Begonia caricea Girmansyah

Begonia tenuifolia Girmansyah

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A TAXONOMIC STUDY OF BALI AND LOMBOK BEGONIA (BEGONIACEAE)

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DEDEN GIRMANSYAH
Herbarium Bogoriense, Research Centre for Biology LIPI, Bogor, Indonesia

ABSTRACT
GIRMANSYAH, DEDEN. 2009. A taxonomic study of Bali and Lombok *Begonia (Begoniaceae*). *Reinwardtia* 12(5): 419–434. — A taxonomic study of Bali and Lombok *Begonia* was based on an investigation of morphological characters from 60 specimens in Herbarium Bogoriense. This study shows that there are 8 species that can be recognized: three species already in the genus (*Begonia coriacea, B. longifolia,* and *B. tenuifolia*) and five new (*Begonia baliensis, B. lempuyangensis, B. pseudomuricata, B. multibracteata,* and *B. lombokensis*).

Keywords: *Begoniaceae*, *Begonia*, Bali, Lombok, Indonesia

ABSTRAK
GIRMANSYAH, DEDEN. 2009. Studi Taksonomi *Begonia* Bali dan Lombok. *Reinwardtia* 12(5): 419–434. — Studi taksonomi *Begonia* Bali dan Lombok dilakukan dengan menggunakan 60 spesimen di Herbarium Bogoriense. Hasil penelitian menunjukkan terdapat 8 jenis *Begonia.* Tiga jenis yang telah dikenal sebelumnya (*Begonia coriacea, B. longifolia* dan *Begonia tenuifolia*) dan lima jenis diusulkan sebagai jenis baru (*Begonia baliensis, B. lempuyangensis, B. pseudomuricata, B. multibracteata* dan *B. lombokensis*).

Kata Kunci: *Begoniaceae*, *Begonia*, Bali, Lombok, Indonesia

INTRODUCTION

The first description of a plant that we now call *Begonia* was made by Francisco Hernandez in 1651, for a plant from Mexico named 'Toto-caxoxo coyollin'. The second plant was 'Tsjeria-nariampuli' from Malabar (India) described by Rheede in 1689. The name *Begonia* was proposed by Plumier in 1690 who described two species of *Begonia* from the Caribbean (*Begonia purpurea maxima* and *Begonia nivea maxima)*. The genus was named for Michel Bégon (1638-1710), who as governor of French Canada and San Domigo was also a patron of botany. In 1753 Linnaeus reduced the Plumier species into one, named *Begonia obliqua.* In 1791 Dryander, the first monographer of the genus, described 21 species and mentioned 9 'species obscure'. In 1848, Hasskarl described *Begonia coriacea* as new, followed by Klotzsch (1855) who published the results of a meticulous study of the large genus *Begonia* and split it into 37 genera. For example, he transferred some *Begonia* species to the genus *Mitscherlichia* Klotzsch. Miquel (1855) followed Klotzsch in splitting *Begonia* and made new combinations for some *Begonia* species. Some species were transferred to the genera *Diploclinium* Lindley and others to *Mitcherlichia* and *Platycentrum* Miquel.

Since many scientists have worked on *Begoniaceae,* many taxonomic and nomenclatural changes have been made in *Begonia*. In 1986 'The *Begoniaceae*…' published by Smith *et al.* summarized the knowledge at that time. In part I, L.B. Smith and D.C. Wasshausen presented an illustrated key to all known species, the great majority with pictures of the type specimens. Part II, by J. Golding and C.E. Karegeannes, was an annotated species list with relevant literature. In 1998, Doorenbos *et al.* published "The Sections of *Begonia*", that classified *Begonia* into 63 sections. Recently new species of *Begonia* have been published by several scientists such as Tebbitt (2005) who published *Begonia scottii* from Sumatra, and Hughes (2006) published four new species of *Begonia* from Sulawesi named *B. chiasmogyna*, *B. macintyreana*, *B. mendumae*, and *B. stevei*. Finally, Girmansyah (2005) reinstated *Begonia repanda* Blume.

Begonia is the largest genus in the family *Begonia*ceae, and easily recognized by the asymmetric leaves, unisexual flowers, and winged fruits. The very asymmetric leaf is the obvious character for the genus.

Begonia is found wild throughout tropical and subtropical Asia, Africa, and America. More than 1500 species have been named with many more species probably waiting to be discovered (Kiew, 2005). Many species are used as ornamental plants. According to Burkill (1935) leaves of *Begonia* are also used as a flavoring for mixtures of fish and meat. Other species can also be used in traditional medicine (Perry, 1980; Lewis & Elvin-Lewis, 1977). According to Watson & Dallwitz (2000) some *Begonia* species contain secondary metabolites like proantosianin, mostly in the form of cyanidin, flavonols in the form of quercitrin, and also saponins or sapogenins, and the plants also gene-rally contain a lot of acid oxalates.

The current study was based on herbarium specimens of *Begonia* collected from Bali and Lombok Islands of Indonesia. All 60 specimens deposited in the Herbarium Bogoriense (BO) were examined. In addition, some pictures of *Begonia* specimens from Leiden (L), Kew (K), Edinburgh (E), and Aarhus (AAU) were consulted. The living plants in the Bali Botanic Gardens and nearby areas as well as those found in some areas of Lombok Island were also studied in-situ.

Exploration was conducted on Bali and Lombok Islands in addition to study of the Bogor Herbarium collections. Exploration and specimen collection methods were based on those of Rugayah *et al.* (2004). All materials were studied and their morphological characters were examined with a 10 x 40 binocular microscope following the methods suggested by Leenhouts (1968), Rifai (1976), Vogel (1987), and Maxed (1992). For the morphological terminology the author followed Harris & Harris (1954), Lawrence (1955), Doorenbos *et al.* (1998), and Kiew (2005).

MORPHOLOGICAL CHARACTERS

Habit

In Bali and Lombok, most species of *Begonia* are herbs and a few are creeping, rhizomatous, tuberous and/or cane-like shrubs with woody stems. *Begonia longifolia* Blume and *B. lombokensis* Girmansyah are cane-like with erect stems and more than a half meter tall. *Begonia baliensis* Girmansyah, *B. lempuyangensis* Girmansyah, and *Begonia multibracteata* Girmansyah are shrub-like species. *Begonia coriacea* Hasskarl and *B. pseudomuricata* Girmansyah are creeping species always found growing on limestone. *B. tenuifolia* Dryander is tuberous.

Leaves

Almost all the Bali and Lombok *Begonia* species have oblique asymmetric leaves except *B. coriacea* which has peltate leaves. The leaf blade can be broad and cordate or heart-shaped like that of *Begonia baliensis, B. lempuyangensis*, *B. pseudomuricata,* and *B. multibracteata*; ovate to oblong such as the leaves of *B. longifolia*, *B. lombokensis*, *B. tenuifolia*; or peltate as in *B. coriacea*. *Begonia tenuifolia* is the only species producing leaves of various shapes during its lifetime; starting with rounded leaves and later producing narrowly ovate leaves at maturity. The leaf margin of most species is very finely toothed but in a few species like *B. lempuyangensis, B. multibracteata,* and *B. baliensis,* the leaf margins are shallowly scalloped.

Inflorescence

There are two main types of inflorescences found in *Begonia*. The first type is the terminal inflorescence where the inflorescence arises at the apex of the stem, such as found in *B. lombokensis* and *B. tenuifolia*. The second inflorescence type is the axillary inflorescence in which the inflores-cences arise from the leaf axils. This type can be found in the rhizomatous species such as *B. baliensis, B. multibracteata, B. lempuyangensis, B. longifolia, B. coriacea,* and *B. pseudomuricata*. The arrangement of flowers in *Begonia* can be cymose or racemose. The cymose form can be found in *B. baliensis, B. lempuyangensis, B. multibracteata, B. pseudomuricata,* and *B. longifolia*, whereas the racemose form can be found in *B. tenuifolia* and *B. lombokensis.*

Flowers

The flowers of *Begonia* are small, measuring 1–2 cm across. The sepals are coloured and look like petals. Together these sepals and petals are called tepals. Most Bali and Lombok *Begonia* species have white tepals. Each flower is unisexual but male and female flowers are found on the same plant, and frequently in the same inflorescence so the plant is termed monoecious.

