A REVISION OF FARQUHARIA STAPF
AND FUNTUMIA STAPF
(APOCYNACEAE)

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INTRODUCTION

The present publication is a monograph of the genera Farquharia and Funtumia. It is based on the study of herbarium material and living plants as the author had the opportunity to study flowering and fruiting plants in the field of all species involved.

HISTORY

Farquharia was described by Stapf in 1912 with a single species F. elliptica. Independently Chevalier proposed the nomina nuda Alafia jasminiflora (1920) and Alafia mirabilis for the same taxon. Hutchinson and Dalziel (1931) erroneously referred Alafia jasminiflora to the genus Holalafia as they did not notice the clearly apocarpous ovary in the specimen collected by Chevalier. Pichon (1949) created the new genus Aladenia for Holalafia jasminiflora, unaware of Stapf’s name Farquharia elliptica. Brenan (1952) demonstrated that Farquharia elliptica had priority over all the other names mentioned above.

Stapf (1899) proposed the genus Funtumia for 3 African species, formerly accommodated in the genus Kickxia Blume, i.e. K. africana Benth. (1879), K. elastica Preuss (1899) and K. latifolia Stapf (1898), segregating them from the Asian Kickxias. The present author accepts only the species Funtumia africana (Benth.) Stapf and Funtumia elastica (Preuss) Stapf.

ETYMOLOGY

Farquharia is dedicated to J. H. J. Farquhar, who collected the type in Nigeria.

The name Funtumia is derived from ‘funtum’, one of the Ashanti names of Funtumia elastica.

GEOGRAPHIC DISTRIBUTION

Farquharia occurs in tropical Africa from Ivory Coast to Zaïre. The area of distribution of Funtumia which overlaps that of Farquharia is much larger. It extends from Senegal to Tanzania and Zimbabwe.

RELATIONSHIP TO OTHER GENERA

According to Pichon (1950) Farquharia and Funtumia belong to the tribe Neriaeae. Pichon subdivided the Neriaeae in 9 subtribes in the following sequence: Adeniinae, Nerinae, Beaumontiinae, Strophantinae, Mascarenhasiinae, Ala-
fiinae, Kibataliinae, Wrightiinae and Malouetiinae. Although the present author agrees with PICHON's circumscription of the subtribes, he prefers to arrange them differently:

1. Adeniinae with the only genus Adenium.
2. Neriiinae with 5 genera as with PICHON.
3. Beaumontiinae with Beaumontia and Vallaris.
4. Wrightiinae with Wrightia and Pleioceras.
5. Strophanthinae with Strophanthus.
6. Alafiinae with Farquharia and Alafia.
8. Mascarenhasiinae with Mascarenhasia.
9. Malouetiinae with Malouetia and Malouetiella.

Moreover the sequence of the genera within the subtribes Beaumontiinae, Alafiinae and Kibataliinae should be altered as well:

The floral characters in the Wrightiinae resemble those of the Beaumontiinae and Strophanthinae much more than those of the Kibataliinae and Malouetiinae. The similarity in flowers justify a position of the genus Alafia much closer to Kibatalia, while Farquharia is more like Strophanthus: colleters on the petiole as in Farquharia occasionally occur in Strophanthus, while the hairs on connectives and filaments adhere to the style in both genera and a deciduous basal coma is present in Farquharia as well as in Strophanthus. Consequently Alafia changes its position with Farquharia within the Alafiinae while Kibatalia changes with Funtumia within the Kibataliinae.

In their vegetative characters Farquharia and Alafia are much alike, both genera are lianas. However, Farquharia bears colleters on the petiole which are absent in Alafia, while Alafia has intrapetiolar stipules which Farquharia lacks. The generative characters of both genera resemble each other as well: the almost similar stamens are subsessile and the connectives are coherent with the clavuncula or style, the ovary of Farquharia is apocarpous as well as the ovaries of most of the species of Alafia and both genera lack a disk. The presence of a short apical beak on the seed is used by PICHON (1954) to define the subtribe Alafiinae. However the present author discovered a basal coma which is absent in Alafia. PICHON mentions as supplementary difference the style, which is smooth in Alafia and blistered in Farquharia.

The genera Kibatalia and Funtumia originally formed the genus Kickxia, which more or less indicates their relationship. Funtumia was segregated from the Asian genus Kickxia by STAPF in 1899. Kickxia Blume (1848) was changed in Kibatalia G. Don (1837) as it was homonymous with Kickxia L.. According to STAPF Funtumia and Kibatalia can easily be distinguished by the following characters:

- The inflorescences of Kibatalia are one- or few-flowered, while those of Funtumia are usually many-flowered and congested.
- The corolla of Kibatalia is funnel-shaped, not salver-shaped, and comparatively large. The tube of Kibatalia is constricted near the middle, while it is inflated at that level in Funtumia.

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- The staminal cone of *Kibatalia* is usually exserted, while it is completely included in *Funtumia*.
- The placentas of *Kibatalia* are free and remain free from the adaxial wall of the carpel. Those of *Funtumia* are free, but fuse with the adaxial wall when the fruit develops.
- The follicles of *Kibatalia* are more or less parallel, but they spread and form an obtuse angle in *Funtumia*.

The present author is able to confirm the first three differences, but he is in doubt about the validity of the last two. However, he discovered the following complementary differences:

- The inflorescences of *Kibatalia* are more or less umbellate, while *Funtumia* has racemes.
- The pedicels of *Kibatalia* are much longer in comparison to the flowers than is the case in *Funtumia*.
- The style of *Kibatalia* is longer than that of *Funtumia* in comparison to the corolla-tube.

These characters confirm Stapf's proposal to segregate the genera. However *Funtumia* and *Kibatalia* show many resemblances:

- Both genera are trees with a similar habit.
- Domatia in the axils of the secondary veins are generally present.
- The inflorescences alternate in the axils of the subsequent opposite leaves.
- The very similar stamens are coherent with the clavuncula.
- The ovary is apocarpous and a well developed disk is present.
- The seeds have an apical beak which is covered with long straight hairs.
- The cotyledons are folded in the seed.

*Funtumia* is often confused with *Mascarenhasia*. The architecture, leaves and fruits of both genera resemble each other. Both have abundant latex, the similar anthers are coherent with the clavuncula and the fruit consists of two more or less clavate follicles. Even the corollas show remarkable resemblances.

On the basis of the above enumerated characters, the author proposes to move the subtribe *Mascarenhasiinae* to the position indicated above. However, as in *Mascarenhasia* the seeds lack the for *Kibataliinae* characteristic beak, the present author prefers to maintain Pichon's *Mascarenhasiinae*.

The *Malouetiinae* resemble the *Kibataliinae* and *Mascarenhasiinae* in having leaves with domatia, and in the position and shape of the flowers, but their seeds lack the coma.

**GENUS/SPECIES DIAGNOSIS OF FARQUHARIA**


Fig. 1; Phot. 1, 2; Map 1.

Type: Nigeria, Bendel State, Mogumu, *Farquhar 8* (K, holotype).
Heterotypic synonyms: *Holalafia jasminiflora* Hutchinson and Dalziel 1931:

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Liana at least 20 m long. Trunk at least 6.5 cm in diameter; bark pale brown to grey, shallowly longitudinally fissured, with large oval lenticels; wood pale brown to white; colourless or white, not sticky sap in bark and wood; branches terete, reddish-brown or green, lenticellate; branchlets terete, smooth, glossy, green. Leaves opposite, petiolate; stipular lines present; petiole canalicate above, rounded beneath, 3–8 mm long, bearing 1 to 3 rows of pale brown colleters, glabrous; blade coriaceous, elliptic, ovate, narrowly elliptic or narrowly ovate, 1.7–4 × as long as wide, 4.5–15.5 × 1.5–6 cm, acuminate at the apex, cuneate at the base or decurrent into the petiole, entire and slightly revolute at the margin, glabrous, glossy and green above, paler and dull beneath; midrib somewhat impressed above, prominent beneath; secondary veins 3–10, inconspicuous. Inflorescence a dense terminal panicle with 10–100 flowers, 3–6 × 3–11 × 3–11 cm; major branches opposite, bracts triangular, 1.2 × 1.2 mm; branches, bracts and pedicels minutely puberulous with rusty-brown hairs or practically glabrous. Flowers 5-merous, actinomorphic, fleshy, practically scentless; mature buds nearly fusiform. Sepals free, ovate, 1.4–2.9 × 1.3–2.7 mm, obtuse at the apex, pubescent outside, glabrous inside and with a single row of colleters and hairs at the base; colleters 5–11 in each flower, 0.1–0.5 mm long. Corolla white, pale green outside at the base, pale yellow and turning brown in the throat, infundibuliform; tube 10–21 × 3.8–5.6 mm, widened at 53–88% from the base of the tube, slightly constricted at the throat, puberulous to glabrous outside, inside glabrous or sometimes pubescent just below the insertion of the stamens; lobes overlapping to the right, 0.5–1 × as long as the tube, 8.8–15.4 × 2.3–7.8 mm, elliptic or oblong, puberulous or glabrous on both sides, sometimes pubescent at the inside near the base. Stamens pale white, included, 5.2–7.6 × 0.8–1.4 mm, inserted at 40–70% of the base of the tube; filament very short, up to 0.5 mm long, ventrally pubescent or glabrous, dorsally glabrous; anthers narrowly triangular to oblong with sterile basal appendages adnate to the connective and a very short sterile apical tip, 2-celled, introrse with

