A key to help distinguish this taxon from other Madagascar taxa in this genus will be found under *C. baronianum* Oliv. in the present series of notes [58: 184--190].

CLERODENDRUM INCISUM var. *MACROSIPHON* (Hook. f.) J. G. Baker

Additional & emended bibliography: Knuth, *Handb. Blütenbiol.* 3 (2): 77. 1905; Bakh. in Lam & Bakh., *Bull. Jard. Bot. Buitenz.*, ser. 3, 3: 74, 79--80, 109, & ix. 1921; Rehnelt, *Pareys Blumengärtn.*, ed. 1, 280. 1932; Meeuse, *Blumea* 5: 74. 1942; Cave, *Ind. Pl. Chromos. Numb.* 2: 330. 1964; Bose, *Handb. Shrubs* 10 & 42. 1965; Schroeder, *Biol Abstr.* 50: 10807. 1969; Mold., *Phytologia* 61: 23 & 26 (1986) and 62: 317. 1987.

Additional & emended illustrations: Knuth, *Handb. Blütenbiol.* 3 (2): 77. 1905; Wigman, *Teysmannia* 23: 284/285, fig. 5. 1912; Sharma & Mukhopadhyay, *Journ. Genet.* 53: 381, pl. 9, fig. 6 [cytol.]. 1963.

A writer in *The Garden* (London) in 1892 says: "*C. macrosiphon*, from Zanzibar, is a compact little shrub of free growth, forming numerous upright branches, clothed with small-lobed leaves and terminal clusters of erect, long-tubed, white, sweet-scented flowers. It is deciduous, resting in winter and flowering in June. Plants of it may be seen flowering freely every summer in the stoves at Kew, wither it was sent about ten years ago by Sir John Kirk when British representative at Zanzibar."

Bose (1965) describes the plant as a "dwarf bushy shrub...propagated by ground layering". Hore & Bose (1968) report that Cycocal in 8000 ppm improves flowering and inhibits shoot growth and, in their experiments gave "100% increase in the number of flowers produced".

The *Aristeguieta 6163*, cited by López-Palacios (1977) as typical *C. incisum* Klotzsch, will probably prove to be the var. *macrosiphon* instead.

CLERODENDRUM INCISUM var. *PARVIFOLIUM* Mold.

Additional bibliography: López-Palacios, *Fl. Venez. Verb.* 264. 1977; P. Holmgren & al., *Ind. Vasc. Pl. Type Microf.* 441. 1985; Mold., *Phytologia* 60: 281. 1986.

A key to help distinguish this taxon from other Madagascar taxa in this genus will be found under *C. baronianum* Oliv. in the present series of notes [58: 184--190].

CLERODENDRUM INDICUM (L.) Kuntze

Additional synonymy: *Clerodendron angustifolium* Hassk. ex Bakh. in Lam & Bakh., *Bull. Jard. Bot. Buitenz.*, ser. 3, 3: viii. 1921. *Clerodendron siphonatum* Corbin, *Amer. Eagle Hort. Rev.* 42 (14): 6. 1947.

Additional & emended bibliography: Sweet, Hort. Brit., ed. 1, 2: 322. 1827; C. B. Clarke, Journ. Linn. Soc. Lond. Bot. 25: 57. 1890; Mold. in Pulle, Fl. Surin. 4 (2): 314 & 316--317. 1940; Corbin, Amer. Eagle Hort. Rev. 42 (14): 6. 1947; Hocking, Dict. Terms Pharmacog., ed. 1, 53. 1955; Mold., Phytologia 61: 23--30, 88, 90, 183, 187, 395, & 412 (1986), 62: 139, 206, & 312 (1987), and 63: 62. 1987.

Keys to help distinguish this species from other Delhi and Indian medicinal species in this genus will be found under *C. inerme* (L.) Gaertn. and from other Indonesian taxa under *C. klenmei* Elm. in the present series of notes [61: 88--90 and 61: 410--415].

CLERODENDRUM INDICUM f. *SEMISERRATUM* (Wall.) Mold.

Additional bibliography: Mold., Phytologia 61: 26 & 30. 1986.

CLERODENDRUM INERME (L.) Gaertn.

Additional synonymy: *Clerodendron neriifolium* Vahl ex A. F. Broun, Journ. Linn. Soc. Lond. Bot. 37: 58. 1905.