Depending on the species, the male flowers may open first (protandry) or the female flowers may open first (protogyny). The male flowers have two larger rounded outer tepals, oriented up and down. The other two narrower tepals are oriented to the left and right, as found in *B. baliensis, B. lempuyangensis, B. multibracteata, B. pseudomuricata, B. longifolia, B. tenuifolia,* and *B. coriacea*. Only *B. lombokensis* from Lombok has two male tepals. The female flowers usually have five tepals of more or less the same

shape but with the outer ones slightly larger than the inner, as found in *B. baliensis, B. lempuyangensis,* and *B. multibracteata*. In a few cases, as in *B. pseudomuricata* there are three tepals, *B. longifolia* has six tepals, and *B. lombokensis* has two tepals.

Fruits

There are two types of *Begonia* fruits found in Bali and Lombok. The first, a fruit with tiny fibrous wings as found in the cane-like *Begonia*, *B. lombokensis,* which has fruits with three equal-sized wings, and the tuberous *Begonia*, *B. tenuifolia* which has fruits with one larger wing and two short wings that are curved, and the creeping *Begonia, e.g.*, *B. coriacea* and *B. pseudomuricata* with three equal thin wings. The second, a fruit with thick and fibrous wings, as found in rhizomatous *Begonia* species, *B. baliensis, B. lempuyangensis, B. longifolia,* and *B. multibracteata.*

The shape of *Begonia* fruits is related to the number of locules. Fruits with equal wings, as in *B. lombokensis, B. coriacea,* and *B. pseudomuricata* as well as in other species in the rhizomatous group have three locules each with one placenta. The other type of fruit with one larger wing has two locules with two placentae per locule, as in *B. tenuifolia.*

Seeds and Seed dispersal

Begonia seeds are called dust seeds, because they are tiny and very light. A single capsule may produce hundreds of seeds. Like most species of *Begonia*, the Bali and Lombok *Begonia* seeds are brown, barrel-shaped, and about 0.25–0.4 mm long. The base of the seed consists of a lid that narrows to the stalk that attaches the seed to the fruit. Above the lid is a ring of elongated cells called the collar cells, which is a unique feature of *Begonia* seeds. The rest of the seed is covered in polygonal cells. As the seed matures, the thin outer walls collapse and centre of the cell becomes concave while the cell walls stand out as ridges. This gives the seed its characteristic sculptured surface. When falling from the fruit, this uneven surface creates micro turbulence, which slows the rate of fall and potentially increases the distance seeds may move from the mother plant. The rough surface may also help the seed to latch onto vertical rock surfaces. The surface features probably explain why so many species of *Begonia* grow on rocks or on steep banks where leaf litter does not collect. On the forest floor, tiny seedlings would be smothered by falling leaves. However, the hundreds of seeds produced may compensate for their high mortality.

Fruit types in *Begonia* are clearly related to the mode of seed dispersal. Seeds in the fleshy green berries of the *Begonia* species such as *B. longifolia, B. multibracteata,* and *B. baliensis* are presumably eaten and dispersed by herbivores as the fruit does not split to release seeds. Several other Bali and Lombok *Begonia* species have dry winged capsules that split between the locules and wings to release the seeds.

Begonia pseudomuricata and *B. coriacea* have three thin wings of equal size and the fruit dangles down on a long stalk. The slight movement whether by water drops hitting the plant or by air movement will shake the seeds out of the capsule. *Begonia lombokensis* has fruits with three equal-sized wings and a short stalk that holds the fruit below the leaves. The seeds will only be released if the plant is shaken by heavy rain or animals brushing past. The last type is called a splash cup. The capsule has one large fibrous wing and two short curved wings. When ripe, the large, heavy wing hangs down like a keel of boat and the two short wings are upright and form a cup. The seeds are dispersed by large raindrops dripping from high up the canopy hitting the cup with great ballistic force bouncing the tiny seeds out. Splash cup fruits can be found in *B. tenuifolia.*

Dispersal of seeds from the capsular fruits appears to be local as the great majority of these species occupy very narrow geographic ranges. In fact, geographical isolation has probably played an important role in the speciation of *Begonia*. An exception is made for plants in section *Sphenanthera* that have berries. Tebbitt (2003) attributes the wide distribution of species from that section from India to Java to its fruits being animal dispersed.

DISTRIBUTION

Begonia species are found in the wild throughout tropical and subtropical Asia, Africa, and America. From Bali and Lombok, 8 native species of *Begonia* are known. Some of them are endemic. *Begonia lombokensis* and *Begonia multibracteata* are only found in Lombok, while *Begonia baliensis, B. lempuyangensis,* and *B. pseudomuricata* have only been collected from Bali. Meanwhile, the distribution of *Begonia longifolia* extends from the Himalayas (India) to south China, Vietnam and through Thailand, peninsular Malaysia, and Indonesia (Sumatra, Java, Bali, and Lombok). Until now, there are no

collections of *B. longifolia* recorded from Borneo and the eastern parts of Indonesia like Sulawesi, Maluku, and Papua.

Begonia coriacea is a new record from Bali, and it is one of the *Begonia* species that grows on limestone. In Bali, this species was found only in Pura Lempuyang, Karang Asem District, in eastern Bali. One of the exciting finds is the spotted *Begonia*, *B. tenuifolia,* found in Java, Bali, Lombok, and Sumbawa. This species has wide variation in size of habit and leaf colouration. Its leaf colour ranges from bright green to dark brownish green with spotting on upper leaf surfaces. The fruits of this species have unequal wings; the larger one varies in size and tip of wing. The longest wing is about 1 cm long with the tip rounded, while the other wings are narrowly elongated and with the tips pointed. The existence small tuber is a specific character for this species.

POTENTIAL USES

Begonia is a very much appreciated genus of ornamental plants, of economic relevancy, having species prized for their flowers and foliage. Some species can be used commercially for their foliage or flowers in pots or to constitute gardens. Some of the Bali and Lombok *Begonia* species have attractive morphological characters. *Begonia tenuifolia* Dryander has a distinctive spot on the leaves and a very nice specimen if planted in a small pot and kept as an indoor plant. *Begonia coriacea* and *B. pseudomuricata* have flowers with pinkish rosy colour. The colour is very attractive and a good ornamental. *Begonia* has flowers with an acceptable taste. The rosy petals contain relatively high levels of antioxidants. Meanwhile *B. baliensis, B. lempuyangensis* and *B. multibracteata* are species with a robust habit and big stems. All of them can be eaten in salads or cooked with fish. *B. lempuyangensis,* can be used as a palliative medicinal for coughs. Cane-like species such as *B. lombokensis* and *B. longifolia* can also be eaten and/or used medicinally.

Some of the *Begonia* species from outside Indonesia are also used medicinally. Tuberous begonias, which come in a number of different colours, add a fresh appearance and lively flavour to many salads. *Begonia* has a slightly tart citrus flavour and a crunchy texture that provides a distinctively different, yet enjoyable salad ingredient. *Begonia evansiana* Irmscher from China (sect. *Diploclinium*) has tuberous roots and fruits that are anodyne, antiphlogistic, antispasmodic, and can stimulate blood circulation. A decoction is used in the treatment of traumatic pain, haematemesis, gonorrhoea, post-partum vaginal discharge, amenorrhoea and snakebites (http:// www.pfaf.org/database/plants.php?Begonia+grandis+evansiana, accessed on 5/8/2008). *Begonia picta* J. E. Smith from India (*Diploclinium* section) has many uses: the leaves can be eaten raw or cooked, an acid flavour the sour tasting leaf stalks and stems can be pickled, and the juice of the plant is drunk to relieve headaches. The crushed leaves can be used as a poultice on sore nipples. The root juice is used as eyewash to treat conjunctivitis. It is also consumed in the treatment of peptic ulcers. (http:// www.pfaf.org/database/plants.php?Begonia+picta, accessed on 5/8/2008).

TAXONOMY

BEGONIA L.

Linnaeus, Sp. Pl. 2: 1056. 1753; Linnaeus, Gen. Pl., ed. 5: 475. 1754; Linnaeus, Sp. Pl. ed. 2: 1497. 1763. Type: *B. obliqua* L. (lectotype, selected by Golding, Phytologia 45: 246, fig. 2. 1980).

