

A taxonomic revision of *Elaeodendron* Jacq. (Cassinioideae: Celastraceae) in Africa

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The heterogeneous genus, *Cassine* L. s.l. is subdivided into smaller, more natural genera, following new evidence from macromorphology, palynology and anatomy. *Elaeodendron* Jacq., one of the segregate genera, is here revised for Africa. The redefined genus *Elaeodendron* is cosmopolitan, with consists of 30 to 40 species of shrubs and trees distributed in Africa, Asia, Australasia and central America. Eight species of *Elaeodendron* are recognized in Africa. A new combination, *E. transvaalense* (Burt Davy) R.H. Archer (= *Cassine transvaalensis*) is proposed. The other species are *Elaeodendron aquifolium* (Fiori) Chiov., *E. buchananii* (Loes.) Loes., *E. croceum* (Thunb.) DC., *E. matabelicum* Loes., *E. schlechterianum* (Loes.) Loes. and *E. zeyheri* Spreng. ex Turcz. The correct application of the previously misapplied and confused name *E. croceum* is discussed.

Keywords: *Cassine*, Cassinioideae, Celastraceae, *Elaeodendron*, taxonomy.

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Introduction

This paper emanates from a multi-disciplinary study towards a taxonomic revision of the southern African Cassinioideae (Archer & Van Wyk 1996a). It has long been a matter of dispute whether to treat *Cassine* L. in a wide sense (e.g. Ding Hou 1962; Kostermans 1986), or to recognize a number of segregate genera, including *Elaeodendron* Jacq. (e.g. Loesener in Die natürlichen Pflanzenfamilien, 1942a). Following Archer (1990) and Archer and Van Wyk (1992, 1993a, 1993b, 1996a), five distinct southern African genera, the African/Madagascar *Mystroxydon* and the cosmopolitan *Elaeodendron*, can be conclusively recognized on evidence from macromorphology, palynology, and anatomy.

Our present concept of *Cassine* s. str. largely follows Loesener (1942a), Robson (1965, 1966, 1989) and Robson *et al.* (1994) and necessitates many name changes back to the original basionyms in *Elaeodendron* for most species of *Cassine* s.l. from other parts of the world. Fortunately, most species have been well known under *Elaeodendron*, and in most cases correct combinations already exist. Approximately 40 species of *Elaeodendron* can be recognized from central America, Africa and Australasia. Eight taxa are confined to Africa, excluding the Mascarenes and Madagascar, and are here revised. One species, *Elaeodendron orientale* Jacq., which was treated as a cultivated species in Flora Zambesiaca (Robson 1966), seems to exist in that Flora area as a single tree in the Mutare Botanical Garden, Zimbabwe. A synopsis of the known species of *Elaeodendron* worldwide is in preparation and will be published elsewhere.

Herbarium specimens cited here are arranged by the quarter-degree reference system of Edwards and Leistner (1971). One specimen is cited per quarter degree square. Localities north of the equator, or west of Greenwich are indicated by the letters N or W after the longitude or latitude respectively. Codes following the geographical divisions of the *Flora of Tropical East Africa* (Polhill 1988) have been added in the case of specimens cited for the latter region.

Systematic treatment

Elaeodendron Jacq., Icones Plantarum Rariorum t. 48 (1782); Murray: 241 (1784), as *Elaeodendrum*; Jacq. f.: 36 (1787), as *Elaeodendri*; Loes.: 223 (1897); 172 (1942a); Thonner: 331 (1915); N. Robson: 385 (1966); N. Robson *et al.*: 29 (1994). Type: *E. orientale* Jacq.

Rubentia Juss.: 378, 452 (1789); Gmel.: 408 (1791). Type: *R. olivina* J.F. Gmel. [*Elaeodendron orientale* Jacq.].

Schrebera Retz.: 25 (1791) non L. nec Schreb., nec Roxb. Type: *S. albens* Retz.

Portenschlagia Tratt.: 250 (1818). Type: *P. australis* Tratt.

Neerija Roxb.: 86 (1814); Carey et Wallich in Roxb.: 444 (1824); Carey in Roxb.: 646 (1832). Type: *N. dichotoma* Roxb.

Crocoxydon Eckl. & Zeyh., 128 (1834/5); Harv.: 50 (1838); N. Robson: 40 (1965); 390 (1966); N. Robson & Sousa: 36 (1969). Type: *C. excelsum* Eckl. & Zeyh. nom. illeg. (*Elaeodendron croceum* (Thunb.) DC.).

Cassine Loes.: 214 (1892), pro parte excl. typum; Davison 2: 326 (1927) pro parte; sensu auct. plur., non L. Type: *C. peragua* L. type prop. cons.

Cassine L. sect. *Euelaeodendron* Loes.: 215 (1892).

Telemachia Urb.: 334 (1916). Type: *T. trinitensis* Urb. (*Elaeodendron australe* Vent.).

Pseudocassine Bredell: 330 (1937); Compton: 338 (1976). Type: *P. transvaalensis* (Burt Davy) Bredell.

Evergreen or rarely deciduous shrubs to trees; unarmed, glabrous, without elastic threads (trans-1, 4-polyisoprene) in bark and leaves; bark with layers of yellow pigment occasionally present or hardly discernible. *Branchlets* subangular to terete, lenticels usually prominent. *Leaves* opposite to subopposite, or occasionally alternate, spiralled to fasciculate; stipules minute, \pm 1 mm long, \pm triangular, marcescent. *Inflorescences* usually pedunculate, dichasial. *Flowers* usually bisexual, occasionally unisexual, sometimes with petaloid staminodes in female flowers; 3-, 4- or 5-merous (except ovary), pedicellate. *Sepals* equal, subcircular. *Petals* cream to greenish, oblong to ovate, entire or with ventral projections, spreading. *Stamens* erect to spreading, arising inside margin of disc or from sinuses in the margin of the disc; anthers introrse or extrorse, dehiscing by longitudinal slits. *Disc* entire to subentire and convex, fleshy, or flat and quadrangular, with sinuses at the point of stamen insertion, flat to concave. *Ovary* \pm 1/2 immersed in and adnate to the disc, 2-, 3- or 4-locular, with two erect collateral ovules per locule; style short to absent, stigma inconspicuous. *Fruit* drupaceous, spheroid to

ellipsoid, white to yellow; stone narrowly ellipsoid to ellipsoid, surface smooth or with grooves. *Seeds* brownish, narrowly ellipsoid, ovoid, flattened to triangular, postchalazal vascular bundles often present, endosperm present; embryo erect with cotyledons fleshy, elliptic or ovate.

Elaeodendron is one of the largest genera in the Celastraceae, consisting mostly of shrubs or trees. An estimated 30 to 40 species occur in central America, Africa, Asia and Australasia. Some members are commercially exploited or have potential for wood production.

The African species of *Elaeodendron* are more frequent in southern Africa and the eastern lowland parts of the continent. Three species, *E. buchananii*, *E. matabelicum* and *E. transvaalense*, also extend to the drier parts of western tropical Africa.

Much uncertainty exists in recent literature concerning the correct spelling and author citation of the name *Elaeodendron* (Archer & Van Wyk 1996b). Kostermans (1986) pointed out that *Elaeodendrum* Murray has priority over *Elaeodendron* Jacq. f., while most authors considered either Jacq. f. or Jacq. to be the correct author of the generic name. Archer and Van Wyk (1996b) argue that *Elaeodendron* Jacq. (1782) is validly published as a plate with an analysis and that it predates both Murray (1784) and Jacquin f. (1787).

Robson (1965, 1966) treated *E. zeyheri* (*Cassine crocea* auct. non Thunb.) and *E. transvaalense* under the genus *Crocoxylon*. The latter genus is supported by a distinctive pollen type with a rugulose-reticulate exine structure (Archer & Van Wyk 1992). However, several tropical African and extra-African species are intermediate (in pollen structure and flower morphology) between *Elaeodendron* and Robson's concept of *Crocoxylon*. The key provided below gives some indication of the considerable variation in the number of floral parts in the African members of *Elaeodendron*. At this stage it is not considered feasible to recognize *Crocoxylon* as a segregate genus or even any supraspecific taxa. Incidentally, the name *Crocoxylon* is to be regarded as a synonym of *Elaeodendron*, typified by *E. croceum* (Thunb.) DC. (not *Crocoxylon crocea* (Thunb.) N. Robson).

Key to the African species of *Elaeodendron*

- 1a Flowers with ovary heteromerous with other floral whorls, 2- or 3-locular. 2
- 2a Flowers 4-merous, ovary 2-locular 3
- 3a Tree; leaf margin denticulate to prominent spinulose on juvenile shoots; fruit large, up to 32 × 15 mm, cream; southern Africa 1. *E. croceum*
- 3b Shrub or small tree (usually less than 3 m high); leaf margin entire or rarely spinulose-denticulate; fruit small, up to 8 × 5 mm, white; coastal areas of east Africa 2. *E. schweinfurthianum*
- 2b Flowers 5-merous, ovary 2- or 3-locular. 4
- 4a Shrub or small irregular tree; leaf margin prominently spinulose; ovary 2-locular; Somalia, Kenya 3. *E. aquifolium*
- 4b Tree; leaves serrate or glandular-crenulate, occasionally spinulose; ovary 2- or 3-locular 5
- 5a Leaf teeth incurved; flowers unisexual; ovary 2- or 3-locular; staminodes petaloid. 4. *E. buchananii*
- 5b Leaf teeth spreading or incurved; flowers bisexual (rarely unisexual, then staminodes stamen-like); ovary 3-locular. 6
- 6a Leaf margin spinulose-denticulate, occasional subentire; lamina glossy greyish-green; southern tropical Africa and east Africa. 5. *E. schlechterianum*

- 6b Leaf margin glandular-crenate; lamina pale yellowish green; southern tropical Africa 6. *E. matabelicum*
- 1b Flowers with ovary isomerous with other floral whorls, 3- or 4-locular 7
- 7a Flowers 4-merous; Eastern Cape & KwaZulu-Natal, rare in Mozambique and Northern Province 7. *E. zeyheri*
- 7b Flowers 3-merous; widespread in southern Africa. 8. *E. transvaalense*

1. *Elaeodendron croceum* (Thunb.) DC. Prodrum 2: 11 (1825) [as *Elaeodendron*?]; Papp: 10 (1854); Sond.: 468 (1860) *pro parte*; Marloth: 154 (1925); Archer & Condly: 58 (1995). Type: *Thunberg*, sheet 3807 in Herb. Thunb. (UPS!, holo).

Ilex crocea Thunb.: 32 (1794a); 1: 169; 2: 109 (1794b [original Swedish edition, 1788]); Thunb.: 577 (1818); 159 (1823). *Cassine crocea* (Thunb.) Kuntze: 114 (1891); Von Breitenbach: 637 (1965), *pro parte*; Coates Palgrave: 510 (1977) *pro parte*; non Davison: 334 (1927).

Elaeodendron capense Eckl. & Zeyh.: 127 (1834/5); Graham: 3835 (1841); Sond.: 468 (1860); Bak. f.: 45 (1911); Eyles: 404 (1916); Marloth: 154 (1925); Loes.: 173 (1942a); N. Robson: 386 (1966). Type: Cape, 'Sylvis Sitsikamma & Krakakamma (Georg, Uitenhage). Flor Jul. Fruct. Febr.', *Ecklon & Zeyher s.n.* (SAM!, lecto, here designated, S!, TCD!, Z!).

Elaeodendron papillosum Hochst. in Krauss: 305 [(1844) reprinted: 42 (1846)]; Ettingshausen: 58 (1857). *Cassine papillosa* (Hochst.) Kuntze: 114 (1891); Davison: 334 (1927) *pro parte* excl. syn. *C. lacimulata* Loes.; Palmer & Pitman: 1321 (1973); Von Breitenbach: 228 (1974); Coates Palgrave: 511 (1977); Coates Palgrave *et al.*: 64 (1985); Pooley: 278 (1993). Type: 'sylvis prope Natal, Julio 1839', *Krauss* 270 (TUB, holo., BM!, K!, MO!, S!, TCD!).

Olea sp. Mellis: 312 (1875).

Icones: Graham: t. 3835 (1841); Von Breitenbach: 229 (1974); Coates Palgrave *et al.*: 64 (1985); Archer & Condly: t. 2112 (1995).

Medium to tall evergreen tree, glabrous; bark greyish with layers of powdery yellow pigment in exposed rhytidome, exfoliating in thin scales, surface longitudinally fissured. *Branchlets* subangular to terete, grey-brown, lenticels prominent, black. *Leaves* opposite; lamina elliptic to oblong, dark green above, paler green below, (15-) 35-75 (-220) × (10-) 15-45 (-70) mm, base attenuate to cuneate, apex acute to acuminate, margin glandular-denticulate to prominently spinulose dentate on juvenile shoots; coriaceous; venation indistinctly brochidodromous to semi-craspedodromous in juvenile leaves, ± raised above and below in dried material, fine reticulation less conspicuous; petiole 4-10 mm long; stipules brownish black. *Inflorescences* axillary towards apices of branchlets, usually pedunculate, ± compact dichasial, 1-15-flowered, peduncle (0) 3-12 mm long; bracts minute, bracteoles occasionally present. *Flowers* bisexual, 4-merous, ± 3 mm in diam., pedicels 1-2 mm long. *Sepals* greenish, ovate, 1.5 × 1 mm, fleshy. *Petals* whitish green, broadly ovate, 1.5 × 1.5 mm, spreading. *Stamens* erect to spreading; filaments 0.5 mm long, anthers 0.5 mm long, dorsifixed, introrse. *Disc* quadrangular, subentire with sinuses at the point of stamen insertion, flat to concave. *Ovary* 2-locular; style and stigma inconspicuous. *Fruit* drupaceous, ellipsoid, cream, 20-32 × 10-15 mm, stone narrowly elliptic, tapered at both ends. *Seeds* pale brown, narrowly ellipsoid, 15-20 × 4-5 mm; embryo with fleshy cotyledons (Figure 1).