Fig. 1. Farquharia elliptica Stapf: 1. flowering branch, 2/3 × ; 2. branching: the axis on the left side becomes dominant and continues the growth in length, while the main axis ends in an inflorescence, 2/3 × ; 3. leaf, 2/3 × ; 4. petiole with 3 rows of colleters, 2 × ; 5. flower, 1 × ; 6. opened flower showing stamens and pistil; the connectives are detached from the style, 1/2 × ; 7. stamen, 4 × ; 8. pistil; corolla and 2 sepals removed; 3 × ; 9. clavuncula and stigma; the hairs on the upper part of the style are remnants of the hairs of the connectives, 8 × ; 10. detail of the whorl of colleters and hairs between the calyx and corolla, 4 × ; 11. sepal with colleters and hairs at the base, 6 × ; 12. fruit, 1/3 × ; 13. seed, nearly ripe, 2/3 × ; 14. transverse section of the seed, 4 × ; 15. embryo, 2 × . – (1–4. Zwetsloot 23; 5–11. Zwetsloot 23, spirit material; 12–13. Versteegh & D. Von Put 600; 14–15. Thollon 141).
a 1.7–3.3 mm long fertile portion; connective 5–7.5 mm long, ventrally pubescent with hairs coherent with the style just below the clavuncula, dorsally appressed-pubescent. *Pistil* 10–16 mm long; ovary globose, superior or sometimes nearly hemi-inferior, 0.8–2.2 × 0.8–2.1 × 0.8–2.1 mm, composed of two almost free carpels at the apices united by the base of the style, villose with rusty-brown hairs, sometimes glabrous at the base; carpels sometimes retuse at the apex; style 8–13 × 0.2–0.4 mm, not split at the base, blistered, coherent with the hairs of the connective; clavuncula cylindrical, sometimes with two longitudinal grooves, 0.5–0.9 × 0.2–0.5 × 0.2–0.5 mm; stigma conical, bipartite, 0.1–0.4 × 0.05–0.3 × 0.05 × 0.3 mm. Placenta adaxial, 2-lobed. Ovules 80–170, pendulous. *Fruit* composed of two follicles which are connate at the base; follicles almost cylindrical, straight or somewhat recurved, 22–42 cm long and 2–3.7 cm in circumference, acuminate at the apex, adaxially dehiscent; wall woody, outside puberulous with rusty-brown hairs, smooth and glabrous inside. *Seed* fusiform, 1.5–2.5 × 0.2–0.4 cm, with an apical and deciduous basal coma, with a longitudinal ridge from the base to the apex, on which the hilum is situated; the apical coma consists of a short beak with 3–3.5 cm long straight or slightly curved hairs; basal coma much shorter with about 2 cm long hairs; micropyle apical; endosperm surrounding the embryo, which is straight and somewhat shorter than the seed itself; cotyledons oblong, rounded at the base and obtuse at the apex, folded in the seed.

**Note:** The author doubts the presence of white sticky latex, which is reported by some collectors. LEEUWENBERG and the author himself merely observed a colourless and not sticky juice in bark and wood.
Distribution: Tropical Africa, from Ivory Coast to Zaire.
Ecology: Moist forests, often on sandy soil. Alt. 0–850 m. In Congo it occurs in periodically flooded riverine forests.
Vernacular names:
NIGERIA: onanisankanmen (Benin) (teste: Farquhar 8).
CAMEROUN; nkon (Bulu) (teste: Bates 1454); holo holo (Mbala) (teste: Periquet 158).
CENTRAL AFRICAN REPUBLIC: molo-mokangakanga (Lisongo) (teste: Tisserant 2374).
CONGO: balale (env. of Komono and Sibili) (teste: Chevalier s.n.).
ZAIRE: Prov. Equateur: buku-luku (env. of Bohutu) (teste: Robyns 1040); moheuge (env. of Yambata) (teste: Tisserant 2374); moubala (env. of Yambata) (teste: Montchal 1); imekok (env. of Yambata) (teste: Bony 37); mokoko (Budja), mundele (Libati) (teste: De Giorgi 1054); bomo (env. of Dundusana) (teste: Reygaert 253).

Uses:
In Cameroun the leaves are eaten as a vegetable (teste: Periquet 158) while the juice is of medicinal use (teste: Bates 1454). In Zaire the macerated leaves are used against hart-deseases (teste: Reygaert 253), and the fibres of the bark provide material for fishing nets (teste: De Giorgi 1054).

Specimens examined:
IVORY COAST: Béréby (fl. Nov.) Oldeman 633 (BR, K, WAG); ibid. (fl. May) Pobéguin 46 (P); Kobou Miagni, km 31 Monogaga-San Pedro Road (fl. Mar.) Leeuwenberg 12068 (WAG); Monogaga (fl.) Geering and Bokdam 2411 (BR, MO, WAG); km 20 Monogaga-Sassandra Road (fl. Apr.) Zwetsloot 23 (UCI, WAG); km 15 Sassandra-San Pedro Road (fl. Nov.) Breteler 6056 (WAG); Sassandra (fl. Nov.) Guillameet 1623 (UCI); ibid. (fr. Apr.) De Koning 1286 (WAG); km 37 Sassandra-Lakota Road, Zwetsloot 38 (UCI, WAG); 50 km NEE of Sassandra (fl., fr. Nov.) Breteler 6123 (WAG); Moréonou near Akibilékrou (fl. Dec.) Chevalier 22507 (K, P); Forêt de Krokun (fl. Dec.) Miége and Aké Assi 1211 (UCI); km 95 new Road Abidjan-Ndouci (fl. Oct.) De Kruijf 372 (WAG); Bouroukrou (fl. Jan.) Chevalier 16644 (P); ibid. (fr. Jan.) Chevalier 16742 (P); Mbasso, Bas-Comoé (fl., fr. Mar.) Chevalier 17006 (BR, K, LISC (photo), NY (photo), P, WAG, lectotype of Holalafia jasminiflora L.; For. d’Abousabou (fl. Nov.) Aké Assi 4424 (ABI); ibid. (fl. Dec.) Aké Assi 4515 (UCI); ibid.; Aké Assi 4722 (UCI); ibid., (fl. Jan.) Leeuwenberg 2259 (BR, K, WAG); 40 km NE of Abidjan (fl. Feb.) Leeuwenberg 2718 (WAG); Bingerville, Chevalier 16583bis (P); Abengourou (fl. Dec.), Aké Assi 9386 (UCI); ibid. (fl. May), Bégué 3108 (P); ibid. (fl. Apr.) Miége and Aké Assi 475, 805 (UCI); 20 km NW of Abengourou (fr. July) Versteegh and Den Outer 600 (U, WAG); Assikasso, Chevalier 22582 (P); Kossom (?); Spichiger s.n. (G).
GHANA: Asukese For. Res. (fl. Mar.) Enti GC 39282 (K); Ndumfri (fl. Apr.) Lock 46708 (MO); Daboase to Subri For. Res. (fl. Jan.) Hall and Abbiw GC 45121 (MO); Kumasi (fl. May) Vigne 2011 (K, P); Kade (fl. Jan.) Enti GC 42028 (K, MO, P).
NIGERIA: Bendel State: Owan For. Res. (fl., fr. Feb.) Brenan et al. FHI 8987 (K); Sapoba, Kennedy 3104 (FHI); Ute (fl. Apr.) A. P. D. Jones 3112 (FHI); Mogumu (fl. Mar.) Farquhar 8 (K, type); Anambra State: Onitsha (fl., fr. May) A. P. D. Jones 1667 (FHI); ibid., Baldwin 13748 (MO); Ubulubu (fl. Jan.) Thomas 2245 (K); sin. loc. (fl. June) No. B.R. 10 (K); Cross River State: Okuni (fr. July) Latilo FHI 31860 (K). Sin. loc.: Chesters OBS 156 (K); Kitson s.n. (BM).
CAMEROUN: Bite (fl. May) Bate 1454 (BM); sin. loc., Périquet 158 (P).
GABON: 10 km NE of Lalara (fl. Sep.) Breteler and De Wilde 410/1978 (WAG); Bangania, Thollon 141 (P); 10 km S of Makokou, Florence 44 (WAG); Lastoursville, Le Tesu 7078 (BM, P, WAG), (fl. Apr.) 7201 (BM, P, WAG), (fl. June), 7415 (BM, BR, P).
CENTRAL AFRICAN REPUBLIC: Boukoko (fl. Feb.) Tisserant 2374 (P).

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ARCHITECTURE OF FARQUHARIA

The author observed Troll's model as described by Hallé and Oldeman (1970) in the specimen of which he took herbarium material.

NONIMA NUDA REFERRING TO FARQUHARIA


PHYTOCHEMICAL SCREENING OF FARQUHARIA ELLIPTICA LEAVES

T. A. Van BEEK

A leaf sample of *Farquharia elliptica* was investigated for the presence of alkaloids (1), saponins (1), flavonoids (1), anthraquinones (1), tannins (1), sterols/triterpenes (1), cyanogenic glycosides (1), cardiac glycosides (2), leucoanthocyanins (2) and coumarins (3) according to methods described by others (1, 2, 3).