Terrestrial, perennial or more rarely annual, monoecious or dioecious herbs, or sometimes shrubs; stems herbaceous, often succulent, or woody, frequently rhizomatous, or plants tuberous. Leaves arranged alternate and or spirally, stipulate, petiolate, asymmetric or exceptionally symmetric, sometimes peltate, entire to pinnatifid or rarely even bipinnatifid or palmately compound, pinnately or palmately veined, glabrous or pubescent, without stellate hairs or scale-like. Inflorescences usually cymose, sometimes racemose or racemose with cymose branches, rarely 1-flowered, protandrous or protogynous; cymes dichasial and/or monochasial, sometimes with strongly reduced axes, bracts persistent or not, bracteoles often persistent. Flowers unisexual. Male flowers with 2 or 4 perianth segments (‘tepals’), almost free to variously fused; androecium with many stamens, actinomorphic or zygomorphic and sometimes the stamens arranged into several rows like an amphitheatre; filaments free or variously fused into a column; anthers with 2 thecae, opening lengthwise with slits, with pore-like slits or more rarely with terminal pores, connective frequently extended. Female flowers with 2–6 free or partially fused, often unequal perianth segments (‘tepals’) which are rarely persistent in fruit; ovary inferior, with 3–4 equal or unequal wings with horns, broadly ovoid or

ovoid to globose or fusiform in shape, triangular in circumference, 2–3 locules the locules sometimes incomplete; placentation axillary or less often parietal or septal, occasionally changing from the base of the ovary towards the apex, placental branches 1–2 per locule; styles mostly 3, persistent or caducous, often partly fused, once or more times forked towards the apex or more rarely simple, stigmatic tissue generally in a continuous band coiled around the arms, less often kidney-shaped or in an uncoiled band distributed all over the style. Fruit capsule and berry and fleshy, usually loculicidal, more rarely indehiscent. Seeds characterized by a ring of collar cells below the microphylar-hilar part which acts as an operculum during germination.

Key to Species

1. a. Plants perennial, without tubers, leaves many more than 5 …..……..…….……2
   b. Plant annual with tubers, leaves 2–5……...…… ……..……..... 8. *B. tenuifolia*
2. a. Stems creeping, internodes short, nodes not swollen…….....3
   b. Stems erect, internodes elongated, nodes swollen…….....4
3. a. Leaves peltate, female flowers 2, with four tepals ……..... …….2. *B. coriacea*
   b. Leaves ovate, female flowers 8, with three tepals ..……..…...7. *B. pseudomuricata*
4. a. Fruit with chartaceous wings, male flowers with two tepals, female flowers with two tepals…….. ……..……..…4. *B. lombokensis*
   b. Fruit with thick wings, male flowers with four tepals, female flowers with five to six tepals…..5
5. a. Fruit wings equally-sized……..……..…….6
   b. Fruit wings unequally sized ……..……...…..7
6. a. Lamina oblong, margin entire, glabrous, female flowers with six tepals……..….. 5. *B. longifolia*
   b. Lamina ovate, margin scalloped, sparsely hairy, female flowers with five tepals .....1. *B. baliensis*
7. a. Inflorescence hairy, male and female flowers hairy except for the tepals, bracts many……... ……..…….….. 6. *B. multibracteata*
   b. Inflorescence glabrous to glabrescent, male and female flowers glabrous to glabrescent, without bracts ……..... 3. *B. lempuyangensis*

1. **Begonia baliensis** Girmansyah *sp. nov.* — Fig.1

Habitu *Begonia robusta* Blume simile, differt pedunculus brevis, floribus glabris, fructus parvis, glabris, alis aequalis non cornuatus, fructus similaris fructus *Begonia longifolia* Blume. Type: Bali: Bali Botanic Gardens area, Mt. Batukaru, 11 Mar 2007, *Deden Girmansyah 801* (Holotype–BO).

Stem brownish green to reddish brown, erect and cane-like, succulent, rhizomatous, hairy, herbaceous, seldom branched, 15-50 cm tall, 8-15 mm in diam.; nodes brownish green to reddish brown, swollen; without a tuber. Stipules pale green, glabrous, narrowly triangular, 2-25 x 5-10 mm, margin entire, tip 2–3 mm long, setose, caducous. *Leaves* distant; 5-15 cm apart, petiole pale green to reddish brown, hairy, terete, 7.5–30 cm long, 5–8 mm diam; lamina oblique, hairy above, thinly leathery in life, papery when dried, broadly ovate, asymmetric, 14–21 x 11–18 cm, broad side 6.5–11 cm wide, basal lobe rounded, 3.5–7.5 cm long, margin scalloped and minutely toothed, apex acuminate; venation palmate-pinnate, with 2–3 veins at the base and 2 pairs along the midrib with 2–3 veins in basal lobe, branching one third of the way to the margin, grooved above, beneath prominent. *Inflorescences* axillary, few flowered, shorter than the leaves, protandrous, peduncle 2–8 cm long, green, glabrous; bract absent. *Male flowers* 4, with a pale reddish green pedicel 1.3–2.5 cm long; tepals 4, white and red around the middle toward, glabrous, rotund, margin entire, tip rounded, outer two 13–15 x 11–12 mm, inner two similar but smaller, milky white, 11–14 x 8–9 mm; stamens many, stamen cluster globose, 5-6 mm across; filament *ca.* 1–2 mm long; anthers pale yellow, narrowly obovate, 1.5–2 mm long, apex emarginate, opening by slits. *Female flowers* 7, with a pale green pedicel 4–5 mm long; ovary dark green with reddish brown at the larger wing, thick and fleshy, 7–9 x 5–8 mm, locules 3, placentas 2 per locule; tepals 5, milky white, outer two reddish white, broadly obovate, margin not toothed, tip rounded, 14–17 x 10–11 mm; styles 3, style and stigma greenish yellow, 4–5 mm long, stigma greenish yellow, spiral, caducous. *Fruit* a berry, pendent on a stiff fleshy pedicel, 4–5 mm long, green when ripe, fleshy, 10-15 x 10 mm, globose, elongated into a fleshy beak, glabrous, 3-lobed, with one larger wing, not splitting. *Seeds* barrel-shaped, 0.25–0.3 mm long, collar cell almost as long as or 3/4 the seed length.

Distribution. Bali.

Habitat. Humid forest, along trails at 1300–1800 m.

Notes. This species is common in Bali where it grows in small colonies to large populations. *Begonia balienses* is similar to *B. robusta* from Java, but different in several characters. The flowers of *B. robusta* are bigger than *B. baliensis.*

The fruits wings of *B. baliensis* have similar size but fruit of *B. robusta* with one larger than the other, the wing look like horn. The stem of *B. robusta* cover with the thick hairs or wooly hairs, *B. baliensis* cover by short hairs.

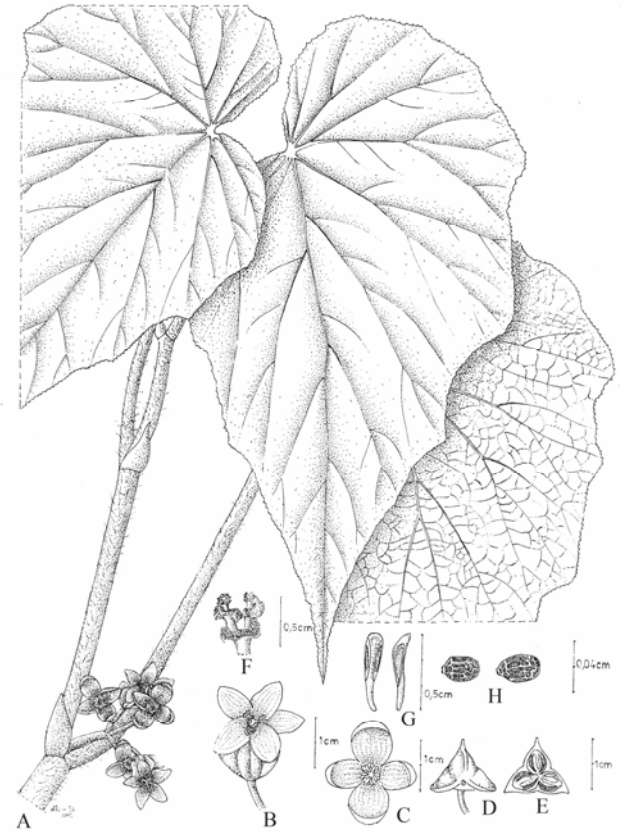

Fig.1. *Begonia baliensis* Girmansyah. (A. Habit, B. Female flower, C. Male flower, D. Fruit, E. Fruit in cross section, F. style, G. stamens, H. seeds).