Elaeodendron croceum occurs on the margins of coastal and montane forest from near Ladismith in the Western Cape to northern KwaZulu-Natal in the east, as well as in isolated spots

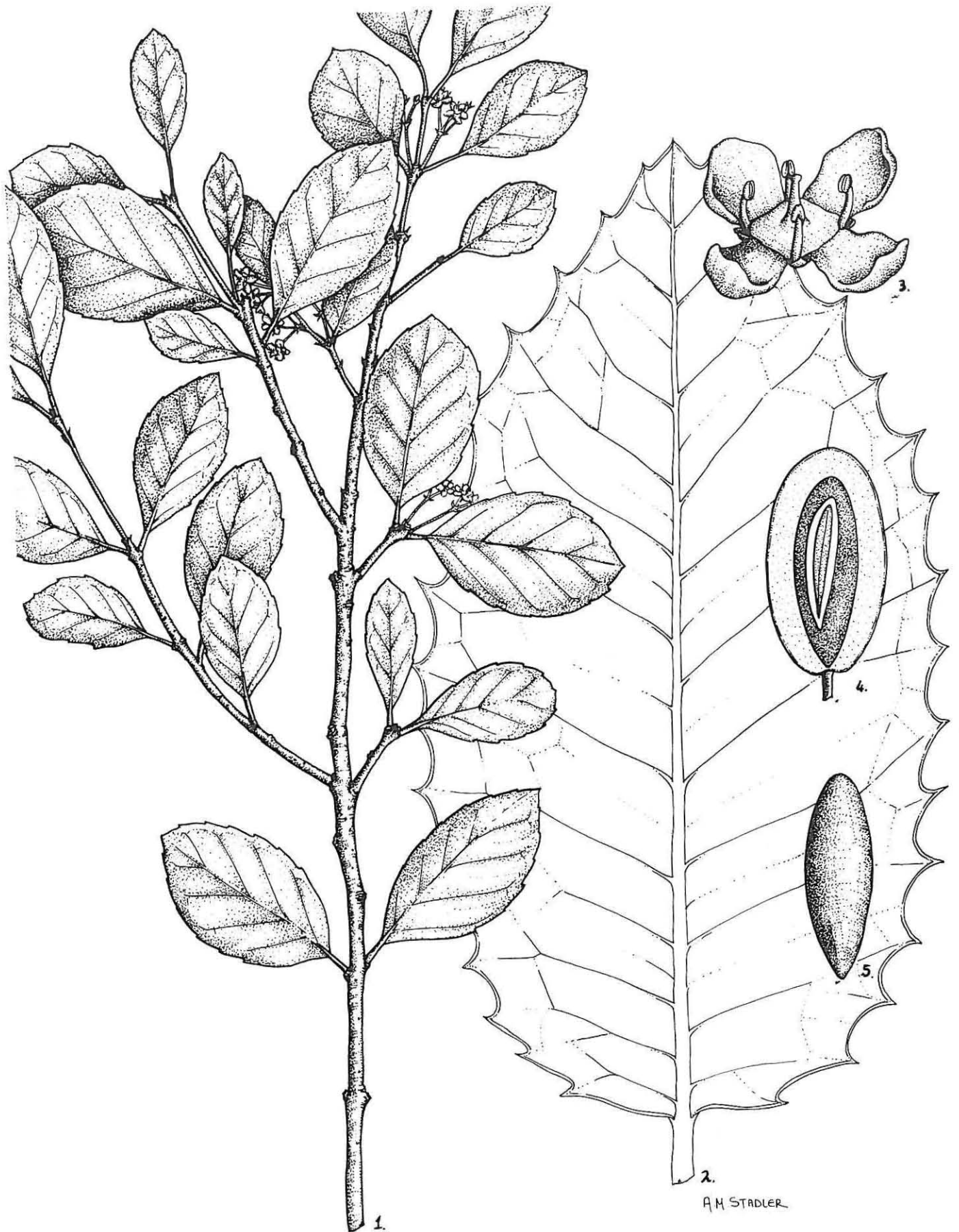


Figure 1 *Elaeodendron croceum*. 1. Flowering branch, $\times 1$; 2. juvenile leaf, $\times 1$; 3. flower, $\times 10$; 4. fruit, $\times 1.5$; 5. seed, $\times 1.5$. Drawn by Anne Stadler from Archer 2090 (PRE); 2. from Taylor s.n. PRE 802955 (PRE).

along the Mpumalanga and Eastern Zimbabwe escarpment (Figure 2). It is most abundant and well known in the southern Cape forests where it was once popular for its bright yellow, durable wood. It is also naturalized and fairly abundant on St. Helena, having spread from plantations of the species established. Mellis (1875) considered this species, which he placed under *Olea* ? sp. and called wild olive, as very common and 'one of the handsomest trees on the island'. *E. croceum* is distributed by fruit bats, Rameron Pigeons and even elephants (pers. obs.; Phillips 1925, 1927; Herzig-Straschil & Robinson 1978). Flowering occurs sporadically in summer. Fruit usually ripens about after a year.

Thunberg (1794b) and Pappe (1858) recorded the use of the fine and durable wood of *E. croceum* for the making of all kinds of furniture, building material, wagons as well as buttercasks. Most parts of the plant are poisonous and valued for medicinal and magical properties (Watt & Breyer-Brandwijk 1962). *Elaeodendron croceum* is a decorative garden plant. Flavonoids and triterpenoids from this species have been studied by Drewes and Mashimbye (1993).

Elaeodendron croceum has been subject to considerable nomenclatural confusion and name changes, evident in literature and on herbarium sheets. Since Ecklon and Zeyher (1834/5), most authors have mistaken the identity of Thunberg's *Ilex crocea*. The type specimen was carefully studied at UPS and there can be no doubt as to its identity. It is likely that Thunberg encountered this species in the Grootvadersbosch, near Swellendam (Thunberg 1794b). On a subsequent visit in 1774, Thunberg was disappointed in again finding few trees in flower or fruit, but continued collecting sterile specimens, certainly amongst others the present species. *Elaeodendron croceum* is frequent in the southern Cape, while the species with which many authors have confused it, *E. zeyheri* (*Cassine crocea* auct.), does not occur west of Port Elizabeth.

The responsibility for this nomenclatural confusion can evidently be laid upon Ecklon and Zeyher (1834/5), who published *E. capensis*, but also chose a superfluous name *Crocoxylon excelsum* as the new name for *E. croceum*. The generic description of *Crocoxylon* and the specimens cited, however, correspond with *Elaeodendron zeyheri*. This confusion has been perpetuated by most subsequent workers, e.g. Robson (1965, 1966) and Coates Palgrave (1977), the latter publishing a description of *Cassine crocea* auct. that applies to *E. croceum*. Most information in literature on forestry and wood hitherto published under *E. croceum* auct. applies to *E. croceum*.

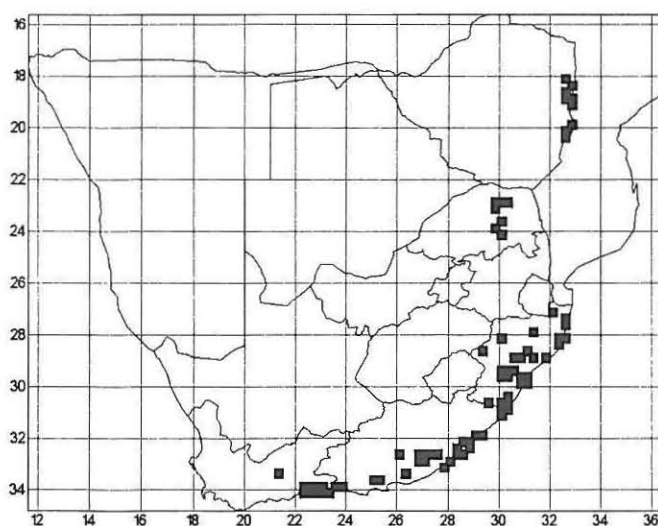


Figure 2 Known distribution of *Elaeodendron croceum*.

Several vernacular names, including 'Saffron' (or 'Common Saffron', 'Saffron wood') and 'geelhout' (yellow wood) were first recorded by Thunberg (1794b). The specific epithet chosen by Thunberg refers to the presence of a bright yellow pigment in the bark.

Selected specimens examined

Zimbabwe

- 1832 (Mutare): Umtali, N Vumba, SSW of Lion Rock, (–BA), Muller 3378 (SRGH); Inyanga [Nyanga], Nyamzu[I]wa River (–BD), Wild 1573 (K, SRGH); Inyanga [Nyanga], Forest on summit of Hongo, Mt Kukwanisa Training School (–DA), Chase 8475 (K, SRGH); Mutare, Gunner's Way Cecil Kop Nature Reserve (–DC), Burrows 2276 (SRGH); Umtali [Mutare], Stapleford, near T. Meikle Forest Research Station (–DD), Muller 2983 (SRGH).
- 1932 (Melsetter): Brumba, plot Mrs Hayter, 23.5 km from Mutare (–BB), Van Wyk BSA 1197 (PRE, PRU); Melsetter, Tarka Forest Reserve (–DD), Goldsmith 27/71 (B. J. K. MO, P, PRE, SRGH).
- 2032 (Chipinge): Mount Selinda, between Mission station and border post (–BA), Van Wyk BSA 1236 (PRE, PRU); Gungunyana Forest Reserve, Top of Chiredza Gorge (–BC), Goldsmith 25/71 (K, PRE, SRGH).

South Africa

- 2229 (Waterpoort): Hanglip (–DD), Legat 68 (K).
- 2230 (Messina): Maname (–CC), Netshungani 1456 (J, PRE); Sibasa, Pepiti Falls (–CD), Smuts & Gillett 3183 (BOL, PRE).
- 2329 (Pietersburg): Happy Rest (–BB), Gerstner 6092 (PRE); Houtboschberg (–DD), Burt Davy 1242 (BOL).
- 2330 (Tzaneen): Westfalia Estate, Berg above Grootbos Forest Reserve (–CA), Scheepers 675 (K, PRE).
- 2430 (Pilgrim's Rest): The Downs (–AA), Remy DB50 (K, PRE).
- 2731 (Louwsburg): Mist Belt Forest, Ngomi [Ngome] (–CD), Gerstner 4442 (PRE).
- 2732 (Ubombo): Sibayi (–AA), Green Sibayi Project-333 (GRA, PRE); 335 (GRA); Sordwana Bay near Nature Reserve gate (–BC), Stephen, Van Graan & Schwabe 1028 (PRE); Sordwana Bay (–DA), Vahrmeijer & Tölken 300 (PRE).
- 2829 (Harrismith): Delville (–CB), Smuts PRE-58360 (BOL, PRE).
- 2830 (Dundee): Krantzkop, The Kop (–AA), Edwards 809 (K, PRE); 2093 (PRE); Qudeni Forest (–DC), Edwards 1506 (K, PRE); Kranskop, near Solitude Store (–DD), Acocks 11651 (PRE).
- 2831 (Nkandla): Nkandla Forest (–CA), Edwards 2310 (K, PRE, Z); Eshowe, Hlinza (–CD), Moll 2787 (K, PRE); Mtunzini, Twinstreams, dune forest near arboretum (–DD), Van Wyk 2655 (PRE).
- 2832 (Mtubatuba): St Lucia, Western Shores, Hell's Gate peninsula (–AB), Nicholas & MacDevette 1268 (K); Maphelane Nature Reserve (–AD), MacDevette 226 (C. K, PRE); Eastern Shores State Forest (–BA), Phillipson 3326 (GRA).
- 2930 (Pietermaritzburg): Farm Ehlatini, Karkloof (–AC), Moll 3442 (K, PRE, S); 15 mile NW of New Hanover, Edge of Yellowwood Forest (–AD), Codd 1480 (K, P, PRE); 12 mile NW of York (–BC), Acocks 12738 (K, PRE); Havaan Forest (–CA), Moll 3102 (K); 3198 (K, PRE, S); [Pieter]maritzburg (–CB), Carnegie 1666/28 (NBG); Inanda (–DB), Wood 937 (BM, K); Krantzkloof Nature Reserve (–DD), Moll 3318 (K, PRE).
- 2931 (Stanger): Umhlanga Rocks (–CA), Moll 2411 (PRE); Durban, Albert Park (–CC), Moll 3580 (PRE, S).
- 3029 (Kokstad): Weza State Forest, Foothills of Ngeli Mountain near Lovedale lookout (–DA), Van Wyk 7547 (PRE, PRU).
- 3030 (Port Shepstone): Dumisa, Hlutankunge (–AD), Rudatis 1768 (PRE); Hell's Gate, Oribi Gorge (–CA), Balkwill & Cron 302a (J, PRE); Timbankulu Forest (–CB), Strey 8740 (K, PRE);

Umtamvuna River (–CC), *Nicholson 1312* (PRE); Uvongo River (–CD), *Nicholson 1347* (PRE).

—**3129** (Port St Johns): Coffee Bay (–CC), *Wells 3512* (GRA); Hluleka Forest near Ngqelene (–CD), *De Winter 8829* (PRE).

—**3130** (Port Edward): Umtamvuna Nature Reserve (–AA), *Abbott 6348* (PRE).

—**3226** (Fort Beaufort): Amatole Mountains, near Cata (–CA), *Furness & Phillipson 265* (MO, PRE); Amatole Mountain, Hogsback Pass (–DB), *Phillipson 883* (K, PRE, UPS); Dal Eendracht Farm, S of Alice (–DD), *Giffen FH-2259* (PRE).

—**3227** (Stutterheim): Keiskamma Hoek, Wolf River Forest (–CA), *Wells 2797* (GRA, PRE); Stutterheim, 8.4 mile from Stutterheim on Keiskamma Hoek road (–CB), *Marais 527* (BOL, GRA, K, PRE); Pirie (–CB), *Sim 2154* (BOL, NBG, PRE); King Williamstown, Pirie Forest (–CC), *Von Gadow 213* (GRA); 3 mile from Amabele (–DA), *De Vries 114* (PRE).

—**3228** (Butterworth): 12.4 mile from Butterworth on Kentani road (–AD), *Marais 468* (GRA, K, PRE); 9.2 mile from Elliotdale on Willowvale road (–BA), *Marais 493* (GRA, K, PRE); 2 mile inland of The Haven, Bashee Mouth (–BB), *Wells 3557* (GRA, PRE); Dwessa Forest Reserve (–BD), *Marais 486* (BOL, GRA, K, PRE); Kei Mouth (–CB), *Flanagan 862* (GRA, MO, NBG, P, PRE, Z); Queensberry Bay (–CC), *Acocks 21058* (PRE); Wavecrest (–DA), *Lubke s.n.* (GRA).

—**3321** (Ladismith): Zwartebergen, Seven Weeks Poort (–AD), *Marloth 8448* (PRE).

—**3322** (Oudtshoorn): George (–CD), *Prior* (K, MEL, PRE, Z); Ebb and Flow Nature Reserve, valley of the Touw River (–DC), *Taylor 7997* (PRE, STE); Knysna, Millwood (–DD), *Lam & Meeuse 4724* (S).

—**3323** (Willowmore): Deepwalls Forest (–CC), *Bos 857* (B, LISC, STE); Blauwkrantz Pass (–DC), *Galpin 3885* (GRA, PRE); Storms River High Forests (–DD), *Keet 544* (GRA, STE).

—**3325** (Port Elizabeth): Groendal Wilderness Reserve, Zunga Catchment basin (–CA), *Scharf 1520* (K, PRE); Port Elizabeth, Springfields (–CB), *Paterson 2190* (PRE).

—**3326** (Grahamstown): Howieson's Poort (–AD), *MacOwan 713* (BM, BOL, K, P, PRE, UPS, Z).

—**3327** (Peddie): Fort Grey Forest Reserve (–BB), *Wells 3911* (GRA, LISC, PRE).

—**3422** (Mossel Bay): Skaapkop River Mouth (–AB), *O'Callaghan, Fellingham & Van Wyk 158* (PRE, STE); Kaaimans River, on National road from Mossel Bay to Wilderness at picnic spot (–BA), *Marsh 1307* (K, PRE, STE); Goukamma Nature Reserve (–BB), *Van der Merwe 2175* (PRE, STE).

—**3423** (Knysna): Knysna (–AA), *Burchell 5527* (K); Keurbooms River (–AB), *Gillett 1336* (BOL, STE).

St. Helena

—**15S05W** St. Helena, Plantation, *Nielsen 1617* (C).

2. *Elaeodendron schweinfurthianum* (Loes.) Loes. in *Natürlichen Pflanzenfamilien*. III. 5. Nachtr.: 223 (1897); 173 (1942a); Loes. & Engl.: 233 (1921); Brenan & Greenway: 123 (1949); Beentje: 337 (1994); N. Robson *et al.*: 31 (1994). Type: Somalia, Brava [Barawa], *Hildebrandt 1323* (K!, lecto., designated here, BM!).

Cassine schweinfurthiana Loes.: 550 (1893); 247 (1895b); Chiov.: 51 (1916); 132 (1932); Dale & Greenway: 133 (1961).

Elaeodendron somalense Vatke *tantum in scheda*, Loes.: 550 (1893); Engl.: 366 (1904).

Elaeodendron schweinfurthianum (Loes.) Loes. var. *cyclophyllum* Chiov.: 132 (1932). Syntypes: Somalia, Brava, *Scasselati 218*; 219 (FI); Cu Daio, *Senni 41* (FI).

Elaeodendron schweinfurthianum (Loes.) Loes. var. *obovatum* Chiov.: 132 (1932). Type: Somalia, Bur Gao, *Senni 96* (FI).

Shrub or lax tree up to 3 m high; bark greyish brown, smooth or flaky, yellow pigment not observed. *Branchlets* subangular, grey, lenticels prominent, grey. *Leaves* opposite; lamina obovate, greyish green, (25–) 30–40 (–50) × (8–) 10–20 (–30) mm, base attenuate, apex rounded to minutely mucronate, margin entire, rarely with spinulose-denticulate teeth; coriaceous; venation brochidodromous, ± raised on both surfaces in dried material, fine reticulation less conspicuous above; petiole 4–7 mm long; stipules greyish. *Inflorescences* axillary, pedunculate, ± compact dichasial, 1(3)–10-flowered, peduncle 5–10 mm long; bracts minute, bracteoles occasionally present. *Flowers* bisexual (or unisexual, the respective parts not fully developed), 4-merous, ± 2.5 mm diam., pedicels ± 1 mm long. *Sepals* greenish, fleshy, depressed-ovate, 0.6 × 1 mm. *Petals* cream or greenish, broadly ovate, 1.5 × 1.0 mm, spreading, apex rounded, lower half of the lamina thickened with fringed projections towards the apex. *Stamens* erect to spreading; filaments 0.5 mm long, anthers 0.2 mm long, dorsifixed, introrse. *Disc* ± quadrangular, subentire with sinuses at the point of stamen insertion, convex. *Ovary* 2-locular; style ± 0.2 mm long, stigma entire or inconspicuously lobed. *Fruit* widely ellipsoid, white when ripe, 8 × 5 mm, stone elliptic, ends rounded; endocarp thin, 0.5 mm thick. *Seed* single, seed-coat brown, widely ellipsoid, 5 × 3 × 1 mm; embryo with fleshy cotyledons.