The reactions for saponins, sterols/triterpenes and tannins were positive, all others were found negative.

LITERATURE:
GENUS DIAGNOSIS OF FUNTUMIA

Type species: F. elastica (Preuss) Stapf.

Evergreen trees or shrubs, trunk mostly straight, cylindrical; bark smooth, sometimes with a few orbicular lenticels, greenish-brown to grey; white sticky latex in bark and pith; wood light, soft; branches terete, smooth, sometimes lenticellate, sulcate when dry, very dark brown; branchlets smooth, terete or laterally compressed with a longitudinal groove below the ocrea. Leaves opposite, petiolate, those of a pair connate into a short ocrea, with many small colletsers in two or three rows in the axils; petiole canalicate above; blade ovate, elliptic or oblong, decurrent into the petiole, acuminate at the apex, entire, glabrous and bright green above, paler green beneath; often domatia in the axils of the secondary veins; secondary veins slightly impressed above, prominent beneath; tertiary veins inconspicuous; margin undulate and revolute. Inflorescences congested, terminal and axillary, cymose, much shorter than the leaves; peduncle terete, short; bracts ovate or elliptic, often with small colletsers in the axils. Flowers 5-merous, actinomorphic, fleshy, fragrant. Sepals free, thick, ovate or nearly so, obtuse or subacute at the apex, often membranaceous and minutely ciliate at the margin, inside with a single row of colletsers at the base. Corolla: tube ventricose at the middle, inside thickened at the throat, densely hirto-pubescent from the insertion of the stamens to the level of the apex of the ovary, with an indumentum which gradually becomes thinner and shorter; lobes in the bud overlapping to the right, often auriculate at the left, entire, recurved. Stamens included; filaments very short or absent, thick, ventrally densely hirto-pubescent, dorsally glabrous; anthers narrowly triangular with a very short tip at the acuminate apex, sagittate at the base, glabrous, 2-celled, introrse, dehiscent throughout by a longitudinal slit; connective dorsally appressed pubescent, ventrally at the base stiffly coherent with the clavuncula. Pistil: ovary composed of 2 almost free carpels which are at the apices united by the base of the style; placenta adaxial, 2-lobed; style not split at the base, with two longitudinal grooves, thickened below the clavuncula; clavuncula coherent with the connectives, grading into the stigma, together ovoid; stigma conical, surrounded by an exudate. Disk 5-lobed: lobes truncate or acute, minutely toothed at the apex. Ovules pendulous, 200–350 in each carpel. Fruit composed of two follicles which are connate at the base, green and glossy when young, turning grey-brown and woody when maturing, striate; follicles adaxially flattened and there dehiscent, abaxially convex, sometimes slightly curved; wall woody, thick, grey-brown outside, smooth and yellowish-brown inside. Seed slender, beaked at the apex, grain itself fusiform; beak at least above the middle with long straight hairs which envelop the seed in the fruit, with a narrow longitudinal ridge from the base to the beak, on which base the narrow hilum and apical micropyyle are situated, testa rugose; endosperm white, surrounding the embryo; embryo
white, straight, about $0.9 \times$ as long as the seed; cotyledons folded in the seed; radicle relatively short, about $0.2 \times$ the length of the embryo. Seedling with ovate cotyledons which are cordate at the base and acute at the apex.

**Distribution:** 2 species in tropical Africa from Senegal to Tanzania and Zimbabwe.

**ARCHITECTURE OF FUNTUMIA**

Both species in *Funtumia* show the same architectural model. It can be characterized by an modular structure and an indistinct differentiation in an orthotropic stem and plagiotropic branches. Each module bears one pair of opposite leaves and may end its growth in an apical inflorescence (Fig. 2B: c). After the apical meristem of a module has ceased functioning, one or two new meristems develop in the axils of the leaf pair. If one module develops it will push aside the inflorescence, rendering the inflorescence apparently lateral (Fig. 2C; Phot. 4). If two modules develop, initially they seem to be equivalent, but one will become dominant and continue the stem, while the other will bear the aspect of a proper branch (Fig. 2B; Phot. 3). According to Prévost (1967) both meristems originate in the axil of a single leaf of a pair, but the present author could not support this view when observing living plants. Branching is correlated with flowering or in sterile stages with abortion of the apex. The branches seem to alternate on the main stem (Phot. 5). They show an indistinct plagiotropic differentiation by substitution. The development of these branches follows a similar pattern as the main stem.

**PHOT. 3. Funtumia elastica** (Preuss) Stapf: Branching, two meristems develop in the axils of a leaf pair. Notice the undeveloped apical inflorescences. – (Zwetsloot 31).

The architectural model as described above agrees well with the model of Kwan Koriba and disagrees with that of Prévost as defined by Hallé and Oldeman (1970).
FIG. 2. Architecture of *Funumia* Stapf

A. habit, schematic.

B. two meristems develop in the axils of a leaf pair: a, b. one becomes dominant and continues the stem; c. one single module with one pair of leaves and an apical inflorescence.

C. one meristem develops in the axils of a leaf pair and pushes the inflorescence aside.

DISCUSSION OF THE DELIMITATION OF THE SPECIES OF FUNTUMIA

The present author distinguishes two species within *Funtumia* Stapf: *F. africana* (Benth.) Stapf and *F. elastica* (Preuss) Stapf. *F. elastica* is not very variable and has never been subdivided. It has always been considered as clearly distinct from the other species, here reunited in *F. africana*. *F. africana* is much more variable and has been considered to represent several species. Stapf published in 1898 *Kickxia latifolia* as a new species, distinguishing it from *K. africana* by its wider leaves with a rounded base, by the corolla lobes which were much shorter than the tube and by its minutely puberulous, white corolla. Careful analysis of herbarium specimens and spirit material showed that such characters represent the extremes of a wide range of variation:

- within a single plant the leaf base may vary from rounded to cuneate;
- the length of the corolla lobes varies from much shorter to much longer than the tube;
- the corolla may be entirely puberulous or glabrous, or it may show a puberulous tube and glabrous lobes.

The above listed characters vary independently from each other. Completely puberulous corollas with lobes shorter than the tube occur, as well as with lobes longer than the tube. The same is observed in glabrous corollas.

Schumann distinguished in 1900 the species *Kickxia scheffleri* Schum. from Tanzania and *Kickxia zenkeri* Schum. from Cameroun. De WildeMan described in December 1900 two new species in *Kickxia*: *K. gilletii* and *K. congolana*, both from Kisantu in Zaïre. The characters used to segregate these four species were the shape of the leaves, the shape and length of the disk and the size of the flowers. They also turned out to be not tenable. They show continuous transitions from the one extreme to the other. Already in 1901 Stapf reported the similarity of *Kickxia zenkeri* and *Funtumia africana*.

In the conception of the present author all these taxa belong to a single species, *Funtumia africana*, that was described by Bentham in 1879 as *Kickxia africana*. The resulting two species in *Funtumia* can clearly be distinguished by a single character: the indumentum of the ovary; it is always glabrous in *F. elastica* and always pubescent in *F. africana*. All other characters show an overlap to a certain degree. Nevertheless it is quite possible to recognize both species as separate units by studying their characteristics in combination. The most important differences between the two species are enumerated in Table 1.

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Meded. Landbouwhogeschool Wageningen 81-16 (1981)
### Table 1: Most important differences between *F. africana* and *F. elastica.*

<table>
<thead>
<tr>
<th></th>
<th><em>F. africana</em></th>
<th><em>F. elastica</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>domatia</td>
<td>No pits. A tuft of straight hairs, which vary in number. The hairs may be arranged in such a way that they give the impression of indistinct cavities. Often absent.</td>
<td>Pits, sometimes with a more or less densely ciliate margin. In herbarium specimens the pits may be closed, due to drying.</td>
</tr>
<tr>
<td>petiole and branchlets</td>
<td>minutely pubescent or glabrous.</td>
<td>always glabrous.</td>
</tr>
<tr>
<td>mature bud</td>
<td>usually cylindrical and obtuse at the apex.</td>
<td>apical portion conical, acute or subacute at the apex.</td>
</tr>
<tr>
<td>calyx</td>
<td>1.5–4 mm long, glabrous or puberulous.</td>
<td>3–5 mm long, glabrous.</td>
</tr>
<tr>
<td>corolla</td>
<td>pale green to creamy, glabrous or puberulous.</td>
<td>white, glabrous.</td>
</tr>
<tr>
<td>lobes</td>
<td>shorter or longer than the tube, obliquely ovate or narrowly oblong, sometimes auriculate.</td>
<td>shorter than the tube, triangular and distinctly auriculate.</td>
</tr>
<tr>
<td>ovary</td>
<td>pubescent.</td>
<td>glabrous.</td>
</tr>
<tr>
<td>style</td>
<td>glabrous or sometimes minutely puberulous.</td>
<td>glabrous.</td>
</tr>
<tr>
<td>fruit: follicle</td>
<td>almost fusiform, 8.5–32 cm long, 1.4–5.1 cm in circumference; tapering, apex acute or acuminate, sometimes subobtuse.</td>
<td>more or less clavate, 8–19 cm long, 3.6–8 cm in circumference; not tapering, apex obtuse, sometimes acute.</td>
</tr>
<tr>
<td>seed: testa</td>
<td>sometimes puberulous.</td>
<td>glabrous.</td>
</tr>
<tr>
<td>latex</td>
<td>coagulating not easily.</td>
<td>coagulating easily.</td>
</tr>
</tbody>
</table>

