

## A monograph of *Tacazzea* (Periplocaceae)

H.J.T. Venter\*, R.L. Verhoeven and Janetta D.S. Kotze

Department of Botany, University of the Orange Free State, Bloemfontein, 9300 Republic of South Africa

Accepted 28 August 1989

A taxonomic revision of *Tacazzea* Decne. is presented. Four species out of a total of 17 species and three varieties described are maintained. *T. apiculata* Oliv., *T. conferta* N.E. Br., *T. rosmarinifolia* (Decne.) N.E. Br. and *T. venosa* Decne. are recognized. Most of the synonyms belong to the widely distributed, polymorphic *T. apiculata*. *Tacazzea* is endemic to and widely distributed in Africa. All four species inhabit moist habitats of river banks. Two species are lianas, the other two are shrubs.

'n Taksonomiese hersiening van *Tacazzea* Decne. word aangebied. Vier spesies uit 'n totaal van 17 spesies en drie variëteite wat beskryf is, word behou. *T. apiculata* Oliv., *T. conferta* N.E. Br., *T. rosmarinifolia* (Decne.) N.E. Br. en *T. venosa* Decne. word erken. Meeste van die sinonieme behoort tot die wydverspreide polimorfe *T. apiculata*. *Tacazzea* is endemies in Afrika en wyd daaroorheen versprei. Al vier spesies kom in vogtige habitats van rivieroewers voor. Twee spesies is liane, die ander twee is struike.

**Keywords:** Anatomy, Periplocaceae, pollen, *Tacazzea*, taxonomy

\*To whom correspondence should be addressed

### Introduction

*Tacazzea* Decne. belongs to the Periplocaceae which is a family of lianas [from Greek: 'peri' — around and 'plecein' — to twine (Browicz 1966)]. This 'Old World' family occurs in Africa and Asia and comprises about 50 genera of which 20 genera, representing some 70 species, are present in Africa. Virtually all of the African genera are endemic to it and with the exception of *Raphionacme* Harv. (36 species), *Periploca* L. (12), *Cryptolepis* R. Br. (12), *Curroria* Planch. (5) and *Tacazzea* (4) they are all small genera comprising one or two species. Most of the genera are lianas although a small number are shrubs. One genus is herbaceous and geophytic. Another is epiphytic.

The Periplocaceae is related to the Apocynaceae on one hand and to the Asclepiadaceae on the other. All three families have in common a milky latex, flowers with coronas, fruits composed of paired follicles and seeds having comas of hairs. However, the Periplocaceae are distinguished by their spathulate pollen carriers and pollen tetrads in contrast to single-grained pollen and absence of pollen carriers in the Apocynaceae and pollinia attached to wishbone-shaped translators in the Asclepiadaceae.

Decaisne established the name *Tacazzea venosa* in 1844 for a collection made by Schimper in 1839 of a shrub species that grew on the banks of the Tacazzé (Tekezé) River in northern Ethiopia. On the next page of the same publication Decaisne described a new species from Angola which he called *Aechmolepis rosmarinifolia*. Thirty-one years later in 1857 Oliver established the second species in the genus and named it *Tacazzea apiculata* based on specimens collected from a liana species found on the banks of the Madi Stream in Uganda by Speke and Grant in 1862.

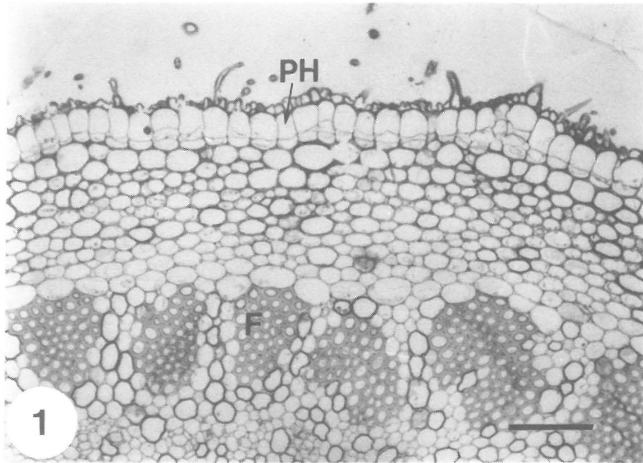
By the time that N.E. Brown treated the genus for the

Flora of Tropical Africa in 1902, several new species were added to *Tacazzea*. Amongst them *Tacazzea conferta*, a liana species collected at Efat in Ethiopia by Roth in 1842 and which was named and described by Brown himself in 1895. He also recognized the similarity between Decaisne's *Tacazzea venosa* and *Aechmolepis rosmarinifolia* referred to above and transferred the latter as species to *Tacazzea*.

Between 1902 and 1954 some more species were described, noteworthy here the species *Tacazzea tomentosa* by Bruce in 1937 from a specimen collected in that same year by Eggeling in north-west Uganda. Strangely and in contrast to the other species of *Tacazzea*, *T. tomentosa* was found in semi-arid savanna, the type of habitat in which *Periploca* is more commonly found. Morphologically, *Tacazzea tomentosa* also agrees much more with *Periploca* and it is thus omitted from this monograph.

The most recently added new species is *Tacazzea galactagoga* which was described by Bullock in 1954. However, this is a synonym of *Tacazzea conferta*. Out of the total of 17 species and three varieties described, four species are maintained. These are *Tacazzea apiculata* Oliv., *T. conferta* N.E. Br., *T. rosmarinifolia* (Decne.) N.E. Br. and *T. venosa* Decne. No subspecific taxa are distinguished here. Lectotypes have been chosen by the authors, from among the available isotypes or syntypes.

The present monograph is the first for the genus. So far discussions and descriptions of *Tacazzea* appeared in the regional floras, Flora of Tropical Africa (Brown 1902), Flora Capensis (Brown 1909), Flora of West Tropical Africa (Hutchinson & Dalziel 1931; Bullock 1963) and in notes on the African Asclepiads by Bullock 1954. The monograph is based on an investigation of herbarium material supplemented by field observations and fresh material of *Tacazzea apiculata*. Pollen was



**Figure 1** Segment of the stem of *T. apiculata* [Venter 8987 (BLFU)] showing the origin of phellogen (PH). F – extra-xylary fibers. Scale bar = 100  $\mu\text{m}$ .

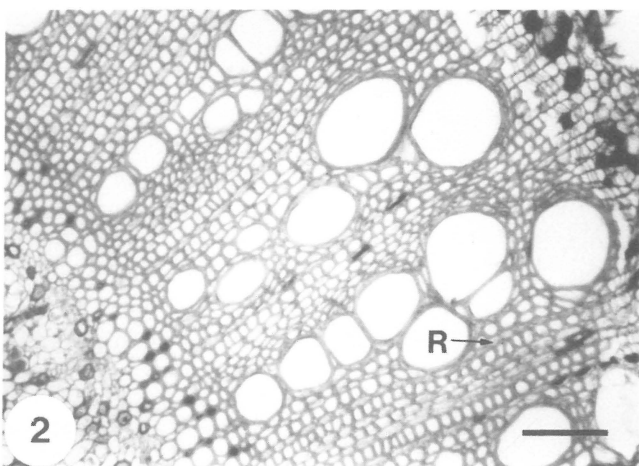
collected from all four species and studied by light and electron microscopy (Verhoeven *et al.* 1989). Anatomical studies supplemented the investigation.

Specimens from the following herbaria were studied: ALF, BLFU, BM, BOL, BR, COI, FI, G, GRA, K, LISC, M, MO, NBG, NH, NU, P, SRGH, W, WAG, WIND and Z. Unless indicated all specimens cited in this revision were seen by the first author. The localities of the specimens cited are listed as for example 14S25E(AB) being 14° south latitude and 25° east longitude, with AB being the 1/16-degree square location. Indumentum types were identified and named following Lawrence (1951) and shapes of leaves, bracts, sepals, etc. follow the recommendations of the Systematics Association (1962). No glands or glandular hairs are present.

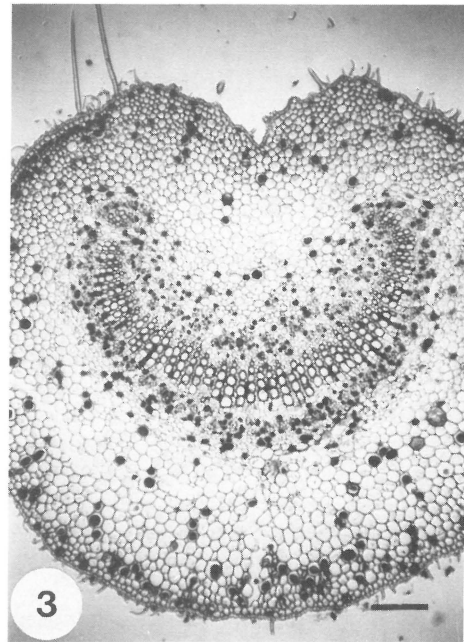
## Results

### Anatomical characteristics

Specimens chosen from different localities within the



**Figure 2** Segment of the stem of *T. apiculata* [Venter 8799 (BLFU)] showing continuous xylem cylinder with uniseriate rays (R). Scale bar = 100  $\mu\text{m}$ .



**Figure 3** Petiole of *T. apiculata* [Venter 8799 (BLFU)] showing the typical shape. Scale bar = 200  $\mu\text{m}$ .

distributional range of *Tacazzea* were studied anatomically. Stems and leaves freshly fixed in FAA and dry herbarium material were prepared. Dry herbarium material was treated according to the method of Franklin (1983) prior to fixation. Material for the light microscope was embedded in Histosec wax. Transverse sections, 10  $\mu\text{m}$  thick, were stained with Safranin and Fast Green and mounted in Entellan.

Material for use in the scanning electron microscope was fixed in 3% glutaraldehyde (0.1 mol  $\text{dm}^{-3}$  phosphate buffer, pH 7.0), dehydrated in ethyl alcohol, critical-point dried and sputter coated with gold. The material was examined with an ISI 100 SEM at 20 kV.

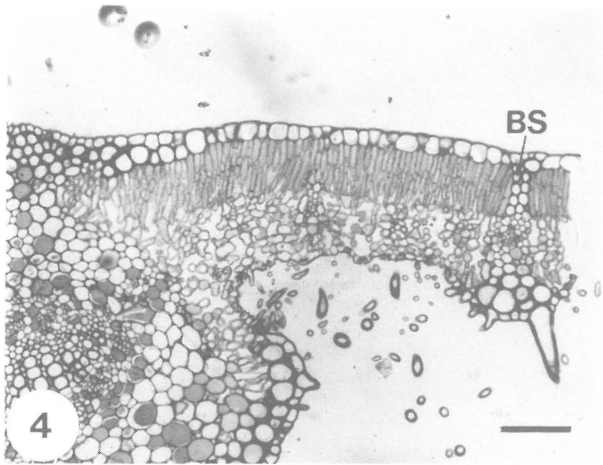
### Stem

The epidermis is uniseriate with stomata seldom occurring. Unicellular and multicellular non-glandular trichomes, similar to those on the leaves are usually present. The phellogen arises superficially in the collenchyma layer directly beneath the epidermis (Figure 1). The bicollateral vascular bundles are sheathed by extra-xylary fibers which occur in groups separated by parenchyma cells. The xylem in the form of a continuous cylinder is traversed by uniseriate rays (Figure 2).

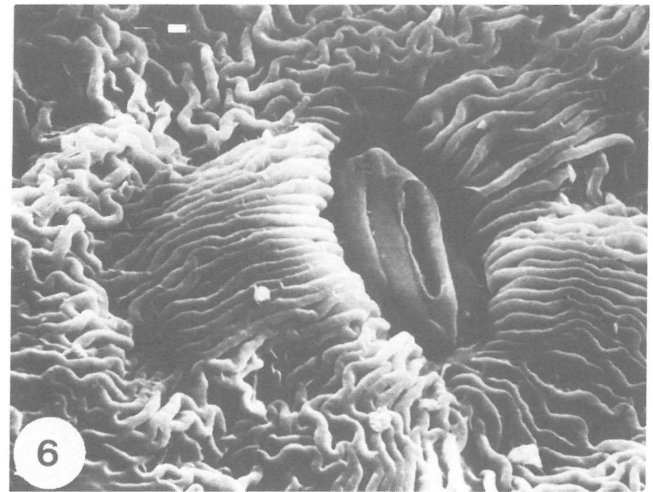
### Leaf

The leaf anatomy of all the species is basically the same. The petiole (Figure 3) is adaxially grooved in all the species. The epidermis is uniseriate with trichomes. The peripheral part of the cortex consists of collenchyma and the deeper layers of parenchyma. Tannin-containing cells are conspicuous in the cortex and phloem. The vascular tissue is arranged in a single bicollateral vascular bundle without extra-xylary fibers.

The leaves are dorsiventral (Figure 4) and hyposto-



**Figure 4** Segment of the leaf of *T. apiculata* [Venter 8987 (BLFU)] showing structure of mesophyll and bundle sheath extension (BS). Scale bar = 100  $\mu\text{m}$ .



**Figure 6** Scanning electron micrograph of *T. venosa* [Schimper 636 (K)] stoma with striae extended as lateral wings. Scale bar = 1  $\mu\text{m}$ .

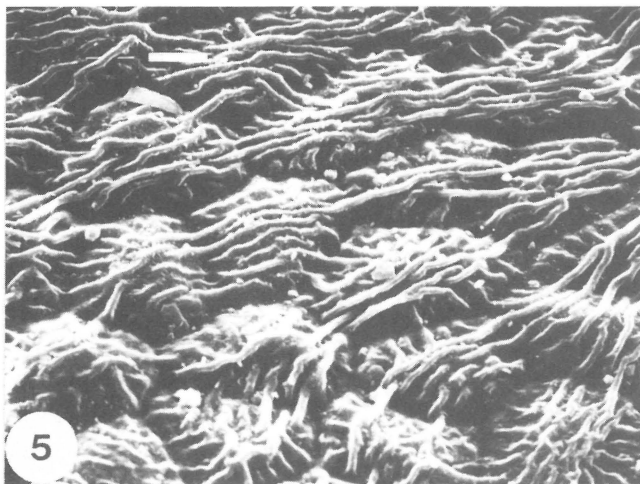
matic with paracytic stomata. In transection the uniserial adaxial epidermal cells are larger than the abaxial epidermal cells. The epidermis is covered with a cuticle which reveals wavy parallel striae (Figure 5). In *T. apiculata* the cuticle varies from slightly striated to smooth. Perpendicular to the guard cells the striae are forming radiating wings (Figure 6). Trichomes, with warty outgrowths, are conspicuous on abaxial leaf surface of all the species (Figure 7, 8 & 9). On the adaxial leaf surface the density of the trichomes varies from scattered to almost glabrous. The mesophyll consists of a single layer of palisade parenchyma and irregularly arranged spongy parenchyma. The palisade is not continuous but interrupted by collenchyma at the main vein and by bundle sheath extensions at the lateral veins (Figure 4). The midrib has a single bicollateral vascular bundle embedded in parychyma cells and is abaxially and adaxially strengthened by a number of collenchyma cells.