Additional & emended bibliography: Lour., Fl. Cochinch., ed. 1, imp. 1, 2: 388. 1790; Steud., Nom. Bot. Phan., ed. 1, 207, 889, & 890. 1821; Sweet, Hort. Brit., ed. 1, 2: 322. 1827; A. F. Broun, Journ. Linn. Soc. Lond. Bot. 37: 58. 1905; Hiern, Journ. Bot. Brit. 44: Ind. 44. 1906; Pulle in Lorentz, Nova Guinea, ser. 1, 8: 402. 1910; Léveillé, Fl. Kouy-Tchéou 442. 1915; H. J. Lam, Verbenac. Malay. Arch. 251, 252, 318, & 363. 1919; J. G. Baker in Rendle, Journ. Bot. Brit. 63: Suppl. 81. 1925; Meeuse, Blumea 5: 74. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 560 (1946) and imp. 2, 2: 1219. 1946; Arthur, Sympos. Phytochem. 241. 1954; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 560 (1960) and imp. 3, 2: 1219. 1960; Lour., Fl. Cochinch., ed. 1, imp. 2, 2: 388. 1967; Ganapaty & Rao, Indian Journ. Pharm. Sci. 47: 167--168. 1985; P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 61: 166--169, 183, 272, 276, 277, 410, 415, & 419. 1986; Tomlinson, Bot. Mangr. 186. 1986; Mold., Phytologia 61: 458, 479, & 482--485 (1987), 62: 81, 139, 206, 319, & 320 (1987), and 63: 62. 1987.

A key to help distinguish this species from other Taiwanese taxa in this genus will be found under *C. intermedium* Cham. in the present series of notes [61:276].

Meeuse (1942) asserts, apparently quite correctly, that "*Cl. inerme* and *Cl. neriifolium* cannot be regarded as distinct species, for they are linked by a continuous series of intermediate forms".

The "*Volkameria inermis* L." of Gonzalez (1881) is actually *C. ligustrinum* (Jacq.) R. Br., which see.

Baker (1925) cites Forbes 1802 for *C. inerme* from Sumatra.

Broun (1905) record an unidentified species of *Clerodendrum* from termite hills along the Upper Nile which he claims is "near *neriifolium* Vahl."

Ganapaty & Rao (1985) have isolated the triterpenoids β -sitosterol, α -amyrin acetate, lupeol, ursolic acid, and betulinic acid from the stem-bark of *Clerodendrum inerme* in India.

CLERODENDRUM INERME f. **PARVIFOLIUM** Mold.

Additional bibliography: Sweet, Hort. Brit., ed. 1, 2: 322. 1827; Thiselt.-Dyer, Ind. Kew. Suppl. 2: 43. 1904; P. Holmgren & al., Ind. Vasc. Pl. Type Microf. 442. 1985; Mold., Phytologia 61: 166--169 (1986) and 61: 484. 1987.

CLERODENDRUM INFORTUNATUM L.

Additional & emended bibliography: Lour., Fl. Cochinch., ed. 1, imp. 1, 2: 387--388. 1790; Sweet, Hort. Brit., ed. 1, 2: 322. 1827; Van Houtte, Fl. Serres, ser. 1, 9: 18. 1853; Forbes & Hemsl., Journ. Linn. Soc. Lond. Bot. 26: [Ind. Fl. Sin. 2]: 261. 1890; Hiern, Journ. Bot. Brit. 44: Ind. 13. 1906; Meeuse, Blumea 5: 75--77. 1942; Lour., Fl. Cochinch., ed. 1, imp. 2, 2: 387--388. 1967; Mold., Phytologia 61: 169--188, 275, 327, 379, 388--390, 394, & 396 (1986) and 62: 139, 200, 206, 312, & 327. 1987.

The Ramos & Edaño, Herb. Philip. Bur. Sci. 37836, distributed as *C. infortunatum*, actually is *C. multibracteatum* Merr., which see.

CLERODENDRUM INGRATUM Lauterb. & K. Schum.

Additional bibliography: Mold., Phytologia 61: 188, 270--271, & 412. 1986.

CLERODENDRUM INTERMEDIUM Cham.

Additional synonymy: *Clerodendron paniculatum* Perr., Mem. Soc. Linn. Paris 3: 110. 1824 [not *Clerodendrum paniculata* L., 1767, nor Perry, 1972, nor *C. paniculatum* Willd., 1812, nor *Clerodendron paniculata* L., 1912, nor *C. paniculatus* L., 1973, nor *C. paniculatum* L., 1819, nor *Clerodendrum paniculatum* Retz., 1772, nor *Clerodendrom paniculatum* Menninger, 1960].