**Phot. 6. Funtumia africana** (Benth.) Stapf, flowering branch. – (Zwetsloot 6).
KEY TO THE SPECIES OF FUNTUMIA

Domatia, if present, in the axils of the secondary veins, not consisting of pits, but only of a tuft of straight hairs; ovary pubescent; fruit almost fusiform, 8.5–32 cm long, 1.4–5.1 cm in circumference, tapering towards the acute or rarely subobtuse apex;

mature buds 8.5–22 mm long, obtuse or acute at the apex; sepals 1.5–4 mm long; corolla lobes sometimes auriculate, shorter or longer than the tube, 5–15 mm long and obtuse or acute at the apex; corolla outside glabrous or puberulous . . . . . . . . . . . F. africana

Domatia, if present, in the axils of the secondary veins consisting of pits which may have a more or less densely ciliate margin; ovary glabrous; fruit more or less clavate, 8–19 cm long, 3.6–8 cm in circumference, not tapering, with an obtuse or subacute apex;

mature buds 7–17 mm long, acute or subacute at the apex; sepals 3–5 mm long; corolla lobes auriculate, shorter than the tube, 3–7 mm long, acute at the apex; corolla outside glabrous . . . . . . . . . . . F. elastica

Note: for statistical keys for flowers and fruits is referred to page 34–37.

SPECIES DESCRIPTIONS OF FUNTUMIA


Fig. 3; Phot. 4, 6, 7, 8; Map 2.


Types: Equatorial Guinea: Fernando Poo, Bagru R., Mann817 (K, lectotype; isotypes GH, P); Nigeria: Rivers State, Bonny, Kalbreyer 82 (K, paratype).


PHOT. 7. Funtumia africana (Benth.) Stapf, flowering branch. – (Zwetsloot 6).

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Tree or shrub up to 30 m high. Trunk up to 50 cm in diameter; bark smooth, sometimes with a few orbicular lenticels or finely fissured in both directions, greenish-brown to grey, mottled; latex not coagulating easily; branchlets glabrous or minutely pubescent. Leaves: petiole 0.3–1.5 cm long, glabrous or minutely pubescent; blade subcoriaceous to coriaceous, 1.5–4 × as long as wide, 5–32 × 1.7–17 cm; often puberulous on the midrib; secondary veins 6–13, mostly parallel; domatia consisting of a tuft of straight hairs, which varies in density, sometimes absent; margin slightly undulate and somewhat revolute. Inflorescence 3–40-flowered, 2–2.5 × 1.5–4.5 × 1.5–4.5 cm; pedicels 3–15 mm long, glabrous or puberulous; bracts obtuse or acute at the apex, 0.9–2 mm long with colleters in the axils. Flowers: mature buds pale green, cylindrical to slightly conical, 8.5–22 mm long, obtuse to subacute at the apex. Sepals triangular to broadly ovate, 1.5–4 × 1.8–3 mm, outside glabrous or puberulous; 5–50 colleters which vary in shape and size, even in a single flower, 0.3–1 mm long. Corolla: tube very pale green to creamy, almost cylindrical, ventricose at 40–75% from the base, 1.7–5 × as long as the calyx, 1.3–3.6 × as long as wide, 5.8–10 × 2.5–5 mm, glabrous to puberulous outside; lobes creamy, recurved, 0.5–1.6 × as long as the tube, obliquely ovate to narrowly oblong, sometimes auriculate, 1–5.5 × as long as wide, 5–15 × 2–5 mm, obtuse or acute at the apex, glabrous to puberulous on both sides, sometimes inside pubescent near the base. Stamens 1.1–4.5 × 0.6–1.5 mm, inserted at 38–75% from the base of the tube; anthers 1–4.5 × 0.6–1.5 mm with a 1.1–2.2 mm long fertile portion; connective 1.8–4 mm long, dorsally appressed pubescent with 0.25–0.5 mm long hairs. Pistil 4–7 mm long; ovary almost cylindrical to subglobose, slightly 5-lobed at the apex, 1.2–2 × 0.9–2 × 0.9–2 mm, pubescent at the apex, indumentum gradually diminishing towards the base; style 1.2–3 × 0.2–0.35 mm, glabrous or with a few erect hairs; clavuncula and stigma 0.9–2.4 × 0.3–1.1 mm; stigma surrounded by an exudate. Disk 5-lobed: lobes 0.4–1.6 mm long, shorter than or rarely as long as the ovary. Fruit: follicle almost fusiform, 8.4–32 cm long and 1.4–5.1 cm in circumference, acuminate to acute at the apex, rarely subobtuse, sometimes slightly curved; flat adaxial side 0.6–3.6 cm wide. Seed 3.5–7.5 × 0.2–0.6 cm; beak 1.6–6 cm long with 3.2–9 cm long hairs; glabrous basal portion of the beak 0–1.1 cm long; testa rugose, sometimes puberulous. Seedling: hypocotyl puberulous.

Note: Slight butresses are reported from Uganda by EGGLEING (1951), but the present author did not observe their presence in Ivory Coast.

Fig. 3. Funtumia africana (Benth.) Stapf: 1. flowering branch, 2/3 ×; 2. domatium in the axis of a secondary vein, 4 ×; 3. flower, 2 ×; 4. longitudinal section of the flower, 4 ×; 5. opened fruit, 2/3 ×; 6. transverse section of the fruit, 2/3 ×; 7. detail of the haired beak, 2 ×; 8. detail of seed, 2 ×. – (1–2. Zwetsloot 28; 3–4. Zwetsloto 28, spirit material; 5–8. Zwetsloot 21).
Distribution: Tropical Africa from Senegal to Tanzania and South to Zimbabwe and Moçambique.

Ecology: Moist light or secondary forest, in savanna area in gallery forests. Alt. 0–1300 m.

Uses: The latex does not yield a good rubber, but was formerly used as a rubber adulterant and now sometimes as bird lime. The wood provides material for making stools, plates, ladles, combs, shoes, bowls, carved figures and light carpentry (Irvine 1961: 621). Medicinal uses include powdered dry leaves for fire burns, leaves, bark and twigs against constipation, the roots for curing a weak bladder (Ayensu 1978: 48), the pounded roots, in palm-wine and water, for incontinence of the urine and the bark and leaves as an enema for assisting conception (Irvine 1961: 621). Additionally Irvine (1961) mentions the seeds as an adulteration for Strophanthus seeds and the floss of the seeds as a stuffing for cushions.

Vernacular names:
SENEGAL: ba kanali (Floup), budikédo (Foula) (Berhaunt 1971: 382).
SIERRA LEONE: bobo (Mende) (teste: Deighton 679); boboi, buboi, gboboi, bobo, waria, kawattia (Ayensu 1978: 48); yete, ekita, nunda (teste: Thomas 5383).
Liberia: bu-ay-boh (Bassa (Ayensu 1978: 48)).

Ivory Coast: pëstin (Attié), pri (Attié of Potou Lagoon), manan (= rubber), wale (Bendoukou) (Chevalier 1909: 122); pouso oué (env. of Abidjan) (testes: Aubréville 32); pé-sain, krokué, sohué (Attié), pwo (Abé), poyu (Abé), afomouondu (Apoll.), wala, manan-wala (Bendoukou), adiakoï, adiakua (Ebrié) (Hutchinson & Dalziel 1937b: 371).

Ghana: oseese (Twi, Ashanti), oseow (Fanti), oseose (Ga, Krobo), kroku (Attié), krokmol (Attié) (Hutchinson & Dalziel 1937b: 371); okae, mana (Ashanti) (Irvine 1961: 621, 622).

Nigeria: okeng (lagoons state) (Jumelle 1903: 383); ire (Yoruba), bassa-bassa (Benin) (Kennedy 1936: 205); aki ire (Yoruba), anyan (Bini), mbamiri (Ibo), nkong (Boki) (Keay, Onochie & Stanfield 1964: 384); ayon, anyon (Benin), male fantum, white ofruntum (Hutchinson & Dalziel 1937b: 371).

Cameroon: okeng (Fantis) (Preuss 1899: 66); ngon (Yaoundé, Bassa), egon (Pahouin) (testes: Fleury in herb. Chevalier 33286).

Gabon: n'goué-yo-naye (M'pongoué), mgombam (Pahouin) (Lecomte 1897: 44); eté, ngombo (Fang), otanda (Mitsongo, Ivéa), mokanda-kanda (Bavoué, Apindji), dutumba (Éshira, Bavarama, Bavungu, Bapumun), letumba (Banzabi), mulimbam (Bavili), letotó (Bakelé), onembu-nembu (Orungu), ngéga (Nkomi (?), onomononye (Mpongwe) (Walker & Sillans 1961: 82); bebende (testes: Sargos 41).

São Tomé: pau cadeira, pau visco (Lecomte 1897: 18).

Angola: alsyra (env. of Buco Zau) (Teste: Gossweiler 7328); linhumbo (env. of Belize, Mayombe) (testes: Gossweiler 7590).

