

**FLORA**  
OF  
**TROPICAL EAST AFRICA**

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

EDITOR

R.M.POLHILL, B.A., Ph.D., F.L.S.

**EUPHORBIACEAE (Part 2)**

BY

SUSAN CARTER, M.Sc.  
AND A.R.-SMITH, B.Sc.



PUBLISHED ON BEHALF OF  
THE EAST AFRICAN GOVERNMENTS

BY

A.A.BALKEMA/ROTTERDAM/BROOKFIELD  
AND OBTAINABLE FROM THE ADDRESSES  
LISTED ON THE BACK OF THE COVER

21ST APRIL 1988  
ISBN 90 6191 338 1

**FLORA**  
OF  
**TROPICAL EAST AFRICA**

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

EDITOR

R.M.POLHILL, B.A., Ph.D., F.L.S.

**EUPHORBIACEAE (Part 2)**

BY

SUSAN CARTER, M.Sc.  
AND A.R.-SMITH, B.Sc.



**CRC Press**

Taylor & Francis Group

Boca Raton London New York

---

CRC Press is an imprint of the  
Taylor & Francis Group, an **informa** business

A BALKEMA BOOK

CRC Press  
Taylor & Francis Group  
6000 Broken Sound Parkway NW, Suite 300  
Boca Raton, FL 33487-2742

© 1988 by Taylor & Francis Group, LLC  
CRC Press is an imprint of Taylor & Francis Group, an Informa business

No claim to original U.S. Government works

This book contains information obtained from authentic and highly regarded sources. Reasonable efforts have been made to publish reliable data and information, but the author and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The authors and publishers have attempted to trace the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission to publish in this form has not been obtained. If any copyright material has not been acknowledged please write and let us know so we may rectify in any future reprint.

Except as permitted under U.S. Copyright Law, no part of this book may be reprinted, reproduced, transmitted, or utilized in any form by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying, microfilming, and recording, or in any information storage or retrieval system, without written permission from the publishers.

For permission to photocopy or use material electronically from this work, please access [www.copyright.com](http://www.copyright.com) (<http://www.copyright.com/>) or contact the Copyright Clearance Center, Inc. (CCC), 222 Rosewood Drive, Danvers, MA 01923, 978-750-8400. CCC is a not-for-profit organization that provides licenses and registration for a variety of users. For organizations that have been granted a photocopy license by the CCC, a separate system of payment has been arranged.

**Trademark Notice:** Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

**Visit the Taylor & Francis Web site at**  
**<http://www.taylorandfrancis.com>**

**and the CRC Press Web site at**  
**<http://www.crcpress.com>**

# FLORA OF TROPICAL EAST AFRICA

## EUPHORBIACEAE (Part 2)

SUSAN CARTER & A.R.-SMITH\*

This part contains the tribe Euphorbieae, and also concludes with the treatments of those five genera (73. *Bischofia*, 74. *Uapaca*, 75. *Antidesma*, *Hymenocardia* (Hymenocardiaceae) & *Microdesmis* (Pandaceae)) about which there has been considerable dispute as to their familial status.

### Tribe Euphorbieae

Boiss. in DC., Prodr. 15(2): 4(1862)

Flowers monoecious, with numerous ♂ flowers surrounding a solitary ♀ flower and all enclosed within a cup-like involucre; each ♂ flower reduced to a single pedicellate stamen without a perianth; ♀ flower consisting of a pedicellate tricarpellary pistil with perianth absent or reduced to a rim or 3 lobes. Milky latex is always present.

A well-defined tribe which includes, besides the very large genus of *Euphorbia* itself, 10 other small genera of tropical and subtropical regions; of these 6 are endemic in tropical Africa, 3 occurring in East Africa (*Elaeophorbia*, *Synadenium* and *Monadenium*). *Pedilanthus*, from tropical America, is also used as an ornamental.

#### KEY TO GENERA

- |  |                         |
|--|-------------------------|
| 1. Cyathia actinomorphic . . . . .   | 2                       |
| Cyathia zygomorphic . . . . .  | 4                       |
| 2. Gland continuous, rim-like, with no gap to one side . . . . .   | <b>70. Synadenium</b>   |
| Gland single, lateral, or glands 2-8, distinct . . . . .   | 3                       |
| 3. Fruit not or only slightly fleshy, dehiscent . . . . .  | <b>68. Euphorbia</b>    |
| Fruit thick, fleshy, indehiscent, drupaceous . . . . .   | <b>69. Elaeophorbia</b> |
| 4. Gland a continuous rim except for a gap at one side, surrounding the upper part of the cyathium . . . . . | <b>71. Monadenium</b>   |
| Glands completely enclosed by the cyathium . . . . .   | <b>72. Pedilanthus</b>  |

### 68. EUPHORBIA

L., Sp. Pl.: 450 (1753) & Gen. Pl., ed. 5: 208 (1754); Boiss. in DC., Prodr. 15(2): 78 (1862); G.P. 3(1): 258 (1800); N.E. Br. in F.T.A. 6(1): 470 (1911); Pax in E. & P. Pf., ed. 2, 19C: 208 (1931)

Annual, biennial or perennial herbs, shrubs or trees, sometimes succulent and unarmed or spiny, with a milky usually caustic latex, monoecious (elsewhere rarely dioecious). Roots fibrous, or thick and fleshy, sometimes tuberous. Leaves opposite, alternate or verticillate, often stipulate, subtended by spiny outgrowths on some succulent species. Inflorescence with cyathia in simple, dichotomous or umbellate terminal or axillary cymes; bracts paired, often leaf-like, sometimes brightly coloured and showy. Involucres with (1-)4-5(-8) glands around the rim alternating with 5 fringed lobes. Male flowers in 5 groups separated by fringed membranes, bracteolate. Female flower

\* Euphorbieae by Susan Carter, other genera by A.R.-Smith.