#### Taxonomy

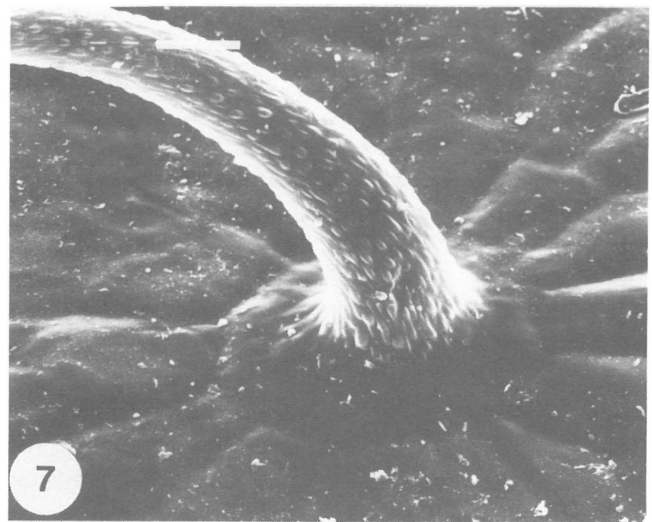
*Tacazzea* Decne., Asclepiadaceae in DC., Prodrum 8: 492 (1844); Benth.: 745 (1876); K. Schum.: 215 (1895a); N.E. Br.: 260 (1902), 540 (1909); Bullock: 350 (1954); Huber: 7 (1967); R.A. Dyer: 471 (1975). Type: *Tacazzea venosa* Decne.

*Aechmolepis* Decne.: 493 (1844).

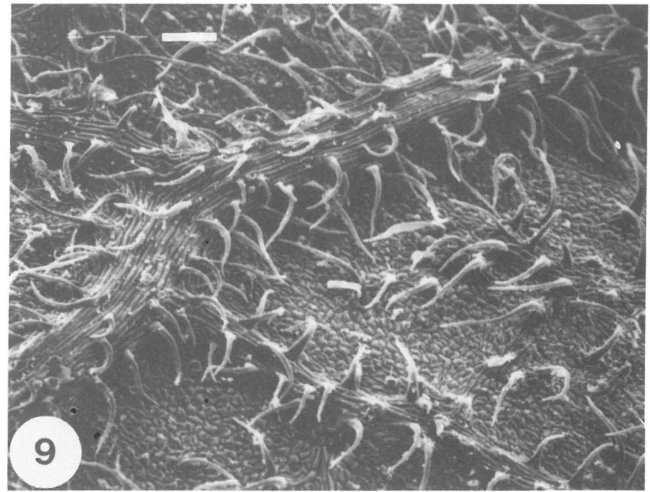
Large lianas or erect virgate shrubs. *Stems* perennial, woody, climbing or erect, young stems puberulous or tomentose, older stems glabrous, bark brown and often verrucose. *Leaves* mostly opposite, sometimes alternate, rarely whorled, puberulous; petiole short to long, with interpetiolar toothed ridges; blade linear-ovate, narrowly to broadly ovate or elliptic to broadly elliptic, adaxially glabrous to puberulous, abaxially puberulous, base narrowly to broadly cuneate, obtuse or cordate,



**Figure 5** Scanning electron micrograph of the adaxial leaf surface of *T. rosmarinifolia* [Gossweiler 2310 (K)] illustrating wavy parallel cuticular striae. Scale bar = 10  $\mu\text{m}$ .



**Figure 7** Scanning electron micrograph of *T. apiculata* [Venter 8978 (BLFU)] trichome showing warty outgrowths. Scale bar = 10  $\mu\text{m}$ .



**Figures 8 & 9** Scanning electron micrographs of abaxial leaf surfaces of *Tacazzea* species showing trichome density. **8.** *T. apiculata* [Venter 8978 (BLFU)]. **9.** *T. rosmarinifolia* [Gosswiler 2310 (K)]. Scale bar = 100  $\mu$ m.

apex apiculate, acuminate to obtuse or emarginate and mucronate, sometimes with prickles on midrib adaxially, margin entire. *Inflorescence* a cymose panicle with dichasial and monochasial branches, axillary at terminal nodes, bracts narrowly to broadly ovate, apex acuminate. *Flowers* pentamerous, actinomorphic, bisexual, partly epigynous. *Sepals* 5, free, pale green to reddish, broadly ovate, apex acuminate to obtuse, glabrous to puberulous, margin ciliate, with pairs of dentate lobules at inner base. *Corolla* pale green, pale yellow to reddish, tube short, lobes 5, broadly ovate to oblong-ovate or oblong, apex obtuse, glabrous to sparsely puberulous. *Corona* arising from corolla mouth, uniseriate, long lobes alternating with short lobules; long lobes 5, filiform to narrowly ovate and antisepalous; lobules 5, antipetalous, alternating with staminal filaments and encircling style, subquadrate, emarginate or bifid. *Stamens* 5, epipetalous; filaments free, fused to inner base of long corona lobes; anthers 2-theous, glabrous, fertile basal part broadly oblong and fused to stigma, sterile apices connivent over gynostegium; pollen carriers ovate, obovate or rhomboidal with viscidium elliptic, orbicular or bifid; pollen tetrads rhomboidal, tetragonal, tetrahedral or decussate, exine smooth, pores 4–6 per single grain. *Gynoecium* of 2, free, half-inferior, hemispherical ovaries, ovules numerous; styles 2, free, terete; gynostegium broadly angular-ovoid. *Follicles* paired, divergent, cylindrical-ovoid to ovoid, apex sharply or bluntly acuminate, glabrous to puberulous or tomentose. *Seed* narrowly ovate with terminal coma of hairs.

#### Diagnostic features

Lianas or virgate shrubs. Stems perennial, climbing or erect. Leaves linear-ovate, narrowly to broadly ovate or elliptic to broadly elliptic. Inflorescence a cymose panicle. Corolla pale green, pale yellow to reddish, tube short (almost absent). Corona arising from corolla mouth, uniseriate, long filiform to narrowly ovate lobes

alternating with short subquadrate lobules. Stamens fused to inner base of long corona lobes.

#### Distribution and ecology

*Tacazzea* is widely distributed throughout the tropics and sub-tropics of Africa. Its species are found from Transkei, in the south-east, through the equatorial forests and highlands of eastern and central Africa to Ethiopia, in the north-east, and westwards to south-western and western Africa.

The two liana species are found in swamp forests along fresh water courses and lakes, from lowland coastal areas to mountainous areas. The two shrubby species are found in more arid areas but are associated with water courses.

#### Key to the species of *Tacazzea*

- 1a. Erect shrubs; leaves linear ovate to narrowly ovate (restricted to Ethiopia, south Angola and Zaire) ..... **2.**
- 1b. Lianas; leaves ovate, broadly ovate to elliptic or broadly elliptic (widely distributed in Africa) ..... **3.**
- 2a. Corona lobes shorter than corolla lobes, subulate to narrowly ovate and fleshy (restricted to Angola and Zaire) ..... **3. *T. rosmarinifolia***
- 2b. Corona lobes as long as corolla lobes, filiform with apex helically twisted (restricted to Ethiopia) ..... **4. *T. venosa***
- 3a. Leaf blade with apex obtuse-acuminate to obtuse or emarginate, mucronate and base obtuse to cordate; panicles with peduncles and pedicels slender and frail; follicles 180° divergent, narrowly ovoid with apex long-apiculate, 30–85 mm long ..... **1. *T. apiculata***
- 3b. Leaf blade with apex acute to acuminate and base cuneate or obtuse-tapering; panicles with peduncles and pedicels sturdy; follicles slightly divergent, cylindrical-ovoid with apices obtuse-acute, 70–195 mm long ..... **2. *T. conferta***

**1. *Tacazzea apiculata* Oliv.** in Transactions of the Linnean Society 29: 108 (1875); K. Schum.: 320 (1895b); N.E. Br.: 267 (1902); A. Chev.: 196 (1913); Brenan: 68 (1949); Tisserant: 24 (1950); Bullock: 354 (1954), 83

(1963). Type: Uganda: on the banks of the Madi Stream, *Speke & Grant 711* (K!), lecto. here designated); White Nile near Gondokoro, *Speke & Grant s.n.*, 22 February 1863 (K!).

*Tacazzea welwitschii* Baill.: 807 (1889); Schltr.: 314 (1896); Hiern: 678 (1898); N.E. Br.: 264 (1902). Type: Angola: Pungo Andongo, between Luxillo and Gazella, *Welwitsch 4208* (P!, lecto. here designated; BM!, COI!, G!, K!); Huila, Catumba, *Welwitsch 4209* (BM!, K!).

*Tacazzea thollonii* Baill.: 807 (1889); N.E. Br.: 266 (1902). Type: Zaire: Ogôone, *Savorgon 507* (P!, holo.).

*Tacazzea barteri* Baill.: 808 (1889); N.E. Br. 266 (1902); A. Chev.: 429 (1920); Hutch. & Dalz.: 52 (1931). Type: Nigeria, *Barter 1086* (P!, holo., K!).

*Tacazzea brazzaeana* Baill.: 242 (1890), nomen.

*Tacazzea verticillata* K. Schum. 115 (1893); N.E. Br. 265 (1902); Schltr.: 339 (1903). Type: Gabon: Kitamba on the Kuango River, *Buchner 612* (B†?, K!, lecto., here designated).

*Tacazzea apiculata* var. *glabra* K. Schum.: 116 (1893) in adnot., 216 (1895a); N.E. Br.: 267 (1902); Hutch. & Dalz.: 52 (1931); A. Chev.: 429 (1920). Type: Gabon: Seriba Ghattas, *Schweinfurth s.n.* (B†?).

*Tacazzea apiculata* var. *benedicta* Scott Elliot: 91 (1895); N.E. Br.: 267 (1902); A. Chev.: 429 (1920); Hutch. & Dalz.: 52 (1931). Type: Sierra Leone: Dantilia River between Niger and Falaba, *Scott Elliot 5269* (K!, holo.; Z!).

*Tacazzea kirkii* N.E. Br.: 248 (1895), 268 (1902), 540 (1909); Eyles: 446 (1916); Brenan: 68 (1949). Type: Mozambique: Zambesi Region, Lupata, *Kirk*, anno March/June 1859 (K!, lecto., here designated); Zambesi Region, Tete, *Kirk*, anno March/April 1860 (K!); South Africa: Natal, *Gerrard 1796* (K!).

*Tacazzea nigritana* N.E. Br.: 248 (1895), 265 (1902); Hutch. & Dalz.: 52 (1931). Type: Nigeria: Niger Region, Aboh, *Barter 486* (K!, holo.).

*Tacazzea stipularis* N.E. Br.: 255 (1902), *nomen superfluum*, in obs.

*Tacazzea bagshawei* S. Moore: 88 (1906). Type: Uganda: Entebbe, *Bagshawe 745* (BM!, holo.).

*Tacazzea bagshawei* var. *occidentalis* Norman: 92 (1929). Type: Angola: Cuanza Region, Quilela Camabatela, *Gossweiler 8467* (BM!, holo.).

Large perennial liana. *Stems* woody, climbing, up to c. 20 m long and c. 0.15 m in diam., branched, young stems somewhat tomentose, older stems with glabrous reddish-brown bark. *Leaves* opposite, pale green to dark green, semi-coriaceous; petiole (3–)12–20(–60) mm long, sparsely puberulous; blade (30–)65–100(–215) × (20–)30–70(–120) mm, ovate to broadly ovate or elliptic to broadly elliptic, base obtuse to cordate, apex obtuse-acuminate to obtuse or emarginate, with brown mucro 0.5–3 mm long, adaxially glabrous to sparsely puberulous, tertiary veins conspicuously netted, abaxially whitish to greyish and tomentose. *Inflorescence* of panicles at terminal 5–10 nodes; peduncles slender and frail, (3–)10–35(–60) × 0.5–1 mm, whitish tomentose; pedicels (2–)4–12(–15) × 0.3–0.5 mm, puberulous; bracts c. 1 mm long, ovate, sometimes puberulous on

outside, margin ciliate. *Sepals* broadly ovate, c. 1.5 × 1.5 mm, pale green to brownish-red, apex acuminate to obtuse, outside puberulous, margin ciliate. *Corolla* pale green to pale yellow or reddish, glabrous; tube 0.5–1 mm long; lobes ovate, 5–7 × 2 mm, apex obtuse to acute. *Corona*: long lobes 6–12 mm long, pale green to yellowish or reddish, basally ovate becoming filiform terminally with apex helically twisted and sometimes bifid or trifid; short lobules c. 2 × 2 mm. *Stamens* c. 1.5 mm long; filaments c. 0.5 mm long, terete; anthers ovate with sterile acuminate apex, c. 1 mm long; pollen carriers c. 1 × 0.5 mm, rhomboidal with viscidium sub-orbicular; pollen tetrads tetragonal (40 × 38 μm) or rhomboidal (43 × 41 μm). *Ovaries* c. 1 mm long, gynostegium subsessile, apex conical, c. 1 mm long. *Follicles* 180° divergent, narrowly ovoid with apex long-apiculate, (30–)50–70(–86) × (4–)6–12(–15) mm, hirsute or tomentose to softly puberulous or glabrous. *Seed* 3–9 × 2–4 mm; coma 20–45 mm long. (Figures 10 & 11.1).

#### Diagnostic features

Large liana. Leaves opposite with blade ovate to broadly ovate or elliptic to broadly elliptic, base obtuse to cordate, apex obtuse-acuminate to obtuse or emarginate and mucronate, tertiary veins adaxially conspicuously netted. Inflorescence with peduncles and pedicels slender and frail. Long corona lobes filiform with apex helically twisted. Follicles 180° divergent, narrowly ovoid with long-apiculate apices, c. 50–70 mm long, usually very hirsute.

#### Distribution and ecology

*Tacazzea apiculata* is not only the most widely distributed but also the most polymorphic species of the genus. It is widely distributed in tropical and subtropical Africa, from the east coast to the west coast and from Ethiopia in the north-east to Transkei in the south-east (Figure 12).

This large liana species inhabits the margins of tropical forests along fresh water lakes and rivers and occurs from sea level to an altitude of approximately 2 000 m. It is distributed in so many different habitats such that a variety of morphological forms are distinguishable. In Central Africa where no seasons occur, flowering and fruiting take place throughout the year. In the subtropical regions flowers are borne in the spring and early summer. The fruit ripens about 4 months later when the seed is dispersed by the wind. Nothing is known of the pollination of this species. Although large ants were observed on the species in Zimbabwe, they are probably only nectar thieves.