Zaire: dimbu-dimbu, ndimbu-dimbu (Kiomba), bolle (env. of Kisantu), mobole, moboli (env. of Sankuru), bobole (env. of Moki), busumba (env. of Bumbuli), bole, mbole, mbole (Kundu, Mongo), bosuma, isote (env. of Lulonga), boli, dembo, mabe, mariguongo (env. of Bangala), bohole (Mongo), wembe (Turumbu), osuma (env. of Kisangani), bongon (Mangbetu), kimbaki (env. of Kisantu), mazi mazi (Kiomba), usumba (Tshitetela, Kiswahili), mulumba (env. of Maniema) (Duchesne 1938: 231); busumba (env. of Bumbuli), dembo, ake (env. of Giri) (De Wildeman 1905: 573–574); iswété (Mongo) (testes: Coulon 11); mangbongo (env. of Bambesa) (testes: Gerard 2907); ngusale nguhalé (Kinyanga) (testes: Troupin 3768 Gutzwiller 2572); gbanga (Arrange), buole, borombo (env. of Boyeka) (testes: Dubois 163); mumbulimusumba (Kirega), lusumba (Kisongola), usumba (Kikusui, Kiswahili) (testes: Gaillez 220); bosombo (Lotundo), ntoma (Gombés) (testes: Gobatoff 28); mowa (Kirega, Kitembo) (testes: Troupin 10923, Gutzwiller 2357); murembom (Kinande), mbueya (Kinyanga) (testes: Troupin 2465); utshumba (env. of Forama) (testes: Tondeur 103).

Uganda: munyamatunga (Lunyankole), munyamagozi (Lukiga), musanda (Lunyoro), nkago (Lusoga) (Eggeling 1951: 28); namakagy zimbaru (Bugisha) (testes: Brasnett 1).

Kenya: mutondo (Kakamega), bastard wild rubber (Dale & Greenway 1961: 46).

Tanzania: nwale (Tongwe) (testes: Itani & Izawa 50); kilimboti (Kishamba)
(teste: Mgaza 462); mfijufiju (Swahili) (teste: Lyne 118); kaku (Ki-Tongwe) (teste: Itani 81); mboreti (Kishambaa) (teste: Peter 58194); mueyue, karungurungu, karerembe (Ki-Tongwe (teste: Suzuki 25, 246, 268).

MOÇAMBIQUE: inhampuepua (Cheringoma) (GOMES E SOUZA 1967: 653); muri (Maconde) (teste: Gomes e Souza 4516).

Geographic variation

The variation of F. africana is partly correlated with its geography. Certain forms occur mainly in particular parts of the area of distribution. Some of these forms have been regarded as distinct species in the past. As the transitions between these forms are always continuous the present author refrains from delimitating subspecies or varieties. He confines himself to indicate some characters that show a distinct correlation with the geography:

- Indumentum of the corolla. In West Africa the corolla is usually glabrous, although minutely puberulous corollas occur there. The same applies to
Cameroun, Gabon and Zaire in the province Bas-Zaïre. However in Angola, Central and East Zaïre the corolla is more frequently puberulous, while in Uganda, Kenya, Tanzania, Zimbabwe and Moçambique the corolla is always puberulous.

- Fruit. In West Africa, Cameroun, Congo and Angola, the fruit is always quite narrowly fusiform with an acute or acuminate apex. But in Zaire, Uganda, Kenya, Tanzania and Moçambique the fruit may be shorter and thicker and as such it may resemble that of *F. elastica*.

A selection of the about 600 specimens examined:

**SENEGAL:** Emay, Basse Casamance (fl. Sep.) Berhaut 7388 (BR, M, P).


**GUINEA:** Macenta (fl. Apr.) Jacques-Felix 862 (P).

**SIERRA LEONE:** Port Lokko (fl. Dec.) Thomas 5820 (P); Kukuna (fr. Jan.) Scott Elliot 4506 (BM, BR, K, MO); Yonibana (fr. Nov.) Thomas 4732 (W); Ronietta (fl. Nov.) Thomas 5611 (EA); Njala (fr. Sep.) Small 391 (BR, K, P); Kabala (fl. July) Glanville 249 (K); Kambui Forest. T.E.E. 196 (FHO).


**IVORY COAST:** 14 km WSW of Toulepleu, Beentje 923 (WAG); 25 km WSW of Man (fl. May) Beentje 350 (WAG); Triépo, Chevalier 19439 (P); Tabou, De Koning 2374 (WAG); 64 km N of Sassandra (fl. Jan.) Leeuwenberg 2614 (BR, FHO, K, L, UC, WAG); 25 km W of Sassandra (fl., fr. Apr.) Zwetsloot 21 (UCI, WAG); km 19 Gagnoa-Soubre Road (fl. Apr.) Zwetsloot 29 (UCI, WAG); Triépoint (fl. Apr.) Zwetsloot 39 (UCI, WAG); 9 km E of Divo (fl. May) Zwetsloot 39 (UCI, WAG); 9 km N of Cosrou (fl. May) Leeuwenberg 4254 (BR, K, L, MO, P, WAG); Dabou (fl., fr. May) Jolly 169 (K, P); 17 km W of Abidjan (fl. June) W. de Wilde et al. 295 (BR, K, P, UC, WAG, Z); Yapo (fl., fr. Apr.) Zwetsloot 9 (UCI, WAG); 25 km N of Abidjan (fl. May) Versteegh and Den Outer 37 (BR, MO, U, WAG); Yakassé Mè (fl., fr. Apr.) Zwetsloot 6 (UCI, WAG); 7 (UCI, WAG); 2 km S of Aghien (bud. June) Beentje 497 (WAG); Zaranou, Chevalier 17617 (K, P); Aboisso (fl. Apr.) Chevalier 16303bis (F, P, WAG); 1 km E of Maferè (fl. Mar.) Leeuwenberg 12018 (WAG).

**GHANA:** Fure Headwaters For. Res., Foggie 127 (FHO); Benso-Subiri For. Res., Deaw 312 (MO); Axim (bud Feb.) Irvine 2251 (E); Ankobra Junction (fl. Feb.) Kitson 1021 (K); 7 km N of Agoua Junction (fr. Mar.) Leeuwenberg 11134 (GC*, WAG); Owabi (fl. Apr.) Andoh 4180 (A, BM, BR, FHO, K); Praha (fl., fr. Dec.) W. Johnson 925bis (K); Ofin Head Water (fl. Apr.) Vigne 1905 (FHO); Agoge (fl. Apr.) Adams 2615 (P); between Abandzi and Saltpond Junction (fr. Feb.) Leeuwenberg 11110 (GC*, WAG); Koforduara (fr. Dec.) W. Johnson 434 (A, K); Amedjove (bud Apr.) Schlechter 12979 (BR); Hohoe District (fl., fr. Nov.) St. Clair-Thompson 3676 (FHO).

**BENIN:** Boguila near Abomey (fl. Feb.) Chevalier 23190 (P); Torikada, Poisson 24 Jan. 1901 (P); Bokoutou For. Res. near Porto Novo, Chevalier 22868 (P); Pobé, Adjahounou 93 (P); Adjia Ouéré (?) (fl. Jan.) Le Testu 103 (BM, BR, FHO, LIS, MO, NY, P, S, UC, WAG).

128 Calabar-Mamfe Road (fl. Apr.) Van Meer 1341 (WAG); Old Calabar, Holland 3 (K); Oban Group For. Res. (fl. Apr.) Van Meer 1373 (WAG); Ajosso on the Ikom-Mamfe Road (fl. Feb.) Lattilo and Ogunmayo FHI 67659 (K, WAG); km 117 Calabar-Mamfe Road (fl. Feb.) Onyeachusim and Lattilo FHI 54098 (BR, K, WAG).


São Tomé: Porto Mégé (fr. Sep.) Chevalier 13765 (P); BoaEntrado, Chevalier 13498 (BR, P, K).


Congo: Kouilou, Sargos 41 (P); Kakamoeka (fr. Aug.) Lecomte 21 aug. 1893 (P); near Dimonika (fl. Dec.) Casset 779 (P); Mayombe, Lecomte 852 (P); between Renéville and Mbamou, Chevalier 27608 (P).

Angola: Mayombe (fl. Jan.) Gossweiler 6087 (BM, BR, COI, LISC); Buco Zau (fr. Aug.) Gossweiler 6604 (BM, COI, K, LISC, LISU); Ambritz, Monteiro et al. 398 (LISC); Golongo Alto (fl. Oct.) Gossweiler 4400 (BM, COI, K); Loanda (fl. Oct.) Gossweiler 4393 (BM, COI, K); Quela, Nolde 417 (BM).

Zaire: Prov. Bas-Zaïre: Lundu, Goossens 1318 (BR); Luki (fl. Nov.) Maudoux 197 (BR); ibid. (fr. Sep.) Tousaint 2450 (BR, C, P, K); Seka Banza, Breyne 3310 (BR); Temvo, Vermeosen 1830 (A, BR, G, K, MO, S, US, Z); Kisantu, Gillet 387 (BR, K, type of K. congolare), (fl., fr. Dec.) 886 (BR, K, type of K. gigellet); Mvuazi (fl. Nov.) Devred 47 (BR, K); Kimuena (fr. July) Evrard 6409 (BR, MO); Kingoma, Pauwels 1927 (BR); Kimvula, Pauwels 272 (BR); Bundu (fl.) Jansen 7 Sept. 1909 (BR); Kutu (fl.) E. Laurent 7 Nov. 1903 (BR); Madibi (fl.) Sapin July 1906 (BR); Lusubi (fl. June) Lesacrovaet 66 (BR); Ipamu (fl. July) Vanderijst 9930 (P); Kiyaka (fl. July) Devred 2350 (BR, WAG); Bumbuli, Serv. de l'Agric., lettre 311, 5 Aug. 1907 (BR); Kompani (fl. Mar.) Compère 1661 (BR).