A characteristic species of coastal bushland, swamps and forest margins, close to the sea and tidal lagoons, from southern Somalia, through Kenya to southern Tanzania (Figure 3).

This species is closely related to *E. schlechterianum*, but is a much smaller shrub or tree with a different leaf shape, 4-merous flowers, 2-locular ovary, and smaller fruit. Robson *et al.* (1994) considered *E. schweinfurthianum* to be unisexual, but this needs confirmation in the field.

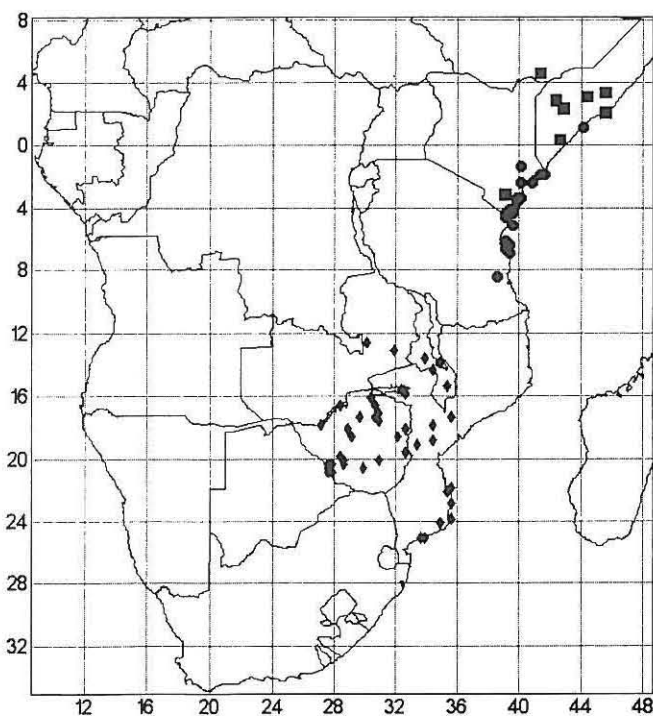


Figure 3 Known distribution of *Elaeodendron schweinfurthianum* (●), *E. aquifolium* (■), and *E. matabelicum* (◆).

Selected specimens examined

Somalia

—01N44E: Brava [Barawa] (–AA), *Hildebrandt 1323* (BM, K).

Kenya

—01S40E: K7, Sabaki, 4 mile N of Malindi (–AC), *Polhill & Paulo 756* (K, PRE, UPS).

—01S41E: K7, Lamu, Kui Isl. (–CD), *Rawlins, 134* (K); K7, Kiunga, near Italian Border (–DC), *Dale 3528* (K).

—02S40E: K7, Garsen Witu road, 12.5 km towards Witu from Garsen ferry crossing, (–AC), *Faden & Faden 74/1067* (K, PRE); Lamu Isl., Mnazi Moja (–BD), *Greenway 8868* (K);

—03S39E: K7, Arabuko-Soko Forest, N of Soko Forest station (–BD), *Musyoki & Hansen 1020* (C, K); K7, Kilifi (–DB), *Simpson 36* (K).

—03S40E: K7, Gede Forest, Gedi National Monument (–AC), *Gerhardt & Steiner 157* (UPS).

—04S39E: K7, Shimba Hills, forest station (–AB), *Magogo & Glover 1133* (K); K7, Likoni, S of Mombasa (–AC), *Baagoe, Danielsen & Vollesen 20* (C); K7, Kitoni, near Kikoneni (–AD), *Makin 423* (K); K7, Mombasa (–BA), *Wakefield* (K); K7 Kwale, Diani Forest (–BC), *Gillet & Kibwa 19871* (K, MO, P, UPS); K7, Ngowa [Ngowa], Vanga (–CA), *Graham 2193* (BM).

Tanzania

—05S39E: T3, Machui, sea level (–BA), *Faulkner 1867* (S).

—06S39E: Zanzibar, Mazizini (–AA), *Faulkner 2283* (S); Zanzibar, Ras Fumba [Fumba], Shamba area (–AD), *Frazier 2300* (MO); T6, Kunduchi (–CA), *Harris 4981* (MO); T6, Msassani (–CD), *Vaughan 2709* (BM).

—08S38E: T8, Kingupira Forest, ground-water forest (–BC), *Vollesen 2399* (C).

3. *Elaeodendron aquifolium* (Fiori) Chiov., *Flora Somala* 1: 125, t 47, fig. 1. (1929); Chiov.: 133 (1932); Loes: 173 (1942a); N. Robson: 344 (1989); Beentje: 337 (1994); N. Robson *et al.*: 32 (1994). Type: Somalia, Gezira, Lugh, *Paoli 1007* (FI, lecto, designated by Robson (1989); K, photo!).

Cassine aquifolia Fiori: 50 (1915) as *aquifolium*; Chiov.: 51 (1916); Dale & Greenway: 133 (1961).

Hartogia agrifolia Chiov.: 125 (1929), as *agrifolium*; Loes.: 180 (1942a). Type: Somalia, Obbia between Scemarca Hassan and Tobunjab, *Puccioni & Stephanani 643* (FI, holo.).

Elaeodendrum papillosum non Hochst.: Brenan & Greenway: 123 (1949).

Icones: Chiov. 47, t.1, photo. (1929).

Suffrutex, shrub or small irregular tree up to 4 m tall; bark greyish brown, cracking longitudinally, yellow pigment present, at least on root bark. *Branchlets* subangulate to terete, greyish brown, lenticels inconspicuous. *Leaves* opposite to subopposite; lamina elliptic to ovate, (25–) 35–60 (–85) × (5–) 10–25 (–35) mm, greyish green above, paler below, base cordate to attenuate, apex spinose, margin prominently aculeate with long stiff spines, 2–4(5) on each side; crustaceous; venation mixed craspedodromous, ± raised on both surfaces in dried material, fine reticulation more conspicuous above; petiole 1–4 mm long; stipules greyish. *Inflorescences* axillary, pedunculate, irregular dichasial, 1–4-flowered, peduncle 5–20 mm long; bracts minute. *Flowers* bisexual, 5-merous, 3–4 mm diam., pedicels 2 mm long. *Sepals* greenish, membranous, ± 1.0 × 1.0 mm, circular to depressed ovate, apex rounded, margin entire. *Petals* greenish, ovate, 2.5 × 1.5 mm, margin entire, apex rounded, spreading. *Stamens* erect; filaments ± 0.5 mm long, anthers 0.5 mm long, dorsifixed, introrse. *Disc* subtire with sinuses at the point of

stamen insertion, flat to slightly convex. *Ovary* 2-locular; style 0.2 mm long, stigma inconspicuous. *Fruit* drupaceous, widely ellipsoid, white or brown when ripe, 10–15 × 8–12 mm, stone with endocarp 1–2 mm thick. *Seed* 1, seed-coat dark brown, widely elliptic and flat on one side, 8 × 5 × 2 mm; embryo with fleshy cotyledons.

Found in the dry regions of Somalia and Kenya, where it occurs in low, deciduous woodland (Figure 3). *E. aquifolium* is singular in its very stiff and pronounced leaf spines.

Reported as unisexual (Robson *et al.* 1994), but this was difficult to confirm as only a few herbarium specimens were available for detail study. The ovary is 2-locular, not 4-locular as reported by Chiovenda (1929) and Robson *et al.* (1994).

Selected specimens examined

Somalia

—5N48E: Plateau, NW of Gawen village (–CB), *Gillett, Hemming & Watson 22272* (K).

—4N45E: Near Berdale, 68 mile SE of Lugh Ferrandi (–CC), *Bally 9327* (K).

—3N44E: Bur Heybe (–AB), *Brien 104* (K).

—3N45E: Hiiraan, 2.5–3 km NE of turning to Jalalaqsi on Buulo Barde road (–BC), *Thulin & Abdi Dahir 6403* (K, UPS).

—2N42E: Bay Region, 0215N 4248 (–BD), *Beckett & White 1576* (K); 73 km N of Bardera on road to Garba Harre (–CD), *Gillett & Hemming 24766* (K).

—2N45E: Coast rd, 28 km NE of Mogadishu (–BA), *Gillett & Hemming 24453* (K).

—0N42E: Homboy, 1 km W of Bagdad (–BC), *Madany 89/5* (UPS).

—0S41E: S Somalia, 46 Km N of bend in Border, *Gillett, Hemming, Watson & Julin 25234* (K).

Ethiopia

—4N41E: Sidamo, 20 km N of Bokol Mayo on road to Filtu (–CB), *Gilbert, Sebsebe & Vollesen 8208* (C, K, UPS).

Kenya

—03S39E: K7, Voi, Tsavo National Park, Gate Sala (–AA), *Greenway & Kamuri 12940* (K).

4. *Elaeodendron buchananii* (Loes.) Loes. in *Natürlichen Pflanzenfamilien* III, 5, Nachtr 223 (1897); Loes. & Engl.: 223 (1921); Eggeling: 41 (1940); 79 (1952); Burt Davy & Hoyle: 37 (1936); 40 (1958); N. Robson: 388 (1966); 344 (1989); Mendonça & Sousa: 183 (1968); Verdcourt & Trump: 100 (1969); Villiers: 7 (1975); Noad & Birnie: 73 (1989); Beentje: 337 (1994); N. Robson *et al.*: 32 (1994). Type: Njassaland [Malawi], without locality, *Buchanan 710* (B†, holo.; BM!, K!).

Cassine buchananii Loes.: 551 (1893); 247 (1895b); Keay & Blakelock: 626 (1958); Wilczek: 130 (1960); Dale & Greenway: 133 (1961); Irvine: 453 (1961); White: 216 (1962); Boughey: 163 (1964).

Elaeodendron afzelii Loes.: 157 (1900); 174 (1942a); Hutchinson & Dalziel: 445 (1927). Type: Sierra Leone, *Afzelius* (B†, holo.; UPS!).

Elaeodendron warneckeii Loes.: 309 (1908); 174 (1942a); Exell & Medonça: II (1954); Types: Togo, near Lomé, *Warnecke 45* (B†, lecto, designated by Robson *et al.* 1994; BM, EA, K!, P!).

Elaeodendron keniensis Loes.: 489 (1926); Eggeling: 79 (1952), as nr. *E. keniense*. Type: Kenya, near Nyeri, *Fries & Fries 206* (B†, holo.; K, UPS!).

Elaeodendron friesianum Loes.: 490 (1926); 174 (1942a). Type: Kenya, near Meru [Mt. Aberdare], *Fries & Fries 1731* (B†,

holo.; K, UPS!).

Elaeodendron stolzii Loes.: 35 (1934); Brenan & Greenway: 123 (1949). Type: Tanganyika, Rungwe Distr. near Ulambya, *Stolz* 2250 (B!, holo.; BM!, C!, MO!, P!, PRE!, S!, SAM!, UPS!).

Elaeodendron glaucum Pers. var. *kamerunense* Loes.: 35 (1934); 173 (1942a). *Cassine glauca* (Pers.) Kuntze var. *kamerunensis* (Loes.) Wilczek: 131 (1960). *Elaeodendron kamerunense* (Loes.) Villiers: 10 (1975). Type: Democratic Republic of Congo [Zaire], Lake Albert, Nioka, *Gomez* 3 (BR, *neo.*, designated by Villiers: 10 (1975).

Elaeodendron sp. *sensu* Battiscombe: 91 (1936).

Elaeodendron albivenosum Chiov.: 132 (1932). *Cassine albivenosa* (Chiov.) Cuf.: 482 (1958). Type: Somalia, Jak Omissso, *Senni* 275 (F1, holo.).

Elaeodendron sp. *sensu* Eggeling: 80 (1952).

Icones: Robson: 389, t. 82 B (1966); Verdcourt & Trump: 101 (1969); Villiers: 9, t. 2; 11, t. 3 (1975); Noad & Birnie: 74 (1989); Beentje: 337 (1994); Robson *et al.*: 30, Fig 7, 4–7 (1994).

Shrub or tree up to 30 m tall; bark greyish to dark grey, smooth with powdery yellow pigment not observed. *Branchlets* subangular, grey-brown, lenticels prominent, whitish. *Leaves* opposite to subopposite; lamina elliptic or slightly obovate, pale green to greyish above, greyish below. (30–) 50–75 (–125) × (20–) 30–50 (–75) mm, base rounded to attenuate, apex retuse, rounded or acute, margin glandular-crenulate, 5–15 crenations on each side; coriaceous; venation brochidodromous, ± raised on both sides in dried material, fine reticulation less conspicuous; petiole 5–12 mm long; stipules greyish. *Inflorescences* axillary or in axils of bracts on specialized shoots, pedunculate, ± regular dichasial, 50 mm long, forming a paniculate many-flowered inflorescence, 15–40-flowered, peduncle 10–18 mm long; bracts minute. *Flowers* unisexual, with petaloid staminodes in female flowers, 5-merous, 3–4 mm diam., pedicels 2 mm long. *Sepals* greenish, membranous, ± 1.0 × 1.0 mm, circular to depressed ovate, apex rounded, margin entire. *Petals* cream or greenish, ovate, 1.6 × 1.0 mm, margin entire, apex rounded, spreading. *Stamens* of male flowers ± erect; filaments 1.2 mm long, inserted below margin of disc, anthers 0.5 mm long, dorsifixed, introrse; staminodes of female flowers usually petaloid, slightly smaller and similar in shape to petals. *Disc* subtentire with shallow sinuses at the point of stamen insertion, convex in female flowers, flat in male flowers. *Ovary* 2- or 3(4)-locular; style 0.5 mm long, stigma entire or inconspicuously lobed, absent in male flowers. *Fruit* drupaceous, widely ellipsoid, cream or yellow, 20–25 × 15–20 mm, stone ellipsoid, tapered at both ends; endocarp 2–3 mm thick. *Seeds* 1 or 2, brown, elliptic and flattened on one side, 12 × 5 × 2 mm; embryo with fleshy cotyledons.

Elaeodendron buchananii occurs in evergreen and riverine forest, deciduous woodland, grassland as well as on termitaria. The most widespread of the African species of *Elaeodendron*, it occurs in most countries from west to east in Central Africa (Figure 4). This wide distribution perhaps accounts for the many synonyms recorded. Easily recognized in *Elaeodendron* by its dioecious flowers with petaloid staminodes, a character shared with the Central American *E. xylocarpum* (Vent.) DC.

E. buchananii is very common in parts of Uganda where it is a possible source of timber production. The wood is fine-textured and hard, but can be worked to a smooth surface (Dale & Greenway 1961). Dale and Greenway (1961) and Verdcourt and Trump (1969) also reported it as being extremely poisonous to livestock. Verdcourt and Trump (1969) mentioned that in grassland the species is often small and shrubby within reach of stock with fatal results; however, it is frequently browsed by giraffe.