Specimens examined. BALI. Mt. Batukaru complex, Bedugul, *KK & SS 93* (BO); 32 km S of Singaraja-Bedugul Road, *W. Meijer 10442* (BO); Lake Bratan, near Bedugul, Bali. *W. Meijer 10551* (BO); North of Tabanan, Mt. Batukaru, *Nengah Wirawan 454* (BO); Gunung Batukaru, *Sarip 385* (BO).

2. BEGONIA CORIACEA Hasskarl— Fig.2

Begonia coriacea Hassk., Cat. Hort. Bogor. 192. 1844; Hassk., Pl. Jav. Rar. 239. 1848; Hassk., Hort, Bogor. Descr. 328. 1858. — *B. hasskarlii* Zoll. & Mor., Syst. Verzeich. 31. 1846. — *Mitscherlichia coriacea* (Hassk.) Klotzsch, Abh. Königl. Akad. Wiss. Berlin 1854: 74. 1855. Type: *Hort. Bog. 6075* Holotype (L).

Begonia hernandiifolia Hook., Bot. Mag. 78: t. 4676. 1852. Type**:** Hooker, Plate 4676 (Smith *et al.* 1986 [page 154, fig. 2:30] cite this plate as the type for *B. coriacea*).

Mitcherlichia junghuhniana Miq., Fl. Ned. Ind. 1(1): 696. 1856; — *Begonia junghuhniana* Miq., Pl. Jungh, 4: 418. 1857. Type**:** Java, *Junghuhn s. n.* (lectotype, here designated, L!, sheet no 898. 195-2).

Stem creeping, subglobose, rooting at the nodes, succulent, unbranched, stout, without tuber, 10–18 cm long, 1–3 cm thick, nodes not swollen, internodes 5–15 mm long, 2.5–10 mm thick. Stipules broadly triangular, spreading, 12–16 x 7–10 mm, hairy on the middle, margin not toothed, tip pointed, terminating in a hair, setose, persistent. *Leaves* tufted, up to 5–6 mm apart; petioles terete, glabrous, 10–21 cm long, *ca.* 2–3 mm in diam.; lamina peltate, glabrous, oblique, drying papery, upper side dark green and glossy, pale green beneath, 16–24 x 13–23 cm, broad side 4.5–5.2 cm wide, base rounded *ca.* 2.3 cm long, margin not toothed, crenate, tip rounded; venation palmate-pinnate, 3 pairs with another 3 veins at the peltate base, branching toward the margin, veins plane above, red beneath. *Inflorescences* axillary, longer than the leaves, 10–16 cm long with a peduncle 9–15 cm long, branches 1–2 cm long, glabrous, protandrous. Bract brownish green, *ca*. 3 x 2 mm, bracteoles *ca.* 2 x 1 mm, pale green, margin hairy. *Male flowers* with pedicel 5–6 mm long; tepals 4, margin entire, tip rounded, outer two orbicular, 10–13 x 9–13 mm, inner two

narrowly obovate, 9–13 x 5–6 mm; stamens many, golden yellow, stamen cluster with a stalk *ca*. 1 mm long; filaments *ca*. 1 mm long; anthers dull yellow, broadly obovate, 0.75–1 mm long, tip rounded, opening by slits. *Female flowers* with a pedicel *ca*. 11 mm long; ovary of 3 locules, placenta 1 per locule; tepals 4, glabrous, outer two broadly obovate, 11–13 x 10–11 mm, inner two narrowly obovate, 9–11 x 5–6 mm; style and stigma golden yellow, 4 mm long, stigmas spiral. *Fruit* a capsule with a reddish green pedicel 10–11 mm long with 3 equal wings. *Seed* barrel-shaped, *ca*. 0.35–0.4 mm long, collar cell a quarter of the seed length.

Distribution. Java and Bali.

Habitat. Confined to karst limestone at 30–1000 m, in shaded stony situations, and in steep gullies.

Notes. *Begonia coriacea* is the only peltate leaved *Begonia* in Bali and Lombok where it grows on limestone. This species is a new record from Lombok and Bali.

Specimens examined. BALI. Lempuyang Temple, Abang Subdistrict. Karang Asem Distr., 13 Mar 2007, *Deden Girmansyah 802* (BO); Lempuyang. 24 Apr 2006, *leg. ign. DM 1267* (BO).

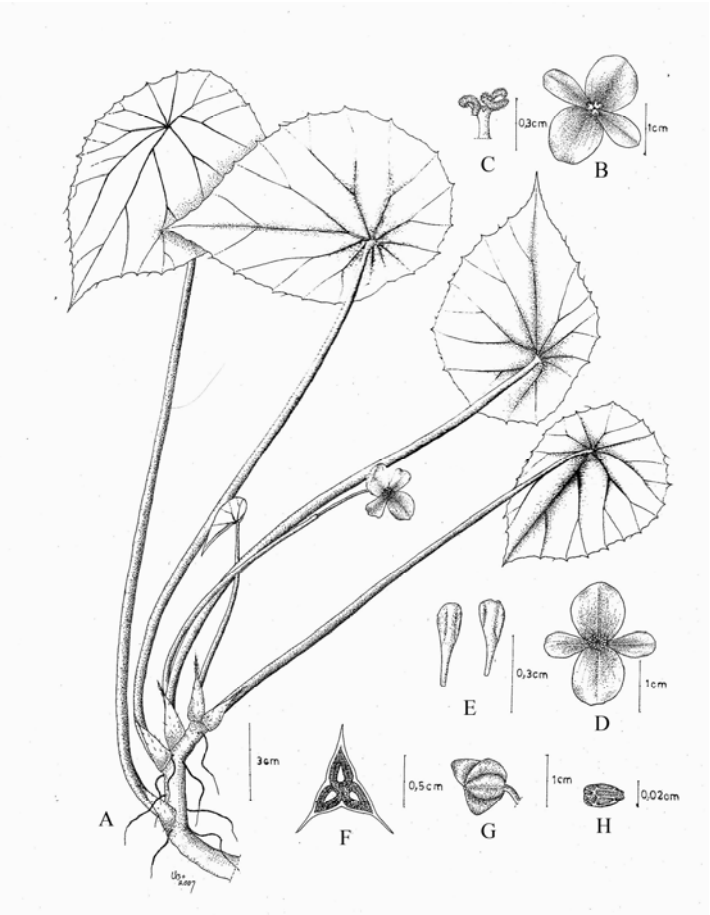

Fig.2. *Begonia coriacea* Hassk. (A. Habit, B. Female flower, C. Style, D. Male flower, E. Stamens, F.Fruit in cross section, G. Fruit, H. Seed).

3. **Begonia lempuyangensis** Girmansyah *sp. nov.* — Fig.3

Begonia robusta Blume omino glabra, pedunculus breviore (petiolis pedunculis triplo longioribus), fructus alis non cornuatus differt.—Type: Bali: Lempuyang Temple, Abang Subdistrict, Karang Asem Distr., 13 Mar 2007, *Deden Girmansyah 805* (Holotype–BO).