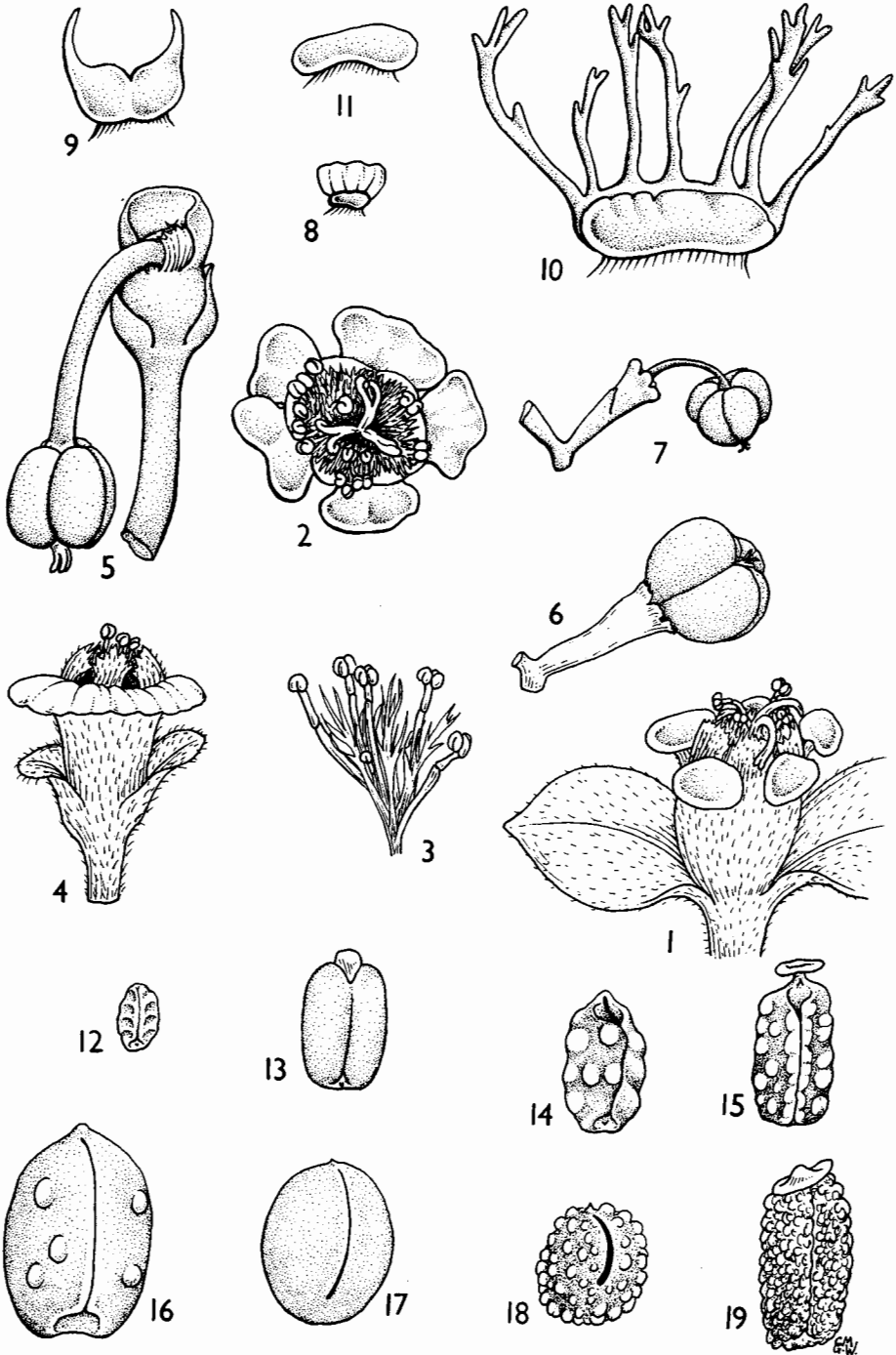


FIG. 76. Key characters. Cyathia of 1, *Euphorbia*, with glands distinct, 2, surface view, 3, stamens and bracteoles, 4, *Synadenium*, with glandular rim complete, 5, *Monadenium*, with glandular rim broken at one side. Capsules 6, sessile or subsessile, 7, exserted. Involucral glands of 8, *Euphorbia* subgen. *Chamaesyce*, 9, subgen. *Esula*, 10, subgen. *Trichadenia*, 11, subgen. *Euphorbia*. Seeds of 12, *Euphorbia* subgen. *Chamaesyce*, 13, subgen. *Esula*, 14, subgen. *Euphorbia*, 15, sect. *Eremophyton*, 16, subgen. *Trichadenia*, 17, subgen. *Lycopsis*, 18, subgen. *Euphorbia*, 19, *Monadenium*. Drawn by Christine Grey-Wilson.

subsessile or with the pedicel usually elongating and reflexed in fruit but straightening before dehiscence; perianth reduced to a rim below the ovary, seldom 3-lobed; ovary 3-locular, with 1 pendulous ovule in each locule; styles 3, partly united. Fruit a capsule, sometimes fleshy but becoming woody at maturity, loculicidally and septicidally dehiscent (a regma). Seeds with or without a caruncle.

*Euphorbia* is one of the largest genera of flowering plants, with possibly over 2000 species and a world-wide distribution in temperate and tropical zones. About 1300 species are herbaceous. The other shrubby, tree and succulent species are confined almost entirely to the tropics and subtropics. With relatively few exceptions the succulent species, numbering over 500, occur in drier regions of the African continent (including Madagascar), well adapted to survive in often extreme xerophytic conditions. Their growth habit is extremely diverse, from small herbs to shrubs and large trees.

A number of species possessing showy leaves or bracts are of horticultural value, those introduced into East Africa including the well-known *E. pulcherrima* Klotzsch (*Poinsettia*) from Central America and *E. milii* Des Moulins from Madagascar (see notes on Cultivated Species, p. 413). All the succulent species are of interest to specialist collectors, many being at risk in the wild and listed as endangered. The lightweight wood of some tree species has occasionally been used commercially for such items as matchsticks and banana crates.

The latex of all species is abundant and usually caustic, sometimes exceedingly so. Because of this and its irritant qualities, it is often a component, in Africa, of arrow and fish poisons, and is used widely in native medicines. As such it is known occasionally to promote some forms of cancer and consequently its chemical properties are of importance in cancer research. Attempts have been made in the past to use the latex as a rubber substitute, but resulting compounds proved to be unstable. Currently some species are being investigated for their hydrocarbon content as a source of fuel.

Because of the unifying structure of the cyathium, classification of this large and otherwise diverse aggregate of species has always been difficult and no system proposed so far has proved entirely satisfactory. Some authors have separated *Euphorbia* into a number of genera, with reasons usually based upon slight peculiarities of the cyathial structure. As treatment is often confined to limited geographical areas, such concepts invariably break down when applied to related species from other regions. The arrangement employed here loosely follows Pax's adaptation (1931) of Boissier's work (1862), with modifications to better accommodate a number of distinct groups recognized within East Africa. These are placed in subgenera and sections in a sequence which is not strictly phylogenetic but shows increasing specialization towards succulence, and a synopsis of which follows.

#### SYNOPSIS OF SUBGENERA AND SECTIONS

Subgen. **Chamaesyce** Raf. in Amer. Month. Mag. 2:119 (1817). Principally of New World origin and regarded by some authors as an easily defined genus with several distinguishing and often advanced characters. Its main stem is reduced, the entire plant at maturity consisting of an expanded dichotomously branching pseudumbellate inflorescence, with the floral bracts assuming the appearance and function of normal leaves. Stipules are obvious, the 4 involucreal glands bear petaloid appendages on the outer margin and the seeds are ecarunculate.

Sect. **Hypericifoliae** Pojero, Fl. Sicula 2(2): 327 (1907). Includes species with 10 or more cyathia grouped or congested into often capitate cymes, and of which there are 3 introduced species in East Africa. Species 1-3.

Sect. **Chamaesyce**. Includes species with solitary cyathia or a few clustered in leafy cymes. Species 4-22.

Subgen. **Poinsettia** (Grah.) House in Bull. N. York St. Mus. 254: 472 (1924). Syn. — *Poinsettia* Grah. in Edinb. New Philos. Journ. 20: 412 (1836). Also of New World origin and often regarded as a separate genus. Large floral bracts and a distinctive single funnel-shaped involucreal gland. 2 herbaceous species have been introduced and become naturalized in East Africa. Species 23, 24.

Subgen. **Esula** Pers., Syn. Pl.: 14 (1806). Generally (not always) accepted as the most primitive, although its species possess some characters more advanced than those of many others in Africa, such as the development of an herbaceous habit, loss of stipules and a condensed pseudumbellate inflorescence. It has diversified as a group especially in temperate zones to become possibly the subgenus with the largest number of species. All indigenous East African species belong to sect. *Esula*, with leafy bracts, 4 involucreal glands and carunculate seeds. Species 25-35.