Elaeodendron kamerunense may well be regarded as a good

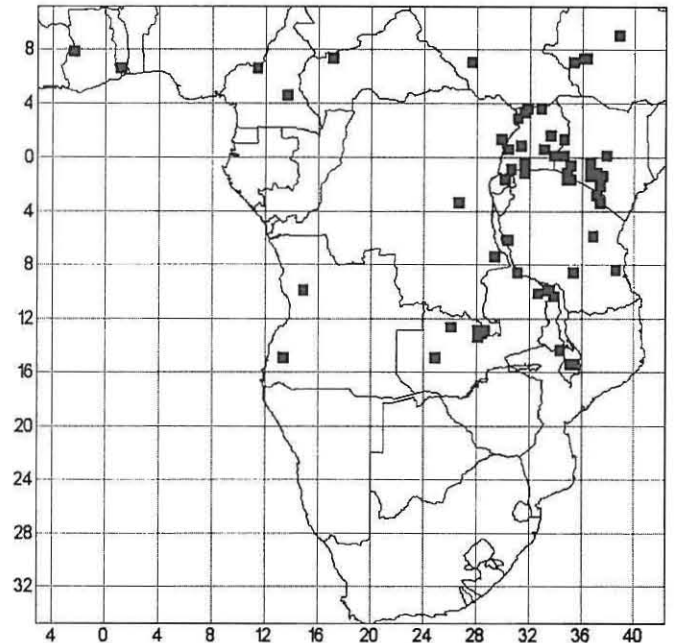


Figure 4 Known distribution of *Elaeodendron buchananii*.

species differing from *E. buchananii* in its bisexual flowers, inflorescences less dense and leaves not coriaceous (Villiers 1975). No material of the species was studied here. Villiers studied material of the neotype only, since the original material was apparently destroyed in B. More material and fieldwork are needed to evaluate the differences between the two taxa. The selected neotype from Lake Albert, Congo [Zaire], is possibly suspect since it is collected quite far from the original localities in Cameroon cited by Loesener (1934).

Selected specimens examined

Sudan

—07N27E: R. Numatinna (–BA), *Turner* 102 (K).

Ethiopia

—7N35E: Illubabor, 3 km s of Tepi (–AB), *Friis, Gilbert & Vollesen* 4142 (C, K, UPS).

—7N36E: Wash plantation, 22 km W of Onga (–AC), *Meyer* 9075 (K); Gobeb River, N of bridge on Jimma-Bongo rd (–AD), *Friis*, 2339 (K).

—9N38E: Mt Entotto, about 5 Km N of Addis Ababa (–BB), *De Wilde & De Wilde-Duyffes* 8252 (C, P).

Ghana

—7N2W: Hani near Nsawkkaw (–CD), *Hall & Lock* 43919 (K, MO).

Togo

—6N01E: Lomé (–CA), *Warnecke* 45 (BM, K, P).

Nigeria

—6N11E: Mambilla Plateau, banks of river at Mayo Selbe (–CB), *Chapman* 2753 (K).

Central African Republic

—4N17E: Bangui (–CA), *Guignis & Normand* 450 (K, P).

Cameroon

—4N13E: Houndi, Bertoua (–DA), *Letouzey 2659* (K, P).

Democratic Republic of Congo [Zaire]

—1N29E: Irumu (–BD), *Bequaert 2891* (K).

—0326E: Katanga (–BC), *Ringoet 119* (K).

—0729E: Ganza, Kamandula (Parc National de l'Upemba) (–AD), *De Witte 6514* (C, K).

Uganda

—4N32E: Imatongs (–BB), *Eggeling 3565* (K).

—3N31E: Koich River, Rumogi (–BC), *Eggeling 1827* (K); Amua West, Madi (–DB), *Eggeling 1808* (K).

—3N32E: Mountain Forest above Lututuru, Chua (–DB), *Eggeling 3498* (K).

—2N31E: Luku Local Forest reserve, Ajii (–CC), *Obina* (K).

—1N33E: Seren[g]e, Teso (–DA), *Chandler 1102* (K).

—1N34E: U3, Sit[i] River, Kyesowen[ri] (–BC), *Eggeling 5731* (K).

—0N30E: U2, Kibale Forest, Fort Portal (–CB), *Clutton-Brook 505* (K).

—0N31E: Mif[u]jizi, Lake Albert (–CD), *Bagshawe 1320* (BM).

—0N33E: U4, Maliva, Forest Path (–CA), *Dümmer 4425* (BM, P).

—0S30E: Kigarama Hill, Ruampara, (–DC), *Eggeling 643* (K).

—0S31E: U4, Buddu (–BC), *Dawe 977* (K).

Rwanda

—01S30E: Biumba (–CA), *Troupin 5008* (K).

Kenya

—0N33E: K5, Port Victoria, 200 yards from lake (–BB), *Glasgow 48/4* (K).

—0N34E: K3, SE Mt Elgon (–BA), *Jackson, com. Lugard 318a* (K, PRE).

—0N37E: K4, Meru, Lower Imenti Forest (–BB), *Vercourt & Polhill 2983* (K, PRE).

—0S35E: K5, Aitibu Sotik (–CA), *Dale 1015* (K, P, PRE).

—0S36E: K3, Mt Aberdare (–BC), *Fries & Fries 1731* (K, UPS); K3, Mt. Margaret (–DC), *Bally 1159* (K).

—01S34E: K6, 3 mile E of Lolgorian, Masai area (–BB), *Edwards 3120* (K).

—01S35E: K6, Mara Masai Reserve, Egerok [Keekorok] Forest (–CA), *Bally 5444* (C, K).

—01S36E: K4, Muguga (–BA), *Kirika 507* (K, PRE); K4, Mbaghati Stream (–BC), *Rogers 543* (K, S); K4, Nairobi, High Ridge Golf Course (–BD), *Bally 102* (BM, K).

—01S37E: Thika Falls (–AA), *Pole Evans & Erens 1163* (K, P, PRE); K4, Mua Hills (–AC), *Hemming 231* (K); Mutanga (–BC), *Battiscombe 642* (K).

—02S37E: Emali Hill (–AB), *Van Someren 108* (K).

Tanzania

—01S31E: Minziro Forest Reserve, Bukoba Distr. (–BA), *Procter 928* (K).

—01S34E: Serengeti, Kogatcu[n]dr[e]-Nyambiri (–DB), *Herkotter 664* (K).

—01S35E: T1, Klein's Camp, Coliondo (–CA), *Tanner 1834* (K).

—02S37E: T2, Ketembelion, OIMolog, West Kilimanjaro (–CC), *Freyburg EA15510* (K).

—03S37E: Moshi Distr., Mt Kilimanjaro (–AD), *Hughes 222* (K).

—05S36E: T5, Mpwapwa Distr., Njoge Mt. F.R. (–DD), *Ruffo 1462* (K).

—06S30E: T4, Mwesi, Mpanda Distr. (–AB), *Procter 1899* (K).

—08S35E: T7, Iringa, Ngwazi (–CB), *Lovett & Lovett 698* (MO, PRE).

—08S38E: T8, Selous Game reserve, Kingupira (–BC), *Follesen 2700* (C, K).

Angola

—09S14E: Malang[j]e (–DD), *Gosweiler 1412* (BM, K, P).

—14S13E: Serra E Chela, Uahita, Vila Arriaga (–CD), *Gosweiler 12994* (BM, MO).

Zambia

—08S31E: River Kalambo, just above Falls (–CA), *Brenan & Greenway 8179* (K).

—10S32E: Isoka (–BA), *Fanshawe 7204* (K).

—12S26E: Mufulira (–CA), *Fanshawe 1551* (K).

—12S28E: Kitwe (–CC), *Fanshawe 11480* (K); Ndola Botanical [Forest] Reserve (–DC), *White 3196B* (K).

—13S28E: Luanshaya (–AB), *Fanshawe 1403* (K); Ndola Distr., Mpongwe (–AC), *Grout 25/49* (K).

—14S24E: Mankoya (–DD), *Fanshawe 8990* (K).

Malawi

—0933: Chendo River, between Fort Hill and Chisenga (–CD), *Robson 555* (BM, K, PRE).

—1033: Chitipa Distr., lower Mondwe River (–BD), *Brummitt & Synge WC231* (K).

—1434: Dedza mountain forest (–AD), *Banda 476* (BM, SRGH).

—1535: Zomba, Mhita tobacco estate, Thondwe (–AC), *Chapman & Patel 5883* (K); Zomba, c. 1 km upstream from the Mlunguzi bridge on Old Naisi road (–AD), *Chapman, Patel & Balaka 6425* (K).

5. *Elaeodendron schlechterianum* (Loes.) Loes. in *Natürlichen Pflanzenfamilien* III. 5, Nachtr. 1: 223 (1897); 173 (1942a); N. Robson: 387 (1966); N. Robson & Sousa: 35 (1969); Beentje: 337 (1994); N. Robson *et al.*: 29 (1994). Type: Mozambique, Tete, Boruma, *Menyhart 2a* (Z!, holo.).

Cassine schlechteriana Loes.: 432 (1896); Schinz: 60[426] (1905); 314 (1936); Coates Palgrave: 513 (1977).

Cassine lacinulata Loes.: 432 (1896); Schinz: 60[426] (1905); 314 (1936). *Elaeodendron lacinulata* (Loes.) Loes.: 223 (1897). Type: Mozambique, Tete, Boruma, *Menyhart 1a* (Z!, holo.).

Elaeodendron stuhlmannii Loes.: 156 (1900); Loes. & Engl.: 233 (1921); Loes.: 174 (1942a); Brenan & Greenway: 124 (1949). *Cassine stuhlmannii* (Loes.) Blakelock 12: 555 (1957). Syntypes: Tanzania, 'Zanzibarküste: Usaramo, Kidenge', *Stuhlmann 6326* (B†); 'Station N'honge in NW-Usaramo im Walde bei Dengua', *Stuhlmann 8652* (B†).

Elaeodendron bussei Loes. 41: 309 (1908); Loes. & Engl.: 233 (1921); Brenan & Greenway: 123 (1949); Type: Tanzania, Lindi, *Busse 2412* (B†, holo.; EA).

Elaeodendron papillosum sensu Brenan & Greenway: 123 (1949), *non* Hochst.

Elaeodendron capense sensu Burt Davy & Hoyle: 37 (1936); 40 (1958) *non* Eckl. & Zeyh.

Shrub or tree up to 18 m tall; bark greyish brown, smooth or finely reticulate with yellow pigment not observed. *Branchlets* subangular to terete, grey to brown, lenticels prominent, grey. *Leaves* opposite or subopposite; lamina elliptic to broadly obovate, greyish green, often glossy above, paler green below. (15–) 25–100 (–130) × (10–) 15–35 (–80) mm, base attenuate, apex retuse, occasionally rounded or cleft, margin entire or glandular denticulate to spinulose-glandular-denticulate; coriaceous; venation brochidodromous to semi-craspedodromous, ± raised on both surfaces in dried material, fine reticulation less conspicuous; petiole 4–10 mm long; stipules greyish. *Inflorescences* axillary, pedunculate, ± compact dichasial, (1)3–

15-flowered, peduncle 4–10 mm long; bracts minute, bracteoles occasionally present. *Flowers* bisexual or partly unisexual with the respective parts not fully developed, (4)5-merous, ± 5.0 mm diam., pedicels ± 2 mm long. *Sepals* greenish, ovate to circular, 1.0×1.0 mm. *Petals* cream or greenish, elliptic to obovate, 3×2 mm, spreading, apex rounded, lower half of the lamina thickened with ridges ending with fringed projections towards the apex. *Stamens* erect to spreading; filaments 1 mm long, anthers 0.5 mm long, dorsifixed, introrse; staminodes of female flowers ± 1 mm long. *Disc* subtire with sinuses at the point of stamen insertion, concave. *Ovary* 3-locular; style and stigma inconspicuous. *Fruit* widely ellipsoid, cream, $15\text{--}25 \times 12\text{--}20$ mm, stone broadly ellipsoid, ends rounded; endocarp thin, ± 2 mm thick. *Seeds* 1 or 2, seed-coat dark-brown, widely ellipsoid, $11 \times 5 \times 2$ mm; embryo with cotyledons fleshy.

Elaeodendron schlechterianum occurs in dry deciduous woodland or riverine forest, often on termitaria. Widespread in the southern and tropical east African countries of Kenya, Tanzania, Mozambique, Malawi, Zambia and Zimbabwe (Figure 5). Flowering October to April.

Most of Menyhart's specimens from Mozambique are at Z (Schinz 1905) with duplicates in C, K and WU (Vegter 1986). The two Zurich specimens were cryptically annotated in Loesener's hand and have been accepted as the holotypes of *E. schlechterianum* and *Cassine lacunculata* respectively. This taxon is not to be confused with *Cassine schlechteri* (= *Mystroxydon aethiopicum*) as in Gomes e Sousa (1967). We have followed Robson (1966) and Robson *et al.* (1994) in keeping *E. stuhlmannii* Loes. in synonymy. It might, however, be sufficiently distinct with its smaller, rounded leaves.

Selected specimens examined

Kenya

- 0138: Mo[u]tomo Hill (–DC), *Bally 1581* (K).
- 0140: Lamu Distr., Lunghi Forest Reserve (Proposed), 23 km E of Bodheĩ (–DD), *Luke & Robertson 1538* (K).
- 0240: K7, Tana River, Garsen to Witu (–AD), *Luke & Robertson 1265* (K).

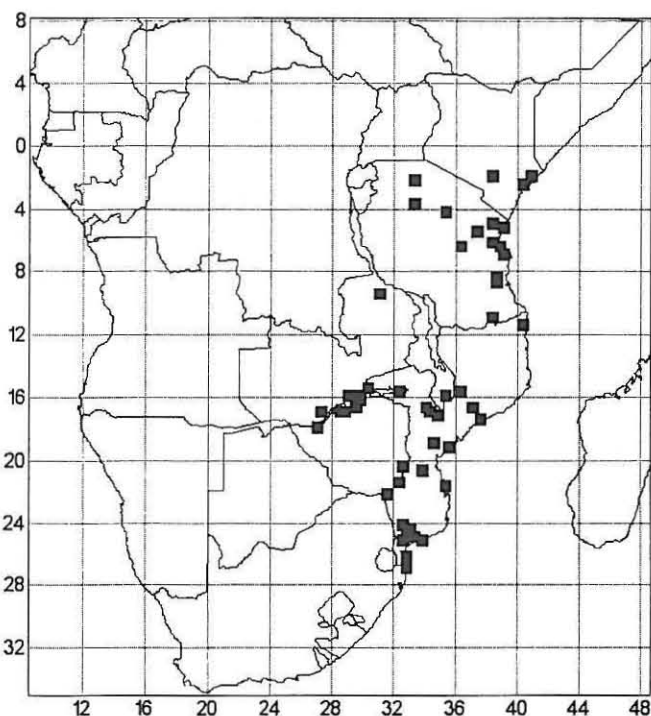


Figure 5 Known distribution of *Elaeodendron schlechterianum*.

Tanzania

- 0233: T1, Mkalama, Summit of Iramba Scarp, above Sekenke (–AB), *Burt 3372* (K).
- 0333: T1, Shinyanga (–CB), *Burt 5567* (BM, K, P).
- 0435: [N]kandoa Distr., Bubu valley (–AB), *Burt 819* (BM, K).
- 0438: T3, Lushoto Distr., West Usambara Mts, Baga I Forest Reserve (–CD), *Borhidi, Mziray & Pocs 84451* (UPS).
- 0537: T2, Handeni Distr., Mbuga wa Mbaas near Loskiti[ok] Mtn (–AD), *Burt 4909* (K).
- 0539: T3, Tanga prov, 8 mile NW of Tanga (–AA), *Perdue & Kibuwa 8492* (K, UPS).
- 0636: T5, Mpwapwa (–AD), *Hornby 44* (K).
- 0638: T6, Mandera (–AB), *Saxleux 976* (P); T6, Bagan[mo]yo (–BD), *Kirk 2/71* (K).
- 0639: T6, Pugu Hills (–CC), *Hawthorne 1744* (K).
- 0838: T8, Kingupira, Selous Game Reserve (–BC), *Ludanga 1344* (C, K); T8, Kingupira Forest (–DA), *Vollesen 2743* (C, K).

Zambia

- 0931: Abercorn, Chinakila (–AC), *Kafuli 192* (SRGH).
- 1530: Katondwe (–AD), *Fanshawe 8122* (K).
- 1627: Highlands of Batoka Country (–CD), *Kirk, Jul 1860* (K):

Malawi

- 1435: Zomba, Liwonde National Park (–CD), *Dudley s.n.* (SRGH).
- 1634: Chickwawa, Lengwe Game Reserve (–CD), *Hall-Martin 902* (K, PRE, SRGH).

