

FLORA
OF
TROPICAL EAST AFRICA

PREPARED AT THE ROYAL BOTANIC GARDENS, KEW
WITH ASSISTANCE FROM THE EAST AFRICAN HERBARIUM

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LORANTHACEAE

BY

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FLORA OF TROPICAL EAST AFRICA

LORANTHACEAE

R.M. POLHILL & D. WIENS*

Shrubs hemiparasitic on the branches (or elsewhere rarely the roots) of other dicotyledons, attached by woody haustoria, with or without surface runners producing secondary haustoria, generally evergreen. Leaves opposite, alternate or whorled, simple, entire, often leathery or rather fleshy, estipulate. Flowers bisexual (rarely unisexual elsewhere), variously borne singly or in racemes, umbels or heads (elsewhere often in 3-flowered dichasia) in axils, at old nodes or terminally, in Africa often large and brightly coloured; bract usually 1 per flower, cupular or unilateral, with a small to leafy limb. Calyx rim-like to tubular, entire to shortly toothed. Petals free or united, 4–5 in Africa, valvate, radially symmetrical or opening with a unilateral split. Stamens as many as petals, epipetalous; anthers basifixed in Africa, 2–4-thecous, sometimes locellate, opening lengthwise. Ovary (receptacle) inferior, unilocular or in more primitive genera with several obscure locules; ovules not differentiated; embryo sacs formed at the base of ovary (mamelon); style and stigma simple. Fruit a berry in Africa (rarely dry and winged elsewhere). Seeds without a testa, normally surrounded by a sticky layer developed from the fruit-wall.

77 genera and about 950 species, widely distributed from the tropics to temperate regions, particularly in the south.

The aerial stem-parasites commonly known as mistletoes belong to several families, of which the major ones are Loranthaceae and Viscaceae. These two families were formerly regarded as subfamilies, but are now considered to have originated separately, the Loranthaceae related to Olacaceae, the Viscaceae to Santalaceae. They differ principally in that Loranthaceae have hermaphrodite flowers with a calyx and showy corolla, while Viscaceae have small inconspicuous flowers and only one perianth whorl. The precarious mode of establishment is, however, similar in most genera of both. The sticky seeds are dispersed by birds, in Africa principally tinkerbirds. The modified hypocotyl forms a pad that adheres to the host-branch to form the haustorium. This penetrates the host to connect with its sap stream to permit further growth of the seedling; secondary haustoria are sometimes produced on runners spreading over the host-branches, as seen in *Plicosepalus* and *Vanurkya*.

The least specialised genera of Loranthaceae occur in southern S. America, New Zealand and Australia. Two genera, *Helixanthera* and *Taxillus*, occur both in Asia and Africa, but the other 21 genera now recognised in Africa, Arabia and Madagascar are all restricted to the region and seem to have undergone most of their radiation there. They may be attributed to two groups of genera. The Tapinantheid group (genera 1–10) has simple or irregularly branched hairs. The Taxilloid group (genera 11–16) has hairs with whorls of branches (stellate or dendritic). The bracts of these two groups also tend to differ, cupular in the first, unilateral in the latter. The currently accepted genera are largely coincident with the sections adopted in much of the African literature, notably the masterly account by Sprague in the Flora of Tropical Africa (1910–1911), modified from the earlier works of Engler, who described the majority of the common species from tropical Africa around the turn of the century. Segregate classifications have been advocated by van Tieghem in the 1890s, Danser in the 1930s, Balle in the 1950–1960s and by ourselves and our co-workers since the 1970s.

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The distinction of the genera is based nowadays principally on modifications of the flowers related to their mode of pollination. Flowers of the less specialised genera in Africa, notably *Helixanthera*, *Taxillus* and *Vanyoykia* in the Flora area, open spontaneously or with little probing. In more advanced genera of both the Tapinantheid and Taxilloid groups the flowers are increasingly complicated with special mechanisms that can only be manipulated by birds and various signals are developed to attract their attention. In most cases vents appear in the mature bud just below where the anthers are held in the tip of the bud, with the stamens and corolla-lobes held under tension. The region is often indicated by contrasting bands of colour on the corolla and on parts visible through the vents. Probing by the beak of the bird causes the corolla to split open explosively, either radially or unilaterally with a distinct V-split, dusting the bird's head with pollen. Further refinements occur with a more economic and precise directing of the pollen puff. These have occurred with a remarkable degree of convergent evolution in the two groups of genera, such that species of *Agelanthus* and *Phrygananthera* have been included within a broad concept of *Tapinanthus* until recently.

The pollination strategy in *Globimetula* is quite different. Here the distinct head of the mature bud darkens and when pecked the petals coil outwards to reveal vents at the base of the staminal column, probing of which causes the stamens to coil inwards explosively, bending the style in the same direction. The species of *Tapinanthus* (in the strict sense used here) also have a bud-head that darkens at maturity. Pecking causes a V-shaped rent and precise deposition of pollen and inflexion of the style. The divergence of ecogeographic races and species is often marked, among other features, by shifts in signals given to visiting birds. It is noticeable that the modifications in flowers with swollen bud-heads tend to occur on that structure, with various ridges, wings and crowns, whereas those with vents show more variation related to colour-banding, shape and internal hardening of the corolla-lobes.

For further discussion of the biology and biogeography see Kuijt, *The Biology of Parasitic Flowering Plants* (1969); Barlow & Wiens, *The cytogeography of loranthaceous mistletoes*, in *Taxon* 20: 291-312 (1971); Visser, *South African Parasitic Flowering Plants* (1981); Calder & Bernhardt (eds), *The Biology of Mistletoes* (1983); Feehan, *Explosive flower opening in ornithophily: a study of pollination mechanisms in some Central African Loranthaceae*, in *J.L.S.* 90: 129-144 (1985); Polhill, *Speciation patterns in African Loranthaceae*, in Holm-Nielsen, Nielsen & Balslev (eds), *Tropical Forests*: 221-236 (1989); Polhill & Wiens, *Mistletoes Afr.* (1998).

- 1. Hairs simple, irregularly branched or lacking 2
 - Hairs stellate or dendritic with whorls of branches, rarely present only on youngest parts, sometimes with subsimple hairs admixed 11
- 2. Flowers in racemes or spikes, sometimes crowded at apex of peduncle; petals 4, separate, coherent below, radially spreading to reflexed from the middle where the short erect stamens are generally attached **1. Helixanthera**
 - Flowers borne in heads, umbels, clusters or singly; petals not as above, usually joined into a tube below or if free (*Plicosepalus* in part) then 5 and strongly ridged inside 3*
- 3. Lower part of petals and corolla-tube if present with series of strong paired folds inside; secondary haustoria present on extensive surface runners **2. Plicosepalus**
 - Petals without marked folds inside; plants with a single haustorial attachment 4
- 4. Corolla 6-9 cm. long, when open with 4 radially arranged reflexing lobes, the long stamens remaining weakly attached to the style by connective-appendages **3. Emelianthe**
 - Corolla smaller, opening with an explosive release of pollen, the short filaments inflexed or inrolled 5

* *Oedina pendens* has dendritic hairs only on the youngest parts and might key here, but has racemes with large long-tubed red flowers.