Stem without a tuber, brownish green to red, erect, unbranched, glabrous, succulent, arising from a basal rhizome, up to 50 cm tall, 11–14 mm thick at base, nodes red or reddish green, swollen; internodes short, 7–12 cm. Stipules caducous. *Leaves* distant, alternate; green to brownish green, glabrous, 15–21 cm long; thick 6–11 mm; lamina very oblique, glabrous, thinly papery when dried,

broadly ovate, asymmetric, 23.5–24 x 13–16 cm, broad side 8.5–14 cm wide, base deeply cordate, unequal, basal lobes not overlapping, basal lobe rounded, 5–6.5 cm long, margin shallowly to deeply scalloped; venation palmate-pinnate, 2–3 pairs of veins at the base and 2–3 pairs along the midrib with 2 pairs in the basal lobes, bifurcating at 1/3 of the distance from the base towards the margin, veins impressed above, beneath prominent, with sparse hairs. *Inflorescences* axillary, erect, shorter than the leaves, with glandular hairs, peduncle 5-10 cm long, flowers, protandrous. Bracts caducous. *Male flowers* 12, with reddish to reddish white pedicel 2–2.5 cm long; tepals 4, rotund, margin entire, tip rounded, outer two reddish on the dorsal side, 14–17 x 12–14 mm, inner two smaller, white, 13–15 x 9–10 mm; stamens many, cluster globose, filaments 1–2 mm long, anthers yellow, narrowly obovate, tip rounded, opening by slits, 2–3 mm long. *Female flowers* 8, with reddish white pedicels, 9–10 mm long; ovary pale green with white spot, sub globose, 6–10 x 6–13 mm; wings 3, unequal, larger one with reddish on the margin, locules 3, placenta one per locule; tepals 5, white, broadly elliptic, margin entire, tip rounded, outer three, 9–17 x 7–11 mm, reddish around the middle, inner two glabrous, white, 9–13 x 6–9 mm, styles 3, style with stalks 2 mm long, greenish yellow, *ca.* 3 mm long, stigma spiral, greenish yellow, *ca.* 3 mm long. *Fruit* a berry splash cup pendent on a fine pedicel, 9–11 mm long, globose, *ca*. 11 x 17 mm, glabrous, wings 3, unequal, usually one longer than the other two. *Seeds* brown, broadly ellipsoid, 0.3–0.4 mm long, base truncate, rounded distally, collar cell half of the seed length.

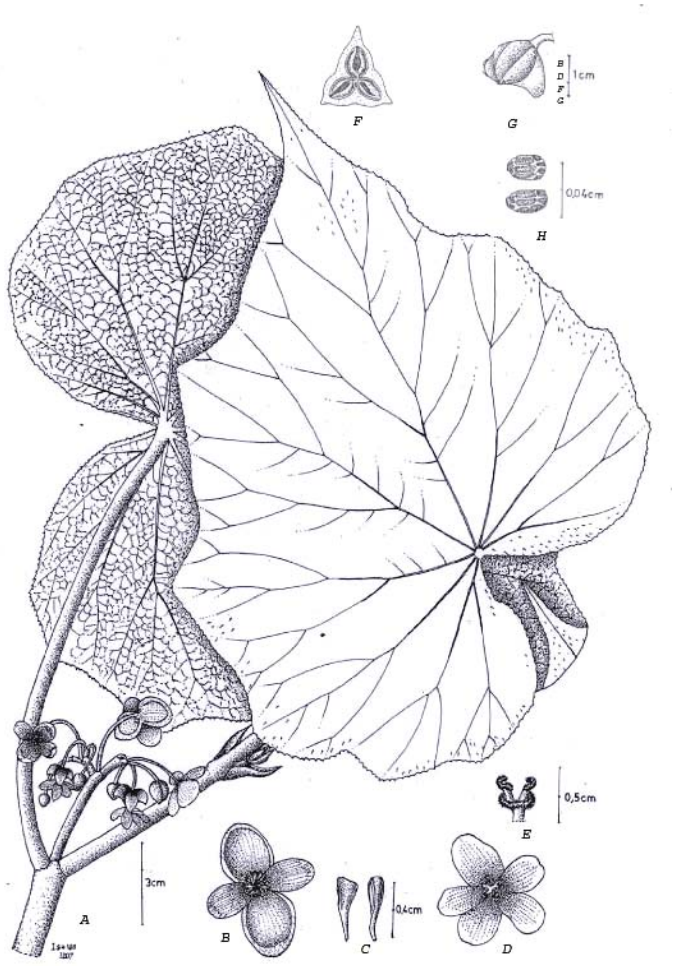

Fig.3. *Begonia lempuyangensis* Girmansyah. (A. Habit, B. Male flower, C. Stamens, D. Female flower, E. Style, F. Fruit in cross section, H. Fruit, I. Seeds).

Distribution. Pura Lempuyang, Bali.

Habitat. Humid shady situations, especially on the forest floor at 1000–2000 m.

Notes: *Begonia lempuyangensis* resembles *B. robusta* in being rhizomatous and having similarly shaped leaves, but the species differ in several characters. *B. robusta* has fruits with a single

large wing, peduncles more than half the length of the petioles and the plant body is covered with long hairs while *B. lempuyangensis* has fruits with similar or equally short wings, very short peduncles about a quarter of the petiole length and the stem without hairs.

Specimen examined. BALI. Gunong Abang**,** 9 Apr 1936, *van Steenis 8059* (BO).

4. **Begonia lombokensis** Girmansyah *sp. nov.* —Fig.4

Begonia isoptera Dryander foliis serratis, stipulis persistens angustae ovatae, flore femineo tepalis duo differt. Type: Lombok: Jeruk Manis waterfall, 18 March 2007, *Deden Girmansyah 812* (Holotype–BO).

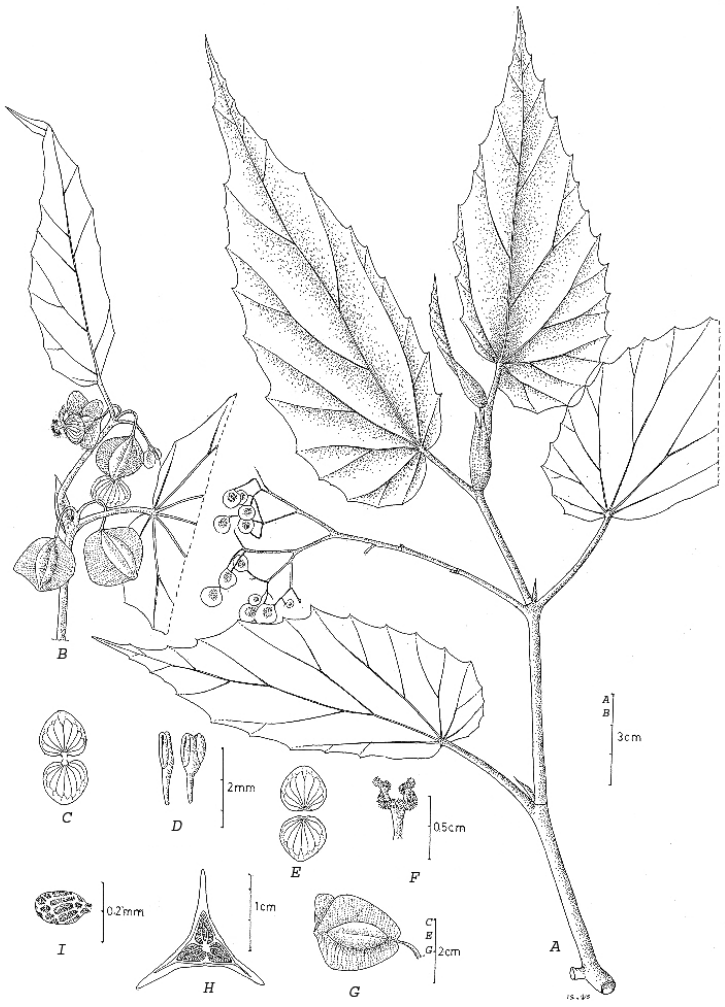

Fig.4. *Begonia lombokensis* Girmansyah. (A. Habit, B. Male inflorescence, C. Male flower, D. Stamens, E. Female flower, F. Style, G. Fruit, H. Fruit in cross section, I. Seed).