Subgen. **Eremophyton** (Boiss.) Wheeler in Amer. Midl. Nat. 30: 483 (1943). Syn. — sect. *Eremophyton* Boiss. in DC., Prodr. 15 (2): 70 (1862). Contains an unsatisfactory grouping of 2, or possibly 3 sections, of annual or short-lived perennial herbaceous species, with a woody or somewhat succulent stem, rarely woody shrubs, petiolate leaves, stipules modified as glands or subulate filaments, leafy bracts and usually 4 involucreal glands.

Sect. **Pseudacalypha** Boiss. in DC., Prodr. 15 (2): 98 (1862). Used here in its broadest sense to include species with terminal and/or axillary simple or umbellate cymes, and ecarunculate conical seeds with horizontal grooves and ridges. Species 36–43.

Some authors prefer to use the section in its narrowest sense, as represented by the typical species *E. acalyphoides*, to include only those species with axillary cymes which dichotomize just once or twice, and involucre glands hairy on the upper surface (Species 36–41). Other species are then placed in sect. *Holstianae* Pax & K. Hoffm. in V.E. 3(2): 148 (1921), characterized by axillary and terminal 3-rayed umbels branching dichotomously many times and glabrous involucre glands (Species 42, 43).

Sect. **Eremophyton**. In East Africa typified by *E. agowensis*, includes woody stemmed herbaceous species with axillary and terminal inflorescences of dichotomously branching 3-rayed umbels, elongated capsules and flattened seeds with a conspicuous cap-like caruncle. Its relationship with the previous section is somewhat tenuous, linking factors existing in the inflorescence structure and in habit, which is especially evident in the close similarity between *E. pivottae* in this section and *E. longituberculosa*. Species 44–47.

Subgen. **Trichadenia** (Pax) S. Carter in K.B. 40: 816 (1985). Syn. — sect. *Trichadenia* Pax in V.E. 3(2): 152 (1921). Includes species with dichotomously branching 3–many-rayed pseudumbels, leafy bracts, stipules modified as glands or subulate filaments, 4 or 5 crenulate, lobed or large pectinate involucre glands and relatively large capsules with ecarunculate seeds. They are trees or shrubs, with woody or semi-succulent branches, or herbs which have developed a fleshy rootstock. Species 48–58.

Subgen. **Lyciopsis** (Boiss.) Wheeler in Amer. Mill. Nat. 30: 483 (1943). Syn. — sect. *Lyciopsis* Boiss. in DC., Prodr. 15(2): 97 (1862). Consists of 3 well-defined sections of woody shrubs or herbs with a thick woody rootstock, with conspicuous glandular stipules, terminal cymes with up to 3(–7) lateral branches and cyathia with 5 glands.

Sect. **Somalica** (S. Carter) S. Carter, comb. nov. Syn. — subgen. *Trichadenia* (Pax) S. Carter sect. *Somalica* S. Carter in K.B. 40: 817 (1985). Accommodates softly woody semi-succulent stemmed shrubs, with usually small scarios deciduous bracts, crenulate or usually pectinate involucre glands and large often ornamented capsules, with compressed ecarunculate seeds. Habit, glandular stipules, inflorescence features and seeds are more characteristic of subgen. *Lyciopsis* than they are of subgen. *Trichadenia* where it was first placed. This section occurs predominantly in Somalia, with one species in East Africa. Species 59.

Sect. **Lyciopsis**. Includes woody shrubs with leafy or scarios bracts, often saucer-shaped involucre glands, sessile capsules and subglobose seeds. Species 60–68.

Sect. **Espinosa** Pax & K. Hoffm. in V.E. 3(2): 149 (1921). Predominantly southern African, with only one species extending into East Africa, *E. spinosa* itself. This is a woody subsucculent shrub, with solitary cyathia, scarios bracts, large exserted capsules and seeds with a conspicuous caruncle. Fruit and seeds are typical of subgen. *Tirucalli* which follows in this sequence. Species 69.

Subgen. **Tirucalli** (Boiss.) S. Carter in K.B. 40: 823 (1985). Syn. — sect. *Tirucalli* Boiss. in DC., Prodr. 15 (2): 94 (1862). Includes in East Africa 2 well-defined sections which have not, however, been formally separated, as distinctions are less apparent in southern Africa where a greater proliferation of species occurs. Characteristic features include cylindrical succulent branches, with small quickly deciduous leaves, prominent leaf-scars, 5 involucre glands, fairly large exserted capsules and subglobose carunculate seeds. *E. tirucalli* itself, with no close relatives in East Africa is a shrubby tree with glandular stipules, a much congested inflorescence of the dichotomously branching rays of a pseudumbel and small scarios bracts. The other species can be grouped and related to *E. mauritanica* L. in South Africa. They are erect or scrambling shrubs, with terminal pseudumbels of 3 to 8 rays and leafy bracts. There are no stipules, but callouses, which become very prominent and appear to be glandular, quickly form around and over the leaf-scars. Species 70–73.

Subgen. **Euphorbia**. The largest subgenus in tropical Africa, and probably developed from a group which became distinct at a relatively early stage, but after the separation of Madagascar which has no endemic species. The tree habit has persisted in some species, while others show advancement in extreme specialization, involving increased succulence of the stems and a reduction in size. Stipules have become modified as prickles mounted on a horny pad (the spine-shield) which surrounds the base of the leaf-scar and bears in addition a pair of spines. The structure of this armature is usually diagnostic. Inflorescences are always axillary, consisting of one or more cymes branching usually once only, a feature which probably represents a reduction of a more complex pseudumbellate arrangement. Involucre glands number 5 and are always entire. Capsules may be sessile or exserted, a feature indicative of species relationships. Seeds are subglobose, smooth or tuberculate and ecarunculate.

Attempts by Pax and a few other authors to distinguish sections within this subgenus have so far proved unsatisfactory, and none are used here. All the known species of spiny *Euphorbia* (probably about 200) would have to be taken into account before this could be successfully accomplished. There are 86 species from East Africa described in this Flora, but several more taxa exist which I know only from incomplete material or photographs. Species 74–159.

Subgen. *Lacanthis* (Raf.) M.G. Gilbert in K.B. 42: 238 (1987). Syn. — *Lacanthis* Raf., Fl. Tell. 2: 94 (1837). Represented in East Africa only by *E. brunellii*. Gilbert considers this, together with several other Ethiopian species to be related to a much larger group of species which have proliferated in Madagascar. They all have succulent or semi-succulent stems, stipules which have become feathery or developed as crests of soft spines, and usually colourful bracts subtending the cyathia. The stipules are absent in *E. brunellii* but the floral bracts are relatively large and the succulent stem has developed as an underground fleshy caudex. Species 160.

## CULTIVATED SPECIES

*E. cotinifolia* L., Sp. Pl.: 453 (1753). This popular, small shrubby tree, originating from Central America produces vast numbers of seedlings and naturalizes easily. It grows to  $\pm 3$  m. high and is prized for its ornamental foliage, its leaves being purplish brown and broadly ovate with long petioles. The inflorescences are relatively inconspicuous, produced as small, few-branched cymes consisting of tiny cyathia bearing purplish glands with creamy lobed petaloid appendages. Its latex is apparently particularly noxious. Reference specimen — Kenya, Machakos District, Donyo Sabuk, 15 Apr. 1963, Bally 12666!

*E. leucocephala* Lotsy in Coult. Bot. Gaz. 20: 350 (1895). A densely branching shrub to  $\pm 2$  m. high, introduced from Central America as an ornamental. Its small lanceolate leaves  $\pm 3$  cm. long are unexceptional, but in flower the branch apices are smothered with clusters of tiny cyathia bearing inconspicuous petaloid glands and subtended by showy creamy-white oblanceolate bracts  $\pm 1$  cm. long. Reference specimen — Kenya, Nairobi, Museum [Ainsworth] Hill, 2 June 1961, Verdcourt 3183!