Additional bibliography: E. D. Merr., Philip. Journ. Sci. Bot. 3: 431. 1909; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 561 (1946), imp. 2, 2: 1219 (1946), imp. 3, 1: 561 (1960), and imp. 3, 2: 1219. 1960; Mold., Phytologia 61: 272--280, 327, 331, 338, 393, & 395--397 (1986) and 63: 51, 57, & 62. 1987.

The various homonymy listed in the synonymy (above) all belong in the synonymy of the true *Clerodendrum paniculatum* L., which see.

Merrill (1909) cites *Fenix 4145* from Camiguin island in the Philippines and comments that the species is "Very common and widely distributed in the Philippines, but with very closely allied forms found both in Formosa and in Celebes."

The Clemens & Clemens 4383 and Villamil 128, distributed as *C. intermedium*, actually are *C. paniculatum* L.

CLERODENDRUM INVOLUCRATUM Vatke

Additional bibliography: Mold., Phytologia 61: 280--282 & 335 (1986) and 61: 475. 1987.

The d'Alleizette 1080m, distributed as *C. involucratum*, actually is *C. laxiflorum* J. G. Baker.

[to be continued]

NEW SPECIES AND COMBINATIONS IN MEXICAN HETEROTHECA
(ASTERACEAE-ASTEREAE)

B. L. Turner

Department of Botany, University of Texas, Austin TX 78713

Recent collections from the upper Rio Mayo regions of Chihuahua have revealed the following undescribed species. Additionally, the recently described species, Haplopappus thiniicola and Osbertia chihuahuana, are transferred to Heterotheca.

HETEROTHECA VANDEVENDERORUM B. L. Turner, sp. nov.

H. mexicanae affinis sed pedunculis monocephalis glandulosis 20-30 cm longis et foliis albo-tomentosis differt.

Perennial erect herbs, 20-40 cm high. Stems white-tomentose, arising from a lignous, and probably rhizomatous, branched rootstock. Leaves oblanceolate to spatulate, white tomentose, mostly 2-3 cm long, 4-6 mm wide, crowded upon the lower part of the plant, the heads single on elongate naked, glandular-puberulent, peduncles up to 30 cm long. Involucre campanulate, 11-12 mm high, 15-18 mm wide; bracts linear lanceolate, 5-6 seriate, graduate, 3-12 mm long, ca 1 mm wide, the outer series glandular pubescent, the inner series with pinkish scarious margins. Receptacle plane or somewhat convex, 5-6 mm across. Ray corollas 21, pistillate, fertile; corollas glabrous, yellow; tube ca 6 mm long, the ligule ca 7 mm long, 2 mm wide, weakly 4-nerved, the apex with 3 short lobes. Disk florets numerous; corollas yellow, glabrous, ca 8 mm long; tube ca 5 mm long, the throat funnelform ca 2 mm long. Anthers ca 2.5 mm long. Achenes linear-falcate, flattened, ca 5 mm long, densely villous; pappus of 2-3 series, an inner 1-2 series of numerous delicate, readily deciduous, barbellate awns, 8-9 mm long, and an outer series of ca 30-40 very narrow, persistent lacerate scales 2-3 mm long.

TYPE: MEXICO. CHIHUAHUA: Rio Mayo Region, El Capitan (108°07'30"W x 28°13'30"N), 2000 m, 26 Jun 1986, P. S. Martin 56 (holotype TEX; isotype ARIZ).

This very distinctive species is named for Dr. and Mrs. VanDevender of The University of Arizona, Tucson, avid scholars of the vegetation and flora of northwestern Mexico and who first called the plant to my attention.

HETEROTHECA THINICOLA (Rzed. & Ezcurra) B. L. Turner, comb. nov.
based upon Haplopappus thiniicola Rzed. & Ezcurra, Ciencia
Interamericana 26: 16. 1986.

The authors of this very distinct taxon relate it to Haplopappus (Hazardia) berberidis A. Gray or H. detonsus (Greene) Raven, albeit superficially. I would, however, include the species in the genus Heterotheca; it has all the characteristics of the latter except that the outer pappus bristles are essentially the same as the inner. Pappus bristles of a similar nature, however, occur in H. vandevendorum, H. mexicana and yet other species of Heterotheca (Turner, 1984). In over-all characteristics, including habit and geographical location it is probably closest to H. sessiliflora (Nutt.) Shinners.

HETEROTHECA CHIHUAHUANA (B. Turner & Sundberg) B. Turner comb. nov., based upon Osbertia chihuahuana B. Turner & Sundberg, Pl. Syst. Evol. 151: 233. 1986.