5. Corolla-lobes inrolled at anthesis **6. Oliverella**
 Corolla-lobes erect, reflexed or rolled outwards at anthesis 6

6. Corolla-lobes 4 **7. Englerina**
 Corolla-lobes 5 7

7. Corolla usually banded with 1–several contrasting colours, with vents opening below the corolla-tip in mature buds, the lobes generally remaining erect, sometimes recurved or loosely looped 8
 Corolla reddish, sometimes white or greenish towards extremities or spotted, with tips of buds swollen and darkening at maturity, without vents below, opening explosively with lobes generally abruptly reflexed about the middle or tightly rolled outwards (elsewhere occasionally erect) 10

8. Corolla-lobes much shorter than the tube **8. Agelanthus**
 Corolla-lobes longer than the tube 9

9. Corolla-buds straight, with a distinct tube developing a V-split (the other lobes sometimes separating to this point in dried specimens) **4. Oncocalyx**
 Corolla-buds bent at base (not always in *S. curta* from NE. Tanzania), with a very short tube split to base without a distinct V **5. Spragueanella**

10. Corolla-lobes reflexed in E. Africa; stigma small, ovoid to globose **9. Tapinanthus**
 Corolla-lobes coiled outwards at anthesis; stigma top-shaped to peltate **10. Globimetula**

11. Flowers in extended spikes or racemes 12
 Flowers in umbels, clusters or heads 13

12. Corolla yellow to red without dark markings; tip of corolla-bud narrow, enclosing elongate anthers; montane **13. Oedina**
 Corolla orange to pink or red with dark glandular spots at base of lobes; tip of corolla-bud obovoid, enclosing small anthers with unequal thecae (more elongate only in *O. schliebeniana*) **14. Oncella**

13. Corolla opening radially, the lobes as long as to distinctly longer than the tube; filaments inserted well up the corolla-lobes, elongate, the upper part thickened, generally articulated and breaking off **15. Erianthemum**
 Corolla with a short V-slit at anthesis, the lobes shorter than the tube; filaments attached ± at the base of the lobes, short, isodiametric, erect or inrolled 14

14. Anthers locellate, the thecae subdivided into a series of small chambers; stems from a single haustorial attachment **16. Phragmanthera**
 Anthers not chambered (in Africa); secondary haustoria developed on extensive surface runners 15

15. Corolla slightly curved in bud, slightly inflated medially, shortly hairy; stamens separate; style glabrous **11. Taxillus**
 Corolla straight-sided, tomentose; filaments short, incurved, the anthers forming a central pollen-mass; style hairy on lower half **12. Vanwykia**

1. HELIXANTHERA

Lour., Fl. Cochinch.: 142 (1790); Polh. & Wiens, Mistletoes Afr.: 79 (1998)

Loranthus L. sect. *Acrostachys* Benth. & Hook.f., G.P. 3: 208 (1880)

Sycophila Tiegh. in Bull. Soc. Bot. Fr. 41: 485 (1894)

Acrostachys (Benth. & Hook.f.) Tiegh. in Bull. Soc. Bot. Fr. 41: 504 (1894)

Mostly small shrubs from a single haustorial attachment in Africa, essentially glabrous in Africa, elsewhere sometimes with a scurfy indumentum including scales, short stiff hairs and small branched hairs; twigs terete, flattened or angular. Leaves opposite to alternate, sessile to petiolate, usually penninerved. Flowers usually in terminal and/or axillary racemes or spikes, sometimes crowded at the apex of peduncle, subumbellate, 4(–7 in Asia)-merous; bract unilateral to cupular, with a small ovate-triangular limb, often umbonate. Calyx rim-like to cupular, subentire to slightly toothed. Petals separate, white, yellow or red, but not conspicuously banded; lower part erect, generally thickened, sometimes callused inside at top; upper longer part caudate to spatulate, spreading to reflexed. Stamens erect, normally arising from top of lower part of petal, sometimes higher; anthers shorter or longer than filament, 2–4-theous, sometimes locellate. Style angular, slender with a small stigma in Africa. Berries round to ellipsoid, smooth or warted.

About 45 species, 12 in tropical Africa, the rest in tropical Asia, south-east as far as Sulawesi.

1. Anthers locellate (fig. 1/4); racemes terminal and axillary; petiole glabrous; forests 2
- Anthers not chambered; racemes terminal; petiole (if well developed) generally glandular-hairy in the groove; open country 3
2. Petals white or cream, ± tinged pink; receptacle and berries usually smooth 1. *H. mannii*
- Petals yellow to orange-yellow; receptacle and young fruits covered in small warts 2. *H. verruculosa*
3. Leaves mostly alternate on long shoots, crowded on short shoots; racemes secund 5. *H. thomsonii*
- Leaves mostly opposite or subopposite, the pairs well spaced except sometimes just below the inflorescence; flowers spirally disposed 4
4. Flowers 4–9 mm. long 3. *H. kirkiei*
- Flowers 20–23 mm. long 4. *H. tetrapartita*

1. *H. mannii* (*Oliv.*) *Danser* in Verh. K. Akad. Wet., sect. 2, 29(6): 58 (1933); Balle in F.W.T.A., ed. 2, 1: 659 (1958) & in Bol. Soc. Brot., sér. 2, 38: 42, t. 3/1–2, 4/1 (1964) & in Fl. Cameroun 23: 23, t. 5/1–8 (1982); Polh. & Wiens, Mistletoes Afr.: 81, photo. 16, fig. 2A (1998). Type: São Tomé, *Mann* 1075 (K!, holo., P!, iso.)