Prov. Shaba: Tshifunga, Schmidt 5299 (BR); Kianiama (fl. Aug.) Herman 2041 (BR, P); Mulolwa, Delvaux 454 (BR); Mahila, 90 km N of Kalemie, Delvaux 703 (BR); Kalemie, Delvaux 742 (BR, WAG). Prov. Haut-Zaïre: Titule (fl. Apr.) Lebrun 2713 (BR, WAG); Mobwasa, Reygaert 498 (BR); Barumbu (fl. Jan.) M. Laurent 1792 (BR); Yambyua, Solheid 57 (BR); Yangambi (fl., fr. Feb.) Germain 155 (BM, BR, K, MO, P); Romée (fl. Jan.) M. Laurent 1791 (BR); km 22 Kis-Bengamisa Road, Bokdamin 3562 (WAG); 5 km N of Kisangani (bud. Feb.) Bokdamin 3071 (WAG); Wanie Rukula (fl. Jun.) Lisowski 52626 (BR, POZ); Bambesa (fl. May) Leemans 2907

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(BR); Nala (fl. May) *Van Rijsselberghe* 2 (BR); Tshopo (fl. Nov.) *Lisowski* 15098 (BR, POZ).

Prov. Kivu: km 37 Elundu-Kindu Road (fl. July) *Gailez-Mahin* 59 (BR); Lubutu (fl. Apr.) *Bokdam* 4103 (WAG); Fangi, *Michelson* 253 (BR); Irangi (fl. July) *Troupin* 3768 (BR, K); Itibero, *Troupin* 2465 (BR, K, WAG); Musenge (fl. Feb.) *Léonard* 4898 (BR, WAG); Bwemba (fl. Oct.) *Pierlot* 2630 (BR); Ilunga (fl. Dec.) *Pierlot* 623 (BR); Kembe (fl. June) *Pierlot* 2233 (BR); Ngandu (fl. July) *Léonard* 4898 (BR, WAG); Shabunda (fl. Aug.) *Pierlot* 735 (BR); Bwemba (fl. Oct.) *Pierlot* 2630 (BR); Bunyakiri (fl. Apr.) *Gutzwiller* 2792 (BR, WAG); Rutshuru (fl. Mar.) *Gesquitrier* 3877 (B, K, LISJC); Makwera (fr. May) *Léonard* 4898 (BR, WAG); Kisharo (fl. June) *Pierlot* 3023 (BR, WAG).


*Not seen by the author, annotated by LEEUWENBERG.*

Some of the cultivated specimens examined:

GUINEA: Conakry (fr. Feb.) *Chevalier* 12727 (P).


PRINCIPE: Esperança (fl. Dec.) *Exell* 696 (BM).

ZAMBIA: Amani (fl. Jan.) *Peter* 581 (WAG).


Tree or shrub up to 35 m high. Trunk up to 50 cm in diameter; bark smooth, sometimes with a few orbicular lenticels, greenish-brown to grey, mottled; the white latex rolls easily into balls; branchlets glabrous.

Leaves: petiole 0.2-1.5 cm long, glabrous; blade coriaceous, 1.4-3.5 x as long as wide, 6-27 x 1.5-10 cm, beneath sometimes with a few hairs on the midrib; domatia consisting of pits, often with a ciliate margin, sometimes absent; margin undulate and revolute; 6-12 secondary veins on each side of the midrib. Inflorescence congested, terminal and at the same time axillary, 3-35-flowered, 2-2 x 1.5-4 x 1.5-4 cm; pedicel 2-8 mm long, glabrous.

Flowers: mature buds pale green, apical portion conical, 7-17 mm long, acute or subacute. Sepals elliptic to broadly ovate, 3-5 x 2.1-4.5 mm, glabrous on both sides; 6-20 0.2-1 mm long colleters which are variable in shape and size. Corolla: tube very pale green to white, ventricose at 43-67% from the base, 1.4-2.8 x as long as the calyx, 1.6-2.5 x as long as wide, 5.5-10.5 x 3-5.5 mm, glabrous outside; lobes white, triangular to ovate, distinctly auriculate, 0.35-0.85 x as long as the tube, 1.4-2.7 x as long as wide, 3-7 x 2-4 mm, sometimes minutely ciliate at the margin, glabrous on both sides or sometimes inside near the base pubescent. Stamens 2.7-4 x 1-2 mm, inserted at 37-57% from the base of the tube, subsessile; anthers 2.2-4 x 1-2 mm with a 1.1-2.3 mm long fertile portion; connective 2.4-3.5 mm long, dorsally appressed-pubescent with 0.3-0.5 mm long hairs. Pistil 4-6 mm long; ovary subglobose, 1.1-2 x 1-2.4 x 1-2.4 mm, glabrous; style 1.5-3 x 0.15-0.4 mm, glabrous; clavuncula and stigma ovoid, 1.1-2.6 x 0.4-1 mm; stigma conical, surrounded by an exudate. Disk: lobes 1.1-2.1 mm long, truncate, longer than the ovary or rarely as long as the ovary. Fruit: follicles almost clavate, 8-19 cm long, 3.6-8 cm in circumference, subacute or acute at the apex, sometimes slightly curved; flat adaxial side 2.4-5.2 cm wide, mostly with raised edges. Seed 4.5-7 x 0.3-0.4 cm; beak 3-5 cm long with straight 4.5-7 cm long hairs; glabrous basal portion of the beak 0.5-1.3 cm long; testa rugose, glabrous. Seedling glabrous.
**Map 3. Funtumia elastica** (Preuss) Stapf

**Distribution**: Tropical Africa from Senegal to Tanzania.

**Ecology**: Secondary, evergreen and deciduous forests. Alt. 0–1200 m.

**Uses**: It is regarded as a valuable rubber tree. The latex coagulates easily and yields about one-third of its weight of pure rubber, which is of a high quality. It is called 'Lagos silk rubber'. Because of its low output per hectare per annum it could not compete with *Hevea brasiliensis*. Notwithstanding large plantations have been established in Ghana, Nigeria and Cameroun and it was introduced in many tropical countries outside Africa (PURSEGLOVE 1968: 628). The latex provides a medicine against male impotence (AYENSU 1978: 49). The wood is used for making stools (IRVINE 1961: 622), for carving images and making boxes (IRVINE 1930: 200), for making paddles and domestic tools (WALKER & SILLANS 1961: 82) and it is proposed as match stick wood as it burns readily (DALE & GREENWAY 1961: 47). In Ghana the bark serves as a remedy for piles and in Ivory Coast it is an ingredient in Guéré arrow poisons (IRVINE 1961: 622). The steeped bark is used against jaundice (AYENSU 1978: 49). The seeds are employed as an adulterant of *Strophanthus* seeds. The floss of the seed has been found to be capable of being spun and is often used locally to stuff cushions (HUTCHINSON & DALZIEL 1937: 372).
Vernacular names:

SIERRA LEONE: boboi, buboi, gboboi, watia, lel-boi (AYENSU 1978: 49).


IVORY COAST: efurumundu (Agni), ofuntum (Apollonien), pé chi (Attié), po yu dua (Fanti), twi (Néyau), urubasu (Bété), bébéti (env. of Cavally R.), dorosé popüli (Plapo) (CHEVALIER 1909: 124); wolobatou (Oubi) (teste: Adjanohoun & Aké Assi 55); funmundu (Agni), amane dua (= rubber tree) (HUTCHINSON & DALZIEL 1937b: 371).

GHANA: funtum, fruntum (Ashtanti) (teste: Vigne 126, 1513); ofruntum (Twi, Fanti, Ashanti), funtum (Krepi), efunmundum (Nzima, Aowin) (IRVINE 1930: 200); guni, puni (Krepi) (HUTCHINSON & DALZIEL 1937b: 371); frummundu, fummundu, potombo, ofrundum (AYENSU 1978: 49).

NIGERIA: chighan ete (Nupe), ire (Yoruba), anyan (Bini), mba (Ibi), nkware (Bokí) (KEAY, ONOCHE & STANFIELD 1964: 385); ayan, anyon, anyo, bassa-bassa (Benin), mini-ema (Ekpaffia), aba-oji (Nsokpo), amamakake (Abuan), abakwa (Engenni) (HUTCHINSON & DALZIEL 1937b: 371); araba (Benin) (teste: T. Smith 21).

CAMEROUN: dinjongo (Bakd.), manjongo (Bakw.), ebongo manjongo (Duala) (HUTCHINSON & DALZIEL 1937b: 371); ndamba (Yaoundé, Bassa) (teste: Benoît 83).
EQUATORIAL GUINEA: *envila* (teste: *Tessmann 590*).

CENTRAL AFRICAN REPUBLIC: *mondembo* (env. of Mbaiki) (teste: *Badré 335*).