Because of the discovery of H. vandevendorum I have had second thoughts about inclusion of this taxon in Osbertia. Turner & Sundberg noted that the floral details of Osbertia chihuahuana and Heterotheca mexicana were quite similar. We emphasized the "Stolons" and terminal heads in positioning H. chihuahuana in Osbertia. It appears, however, that the "stolons" are actually shallow rhizomes and, what with the terminal heads in H. vandevendorum, it seems best placed in Heterotheca somewhere between the latter and H. mexicana. I now predict a chromosome count of $n=9$, instead of the $n=5$, if the species were especially close to Osbertia.

ACKNOWLEDGEMENTS

I am grateful to Dr. Guy Nesom for the Latin diagnosis and to Dr. J. Rzedowski for providing me with a reprint of his paper on Haplopappus thiniicola.

LITERATURE CITED

Turner, B. L. 1984. Three new species of Heterotheca (Asteraceae-Astereae) from northern Mexico. *Phytologia* 55: 204-208.

ARE THE DISTINCTIONS OF DELISSEA VALID?
HAWAIIAN PLANT STUDIES 137

Harold St. John and Wayne Takeuchi
Bishop Museum, Box 19000A, Honolulu, Hawaii 96817. USA.

Two of the accepted, closely related Hawaiian genera of Lobeliaceae are Delissea and Cyanea, both described by Gaudichaud in the same book. Delissea included three species, D. subcordata, D. undulata, and D. acuminata, but the last of these has been removed and is now classified as Cyanea acuminata (Gaud.) Hillebr. Gaudichaud characterized the genus Delissea by having the calyx 5-dentate, with leafy lobes; and with only the two lower anthers bearded. Hillebrand (1888) with many more species and with field knowledge of the two groups, redefined the genera. In Delissea he had seven species, including D. subcordata and D. undulata of Gaudichaud. As generic distinctions, he listed: seeds white, wrinkled; corolla white, with a dorsal, and often with two lateral knobs; and the leaves fleshy. Rock (1919) maintained Delissea with similar characterization and the same seven species, but described the seeds as grayish white and dropped the fleshy leaves as a character. Skottsberg (1926) noted for D. undulata that the fresh, ripe seeds were light grayish or brownish lilac. Wimmer (1956) accepted Delissea and characterized it as did Rock, and included eight species.

Cyanea was published by Gaudichaud, based solely on C. Grimesiana Gaud., and distinguished by the large, foliaceous calyx lobes. Hillebrand (1888) accepted Cyanea, and included 28 species. He characterized the genus as with smooth, shining seed; corolla white or purplish, without knobs; and the leaves not fleshy. Rock (1919) accepted Cyanea with the same characteristics, and included 50 species. Wimmer (1956) retained Cyanea, with 61 species, and the same characterization and wording as used by Rock.

Takeuchi has now made field observations and abundant collections of Delissea subcordata from several sites in the Waianae Mountains of Oahu. The flowers mostly had the protruding knobs or bumps, a dorsal one just below the dorsal sinus, and also two lateral ones. These protrusions are 1-1.5 mm in diameter. They are not a constant feature and flowers lacking knobs are borne in the same cymes as those with them. In any case, when dried and mounted on a herbarium sheet, the knobs are usually invisible. Fruiting specimens were also gathered. Fresh, ripe seeds had the seed coat with transverse ridges, but the surface was brownish. It is evident that the seeds which were described as white were immature ones.

Of the characters previously used as generic ones, the white color of the flower, the texture of the leaves, the white color of the seeds -- none of these are of any

value. In Delissea the seeds are cross ridged, while in some Cyanea species they are smooth. In Delissea the corollas may have 1-3 slight protruding knobs or none at all. This character is inconstant and impractical. Of all the alleged generic characters, only the nature of the seed coat remains valid. In habit Delissea and Cyanea are identical. The sole remaining character, the texture of the seed coat, is not now judged to be of generic value. Consequently, one of this pair of genera should be treated as a synonym of the other.

In an accompanying article, this needed transfer is made.

Literature Cited

- Hillebrand, William, 1888. Flora of the Hawaiian Islands, 1-673, frontispiece, 4 maps. C. Winter, Heidelberg.
- Rock, Joseph Francis Charles, 1919. A Monographic Study of the Hawaiian Species of the Tribe Lobelioideae, Family Campanulaceae. Memoirs, Bernice Pauahi Bishop Museum 7(2): 1-394, pl. 1-217.
- St. John, Harold, 1985. Earlier dates of valid publication of some genera and species in Gaudichaud's Botany of the Uranie Voyage. Taxon 34: 663-665.
- Skottsberg, Carl, 1926. Vascular Plants from the Hawaiian Islands I, Acta Horti Gothob. 2: 185-284.
- Wimmer, F. E. 1956. Campanulaceae - Lobelioideae, Engler's Pflanzenfamilien IV 276b: 1-260.