Stems spreading and pendent, up to 1 m. or so; branchlets 1–3 mm. diameter, reddish to purple-brown. Leaves opposite, subopposite or rarely ternate; petiole 4–12 mm. long; lamina chartaceous, narrowly elliptic-oblong to elliptic, ovate or oblong-oblancheolate, 6–10(–14) cm. long, 1–4 cm. wide, usually pointed, often slightly acuminate at the apex, with 6–10(–12) pairs of fine lateral nerves. Racemes terminal and in many axils, 2–10(–15) cm. long, 20–50-flowered; pedicel 1–5 mm. long; bract ovate-triangular, sometimes slightly gibbous, 0.7–1.5 mm. long, glandular-ciliolate. Receptacle 1–3 mm. long; calyx entire to slightly toothed, 0.3–1 mm. long, glandular-ciliolate. Corolla in bud 4-angular in lower part, ± shouldered to the tapered upper part; petals white to pinkish, linear, (4–)8–18(–24) mm. long, thickened, grooved

and sometimes papillate below filament-insertion. Stamen-filament arising from behind a flap-like petal-appendage; anthers locellate, 5–9 mm. long. Style 3–7 mm. long. Berry tinged red, ellipsoid, 5–6 mm. long, generally smooth, but in Gabon often with fine lines of longitudinal pimples. Fig. 1/1–5 (p. 6).

UGANDA. Toro District: Bwamba, Oct. 1925, *Fyffe* 21!

DISTR. U 2; westwards to Nigeria, São Tomé and Angola

HAB. Rain-forest, on a wide variety of hosts; ± 800 m.

SYN. *Loranthus mannii* Oliv. in J.L.S. 7: 101 (1863) & in Hook., Ic. Pl. 14, t. 1303 (1880); Engl. in E.J. 20: 81 (1894); Sprague in F.T.A. 6(1): 274 (1910); Balle in F.C.B. 1: 316, t. 33 (1948)

L. mannii Oliv. var. *combretoides* Engl. in E.J. 20: 81 (1894). Type: Angola, Pungo Andongo, Calemba Lake, *Welwitsch* 4852 (COI!, holo., B!, BM!, K!, P!, iso.)

Sycophila combretoides Tiegh. in Bull. Soc. Bot. Fr. 41: 486 (1894). Type as for *Helixanthera mannii* var. *combretoides*

S. mannii (Oliv.) Tiegh. in Bull. Soc. Bot. Fr. 41: 487 (1894)

Loranthus combretoides (Tiegh.) Engl. in E. & P. Pf., Nachtr. 1: 128 (1897); Sprague in F.T.A. 6(1): 274 (1910)

Helixanthera combretoides (Tiegh.) Danser in Verh. K. Akad. Wet., sect. 2, 29(6): 56 (1933)

2. **H. verruculosa** *Wiens & Polh.*, Mistletoes Afr.: 83 (1998). Type: Tanzania, Iringa District, Mufindi, Livalonge, *Congdon* 28 (K!, holo., BR!, DSM!, EA!, iso.)

Stems well branched, up to 80 cm. long; branchlets 1–3 mm. diameter, brown to purple-brown. Leaves opposite or subopposite; petiole 5–10 mm. long; lamina thinly textured, dark green at maturity, elliptic to elliptic-oblong, 5–10 cm. long, 2–5 cm. wide, slightly acuminate at the apex, cuneate to rounded at the base, with 6–10 pairs of lateral nerves. Racemes terminal and axillary, 4–8 cm. long, mostly 30–50-flowered; pedicel 2–3 mm. long; bract ovate-triangular, 1 mm. long, umbonate, ciliolate. Receptacle narrowly obconic, 1.5 mm. long, covered in small warts; calyx 0.5–0.8 mm. long, ciliolate. Corolla in bud 4-angular in lower quarter, slightly shouldered to tapering upper part; petals yellow to orange-yellow, linear, 6–7 mm. long, thickened and papillate below filament-insertion, reflexed above. Stamen-filament arising from nectariferous callus, 2–3 mm. long; anthers locellate, 1.5–3 mm. long. Style 5–7 mm. long. Berry obovoid-ellipsoid, 5–6 mm. long, 3.5–4 mm. in diameter, verruculose, becoming smooth and red at maturity; seed greenish-yellow, translucent at the base.

TANZANIA. Iringa District: Kigogo Forest Reserve, Dec. 1981, *Rodgers & Hall* 2827! & Kibao, 5 Jan. 1986, *Wiens et al.* 6543! & Livalonge Estate, 4 May 1986, *Polhill et al.* 5263!

DISTR. T 7; not known elsewhere

HAB. Upland rain-forest, on various hosts, but commonly *Maesa*; 1450–1900 m.

3. **H. kirkii** (*Oliv.*) *Danser* in Verh. K. Akad. Wet., sect. 2, 29(6): 57 (1933); *Polh.* & *Wiens* in U.K.W.F., ed. 2: 154 (1994) & Mistletoes Afr.: 83, photo. 17, fig. 2B (1998). Type: Tanzania, Mikindani District, Ruvuma Bay, *Kirk* (K!, holo., P!, fragment)

Stems laxly branched, to 60 cm. or so; branchlets thickening to 3–5 mm. diameter, greenish turning reddish brown to grey. Leaves mostly opposite or subopposite, sometimes one alternating with pairs; petiole (0.5–)0.8–2.5 cm. long, glandular-puberulous in the groove; lamina slightly fleshy, usually ovate to elliptic, sometimes lanceolate or subcircular, 3–10 cm. long, 1.5–7 cm. wide, blunt or pointed at the apex, with ± 6–12 pairs of lateral nerves. Racemes terminal, 5–10(–15) cm. long, mostly subdensely 40–100-flowered, sometimes with scurfy indumentum; pedicel 3–5(–8 in fruit) mm. long; bract broadly ovate, 1–1.5 mm. long. Receptacle 1–2 mm. long; calyx subentire. Corolla in bud narrowed one-third to halfway up, slightly quadrangular below, a little tapered above; petals yellow to orange- or purple-red,