SÃO TOME: *pau cadeira* (teste: *Espírito Santo 132*).


A selection of the about 360 specimens examined:


SIERRA LEONE: *km 100 Freetown-Lunsar Road* (fr. Jan.) *Cole and Jarr EAC 35* (GC*, K*, SL*, WAG); *Mano, Thomas 10359* (BM); *Njala (fl. Apr.) Deighton 1159* (BM, K, MO); *Panguma Distr.* (fr. Feb.) *Bamps 2073* (Br, K, P, WAG); *8 km W of Soubre (fl., fr. May) Zwetsloot 31* (UCI, WAG); *18 km S of Soubre (fl., fr. Apr.) Zwetsloot 32* (UCI, WAG); *8 km of Soubre (fl., fr. May) Zwetsloot 37* (UCI, WAG); *9 km S of Soubre (fl., fr. Apr.) Zwetsloot 38* (UCI, WAG); *18 km S of Soubre (fl., fr. Apr.) Zwetsloot 39* (UCI, WAG); *25 km E of Abengourou, Versteegh and Den Outer 612* (U, WAG).

IVORY COAST: *Cavally R., Chevalier 15841* (P); *5–9 km E of Tienkula (fl. Mar.) Bernardi 8398 (A, K, M, P, S, WAG); *Forêt de Kôlékahinou, Miège and Aké Assi 3996 (ABI); Man-Kouibili Road, Portières Dec. 1929* (P); *For. Res. of Soubre (fl. Feb.) Bamps 2073* (Br, K, P, WAG); *18 km S of Soubre (fl., fr. Apr.) Geerling and Bokdam 2500* (BR, MO, WAG); *Toudjdi, km 45 Soubré-San Pédro Road (fl. May) Zwetsloot 32* (UCI, WAG); *55 km S of Sassandra-Lakota Road (fl. May) Zwetsloot 37* (UCI, WAG); *8–10 km E of Daloa (fl. Mar.) Bernardi 8494 (G, K, P); *56 km of Sassandra (fl., fr. Jan.) Leutewenberg 2604* (FR, FHO, K, L, P, UC, US, WAG, Z); *95 new Abidjan-N’Douci Road (fr. Oct.) De Kruif 384* (WAG); *25 km E of Abengourou, Versteegh and Den Outer 612* (U, WAG).


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**LEEUWENBERG.** *Not seen by the author, annotated by (Z). Rohrer 5 Dec 1910 (bud). Styles 228 (FHO, K). Dummer 377 Wilson 214 (UC); Kirerema (fl. Oct.) 5756 J. de Wilde 3 (A, BR, C, K, LISC, (BR, WAG); Pare Nat. Virunga, Semliki R. (fl. June) (BR, C, K). MO, WAG); Mwenda (fl. Dec.) J. de Wilde 4 (A, BR, C, K, LISC, (BR, WAG); Lebrun 5228 (BR); Urega (fl. July) Seret 476 (BR); Faradje (fl. Aug.) Vanderben 1265 (BR, K, LMA); Kawa, PAgric, lettre 159, 6 May 1901 (BR); Penghe (fl., fr. Jan.) (BR); Gombari (fr. Feb.) Bequaert 215 (BR); ngamisa (fr., fr. Nov.) (BR, WAG); Bambesa, Pittery 184 (BR); Digba-Ango (fr. Feb.) Louis 626 (BR, P); Ben- (BR); Ngazi, M. Laurent Jan. 1906 (BR); Romee (fl.) Lemaire 408 (BR, P, WAG); Panga (fl.) (BR, WAG); Mombele (fr. July) Gerard 5642 (BR, Serv. de serv. de PAgric, lettre 125, 3 Apr. 1908 (BR); Manghay (fr.)X (BR). Prov. Haut-Zai’re: Between Libenge (BR). Prov. Kasai-Kombe (fr.) Serv. de PAgric, lettre 854, 5 Nov. 1904 (BR); Eula. (K); Tone, Perdu 884 (K, UPS); Amani (bud) Rohrer 5 Dec 1910 (Z).

*Not seen by the author, annotated by LEEUWENBERG.*

**Meded. Landbouwhogeschool Wageningen 81-16 (1981)**
Some of the cultivated specimens examined:

**SIERRA LEONE:** Botanic Gardens, Fourah Bay College (fr. Mar.) Morton 1747 (K, MO, WAG).
**IVORY COAST:** ORSTOM, Adiopodoumé (fr. Apr.) Zweisnot 10 (UCI, WAG).
**GHANA:** Aburi, Chevalier 13882 (P).
**BENIN:** Porto Novo (bud Oct.) *Le Textu* 1 (BM).
**SAO TOME:** Agua Coco, Espirito Santo 4773 (LISC, LISJC).
**ANGOLA:** Loanda (fl. Apr.) Gossweiler 5633 (BM, COI, LISJC, LISU).
**UGANDA:** Entebbe Botanic Gardens (fl. Nov.) Dawkins 669 (EA, FHO).
**TANZANIA:** Amani (bud Nov.) Ruffo 290 (EA, BR, LISC).
**SRI LANKA:** Along Peradeniya-Kandy Road (fl. Apr.) Kostermans 24551 (Z).
**INDONESIA:** SUMATRA: Riouw, Muara Padjanki (bud Apr.) Buwalda 6493 (NY).
**SAMOA:** Upolu (bud Nov.) Whistler 1093 (B).
**CUBA:** Havana, Ekman 18995 (S).
**GRENADA:** Annantale, *Broadway* 3797 (K).
**GUYANA:** Anderson 334 (K).
**HAITI:** Petionville, Massif de la Selle (fl. June) Ekman 7087 (S).
**JAMAICA:** Kingston, Gagzo 1905 (HBG, Z).
**PORTO RICO:** (fl.) Aetland May 1926 (MO).
**TRINIDAD:** St. Ana's (fl. Sep.) *Broadway* 5076 (BM, G, MO); Maracas Valley, Simmons 15429 (K). MARTINIQUE: Stehle 7224 (UC).
**DOMINICA:** St. Paul (fl. Feb.) Wasshausen 395 (B).
**UNITED STATES:** New York Botanical Garden, Taylor 18773 (NY).

**Note:** *F. elastica* is naturalised in Trinidad, Martinique and Sumatra.

**SOMATIC CHROMOSOME NUMBERS IN FUNTUMIA**

J. C. ARENDS & F. M. VAN DER LAAN

The chromosome number for the two species of *Funtumia* as recognized in this monograph is 2n = 22. The chromosomes have been observed in cells of squashed root tips after pretreatment in 8-hydroxyquinoline, fixation in acetic-alcohol and staining in aceto-orcein. The somatic metaphase plates of *F. africana* and *F. elastica* are shown in figures 5 and 6 respectively. An earlier report of 2n = 24 for *F. africana* by the authors (1979, *Taxon* 28 (4): 637) appears to be incorrect. This report was obtained from sectioned root tips fixed in Ivory Coast by De Koning. The pertaining slide was analyzed again and it is concluded that some of the relatively long chromosomes have very distinct, somewhat extended centromeric regions.

It is obvious that such chromosomes can easily be interpreted as two smaller chromosomes, thus leading to a misinterpretation. In the pictured cell of *F. africana* (figure 5) which resulted from squash preparation some of the chromo-

somes with distinct centromeres can be seen also. The two species cannot be separated on the basis of their karyotypes, as these are similar. The number of \( 2n = 22 \) for *Funtumia* was already recorded by Mangenot & Mangenot (see Federov, 1969, Chromosome numbers of flowering plants).

**PHYTOCHEMISTRY OF FUNTUMIA**

N. G. Bisset

The species of this genus contain in their leaves, bark, and seeds steroidal alkaloids which are mostly derivatives of 5a-pregnane and/or pregn-5-ene containing amino groups at the 3- and/or 20-positions, e.g. funtumine and related bases. Such substances are suitable starting materials for the (hemi)synthesis of therapeutically important steroids, e.g. oestrane and androstane compounds, and the discovery that the leaves of the widely occurring *F. africana* (*F. latifolia*) have a very high content of the alkaloids (up to about 4%) has led to their exploitation on an industrial scale particularly in France and Belgium.

Similar steroidal alkaloids are found in other genera of the *Apocynaceae* – *Holarrhena* (q.v.), *Kibatalia*, *Malouetia*, etc.

**REFERENCES**


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HYBRIDS OF FUNTUMIA AFRICANA AND ELASTICA

Hybrids of the two species are found in Zaïre and Uganda. As far as the author could verify they are artificial and have been made in quest of better rubber producing trees. Some wild specimens were supposed to be hybrids, but they invariably turned out to belong to one of the two species. True hybrids show intermediate characters in:
- domatia: indistinct pits surrounded by short straight hairs on the mesophyll, the midrib and secondary veins;
- corolla lobes: narrowly triangular, usually shorter than the corolla tube;
- fruit: intermediate in length and circumference, with a subacute or obtuse apex.

The ovary of the hybrids analysed was always pubescent.


UGANDA: Christy 15 Mar. 1920 (K); Entebbe (fl. Oct.) Eggeling 2316 (K).