Attempts to extract rubber from this species failed since the production of latex was too slow. It is said to be very poisonous, although powdered leaves are allegedly used in the Cameroons, to rub onto the skin to alleviate the itching of 'crawcraw' (notes on herbarium specimen labels).

Vernacular names: Cameroons: 'Wakwange'; Botswana: 'Sirozinama litiella'; Ethiopia: 'Dali' (Dassanetch

tribe), 'Shag-el-fil', 'Halleyu', 'Abou Lebben', 'Abay Weng'; Nigeria: 'Yadiyar kada' (Hausa); Sudan: 'Bugli' (Zande) or 'Riga'; Tanzania: 'Mugombogombo' (Turu); Uganda: 'Murondwa'; Zaire: 'Inoolo o bosambala' (Turumbu) or 'Solo e fufow' (Turumbu), 'Gbandja' (Dungu territory).

#### Specimens examined

Angola: — 06S14E: Chianga, Quanza Sul. (-AA), *Teixeira & Seles 6280* (SRGH).

— 06S15E: Distr. Pungo Andongo, Quilanga (-CB), *Welwitsch 4210* (BM, K).

— 07S20E: NE of Luanda, de Chitato, Loc. Dundo (-BD), *Gossweiler 13751* (K).

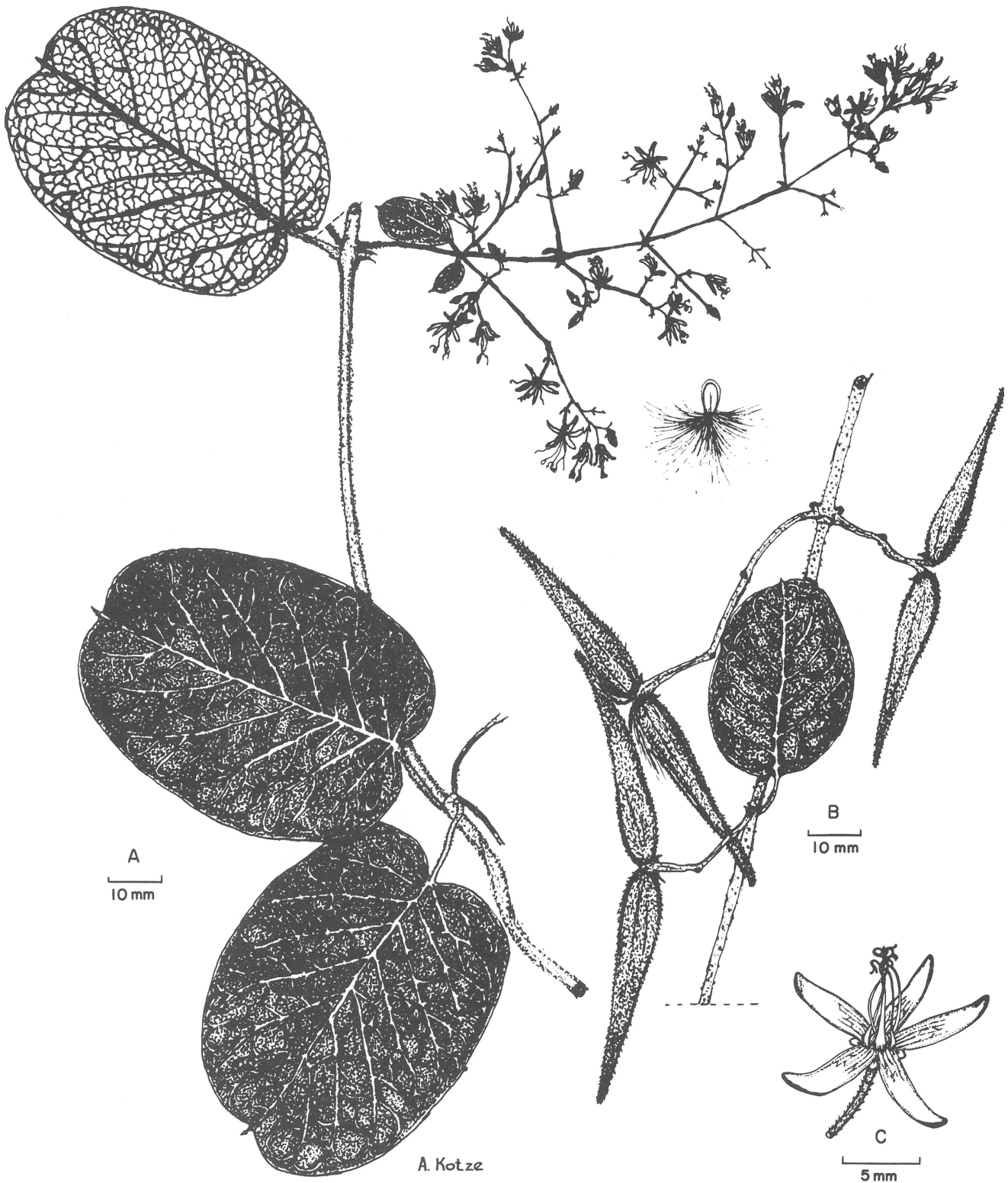


Figure 10 *Tacazzea apiculata*. A. habit; B. follicles; C. flower [A: *Chase 2229* (BM), B & C: *Brummitt & Eccles 8823* (K)].

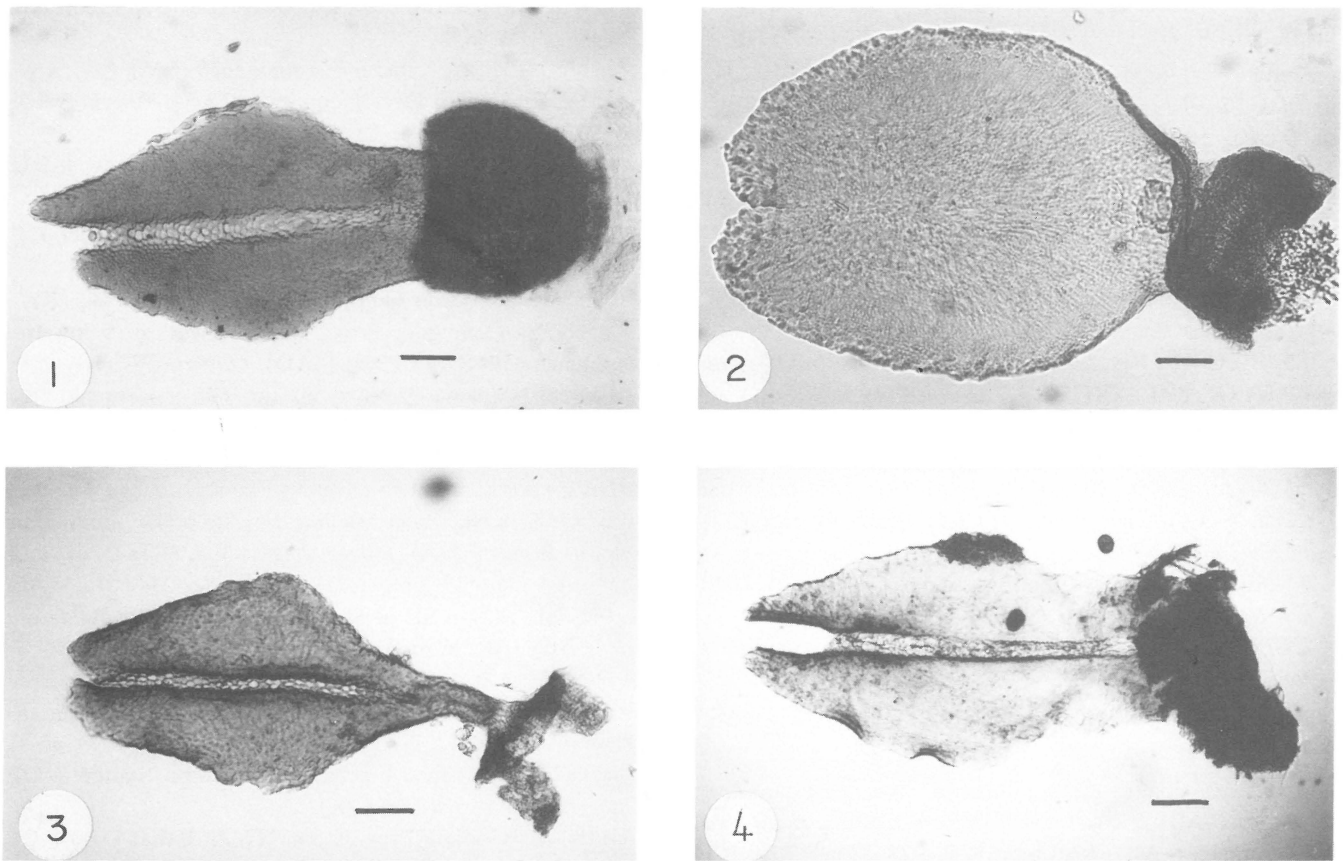


Figure 11 Pollen carriers of 1. *Tacazzea apiculata*, 2. *T. conferta*, 3. *T. rosmarinifolia* and 4. *T. venosa*. Scale bar = 0.1 mm.

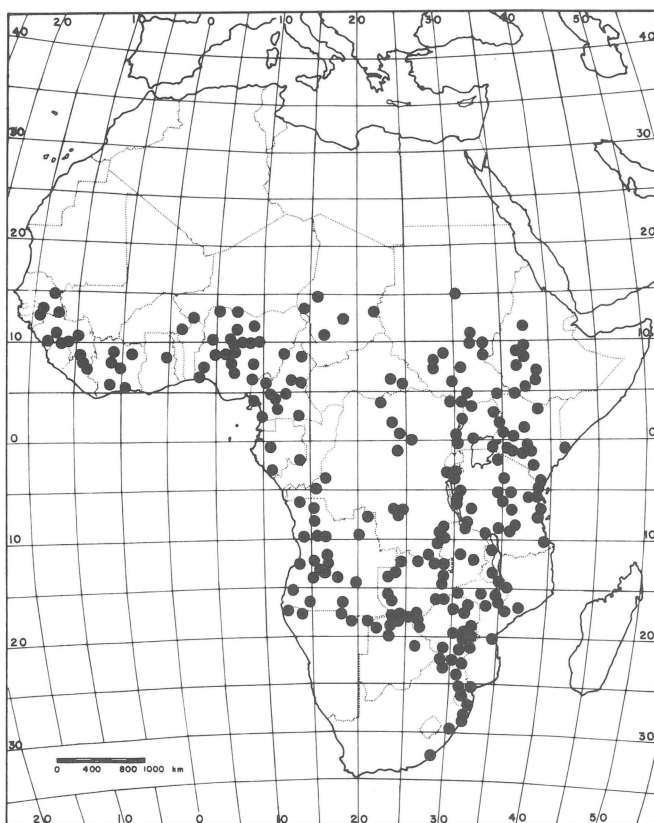


Figure 12 Known geographical distribution of *Tacazzea apiculata*.

- 08S15E: Cuanza Reg., loc. Quilela, Camabatela near source of R. Fenza (–AB), *Gossweiler 8467* (BM, BR).
- 09S14E: Huila, Catumba (–CB), *Welwitsch 4099* (BM, K).
- 09S15E: Pungo Andongo, between Luxillo and Cazella (–DA), *Welwitsch 4208* (BM, COI, G, K).
- 09S16E: Malange (–CB), *van Mechow 320* (M); Malange, loc. Colonato do Cole (–DA), *Raimunco & Matos 521* (BR).
- 09S20E: Lunda, R. Cassai (–CA), *Exell & Mendonca* (BM).
- 11S16E: Dist. Bie-Andulo, loc. Moxito do Chilessso, Camacupa Canata (–DA), *Teixeira 9962* (COI).
- 12S13E: Lobito (–BC), *Gossweiler 9326* (BM, K).
- 12S15E: Benguella, between Ganda and Caconda (–AA), *Hundt 759* (BM, COI); Dist. Huambo, Nova Lisboa (–DD), *Silva 2678* (COI).
- 12S16E: Reg. Bihe, loc. Bie (–BD), *Gossweiler 1930* (BM); Huambo, Bela Vista (–CA), *da Ponte s.n.* (SRGH).
- 13S16E: Dist. Bie, Chitembo (–DA), *Teixeira 10896* (COI).
- 14S15E: Huila, Lubango, Sa da Bandeira (–AA), *Couto 85* (K, LISC, SRGH).
- 14S17E: Cuando-Cubango, Vila Serpa Pinto, near Cueba River (–BB), *Barbosa & Moreno 9941* (COI, K, LISC).
- 14S19E: Kitamba on R. Kuango (–BD), *Buchner 612* (K).
- 15S13E: Huila, loc. Tchivinguiro (–AB), *Gossweiler 13123* (LISC); Tchivinguiro, Mission Caholo (–AB), *Barbosa & Moreno 10048* (SRGH).
- 16S14E: Huila, Mucope, Tehicha, Lagoa do Pocolo (–BD), *Henriques 215* (K).