*E. fulgens* Klotzsch, Allg. Gartenz. 2: 26 (1834); Jex-Blake, Gardening in E. Africa, ed. 4: 113 (1957). A small shrub with arching branches, and cyathia  $\pm 1$  cm. in diameter bearing yellow glands with large bright red petaloid appendages. A native of Central America it is difficult to propagate and not widely grown. No E. African specimens seen.

*E. pulcherrima* Klotzsch, Allg. Gartenz. 2: 27 (1834); U.O.P.Z.: 255 (1949); Jex Blake, Gardening in E. Africa, ed. 4: 113 (1957); F.F.N.R.: 199 (1962). Usually called *Poinsettia*, this species from Central America is commonly grown throughout East Africa as an ornamental shrub. It can grow to  $\pm 4$  m. high and is characterized by the large (to  $\pm 15$  cm. long) brilliant red, occasionally creamy yellow, bracts of the inflorescence. Reference specimen — Tanzania, Lushoto District, Chakechake, 17 May 1969, Ngoundai 326!

*E. althaudii* Drake in Bull. Mus. Hist. Nat. Paris, sér. 2, 9: 43 (1903). Syn. — *E. leucodendron* Drake, l.c. 9: 46 (1903). A densely branched leafless tree to  $\pm 4$  m. high, with succulent yellowish-green cylindrical branches  $\pm 1.5$  cm. thick and tiny yellow cyathia loosely clustered towards the ends of the branchlets. Introduced from Madagascar and occasionally seen in cultivation, where it is most usually known as *E. leucodendron*. This species, however, was described by Drake in a footnote with no specimens cited, and was considered to be probably synonymous by Friedmann & Cremers in Adansonia 16: 256 (1976). Reference specimens — Kenya, Nairobi, 27 Nov. 1971, Mwangangi 1870!; Tanzania, Lushoto District, Amani, 5 Nov. 1936, Greenway 4725!

*E. stenoclada* Baill. in Bull. Soc. Linn. Paris 1: 672 (1887). Syn. — *E. insulae-europae* Pax in E.J. 43: 224 (1909); T.T.C.L.: 210 (1949). Introduced from Madagascar as an ornamental, this species eventually forms a large shrub or tree to  $\pm 6$  m. high. Its leafless succulent pale olive-green branches bear alternating spines 1–3 cm. long formed from modified branchlets. In flower these terminate in tightly packed clusters of tiny crimson cyathia. Reference specimen — Tanzania, Lushoto District, Amani, Sigi Chini, 9 Dec. 1940, Greenway 6072!

*E. milii* Des Moulins var. *splendens* (Hook.) Ursch & Leandri in Mem. Inst. Sc. Mad. B. 5: 148 (1954); & as *E. splendens* Hook. in T.T.C.L.: 213 (1949); U.O.P.Z.: 255 (1949); F.F.N.R.: 198 (1962); F.P.U.: 112 (1962). *E. milii* is a very spiny  $\pm$  succulent stemmed species native to Madagascar, with a purplish-brown bark, dark green lanceolate leaves 1–5 cm. long, and paired subcircular brilliant red, or occasionally yellow petaloid bracts below the sessile cyathia. There are a number of varieties of which var. *splendens*, usually known as the Christ Thorn, is most popularly cultivated. It is semi-prostrate and quickly forms a low dense hedge which can be easily trimmed without harming the plant. Var. *hislopii* (N.E.Br.) Ursch & Leandri, loc. cit., another popular form is more sturdy with an erect habit. Reference specimens: var. *splendens* — Tanzania, Lushoto District, Amani, 26 Aug. 1929, Greenway 1702!; var. *hislopii* — Kenya, Nairobi, Hilton Hotel, 26 Jan. 1971, Wendelberger U167!

*E. hedyotoides* N.E. Br. in F.T.A. 6(1): 515 (1911); Léandri in Adansonia 2: 220 (1962). Type: Tanzania, Lushoto District, cult. Mombo, Braun in Herb. Amani 1680 (B, holo.†, K, drawing of holo.!, EA, iso.!). In his description of a small woody almost leafless shrub, with leaf-scars fasciculated at the



thickened apices of the branches, N.E. Brown did not mention that the specimen he used was from a cultivated plant. It originated from Madagascar and was being tested as a possible source of rubber, but apart from Zimmerman's collection made two years later, also from a cultivated plant, the species has not since been recorded from East Africa. Reference specimen — Tanzania, Lushoto District, Amani, 25 Oct. 1910, *Zimmerman* 3218!

## KEY TO SUBGENERA AND SECTIONS

1. Hysteranthous geophytes with leaves in a rosette at ground level . . . . . 2
  - Herbs, shrubs or trees . . . . . 3
2. Cyathia solitary . . . . . 8. subgen. **Euphorbia**  
(159, *E. monadenioides*), p.531
  - Cyathia in dichotomous cymes . . . . . 9. subgen. **Lacanthis**  
(160, *E. brunellii*), p.531
3. Herbs with apparently opposite leaves (leaf-like bracts); involucre glands entire, with petaloid appendages . . . . . 4
  - Herbs, shrubs or trees with alternate leaves; involucre glands entire, lobed, horned or with finger-like processes . . . . . 5
4. Cyathia 10 or more in capitate or occasionally loose cymes, with small bracts . . . . . 1a. subgen. **Chamaesyce** sect. **Hypericifoliae**, p.415
  - Cyathia solitary or up to 5 in congested leafy cymes . . . . . 1b. subgen. **Chamaesyce** p.418
5. Involucre gland 1, funnel-shaped . . . . . 2. subgen. **Poinsettia**, p.430
  - Involucre glands 2-8 . . . . . 6
6. Branches succulent, with horny pads or longitudinal ridges bearing spines (sometimes minute) at least on young growth . . . . . 8. subgen. **Euphorbia**, p.475
  - Branches herbaceous, woody or if succulent then spineless . . . . . 7
7. Branches succulent or semi-succulent, strictly cylindrical to 1 cm. thick; leaves small (to 4 × 1 cm.), quickly deciduous . . . . . 7. subgen. **Tirucalli**, p.471
  - Branches herbaceous or woody, or if semi-succulent then not strictly cylindrical and leaves large (10 × 2cm. or more) and persistent . . . . . 8
8. Cyathial bracts scarious, shorter than the involucre . . . . . 9
  - Cyathial bracts leafy, longer than the involucre . . . . . 11
9. Glands with finger-like processes; shrubs with semi-succulent branches . . . . . 6a. subgen. **Lyciopsis** sect. **Somalica**, p.459
  - Glands entire; woody shrubs . . . . . 10
10. Capsules sessile; seeds ecarunculate . . . . . 6b. subgen. **Lyciopsis** sect. **Lyciopsis**, p.461
  - Capsules exserted; seeds carunculate . . . . . 6c. subgen. **Lyciopsis** sect. **Espinosa**, p.470
11. Seeds carunculate . . . . . 12
  - Seeds ecarunculate . . . . . 13
12. Stipules absent; cyathial bracts deltoid; seeds ovoid . . . . . 3. subgen. **Esula**, p.432
  - Stipules glandular, or if apparently absent then cyathial bracts similar to the leaves rarely deltoid; seeds compressed dorsio-ventrally with a pointed apex . . . . . 4b. subgen. **Eremophyton** sect. **Eremophyton**, p.448
13. Trees or shrubs with succulent or semi-succulent stems and branches, or perennial herbs with a large fleshy rootstock producing annual stems; glands with marginal processes, horned, lobed or crenulate, rarely entire . . . . . 5. subgen. **Trichadenia**, p.451