NEW COMBINATIONS AND STATUS CHANGES IN ASTER (ASTERACEAE).

Almut G. Jones

Department of Plant Biology, University of Illinois
at Urbana-Champaign, 505 S. Goodwin, Urbana, IL 61801

Over the years, I have recognized several taxa in Aster at subspecies rank (Jones 1978, 1980, 1984) but neglected to make the corresponding varietal combinations. I now find that these combinations are needed, in some instances because additional varieties are to be distinguished under the same subspecies, and in others to have uniformity and comparability of infraspecific rank in a regionally limited floristic treatment. The new combinations are presented in alphabetic order. Following citation of the basionyms, other homotypic synonyms are also listed chronologically. Type information cited exclusively from the protologues is placed within quotation marks.

Aster falcatus Lindley in Hooker var. commutatus (Torrey & Gray) A. G. Jones, comb. nov. A. multiflorus Aiton var. γ commutatus Torrey & Gray, Fl. N. Amer. 2: 125. 1841; A. commutatus (Torrey & Gray) A. Gray, Syn. fl. N. Amer. 1(2): 185. 1884; A. ericoides L. var. commutatus (Torrey & Gray) Boivin, Nat. Canad. 89: 67. 1962; A. falcatus subsp. commutatus (Torrey & Gray) A. G. Jones, Rhodora 80: 340. 1978. TYPE: [U.S.A.,] "Upper Missouri," Long's Exped. Dr. James s.n. [lectotype (cf. Cronquist 1955): NY!].

Aster cordifolius L. var. sagittifolius (Wedem. ex Willd.) A. G. Jones, stat. nov. A. sagittifolius Wedem. ex Willd., Sp. pl. 3: 2035. 1803; A. cordifolius subsp. sagittifolius (Wedem. ex Willd.) A. G. Jones, Brittonia 32: 249. 1980. TYPE: Herb. Willdenow 15881, sheet 1 [lectotype (cf. Jones 1980): B!; 2 isolectotypes (sheets 2 and 3): B!].

Aster drummondii Lindley in Hooker var. parviceps (Shinners) A. G. Jones, comb. nov. A. texanus Burgess in Small var. parviceps Shinners, Field & Lab. 21: 156. 1953; A. drummondii subsp. parviceps (Shinners) A. G. Jones, Phytologia 55: 381. 1984. TYPE: [U.S.A.,] Texas, Bowie County, Lewis Ferry, 8 miles N of New Boston, 29 Sep. 1948. Whitehouse 20503 (holotype: SMU!).

Aster drummondii Lindley in Hooker var. texanus (Burgess in Small) A. G. Jones, stat. nov. A. texanus Burgess in Small, Fl. s. e. U. S., 1214, 1339. 1903; A. drummondii subsp. texanus (Burgess in Small) A. G. Jones, Phytologia 55: 380. 1984. TYPE: [U.S.A.,] "Tex., Lindheimer, 1842, (?) in Herb. Mo. B. G." (i.e. the holotype presumed to be at MO but not found); Texas, Comanche Spring, New Braunfels, etc., Oct. 1849, Lindheimer 872 [lectotype or neotype (cf. Jones 1984): NY!; isolectotypes: BM!, K!, NY!, P!].

Aster lanceolatus Willd. var. interior (Wieg.) A. G. Jones, comb. nov. A. interior Wieg., Rhodora 35: 35. 1933; A. simplex Willd. var. interior (Wieg.) Cronq. in Gleason, New Britton & Brown ill. fl. 3: 466. 1952; A. lanceolatus subsp. interior (Wieg.) A. G. Jones, Phytologia 55: 383. 1984. TYPE: [U.S.A.,] Illinois, [Fulton County,] Canton, 1893. Wolf s.n. (holotype: GH!; possible isotype: GH!).

Aster lanceolatus Willd. var. simplex (Willd.) A. G. Jones, comb. nov. A. simplex Willd., Enum. hort. Berol. 2: 887. 1809; A. paniculatus Lam. var. simplex (Willd.) Burgess in Britton & Brown, Ill. fl. n. U.S. 3: 377. 1898; A. lanceolatus Willd. subsp. simplex (Willd.) A. G. Jones, Phytologia 55: 383. 1984. TYPE: Herb. Willdenow 15921, sheet 1 [lectotype (cf. Jones & Hiepkö 1981): B!; 2 isolectotypes: B!].