Stem cane-like, glabrous, rooting at the base, stem green, up to 1 m tall, erect, much branched, succulent, woody at the base; stipules narrowly triangular, *ca*. 17 mm long, caducous, green, glabrous, base truncate, margin entire, apex acuminate ending with a hair; internodes 2–8 cm long. *Leaves* distant, 5–10 cm apart, held horizontally; petiole 1–8 cm long, glabrous, terete; lamina plain, thinly and soft when life, papery when dried, broadly ovate, strongly asymmetric, 8–15 x 3–7 cm, broad side 1.8–4 cm wide, basal lobe broadly rounded, 1–3.5 cm long, margin scalloped and toothed at the vein endings and minutely toothed between, apex elongate, venation palmate-

pinnate, 2 veins in basal lobe, 4–6 pairs along the midrib, branching 2/3 of way to margin, plain above, prominent beneath. *Inflorescences* axillary and terminal, pale green, shorter than the leaves, 2 pairs of female flowers at the base and many male flowers above, female flowers open first (protogynous). *Male flowers* with pedicels 1-2 cm long, tepals 2, white or greenish white, broadly ovate, 8–15 x 5–10 mm base truncate, margin entire, tip rounded; stamens many, *ca*. 24, cluster conical, filaments 1–2 mm long, anthers broadly obovate, *ca*. 1 mm long, tip notched, opening by slits for about 1/3. *Female flowers* with pedicels *ca*. 13 mm long, ovary ellipsoid, glabrous, locules 3, placentas 2 per locule, 12–14 mm long; wings 3, equal, 6 mm wide; tepals 2, 11–16 x 12–15 mm, broadly ovate, glabrous, pure white, basally truncate, margin entire, tip rounded; style and stigmas pale yellow, 5–7 mm long, stigma spiral. *Fruits* with pedicels 1.2–2.8 cm long, capsule 1.8–2.5 x 1.7–2.4 cm, broadly ovate, glabrous, splitting between the locules; wings 3, equal, 7–9 mm wide, entire wings thinly fibrous. *Seeds* barrel-shaped, *ca*. 0.35 mm long, collar cells about half of seed length.

Distribution. Lombok (close to Jeruk Manis waterfall area).

Habitat. Open areas and on the forest floor at 1000 – 2000 m.

Notes. *Begonia lombokensis* has been found only in the area near the Jeruk Manis waterfall. It is similar in habit, stem, and leaves to *Begonia isoptera* from Java but different in the number of female tepals and the persistent stipule. The flowers of *Begonia isoptera* have five tepals, and *B. lombokensis* has only two. This species is endemic in Lombok.

Specimens examined. Jeruk Manis waterfall, 21 Jul 2003, *Tokuoka et al. T.0030* (BO); Jeruk Manis waterfall, 2 Aug 2003, *Tokuoka et al. T.0334* (BO).

5. BEGONIA LONGIFOLIA Blume —Fig.5

Begonia longifolia Bl., Catalogus 102. 1823; Koord., Exkurs. Fl. Java 2: 650. 1912; Back. & Bakh. *f.* Fl. Java vol 1: 313. 1964; Steenis, Mt. Fl. Java, Pl. 5-7. 1972; Tebbitt, Brittonia 55 : 25. 2003 ; Kiew, *Begonia* of Pen. Malay. :107-111. 2005. *Diploclinium longifolium* (Blume) Miq., Fl. Ned. Ind. 1(1) : 687. 1856. *Diploclinium longifolium* var. *luxurians* Miq. ex Koord., in Exkurs. Fl. Java 2 : 650. 1912. Type: Java, Salak, *Blume 740* (B †, Holotype–L).

Begonia trisulcata (A.D.C.) Warb., in Engler & Prantl, Nat. Pflanzenfam. 3.6A (1894) 142. Type: Java, *Zollinger 2850* (Holotype–G).

Stem erect, cane-like, glossy, woody, unbranched, nodes swollen, stout, up to 150 cm tall, 2 cm thick at base; without a tuber. Stipules pale green, glabrous, narrowly triangular, 10–17 x 2–3 mm, margin entire, tip 2–3 mm long, setose, caducous. *Leaves* distant, internode length 3–14 cm apart; petiole pale green, 2–15 cm long, grooved above; lamina oblique, green with short hairs on the upper surface, thinly leathery in life, papery when dried, oblong-lanceolate, asymmetric, 9–23 x 4–12 cm, broad side 2.5–7 cm wide, basal lobe rounded, 1.5–6 cm long, margin minutely toothed, apex elongate; venation pinnate, 5–6 pairs of veins along the midrib and another 2–3 veins in basal lobe, branching towards the margin, impressed above, prominent beneath. *Inflorescences* axillary, shorter than the leaves, few flowered, once branched per axil, 9–13 mm long, peduncle green, glabrous, 5–10 mm long, protandrous. Bract pair pale or whitish green, narrowly triangular, 6–12 x 2–4 mm, margin entire, tip narrowing and setose, persistent. *Male flowers* 3, with a pale green pedicel 6–25 mm long; tepals 4, white, glabrous, rotund, margin entire, tip rounded, outer two *ca.* 11 x 11 mm, inner two similar but smaller, 9–11 x 7–10 mm; stamens many, stamen cluster globose, *ca*. 5 mm across, stalk 1.5 mm long; filaments *ca*. 1 mm long; anthers pale yellow, narrowly obovate, *ca.* 2 mm long, apex emarginate, opening by slits. *Female flowers* 4, with a pale green pedicel 5–7 mm long; ovary white becoming green, thick and fleshy, 3-angled on top, 10–13 x 8–11 mm, locules 3, placentas 2 per locule; tepals 4–6, white, broadly oval, margin not toothed, tip rounded, 11–12 x 8–9 mm; styles 3, style and stigma greenish yellow, 4–5 mm long, stigma spiral. *Fruit* pendent on stiff fleshy pedicel, 7–10 mm long, berry green with ripe, fleshy, 14–20 x 12–17 mm, globose, elongated into a fleshy beak, *ca.* 4–6 mm long, glabrous, 3-lobed, without wings, locules 3, not splitting, stigma persistent. *Seeds* barrel-shaped, 0.25–0.3 mm long, collar cell almost as long as or 3/4 the seed length.

Distribution. Northeastern India, Bhutan, Southern China (Yunnan to Fujian, including Hainan), Taiwan, Myanmar, northern Thailand, northern and central Vietnam, Peninsular Malaysia, Sumatra, Java, Bali, and Sulawesi.

Habitat. Shady and humid forests, and along riversides, at 1000–2000 m

Notes: Having a very widespread distribution, *Begonia longifolia* is distinct from other species in Sect. *Sphenanthera* in being completely glabrous. The others are densely hairy.

Specimens examined. BALI. Bedugul Forest Region, Mt. Batukau Complex, 23 Jun 1958, *Kostermans cs 92* (BO); Batu Karu, 23 Jan 1935, *de Voogd 2142* (BO); Mt. Abang, 7 Apr 1936, *v. Steenis 7925* (BO); Bratan Kaldera, 11 Apr 1936, *v. Steenis 8075* (BO); Bedugul. Bali Botanic Gardens area, 11 Mar 2007, *Deden Girmansyah 802* (BO).

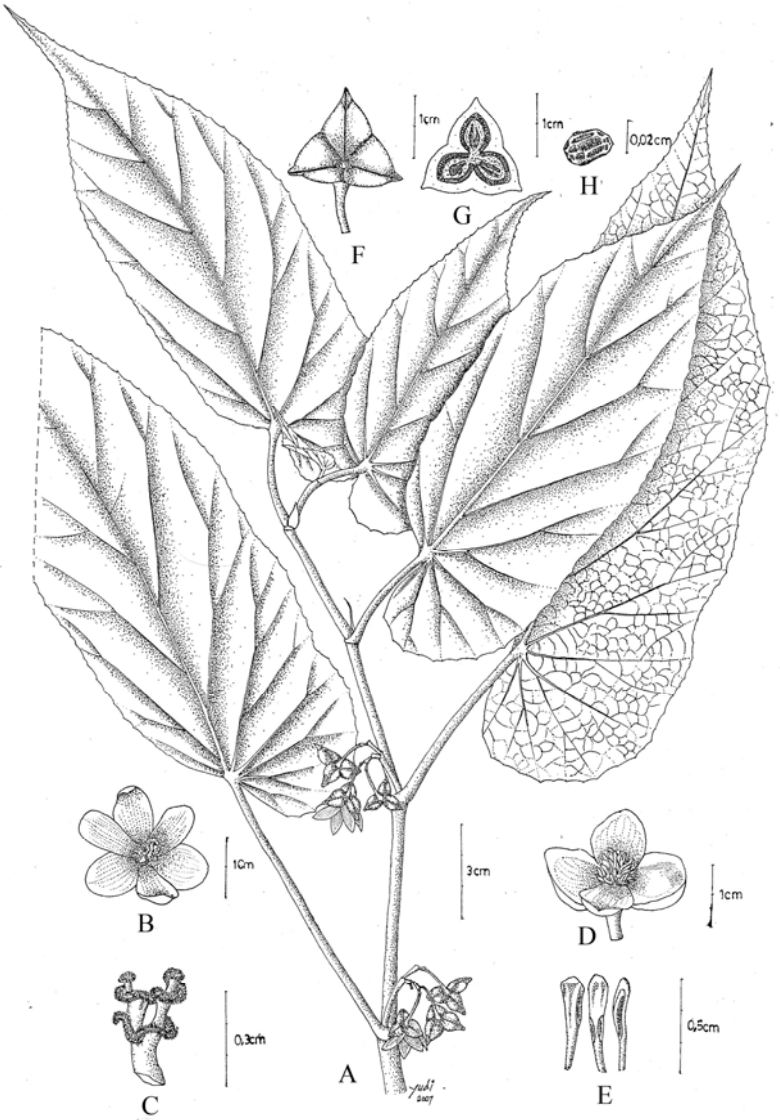

Fig.5. *Begonia longifolia* Blume (A. Habit, B. Female flower, C. style, D. Male flower, E. Stamens, F. Fruit, G. Fruit in cross section, H. Seed).