- c. 16S18E: Kubango at Chirumba (–), *Baum* 276 (BM, COI, K, M, W, Z).
- Botswana: — 17S25E: Chobe River, Kasane (–CC), *Gibbs Russell & Biegel* 1355 (K, SRGH); Chobe River bank, Serondela (–CC), *Muller B/1280* (K, PRE); Chobe 'rapids' near Kasane (–CD), *Pole Evans* 4622 (PRE).
- 18S22E: Bank of Okavango River, below Sepopa (–CA), *Smith* 1547 (K, MO, PRE, SRGH).
- 18S23E: Kwando (–BC), *Williamson* 122 (K, MO, PRE, SRGH); Kwando Gauge Post (–CB), *Williamson* 77 (BR, K, PRE, SRGH).
- 18S24E: Chobe River, 40 km N. of Kachikau (–AB), *Pole Evans* 374 (K, PRE, SRGH).
- 19S23E: Okavango Delta, North of Shindi Lediba (–AA), *Smith* 385 (MO, PRE, SRGH); Okavango Delta near Lopis Island (–AA), *Smith* 334 (BR, K, MO, PRE, SRGH); Road to Kwaai (–BA), *Pole Evans* 414 (K); Boro River (–CD), *Smith* 229 (NBG, SRGH).
- 20S26E: Nata River, 10 km upstream from Nata R. Delta (–CC), *Ngoni* 525 (K, PRE, SRGH).
- 22S29E: Tuli Block, Farm Merryhill (–AA), *Stephen & Wilson* 536 (PRE).
- Burkina: — 11N01E: Arly, forest fringing Arly River (–CB), *Geerling & Bokdam* 2702 (BR, WAG).
- Burundi: — 03S29E: Terr. Bubanza, Loc. Randa, River Kidwebezi (–AB), *Lewalle* 6430 (BR, K); Bubanza, Randa, valley Mpanda (–AB), *Reekmans* 9260 (BR); Plain Rusizi, 14 km from Kajeke (–AD), *Reekmans* 8540 (BR).
- 03S30E: Valley River Karuzi, c. 10 km from Karuzi (–AA), *van der Ben* 2164 (BR, K); Terr. Kitega, confluence of Karuzi-Ruvuba (–AC), *van der Ben* 2372 (BR, K); Route Ruyigi-Kwisumo (–AC), *Reekmans* 7268 (BR, K); Route Gitega-Ryigi km 32 pont Nyakijanda (–CA), *Reekmans* 7148 (BR, K).
- Cameroons: — 02N09E: Buia (–BB), *Mildbraed* 9438 (K).
- 02N14E: Baréto (–AC), *Mildbraed* 9668 (K).
- 03N09E: Sanaga River, near ferry Nachtigal, c. 20 km N. of Ohala (–CC), *de Wilde & de Wilde-Duyffes* 2670 (BR, K, WAG); Sanaga Forest Area (–DA), *Zenker* 1448 (BM, BR, COI, G, M, K, WAG, Z).
- 03N11E: Bank of the Nyong River, 40 km SE of Yaoundé (–BC), *Breteler* 1770 (WAG).
- 04N10E: Nde-Noun, 20 km NNE from Ndikinimeki (–DD), *Letouzey* 11255 (BR).
- 04N11E: Nyong River, Ebogo, SSW of Mbaimayo (–AD), *Letouzey* M285 (BR, K, WAG).
- 04N12E: S. of Sanaga between Jaunde & Dengdeng, near confluence of the Lom and Djerem, 165 km NE of Jaunde (–DC), *Mildbraed* 8397 (K).
- 05N10E: River Noun, c. 21 km NNE from Tonga (–CC), *de Wilde & de Wilde* 2468 (BR, WAG).
- 06N13E: Lom River (–AC), *Mildbraed* 9186 (K).
- 06N14E: Kongolo (–AB), *Mildbraed* 9140 (BM, K).
- 08N14E: Bodo (–AD), *Fotius* 1333 (G).
- Central African Republic: — 06N23E: Region Bozoum, Riv. Koyali (–AD), *le Testu* 3092 (BM).
- Chad: — 10N16E: Pont du Ba-lili (–DA), *Andru* 56 (ALF).
- 11N17E: Baguirmi, region of Lake Fitri (–AA), *Chevalier* 9757 (K).
- 12N18E: Baguirmi, region of Lake Fitri Korbo (–AB), *Chevalier* 9339 (K).
- c. 13N14E: Lake Chad (–), *Talbot* 1018 (BM).
- 13N22E: Soudan Occ. Goundang (–AA), *Chevalier* 2695 (COI).
- 14N15E: Lake Chad et Kanem, Fort Lamy (–DD), *Chevalier* 10364 (Z).
- Ethiopia: — 04N36E: SW extreme along Omo River (–CC), *Carr* 870 (K).
- 05N36E: SW lower Omo Valley (–AA), *Tornay* 41 (K).
- 05N37E: Gemugofa Prov., Woito River, c. 5 km from confluence with Sagan River (–AD), *Gilbert* 1572 (K).
- 06N38E: Sidamo Prov., c. 60 km NW of Kebre Mengest along rd. to Agere Selam (–BA), *de Wilde* 5994 (WAG); c. 12 km S. of Wondo along rd. to Kebre Mengest (–CB), *de Wilde & Gilbert* 304 (WAG).
- 07N36E: Kaffa Prov., Bellete Forest, 41 km from Jimma towards Bonga (–DA), *Gilbert* 2006 (K); c. 8 km E. of Jimma along rd. to Addis Ababa (–DB), *de Wilde* 5234 (BR, WAG).
- 07N38E: 20 km SE of Shashemené (–BA), *de Wilde et de Wilde* 7057 (BR, WAG).
- 08N37E: Nari (–CB), *Corradi* 8059 (F), 8060 (F).
- 09N36E: c. 10 km W. of Lekemti (–BA), *de Wilde et de Wilde* 6725 (BR, K, WAG).
- 09N37E: Wallega, Fincha Hydroelectric Station (–DB), *Gilbert M.G. & S.B.* 1968 (K).
- 11N37E: Godjam Prov., 2 km NW of Bahar Dam (–CB), *Sebald* 2115 (M), 2136 (M); Bacino del Lago Tana, Bahir-Dar (–CB), *Pichi-Sermolli* 2136 (K, MO).
- Gabon: — 01S10E: Waka, 60 km N. of Bambau (–BD), *Tisserant* 1491 (BM).
- 02S10E: Pakozambi (–DD), *Le Testu* 1133 (BM, BR).
- 02S14E: Haut-Ogooué? (–AA), *Le Testu* 5152 (BM).
- Ghana: — 08N00W: Ekumdipe, Kpandai to Salapa (–AC), *Hall* 40410 (MO, WAG).
- Guinea: — 08N09W: La Koukoré (–AB), *Pobeguïn* K12 (P); Macenta (–CB), *Jacques-Felix* 831 (P); Entre Macenta et Gueckedon (–DA), *Roberty* 7182 (Z); Macenta, Sérédou (–DA).
- 10N09W: Kouroussa (–DB), *Pobeguïn* 805 (P), 1008 (P).
- 10N10W: Faranah (–BA), *Chevalier* 13191 (P).
- 10N12W: Kindia (–BB), *Jacques-Felix* 1607 (P), Mamou (–CA), *Pobeguïn* 1589 (P), *Chevalier* 12711 (P); Ditinn (Fouta Djallon) (–CC), *Chevalier* 12947 (P).
- Guinea Bissau: — 12N13W: Gabu, entre Pitche Burumtuma (–BD), *Santo* 2708 (LISC).
- Ivory Coast: — 05N03W: Bank of Comoé River, opposite Grand Bassam (–BA), *de Wilde* 480 (BR, WAG, Z); Near Canal d'Assini, E. of Grand Bassam (–BA), *Oldeman* 149 (BR, WAG).
- 05N04W: Swamp near Agnéby, 6 km E. of Dabou (–AD), *Leeuwenberg* 4582 (BR, WAG); Agnéby (–AD), *Assi* 8881 (G).
- 05N06W: Sassandra River, W. from Soubré near Niamagbi (–CC), *de Wilde* 165 (WAG).
- 07N05W: Bouaké (–CA), *Roberty* 6877 (G).
- 08N03W: 30 km N. of Kakpin (–DD), *Geerling & Bokdam* 738 (BR, WAG).
- 08N06W: 17 km NW of Mankono, near Marahoné River



- (-AA), *de Wilde 958* (WAG).  
 — 09N03W: Near Iringo River, along road from Saye to Gawi (-BA), *Geerling & Bokdam 234* (WAG).  
 — 09N05W: Kiemou, 60 km S. of Korhogo (-BA), *Geerling & Bokdam 2722* (BR, WAG); 20 km S. of Korhogo on road to Dikodougou (-BC), *Versteegh & den Outer 503* (WAG); Sakasso, Koka (-DA), *Boudet 2749* (ALF).
- Kenya: — 00N35E: Rift Valley Prov., Sirikusa? Hoeyes Bridge on Nzoia River (-CA), *Tweedie 4075* (BR, K).  
 — 00N36E: K3, Laikipia, Kisima farm near Narok-river-turbine (-AD), *Bally 15081* (K).  
 — 01N37E: N.F.P., Mandasion, Mathews Range (-AD), *Kerfoot 2576* (K).  
 — 03N39E: N. Province, Moyale (-CA), *Gillett 13568* (BM, BR, G, K, LISC, SRGH, W).  
 — 00S33E: N. Front. Province, Garissa (-BC), *Bally 1976* (K).  
 — 00S35E: Nyanza Prov., Kericho Distr., south-west Mau Forest (-CB), *Geesteranus 5738* (COI).  
 — 00S37E: K4, Embu Dist., crossing on Embu-Meru Road (-BC), *Gillett & Mathew 19082* (K); Kirinyaga Distr., Tebere Cotton Research Station (-CB), *Robertson 2084* (K, SRGH); S. bank of Thiba River, below new bridge near Mashamba (-DA), *Robertson 1898* (K); Machakos Distr., Kindaruma Dam, Tana River (-DD), *Gillett & Faden 18217* (K).  
 — 01S35E: Narok Distr., Musilo (-BB), *Paulo 694* (K, MO).  
 — 01S36E: Nairobi Distr., Ngong Forest (-BC), *Napier 6207* (BR, K); Nairobi, Morogogo, 1.6 km S. of Mkata Station (-BD), *Welch 359* (K); Machakos Distr., Valley of Athi River at Athi (-BD), *Polhill 224* (BR, K).  
 — 01S37E: K4, Thika Distr., Thika, Chania River (-AA), *Faden 67433* (K); Thika Distr., 14-Falls (-AB), *Robertson 1535* (K), *Verdcourt 1570* (BR, K); River Athi, 32 km past Thika (-AD), *Bally 8628* (K).  
 — 02S37E: S. Province, Machakos Distr., Chyulu Hills (-DB), *Bally 7924* (G).  
 — 02S38E: Machakos Distr., Masaleni (-AC), *Napper & Kanuri 2057* (K, LISC, WAG).  
 — 03S39E: Kwale Distr., River Matumbi, c. 20 km from Mariakani to Kinangoni (-CD), *Verdcourt 5297* (BR, MO, K), 5293 (K, MO); Mwachi, 5 km S. of Mazeras (-DC), *Drummond & Hemsley 4263* (BR, K).
- Liberia: — 07N08W: Adm. Saniguellie, Vill. Zahn (-BC), *Adam 27798* (BR, M, MO).
- Malawi: — 11S33E: N. Province, Rumphu Distr., N. side of Rumphu Gorge (-BB), *Pawek 13790* (BR, K, SRGH).  
 — 13S33E: Njakwa (-BB), *Benson 1176* (K).  
 — 14S34E: Thumbi Island (-BB), *Salubeni 2238* (SRGH); Tumbi Island East (-BB), *Brummitt & Eccles 8823* (BR, K, SRGH).  
 — 14S35E: Machinga Distr. Makogolo stream in Lipuputa Village (-DC), *Nkhokwe 112* (K).  
 — 15S34E: Shire River, Mpatamanga Gorge (-DA), *Richards 14502* (K); Blantyre Distr., Nkula Falls on Shire River (-DB), *Brummitt 11757* (K, SRGH).  
 — 15S35E: Machinga Distr., Likwenu River outside Liwonde Nat. Park (-AA), *Blackmore 268* (K).  
 — 16S34E: Lengwe Game Reserve (-BD), *Hall-Martin 873* (K).
- Mali: Mountains of Bafny, *Lecard 65* (BR, P, WAG).
- Mozambique: — 15S30E: Zambesi Region, Lupata (-CB), *Kirk March/June 1859* (K).  
 — 15S33E: Zambesi Region, Tete (-CA), *Kirk March/Apr 1860* (K); Tete-Songo (-CA), *Maçêdo 5274* (SRGH).  
 — 16S33E: Tete, Mazoe River, Kabankanywa Kraal (10 km from Zimbabwe border) (-CB), *Wild 2600* (K, SRGH).  
 — 17S35E: Zambesi mid section, Boruma, am Marenza (-BC), *Menyharth 754* (Z), 833 (K, W).  
 — 17S37E: Mocumba Distr., Mamagoa (-AA), *Faulkner 52* (BM, BR, K, PRE?).  
 — 20S34E: Barada Distr., Sisitso (-BA), *Chase 2229* (BM).  
 — 25S32E: Maputo, Moamba, (Uoamba?), Chinhanganine (-BC), *de Koning 7760* (K); Vila Luisa near Bobole (-DA), *Balsinhas 499* (BM, K).
- Niger: — 12N02E: Kirtachi, Seybon, 96 km S. of Niamey (-CD), *Hepper 3846* (WAG).  
 — 13N07E: Madaroumfa (-AC), *de Febrégués 1239* (ALF).
- Nigeria: — 05N06E: Aboh (-DA), *Barter 486* (K).  
 — 06N03E: South Nigeria, West Area: Ebute Ikorodu (-CB), *Gillett 15373* (K).  
 — 06N08E: State B. Plateau, Distr. Keffi, loc. Nyanya (-DB), *Eimunjeze, Adehusuyi & Macauley FHI-66466* (K).  
 — 07N03E: North, Tapa (-DA), *Hambler 476* (K).  
 — 07N06E: Prov. Kabba, Distr. Igala, loc. Ibaji Ojoko Forest Reserve (-BB), *Latilo FHI-47662* (K).  
 — 07N08E: North, Abinsi (-DD), *Dalziel 691* (K).  
 — 08N04E: S. of Samaru, near Zaria (-BB), *Blum 2454* (K).  
 — 08N05E: Prov. Zaria, Distr. Kaduna, banks of Kaduna River (-DD), *Jackson 221* (K).  
 — 08N06E: NW State, Distr. Minna, loc. Gurara Falls, bank of Gurara River (-BA), *Eimunjeze Adebusuyi & Macauley FHI-66385* (K).  
 — 08N12E: Prov. Bemenda, Distr. Wum, River Metschum (-CD), *Ujor FHI-29282* (K).  
 — 09N06E: North, SE districts, near the Abuja road junction towards Gawu (-BB), *Onochie FHI-35384* (K); Zungeru (-CC), *Dalziel 5* (K).  
 — 09N07E: Distr. Gwari, loc. Bonu at Gurara Falls (-AC), *Onochie FHI-40162* (K); Minna, loc. Kafin Koro, Jibidiga Forest Reserve (-CA), *Eimunjeze, Adebusuyi & Macauley FHI-66493* (K); Kaduna Div., at stream 6 km from Kachia towards Kaduna (-DD), *Meikle 1204* (K).  
 — 09N08E: Plateau Prov., loc. Jemaa, 80 km S. of Vou (-AD), *McClintock 183* (K); North, Kagora (-CB), *Sharland 418* (K), 491 (K); Zaria Prov., Jamaa Distr., Nimbria Forest Reserve, bank of River Gimi (-DA), *Latilo FHI-47406* (BR, K); North, Jos Plateau (-DD), *Batten-Poole 294* (K); Naraguta Game Reserve (-DD), *Oyayomi et al. FHI-80405* (K).  
 — 10N04E: Prov. N. Ilorin, Shagunnu, River Niger (-AD), *Cook 383* (K, Z).  
 — 10N06E: Prov. Niger, Distr. Alawa, River Kuzata, just S. of River Kuka (-BC), *Keay FHI-25877* (K).  
 — 10N07E: Prov. Zaria, Distr. Zaria, Loc. Anara Forest Reserve Kan Gimi (-DA), *Keay FHI-25786* (K), KanGimi at River Bahago (-DA), *Keay FHI-22925* (K).  
 — 10N08E: North Prov., Tilde Fulani (-BB), *Lely 231* (K); Prov. Zaria, Distr. Anchau, loc. Banke (-DC), *Ogua FHI-7848* (K).  
 — 10N09E: North, Panshanu near Jos. Bauchi Prov. (-AA),