- Annual or short-lived perennial herbs, without a fleshy rootstock, rarely woody shrubs; glands entire . . . . . 14
14. Involucral glands 2 or 4; seeds conical or ovoid with pointed apex, usually ornamented . . . . . 4a. subgen.
- Eremophyton** sect. **Pseudacalypha**, p.442
- Involucral glands 5; seeds smooth, subglobose or rarely angular . . . . . 6b. subgen. **Lyciopsis** sect. **Lyciopsis**, p.461

1. Subgen. **Chamaesyce**

Annual or perennial herbs, erect or prostrate, branching from near the base. Leaves (bracts) opposite, the base obliquely rounded to subcordate; stipules present. Cyathia terminal and axillary or cymose and often capitate. Involucres bisexual with 4 glands, rarely unisexual (♂) with 5 glands; glands with an entire or lobed petaloid appendage on the outer margin. Stamens just exerted, with sessile anthers. Perianth of the ♀ flower reduced to a rim below the ovary; styles joined at the base only. Seeds ± 4-angled, without a caruncle.

1a. Sect. **Hypericifoliae**

Annual herbs. Cyathia clustered 10 or more together in terminal and axillary usually pedunculate capitate cymes. Seeds oblong-conical.

1. Capsules always completely glabrous . . . . . 3. *E. hyssopifolia*
- Capsules pubescent, at least when young . . . . . 2
2. Pubescence of white hairs interspersed with long yellow hairs . . . . . 1. *E. hirta*
- Pubescence of white hairs only . . . . . 2. *E. indica*

1. *E. hirta* L., Sp. Pl.: 454 (1753); N.E. Br. in F.T.A. 6(1): 496 (1911) & in Fl. Cap. 5(2): 249 (1915); W.F.K.: 36 (1948); U.O.P.Z.: 254 (1949); F.P.S.2: 71 (1952); E.P.A.: 449 (1958); F.W.T.A., ed. 2, 1: 419 (1958); F.P.U.: 112 (1962); Hadidi in B.J.B.B. 43: 86 (1973); U.K.W.F.: 221 (1974); S. Carter in K.B. 39: 643 (1984). Types: India, *Linnean Herbarium* 630: 5, 6, 7 (LINN, syn., K, photos!)

Annual herb, prostrate to ascending, with branches to 50 cm. long, the whole plant pilose, including the inflorescence and capsule, with minute white adpressed hairs interspersed by yellow spreading segmented hairs ± 1.5 mm. long principally on the branches and especially on younger growth. Leaves ovate, 1-4 × 0.5-2 cm., base very obliquely rounded, apex subacute, margin finely toothed, upper surface sometimes almost glabrous, often blotched with purple especially in the region of the midrib; petiole to 3.5 mm. long; stipules linear, rarely laciniate on lush specimens, to 2.5 mm. long. Cyathia in dense capitate, terminal and axillary cymes to 15 mm. in diameter on peduncles to 15(-20) mm. long, occasionally subtended by 1-2 small leafy bracts ± 1 cm. long; cyathial peduncles to 1 mm. long; bracts deltoid, deeply laciniate to 1 mm. long. Cyathia ± 0.8 × 0.8 mm. with cup-shaped involucre, usually tinged with purple; glands 4, minute, elliptical, green or purplish, with minute entire white to pink appendages; lobes triangular, fimbriate. Male flowers: bracteoles linear, fimbriate; stamens 1 mm. long. Female flower: ovary shortly pedicellate; styles 0.4 mm. long, spreading, bifid almost to the base, with thickened apices. Capsule just exerted on a pedicel 1 mm. long, acutely 3-lobed, with truncate base, 1 × 1.25 mm., pilose with short yellow adpressed hairs. Seeds oblong-conical, 0.8 × 0.4 mm., pinkish brown, with slight transverse wrinkles.

UGANDA. W. Nile District: Maracha rest camp, 3 Aug. 1953, *Chancellor* 109!; Teso District: Serere, 25 Oct. 1955, *Langdale-Brown* 1596!; Mengo District: Old Entebbe, 28 Jan. 1956, *Harker* 137!

TANZANIA. Musoma District: Seronera, 17 Apr. 1962, *Greenway* 10603!; Mbulu District: Lake Manyara National Park, Main Gate, Marera R., 9 Mar. 1964, *Greenway & Kanuri* 11328!; Uzaramo District: Kisarawe, 4 Mar. 1964, *Semsei* 3652!; Zanzibar I., Massazine, 24 Sept. 1959, *Faulkner* 2368!

DISTR. U 1-4; K 1-7; T 1-8; Z; P; a very common pantropical weed native to Central America

HAB. Cultivated land, roadsides and waste places; 0-2000 m.



FIG. 77. *EUPHORBIA INDICA* — 1, habit,  $\times \frac{2}{5}$ ; 2, cyathium,  $\times 8$ ; 3, seeds,  $\times 18$ . *E. HYSSOPIFOLIA* — 4, flowering branch,  $\times 4$ ; 5, seeds,  $\times 18$ . 1, 3, from Tanner 2907; 2, from Tweedie 2253; 4, 5, from Harris 1093. Drawn by Christine Grey-Wilson.

SYN. [*E. pilulifera* sensu Boiss. in DC., Prodr. 15(2): 21 (1862), *non* L. et al., see N.E. Br. in F.T.A. 6(1): 496 (1911)]

*E. pilulifera* Boiss. var. *procumbens* Boiss. in DC., Prodr. 15(2): 21 (1862); F.P.N.A. 1: 476 (1948). Numerous syntypes from tropical America and Asia (C, syn., K, photos.)

*E. hirta* L. var. *procumbens* (Boiss.) N.E.Br. in F.T.A. 6(1): 497 (1911)

VAR. Mostly a prostrate herb (N.E. Brown's variety) growing on bare ground and strongly coloured with reddish purple, but it can be erect and entirely green when occurring amongst other vegetation in damp shady situations. All gradations between the two extremes can be found, with no justification for the erection of varieties.

**2. *E. indica* Lam.**, Encycl. Méth. Bot. 2: 423 (1786); Boiss. in DC., Prodr. 15(2): 22 (1862); F.P.S.2: 71 (1952); Raju & Rao in Ind. J. Bot. 2: 202 (1979). Type: East Indies, *Sonnerat* (P, holo., K, photo.!)

Annual herb, spreading or erect with branches to 50(-100) cm. long, the whole plant including the capsule at least when young sparsely pilose, more so on young growth, and often purplish tinged. Leaves ovate, to 3(-5) × 1.5(-2.5) cm., base obliquely rounded, apex rounded, margin obscurely toothed, upper surface sometimes almost glabrous, glaucous especially the lower surface; petiole to 3 mm. long; stipules broadly triangular, lacinate, to 1.5 mm. long. Cyathia in terminal and axillary capitate cymes to 1.5 cm. in diameter on peduncles to 3 cm. long, subtended by a pair of small leafy bracts; cyathial peduncles to 2 mm. long; bracts linear, to 2.5 mm. long. Cyathia ± 1 × 1 mm., with cup-shaped involucre; glands 4, minute, rounded, green, with appendages varying in size to 1 mm. in diameter, white; lobes acutely triangular, 0.5 mm. long. Male flowers: bracteoles linear; stamens 1.25 mm. long. Female flower: ovary shortly pedicellate; styles 0.5 mm. long, suberect, bifid almost to the base. Capsule exerted on a reflexed pedicel 1.5 mm. long, acutely 3-lobed, 1.5 × 2 mm. Seeds oblong-conical, 1 × 0.75 mm., reddish brown, with obscure transverse ridges. Fig. 77/1-3.