Mozambique

- 1038: Niassa, Palma (–CD), *Barbosa 2143* (LISC).
- 1140: Mechanga farm, 5 km from Mocimboa da Praia (–AD), *Gomes e Sousa 4696* (K, PRE).
- 1532: Zambezi Valley, near Chicoa, 30 miles above Tete (–CB), *Hornby 2745* (K, PRE, SRGH).
- 1536: Zambezia, Molumbo (–CB), *Phillips 2/70* (SRGH).
- 1634: Manica e Sofala, Tambara [Nhacolo] (–CA), *Bond J10* (SRGH).
- 1637: Zambesia, Ile, entre Ile e Mugeba (–CA), *Torre 5506* (LISC, SRGH).
- 1734: Tete, Sinjal (–BB), *Barbosa & Carvalho 3762* (K).
- 1737: Maganja da Costa (–BC), *Torre & Correia 14125* (LISC).
- 1834: Beira, Gorongozo National Park, road 3, near saline areas (–DC), *Tinley 1927* (B, K, LISC, P, PRE, SRGH).
- 1935: Chiniziua (–BA), *Gomes e Sousa 4435* (K, PRE).
- 2033: Buzi, Muccheve (–DB), *De Carvalho 748* (K).
- 2135: Bazaruto Island, Ponte Gengareme (–CB), *Mogg 28740* (SRGH).
- 2231: Guija, Malvernia (–BA), *Barbosa & Lemos 8170* (K, LISC, SRGH).
- 2432: Gaza, de Estivane para a Aldeia da Barragem, a 10 km da Aldeia da Barragem (–BA), *Barbosa & de Lemos 8215* (K); Guijã, de Motase (–DD), *Mendonça 2774* (K, LISC, PRE).
- 2433: Caniçado (Chamusca) (–AC), *Torre 7876* (B, Z); Macia, Muianga [Mananga] (–CA), *Pedrogão 1448* (K, PRE, SRGH); Bilene, do Chipenhe para Maniquenique, a 1 km depois do Licile (–CD), *Lemos & Balsinhas 54* (BM, K, LISC, PRE, SRGH).
- 2532: Magude, Chobela (–BA), *Torre 7054* (LISC).
- 2533: Gaza, ao 6 km da Praia Chongoana para a praia Sepulveda (–BB), *Correia & Marques 1476* (PRE, SRGH).
- 2632: Inhaca Island, Hlanganyani Hill (–BB), *Mogg 27614* (J); Maputu, andades 6 km da Ponta do Cure [Ouro] (–DD), *Correia & Marques 2965* (SRGH).

Zimbabwe

- 1529: Urungwe, 18 km W of Mana Pools (–CC), *Pope 1985* (MO, PRE, SRGH); Mana Pools (–CD), *Gordon 50* (SRGH); Urungwe, near Sapi River (–DC), *West 4537* (BM, SRGH).
 —1628: Urungwe, Chirundu Aerodrome (–DD), *Burrows 15/65* (SRGH); Matusadona Game Reserve (–DC), *Mushori 12* (SRGH).
 —1629: Urungwe (–DA), *Savory 692* (SRGH); Upper Chewore area, in alluvium of Kachowe River (–BB), *Cleghorn 1749* (SRGH).
 —1727: Sebungwe, Chalala River (–CC), *Davies 1487* (K, SRGH).
 —2032: Chikore Hills (–BC), *Swynnerton 167* (K, Z).
 —2132: Denga, Sabi-Lundi Junction, Chitsa's Kraal (–AD), *Chase 2286* (BM, K, SRGH).

6. *Elaeodendron matabelicum* Loes. in *Botanische Jahrbücher* 40: 61 (1907); 174 (1942a); Eyles: 404 (1916); N. Robson: 385 (1966); N. Robson & Sousa: 33 (1969). Type: 'Rhodesia, Matabeleland, Baumsteppe bei Matoppos in etwa 1600 m, September', *Engler 2835* (B†). Neotype: Matobo, Farm Besna Kobila, *Miller 8290* (K!, neo., here designated; PRE!, SRGH!).

Cassine matabelica (Loes.) Steedman: 41 (1933); Coates Palgrave 511 (1977). *Elaeodendron capense* sensu Miller: 48 (1952).

Cassine sp. 1. White: 216 (1962).

Elaeodendron fruticosum N. Robson: 39 (1965); 386 (1966); N. Robson & Sousa: 34 (1969). Type: Mozambique, Gaza, Vila de João Belo beach, *Torre 3878* (LISC!, holo., SRGH!).

Icones: Robson: 389, t. 82 A (1966).

Medium to tall tree, up to 15 m high; bark greyish with yellow pigment absent or hardly visible, exfoliating in irregular scales, surface smooth to roughly fissured. *Branchlets* subangular to terete, greyish-brown, lenticels usually inconspicuous, whitish. *Leaves* opposite to subopposite, often ternate at apex, lamina elliptic to oblong or obovate, (25–) 35–65 (–85) × (8–) 15–25 (–35) mm, yellowish green, paler grey-green below, base attenuate to cuneate, apex acuminate, margin glandular-crenate, crenations usually 10–25 on each side, coriaceous; venation indistinctly brochidodromous, raised below and above in dried material, fine reticulation conspicuous above, inconspicuous below; petiole 8–15 mm long; stipules brownish black. *Inflorescences* axillary, pedunculate, stout, regularly dichasial, flowers densely arranged in each dichasium, numerous, 20–80-flowered; peduncle 10–45 mm long. *Flowers* bisexual, 5-merous, 3–5 mm diam.; pedicel ± 2 mm long. *Sepals* greenish, fleshy, often irregular, 0.7 × 1.3 mm, depressed ovate, apex rounded, margin entire. *Petals* greenish, oblong to ovate, 2.5 × 2.0 mm, margin entire, often undulate, apex rounded, spreading. *Stamens* initially erect, soon becoming recurved outwards with anthers almost touching the sepals; filaments ± 0.2 mm long, arising from near centre of disc, anthers 0.3 mm, dorsifixed, extrorse. *Disc* entire, convex, thick and fleshy. *Ovary* 3-locular; styles ± 2 mm long, stigma inconspicuously lobed. *Fruit* cream or yellow, drying reddish, widely ellipsoid to globose, 15–20 × 15–17 mm, ends rounded, stone widely ellipsoid to globose, 12–16 × 13–15 mm; endocarp ± 2 mm thick, seeds dark-brown, elliptic, flattened to triangular, 9.0 × 6.0 × 2.5 mm, embryo erect, widely elliptic.

A widespread and distinct species in dry deciduous woodland regions of Angola, Zambia, Zimbabwe and Mozambique (Figure 3). It is particularly plentiful near Bulawayo and in the Rhodes Matopos National Park, Zimbabwe. Unlike other widespread species of African *Elaeodendron*, few synonyms exist for this relatively homogeneous species.

Robson (1965) distinguished *E. fruticosum* from *E. matabelicum* on the basis of 'habit, fruit colour, and the size and number of flowers'. Robson based his observations of flowers on the

type specimen, the only flowering collection available to him. Flowers of additional specimens have now been examined and are ± identical to those of *E. matabelicum*. The reported orange colour of the fruit (Robson 1965, 1966), instead of white or cream as in other species of *Elaeodendron*, is doubtful. Fruit of *Torre 6717*, cited by Robson (1965) was described as 'esbranquiçadas' (= whitish). In two additional specimens cited by Robson (1965), *Gomes e Sousa 1828 & 1871*, the original Portuguese labels were replaced by new labels in French. It is likely the colour of fruit was incorrectly translated or that the colour of dried fruit, brown or reddish brown, was noted. It seems thus likely that *E. fruticosum* is merely a local variant of *E. matabelicum*. There is a need for more fieldwork on the taxon in Mozambique.

E. matabelicum is possibly the species of *Elaeodendron* referred to in Watt and Breyer-Brandwijk (1962) involved in 'trials of ordeal' in Zimbabwe. It is also used as an aphrodisiac, for abdominal and chest pains, menorrhagia and diarrhoea in Zimbabwe (Gelfand *et al.* 1985).

Selected specimens examined

Zambia

- 1230: Kasanka National Park (–CA), *Harder et al. 1908* (MO, PRE).
 —1331: Luangwa Valley, Mfuwe (–BB), *Astle 4871* (SRGH).
 —1628: Siamambo Forest Reserve. (–CB), *White 3014* (BM, PRE).
 —1727: Mazabuka, Mochipapa Agricultural Station. (–CC), *White 6230* (SRGH).

Malawi

- 1333: Dowa, Lake Nyasa Hotel (–DB), *Chase 3881* (BM, MO, PRE, SRGH, UPS).
 —1334: Cape MacClear, Nkhunguni Hill, near the house (–DD), *Patel 84b* (SRGH).
 —1434: Dedza mountain forest (–AD), *Banda 476* (SRGH).
 —1535: Zomba, c. 1 km. upstream from the Mlunguzi bridge (–AD), *Chapman, Patel & Balaka 6425* (SRGH).

Mozambique

- 1532: Cabora Bassa, Marávia, arredores de Chicoa (–CB), *Mendonça 418* (K, LISC, P, SRGH); Cabora Bassa, Mágoê, 30 km para Chicoa (–DC), *Torre & Correia 18262* (LISC, K).
 —1734 (Chemba): Manica e Sofala, Maringuê (–CD), *Bond 964* (SRGH).
 —1735: Zambesia Distr., Serra Morrumbala (–BC), *Müller & Pope 1988* (LISC, SRGH).
 —1834 (Vila Paiva de Andrada): Manica e Sofala, Gorongosa National Park (–CD), *De Aguiar Macêdo 2237* (SRGH).
 —1933 (Vila Pery): Chimoio, perto do rio Vanduzi (–AB), *Andrada 1207* (LISC).
 —2135 (Bazaruto): Magaruque I. (–DC), *Gomes e Sousa 1871* (K, COI).
 —2235 (Mapinhane): Vilanculos (–AB), *Barbosa & Balsinhas 5017* (BM); Ponta [de] Barra Falsa (–DC), *Mogg 28929* (J, K, SRGH).
 —2335 (Inhambane): Old Inhambane (Estevam), 24 km E of Inhambane (–DC), *Gomes e Sousa 2023* (K).
 —2434 (Panda): Panda [Jacubécua] (–BB), *Gomes e Sousa 1871* (COI, K).
 —2533: Gaza, Vila de João Belo [Xai-Xai] (–BA), *Torre 3878* (LISC, SRGH); Gaza, Chongoéne, a cerca de 1 km do hotel (–BB), *Rodrigues, Pereira, Marques & Balsinhas 247* (PRE, SRGH).

Zimbabwe

- 1630: Lomagundi, Doma Hill (–AB), *Eyles 5703* (SRGH); Sipolilo, Great Dyke, growing near vlel (–DA), *Nyariri 149* (SRGH).
 —1729 (Copper Queen): Melssetter, Biriwiri Reserve (–BC), *Ball 17*

(SRGH, UPS).

—1730 (Sindia): Mazoe, Umvukwes [Mvurwi] (–BB), *McGregor 11737* (SRGH); Mazoe, Chipoli, Farm Shamva (–BC), *Moubray s.n.* (SRGH); Mazoe (–DB), *Bell 926* (SRGH).

—1828 (Gokwe): Gokwe, 5 mile N.E. of the district commissioners office (–BB), *Bingham 984A* (SRGH).

—1829 (Kwekwe): 8 mile SE of Gwelo (–CA), *Biegel 1608* (MO, SRGH).

—1832 (Mutare): Inyanga, Cheshire (–BA), *Norlindh & Weimark 4812* (BM, MO, SRGH); Makoni, Rusape (–CA), *Edwards 2/36* (SRGH).

—1928 (Nyamandlovu): Nyamandlovu, Pasture Research Station, (–CD), *Plowes 1640* (K, PRE, SRGH).

—1932 (Melsetter): Chipinga Distr., along road between Skyline Junction and Cashell Valley (–DA), *Van Wyk BSA 1179* (PRE, PRU).

—2027 (Plumtree): Bulalima Mangwe, Dombodema Mission Station about 1 km N of old Mission House (–BC), *Norrgram 208* (B, S, SRGH); Plumtree (–BD), *Meara 29* (PRE, SRGH); Bulalima Mangwe (–DD), *West 6614* (B).

—2028 (Bulawayo): Bulawayo (–BA), *Sim 19240* (PRE); Matopos (–BC), *Hodgson 6/52* (MO, PRE, SRGH).

—2029 (Filabusi): Belengwe, outside the district commissioners' office (–DB), *West 6633* (P, SRGH).

—2030 (Masvingo): Fort Victoria, Flamboyant Motel, 2.5 km west of the Motel (–BB), *Gross 168* (MO, PRE, SRGH).

Botswana

—2027 (Plumtree): 4.5 km N of Tsessebe (–DA), *Venter, Archer & Hahn 407* (PRE); Tsessebe (–DC), *Pole-Evans 3246(44)* (PRE).

7. *Elaeodendron zeyheri* Spreng. ex Turcz. in Bulletin de la Société Impériale des Naturalistes de Moscou 31(2): 452 (1858). Type: Eastern Districts, Zeyher (KW, holo.; K, MEL!, P!, S!).

Rhamnus zeyheri Spreng. *tantum in scheda* Zeyher, Harv.: 230 (1860) in syn. *nom. nud.* [name on sheets in P and S], *non Rhamnus zeyheri* Sond.

Cassine parvifolia E. Mey. *nom. nud.* [sheet in S].

Salacia zeyheri Planch. ex Harv.: 230 (1860); Sond.: 468 (1860) as syn. Type: presumably the same as for *Elaeodendron zeyheri*.

Crocoxylon excelsum Eckl. & Zeyh.: 128 (1834/5) *nom. illeg.* *Elaeodendron excelsum* (Eckl. & Zeyh.) Ettingshausen: 57 (1857).

Elaeodendron croceum auct. *non* Thunb.: Thonner: t.82 (1915). *Crocoxylon croceum* auct. *non* Thunb.: N. Robson: 41 (1965); 390 (1966). *Cassine crocea* auct. *non* Thunb.: Davison: 334 (1927); Coates Palgrave: 510 (1977), *pro parte*; Arnold & De Wet: 482 (1993); Pooley: 276 (1994).

Icones: Thonner: t. 82 (1915).

Small to medium evergreen tree; bark greyish with layers of conspicuous powdery yellow pigment, rhytidome exfoliating in thin scales, surface longitudinally fissured. *Branchlets* subangular to terete, greyish-brown, lenticels inconspicuous. *Leaves* opposite to subopposite, often ternate at the apex; lamina elliptic to obovate, greyish green, (10–) 25–40 (–60) × (5–) 10–25 (–35) mm, base cuneate to rounded, apex rounded, rarely acute; margin glandular-denticulate, 8–15 on each side; coriaceous; venation indistinctly brochidodromous, ± raised above and below in dried material, fine reticulation conspicuous, ± raised; petiole 3–5 mm long; stipules greyish. *Inflorescences* axillary, pedunculate, ± compact dichasial, (1)3–7-flowered, peduncle 5–10 mm long; bracts minute. *Flowers* bisexual, 4-merous, ± 5 mm diam.; pedicels 2–5 mm long. *Sepals* greenish, subcircular, 1.3 × 1.5 mm long, membranous, margin

entire. *Petals* cream to green, oblong to ovate, 3 × 2 mm, sessile, spreading, apex rounded, margin entire. *Stamens* initially erect, soon curving outwards with anthers almost touching sepals; filaments ± 1 mm long, arising from near centre of disc, anthers 0.5 mm long, extrorse. *Disc* entire, convex, thick and fleshy. *Ovary* 4-locular; style short to astylous; stigma inconspicuous. *Fruit* drupeaceous, spheroid to widely ellipsoid, yellowish, drying dark brown, 20–25 mm diam., stone broadly elliptic, surface smooth with equal spaced grooves across the ends, 15–20 × 11–14 mm diam.; endocarp 2 mm thick. *Seeds* 1 or 2 per fruit, seed-coat dark brown, ellipsoid, subangular, 10 × 5 × 3 mm, postchalazal vascular bundles observed; embryo widely ovate (Figure 6).

Elaeodendron zeyheri is a relatively rare tree, only locally frequent in the Eastern Cape and some parts of KwaZulu-Natal. The known distribution in the Eastern Cape, KwaZulu-Natal and one locality in Mozambique near the Mpumalanga-Swaziland border has been extended considerably by Mr. S. Venter who discovered several new records in the Northern Province (Figure 7). Though listed as indeterminate in Hall *et al.* (1980), under the name *Cassine crocea* auct., there appears to be no need for any conservation status at present. Flowering October to April. Fruiting December to June.