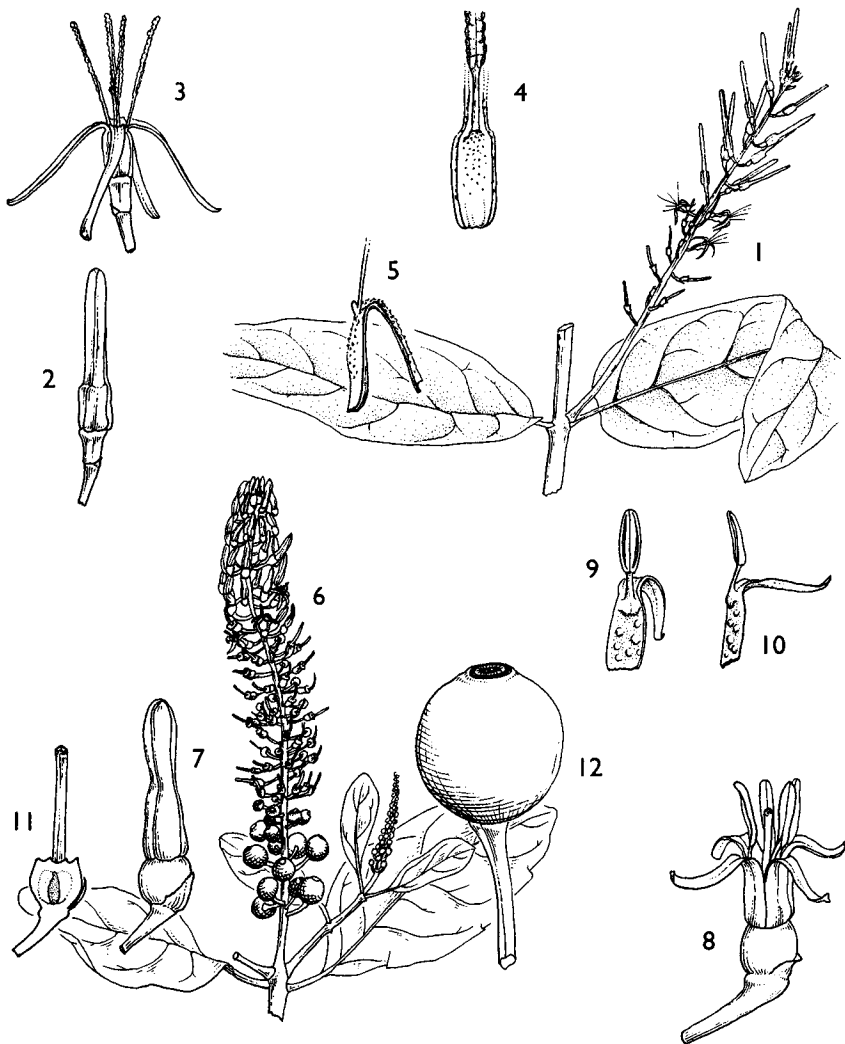


FIG. 1. *HELIXANTHERA MANNII* — 1, flowering node, $\times \frac{2}{3}$; 2, flower bud, $\times 2$; 3, flower, $\times 2$; 4, 5, base of petal showing stamen insertion, front and side views, $\times 4$. *HELIXANTHERA KIRKII* — 6, habit, $\times \frac{2}{3}$; 7, flower bud, $\times 4$; 8, flower, $\times 4$; 9, 10, petal and stamen, front and side views, $\times 4$; 11, section of gynoecium, $\times 4$; 12, fruit, $\times 4$. 1–5, from Sanford 6262; 6, from Drummond & Hemsley 2316; 7–12, from Faulkner 1730. Drawn by Christine Grey-Wilson.

sometimes with green, linear-lanceolate, 4–9 mm. long, slightly thickened, folded and medially grooved below filament-insertion. Anthers 2–4 mm. long, 1–6 times as long as filament. Style 3–5 mm. long. Berry turning red then black, globose, 5 mm. across. Fig. 1/6–12.

KENYA. Northern Frontier Province: Mt. Kulal, El Kajata gorge, 28 Dec. 1978, *Synnott* 1760!; Masai District: 56 km. on Magadi–Nairobi road, 5 Aug. 1957, *Greenway* 9220!; Kwale District: Waa, 20 Sept. 1982, *Polhill* 4811!

TANZANIA. Mbulu District: Oldeani–Mongala, 16 km. from turn-off on Oldeani coffee farm road, 1 Apr. 1964, *Verdcourt* 4020!; Lushoto District: Mkomazi R. on Mkomazi–Buiko road, 30

Apr. 1953, *Drummond & Hemsley* 2316!; Uzaramo District: Dar es Salaam, University, 3 June 1966, *Mvusumbi* 10141!

DISTR. K 1, 4, 6, 7; T 2, 3, 5, 6, 8; along the coast from S. Somalia to N. Mozambique, inland to the Great Rift Valley of Kenya and Tanzania, then disjunctly to S. Angola.

HAB. Coastal bushland and mixed dry bushland and woodland inland, on various hosts, commonly *Cordia*, *Grewia* and *Markhamia*; 0–1350 m.

SYN. *Loranthus kirkii* Oliv. in J.L.S. 7: 101 (1863) & in Hook., Ic. Pl. 14, t. 1309 (1880); Engl. in E.J. 20: 129 (1894) & P.O.A. C: 167 (1895); Sprague in F.T.A. 6(1): 276 (1910); F.D.O.-A. 2: 160 (1932); T.T.C.L.: 280 (1949); U.K.W.F.: 330 (1974)

L. kirkii Oliv. var. *ciliatus* Engl. in E.J. 20: 129 (1894) & P.O.A. C: 167 (1895); F.D.O.-A. 2: 161 (1932). Type: Kenya/Tanzania, without locality, *Fischer* I. 302 (HBC!, holo., B!, iso.)

L. kirkii Oliv. var. *populifolius* Engl. in E.J. 20: 130 (1894) & P.O.A. C: 167 (1895); F.D.O.-A. 2: 161 (1932). Type: Tanzania, Bagamoyo District, Kingani [Kigani] R., *Hildebrandt* 1141 (B!, holo.)

Acrostachys kirkii (Oliv.) Tiegh. in Bull. Soc. Bot. Fr. 41: 504 (1894)

Loranthus stefaninii (fig.) & *somalensis* (descr.) Chiov. Result. Sci. Miss. Stef-Paoli, Coll. Bot. 1: 155, t. 15B (1916); E.P.A.: 32 (1953). Type: Somalia, between Torda and Margherita, *Paoli* 342 (FT, holo.)

Helixanthera somalensis (Chiov.) Danser in Verh. K. Akad. Wet., sect. 2, 29(6): 59 (1933)

NOTE. The E. African coastal populations have dull reddish flowers, those from inland are bright yellow or orange and those from Somalia are recorded as yellow and green. The Angolan populations have distinctly more pointed leaves than those from E. Africa, and, as in E. Africa, there may be a rather similar variation in flower colour, the coastal plants tending to have redder flowers at least at maturity.

4. **H. tetrapartita** (*E.A. Bruce*) *Wiens & Polh.* in Lebrun & Stork, Enum. Pl. Fl. Afr. Trop. 2: 169 (1992) & *Mistletoes Afr.*: 85 (1998). Type: Tanzania, Dodoma District, Dodoma–Iringa, near Great Ruaha R., *St. Clair-Thompson* 369 (K!, holo.)