- Lawlor & Hall 324* (K); Lemme (–AD), *Lely 152* (K); Bauchi Plateau (–BA), *Lely, P. 282* (K).
- 11N07E: Prov. Zaria, Distr. Giwa, c. 1.6 km N. of Iyatawa (River Gora) (–AD), *Keay FHI-25946*; Zaria, Mairabo Plantation (–BA), *Lowe 3* (K).
- 11N09E: Prov. Kano, Loc. Gaya, Duduru (–CC), *Daggash FHI-22393* (K); Faleore? (–DA), *Sharland 1269* (K).
- 13N05E: North, Sokoto Prov., Sokoto (–AC), *Dalziel 525* (BR, K).
- 13N07E: Katsina Division, 8 km W. of Katsina (–BA), *Meikle 988* (K).
- Senegal: — 12N12W: Kanéméré (–CC), *Fotius 138* (ALF, P).
- 13N13W: Ouassadou (–BB), *Berhaut 1342* (BR, P, Z).
- 14N17W: Sangalkam (–CC), *Berhaut 5078* (P), *5092* (P).
- Sierra Leone: — 09N11W: Dantilia River between Falaba and Niger (–CD), *Scott Elliott 5269* (K, Z).
- Somalia: — 00S41E: Sidley, I'Hamari, luugo il Ganana (–DA), *Riva 1093* (Z).
- South Africa: — 22S28E: Limpopo River near Usutu (–DA), *van Graan & Hardy 449* (PRE).
- 22S29E: Zoutpansberg on road to Waterpoort (c.–CD), *Smuts & Gillett 3160* (PRE).
- 22S30E: Messina, Limpopo River (–AC), *Spreeth & van Greuning 79* (PRU); Venda, Mutale river, bridge on road to Masisi (–BD), *Pienaar 1131* (PRE).
- 22S31E: 15 km NW of Punda Maria (–CA), *Codd 5377* (PRE).
- 23S30E: Hans Merensky Nature Reserve, Letaba River (–DA), *Oates 120* (PRE), *304* (PRE).
- 24S31E: Kruger National Park, Nungwini River (–BD), *Brynard & Pienaar 4346* (PRE); Skukuza (–DC), *van der Schijff 1783* (PRE); 3 km NE of Skukuza on Tshokwane road (–DC), *Codd 5056* (BM, PRE, SRGH).
- 25S30E: Nelspruit, near river (–BD), *Mogg s.n.* (PRE); Nelspruit, Lowveld Botanic Garden (–BD), *Buitendag 959* (NBG, PRE).
- 25S31E: Kruger National Park, Sabiepoort (–AA), *van der Schijff 2479* (PRE); Komatipoort (–BD), *Rogers 12633* (BOL, PRE); *Schlechter 11835* (BM, BOL, COI, G, GRA, K, PRE); Kaapmuiden (–CB), *Mogg s.n.* (PRE); Barberton (–CC), *Smith 7018* (PRE).
- 26S32E: Zululand, Ingwavuma, Ndumo Game Reserve (–CD), *Tinley 547* (NH, NU, PRE, SRGH); *Moll 4281* (NH, PRE, SRGH).
- 27S32E: Natal, Makanespont bridge (–AB), *Venter 8987* (BLFU); Pongola River, 0.5 km N. of Makanes Drift (–AB), *Stephen 801* (PRE); Josini Dam, 1 km E. of wall (–AC), *Venter 8791* (BLFU); Pongolapoort (–BD), *Wells 2684* (NH, PRE, SRGH); Josini Dam, c. 15 km on road to Ubombo (–CA), *Venter 8793* (BLFU); Ubombo, Sordwana Bay (–DA), *Vahrmeijer 625* (PRE), *Venter 4463* (ZULU).
- 28S31E: Hlabisa, edge of Kutululu Lake (–BB), *Moll 2753* (NU, PRE); Eshowe, Ngoye Forest Reserve (–DC), *Venter 4500* (ZULU); Richards Bay, Enseleni Nature Garden (–DD), *Venter 6038* (BLFU, PRU, ZULU); Old Tugela Road Bridge, Mandini (–DD), *Edwards 2833* (M, NU, PRE).
- 28S32E: Hluhluwe Game Reserve (–AA), *Ward 1752* (NU, PRE), *Hitchins 564* (NH, PRE); Richards Bay, Mzingazi River Mouth (–CC), *Venter 8979* (BLFU).
- 29S30E: Pietermaritzburg (–CB), *Carnegie NBG-125/31* (NBG); Pinetown, Kloof Nature Reserve (–DD), *Gibson s.n.* (NU).
- 29S31E: Durban Botanic Garden (–CC), *Venter 8977* (BLFU).
- 30S30E: Natal, Kenterton (–AB), *Rudatis 1702* (STE).
- 32S28E: Kentani (–AD), *Pegler 916* (SAM).
- South West Africa/Namibia: — 17S12E: Kaokoveld, Kunene at Otjinunga (–AB), *Giess 8951* (M, PRE, WIND); Kunene (–AD), *Story 5811* (BM, M, NBG, PRE); Otjomborombonga (–BA), *Leistner, Steenkamp et al. 106* (MO, PRE).
- 17S14E: Ruacana Falls (–AC), *Kotze 2* (M, WIND); Island in Kunene River, Ruacana Falls (–AC), *Rycroft 2413* (NBG).
- 17S18E: Okavango, Ombongo, Mbambi (–AD), *Soini s.n.* (M).
- 17S19E: Okavango valley at Runtu (–DC), *Volk 1959* (M); Runtu, Kapuko (–DC), *de Winter 3800* (M, PRE, WIND).
- 17S23E: Caprivi, Singalamwe (–CB), *Killick & Leistner 3816* (SRGH), *3216* (G, M, PRE, WIND).
- 17S24E: Katima Mulilo, Banks of Zambezi River (–AD), *Killick & Leistner 3317* (M, PRE).
- 18S21E: Shanjima Falls in Okavango River at Andara Mission (–AB), *de Winter 4257* (M, PRE, WIND); Okavango River, Popa Falls (–BB), *Maguire 1674* (NBG); *Merxmüller 2034* (M, WIND);
- Sudan: — 03N30E: Alivi (Kakwa) (–DD), *Meyers 8757* (K).
- 04N31E: White Nile near Gondokoro (–DC), *Speke & Grant s.n.* (K).
- 04N34E: Ngoti (–DC), *Schweinfurth 4075* (K).
- 05N31E: Lado, Yei River (–BA), *Sillitoe 293* (K).
- 06N29E: Mvolo (–BB), *Andrews 489* (K).
- 07N28E: River Busseri near Ferry (–CA), *Tarner 231* (K).
- 07N30E: Jur (–BC), *Schweinfurth 1958* (K).
- 08N28E: Equatorial Prov., Zande, loc. Gogrial (–CA), *Wyld 284* (BM).
- 08N33E: Above Nasser, Sobat River (–CA), *Simpson 7079* (BM, K).
- 09N29E: Chaba el Arab, Bahr el Arab (–AB), *Simpson 7392* (BM, K).
- 09N32E: Fashoda at White Nile (–CC), *Schweinfurth 1070* (K).
- 09N33E: Jongols Post (–DC), *Sherif 3902* (K); Kana (kannah?) (–DD), *Schweinfurth 961* (K).
- 10N32E: Nile Valley, Barbit? (–CC), *de Vilmorin s.n.* (BR).
- 15N30E: San (–AB), *Chevalier 1031* (BM).
- Swaziland: — 25S31E: Tshaneni Lowveld (–DC), *Barrett 477* (PRE).
- 26S32E: Blue Jay Ranch, Lubombo Mtns., gorge of Black Umbeluzi River (–AA), *Culverwell 876* (PRE); Stegi, Blue Jay Ranch (–AA), *Dlamini s.n.* (NBG, PRE).
- Tanzania: — 02S34E: Musoma Dist., Duma River, Namarehe Guard Post (–BA), *Greenway 10250* (K).
- 04S35E: Mbulu/Singida Distr., Yaida Valley, Yaida River (–AA), *Richards 25218* (K).
- 04S39E: Kakombe Valley, Urutura (KI) (–CC), *Pirozynski P438* (K).

- 05S30E: Kigoma area T4 (–CA), *Koyoto University Exp. 1009* (K).
- 05S31E: S. of Furié (Zegi?) (–AA), *Dainelli 2135* (BR).
- 05S34E: Singida Distr., Ugwandi River near Ngasis (–BA), *Burt 1415* (K).
- 05S35E: Kondoa Distr., Bubu River near Salia (–BB), *Burt 1038* (K).
- 05S37E: Turiani T6 (–DB), *Harris, B.J. & S. 3826* (K).
- 05S38E: Tanga Region T3, Korogwe Distr., Luengera Valley (–AB), *Semsei 3912* (COI, K); Pangoni River, Magunga Estate, Vigai Area (–AB), *Faulkner 1372* (BR, K); Pangani (–DB), *Tanner 2903* (BR, K).
- 06S29E: Mpanda Distr., Mahali Hills Lubulungu (–CA), *Newbould & Jefford 2582* (BR, K, MO).
- 06S31E: Mpanda Distr., Mala Hills (–DD), *Richards 11568* (BR, K).
- 06S35E: T5, Bahi near Dodoma (–AA), *Mapunda & Raya 1063* (K).
- 06S37E: Eastern Region, Morogoro Distr., Turiani Rest Camp (–BA), *Semsei 3620* (BR, K); 1.6 km S. of Mkata Station, Morogoro (–CD), *Welch 359* (BR).
- 06S39E: Dar es Salaam, Ubongo (–CC), *Mwasumbi 10414* (K).
- 07S31E: Ufipa Distr., Sumbawanga, Kara River (–DC), *Richards 7406* (BR, K).
- 07S35E: Iranga Distr., Ruaha River, c. 4 km W. of Mtera Bridge (–BB), *Thulin & Mhoro 728* (K).
- 07S38E: Utete Road (–DD), *Vaughan 2732A* (K).
- 07S39E: Dar es Salaam, near Mbezi River down Kilwa Rd (–AB), *Bally? 343* (K, SRGH).
- 08S34E: Malange (–DB), *von Mechow 320* (W).
- 08S35E: Mwangusi River, Ruaha National Park (–CD), *Richards 21011* (K).
- 08S36E: Mahenge (–DA), *Schlieben 1604* (BM, BR, G, M, Z).
- 09S33E: Nyassa Highland Station Kyimbila (–BC), *Stolz 505* (G, M, WAG, Z).
- 09S35E: Wanga, Distr. Taveta (–BA), *Haerdi 405/0* (BR, K, WAG).
- 10S39E: 40 km W. of Lindi (–BA), *Schlieben 5625* (M).
- Uganda: — 00N30E: Ruwenzori (–CA), *Scott-Elliott 7969* (BM); Ruwenzori, Kivata (–CB), *Scott-Elliott 7688* (K); Forest, near mouth of Mpanga, Toro (–DA), *Bagshawe 1182* (BM), *1236* (BM).
- 00N32E: Entebbe (–AB), *Bagshawe 745* (BM); Kampala, Kings Lake (–BC), *Chandler-Hancock 142* (BR, K).
- 01N34E: Karamoja South, Riparian rain forest Moruita (–DD), *Eggeling E-5784* (BR, K).
- 02N34E: River Karamoja (–CD), *Tweedie 2533* (K).
- 03N31E: Banks of Madi Stream (–BD), *Speke & Grant 711* (K); Madi, Nile Prov. (–BD), *Bagshawe 1631* (BM, MO); Baringa (–CB), *Johnston 1901* (K).
- 00S30E: Kanyanja River (–AD), *Dümmer 1081* (BOL, K, NBG); Ruizi River (–DB), *Jarrett 461* (K).
- Zaire: — 00N24E: Yangambi, Booke wa Mbole (–CB), *Louis 10782* (BR); Yangambi, Ile Esali (–CD), *Germain 5336* (BR); Yangambi, River Boende (–CD), *Bamps 624* (BR, SRGH); Ile Yalutcha (–DA), *Germain 4565* (BR); Yangambi, plateau of l'Isalowe (–DA), *Louis 8940* (BR).
- 00N25E: 5 km from Wanie-Rukula, river gorge (–BA), *Lisowski 86458-BR* (BR); Kisangani (–CA), *Mandango 733* (BR).
- 01N23E: Barumbu (–DC), *Laurent 966* (BR).
- 02N31E: Plains at Lake Mahagi Ishwa (–AA), *de Craene 333* (BR).
- 04N22E: Bas-Uele (–AB), *DeWulf 859* (BR).
- 04N29E: Prov. Orientale, Territ. Dungu, loc. National Garamba Park (–BA), *de Saeger 545* (BR, K).
- 00S24E: Yangambi, Lotumba (–CB), *Louis 10538* (BR); Prov. Orientale, Tsange Territ., Tofende (–DC), *Leonard 1004* (BR, K).
- 02S29E: Plain at Ruzizi, River Muniove, route Lemera (–CC), *Germain 7106* (BR).
- 03S16E: Kasai (–DD), *Achten 747* (BR).
- 04S15E: Terr. Nsele, Kabongo, Stanley Pool (–DC), *Pauwels 4603* (BR).
- 06S23E: Katanga, Kambayo (–DC), *Quarré 2135* (BR, K).
- 07S23E: Katanga, Sacomintra (–BD), *Quarré 2188* (BR).
- 07S24E: Pastorale (–BA), *Tuavere 2737* (K), *Quarré 2782* (BR).
- 09S28E: Katanga, near Kiwalo, near Luapula River (–BC), *Hirschberg 247* (K, PRE).
- 10S28E: Kasenga (–BC), *Lynes 464* (BR), Kasomena (–CB), *Malaisse 11349* (BR); Kasomena, River Lufutizi at pont on route to Minga (–CB), *Symoens 8623* (K).
- 11S27E: Kisanga (–CB), *Malaisse 11360* (BR).
- 12S29E: Katanga, loc. Musolo (–AC), *Lukuesa 907* (K).
- Zambia: — 08S29E: Mweru 5 km from Chienge (–CA), *Astle 679* (K, SRGH); Puta (–CA), *Fanshawe 4714* (K); Mweru Dist., Wa Ntipa, Kaputa (–CB), *Bullock 1313* (K); Mweru-wa-Ntipa swamp (–DC), *Tyrer 341* (BM, SRGH).
- 08S31E: Zombe-Zambia border, edge of Safu River (–CB), *Sanane 445* (K); Abercorn Distr., Inono Bridge, Mpulungu Road (–CC), *Richards 19738A* (K, SRGH); Lume Marsh, Kawimbe (–DC), *Richards 12023* (K, SRGH).
- 09S29E: Luanga Valley, Kasenengwa, Munkanya (–CC), *Phiri 175* (K).
- 09S31E: Mbala Distr., Sansia Falls, Kaslembo River (–AA), *Sanane 1507* (BR, K); Abercorn Distr., Kawa River Gorge (–AA), *Richards 10904* (K).
- 11S30E: Luwingu Distr., Lake Wumba (–BC), *Watmough 285* (K, LISC, SRGH).
- 11S32E: Mpika Distr., Luangwa Valley Game Reserve N. (–CD), *Mitchell 2882* (K).
- 12S24E: W. Prov., Mwinilunga Distr., edge of Mayowa Plains (–BA), *White 3443* (BR, K); Mwinilunga Distr., Lunga (–BA), *Milne-Redhead 3333* (BM, BR, K).
- 12S26E: W. Distr., Solwezi (–AB), *Angus 408* (BR, K).
- 12S28E: Mufulira (–CA), *Cruse 180* (BR, K); Kitwe, Kafue River (–CC), *Mutimushi 37* (BR), *238* (K); Ndola (–DC), *Fanshawe 1753* (BR, K).
- 13S23E: Balovale, Lungwabunga River (–CA), *West 3500* (K).
- 13S24E: W. Prov., Kabompo Distr., near Kabompo River below 'Boma' (–AC), *Holmes sn.* (K).
- 13S29E: Kabongo Mouth (–DC), *Gilges 377* (K).
- 14S28E: Mulungushi Dam (–DB), *Fanshawe 4363* (K).
- 15S23E: Barotseland, Mongu (–AC), *van Rensburg Z-23028* (K, SRGH).
- 16S23E: Senanga, Silowane (–AB), *Reynolds C-18*

(SRGH); Senanga, Sioma Falls (-DA), *Williamson 2241* (SRGH), *Brummitt, Chisumpa & Polhill 14214* (BR, K, SRGH).