6. **Begonia multibracteata** Girmansyah s*p. nov.* — Fig. 6

Begonia robusta Blume bracteis et bracteolis persistens, petiolis pedunculis triplo longioribus, fructus glabrus vel glabrescens sine aliis cornuatus differt. Type**:** Mt. Rinjani, between shelter 1 and shelter 2, trail to the summit from Senaru, 16 Mar 2007, *Deden Girmansyah 811* (Holotype–BO).

Stem rhizomatous, rooting at base, green to reddish green, hairy, succulent, unbranched, up to 1 m tall. Stipule persistent, broadly triangular, 25–18 x 8–16 mm base truncate, margin entire, apex acuminate, ending with a hair. *Leaves* distant; petiole 7–13 cm long, green to reddish green, hairy; lamina broadly ovate, hairy on both surfaces, 11–17.5 x 8.5–15 cm, strongly asymmetric, broad side 4.5–8.5 cm, base unequally heart shaped, not overlapping, basal lobes 10–15 cm long, margin deeply scalloped, toothed, each tooth tipped by a hair, apex acuminate; venation

palmate-pinnate, 2 pairs at the base, 4–5 pairs along the midrib, 2–3 in basal lobes, branching towards the margin, vein impressed above, prominent beneath. *Inflorescence* axillary, cymose, erect, hairy, peduncle shorter than petiole and *ca*. 6.5 cm long, with two main branches; bract persistent, broadly ovate, glabrous, violet. *Male flowers* white, pedicels 2.5–4 cm, tepals 4, broadly ovate, 16–17 x 12–13 mm, margin entire, tip rounded, outer tepals hairy on outside; inner two oval, 14–15 x 7–9 mm; stamens yellow, *ca*. 87, cluster globose, 6 mm across, filaments 1–2 mm long, pale yellow, anthers oblong to narrowly obovate, 2–2.5 mm long, yellow, tip notched, opening by slits. *Female flowers* white, pedicels 5–7 mm long, ovary thick and fleshy, 3 angled, 1–13 x 14–20 mm, locules 3, placentas 2 per locule. Tepals 5, outer one broadly ovate 18 x 12 mm, with scattered hairs outside, inner one smaller, narrowly ovate, 18 x 8 mm, glabrous; style 3, yellowish green, stigmas spiral, Y-shaped, 7–8 mm long, persistant. *Fruit* a berry, globose, with scattered hairs, 3-lobed, each lobed with a fleshy ridge, without wings, locule not splitting, 1.2–1.8 x 1.5–2.3 cm; pedicels hairy, 9–15 mm long. *Seed* barrel-shaped, *ca*. 0.4 mm long, collar cells half the seed length.

Fig.6. *Begonia multibracteata* Girmansyah (A. Habit, B. Bract, C. Bracteole, D. Fruit, E. Female flower, F. Male flower, G. Fruit in cross section, H. Stamens, I. Style, J. Seed).

Distribution. Bali, Mt Rinjani, between Senaru village and the summit.

Habitat. On primary forest floor at 1000–2000 m.

Notes. *Begonia multibracteata* was found on the forest floor along the trail between shelter I and shelter II on Mt. Rinjani. Plants were scattered in a small colony, associated with gesneriads and *Urticaceae*. This species similar to *B. robusta* in habit with a rhizomatous stem, but differs in indumentum and leaf colour, colour and

indumentum of flowers while the fruits lack the larger wing. This species has also special characters on the inflorescences. The male flowers are covered by more than one large persistent bract.

Specimen examined: BALI**.** Mt. Rinjani, around position 2, 26 Jul 2003, *Tokuoka et al. T.0150* (BO).

7. **Begonia pseudomuricata** Girmansyah *sp. nov.* —Fig. 7

Begonia pseudomuricata Girmansyah, habitu *Begonia muricata* Blume simile, differt caule glabra vel glabrescens, floribus glabris et fructus rubellus. Type**:** Bali, Tegal Cangkring, Negara, 15 Mar 2007, *Deden Girmansyah 810* (Holotype–BO).

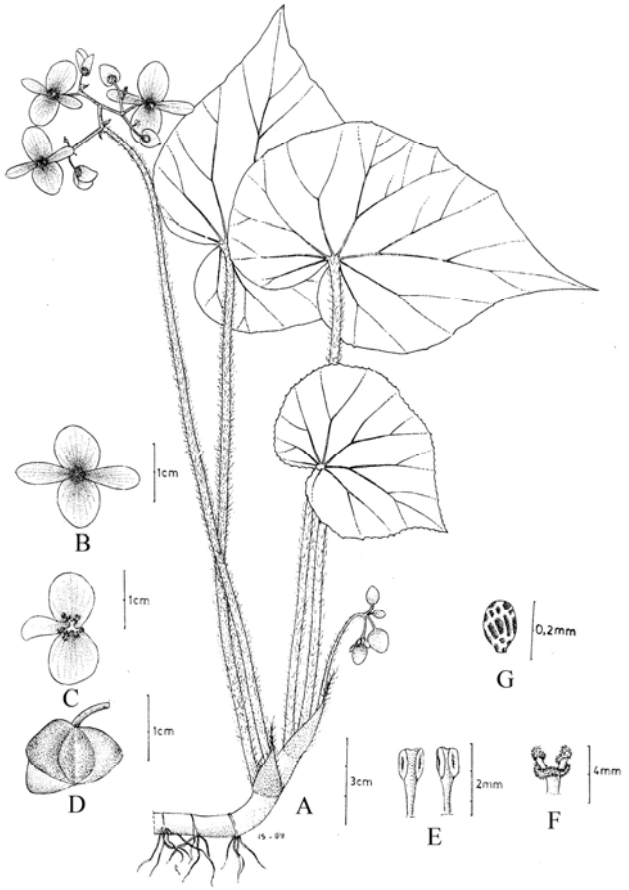

Fig. 7. *Begonia pseudomuricata* Girmansyah (A. Habit, B. Male flower, C.Female flower, D. Fruit, E. Stamens, F. Style, G. Seed).

Stem rhizomatous, slender, up to 5 cm tall, 5–9 mm thick, unbranched, rooting at the nodes, pale green to reddish, hairy, succulent, without a tuber. Stipules triangular, 9–10 x 10–11 mm, bright rosy red, broadly margin entire, hairy along the middle toward, tip ending with a long hair 0.9–1 cm long. *Leaves* tufted; petiole 5–20 cm long, 2–4 mm in diam., rounded in cross section, pale green to bright rosy red, hairless; lamina oblique, ovate, strongly asymmetric, 5.5–10 x 5–9 cm, broad side 3–5.5 cm wide, pale green above and beneath, thinly succulent in life, thin and papery when dried, slightly glossy above, margin undulating, very minutely toothed, base heart-shaped, basal lobe 2–3 cm long, apex acute, veins palmate-pinnate, 2–3 pairs of vein at the base and 2–3 pairs along with midrib with 1–2 in the basal lobe, branching a halfway to margin, veins slightly impressed above, slightly prominent beneath, without hairs. *Inflorescences* axillary, longer than the leaves, protandrous, peduncle erect, 10–25 cm long with two main branches, each 1–2 cm long, brownish pale green, without hairs; bract pair elliptic, *ca.* 3 x 1 mm, persistent. *Male flowers* 8, with a yellowish green pedicel, 10–15 mm long, tepals 4, outer two ovate, 12–15 x 11–12 mm, inner two narrowly oval 15–19 x 7 mm, pale pink outside, almost white inside, glabrous, margin entire, apex rounded; stamens many, in a globose cluster, filaments 0.5–1 mm long, anthers narrowly obovate, 0.7–1 mm long yellow, tip rounded, opening by slits. *Female flowers* 10,

with reddish white pedicels, 7–9 mm long; ovary subglobose, 7–8 x 4–5 mm, reddish white; wings 3, equal, locules 3, placenta one per locule; tepals 3, broadly elliptic, bigger one 10–11 x 9–10 mm, pink, smallest one, pinkish white, 9–10 x 3–4 mm, margin entire, tip rounded; styles and stigmas pale yellow and slightly greenish, style 3, without stalk, *ca*. 2 mm long, stigma spiral, *ca*. 2 mm long. *Fruit* a capsule, *ca*. 1.1 x 1.7 cm, dangling from a slender pedicel, 5–10 mm long. *Seeds* barrel-shaped, broadly ellipsoid, 0.2–0.3 mm long, collar cell a quarter of the seed length.