In the Eastern Cape and Northern Province bark is extensively collected for medicinal and magical purposes (Vernon 1994; personal observations).

Until recently, the names *Crocoxylon croceum* (Robson 1965, 1966) or *Cassine crocea* (Arnold & De Wet 1993) have been widely applied to this species. Ecklon and Zeyher were not only unaware of the true identity of Thunberg's *Ilex croceum* when they published a taxonomic synonym, *Elaeodendron capensis*, in their *Enumeratio Plantarum*, but they also chose the superfluous name *Crocoxylon excelsum* as the new name for *E. croceum*, therefore the type of *Crocoxylon* Eckl. and Zeyh. is *E. croceum*. The generic description of *Crocoxylon* and the two specimens cited in the *Enumeratio Plantarum*, however, clearly refer to the present species. This confusion has been perpetuated by most subsequent authors, adding to the confusion by misconstruing the characters and distribution of the two species (e.g. Von Breitenbach 1965, Coates Palgrave 1977). Most information in literature referring to *Cassine crocea* (hitherto often incorrectly referred to as *Cassine papillosa*) is applicable to *Elaeodendron crocea* and not *E. zeyheri*.

Both manuscript names, *Salacia zeyheri* and *Rhamnus zeyheri* were presumably provided on duplicate specimens of a collection of Zeyher. Inexplicably, Harvey (1860) described *Salacia zeyheri* with flowers 4-parted, but with ovary trilobular and with three stamens in the treatment of Hippocrateaceae in *Flora Capensis*. This observation was confirmed by Sonder (1860) in the treatment of Celastraceae in the same volume of *Flora Capensis*. This particular specimen could not be accounted for, and is possibly aberrant (as suggested by Sonder (1860)). Sonder placed *E. zeyheri* as *C. [Cassine?] zeyheri* Turcz. under an inclusive *Elaeodendron croceum*.

Robson (1965, 1966) considered *E. zeyheri* and *E. transvaalense* as being sufficiently distinct from *Elaeodendron* due to their flowers with isomerous ovaries and stamens situated inside the disk to justify the segregate genus *Crocoxylon* Eckl. and Zeyh. Leaf margins of *E. zeyheri* are glandular-denticulate, never spinulose-denticulate, a condition often very marked in juvenile leaves of *Elaeodendron croceum*.

Selected specimens examined

Mozambique

—2632 (Bela Vista): Goba, Fonte de Goba (–AA), *De Carvalho 654* (K).

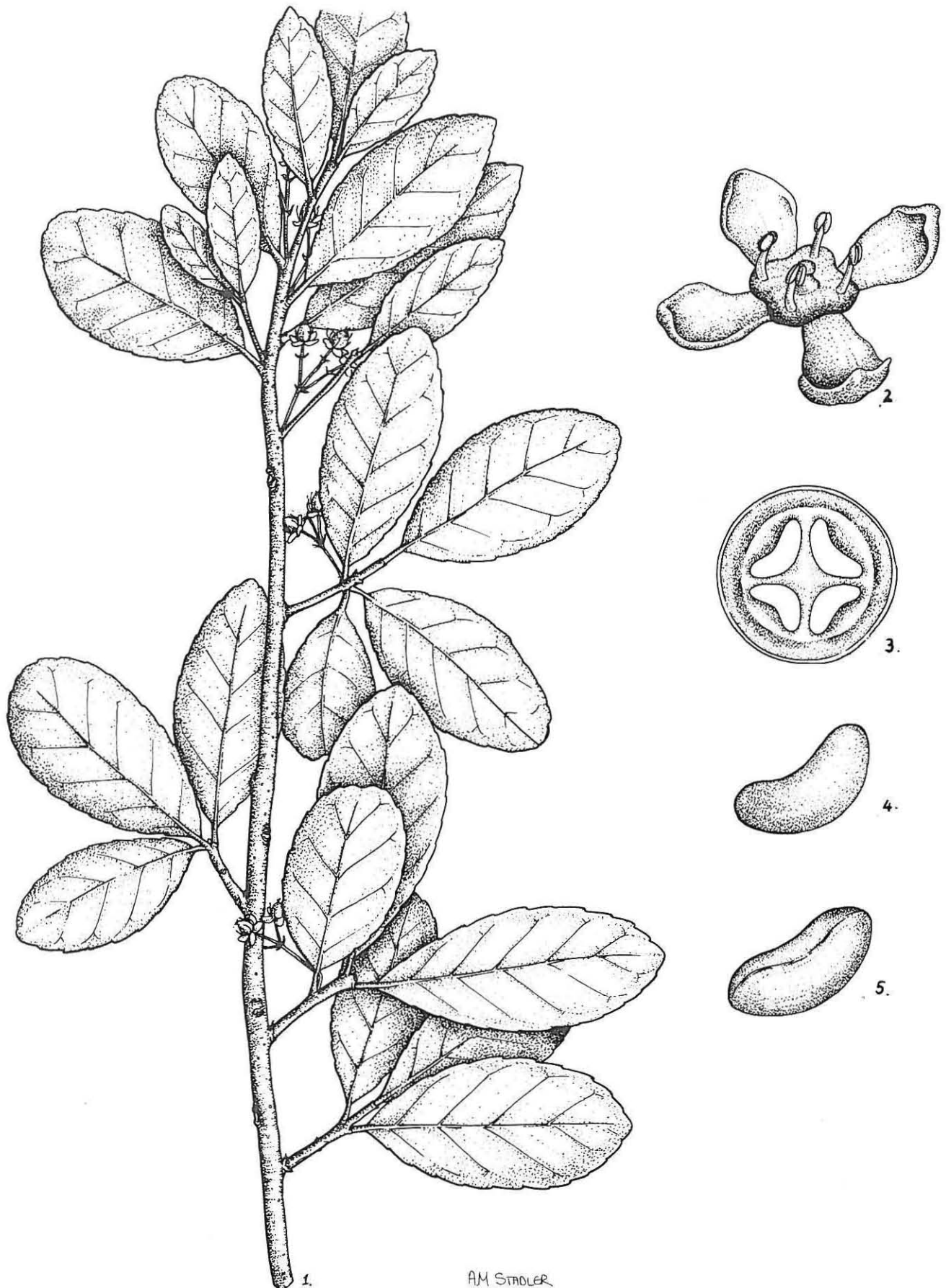


Figure 6 *Elaeodendron zeyheri*. 1. Flowering branch, $\times 1$; 2. flower, $\times 10$; 3. fruit, $\times 1$; 4. & 5. seed, $\times 1.5$. Drawn by Anne Stadler from Story 1267 (PRE); 3–5. from Briers *s.n.* (PRU).

South Africa

- 2329 (Pietersburg): Soutpansberg, Vivo. Farm of Mr Maggs, behind house (–AB). *Archer 482* (PRE); Houtboschdorp (–DD). *Venter s.n.* (PRE).
- 2430 (Pilgrim's Rest): Ofcolaco, rocky outcrop on riverbank (–AB). *Garlick 10* (PRE).
- 2731 (Louwsburg): Magut, 2 mile SW of Magut on W slopes of mountain (–DA). *Acocks 13027* (K, PRE).
- 2732 (Ubombo): False Bay Park (–CD). *Nichols 795* (NH, PRE).
- 2830 (Dundee): Muden, Mooi River (–CD). *Watt & Brandwijk 1476* (PRE).
- 2831 (Nkandla): 10 mile W Nkandla in Nsuzi River Valley (–CA). *Codd 1421* (PRE); Mpofu Game Reserve (–CD). *Mzazi PRE-60785* (PRE).
- 2930 (Pietermaritzburg): Greytown to Mooi River, 18 km (–AA). *White 10503* (NH, PRE); Tweedie, Ashley Grange (–CA). *Moll 953* (K, NH, PRE); Cato Ridge (–DA). *McClellan & Ogilvie* (NH, PRE).
- 3127 (Lady Frere): Elliot, Bloemvlei on mountain slope (–BD). *Van Zinderen Bakker 66* (K, PRE).
- 3128 (Umtata): Engcobo, All Saints Nek, 2.2 mile from Engcobo (–CA). *Marais 503* (K, PRE).
- 3226 (Fort Beaufort): Pefferskop (–DB). *Acocks 8989* (PRE); Koonap Heights (–DC). *Britten 2055* (GRA, PRE); Alice, Mavuso Location, between location and town of Alice (–DD). *Gibbs-Russell 3929* (GRA, PRE).
- 3227 (Stutterheim): Fort Cunynghame (–AD). *Sim 2120* (BOL, GRA, PRE); Stutterheim, 8.4 mile from Stutterheim on Keiskamma Hoek road (–CB). *Marais 528* (GRA, K, PRE); Woods near Komga (–DB). *Flanagan 775* (GRA, PRE).
- 3324 (Steytlerville): Beans Bush, Patensie (–DD). *Bayliss BRI.B. 534* (PRE).
- 3325 (Port Elizabeth): David Birch, Farm Mimosa on Paterson Road to Addo (–BD). *Rippon PRE-644923* (PRE); Addo National Park, Zuurkop (–DA). *Hall-Martin 5959* (PRE).
- 3326 (Grahamstown): 19 mile from Fort Beaufort on Grahamstown road (–AA). *Marais 529* (BOL, GRA, K, PRE); Farm Groot Tootabi (–AC). *Archibald 5893* (GRA, PRE); Ecce River Valley, Glen Dew (–BA). *Taylor & Edwards 8791* (GRA, K, PRE); Grahamstown, 6–16 km from Grahamstown along Manley flats turnoff on East London road (–BC). *Jones PRE-57729* (K, PRE); Bathurst, Hopewell (–BD). *Acocks 12069* (PRE); Fonteinskloof, 27 km from Alexandria on road to PE (–CA). *Burrows 2835* (GRA); Alexandria Forest (–CB). *Marais 540* (GRA, K, PRE); 1 mile E of Kariega

River, road Southwell-Alexandria (–DA). *Acocks 12069* (GRA, PRE); Bathurst State Forest, Waters Meeting Nature Reserve (–DB). *Herman 865* (PRE).

—3327 (Peddie): East London (–BB). *Irving TRV-26234* (PRE).

8. *Elaeodendron transvaalense* (Burt Davy) R.H. Archer, comb. nov. Type: Transvaal, Lydenburg Distr., Sabie-hoek forest, *Burt Davy 1699* (PRE!, holo?; BOL!).

Salacia ? transvaalensis Burt Davy: 51 (1921). *Pseudocassine transvaalensis* (Burt Davy) Bredell: 330 (1937); Loes.: 230 (1942b); Miller: 35 (1948); Pardy: 631 (1956); Boughey: 164 (1964); Gomes e Sousa: 499 (1967); Compton 338 (1976). *Crocoxylon transvaalense* (Burt Davy) N. Robson: 41 (1965); 391 (1966); N. Robson & Sousa: 37 (1969); Mendonça & Sousa: 183 (1968); Roessler: 2 (1968). *Cassine transvaalensis* (Burt Davy) Codd: 124 (1966); Palmer & Pitman: 1322 (1973); Van Wyk: 347 (1974); 147 (1984); Coates Palgrave: 513 (1977); Drummond: 128 (1981); Arnold & De Wet: 483 (1993); Pooley: 278 (1994).

Hippocratea seineri Seiner: 44 (1911), *nom nud.*

Elaeodendron croceum var. *triandrum* Dinter: 189 (1921), *nom nud.*

Elaeodendron croceum (Thunb.) DC. var. *heterophyllum* Loes.: 35 (1934). Type: Grootfontein, *Dinter 919* (SAM!, lecto., here designated).

Icons: Robson: 392, t. 83 (1966); Gomes e Sousa: t. 128 (1967); Van Wyk: t. 416 (1974); 147 (1984); Drummond: 129, t. 60 (1981).

Irregular shrub to tall rounded bush or tree; bark greyish, yellow pigment absent or hardly visible, rhytidome exfoliating in thin scales, surface deeply longitudinally fissured. *Branchlets* terete, greyish, lenticels inconspicuous. *Leaves* alternate, spiralled to clustered (fasciculate) or subopposite, often ternate at the apex; lamina elliptic to oblong to narrowly oblong, green to greyish green, (10–) 15–40 (–90) × (5–) 7–15 (–25) mm, base cuneate, apex rounded; margin entire to glandular-denticulate to spinulose-denticulate on juvenile shoots; coriaceous; venation indistinctly brochidodromous, ± raised above and below in dried material, fine reticulation less conspicuous; petiole 2–5 mm long; stipules brownish black. *Inflorescences* axillary towards apices of branchlets, pedunculate, compact dichasial, 3–10(–15)-flowered, peduncle 4–10 mm long; bracts minute. *Flowers* bisexual, 3-merous, ± 6 mm in diam., pedicels 3–4 mm long. *Sepals* greenish, subcircular, 1.2 × 1.6 mm long, subcoriaceous, margin entire. *Petals* cream to green, oblong to obovate, 3–4 × 2.5 mm, sessile, spreading, apex rounded, margin entire, the lower half revolute, involute towards the apex (appearing spatulate), the lower half of the lamina thickened with projections towards the apex. *Stamens* initially erect, soon curving outwards with anthers almost touching sepals; filaments ± 1 mm long, arising from near centre of disc, anthers 0.4 mm long, extrorse. *Disc* entire, convex, thick and fleshy. *Ovary* 3-locular; style ± 0.4 mm long; stigma inconspicuous. *Fruit* drupaceous, spheroid to widely ellipsoid, cream or yellowish, drying dark brown, 10–15 mm diam., stone spheroid to broadly elliptic, surface smooth, 8–12 mm diam.; endocarp 2 mm thick. *Seeds* 1 or 2(3) per fruit, seed-coat dark brown, ovoid, flattened, 8 × 5 × 2 mm; embryo ovate.

Elaeodendron transvaalense is widespread in southern Africa, being recorded from Zambia, Zimbabwe, South Africa, Swaziland, Namibia, Botswana and Mozambique (Figure 8) where it occurs in woodlands and bushveld, occasionally growing on termite mounds. In the KwaZulu-Natal bushveld it is particularly conspicuous. The Ingwavuma District in KwaZulu-Natal is named after the common Zulu name of the tree. Flowering

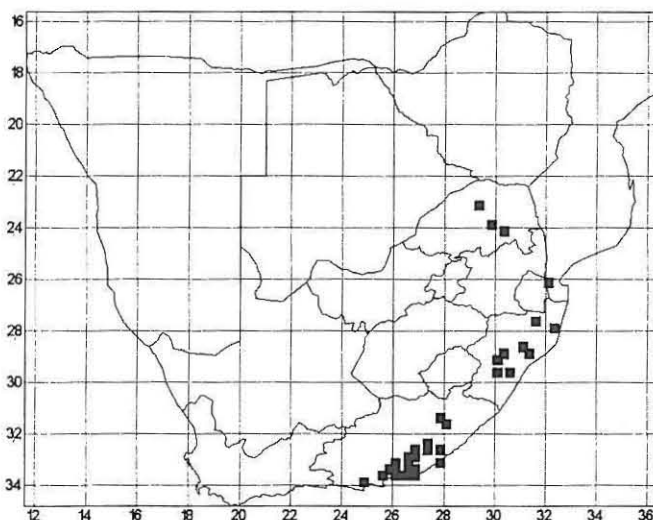


Figure 7 Known distribution of *Elaeodendron zeyheri*.

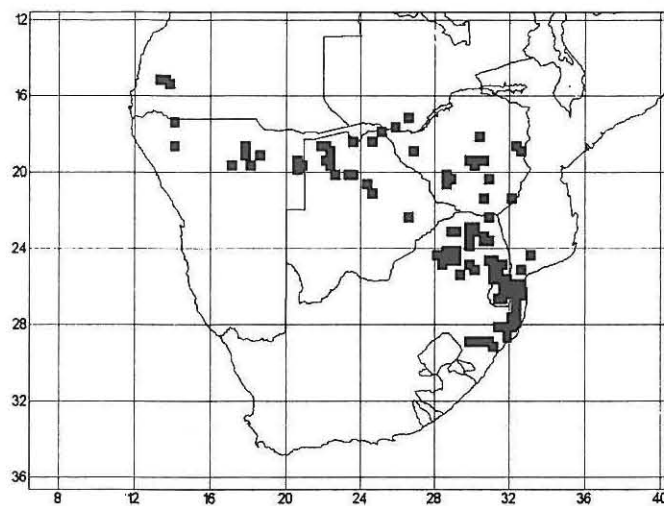


Figure 8 Known distribution of *Elaeodendron transvaalense*.