Stems to 50 cm. or so; branchlets soon thickening to 3–5 mm. diameter, reddish brown turning grey. Leaves mostly opposite or subopposite, but often a few crowded below inflorescence; petiole 0.5–2 cm. long, glandular-hairy in groove; lamina slightly fleshy, ovate-lanceolate to ovate or broadly elliptic, 3.5–5 cm. long, 2–4 cm. wide, bluntly pointed at the apex, with 3–6 pairs of obscure lateral nerves. Racemes terminal on long and few-leaved short shoots, 7–17 cm. long, laxly 30–50-flowered; pedicel 2–4 mm. long; bract ovate-triangular, slightly gibbous, 1.5 mm. long. Receptacle 2–2.5 mm. long; calyx subtentire to slightly toothed, glandular-ciliate. Corolla in bud quadrangular in lower sixth or seventh, scarcely shouldered to tapered upper part; petals red or yellow, linear, 2–2.3 cm. long, slightly thickened and grooved below filament-insertion. Anthers 8 mm. long, ± as long as filament. Style 14–15 mm. long. Berry red, obovoid, 7 mm. long.

TANZANIA. Mpwapwa, 19 Feb. 1933, *Hornby* 502!; Mbeya District: Ruaha National Park, summit of Magangwe Hill, 12 Mar. 1973, *A. Bjørnstad* 2621!; Njombe District: Lower Ndumbi valley, ± 5 km. from main road, 24 May 1986, *J. & J. Lovett* 756!

DISTR. T 5, 7; not known elsewhere

HAB. Deciduous mixed woodland at the interface of *Brachystegia* and *Acacia-Commiphora* associations, recorded on *Commiphora*; 950–1700 m.

SYN. *Loranthus tetrapartitus* E.A. Bruce in K.B. 1935: 278 (1935), as '*tetrapartitus*'; T.T.C.L.: 280 (1949)

5. **H. thomsonii** (*Sprague*) *Danser* in Verh. K. Akad. Wet., sect. 2, 29(6): 60 (1933); M.G. Gilbert in Fl. Ethiopia 3: 362, fig. 114.1 (1990); Polh. & Wiens, *Mistletoes Afr.*: 86, photo. 19 (1998). Type: N. Somalia, Haud, *D. Thomson* 23 (K!, holo.)

Stems to 50 cm. or so; branchlets soon thickening to 4–10 mm. diameter, red-brown to purple, becoming silvery from detaching epidermis and then grey. Leaves mostly alternate on long shoots, crowded on short shoots; petiole 1–10 mm. long,

glandular-puberulous in the groove; lamina fleshy, oblanceolate-spathulate, 4–25 mm. long, 1.5–6 mm., subacute to rounded at the apex. Racemes terminal on short shoots, secund, 1–5 cm. long, densely 10–20-flowered; pedicel 0–2 mm. long; bract ovate-triangular, 1–1.5 mm. long. Receptacle 1–2 mm. long; calyx subentire to slightly toothed, glandular-ciliolate. Corolla in bud linear, slightly swollen in lower one-fifth to one-eighth below insertion of the filaments and over anthers near the apex; petals pale greenish turning yellow, very narrowly linear-spathulate, looped near middle, 1.5–3 cm. long, notably thickened only at insertion of filaments. Anthers 2–5 mm. long; filaments very much longer, pink to red, thickened at the base. Style as long as petals. Berry bright red, obovoid, 7 mm. long.

KENYA. Northern Frontier Province: Moyale, 12 Mar. 1952, *Gillett* 12529! & Ramu–Banissa, 29 km. from turning to Banissa, 4 May 1978, *M.G. Gilbert & Thulin* 1436! & Kenya-Somalia border, 23 Apr. 1973, *Oxtoby* in *E.A.* 15338!

DISTR. K 1, 4; Ethiopia (Ogaden), Somalia and Yemen

HAB. Deciduous bushland, on various hosts, including *Commiphora* and *Lansea*; 10–1100 m.

SYN. *Loranthus thomsonii* Sprague in *F.T.A.* 6(1): 276 (1910) & in *K.B.* 1911: 88 (1911)

2. PLICOSEPALUS

Tiegh. in *Bull. Soc. Bot. Fr.* 41: 504 (1894); Polh. & Wiens, *Mistletoes Afr.*: 87 (1998)

Loranthus L. sect. *Plicopetalus* Benth. & Hook.f., *G.P.* 3: 208 (1880); Sprague in *F.T.A.* 6(1): 258 (1910)

Loranthus L. sect. *Tapinostemma* Benth. & Hook.f., *G.P.* 3: 209 (1880); Sprague in *F.T.A.* 6(1): 259 (1910)

Tapinostemma (Benth. & Hook.f.) Tiegh. in *Bull. Soc. Bot. Fr.* 42: 243, 257 (1895)

Stems a few cm. to several m. long, glabrous or rarely with short stiff simple hairs, spreading by haustoria-bearing surface runners. Leaves irregularly opposite to alternate, often clustered on short shoots, sessile to shortly petiolate, leathery to slightly fleshy, palminerved. Flowers (1–)few in umbels in the axils or terminal on short shoots, 5-merous; bract saucer-shaped, with a small umbonate or spurred oblong to ovate-triangular limb, sometimes lacerate. Calyx rim-like to cupular, sometimes split as flower opens. Petals connivent or joined in lower part, slightly to markedly curved in bud, mostly red or yellow, with 2 rows of oblique folds below the filament-insertion, these parts connivent, the upper part narrow below the linear-lanceolate to linear-spathulate tips, reflexing, looped and often twisted; corolla-tube, if present, sometimes with further series of flaps or a lobed ledge. Stamens following curve of style and subequal in length, red at least above; anthers 4-theous. Style filiform, angular, slightly curved to sinuous, sometimes corrugated near the base, only slightly thickened where anthers appressed in bud; stigma capitate. Berry red or yellow, ellipsoid or urceolate, smooth or warty.

12 species from the Middle East and Arabia, extending down the eastern side of Africa to Angola and South Africa, mostly in dry country, mainly on legumes or Bursaceae.

- 1. Corolla with a long tube, pinkish tipped green or greenish blue; umbels with 1–2 flowers often on very contracted stems 4. *P. meridianus*
- Corolla of separate petals connivent in lower part, variously yellow, red and whitish 2
- 2. Receptacle (5–)6–8 mm. long; berries 12–15 mm. long 3. *P. kalachariensis*
- Receptacle 2.5–4(–5) mm. long; berries 9–12 mm. long 3
- 3. Leaves all cuneate to a short petiole 1. *P. curviflorus*
- Leaves cordate to sagittate on long shoots (variably shaped and sometimes shortly petiolate on short shoots) 2. *P. sagittifolius*

1. ***P. curviflorus*** (*Oliv.*) *Tiegh.* in Bull. Soc. Bot. Fr. 41: 504 (1894); Danser in Verh. K. Akad. Wet., sect. 2, 29(6): 100 (1933); Blundell, Wild Fl. E. Afr.: 131, t. 514 (1987), pro parte; M.G. Gilbert in Fl. Ethiopia 3: 364, fig. 114.5 (1990); Polh. & Wiens in U.K.W.F., ed. 2: 154, t. 54 (1994) & Mistletoes Afr.: 88, photo. 8, fig. 3A (1998). Type: Ethiopia, without precise locality, *Plowden* (K!, holotype).