UGANDA. Karamoja District: Lochoi, 24 May 1940, A.S. Thomas 3519!; Teso District: Serere, Nov.-Dec. 1931, *Chandler* 87!; Mengo District: Kampala, Jan. 1936, *Chandler* 1540!

KENYA. Kilifi District: Malindi, Sabaki R., Oct. 1965, *Tweedie* 3138!; Tana River District: 48 km. S. of Garsen, 23 Sept. 1961, *Polhill & Paulo* 536! & 2 km. S. of Ngao, 1 Mar. 1977, *Hooper & Townsend* 1122!

TANZANIA. Pangani District: Mwera, Mseka, Mtaru, 7 June 1956, *Tanner* 2907!; Buha District: Gombe Stream Reserve, Rutanga valley, 19 Feb. 1964, *Pirozynski* 408!; Ufipa District: Rukwa, 3 May 1935, *Michelmore* 1145!; Zanzibar I., Mwera, 16 Nov. 1930, *Vaughan* 1681!

DISTR. U 1-4; K 1, 3-5, 7; T 3, 4, 6, 8; Z; P; a common weed introduced originally from India

HAB. In damp grassland on seasonally waterlogged, usually black cotton soils, or near permanent water; 0-1330 m.

SYN. *E. indica* Lam. var. *angustifolia* Boiss. in DC., Prodr. 15(2): 22 (1862). Types: Sudan, Kordofan, *Kotschy* 154 (K, isosyn.!) & Ethiopia, *Schimper* 1632 (syn., whereabouts unknown) & Java, *Blume* (syn., whereabouts unknown)

*E. indica* Lam. var. *pubescens* Pax in E.J. 19: 117 (1894). Types: Tanzania, Pangani, *Stuhlmann* 308 & 841 (B, syn.†)

[*E. hypericifolia* sensu N.E. Br. in F.T.A. 6(1): 498 (1911) & in Fl. Cap. 5(2): 248 (1915); F.P.N.A. 1:476 (1948); E.P.A.: 449 (1958); Hadidi in B.J.B.B. 43: 87 (1973), *non* L.]

VAR. Leaf-size and pubescence varies according to environmental conditions, plants with more hairy, spreading branches bearing smaller leaves occurring in drier situations. Such variability easily encompasses the above varieties.

NOTE. N.E. Brown mistakenly considered this Old World species to be synonymous with *E. hypericifolia* L., a name which has been used in African taxonomy ever since. *E. hypericifolia* is, however, a widespread species of the New World tropics and subtropics, apparently not, so far, introduced into East Africa. It is characterised by a slightly smaller capsule which is always completely glabrous.

**3. *E. hyssopifolia* L.**, Syst. Nat. 10: 1048 (1759); F.W.T.A., ed. 2, 1: 419 (1958). Type: Jamaica, *Brown* in *Linnean Herbarium* 630: 9 (LINN, holo., K, photo.!)

Annual herb, semi-prostrate to erect, with branches to 40 cm. long, glabrous except for usually a few scattered hairs on branches, leaves and young growth. Leaves lanceolate-ovate, to 2.5 × 1 cm. but usually much smaller, base obliquely rounded, apex rounded, margin minutely toothed; petiole 1 mm. long; stipules broadly triangular, to 0.75 mm. long, fimbriate. Cyathia in terminal and axillary cymes, with peduncles elongating up to 10 mm. within each cyme; bracts enlarging from 1 mm. long to eventually resemble the

leaves. Cyathia  $\pm 0.8 \times 0.8$  mm., with cup-shaped involucre; glands 4, green tinged red, minute, rounded, with minute creamy appendages; lobes acutely triangular, less than 0.2 mm. long. Male flowers: bracteoles fimbriate; stamens 1 mm. long. Female flower: ovary shortly pedicellate; styles 0.4 mm. long, suberect, bifid almost to the base. Capsule exerted on a reflexed pedicel 1.25 mm. long, acutely 3-lobed, with base truncate,  $1.5 \times 1.5$  mm., glabrous. Seeds oblong-conical,  $1 \times 0.5$  mm., reddish black, with 3 transverse ridges. Fig. 77/4, 5, p. 416.

TANZANIA. Kilosa District: Mikumi Game Lodge, 15 Nov. 1970, *Batty* 11011; Uzaramo District: Dar es Salaam, University College, 15 Oct. 1967, *Harris* 10931; Rungwe District: 2 km. beyond Kiwira R. on Mbeya-Tukuyu road, 17 Mar. 1975, *Hooper & Townsend* 8501

DISTR. T 6, 7; recently introduced weed of central America, also found extensively in West Africa  
HAB. Disturbed ground in grassland and stony, sandy soils; 0-1500 m.

SYN. *E. brasiliensis* Lam., Encycl. Méth. Bot. 2: 423 (1786). Type: Brazil, *Commerson* (P, holo., K, photo.)

### 1b. Sect. *Chamaesyce*

Annual or perennial herbs. Cyathia terminal and pseudoaxillary (one axillary bud develops into a strong branch, reducing the terminal cyathium to an apparently axillary position), solitary or up to 5 together in congested leafy cymes. Seeds conical.

- |   |                              |
|---|------------------------------|
| 1. Annuals with fibrous roots . . . . .   | 2                            |
| Perennials with thick woody or tuberous roots . . . . .   | 18                           |
| 2. Seeds smooth . . . . .   | 3                            |
| Seeds variously pitted, wrinkled or grooved . . . . .   | 4                            |
| 3. Leaves subcircular; stipules broadly triangular . . . . .  | 8. <i>E. serpens</i>         |
| Leaves obovate; stipules linear . . . . .   | 16. <i>E. lissosperma</i>    |
| 4. Branches all distinctly hairy, at least with some scattered hairs evenly distributed . . . . .                     | 5                            |
| Branches glabrous, rarely with a few hairs on young growth or scattered on leaves and capsules . . . . .              | 16                           |
| 5. Leaves entire . . . . .  | 6                            |
| Leaves toothed, sometimes obscurely so . . . . .  | 8                            |
| 6. Capsules sparsely pilose with long spreading hairs . . . . .   | 14. <i>E. granulata</i>      |
| Capsules densely pilose with short adpressed hairs . . . . .  | 7                            |
| 7. Leaves ovate-oblong; gland-appendages minute, red . . . . .  | 4. <i>E. kilwana</i>         |
| Leaves lanceolate; gland-appendages obvious, white, 2 larger than the others . . . . .                                | 6. <i>E. lupatensis</i>      |
| 8. Capsule subsessile, included in the involucre . . . . .  | 7. <i>E. thymifolia</i>      |
| Capsule exerted from the involucre . . . . .  | 9                            |
| 9. Capsule densely pilose . . . . .   | 5. <i>E. pilosissima</i>     |
| Capsule glabrous, or pilose but not densely so . . . . .  | 10                           |
| 10. Capsule constricted about the middle, with a fleshy swelling between the sutures . . . . .                        | 12. <i>E. allocarpa</i>      |
| Capsule regularly 3-lobed . . . . .   | 11                           |
| 11. Capsule with a row of hairs along each suture, otherwise glabrous . . . . .                                       | 9. <i>E. prostrata</i>       |
| Capsule glabrous or sparsely pilose . . . . .   | 12                           |
| 12. Upper surface of the prostrate branches pilose, the lower surface glabrous . . . . .                              | 13                           |
| Branches pilose on both surfaces . . . . .  | 14                           |
| 13. Gland-appendages large, to $0.6 \times 1.5$ mm.; capsule 1.6 mm. in diameter . . . . .                            | 11. <i>E. mossambicensis</i> |
| Gland-appendages minute; capsule 1.2 mm. in diameter . . . . .  | 10. <i>E. diminuta</i>       |
| 14. Leaves very distinctly toothed . . . . .  | 15. <i>E. serratifolia</i>   |
| Leaves obscurely toothed . . . . .  | 15                           |
| 15. Branches fairly densely pilose with long adpressed hairs; gland-appendages large, to $0.6 \times 1.5$ mm. . . . . | 13. <i>E. fischeri</i>       |
| Branches very sparsely pilose with long spreading hairs; gland-appendages very small . . . . .                        | 14. <i>E. granulata</i>      |