December to April.

The bark of *E. transvaalense* is used extensively in Zulu traditional medicine (Hutchings 1996). On the Witwatersrand it is among the more popular items in trade on muti markets (pers. comm. V. Williams, Department of Botany, University of the Witwatersrand). Palmer and Pitman (1973) provide a recipe, recounted by Father Gerstner, for a tea made of bark. 11, a peltogynan and three pentacyclic triterpenoids have been isolated from the bark (Drewes *et al.* 1991).

Elaeodendron transvaalense was placed in many genera, amongst others a genus of its own (*Pseudocassine* Bredell 1937). On account of its 3-merous flowers, unusual in the family Celastraceae, Loesener (1942b) placed this species as *Pseudocassine* in the Hippocrateaceae (a group with 3 stamens, although not 3-merous).

Selected specimens examined

Angola

—1513: Huila, Chibota, Tchivinguiro (–AB), *Gossweiler 12715* (BM, MO); Huila (–BA), *Dekindt 604* (P); Huila, Quihita, margens do Rio Caculuar (–BD), *Barbosa & Moreno 10174* (PRE).

Zambia

—1725: King's Mile, Livingstone (–DB), *Brenan & Greenway 7790* (K).

—1726: Hunter's Rest Farm, on rd 347 (to Kabanga Mission) on Naruwamba stream (–BA), *Bainbridge 926* (K).

Zimbabwe

—1826 (Hwange): Main Camp, near Dopu, Wankie National Park (–DD), *Rushworth 1330* (K, PRE, SRGH).

—1830 (Hartley): Hartley, Poole Farm (–AB), *Hornby 3382* (K, SRGH).

—1832 (Mutare): Rusape, Valhalla (–CB), *Dehn R8* (K); Umtali, Commonage (–DC), *Chase 5958* (BM, K, PRE, SRGH).

—1929 (Gweru): Gwelo, 6 mile S of Gwelo (–BD), *Biegel 1952* (K, PRE, SRGH).

—1930 (Mvuma): 2 mile from Lalapanzi on Gwelo road (–AC), *Mullin 11/51* (MO); Umvuma Golf Course (–BC), *Hodgson 3/50* (K, PRE, SRGH); Selukwe, Gwenoro Dam near spillway, south end (–CA), *Biegel 2602* (K, SRGH).

—2028 (Bulawayo): Bulawayo Hillside (–BA), *Hodgson 5/52* (K, PRE, SRGH); Essexvale (–BD), *Borle 87* (K, PRE); Matopos (–DA), *West 2172* (K, MO, PRE, SRGH).

—2030 (Masvingo): [Fort] Victoria [Masvingo] (–BD), *Monro 588* (BM, K).

—2130 (Nuanetsi): Nuanetsi, Matibi Reserve, Pamba Weir Sandvold (–BC), *Davies 2433* (K, MO, PRE, SRGH).

—2132 (Massangena): Lundi area (–AC), *Mullin 98/51* (K, MO, SRGH).

Namibia

—1714 (Ruacana Falls): Ruacana (–AC), *Kotze 15* (PRE).

—1725 (Livingstone): Kazangula (–CC), *Van Rensburg 10486* (PRE).

—1814 (Otjerunda): Kaokoveld, Farm Otjitundua (–CA), *Giess & Leippert 7346* (MO, PRE).

—1817 (Tsintsabas): Tsumeb, Tsintsabis (–DB), *Marsh PRE-47212* (PRE).

—1917 (Tsumeb): Grootfontein, Farm Heidelberg (–BB), *Walter 365* (B, PRE); Farm Kunkauas, road to Post Office (–CA), *Kinges 3016* (PRE).

—1918 (Grootfontein): ± 80 km from Rundu, Farm Taranaki (–BA), *Burgoyne 3228* (PRE); Grootfontein, Venters Post (–CA), *Dinter 7388* (BM, BOL, K, PRE, Z).

—1920 (Tsumkwe): Tsumkwe, Groot Dobe (–BC), *Botha & Bredenkamp 3592* (PRE); Barakapan-Wes (–DB), *Botha & Bredenkamp 3602* (PRE); 13 km E of Tsumkwe (–DC), *Giess, Watt & Snyman 11088* (PRE).

Botswana

—1821: (Andara): 25 km S of Shakawe Fishing Camp (–DB), *Venter, Hahn & Archer 78* (PRE).

—1822 (Kangara): Okavango River, 16 km S of Samocina camp site (–CA), *Müller & Biegel 2292* (MO, PRE); Guma Lediba, W end near harbour (–CD), *Smith 1576* (K, MO, PRE).

—1823 (Siambisso): Kwando River (–BC), *Smith 2343* (K, MO, PRE).

—1824 (Kachikau): Serondela, Chobe River Bank (–BC), *Miller B/1131* (PRE).

—1922 (Nokaneng): 'Blochage' Island Camp (–AB), *Smith 194* (K, LISC, PRE); Gomare, Toakhe River Bank (–AC), *Erens 258* (K, PRE); Mokolane, Central Thoage (–CB), *Smith 1488* (K, PRE).

—2022 (Lake Ngami): Tsau, 13 km N of Tsau alongside Tsau-Nokaneng River road (–BA), *Smith 1456* (K, MO, PRE).

—2023 (Kgwebe Hills): Maun (–AB), *Smith 1234* (K, MO, PRE); Botletle River, 1 km E of Samadupe Drift (–BA), *Biegel & Russell 3736* (LISC, MO, PRE, S).

—2024 (Bushman Pits): Botletle River (–CB), *Erens 209* (K, PRE).

—2124 (Rakops): Toromoja, (–BA), *Ngoni 425* (B, K, MO, PRE); Boteti River (–BA), *Smith 2545* (K, PRE).

—2226 (Serowe): Metsimesau, Serowe (–BC), *Miller B/224* (PRE).

Mozambique

—2433 (Chibuto): Gaza, Caniçado, andados 43 km de Mapulanguene para Massingir (–AC), *Correia & Marques 873* (LISC, PRE).

—2532 (Maputo): Lourenco Marques, Magude (–BA), *Torre 7205* (K, LISC); Lourenco Marques, Matolla bridge (–CD), *Bremekamp LM56* (PRE); Maputo, Quinta da Pedra (–DC), *Gomes e Sousa 3658* (K, MO, PRE).

—2632 (Bela Vista): Lourenco Marques, Umbeluzi (–AB), *Carvalho 998* (NBG); Maputo, near Changanane (–AC), *Torre 7926* (LISC); Lourenco Marques, near Porto Henrique (–BC), *Balsinhas 508* (BM, K, LISC, PRE).

Swaziland

—2631 (Mbabane): Tsanedi, SE side of town (–BA), *Van Jaarsveld 984* (K, NBG, PRE); Mbuluzi Private Nature Reserve, Umbuluzi Estates S of Viti's compound (–BB), *Culverwell 1347* (PRE); 5.5

mile NE of Mpaka Station, near S end of Hlane Wildlife Sanctuary (–BD), *Culverwell 812* (PRE); N of Ngwemphisi River, 4 km SE of Gebeni Royal Kraal (–CB), *Prior 298* (PRE); Timbutini Hills (–DA), *Kemp 1461* (PRE); Stegi, Blue Jay Ranch (–BD), *Compton 32152* (PRE).

—2632 (Bela Vista): Farm Mlawula, 2.5 mile S of Mlawula Station, W of Nkumbane Stream (–AA), *Culverwell 836* (PRE).

South Africa

—2229 (Waterpoort): Foot of Wyllie's Poort (–DD), *Story 5953* (K, PRE).

—2230 (Messina): Mutale River, bridge to Masisi (–BD), *Pienaar 1124* (PRE); Tate Vondo Forest Reserve, Dzanani, Deepkloof (–CC), *Hemm 257* (J, PRE).

—2328 (Baltimore): Blauwberg, near Leipzig Mission Station (–BB), *Smuts & Pole-Evans 831* (BOL, PRE).

—2329 (Pietersburg): Brakrivier (–AA), *Mara Research Station* (PRE); 3 mile N of Bantolierskop (–BD), *De Winter & Killick 8907* (PRE); 5 mile S of Turfloop (–DD), *Thomas 58* (PRE).

—2330 (Tzaneen): Ben Lavin Nature Reserve (–AA), *Ben Lavin Grp. A20* (PRE); 25 km from Gyani on the way to Punda Milia (–BC), *Van Wyk, Dahlgren & Kok 5467* (C, PRE, PRU); Hans Merensky Nature Reserve, Black Hill Dam (–DA), *Oates 246* (PRE); Phalaborwa, Letaba Ranch, (–DB), *Swart 77* (PRU).

—2428 (Nylstroom): Melkriver, 11 km vanaf Vaalwater op pad na Melkriver (–AC), *Coetzee 996* (K, PRE); Zebediela, Farm Wildebeestlaagte (–AD), *Gilfillan sub Galpin 651* (PRE); Stepping Stones Farm, 26 mile NW of Naboomspruit (–BA), *Mogg 37397* (PRE); Warmbaths (–CD), *Balsinhas 3427* (BM, K, PRE); Naboomspruit, Mosdene (–DA), *Galpin 469M* (BM, K, P, PRE).

—2429 (Zebediela): Swartkrans Area, Makapaan's Valley (–AA), *Balkwill & Balkwill 4419* (J); Sekhukuniland, Winterveld Farm (–CA), *Briers 42* (PRE); slopes between Magneethoogte and Schoonoord (–DD), *Maaren 20* (PRE).

—2430 (Pilgrim's Rest): Swadini Nature Reserve, near dam (–DB), *Retief, Reyneke, Coetzer & Reid 1140* (PRE).

—2431 (Acornhoek): Umbabat Bushveld E of Klaseri (–CA), *Shackleton 580* (J); Kruger National Park, 9 mile W of Skukuza (–DC), *Codd & De Winter 5130* (K, PRE).

—2529 (Witbank): Loskop Dam (–AD), *Mogg 30421* (J, K, PRE).

—2530 (Lydenburg): Lydenburg, Uitkyk farm (–AA), *Van Greuning & Students 677* (PRE, PRU).

—2531 (Komatipoort): Kruger National Park, Shabin (–AA), *Van der Schijff 702* (K, PRE); Kruger National Park, Nahpe (–AB), *Van der Schijff 3875* (K, MO, PRE); Komatipoort, Lekasi Bantutown (–AC), *Nel 382* (K, MO, PRE); Lebombo Mountains, Avondstonde plaas by Transvaalse grens tussen Komatipoort en Squamans (–CA), *Coetzee 1380* (K, MO, PRE); Kaap Muiden, Stentor (–CB), *Nel 342* (NBG, PRE); Wilsonskop, 8 mile SW of Hectorspruit (–DA), *Buitendag 965* (PRE); Farm Castellopoules between Komatipoort and Squamans (–DB), *Coetzee 1405* (PRE).

—2632 (Bela Vista): Ndumu, 2.5 km S of Ndumu store on Makane's Drift road (–CD), *Stephen 841* (K, MO, PRE).

—2732 (Ubombo): Pongola Flood Plain (–AD), *Moll 5132* (PRE); Ubombo (–CA), *Gerstner 3777* (K, PRE); Makatini Flats (–CD), *Herman 1022* (PRE).

—2829 (Harrismith): Van der Merweskraal Farm, 9 mile E of Escourt (–DD), *Green 92* (PRE).

—2830 (Dundee): c. 8 mile SE of Weenen (–CC), *Acocks 13862* (PRE); 4 mile from Muden (–CD), *Edwards 902* (PRE); Kranskop, 24 km from Kranskop on Nkandla road (–DD), *Hildyard 116* (C, K, PRE).

—2831 (Nkandla): Mahlabatini (–AB), *Gerstner 4161* (BOL, GRA, K, PRE); 1 mile in Umfolozi Game Reserve toward Mpila woodland (–BB), *Moll 5246* (PRE); Umfolozi Game Reserve (–BD), *Bourquin 440* (PRE); Ian Scott-Barnes' Farm (–DB), *Moll 4959* (K, PRE).

—2832 (Mtubatuba): Hluhluwe Game Reserve (–AA), *Stewart 280* (PRE).

—2931 (Stanger): Mapumulo, Oqaqeni (–AA), *Edwards 1840* (K, PRE).

References

- ARCHER, R.H. 1990. The taxonomic status of *Cassine* L. s.l. (Celastraceae) in southern Africa. M.Sc. Thesis, University of Pretoria, Pretoria.
- ARCHER, R.H. & CONDY, G. 1995. *Elaeodendron croceum*. *Flower. Pl. Afr.* 54: 58–62.
- ARCHER, R.H. & VAN WYK, A.E. 1992. Palynology and intergeneric relationships in some southern African species of subfamily Cassinoideae (Celastraceae). *Grana* 31: 241–252.
- ARCHER, R.H. & VAN WYK, A.E. 1993a. Bark structure and intergeneric relationships of some southern African Cassinoideae (Celastraceae). *IAWA J.* 14: 35–53.
- ARCHER, R.H. & VAN WYK, A.E. 1993b. Wood structure and generic status of some southern African Cassinoideae (Celastraceae). *IAWA J.* 14: 373–389.
- ARCHER, R.H. & VAN WYK, A.E. 1996a. Generic delimitation of subfamily Cassinoideae (Celastraceae) in Africa. In: The Biodiversity of African Plants, eds L.J.G. van der Maesen, X.M. van der Burgt & J.M. Medenbagh de Rooy, pp. 459–463. Kluwer Academic Publishers, Dordrecht.
- ARCHER, R.H. & VAN WYK, A.E. 1996b. Celastraceae: Correct orthography and author citation for *Elaeodendron*. *Bothalia* 26: 41–42.
- ARNOLD, T.H. & DE WET, B.C. (eds). 1993. Plants of southern Africa: names and distribution. *Mem. Bot. Surv. S. Afr.* 62: 1–825.
- BAKER, E.G. 1911. Contribution to the Flora of Gazaland. Dicotyledons. Polypetalæ. *J. Linn. Soc. Bot.* 40: 16–76.
- BATTISCOMBE, E. 1936. Trees and shrubs of Kenya colony, 2nd edn. Government printer, Nairobi.
- BEENTJE, H.J. 1994. Kenya trees, shrubs and lianas. National Museums of Kenya, Nairobi.
- BLAKELOCK, R.A. 1957. Notes on African Celastraceae. II. *Kew Bull.* 1956: 555–557.
- BOUGHEY, A.S. 1964. A check list of the trees of southern Rhodesia. *J. S. Afr. Bot.* 30: 151–171.
- BREDELL, H.C. 1937. *Pseudocassine*, a new genus of Celastraceae from South Africa. *S. Afr. J. Sci.* 33: 330–334.
- BRENAN, J.P.M. & GREENWAY, P.J. 1949. Check-lists of the forest trees and shrubs of the British Empire. No. 5. Tanganyika Territory. Part 1. Imperial Forestry Institute, Oxford.
- BURTT DAVY, J. 1921. III. New or noteworthy South African plants. I. *Bull. Misc. Inf. Kew* 1921: 49–52.
- BURTT DAVY, J. & HOYLE, A.C. 1936. Checklist of the forest trees and shrubs of the Nyassaland Protectorate. Revised by P. Topham, 1958. Government Printer, Zomba.
- CHIOVENDA, E. 1916. Le collezioni Botaniche della Missione Stefanini-Paoli nella Somalia italiana. Vol. I. Cocci, Firenze.
- CHIOVENDA, E. 1929. Celastraceae. In: Flora Somalia I, ed. E. Chiovenda, pp. 125–127. Sindacato Italiano, Roma.
- CHIOVENDA, E. 1932. Celastraceae. In: Flora Somalia II, ed. E. Chiovenda, pp. 132–134. Modena R. Orto Botanico, Roma.
- COATES PALGRAVE, K. 1977. Trees of Southern Africa. 1995 impression. Struik, Cape Town.
- COATES PALGRAVE, K., COATES PALGRAVE, P. & COATES PALGRAVE, M. 1985. Everyone's guide to trees of South Africa. CNA, Johannesburg.
- CODD, L.E. 1966. Celastraceae. The *Cassine* complex. In: New and interesting records of African flowering plants. *Bothalia* 9: 123–151.
- COMPTON, R.H. 1976. The Flora of Swaziland. *J. S. Afr. Bot.*, Suppl. Vol. 11.
- CUFODONTIS, G. 1958. Enumeratio Plantarum aethiopiae Spermatophyta. *Bull. Jard. Bot. État. Bruxelles* 28, Suppl.: 441–488.
- DALE, T.R. & GREENWAY, P.J. 1961. Kenya trees & shrubs. Buchanan's Kenya Estates, Nairobi, in association with Hatchards, London.