Leaves not markedly dissimilar where clustered on short shoots; petiole 1–3 mm. long; lamina usually linear, oblong-lanceolate or -oblanceolate, atypically obovate, 2–7.5 cm. long, 0.2–1.5(–2) cm. wide, basally cuneate, 3–5-nerved but venation often obscure. Umbels 1–3, axillary, at nodes below or on short shoots, 3–7-flowered; peduncle (1–)3–9 mm. long; pedicels 4–11 mm. long. Receptacle campanulate to urceolate, 2.5–4(–5) mm. long; calyx rim-like, 0.5–1 mm. long. Petals separate, 2.5–3.5 cm. long; basal part below filament-insertion red, yellow or less often white or orange, S-shaped, 5–8 mm. long, with 4–5 paired folds inside; distal part normally red, atypically yellow, recurving, ± twisted, linear-spathulate above. Stamens red; anthers 7–12 mm. long. Berry red, ellipsoid or urceolate, 9–12 mm. long, 7 mm. in diameter, smooth. Fig. 2/1–5 (p. 10).

UGANDA. Acholi District: Chua, above Lututuru, Feb. 1938, *Eggeling* 3494!; Karamoja District: Lokitanyala, Sept. 1963, *Tweedie* 2724!; Mbale District: Kyosoweri [Kyesoweri], 17 Oct. 1955, *Norman* 296!

KENYA. Northern Frontier Province: Dandu, 20 Mar. 1952, *Gillett* 12607!; Kitui District: 50 km. E. of Thika on Kitui road, *Wiens* 4486!; Teita District: Mt. Kasigau, 4 km. S. of Rukanga at eastern base, 2 May 1981, *M.G. & C.I. Gilbert* 6123!

TANZANIA. Maswa District: Moru Kopjes, 31 Dec. 1971, *Greenway & Myles Turner* 13956!; Lushoto District: Mkomazi, 27 May 1962, *Gill* 23!; Iringa District: Ruaha National Park, Nyamakuyu rapids, 6 Aug. 1970, *Thulin & Mhoro* 605!

DISTR. U 1, 3; K 1–7; T 1–3, 7; E. Zaire, Somalia, Ethiopia and along the Red Sea coast to southernmost Egypt, also in the Middle East and the Arabian peninsula

HAB. Deciduous bushland and *Acacia* woodland, almost always on *Acacia*, rarely on *Albizia*; 50–2300 m.

SYN. *Loranthus curviflorus* Oliv. in Hook., Ic. Pl. 14, t. 1304 (1880); P.O.A. C: 167 (1895); Sprague in F.T.A. 6(1): 279 (1910); Engl. in V.E. 3(1): 105, fig. 69A–D (1915); K. Krause in N.B.G.B. 8: 504 (1923); F.D.O.-A. 2: 161 (1932); Engl. & K. Krause in E. & P. Pf., ed. 2, 16B: 148, fig. 70A–D (1935); Balle in F.C.B. 1: 318 (1948); T.T.C.L.: 280 (1949); U.K.W.F.: 330, fig. on 331 (1974), excl. syn. *L. sagittifolius* [*L. kalachariensis* sensu T.T.C.L.: 280 (1949), non Schinz]

NOTE. Easily recognised in the main northern part of its range, but intergrading to some extent with *P. sagittifolius* in East Africa. The leaves are always cuneate and shortly petiolate at the base. The petals are normally red or yellow at the base and red above, but along the Rift Valley the flowers may be yellow and orange or wholly yellow. The normally narrow, leathery, obscurely veined, often glaucous leaves vary to obovate and nervose near the East African coast, and are also sometimes unusually broad in the Rift Valley. There is a distinct form of the species in the Kenya Highlands above about 1650 m., notably robust, with very leafy floriferous short shoots and generally yellow petals, red at the base or tip; this form, but with more variably coloured flowers, extends over the Serengeti plains of NW. Tanzania.

2. ***P. sagittifolius*** (*Engl.*) *Danser* in Verh. K. Akad. Wet., sect. 2, 29(6): 100 (1933); M.G. Gilbert in Fl. Ethiopia 3: 364 (1990); Polh. & Wiens in U.K.W.F., ed. 2: 155, t. 55 (1994) & Mistletoes Afr.: 88, photo. 20 (1998). Types: Tanzania, Tanga District, Moa, *Holst* 3103 (B!, syn., COI!, P!, isosyn.) & Lushoto District, Mashewa, *Holst* 8835 (B!, syn., K!, isosyn.)

Leaves heteromorphic, those on long shoots always sessile (except sometimes 1–2 basal pairs) and generally more markedly sagittate or cordate at the base, those on short shoots with a petiole up to 1(–3 inland) mm. long; lamina diversely lanceolate to obovate or circular, 0.8–4.5(–6) cm. long, 0.5–3 cm. wide, rounded to cordate or sagittate at the base, 3–7-nerved, with venation conspicuous to obscure. Umbels

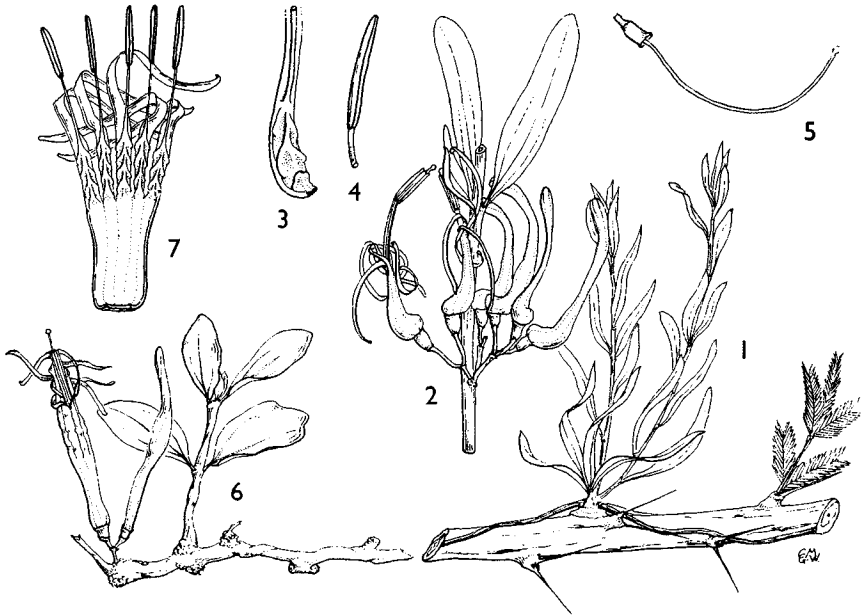


FIG. 2. *PLICOSEPALUS CURVIFLORUS* — 1, young plant showing surface runners, $\times \frac{1}{2}$; 2, flowering branch, $\times \frac{1}{2}$; 3, base of petal showing stamen insertion, $\times 2$; 4, anther, $\times 2$; 5, gynoecium, $\times 1$. *PLICOSEPALUS MERIDIANUS* — 6, habit, $\times \frac{1}{2}$; 7, corolla opened out, $\times 1$. 1, from Tweedie 2489; 2–5, from Bally & Smith 14917; 6, 7, from Tweedie 2974. Drawn by Christine Grey-Wilson.