STATISTICAL KEYS (FUNTUMIA)

The two species in Funtumia can clearly be distinguished by one single character: the indumentum of the ovary. Unfortunately this character is not very useful in a field key as it is hardly observable without a magnifying glass. A field key requires more easily perceivable characters. Moreover the identification of fruiting or even vegetative specimens is desirable. This necessitates the construction of keys based on fruit and vegetative characters. However all these characters show such an overlap that is impossible to base a well working key on each of them separately. But by studying a combination of these characters it is possible to get a key, which identifies specimens with more certainty. Keys are derived by a statistical method called 'discriminant analysis'. These statistical keys are based on a sample from herbarium specimens and spirit material.

The method applied to the sample was described by Bahadur & Anderson in 1962 as a modification of the method introduced to the botanical world by Fisher in 1936. The mathematical background is not the scope of this monograph, but interested readers are referred to the authors mentioned above and Corsten (1964), Cooley & Lohnes (1966), Giri (1977) and Zwetsloot (1981).

Fig. 7 Linear discriminant function for two fruit characters: length and circumference. The normal curves belonging to the characters of both species are drawn along the horizontal and vertical axes. The percentage of the area under the curves which is hatched, represents the probability of mis-identification, which is equal for both species. The line with the equation: 0.31 × (length) – 3.31 × (circumference) = –10.42 divides the swarm of specimens in two parts: specimens on the one side are identified as F. africana, on the other as F. elastica.

\[ o = F. \text{ africana} \]
\[ l = F. \text{ elastica} \]
\[ * = \text{centroids} \]
We, ana

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The method is only suitable for continuous characters: characters that can be measured, such as length, width and circumference. For a legitimate application each single character should have a normal distribution, but moreover the simultaneous distribution of the, say, p characters should be a p-variate normal one. Normality is a disputable assumption. There are several statistical tests on normality of single characters. All characters used were tested with the test of Shapiro & Wilk (1965). The results are shown in Table 2.

<table>
<thead>
<tr>
<th>character</th>
<th>species</th>
<th>n</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flower: sepal length</td>
<td>F. afr.</td>
<td>48</td>
<td>0.98</td>
</tr>
<tr>
<td></td>
<td>F. ela.</td>
<td>24</td>
<td>0.93</td>
</tr>
<tr>
<td>length of corolla tube</td>
<td>F. afr.</td>
<td>48</td>
<td>0.93</td>
</tr>
<tr>
<td></td>
<td>F. ela.</td>
<td>24</td>
<td>0.96</td>
</tr>
<tr>
<td>length of corolla lobe</td>
<td>F. afr.</td>
<td>48</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>F. ela.</td>
<td>24</td>
<td>0.91</td>
</tr>
<tr>
<td>Fruit: length</td>
<td>F. afr.</td>
<td>50</td>
<td>0.98</td>
</tr>
<tr>
<td></td>
<td>F. ela.</td>
<td>48</td>
<td>0.98</td>
</tr>
<tr>
<td>circumference</td>
<td>F. afr.</td>
<td>50</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>F. ela.</td>
<td>48</td>
<td>0.99</td>
</tr>
<tr>
<td>width of adaxial side</td>
<td>F. afr.</td>
<td>50</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>F. ela.</td>
<td>48</td>
<td>0.97</td>
</tr>
</tbody>
</table>

A test on the multivariate normality of p characters is more difficult to perform and has been omitted. Despite some significant deviations of normality the method of Bahadur & Anderson was applied to the data with the restriction of equal losses for both species: a wrong identification is considered equally bad for both species. In contrast with Fisher’s method, the covariance matrices of both species may be unequal: spread and correlation of the characters in both species may be different. The unequality of the covariance matrices is demonstrated in Fig. 7 by the different shape and size of the swarm of points belonging to specimens of F. africana (0) and F. elastica (I).

The resulting keys, so called 'linear discriminant functions' have the following properties:
- They are interpretable in only one way and there are two possible outcomes. Doubt about the identification is impossible: either F. africana or F. elastica.
- The maximum probability of misidentification of both species is minimized. As a result the probabilities of misidentification are equal for both species.
- The probability of misidentification can be estimated.

To identify a specimen, the result of a simple arithmetical function of measured characters has to be compared with a computed critical value.
TABLE 3.
A. Flowers: \(x_1 =\) sepal length (mm), \(x_2 =\) length of corolla tube (mm), \(x_3 =\) length of corolla lobes (mm), \(a = F.\) africana, \(e = F.\) elastica.

<table>
<thead>
<tr>
<th>discriminant function</th>
<th>critical value</th>
<th>if lower</th>
<th>larger</th>
<th>prob. of mis-identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-5.42x_1 + 0.20x_2 + 1.72x_3)</td>
<td>-5.87</td>
<td>e</td>
<td>a</td>
<td>0.03–0.04</td>
</tr>
<tr>
<td>(-3.99x_1 + 0.99x_2)</td>
<td>-5.21</td>
<td>e</td>
<td>a</td>
<td>0.12–0.16</td>
</tr>
<tr>
<td>(-5.30x_1 + 1.77x_3)</td>
<td>-6.73</td>
<td>e</td>
<td>a</td>
<td>0.03–0.04</td>
</tr>
<tr>
<td>(-0.59x_2 + 1.46x_3)</td>
<td>3.84</td>
<td>e</td>
<td>a</td>
<td>0.15–0.16</td>
</tr>
<tr>
<td>(x_1)</td>
<td>3.20</td>
<td>a</td>
<td>e</td>
<td>0.17–0.19</td>
</tr>
<tr>
<td>(x_2)</td>
<td>7.70</td>
<td>e</td>
<td>a</td>
<td>0.37–0.45</td>
</tr>
<tr>
<td>(x_3)</td>
<td>5.70</td>
<td>e</td>
<td>a</td>
<td>0.17</td>
</tr>
</tbody>
</table>

B. Fruits: \(x_1 =\) length (cm), \(x_2 =\) circumference (cm), \(x_3 =\) width of the adaxial side (cm), \(a = F.\) africana, \(e = F.\) elastica.

<table>
<thead>
<tr>
<th>discriminant function</th>
<th>critical value</th>
<th>if lower</th>
<th>larger</th>
<th>prob. of mis-identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.29x_1 - 4.30x_2 + 1.61x_3)</td>
<td>-10.55</td>
<td>e</td>
<td>a</td>
<td>0.05–0.09</td>
</tr>
<tr>
<td>(0.31x_1 - 3.31x_2)</td>
<td>-10.42</td>
<td>e</td>
<td>a</td>
<td>0.05–0.10</td>
</tr>
<tr>
<td>(0.33x_1 - 3.94x_3)</td>
<td>-6.49</td>
<td>e</td>
<td>a</td>
<td>0.13–0.14</td>
</tr>
<tr>
<td>(2.84x_2 + 0.86x_3)</td>
<td>15.51</td>
<td>a</td>
<td>e</td>
<td>0.09–0.11</td>
</tr>
<tr>
<td>(x_1)</td>
<td>14.50</td>
<td>e</td>
<td>a</td>
<td>0.36–0.40</td>
</tr>
<tr>
<td>(x_2)</td>
<td>4.50</td>
<td>a</td>
<td>e</td>
<td>0.11</td>
</tr>
<tr>
<td>(x_3)</td>
<td>2.90</td>
<td>a</td>
<td>e</td>
<td>0.16–0.17</td>
</tr>
</tbody>
</table>

if \(b_1x_1 + b_2x_2 + b_3x_3 + \ldots + b_px_p \geq c\) then: \(F.\) africana, otherwise \(F.\) elastica,

where \(b_1, \ldots, b_p\) are computed coefficients, \(x_1, \ldots, x_p\) are the measured values of characters and \(c\) is the critical value.

In Fig. 7 the resulting key for two fruit characters, the length and circumference, is shown: the line with the equation:

\[
0.31 \times \text{(length)} - 3.31 \times \text{(circumference)} = -10.42
\]

divides the two dimensional space in two parts: a specimen on the one side of the line is identified as \(F.\) africana, on the other side as \(F.\) elastica. The probability of misidentification of this key is between 5 and 9%. The key runs as follows:

if \(0.31 \times \text{(length)} - 3.31 \times \text{(circumference)} \geq -10.42\), then \(F.\) africana, otherwise \(F.\) elastica.

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A taxonomist who is not used to work with figures might be upset by a key of this kind, but the use of simple arithmetic is not uncommon in plant taxonomy: ratios are generally accepted in plant descriptions and keys.

These discriminant functions are derived for flowers and fruits. The analysis of vegetative parts did not result in useful keys of this kind, as the estimated probabilities of misidentification were too high. The results are shown in Table 3. The most favourable key combines a low probability of misidentification with a low number of characters.

In particular this kind of discriminant functions is fit to solve the problem of construction a key with overlapping characters. The author intends to emphasize their advantages: the minimized probability of misidentification at a fixed number of characters, the relative arithmetical simplicity, and the reproducibility. As disadvantage can be mentioned the laborious calculations to derive the key, the assumption of normality and the impossibility of using other than continuous characters. For keys with discrete characters, such as colour or type of indumentum, the reader is referred to Goldstein & Dillon (1978) and Zwetsloot (1981).

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The numbers in parentheses correspond with *Farquharia elliptica* (1), *Funtumia africana* (2), and *Funtumia elastica* (3). Only numbered collections have been listed.

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