Aster novi-belgii L. var. johannensis (Fern.) A. G. Jones, stat. nov. A. johannensis Fern., Rhodora 17: 12. 1915; A. novi-belgii subsp. johannensis (Fern.) A. G. Jones, Phytologia 55: 384. 1984. TYPE: Canada, "Quebec," near Ouatchouan Falls, Lake St. John, 19 Aug. 1904. Wight 228 (holotype: GH!).

Aster novi-belgii L. var. tardiflorus (L.) A. G. Jones, stat. nov. A. tardiflorus L., Sp. pl., Ed. 2, 2: 1231. 1763; A. novi-belgii subsp. tardiflorus (L.) A. G. Jones, Phytologia 55: 385. 1984. TYPE: cult. in Hort. Ups. Herb. Linnaeus [lectotype (cf. Jones 1984): LINN 997.48!; 2 isolectotypes: LINN 997.49! and 997.50!].

Aster occidentalis var. fremontii (Torrey & Gray) A. G. Jones, comb. nov. A. ascendens [as adscendens] Lindley in Hooker var. fremontii Torrey & Gray, Fl. N. Amer. 2: 503. 1843; A. fremontii (Torrey & Gray) A. Gray, Syn. fl. N. Amer. 1(2): 191. 1884. TYPE: [U.S.A., Wyoming,] Wind River Chain of the Rocky Mountains above 7000 feet. Fremont s.n. (holotype: GH!).

Aster puniceus L. var. elliottii (Torrey & Gray) A. G. Jones, stat. nov. A. elliottii Torrey & Gray, Fl. N. Amer. 2: 140. 1841 [based on A. puniceus sensu Elliott, Sketch 2: 355. 1824, non L. (1753)]; A. puniceus subsp. elliottii (Torrey & Gray) A. G. Jones, Phytologia 55: 384. 1984. TYPE: [U.S.A.,] South Carolina, Santee Canal, Ravenel s.n. (ex Herb. Ell.) [holotype (or lectotype designated herein): GH!].

ACKNOWLEDGMENTS

Assistance received in my search for types from the curators and staff at B, BM, GH, K, LINN, MO, NY, P and SMU is gratefully acknowledged. I thank Dr. Robert D. Dorn for alerting me to the fact that, although I used the name Aster falcatus var. commutatus (Jones 1978), I had not validly published it, because I did not explicitly cite the basionym for the combination at that rank. Warren F. Lamboy has critically read the manuscript, and I value his helpful comments.

REFERENCES

- Cronquist, A. 1955. Compositae. In: Hitchcock, C. L., A. Cronquist, M. Ownbey, and J. W. Thompson. Vascular plants of the Pacific Northwest. Part 5. University of Washington Press, Seattle.
- Jones, A. G. 1978. The taxonomy of Aster section Multiflori (Asteraceae).-- I. Nomenclatural review and formal presentation of taxa. *Rhodora* 80: 319-357.
- Jones, A. G. 1980. Data on chromosome numbers in Aster (Asteraceae), with comments on the status and relationships of certain North American species. *Brittonia* 32: 240-261.
- Jones, A. G. 1984. Nomenclatural notes on Aster (Asteraceae)-- II. New combinations and some transfers. *Phytologia* 55: 373-388.
- Jones, A. G. and P. Hiepko. 1981. The genus Aster, s.l. (Asteraceae) in the Willdenow Herbarium at Berlin. *Willdenowia* 11: 343-360.

BOOK REVIEWS

Alma L. Moldenke

"THE ENCYCLOPEDIA OF CACTI" by Willy Cullman, Erich Götz & Gerhard Gröner, 340 pp., 400+ color pl., 12 SEM photo., 40 line draw., 1 map & 5 charts. Alphabooks, Sherborne, Dorset D79 SLIV, U. K. & Timber Press, Inc., Portland, Oregon 97225. 1986. \$45.00.

In the previous issue of PHYTOLOGIA I failed to list the Timber Press, Inc., Portland, Oregon 97225 as the U. S. source for "This excellent and beautiful book [that] has its origin in the also outstanding 'Kakteen' of 1963. In this new edition Gerhard Gröner was chiefly responsible for the sections on cactus culture and the new photographs, while Erich Götz contributed the sections on cactus systematics and the information on the genera and species of cacti."