normally terminal on leafy short shoots, atypically 1–several at leafy or leafless nodes, 3–7(–12)-flowered; peduncle 5–10(–17) mm. long; pedicels 6–10 mm. long. Receptacle campanulate, 2.5–4 mm. long; calyx rim-like, 0.5–1 mm. long. Petals separate, 3–3.5 cm. long, normally ageing from yellow-green through yellow and orange to red, but inland often yellow and sometimes with a redder basal part; basal part slightly S-shaped, 6–8 mm. long, with 4–7 paired folds inside; distal part recurving, twisted, linear-spathulate above. Stamens orange, pink or red; anthers 7–9 mm. long. Berry red, ellipsoid, 9–10 mm. long, 7 mm. in diameter, smooth.

UGANDA. Acholi District: Rom, Dec. 1935, *Eggeling* 2369!; Karamoja District: Moruangaberu [Emoruangaberru], 14 Jan. 1956, *Dyson-Hudson* 117! & Lodoketemit [Lodoketeminit], 8 Nov. 1962, *Kerfoot* 4465!

KENYA. Northern Frontier Province: 60 km. on Wajir-El Wak road, 29 Apr. 1978, *M.G. Gilbert & Thulin* 1215!; W. Suk District: Kongelai [Kongoli] road, July 1961, *Lucas* 186!; Teita District: 8–11 km. W. of Bura Railway Station, 17 Jan. 1972, *Gillett* 19587!

TANZANIA. Masai District: Kitumbeine Mt., 2 Mar. 1969, *Richards* 24259!; Tanga District: Perani Forest, 12 Aug. 1953, *Drummond & Hensley* 3707!; Dodoma District: 26 km. on Dodoma-Morogoro road, 12 Apr. 1988, *Bidgood, Muwasumbi & Vollesen* 1030!

DISTR. U 1; K 1–4, 6, 7; T 2, 3, 5–7; coastal regions from S. Somalia to N. Mozambique, inland to the Rift Valley region from S. Ethiopia to S. Tanzania

HAB. Deciduous bushland and *Acacia* woodland, almost invariably on *Acacia*, rarely on *Albizia* or *Commiphora*; 30–2300 m.

SYN. *Loranthus undulatus* Harv. var. *sagittifolius* Engl., P.O.A. C: 167, t. 18A–C (1895), as '*sagittaeifolius*', & in E.J. 30: 304 (1901)

L. sagittifolius (Engl.) Sprague in F.T.A. 6(1): 278 (1910) & in K.B. 1911: 88 (1911); Engl. in V.E. 3(1): 105, fig. 69J (1915); F.D.O.-A. 2: 161 (1932); Engl. & K. Krause in E. & P. Pf., ed. 2, 16B: 148, fig. 70J (1935); T.T.C.L.: 280 (1949)

NOTE. Agnew, U.K.W.F. (1974), included *P. sagittifolius* in *P. curviflorus* and some herbarium annotations also indicated doubts about the specific distinctness of *P. sagittifolius*. The similarity of populations along the Rift seems to us to result from some secondary introgression. The typical form of *P. sagittifolius* along the E. African coast has very characteristic leafy flowering shoots, the sessile sagittate or cordate primary leaves subtending a short shoot with smaller \pm cordate leaves and terminated by an umbel of flowers that turn from yellow to red with age. Inland *P. sagittifolius* can always be separated by the sessile cordate or sagittate leaves on the long shoots, but firstly the leaves on short shoots tend to become more obviously petiolate, the inflorescences tend to be produced severally and later, and the flowers are normally yellow, often with an orange base. On the Rift floor the differences between *P. sagittifolius* and *P. curviflorus* are reduced essentially to the shape of leaves on long shoots, though local populations seem to remain discrete. In an unpublished research paper at Kew, Jacque Triner demonstrated that the anatomy of the leaves was significantly different in the two species, those of *P. curviflorus* distinctly more xeromorphic.

3. ***P. kalachariensis*** (Schinz) Danser in Verh. K. Akad. Wet., sect. 2, 29(6): 100 (1933); Wiens & Tölken in F.S.A. 10: 35, fig. 14/2 (1979); Polh. & Wiens, Mistletoes Afr.: 90, photo. 21 (1998). Types: Botswana, Okavango, *Fleck* 307 & Lake Ngami, *Fleck* 314a (Z, syn.)

Leaves light green to glaucous; petiole (0–) 1–6 mm. long; lamina variably narrowly oblong to lanceolate, oblanceolate, elliptic-oblong or almost ovate, sometimes slightly curved, 2–12 cm. long, 0.4–5.5 cm. wide, cuneate to rounded or exceptionally somewhat sagittate at the base, 3–7-nerved. Umbels 1–4 in the axils or at the nodes below, 3–6-flowered; peduncle (1–) 3–6 mm. long; pedicels 8–12 mm. long. Receptacle obconic, (5–) 6–8 mm. long; calyx rim-like, 0.5–1 mm. long. Petals separate, 4–5 cm. long, pink to reddish orange, usually darker towards the base, but sometimes banded or mottled; basal part slightly S-shaped, 9–12 mm. long, with 4–5 paired folds inside; distal part recurving, twisted, linear-oblanceolate to linear-spathulate above. Stamens pinkish; anthers 9–15 mm. long. Berry red, urceolate, 12–15 mm. long, 7–8 mm. in diameter.

KENYA. Kwale District: Gongoni Forest, 3 June 1990, *Luke & S.A. Robertson* 2368!

TANZANIA. Morogoro, Forest Office, 27 Aug. 1956, *Semsei* 2441!; Iringa, just north of the township, 14 July 1956, *Milne-Redhead & Taylor* 11078!; Kilwa District: Kingupira, 7 July 1975, *Vollesen* in *M.R.C.* 2538!