- |   |                             |
|---|-----------------------------|
| 16. Leaves entire; plant glabrous except for a minute pubescence at the stem-base . . . . .   | 18. <i>E. arabica</i>       |
| Leaves toothed, sometimes at the apex only; plant glabrous, or rarely with a few long scattered hairs on branches, leaves or capsules . . . . .   | . . . . . 17                |
| 17. Plants erect, glabrous or rarely with a few hairs confined to basal branches and leaves; stipules no more than 1 mm. long, acutely triangular but not divided into linear teeth . . . . . | 19. <i>E. polycnemoides</i> |
| Plants prostrate, rarely suberect, glabrous or rarely with a few hairs on leaves or capsules; stipules $\pm$ 1.5 mm. long deeply divided into 3-5 linear teeth . . . . .                      | 17. <i>E. inaequilatera</i> |
| 18. Plants pilose, at least with some hairs on the branches and/or capsules . . . . .   | . . . . . 19                |
| Plants completely glabrous . . . . .  | . . . . . 20                |
| 19. Whole plant pilose, or at least with some hairs on stems, leaves or capsules; leaves ovate to ovate-lanceolate with apiculate apex . . . . .  | 20. <i>E. zambesiana</i>    |
| Branches pilose; leaves glabrous, broadly ovate with rounded apex . . . . .   | 21. <i>E. selousiana</i>    |
| 20. Leaves $\pm$ lanceolate, apex apiculate; cyathial peduncle to 25 mm. long . . . . .   | 20. <i>E. zambesiana</i>    |
| Leaves subcircular, apex rounded; cyathial peduncle not more than 4 mm. long . . . . .  | 22. <i>E. rivae</i>         |

4. *E. kilwana* N.E. Br. in F.T.A. 6(1): 507 (1911). Type: Tanzania, Kilwa District, Kilwa-Singino, Braun in *Herb. Amami* 1292 (B, holo.  $\dagger$ , K, fragment with drawing!, EA, iso.!)

Annual semi-prostrate herb, with branches to 25 cm. long, often red tinged, pilose with short curved adpressed hairs. Leaves ovate-oblong, to 25  $\times$  8 mm., base obliquely rounded to subcordate, apex obtuse to rounded, margin entire or very obscurely toothed, glabrous or almost so above, thinly pilose beneath, slightly glaucous, paler beneath; petiole to 2 mm. long, pilose; stipules lanceolate, 1 mm. long, pilose. Cyathia  $\pm$  5 clustered together in terminal and axillary cymes, with peduncles to 1 mm. long; bracts similar to, but much smaller than the leaves. Cyathia  $\pm$  1.3  $\times$  1.25 mm., with barrel-shaped pilose involucre; glands 4, minute, circular, red, with minute red appendages; lobes acutely triangular, minute. Male flowers: bracteoles filamentous; stamens 1.5 mm. long. Female flower: ovary pedicellate; styles 0.5 mm. long, erect, bifid almost to the base. Capsule exerted on a reflexed pilose pedicel 2 mm. long, acutely 3-lobed, with truncate base, 2  $\times$  2.5 mm., densely pilose with very short, curved, adpressed hairs. Seeds ovoid, 1.2 mm.  $\times$  0.75 mm., pinkish brown, with 3 or 4 obscure transverse ridges.

TANZANIA. Tanga District: Tanga-Pangani road, Machui, 12 Jan. 1956, *Faulkner* 1793!; Kilosa District: Msada, 29 June 1973, *Greenway & Kanuri* 15289!; Kilwa District: Selous Game Reserve, 13 July 1968, *Rodgers & Agnew* in *MRC* 376!

DISTR. T 3, 4, 6, 8; not known elsewhere

HAB. Seasonally wet grassland, in clay; 0-600 m.

SYN. *E. convolvuloides* Benth. var. *integrifolia* Pax in E.J. 43: 85 (1909). Type as for *E. kilwana*

5. *E. pilosissima* S. Carter in K.B. 39: 643, fig. 1 A-D (1984). Type: Tanzania, Dodoma District, Itigi-Chunya road, *Greenway & Polhill* 11533 (K, holo., EA, iso.)

Annual herb erect to 45 cm., the whole plant pilose with long spreading white hairs  $\pm$  1 mm. long. Leaves obovate, to 18  $\times$  8 mm., base very obliquely rounded, apex obtuse, margin deeply serrate with teeth 0.5 mm. long; petiole 1 mm. long; stipules free, linear, 1.25 mm. long. Cyathia clustered in terminal and axillary cymes of 2-5 cyathia, subsessile; bracts similar to but smaller than the leaves. Cyathia 1.5  $\times$  1.25 mm., with barrel-shaped involucre; glands 4, erect, transversely elliptic, 0.5 mm. wide, red, with minute red 3-5-lobed appendages; involucre lobes acutely triangular, 0.5 mm. long. Male flowers very few ( $\pm$  5): bracteoles filamentous; stamens 1.75 mm. long. Female flower: ovary pedicellate; styles red, 0.75 mm. long, erect, bifid almost to the base. Capsule just exerted on a reflexed pedicel 2 mm. long, 3-lobed, with truncate base, 2 mm. long and in diameter, densely pilose with hairs sometimes tinged red. Seeds oblong-conical, 1.2  $\times$  0.75 mm., pinkish brown, obscurely transversely wrinkled.

TANZANIA. Dodoma District: 11 km. from Itigi on Chunya road, 12 Apr. 1964, *Greenway & Polhill* 11533!

DISTR. T 5; known only from this collection

HAB. Sandy soil in valley of impeded drainage; 1310 m.

NOTE. This collection represents a distinct species related to *E. kilwana* N.E. Br., from which it differs by its overall covering of long, soft hairs, the larger lobed appendages of the involucre glands, and most noticeably by the very distinct serrations of the obovate leaves. More material is needed before variation from the cited specimen can be ascertained. The collectors noted that the plant was common in the valley where it was found.