Distribution. Western Bali, Tegal Cangkring area.

Habitat. Especially in humid shady forests, on the flat forest floor at 1000 – 2000 m.

Notes. *Begonia pseudomuricata* is allied to *Begonia muricata,* mainly in the creeping habit but differs in the stem indumentum, plane upper surface of leaves, glabrous tepals and the colour of fruits and flowers.

Specimen examined. BALI. Gunong Pala, R. *Maier Sarip 278* (BO).

8. BEGONIA TENUIFOLIA Dryander —Fig. 8

Begonia tenuifolia Dryander, Trans. Linn. Soc. 1: 162, pl. 14, fig. 4. 1791; Koord., Exkurs. Fl. Java 2: 651. 1912; Back. & Bakh. *f.* Fl. Jav. 1: 308. 1964. —*Platycentrum tenuifolium* (Dryander) Miq., Fl. Ned. Ind. 1 (1): 693. 1856. Type: Trans. Linn. Soc. 1: 162, pl. 14, fig. 4. 1791.

B. rupicola Miq., Pl. Jungh. 4. 1855 418; *Platycentrum rupicolum* Miq., Fl. Ned. Ind. 1(1) : 693. 1856. Type**:** Bali, Gunong Gambing, *Junghuhn s. n.* (Lectotype L, here designated, sheet no. 898.195-178).

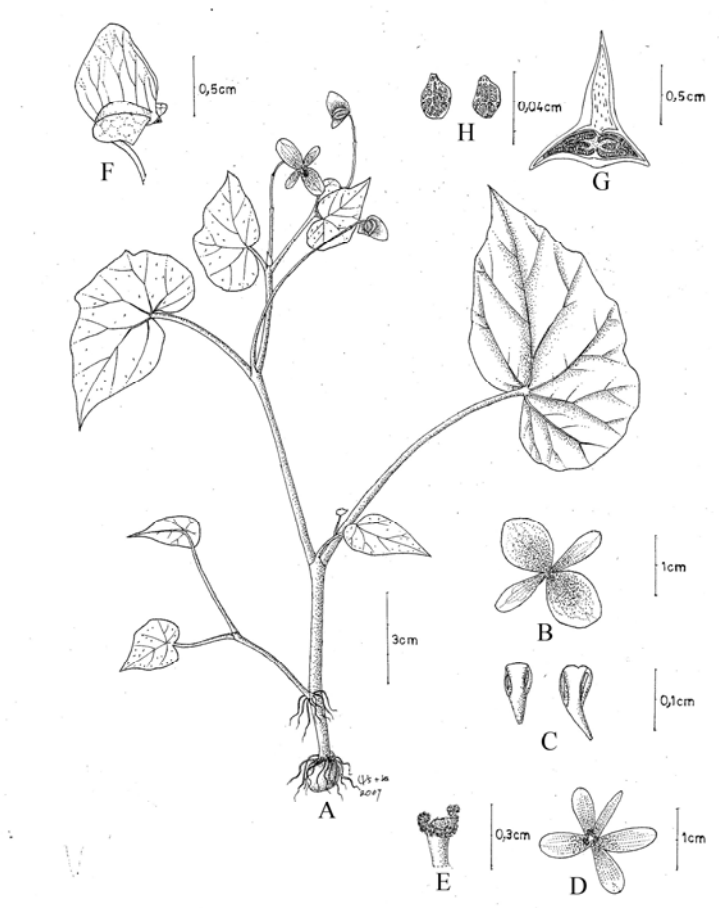

Fig. 8. *Begonia tenuifolia* Dryand. (A. Habit, B. Male flower, C. Stamens, D. Female flower, E. Style, F. Fruit, G. Fruit in cross section, H. Seeds).

Stem weak, erect, 2–25 cm tall, 1–4 mm in diam., little branched, pale green, succulent, densely or sparsely hairy, hairs short, white; tuber small, *ca*. 5 mm; stipules caducous. *Leaves* distant, 1–3 or more on each stem or branchlet; petioles flat or grooved above, 0.5–10 cm long, translucent, pale green or whitish green, densely to sparsely hairy; lamina oblique, broadly ovate,

1.5–8.5 x 1.2–6 cm, asymmetric, broad side 0.7–3.2 cm, dull plain green above and whitish or pale reddish beneath; thin and soft in life, thinly papery when dried, base unequally cordate, basal lobes not overlapping, 0.3–2.3 cm long, apex blunt or rounded; margin minutely toothed with sparse hairs, sometimes undulate, venation palmate-pinnate, 4–5 pairs of veins, with another 2 in the basal lobe, plane or slightly impressed above, beneath slightly prominent, whitish green or reddish. *Inflorescences* terminal, longer than the leaves, reddish white, glabrous, peduncle 5–20 cm long, branched, branches 1–4 cm long, protandrous. *Male flowers* on pedicel 10–11 mm long, pure white to pinkish white; tepals 4, outer two rounded, 7–10 x 6–7 mm, inner two narrowly oval, 7–10 x 2.5–0.3 mm, margin entire, tip rounded; stamens many, in a globose cluster, stalk 2 mm long; filaments 0.5–0.75 mm long; anthers obovate, *ca.* 1 mm long, yellow, tip rounded, opening by slits. *Female flowers* on pedicels 5–12 mm long, white to pinkish white, ovary pinkish white, locules 2, placentas 2 per locule; tepals 5, ovate, outer one larger, 9–12 x 3–4 mm, innermost one smaller, 6–11 x 2–3 mm, white, margin entire, tip rounded; styles 2, Y-shaped, 3–4 mm long, styles and stigmas yellow, stigma spiral, 1.5–2 mm long. *Fruit* a capsule 5–6 mm long, pinkish white or pale green, wings 3, unequal, larger wing 3–7 mm wide, smaller two 2–3 mm wide. *Seeds* ellipsoid to oblong, 0.3–3.5 mm long, brown, collar cell a half or 3/4 of the seed length.

Distribution. Java, Sumatra, Bali, Nusa Tenggara.

Habitat and Ecology. Shady situations in steep stony gullies and sometimes growing on karst limestone at 50-900 m.

Notes. The spotted *Begonia, B. tenuifolia,* shows a great range in habit and leaf size. Plants begin to flower when only 2 cm tall, and having two leaves, each leaf 1.5 cm long. In damp and sheltered conditions plants grow up to 25 cm tall with up to four well-developed leaves, the largest can be up to 8.5 cm. The spotted *Begonia* is apparently a short-lived species, with the vegetative state dying down in the dry season, to resprout from the tuber at the beginning of the rainy season. It also regenerates from seed as small plants and seedlings can always be found.

Specimen examined: BALI. Boomloop Dajan, 8 Feb 1935, *de Voogd 2104* (BO); Baturuen, Troenjan, 23 Mar 1936, *de Voogd 2773* (BO); Gitgit waterfall, Buleleng Distr. 5 Apr 1936, *v. Steenis 7764* (BO); Danau Batur, Trunyan, Mar 1992, *J.J. Afriastini BI-214A* (BO); Gitgit waterfall, Buleleng Distr. 13 Mar 2007, *Deden Girmansyah 804* (BO). LOMBOK. Inland from the northeast, near Gangga waterfall in valley, Genggeang village, *Tobe 1130* (BO).

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