— 16S28E: Distr. Mazabuka, Mapanga, Choma River bank (-AA), *Robinson 2751* (K, M), *2930* (M, SRGH); Zambesi River, 32 km upstream from Chirundu Bridge (-BB), *Angus 1568* (BR, K).

— 17S24E: Lisibiti, 24 km E. of Katimo Mulilo (-AD), *Codd 7104* (BM, K, SRGH); Barotse Prov, Sesheke Distr., edge of Zambezi at Sesheke (-AD), *Angus 1045* (BM, BR, K).

— 17S25E: Livingstone Distr., Kazungula (-CD), *Gilges 707* (K, M); Victoria Falls (-DD), *Meebold 12564* (BR, M); Victoria Falls, Cataract Island (-DD), *Rogers 5313* (Z).

— 17S26E: Livingstone Distr., Katambora (-CA), *Gilges 542* (K, SRGH).

— 17S27E: Gwembe Valley, Sinazongwe Area (-BA), *Bainbridge 505* (LISC).

Zimbabwe: — 16S28E: Kariba Distr., Chirundu, Zambesi River (-BB), *Simon 714* (K, LISC, SRGH).

— 16S31E: Darwin Distr., near upper reaches of Myatandi River (-DA), *Phipps 2432* (BR, K, SRGH); Darwin, Donga River Kandya Tribal Trust (-DA), *Bingham 1502* (SRGH).

— 17S25E: Victoria Falls (-DD), *Rogers 13183* (J).

— 17S30E: Distr. Lomagundi, Hunyani River, between Mangula & Raffingora (-AA), *Jacobsen 3661* (K, SRGH); Raffingora (-AA), *Whellan 1584* (M, SRGH); Near Sinoia at Hunyani River (-AC), *Rodin 4380* (K, SRGH).

— 17S31E: Bindura, Chinamora Tribal Trust Land (-AD), *Müller & Smith 16* (SRGH); Distr. Shamva, Lower Mazoe, E. of Shamva (-BC), *Dale SKF 365* (BR, SRGH).

— 18S26E: Wankie (-AD), *Eyles 8068* (BM, K, SRGH); Hwange, Batoka Gorge (-BC), *Pope & Müller 2009* (SRGH).

— 18S32E: Umtali Golf Course (-DC), *Chase 7501* (K, LISC, M, MO).

— 19S30E: Shurugwi, Jabolinko (-CA), *Davies D2694* (SRGH).

— 19S31E: Buhera, Nyarushanca River Drift (-AD), *Masterson 16* (SRGH).

— 19S32E: Charter Distr., Bank of Sabi River, N. of Birchenough Bridge (-CD), *Chase 7530* (K).

— 20S29E: Gwanda, Horseshoe Valley (-CC), *Davies 1304* (MO, SRGH).

— 20S30E: Lundi River Valley (-DD), *Pole Evans 4710* (K).

**2. *Tacazzea conferta* N.E. Br.** in Kew Bulletin 1895: 247 (1895), 265 (1902); Brenan: 68 (1949); Bullock: 355 (1954). Type: Ethiopia: Efat, *Roth 407* (K!, holo.).

*Tacazzea floribunda* K. Schum.: 381 (1902); N.E. Br. 266 (1902); Mildbr.: 542 (1913); Schltr.: 24 (1924); Robyns: 84 (1947); Bullock: 355 (1954). Type: Tanzania: Ngoso on Porota Mountains in Usafna, *Coetsee 1289* (B?, holo.; K!, lecto., here designated), *syn. nov.*

*Tacazzea galactagoga* Bullock: 358 (1954); Type: Tanzania: Tanana in Ulugurus Mountains, *Bruce 757* (K!, holo.; BM!), *syn. nov.*

Large liana. *Stems* woody, climbing, up to c. 20 m long, young stems tomentose, older stems glabrous, verrucose. *Leaves* opposite, thin and glabrous or thick-textured and tomentose; petiole (7–)15–30(–40) mm

long, puberulous; adaxially with 2 fleshy teeth at apex; blade elliptic to ovate or oblong to oblong-ovate, (65–)95–135(–160) × (25–)40–80(–95) mm, glabrous on both sides to adaxially glabrous or sparsely puberulous and abaxially puberulous, base cuneate or obtuse and tapering, apex acute to acuminate or drip tipped acuminate. *Inflorescence*: opposite panicles at terminal 4–6 nodes; peduncles sturdy, (5–)20–40 × 1–2 mm, puberulous; pedicels 4–10(–17) × 1 mm, puberulous; bracts broadly ovate to ovate, 1–3 × 0.5–1 mm, apex acuminate and glabrous to puberulous. *Sepals* reddish-brown, broadly ovate, c. 1.5 × 1.5 mm, apex acuminate to obtuse, outside puberulous, margin ciliate. *Corolla* pale green to pale yellow or reddish; tube c. 1 mm long, sparsely puberulous outside, apex obtuse. *Corona*: long lobes 5–9 mm long, basally narrowly ovate, terminally filiform with apex helically twisted and sometimes bifid, glabrous or sometimes sparsely hairy; lobules c. 1 × 1 mm. *Stamens*: 2–3 mm long; filaments terete, c. 1 mm long; anthers ovate with apex acute, 1–2 mm long; pollen carriers c. 1 mm long, broadly ovate with apex emarginate, viscidium circular; pollen tetrads tetragonal (43 × 35 μm) or rhomboidal (55 × 39 μm). *Ovaries* c. 1 mm long, gynostegium subsessile, c. 1 mm long, apex acute. *Follicles* slightly divergent and pendulous, cylindrical-ovoid with apices obtuse-acute, (75–) 110–140(–195) × 7–16 mm, glabrous and blackish-brown. *Seed* 8–14 × 3–5 mm; coma (15–)25–50 mm long. (Figures 13 & 11.2).

#### Diagnostic features

Large liana. Leaves opposite with blade elliptic to ovate or oblong to oblong-ovate, base cuneate or rounded and tapering, apex acute to acuminate or drip-tipped acuminate. Inflorescence with peduncles and pedicels sturdy. Long corona lobes filiform and apex helically twisted. Follicles pendulous, slightly divergent, cylindrical ovoid with apices obtuse-acute c. 110–140 mm long, glabrous.

#### Distribution and ecology

*Tacazzea conferta* is widely distributed in equatorial Africa (Figure 14). This giant liana grows on margins of mountainous rain forests at high altitudes of 1 300 to 3 000 m. It is especially common in bamboo forests along the banks of streams. The climate is temperate equatorial.

The root 'which is strongly vanilla-scented, is much sought by natives as a galactagogue for both humans and cattle' (Bullock 1954).

Vernacular names: Central African Republic: 'Bondo' (lissango); Kenya: 'Chepagetviyet' (Kipsigis); Rwanda: 'Inondo' (dial. Kingaruanda), 'Inondwe'; Tanzania: 'Bulikamba' (Kisu), 'Luguli'; Zaire: 'Nyondwe'.

#### Specimens examined

Burundi: — 02S29E: Bubanza Prov., route Rwegura-Ndora, 20 km (-CD), *Reekmans 5372* (BR).

— 03S29E: Muramvya, loc. Nyakarago (-BC), *Lewalle 2020*

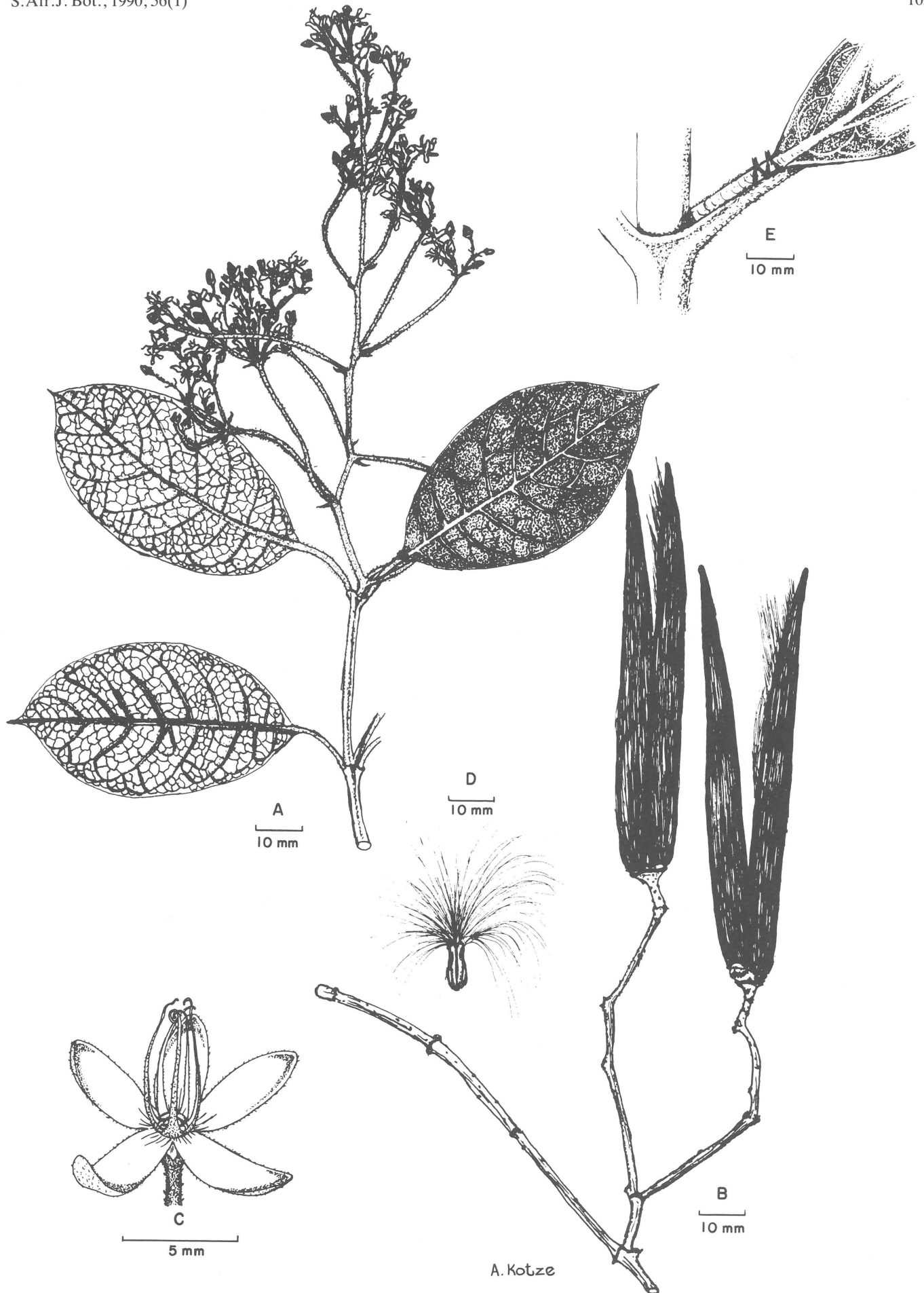
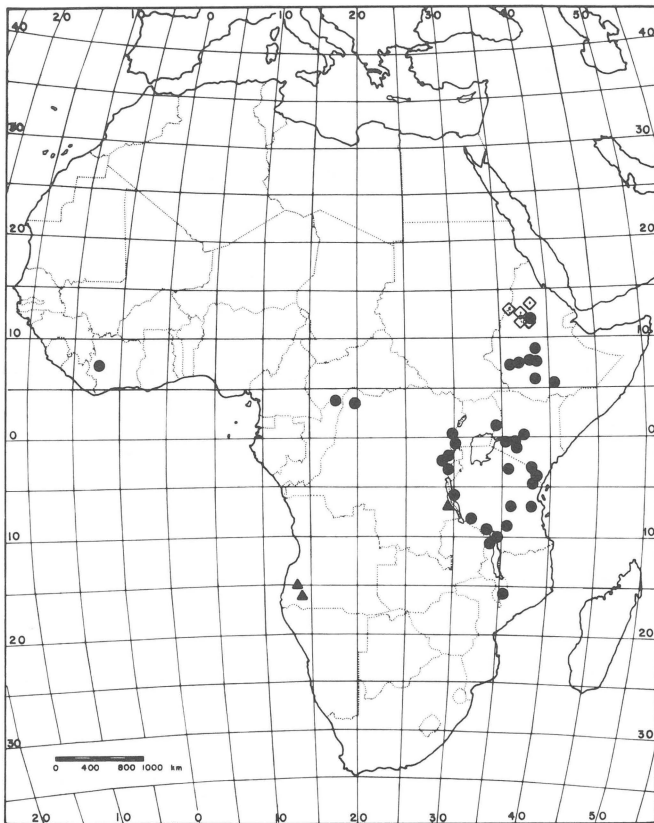


Figure 13 *Tacazzea conferta*. A. habit; B. follicles; C. flower; D. seed with coma; E. petiole with adaxial teeth. [A & E: Coetzee 1289 (K), B, C & D: de Wilde 5994 (WAG)].