DISTR. K 7; T 5–8; south to Angola, Namibia and northern parts of South Africa

HAB. Mixed woodland, generally with *Acacia* or *Brachystegia*, usually on legumes, most commonly *Acacia*, *Albizia*, *Brachystegia* and *Julbernardia*; 30–1850 m.

SYN. *Loranthus kalachariensis* Schinz in Bull. Herb. Boiss. 4, Append. 3: 53 (1896); Sprague in F.T.A. 6(1): 280 (1910) & Fl. Cap. 5(2): 105 (1915); Engl. in V.E. 3(1): 106, fig. 69E–H (1915); Engl. & K. Krause in E. & P. Pf., ed. 2, 16B: 148, fig. 70E–H (1935)

Plicosepalus curviflorus (Oliv.) Tiegh. var. *kalachariensis* (Schinz) Balle ined.; Vollesen in Opera Bot. 59: 64 (1980), *nom. invalid., comb. non rite publ.*

NOTE. *Plicosepalus kalachariensis* differs from *P. curviflorus* essentially only in its larger flowers and fruits, and if it were not for other taxa in the complex might perhaps be more appropriately ranked as a subspecies. Where the ranges abut in Tanzania there is a slight ecological segregation, with *P. kalachariensis* well established (though not common) in *Brachystegia* woodland, and, like plants from this association further south, the leaves tend to be notably broader than in *P. curviflorus* with 5–7 main pairs of nerves. Nevertheless along the walls of the Rift from Kondoia to Mbeya there are slight indications of a narrow zone of more or less intermediate populations, represented, for example, by Iringa, *Semsei* 2442 & Iringa, Kibebe Farm, *Fison* 151.

4. ***P. meridianus*** (Danser) Polh. & Wiens in Nordic Journ. Bot. 5: 222 (1985); Blundell, Wild Fl. E. Afr.: 131, t. 755 (1987); M.G. Gilbert in Fl. Ethiopia 3: 363, fig. 114.2 (1990); Polh. & Wiens in U.K.W.F., ed. 2: 155 (1994) & Mistletoes Afr.: 94, photo. 25, fig. 3F (1998). Type: Tanzania, Dodoma/Iringa District, Njombe R., S. of Kilimatinde between Ilangali [Iringali] and Uwimbi, *von Prittwitz* 175 (B!, holo.)

Leaves opposite to alternate on short stems or directly from the runners or haustoria (appearing as tufts on host); petiole 1–3 mm. long; lamina narrowly elliptic to obovate, 1–4 cm. long, 0.4–2.3 cm. wide, obliquely cuneate at the base, 3–5-nerved from base. Umbels 1–2 from nodes of runners or stems, with or without leaves, or on knobby contracted stems, 2–4-flowered; peduncle 2–6 mm. long; pedicels 4–10 mm. long. Receptacle obconic-cylindrical, 3–4 mm. long; calyx rim-like, 1–2 mm. long. Corolla 4.5–6.7 cm. long, pinkish tipped green or greenish blue; tube very slightly S-shaped, 2–3 cm. long, narrow, slightly flared in upper oblique part; lower connivent part of the lobes 7–15 mm. long, with normally 6–8 paired folds and papillose inside; lobes distally recurving, linear. Filaments red, at least above; anthers 9–10 mm. long, purple. Berry orange or pink tinged, obovoid, 10 mm. long, 6 mm. in diameter. Fig. 2/6, 7 (p. 10).

UGANDA. Karamoja District: Lokitanyala [Lokitaungyala], Jan. 1955, *Philip* 750! & Moroto R., Feb. 1936, *Eggeling* 2958!

KENYA. W. Suk District: Ortum, Jan. 1965, *Tweedie* 2974!; Machakos District: Mombasa–Nairobi road, km. W. of Kibwezi, 24 Jan. 1972, *Wiens* 4548!; Tana R. District: Garissa–Garsen road, 8.3 km. from turnoff to Bura, 7–9 July 1974, *R.B. & A.J. Faden* 74/1022!

TANZANIA. Musoma District: Seronera National Park, 20 Apr. 1965, *Richards* 20237!; Mbulu District: Katesh, 27 Aug. 1970, *Richards* 25801!; Iringa District: Ruaha valley, 15 km. N. of Mbuyuni on Malolo track, 17 May 1990, *Abdallah & Newton* 2261!

DISTR. U 1; K 1, 2, 4, 7; T 1, 2, 5–7; Ethiopia and Somalia

HAB. Deciduous bushland, generally on *Commiphora*, sometimes on *Acacia*; 100–1550 m.

SYN. *Tapinostemma meridianum* Danser in N.B.G.B. 11: 216 (1931) & in Verh. K. Akad. Wet., sect. 2, 29(6): 122 (1933)

Loranthus ngurukizi E.A. Bruce in K.B. 1933: 470 (1933). Type: Tanzania, Dodoma District, Manyoni, *B.D. Burt* 3419 (K!, holo.)

L. meridianus (Danser) K. Krause in E. & P. Pf., ed. 2, 16B: 148 (1935); E.A. Bruce in K.B. 1936: 475 (1936); T.T.C.L.: 283 (1949); U.K.W.F.: 332 (1974)

[*L. acaciae* sensu U.K.W.F.: 330 (1974), *non* Zucc.]

NOTE. The runners have been likened to the roots of epiphytic orchids, and the tendency to produce tufts of leaves and flowers on such short stems that they appear to emerge from the host is curious.

3. EMELIANTHE

Danser in Verh. K. Akad. Wet., sect. 2, 29(6): 53 (1933), pro parte excl. *E. galpinii*; Polh. & Wiens, *Mistletoes Afr.*: 96 (1998)

Loranthus L. sect. *Tetrameri* Sprague in F.T.A. 6(1): 264 (1910)

Shrubs 0.5–2 m., with a single haustorial attachment, glabrous. Leaves mostly alternate and also crowded on short shoots, penninerved. Flowers 2–4, umbellate on a short peduncle or clustered on short shoots of generally leafless branches, shortly pedicellate; bract ovate-triangular from a saucer-shaped based. Calyx cupular. Corolla joined about halfway, 4-lobed, radially symmetrical, with fluted vents opening at top of tube, not explosive when opened, the lobes recurving. Stamens inserted above the base of the corolla-lobes, remaining weakly attached to the style-tip by connective-appendage; anthers 4-theous, with a conspicuous bifid connective-appendage. Style filiform; stigma capitate. Berry obovoid.

A single species in the drier parts of E. and NE. Africa.

The flowers are more regular than *Plicosepalus*, with vents opening on all sides, the tips recurving to reveal the bright red filaments inside. At anthesis the connective-appendages remain adherent to the tip of the style, so that the anthers and stigma remain in proximity. The pollen is not released explosively.