- DAVISON, J.D. 1927. Celastraceae. *Bothalia* 2: 289–346.
- DE CANDOLLE, A.P. 1825. *Prodromus systematis naturalis*. Vol. 2. Treuttel & Würtz, Paris.
- DING HOU. 1962. Celastraceae I, II. In: *Flora Malesiana*, ed. C.G.G.J. Van Steenis, Series I, Vol. 6, pp. 227–421. Noordhoff, Groningen.
- DINTER, K. 1921. Pflanzenarten aus Deutsch-Südwestafrika. *Fedde Rep.* 17: 189.
- DREWES, S.E. & MASHIMBYE, M.J. 1993. Flavanoids and triterpenoids from *Cassine papillosa* and the absolute configuration of 11, 11-Dimethyl-1,3, 8, 10-tetrahydroxy-9-methoxypeltogynan. *Phytochem.* 32: 1041–1044.
- DREWES, S.E., MASHIMBYE, M.J., FIELD, J.S. & RAMESAR, N. 1993. 11, 11-Dimethyl-1,3, 8, 10-tetrahydroxy-9-methoxypeltogynan and three pentacyclic triterpenoids from *Cassine transvaalensis*. *Phytochem.* 30: 3490–3493.
- DRUMMOND, R.B. 1981. Common trees of the central watershed woodlands of Zimbabwe. Department of Natural Resources, Salisbury.
- ECKLON, C.F. & ZEYHER, K.L.P. 1834/5. *Enumeratio plantarum Africae australis extratropicae*. Pars I. Perthes & Besser, Hamburg.
- EDWARDS, D & LEISTNER, O.A. 1971. A degree reference system for citing biological records in southern Africa. *Mitt. Bot. Staatssamml. München* 10: 501–509.
- EGGELING, W. J. 1940. The indigenous trees of the Uganda Protectorate. Government Printer, Entebbe.
- EGGELING, W. J. 1952. The indigenous trees of the Uganda Protectorate, 2nd edn. Government Printer, Entebbe.
- ENGLER, A. 1904. Ueber die Vegetationsverhältnisse des Somalilandes. *S.B. preuss. Akad. Wiss.* 10: 355–416.
- ETTINGSHAUSEN, C. 1857. Über die Nervation der Blätter bei den Celastraceen. *Denkschr. K. Akad. Wiss., Wien* 163: 43–94.
- EXELL, A.W. & MENDONÇA, F.A. 1954. *Conspectus Florae Angolensis*. Vol. 2. Ministério do Ultramar, Lisboa.
- EYLES, F. 1916. A record of plants collected in southern Rhodesia. *Trans. Roy. Soc. S. Afr.* 5: 273–564.
- FIORI, A. 1915. *Plantas somalensis novae* (e missione Stefanini-Paoli). *Bull. Soc. Bot. Ital.* 1915: 49–59.
- GELFAND, M, MAVI, S., DRUMMOND, R.B. & NDEMERA, B. 1985. The Traditional Medical Practitioner in Zimbabwe. *Zambezi* 17.
- GMELIN., J.F. 1791. *Linnaeus's Systema Naturae*, 13th edn., Vol. 1. The author, Leipzig.
- GOMES E SOUSA, A. 1967. *Dendrologia de Moçambique*. Vol. 2. Nacional de Moçambique, Lourenço Marques.
- GRAHAM, R. 1841. *Elaeodendrum capense*. Cape Elaeodendron. *Curtis' Bot. Mag.* t. 3835.
- HALL, A.V., DE WINTER, M., DE WINTER, B. & OOSTERHOUT, S.A.M. 1980. Threatened plants of Southern Africa. South African National Scientific Programmes Report No. 45.
- HARVEY, W.H. 1838. The genera of South African Plants, 1st edn. Robertson, Cape Town.
- HARVEY, W.H. 1860. Hippocrateaceae. In: *Flora Capensis*, eds W.H. Harvey & O.W. Sonder, Vol. 1, pp. 229 & 230. Hodges, Smith & Co., Dublin.
- HERZIG-STRASCHIL, B. & ROBINSON, G.A. 1978. On the ecology of the fruit bat, *Rousettus aegyptiacus leachi* A. Smith, 1829) in the Tsitsikama Coastal National Park. *Koedoe* 21: 101–110.
- HOCHSTETTER, C.F. [1844-]1846. Celastrineae. In: *Beiträge zur Flora des Cap- und Natallandes*, ed. F. Krauss. Regensburg.
- HUTCHINGS, A. 1996. Zulu medicinal plants, an inventory. University of Natal Press, Pietermaritzburg.
- HUTCHINSON, J. & DALZIEL, J.M. 1927. Celastraceae. In: *Flora of West Tropical Africa*, eds J. Hutchinson & J.M. Dalziel, Vol. 1, Part 1, pp. 444 & 445. The Crown Agents for the Colonies.
- IRVINE, F. R. 1961. *Woody plants of Ghana*, with special reference to their uses. Oxford University Press, London.
- JACQUIN, J.F. 1787. *Tria genera plantarum nova, ex horto botanico viennensi*. *Nova Act. Helv. Phys.-Math.-Bot.* 1: 34–41.
- JACQUIN, N.J. 1782 & 1787. *Icones Plantarum Rariorum* 1: t. 48 & 5. Vindobonae [Wien].
- JUSSIEU, A.-L. DE. 1789. *Genera Plantarum*. Herissant, Paris.
- KEAY, R.W.J. & BLAKELOCK, R.A. 1958. Celastraceae. In: *Flora of West Tropical Africa*, ed. R.W.J. Keay, 2nd edn, Vol. 1, Part 2, pp. 623–634. Crown Agents for Oversea Governments and Administrations.
- KOSTERMANS, A.J.G.H. 1986. Notes on Asiatic *Cassine* L. (Celastraceae). *Gdms' Bull., Sing.* 39: 177–191.
- KUNTZE, O. 1891. *Revisio generum plantarum*. Pars I. Felix, Leipzig.
- LOESENER, L.E.T. 1892. Celastraceae. In: *Die Natürlichen Pflanzenfamilien*, eds A. Engler & K. Prantl, Vol. 3, Part 5, pp. 189–222. Engelmann, Leipzig.
- LOESENER, L.E.T. 1893. Celastraceae africanae. *Bot. Jahrb.* 17: 541–553.
- LOESENER, L.E.T. 1895b. Celastraceae. In: *Die Pflanzenwelt Ost-Afrikas und der Nachbargebiete*, ed. A. Engler, Vol. 3. Dietrich Reimer, Berlin.
- LOESENER, L.E.T. 1896. Celastraceae. In: *Beiträge zur Kenntnis der Afrikanischen Flora*, ed. H. Schinz. *Bull. Herb. Boiss.* 4: 429–433.
- LOESENER, L.E.T. 1897. Celastraceae. In: *Die natürlichen Pflanzenfamilien*, Nachträge zum II-IV, eds A. Engler & K. Prantl, pp. 221–225. Engelmann, Leipzig.
- LOESENER, L.E.T. 1900. Celastraceae africanae. III. *Bot. Jahrb.* 28: 150–161.
- LOESENER, L.E.T. 1907. Ein neues *Elaeodendrum*. *Bot. Jahrb.* 40: 61.
- LOESENER, L.E.T. 1908. Celastraceae africanae. IV. *Bot. Jahrb.* 41: 298–312.
- LOESENER, L.E.T. & ENGLER, A. 1921. Celastraceae. In: *Die Pflanzenwelt Afrikas*, ed. A. Engler, Vol. 3, 2, pp. 220–236. Engelmann, Leipzig.
- LOESENER, L.E.T. 1926. Celastraceae. In: *Beiträge zur Kenntnis der Flora des Kenia, Mt. Aberdare und Mt. Elgon VIII*, eds R. Fries & T.C.E. Fries. *Notizbl. Bot. Gart. Mus. Berl.-Dahlem* 9: 485–522.
- LOESENER, L.E.T. 1934. Celastraceae novae vel melius cognoscendae. *Notizbl. Bot. Gart. Berl.-Dahlem* 12: 29–38.
- LOESENER, L.E.T. 1942a. Celastraceae. In: *Die natürlichen Pflanzenfamilien*, eds A. Engler, H. Harms & J. Matfeld, 2nd edn, 20b, pp. 87–197. Duncker & Humblot, Berlin.
- LOESENER, L.E.T. 1942b. Hippocrateaceae. In: *Die natürlichen Pflanzenfamilien*, eds A. Engler, H. Harms & J. Matfeld, 2nd edn, 20b, pp. 198–231. Duncker & Humblot, Berlin.
- MARLOTH, R. 1925. *The Flora of South Africa*. Vol. 2. Darter Bros., Cape Town.
- MELLIS, J.C. 1875. St. Helena. Reeve & Co., London.
- MENDONÇA, F.A. & SOUSA, E.P. 1968. Revisão das Celastraceae de Angola. *Garcia de Orta* 16: 177–192.
- MILLER, O.B. 1948. Check-lists of the forest trees and shrubs of the British Empire. No. 6. Bechuanaland Protectorate. Scrivener, Oxford.
- MILLER, O.B. 1952. The woody plants of the Bechuanaland Protectorate. *J. S. Afr. Bot.* 18: 1–100.
- MURRAY, J.A. 1784. *Systema Vegetabilium*, 14th edn. Gottingae [Göttingen].
- NOAD, T.C. & BIRNIE, A. 1989. *Trees of Kenya*. The authors, Nairobi.
- PALMER, E. & PITMAN, N. 1973. *Trees of South Africa*. Vol. 2. Balkema, Cape Town.
- PAPPE, L. 1854. *Silva Capensis*. Van De Sandt & De Villiers. Cape Town.
- PARDY, A.A. 1956. Notes on indigenous trees and shrubs of southern Rhodesia. *Rhod. Agr. J.* 53: 615–636.
- POLHILL, D. 1988. *Flora of Tropical East Africa*, Index of collecting localities. Royal Botanic Gardens, Kew.
- PHILLIPS, J.F.V. 1925. The Knysna elephant: a brief note on their history and habits. *S. Afr. J. Sci.* 22: 287–293.
- PHILLIPS, J.F.V. 1927. The role of the 'bushdove' *Columba arquatrix* T. & K., in fruit-dispersal in the Knysna forests. *S. Afr. J. Sci.* 24: 435–440.
- POOLEY, E. 1994. *The complete field guide to trees of Natal, Zululand & Transkei*. Natal Flora Publication Trust, Durban.
- RETZIUS, A.J. 1791. *Observationes botanicae* Crusium, Lipsiae

- [Leipzig].
- ROBSON, N.K.B. 1965. New and little known species from the Flora Zambesiaca area XVI. Taxonomic and nomenclatural notes on Celastraceae. *Bolm. Soc. Broteriana* 39 (2.ser.): 5–55.
- ROBSON, N.K.B. 1966. Celastraceae (incl. Hippocrateaceae). In: Flora Zambesiaca, eds A.W. Exell, A. Fernandes & H. Wild, Vol. 2(2), pp. 355–418. Crown Agents for Overseas Governments and Administrations, London.
- ROBSON, N.K.B. 1989. Celastraceae. In: Flora Aethiopica, eds I. Hedberg & S. Edwards. Vol. 3, pp. 331–347. Addis Ababa & Uppsala.
- ROBSON, N.K.B. & SOUSA, E.P. 1969. Celastraceae. In: Flora de Moçambique, Vol. 48(1): 1–66. Centro de botânica, Lisbon.
- ROBSON, N.K.B., HALLÉ, N., MATHEWS, B. & BLAKELOCK, R. 1994. Celastraceae. In: Flora of Tropical East Africa, ed. R.M. Polhill, pp. 1–78. Balkema, Rotterdam.
- ROESLER, H. 1968. Celastraceae. In: Prodrum einer flora von Südwestafrika, ed. H. Merxmüller, 77: 1–6. J. Cramer, Lehre.
- ROXBURGH, W. 1814. Hortus Bengalensis. Mission Press, Serampore.
- ROXBURGH, W. 1824. In: Flora Indica, eds W. Carey & N. Wallich, Vol. 2. Mission Press, Serampore.
- ROXBURGH, W. 1832. In: Flora indica, ed. W. Carey. Mission Press, Serampore.
- SCHINZ, H. 1905. Plantae Menyharthianae, en Beitrag zur Kenntnis der Flora des unteren Sambesi. *Denkschr. mat.-nat. K.l. k. Akad. Wiss., Wien* 78: 367–445.
- SCHINZ, H. 1936. Plantas Menyharthianas, IV, Relação das plantas. Translated by A. Gomes e Sousa. *Bol. Soc. Est. Col. Moçamb.* 32: 293–330.
- SEINER, F. 1911. Pflanzengeographische Beobachtungen in der Mittel-Kalahari. *Bot. Jahrb.* 46: 1–50.
- SONDER, O.W. 1860. Celastrineae. In: Flora capensis, eds W.H. Harvey & O.W. Sonder. Vol. 1, pp. 451–472. Hodges, Smith and Co., Dublin.
- STEEDMAN, E.C. 1933. A description of our trees, shrubs and lianas of southern Rhodesia. Rhodesian Printing and Publishing, Bulawayo.
- THONNER, F. 1915. The flowering plants of Africa. Dulau, London.
- THUNBERG, C.P. 1788. Resa uti Europa, Africa, Asia. Edman, Upsala.
- THUNBERG, C.P. 1794a. Prodrum Plantarum Capensium, Part 1. Edman, Upsala.
- THUNBERG, C.P. 1794b. Travels in Europe, Africa and Asia. Richardson, London.
- THUNBERG, C.P. 1818. Flora Capensis, 1st edn. Gerhardum Bonnierum, Hafniae.
- THUNBERG, C.P. 1823. Flora Capensis, 2nd edn. A. Schultes. Stuttgart.
- TRATTINNICK, L. 1818. Archiv der Gwächskunde. Vol. 5. Wien.
- TURZANINOW, N.S. 1858. Animadversiones ad primam partem herbarii Turczaninowianai. *Bulletin de la Société Impériale des Naturalistes de Moscou [Bull. Soc. Nat., Mosc.]* 31(2): 452.
- URBAN, I. 1916. Sertum antillanum. 8. *Fedde Rep.* 14: 331–343.
- VAN WYK, P. 1974. Trees of the National Kruger National Park. Part 2. Purnell, Cape Town.
- VAN WYK, P. 1984. Field guide to the trees of the Kruger National Park. 2nd impress. 1994. Struik, Cape Town.
- VEGTER, I. 1986. Index herbariorum, Part II (6), Collectors S. *Regnum veg.* 114.
- VERNON, C.J. 1994. List of trees debarked in the Border region. *Naturalist* 38: 3–9.
- VERDCOURT, B. & TRUMP, E.C. 1969. Common poisonous plants of East Africa. Collins, London.
- VILLIERS, J.F. 1975. Celastraceae. In: Flore du Cameroun, eds A. Aubréville & J.F. Leroy, Vol. 19, pp. 3–32. Muséum National D'Histoire Naturelle, Paris.
- VON BREITENBACH, F. 1965. The indigenous trees of southern Africa. Vol. 4. The Government Printer, Pretoria.
- VON BREITENBACH, F. 1974. Southern Cape forest and trees. The Government Printer, Pretoria.
- WATT, J.M. & BREYER-BRANDWIJK, M.G. 1962. The medical and poisonous plants of southern and eastern Africa. 2nd edn. E. & S. Livingstone, Edinburgh.
- WHITE, F. 1962. Forest Flora of Northern Rhodesia. Oxford University Press, London.
- WILCZEK, R. 1960. Celastraceae. Flore du Congo Belge et du Ruandi-Urundi. Vol. 9: 113–232.