**Figure 14** Known geographical distribution of *Tacazzea conferta* (●) *T. rosmarinifolia* (▲) and *T. venosa* (◇).

(BR, K, MO, WAG); loc. Nyakibuye (-BC), *Reekmans 2659* (BR).

Central African Republic: — 03N17E: Boukoko (-DD), *Tisserant 1488* (BM), *1541* (BM).

Ethiopia: — 05N40E: 10 km W. of Gheddo (-AD), *de Wilde & de Wilde-Duyffjes 10409* (BR, MO).

— 06N38E: Sidamo Prov., c. 60 km NW of Kebre Mengist along road to Agere Selam (-BA), *de Wilde & de Wilde-Duyffjes 5994* (BR, WAG).

— 07N35E: Talak Gesha (-BD), *Mooney 8738* (K).

— 07N36E: Jima area, Aba Dima Farm (-DB), *Siegenthaler 1631* (K).

— 07N37E: Kaffa Prov., 40 km along Omonadda Rd. after turnoff Jima Rd at Little Ghibbie River (-CB), *Meyer 7956* (K); Mt. Maigudo, c. 40 km from Jima-Addis road on Omonadda track (-CB), *Friis, Awake et al. 1453* (BR, K, WAG); Shoa Prov. 35 km E. along Hosanna Rd, 29 km W. of lake at Dilla Village (-DD), *Ash 1755* (K, MO).

— 07N38E: SW Arussi: Munessa (-DB), *Haile 1110* (K).

— 07N39E: Rd from Asela to Bekoji, 12 km from Asela (-CC), *Westphal & Westphal-Stevens 3082* (BR, K, WAG); Asela (-CC), *Mooney 5114* (K).

— 09N38E: Shoa, Entoto, c. 7 km from Addis Ababa on rd. to Debre Marcos (-BA), *Gilbert & Gilbert 1910* (K); 5 km N. of Addis Ababa (-BA), *de Wilde & de Wilde-Duyffjes 5933* (BR, MO); Halfway up Entotto Mtn, road past American Embassy, Addis Ababa (-BB), *Meyer 7567* (K).

— 09N39E: Scioa, colle di Nata Daleccia (-AA), *Negri 699* (Z).

— 11N38E: Lago Tana, Medania Alem (Debra Tabor) (-CC), *Pichi-Sermolli 2193* (K, MO).

Grid locality unknown: Efat, *Roth 407* (K).

Ivory Coast: — 07N07W: Mt. Tonkoui (-BC), *Lake Assi 6785* (Z).

Kenya: — 00N37E: Meru Distr., Nyambeni Tea Estate, Nyambeni Hills (c.-BB), *Verdcourt 2934* (K).

— 00S35E: Kericho Distr., Timbilil, SW-Mau (-AD), *Kerfoot 2700* (K); Rift Valley Prov., Nakuru Distr., Nakuru Co., Mt. Londiani (-BA), *Perdue & Kibuwa 9213* (BR, K); Kericho Distr. Mau Forest Reserve (-CB), *Magogo 1492* (K, M, MO), *Geesteranus 5738* (BR, COI, G, K, MO).

— 00S36E: Mt. Aberdare (-BC), *Fries, R.E. & Th. C.E. 2321* (K); Naivasha Distr., Sasama Dam pipeline road, South Kinangop (-DA), *Verdcourt, Polhill & Lucas 3032* (BR, K); Kikuyu escarpment (-DC), *Battiscombe 1194* (K); Fort Hall Distr., Kimakia Forest Reserve (-DD), *Gillett & Kabuye 16649* (BR, K).

— 01S36E: Limuru (-BA), *Snowden 642* (BM, K); Nairobi (-BD), *Dümmer 1622* (BM, K).

— 02S37E: Machakos Dist., Chyulu Range (-DD), *Bally 9724* (G, K).

— 03S38E: K7, Taita Hills, N. face of Vuria Mt. (-AD), *Gillett, Burt & Osborn 17087* (K).

Malawi: — 10S33E: Nyika Plateau, near Lake Kaulime (-DB), *Tyrer 949* (BM, COI); Nyika Plateau, c. 2 km outside gate of National Park (-DD), *Brummitt 11857* (K).

— 15S35E: Zomba Mt. Forest Reserve below Mulumbe Peak (-AD), *Chapman 6122* (K).

— 16S35E: Mlanje Distr., Luchanya Plateau, Mlanje Mt (-AB), *Richards 16619* (K).

Rwanda: — 01S29E: Gikungu, 30 km N. of Rutsiro (-CD), *Troupin 15277* (BR).

— 02S29E: Shangugu: Uwinka, loc. Bukavu-Astrida (-AC), *Troupin 10568* (BR); Gisakura, Marais Kuwintindo (-AC), *Runginya 573* (BR); Rugera (-CD), *Auquier 4004* (BR).

Tanzania: — 03S35E: Arusha Distr., Empakaai Crater, Ngorongoro (-BA), *Frame 275* (BR, K).

— 03S37E: Kilimandjaro-Vorland (-), *Schlieben 4758* (BM, BR, G, LISC, M, Z); N. slopes of Kilimandjaro (-AB), *Rogers 416* (BM, BR, K).

— 04S38E: T3, Lushoto Distr. (-CA), *Ngonyani 80* (K).

— 06S29E: Kasoje Forest (-BA), *Vehara 708* (K); Mahali Hills, 1.6 km S. of Sisaga (-BB), *Jefford, Juniper & Newbould 1846* (K); Mahali Mts., Ujamba (-BB), *Jefford & Newbould 1739* (BR, K).

— 06S35E: Distr. Morogoro, Uluguru Mts., West side (-DD), *Schlieben 2772* (BM, BR, G, M, MO, Z).

— 06S37E: Morogoro Distr., Forest (-DD), *Wallace 320* (K).

— 07S37E: Ulugurus Mts., Tanana (-BA), *Bruce 757* (BM, K).

— 08S31E: Ufipa Distr., Nsanga Forest (-BB), *Richards 13015* (K).

— 08S33E: Mbeya Range (-CD), *Kerfoot T326* (K); Ngoso on Porota Mts. in Usafna (-DC), *Goetze 1289* (BR, G, K); T7, Usafwa, Irambo rain forest edge (-DC), *Leedal 2222A* (K).

— 08S35E: Iringa Distr., Mufindi, Kigogo Forest Reserve (-CB), *Richards 15758* (BR, K); Mufindi, Ipafu Hills, beyond Lupeme Estate (-CB), *Perdue & Kibuwa 11474* (K).

— 09S33E: T7, Mbeya Distr., Umalila, Forest at Ilembo (–AB), *Leedal 3893* (K); Rungwe Distr., c. 2 km beyond Tukuyu turn-off on Mbeya to Soo Hill rd. (–AD), *Brenan & Greenway 8330* (BR, K); Mbeya Distr., Kikondo (–BA), *Richards 6645* (K); Nyassa Hochland, Stat. Kyimbila (–BC), *Stolz 1163* (G, M, W, WAG, Z).

— 09S34E: T7, Milo (–DC), *Archbold 2463* (K); Njombe Distr., Mdando Forest Reserve (–DD), *Gillett 17861* (BR, K).

— 09S35E: Southern Prov., Sangea Distr., Lupembe Forest Reserve, Miyao (–CC), *Semsei 2567* (K).

Uganda: — 01N34E: Bugishu Prov., Mt. Elgon, Bulambuli (–AB), *Synge 1872A* (BM); Sabei (–BC), *Thomas 2606* (K).

— 00S30E: Ruwenzori Distr. (c.–AC), *Bauer 666* (K).

— 01S29E: W. Prov. Kigezi Distr., Virunga-Kettle, N. foot of the Muhavura, Nkanda (–BD), *Stauffer 972* (K).

Zaire: — 00N29E: Ruwenzori (Lanuri) (–BD), *Bequaert 4428* (BR).

— 03N19E: Kalo (–BD), *Goossens 4384* (BR).

— 01S29E: Mukule (–AD), *Bequaert 5927* (BR).

— 02S28E: Kabwe (–BD), *Hendrickx 8165* (BR).

Zambia: — 10S33E: Nyika (–CB), *Fanshawe 9762* (K); Nyika Plateau (–CB), *Pawek 11783* (K); Nyika Plateau, edge of Chowo evergreen forest (–DC), *Pawek 12914* (MO).

**3. *Tacazzea rosmarinifolia* (Decne.) N.E. Br.** in Thist.-Dyer, *Flora Tropical Africa* 4: 263 (1902), 614 (1902). *Aechmolepis rosmarinifolia* Decne.: 493 (1844); K. Schum. 220 (1895a). Type: Angola, without locality and collector (P!, holo.; K!).

*Tacazzea salicina* Schltr.: 339 (1903). Type: Angola: Amboella District at the Nambali (Kubango) River, *Baum 245* (B†?, holo.; G!, lecto. here designated; BM!, COI!, K!, W!).

*Tacazzea oleander* S. Moore: 338 (1912). Type: Angola: Banks of Cubango River near Fort Princeza Amelia, *Gossweiler 2310* (BM!, holo.; COI, K!).

*Tacazzea venosa* subsp. *rosmarinifolia* (Decne.) Bullock: 351 (1954).

Erect, virgate shrub up to c. 3 m high. *Stems* puberulous, glabrescent, bark verrucose. *Leaves* alternate, opposite or whorled with 3 leaves/whorl, petiole 4–10 mm long, sparsely puberulous; blade linear-ovate to very narrowly ovate, (70–)90–115 × 4–6(–13) mm, base cuneate, apex attenuate-mucronate, adaxially dark green and glabrous with fleshy brownish teeth dispersed on midrib, abaxially greyish green and puberulous on veins. *Inflorescence* of opposite panicles at terminal c. 10 nodes, puberulous; peduncles slender, 15–45 mm long; pedicels 7–15 mm long; bracts ovate, 2–4 × 2 mm, apex acuminate. *Sepals* reddish outside and yellowish inside, broadly ovate, 2–3 × 2–2.5 mm, apex acuminate to acute, outside puberulous, margin ciliate. *Corolla* reddish-violet and sparsely puberulous outside, yellow inside; tube c. 1 mm long; lobes oblong-ovate to ovate, c. 5 × 2 mm, apex acute to obtuse. *Corona*: long lobes stout, subulate to narrowly ovate, 2–3 mm long, thick and fleshy, incurved; apex acuminate to bifid, 0.5–1 mm long. *Stamens* c. 1.5 mm long; filaments c. 0.5 mm long,

terete; anthers ovate, c. 1 mm long; pollen carriers c. 1 mm long, rhomboidal with apex split, viscidium bifid; pollen tetrads tetragonal (37 × 36 μm) or rhomboidal (40 × 38 μm). *Ovaries* c. 1 mm long; gynostegium subsessile, c. 1 mm long; apex bifid. *Follicles* slightly divergent, narrowly ovoid with apex acuminate, c. 60 × 7 mm, glabrous. *Seed* c. 7 × 3 mm; coma c. 8 mm long. (Figures 15 & 11.3).

#### Diagnostic features

Virgate, erect shrub. Leaves alternate, opposite or whorled; blade linear-ovate to very narrowly ovate, apex attenuate-mucronate. Inflorescence puberulous with peduncles and pedicels slender. Long coronal lobes stout, fleshy, subulate to narrowly ovate and apex acuminate to bifid. Follicles slightly divergent, narrowly ovoid with acuminate apex, c. 60 mm long, glabrous.

#### Distribution and ecology

*Tacazzea rosmarinifolia* has been collected in a few widely separated localities in south-west and north-east Angola, and in the south-east of Zaire (Figure 14). This large shrub inhabits river bank forests where it can be found in the sand or among rocks. These subtropical to tropical rivers are about 1 250 m above sea level.

#### Specimens examined

Angola: — 08S22E: Amboella Distr., Nambali, Cubango River (–CD), *Baum 245* (BM, COI, G, K, W).

— 15S13E: Vila da Ponte, Huila, Cubango River (–BA), *Gossweiler 2310* (BM, COI, K).

— 16S14E: Huila, Cahama (–AD), *Mendes 1678* (LISC); Caculivan River between Cahama and Tchipelonga (–AD), *Pearson 2553* (K).

Zaire: — 06S29E: Mpala (–DC), *Descamps 89* (BR).

— 07S29E: Baudouinville (–BB), *Descamps 7* (BR).

**5. *Tacazzea venosa* Decne., Asclepiadaceae.** In DC., *Prodromus* 8: 493 (1844); A. Rich.: 32 (1851); Baill.: 808 (1889); Engl.: 341 (1892); K. Schum. 216 (1895a); N.E. Br.: 264 (1902); Andr.: 418 (1952); Bullock: 351 (1954). Type: Ethiopia: Djeladgeranne at the Tacazzé River, *Schimper 636* (P!, holo.; BM!, G!, K!, M!, W!).

*Periploca venosa* Hochst. in Herb. Schimp. ex Decne. in syn. Baill.: 807 (1889).

*Tacazzea martini* Baill.: 808 (1889). *Tacazzea venosa* var. *martini* (Baill.) N.E. Br.: 204 (1902); Andr.: 418 (1952). Type: Ethiopia: *Martin St. Ange*, anno 1850 (P!, holo.). Gallabat, Matama, *Schweinfurth 194* (K!).

Erect, virgate shrub up to c. 3 m high. *Stems* woody, young stems puberulous, and verrucose on old stems. *Leaves* opposite; petiole 10–20 mm long, sparsely puberulous; blade narrowly ovate (75–)100–135 × (16–)20–30 mm, apex acuminate and mucronate, base cuneate to obtuse, adaxially dark green and puberulous. *Inflorescence*: dichasial with 2–8 monochasial branches, each branch with 4–6 flowers; peduncles glabrous to



Figure 15 *Tacazzea rosmarinifolia*. A. habit; B. follicles; C. flower, [A & C: Mendes 1678 (LISC), B: Pearson 2553 (K)].



sparsely puberulous, (15–)25–50 mm long; pedicels 5–10 mm long, glabrous; bracts broadly ovate, acuminate and membranous, glabrous, 2–3 × 2 mm. *Sepals* broadly ovate, subobtuse to acute, 1–2.5 × 1–2.5 mm, glabrous. *Corolla* glabrous, 4.5–6.5 × 2 mm; tube c. 0.5 mm long; lobes oblong-ovate to ovate, 4–6 × 2 mm. *Corona*: long lobes filiform, tortuous above stamens, apex bifid, glabrous, 4–6 mm long; lobules c. 1 × 1 mm. *Stamens* c. 1.5 mm long; filaments c. 0.5 mm long, terete; anthers ovate, c. 1 mm long; pollen carriers c. 1.5 mm long, ovate with apex split; viscidium oblong-elliptic; pollen tetrads tetragonal (38 × 32 μm) or rhomboidal (48 × 38 μm). *Ovaries* 1 mm long, gynostegium sessile, c. 1 × 1 mm, apex bifid. *Follicles* 180° divergent, ovoid, (46–)60–75 × 10–20 mm, apex acuminate, glabrous. *Seed* 6–9 × 2–3 mm; coma 20–35 mm long. (Figures 16 & 11.4).