"TEMPERATURE AND LIFE" by H. Precht, J. Christophersen, H. Hensel & W. Larcher, xx & 779 pp., 263 b/w fig., 6 photo. & 21 tab. Springer-Verlag, Heidelberg & Berlin, Germany, & New York, N. Y. 10010. 1973. \$80.00.

How fortunate for today's biologists in classrooms, in laboratories and in training, as well as physicians, that this very thoroughly prepared and effectively presented book is still available. It is built upon the "Temperatur und Leben" of the first three authors, first published in 1955, enlarged with the addition of the contributions of twelve writers from a variety of cognate fields but still centered on "the adaptation of organisms to changing temperatures", both poikilotherms (microorganisms, plants, animals) and homeotherms (birds and mammals). The illustrated charts and diagrams cover very impressively a worldwide range of organisms and their tested responses to many temperature controlled or temperature naturally varied conditions. I believe that this publication is still the most important one in the field.

"BOTANY -- A Brief Introduction to Plant Biology" 2nd Edition by Thomas L. Rost, Michael G. Barbour, Robert M. Thornton, T. Elliot Weier & C. Ralph Stocking, xi & 398 pp., 483 b/w & colored fig., photo. & pl. & 12 tab. John Wiley & Sons, New York, N. Y. 10158. 1984. \$29.45.

The authors state truly in the preface that "This text stands apart, offering a balanced yet compact introduction to all aspects of botany. Brevity was achieved by concentrating on the central facts and principles that are needed to understand the form, function, and evolution of plants and fungi." It is up-to-date, clearly explained,

well programmed, and copiously and effectively illustrated by the use of two shades of black, two of green and some color photographs. As I have mentioned about other texts over the years: green coloring can be used most effectively as a teaching device when limited to chloroplasts and green parts of plants only.

"THE LILIES OF CHINA -- The Genera *Lilium*, *Cardiocrinum*, *Nomocharis* and *Notholirion*" by Stephen G. Haw, 172 pp., 8 color pl., 22 b/w multi-draw., 1 map & 2 tab., Timber Press, Portland, Oregon 97225. 1986. \$29.95.

The English and Chinese trained author has done admirably in presenting this information in text, color photographs and excellently clear drawings about the 37 wild and cultivated lily species and their several varieties found in this very big section of Asia. "Almost half of all lilies occur naturally in China". The nomenclatorial descriptions of the species are translations by Liang Sung-Yun from the well regarded "Flora Reipublicae Popularis Sinicae". To each species description Haw adds his personal information on geographic distribution, general appearance, means of propagation, & taxonomic evaluation, as well as keys to the genera. The map of China shows (by numbers) the species of *Lilium* within the provinces, and so does a fullpage chart. Appendix I gives the descriptions for the new *Lilium* sections, Appendix II lists the addresses of societies of interest to lily enthusiasts and Appendix III gives recent available information from Chinese botanical publications, even as recent as 1986. If you like lilies this is your book. Horticultural establishments and horticultural departments of universities will need it.

"LIFE PULSE -- Episodes from the Story of the Fossil Record" by Niles Eldredge, x & 246 pp., 85 b/w fig. incl. 67 photo. & 5 maps. Facts on File Publications, New York, N. Y. 10016. 1987. \$19.95.

"After an extinction there is vacant ecological space. This is when evolution becomes its most creative.....producing a wide variety of creatures to take the places of their fallen comrades." With Stephen Jay Gould the author believes that "without extinction to free up these ecological niches, life would still be confined to a primitive state somewhere on the sea bottom." I do not see how this evolution would be so laggard if Darwin's concepts were functioning all along at their slower, less conspicuous and more even pace. The author is a trilobite specialist and an effective writer. He describes their diversions in the Cambrian, life in the Paleozoic seas and the invasion of the land, the "glorious" Mesozoic, then the extinctions and the advent of modern times in the Cenozoic. The book reads easily, yet it covers a great deal of ideas and information for the interested reader and advancing student.

"THE BIRDS - Of Canada" Revised Edition by W. Earl Godfrey, 595 pp., 74 color pl., 107 line draw. & 398 maps, University of Chicago Press, Chicago, Illinois 60637. 1986. \$39.95.

The word "Enjoy!" is passed on to reviewers of this large-sized, reasonably priced book from the National Museum of Natural Sciences of the National Museums of Canada by way of the University of Chicago Press: like me, I pass it on to casual readers, ardent students and professional ornithologists. Almost 600 bird species, with 426 breeding within Canada and 498 depicted in full color, are described, with their known ranges in Canada, their vital measurements, field identification marks, habitats, nesting and notes. American "birders" will be interested in seeing the ranges of "their" birds into Canada and in seeing the very fine color plates and line drawings by John A. Crosby and S. D. MacDonald. This excellent book belongs on the library shelves of persons and institutions with any interest in the bird fauna of Canada and this hemisphere.