#### Diagnostic features

Virgate, erect shrub. Leaves opposite, blade narrowly ovate, apex acuminate-mucronate. Inflorescence a dichasium of 2–8 monochasial branches, glabrous. Long coronal lobes filiform, tortuous, apex bifid. Follicles 180° divergent, ovoid, apex acuminate, c. 50–75 mm long, glabrous.

#### Distribution and ecology

*Tacazzea venosa*, an Ethiopian species is found on sandbanks or in rock crevices on the banks of rivers at an altitude of c. 1 500 m above sea level (Figure 14).

#### Specimens examined

Ethiopia: — 11N37E: Lago Tana, Penisola di Zeghie (–CB), *Pichi-Sermolli* 2137 (W); Asmotsch, High country E. of Lake Tana (–DD), *Schimper* 1345 (BM, K, W).

— 12N36E: Gallabat, Matamma (–CC), *Schweinfurth* 191 (BM, K, P, W), 192 (BM, P, W), 194 (K).

— 12N37E: Bacino del Lago Tana, Lango le rive del lago a Gorgorá (–AD), *Pichi-Sermolli* 1240 (K).

— 13N38E: Tacaze (c.–CD), *Schimper* 1543 (P); River Tacaze, Dscheladscheranne (–CD), *Schimper* 636 (BM, G, K, M, P, W).

Unknown grid references: Ethiopia: — c. 12N37E: Lago Tana, Quonzela (–), *Pichi-Sermolli* 1237 (MO, W); Del Tana, Ilca Tarara (–), *Pichi-Sermolli* 1238 (BR).

—?: NW area, Waldubba Distr. (–), *Steudner* 749 (K).

—?: *Dillon et Petit* 39 (P).

#### Discussion

The flowers of *Tacazzea* are very similar to those of *Periploca* L., *Petopentia* Bullock, *Sarcorrhiza* Bullock and *Zacateza* Bullock. In all four genera the corolla has a very shallow tube with the corona lobes arising just above the stamens at or near the corolla mouth, or the corona bases may be fused to the filament bases. In *Raphionacme* the corona lobes similarly arise in the corolla mouth, but the staminal filaments and corona lobes are always fused at their bases. However, in *Raphionacme* a deep, intricately structured corolla tube exists which clearly separates this genus from the above-

mentioned genera.

*Tacazzea* is best distinguished from *Periploca* by the hairy anthers of the latter. However, the two genera also differ in their leaf venation which is reticulate in *Tacazzea* and divaricate in *Periploca*. *Petopentia* is distinguished from *Tacazzea* by its thick-textured narrowly triangular corolla lobes and glossy leaves with patent venation. *Sarcorrhiza* is an epiphyte, otherwise very similar to *Tacazzea*, while originally *Zacateza* was a species of *Tacazzea* raised to genus level by Bullock (1954) because of the parallel patent venation of its leaves.

*Tacazzea* is most probably insect pollinated. Its flowers are arranged in showy inflorescences and are yellowish to reddish, nectar is produced, pollen carriers with viscid discs exist and the pollen is starchless (Verhoeven *et al.* 1989). However, nothing is known of the pollinators. A variety of pollinators will be able to reach the nectar in the open shallow corolla tubes. In this respect *Tacazzea* is more primitive than *Raphionacme* where the corolla tube is structured in such a way that only pollinators with long probosci are able to reach the nectar deep down in the corolla.

*Tacazzea apiculata* is rather polymorphic with regard to leaf form and size and indumentum, a fact possibly attributable to the species' wide distribution. Although the habitat is always hydrophytic other accompanying factors may cause the polymorphism. With the large number of herbarium specimens presently available all the intergrading variations are observable and it is clear that the 10 species and three variety names given for this material all belong to the one species, *Tacazzea apiculata*. Bullock (1954) arrived at this conclusion and the present investigation verified it. Fruit form is specific in *Tacazzea* and all of the above-mentioned variations have similarly structured follicles.

*Tacazzea rosmarinifolia* and *T. venosa* are very similar morphologically, but they are isolated geographically from one another, the first being from Angola and Zaire, and the second from Ethiopia (Figure 14). Bullock (1954) reduced *T. rosmarinifolia* to a subspecies of *T. venosa* since the only difference he observed between the two taxa was the different indumentum on the sepals. However, differences do exist in the coronas (Figures 15 & 16), the pollen carriers (Figure 11.3 & 11.4) and the pollen (Verhoeven *et al.* 1989). *T. rosmarinifolia* is therefore reinstated.

The study of Verhoeven *et al.* (1989) on the taxonomic value of the pollen of *Tacazzea* reveals that the pollen of the four species are very similar in structure but significantly different in size. Pollen therefore has limited taxonomic value in *Tacazzea*. The pollen carriers, however, are specific for the four species (Figure 11). The study of the anatomy of *Tacazzea* revealed no taxonomic value.

#### Acknowledgements

We thank the following institutions: the C.S.I.R. and the University of the Orange Free State for their financial support; all the herbaria mentioned for the kind loans of



Figure 16 *Tacazzea venosa*. A. habit; B. & C. follicles; D. flower. [A, B & D: Schimper 1345 (BM), C: Schweinfurth 192 (P)].

their specimens without which this investigation would have been impossible; and the kind assistance of the personnel of the Kew Herbarium where the first author did the basic research for this project.

## References

- ANDREWS, F.W. 1952. The flowering plants of the Anglo-Egyptian Sudan. Vol. 2, T. Buncle & Co. Ltd., Arbroath, Scotland.
- BAILLON, H.E. 1889. Sur le groupe des Tacazzées. *Bull. Mensuel Soc. Linn. Paris* 2: 801–808.
- BAILLON, H.E. 1890. Histoire des Plantes. Vol. 10, Librairie Hachette & Cie, Paris.
- BENTHAM, G. 1876. Asclepiadaceae. In: Genera Plantarum, ed. Bentham, G. & Hooker, J.D., Vol. 2, Lovell Reeve & Co., London.
- BRENAN, J.P.M. 1949. Check lists of the forest trees and shrubs of the British Empire. No. 5, Tanganyika, Part 2.
- BROWICZ, K. 1966. The genus *Periploca* L. A monograph. *Arboretum Kornickie* 11: 1–104.
- BROWN, N.E. 1895. Diagnosis Africanæ. *Kew Bull.* 1895: 247–248.
- BROWN, N.E. 1902. Asclepiadaceae. In: Flora of Tropical Africa, ed. Thiselton-Dyer, W.T., Vol. 4, Lovell Reeve & Co., London.
- BROWN, N.E. 1909. Asclepiadaceae. In: Flora Capensis, ed. Thiselton-Dyer, W.T., Vol. 4, Lovell Reeve & Co., London.
- BRUCE, E.A. 1937. *Tacazzea tomentosa*. *Kew Bull.* 1936: 477.
- BULLOCK, A.A. 1954. Notes on African Asclepiadaceae. *Kew Bull.* 10: 349–362.
- BULLOCK, A.A. 1963. Periplocaceae. In: Flora of West Tropical Africa, ed. Hepper, F.N., Vol. 2, pp. 80–85.
- CHEVALIER, A. 1913. Etudes sur la Flore de l'Afrique Centrale, Vol. 1, A. Challamel, Paris.
- CHEVALIER, A. 1920. Exploration botanique de l'Afrique occidentale française, Vol. 1, Paul Lechevalier, Paris.
- DECAISNE, J. 1844. Asclepiadaceae. In: Prodrômus, ed. De Candolle, A.P., Vol. 8, Treutel & Würtz, Strasbourg.
- DYER, R.A. 1975. The genera of South African flowering plants. Vol. 1, Department of Agricultural Technical Services, Pretoria.
- ENGLER, A. 1892. Über die Hochgebirgsflora des Tropischen Afrika. Otto Koeltz, Koenigstein.
- EYLES, F. 1916. A record of plants collected in southern Rhodesia. *Trans. Roy. Soc. S. Afr.* 5: 446.
- FRANKLIN, E.F. 1983. A revision of the genus *Scleria* Bergius (Cyperaceae) in southern Africa. Ph.D. thesis, Univ. of Natal.
- HIERN, W.P. 1898. Catalogue of African plants. Vol. 1, Trustees of the British Museum, London.
- HUBER, H. 1967. Periplocaceae. In: Prodrômus einer Flora von Südwestafrika, ed. Merxmüller, H., Vol. 113, pp. 1–7, Botanische Staatssammlung, München.
- HUTCHINSON, J. & DALZIEL, J.M. 1931. Flora of West Tropical Africa. Vol. 2, The Crown agents for the colonies, London.
- LAWRENCE, G.H.M. 1951. Taxonomy of vascular plants. The Macmillan Co, New York.
- MILDBRAED, G.W.J. 1913. Wissenschaftliche Ergebnisse der Deutschen Zentral-Afrika-Expedition. Vol. 2, Klinkhardt & Diermann, Leipzig.
- MOORE, S. 1906. *Tacazzea bagshawei*. *J. Bot.* 44: 88.
- MOORE, S. 1912. *Tacazzea oleander*. *J. Bot.* 50: 338.
- NORMAN, C. 1929. Asclepiadaceae. *J. Bot.* 67, suppl. 2: 91–92.
- OLIVER, D. 1875. *Tacazzea apiculata*. *Trans. Linn. Soc.* 29: 108.
- RICHARD, M.A. 1851. Voyage en Abyssinie. Vol. 2, Arthus Bertrand, Paris.
- ROBYNS, W. 1947. Flore des Spermatophytes du Parc National Albert. Vol. 2, Brussels.
- SCHLECHTER, R. 1896. Revision of extra-tropical South African Asclepiadaceae. *J. Bot.* 34: 311–315.
- SCHLECHTER, R. 1903. Asclepiadaceae. In: Kunene–Sambesi-Expedition, ed. Warburg, O., E.S. Mittler & Sohn, Berlin.
- SCHLECHTER, R. 1924. Periplocaceae; *Notizbl. Bot. Gart. Berlin* 9: 23–24.
- SCHUMANN, K. 1893. Asclepiadaceae. *Bot. Jb.* 17: 114–119.
- SCHUMANN, K. 1895a. Asclepiadaceae. In: Die natürlichen Pflanzenfamilien, Vol. 4, Wilhelm Engelmann, Leipzig.
- SCHUMANN, K. 1895b. Asclepiadaceae. In: Die Pflanzenwelt Ost-Afrikas, ed. Engler, A., Part 4, Dietrich Reimer, Berlin.
- SCHUMANN, K. 1902. Asclepiadaceae. *Bot. Jb.* 30: 381–382.
- SCOTT ELLIOT, G.F. 1895. On the botanical results of the Sierra Leone Boundary Commission. *J. Linn. Soc. Bot.* 30: 91.
- SYSTEMATICS ASSOCIATION. 1962. Descriptive terminology. *Taxon* 11: 145–156 & 245–247.
- TISSERANT, P. Ch. 1950. Catalogue de la flore de l'Oubangui-chari. No 2, Imprimerie P. Julia, Toulouse.
- VERHOEVEN, R.L., VENTER, H.J.T. & KOTZE, JANETTA D.S. 1989. Pollen morphology of *Petopentia* and *Tacazzea* (Periplocaceae). *S. Afr. J. Bot.* 55: 207–214.

## Appendix

### List of names associated with *Tacazzea*

- Aechmolepis* Decne. [= *Tacazzea* Decne.]
- Tacazzea africana* (Schltr.) N.E. Br. [= *Schlechterella africana* (Schltr.) K. Schum.]
- T. amplifolia* S. Moore [= *Mondia whitei* (Hook.f.) Skeels], *syn. nov.*
- T. apiculata* Oliv.
- T. apiculata* var. *benedicta* Scott Elliot [= *T. apiculata* Oliv.]
- T. apiculata* var. *glabra* K. Schum. [= *T. apiculata* Oliv.]
- T. bagshawei* S. Moore [= *T. apiculata* Oliv.]
- T. bagshawei* var. *occidentalis* Norman [= *T. apiculata* Oliv.]
- T. barteri* Baill. [= *T. apiculata* Oliv.]
- T. brazzaeana* Baill. [= *T. apiculata* Oliv.]
- T. conferta* N.E. Br.
- T. floribunda* K. Schum. [= *T. conferta* N.E. Br.], *syn. nov.*
- T. galactagoga* Bullock [= *T. apiculata* Oliv.], *syn. nov.*
- T. kirkii* N.E. Br. [= *T. apiculata* Oliv.]
- T. laxiflora* Engl. [= *Periploca laxiflora* K. Schum.]
- T. martinii* Baill. [= *T. venosa* Decne.]
- T. natalensis* (Schltr.) N.E. Br. [= *Petopentia natalensis* (Schltr.) Bullock]
- T. nigritana* N.E. Br. [= *T. apiculata* Oliv.]
- T. oleander* S. Moore [= *T. rosmarinifolia* (Decne.) N.E. Br.]
- T. pedicillata* K. Schum. [= *Zacateza pedicillata* (K. Schum.) Bullock]

*T. pedicillata* var. *occidentalis* N.E. Br. [= *Z. pedicillata* (K. Schum.) Bullock]  
*T. racemosus* N.E. Br. [= cf. *Zacateza pedicillata* (K. Schum.) Bullock]  
*T. rosmarinifolia* (Decne.) N.E. Br.  
*T. salicina* Schltr. [= *T. rosmarinifolia* (Decne.) N.E. Br.]  
*T. stipularis* N.E. Br. [= *T. apiculata* Oliv.]  
*T. thollonii* Baill. [= *T. apiculata* Oliv.]  
*T. tomentosa* Bruce [= *Periploca tomentosa* (Bruce) Venter] *comb. nov.*

*T. venosa* Decne.  
*T. venosa* var. *martini* (Baill.) N.E. Br. [= *T. venosa* Decne.]  
*T. venosa* subsp. *rosmarinifolia* (Decne.) Bullock [= *T. rosmarinifolia* (Decne.) N.E. Br.]  
*T. verticillata* K. Schum. [= *T. apiculata* Oliv.]  
*T. viridis* [= *Mondia whitei* (Hook.f.) Skeels].  
*T. volubilis* (Schltr.) N.E. Br. [= *Curroria volubilis* (Schtr.) Bullock]  
*T. welwitschii* Baill. [= *T. apiculata* Oliv.]