"PRINCES AND PEASANTS -- Smallpox in History" by Donald R. Hopkins, xx & 380 pp., 36 b/w pl. & 15 fig. with 4 maps, University of Chicago Press, Chicago, Illinois 60637. 1983. \$25.00 clothbound & 1985. \$12.95 paperbound reprint.

The author has considerable skills as an epidemiologist, as an ardent worker with the World Health Organization's Smallpox Eradication Program, and as an interesting and highly instructive writer on the historical story of the nature of this highly contagious, devastating, and often fatal, widespread disease, including its effect upon history when royal family members who were heads of state or heirs to thrones succumbed. He explains the nature, use and effectiveness of the earlier inoculation treatment, the use of red color cloths and ultimately red lights on and about the pock-marked patients, and finally Jenner's cowpox vaccine which made it possible to state that there is no more smallpox anywhere in the world today. Unlike so many modern scientific advances, this one now has no harmful side effects.

"EARTHLY PLEASURES -- Tales from a Biologist's Garden" by Roger B. Swain, v & 198 pp. & 21 b/w photo., Scribner's Sons, New York, N. Y. 10017. 1981 clothbound. \$10.95 & 1985. \$5.95 paperbound.

The author is a science editor of "Horticulture" and in this book displays his delightful writing style that is picturesque yet accurately factful as he discourses about plants and animals and their interactions, mainly right in his own back yard -- parsnip taste, tree barks, duckweed, fungus connections, tomato ripening, mistletoe, seed travels, rotten apples and even some more.

New York Botanical Garden Library



3 5185 00288 2460

Inasmuch as we do no editing, papers accepted for publication *must* be submitted in *exactly* the form that the author wants to have them published. They will then be photographed and printed by photo-offset in exactly the form as submitted except that we will add page numbers and running-heads.

Typescripts should be prepared single-spaced on clean white heavy bond smooth and opaque paper. Elite type is probably the most space-economical. Typescript text must not exceed a rectangle $5\frac{5}{8}$ inches wide (horizontal) by $8\frac{5}{8}$ inches high (vertical), not including the running-head and page number.

The title of the paper should be typed in all uppercase (capital) letters with 2 blank lines above the title and one beneath; then the name of the author in ordinary upper- and lower-case letters, along with his address (if so desired); followed by 2 blank lines; then the first line of text. It is usually best to leave a blank line between paragraphs.

All scientific plant and animal names and group names should be typed either in italic type (if available) or underscored. Any corrections in the text made by the author must be complete and neat as they will be photographed as they are.

The finished typescript as submitted by the author will be reduced from the $8\frac{5}{8} \times 5\frac{5}{8}$ inch size as submitted to $6\frac{2}{8} \times 4$ inches by the printer. It is therefore advisable to place a centimeter or millimeter scale on all text figures and plates included.

Use a *new* heavily inked black typewriter ribbon and be sure to *clean* the type on the typewriter after each several pages of typing.

Cost of publication at present is \$12.00 US per page, with no subsequent rebates, but this rate may vary depending on inflation and costs, so it is best to inquire as to current rates. The page charges are due *with* the typescript and no paper will be published before payment is received in full. Each author will receive gratis a proportionate share of the printed copies remaining after paid subscriptions are filled, but if separates (reprints or offprints) are desired, these will be charged extra in accord with the current rate for offprints provided by the printer. The cost of all such separates ordered must also be paid for in advance at the time the typescript is sent. No orders for separates will be accepted later, nor can additions or corrections be accepted.

Authors are asked to indicate in light pencil on the *reverse* side of each page of their typescript the page number so that no mistakes in sequence occur.

All manuscripts accepted will be published in the next issue, so that the size of the numbers may vary greatly. A volume will contain 512 pages. The plan insures prompt publication of all accepted manuscript.

Illustrations will be published according to the desires of the authors. No extra charge is made for line drawings, such as are ordinarily reproduced in zinc, or for diagrams, tables, or charts, provided they conform to certain limitations of size and proportion. An extra charge will be made for halftones, depending on their size, as fixed by the engraver.

Articles dealing with research in all lines of botany and plant ecology, in any reasonable length, biographical sketches, and critical reviews and summaries of literature will be considered for publication.