**6. *E. lupatensis*** N.E. Br. in F.T.A. 6(1): 514 (1911). Type: Mozambique, Lower Zambesi, Lupata, *Kirk* (K, holo.!).

Sparsely branched annual erect to  $\pm$  30 cm. high, the whole plant usually red tinged, pilose, sometimes sparsely so, with short curved hairs. Leaves lanceolate, to  $35 \times 5$  mm., base obliquely rounded to subcordate, apex acute, margin entire; petiole 1 mm. long; stipules free, linear, 1 mm. long. Cyathia clustered 2–4 together in terminal and axillary cymes, with peduncles  $\pm$  1 mm. long; bracts similar to but much smaller than the leaves. Cyathia  $2 \times 1.5$  mm., with barrel-shaped involucre; glands 4, elliptic,  $\pm 0.5$  mm. wide, with conspicuous appendages which are cream with a somewhat lobed margin, 2 subcircular  $\pm$  1 mm. in diameter, the other 2 obliquely attached,  $\pm 2 \times 1.25$  mm.; involucre lobes triangular, 0.5 mm. long, pilose. Male flowers: bracteoles lanceolate, pilose; stamens 2 mm. long. Female flower: ovary pedicellate; styles 1.25–1.5 mm. long, suberect, bifid for  $\frac{1}{3}$  their length. Capsule exerted on a reflexed pedicel 1.5 mm. long, 3-lobed,  $1.5 \times 1.75$  mm., densely pilose. Seeds oblong-conical,  $1.1 \times 0.6$  mm., pinkish brown, with 3–4 distinct transverse ridges and grooves.

TANZANIA. Tunduru District: Tunduru–Masasi road, 5 Mar. 1963, *Richards* 17752!; Masasi District: Masasi–Muiti, 25 Apr. 1945, *Schlieben* 6417!

DISTR. T 8; scattered distribution elsewhere, from Mozambique, Malawi, Zambia and Zimbabwe

HAB. Open places by roadsides and open woodland, in stony, sandy soils; 300–900m.

NOTE. The two specimens cited above appear to be the only collections of this species so far made in Tanzania. A third specimen, *Richards* 17891 from Masasi District, 64 km. from Masasi on the Tunduru road, possesses distinctly serrate, rather more ovate leaves to  $18 \times 6$  mm., but appears otherwise to be identical. More material of this is needed before a decision can be made upon its taxonomic status.

**7. *E. thymifolia*** L., Sp. Pl. 1: 454 (1753); Boiss. in DC., Prodr. 15(2): 47 (1862); F.W.T.A., ed. 2, 1: 421 (1958). Type: India, *Linnean Herbarium* 630: 10 (LINN, holo., K, photo.!).

Prostrate densely branching annual herb, with branches to 25 cm. long, glabrous on the undersurface, the upper surface densely pilose with fairly long curved adpressed hairs, the whole plant tinged reddish brown. Leaves ovate, to  $8 \times 4$  mm., base obliquely subcordate, apex obtuse, margin shallowly toothed, upper surface glabrous, the lower surface with long scattered hairs; petiole 0.5 mm. long; stipules free, linear, to 1.25 mm. long, often deeply 2–3-toothed, pilose. Cyathia solitary, sessile, terminal and pseudoaxillary on congested leafy shoots,  $\pm 0.5 \times 0.5$  mm., with funnel-shaped involucre, pilose; glands 4, minute, subcircular, red, with often almost invisible red appendages; lobes minute, triangular, ciliate. Male flowers very few (5 or less): bracteoles reduced to 1 or 2 threads; stamens 0.8 mm. long. Female flower: ovary sessile; styles 0.6 mm. long, erect, bifid to halfway. Capsule sessile (pedicel 0.2 mm. long), splitting the involucre during development, 3-lobed, with truncate base,  $1 \times 1$  mm., pilose with short adpressed hairs. Seeds conical, sharply 4-angled,  $0.6 \times 0.4$  mm., reddish brown, with shallow transverse ridges and grooves.

TANZANIA. Mpanda, 15 July 1968, *Sanane* 228 partly! (the majority of plants on the Kew specimen are *E. prostrata*); Songea, near Government Rest House, 26 Feb. 1956, *Milne-Redhead & Taylor* 8750!

DISTR. T 4, 8; West Africa eastwards to Central African Republic, Zaire and Zambia, with one specimen seen from Mozambique; a pantropical weed apparently only recently spreading into East Africa

HAB. On disturbed ground in sandy soil; 1050–1150 m.

SYN. *E. afzelii* N.E. Br. in F.T.A. 6(1): 506 (1911). Type: Sierra Leone, *Afzelius* (B, holo. †, K, fragment and drawing!)

**8. *E. serpens* Kunth**, Nov. Gen. & Sp. 2: 52 (1817); N.E. Br. in F.T.A. 6(1): 511 (1911). Type: Venezuela, *Humboldt & Bonpland* (P, holo.)

Annual much-branched herb, prostrate, with branches to 10(-20) cm. long, the whole plant completely glabrous. Leaves subcircular, 1-3 mm. in diameter, base obliquely cordate, margin entire; petiole 0.2-0.5 mm. long; stipules united at the swollen nodes, triangular,  $\pm 0.5 \times 1$  mm., with toothed margin. Cyathia solitary on peduncles to 2 mm. long, terminal and pseudoaxillary on short leafy shoots,  $\pm 0.7 \times 0.7$  mm., with cup-shaped involucre; glands 4, minute, transversely elliptic, with small white shallowly lobed petaloid appendages; involucre lobes minute, margin fringed. Male flowers: bracteoles lacinate; stamens 0.7 mm. long. Female flower: perianth evident as a 3-lobed rim below the shortly pedicellate ovary; styles 0.2 mm. long, spreading, bifid almost to the base. Capsule exerted on a reflexed pedicel to 1.8 mm. long, obtusely 3-lobed, with truncate base,  $\pm 1.5 \times 1.8$  mm., yellowish green. Seeds oblong-conical,  $1 \times 0.6$  mm., greyish pink, smooth.

KENYA. Teita District: Voi, 14 Apr. 1969, *Bally* 13250!

DISTR. **K** 7; a pantropical weed but in E. Africa known only from this collection

HAB. Not known, probably by the roadside; 560 m.

SYN. *E. minutiflora* N.E. Br. in F.T.A. 6(1): 1036 (1913). Type: Zimbabwe, Victoria Falls, *Schwartz* in *Bolus* 13027 (K, fragment of holo.!).

**9. *E. prostrata* Ait.** in Hort. Kew. 2: 139 (1789); Boiss. in DC., Prodr. 15(2): 47 (1862); N.E. Br. in F.T.A. 6(1): 510 (1911) & in Fl. Cap. 5(2): 245 (1915); F.P.N.A. 1: 477 (1948); E.P.A.: 455 (1958); F.W.T.A., ed. 2, 1: 421 (1958); Hadidi in B.J.B.B. 43: 98 (1973); U.K.W.F.: 222 (1974). Type: West Indies, cult. *Miller* in England 1758 (BM, holo.!).

Prostrate much-branched annual herb, with branches to 20 cm. long, glabrous on the underside, pilose above with short curled hairs, the whole plant often tinged purplish. Leaves ovate, to  $8 \times 5$  mm., base obliquely rounded, apex rounded, margin obscurely toothed, upper surface glabrous, lower surface sparsely pilose towards the apex; petiole to 1 mm. long; stipules pilose, free on the upper surface of the branch, triangular, 0.5 mm. long, joined on the lower surface to form a broad triangle to 1 mm. long with 2 unequal teeth. Cyathia solitary on peduncles 1.25 mm. long, terminal and pseudoaxillary on short leafy shoots,  $1 \times 0.6$  mm., with barrel-shaped involucre; glands 4, minute, red, with minute white or pink appendages; lobes minute, triangular, pilose. Male flowers few: bracteoles hair-like; stamens 1 mm. long. Female flower: ovary pedicellate; styles 0.2 mm. long, spreading, bifid to the base. Capsule exerted on a reflexed pilose pedicel 1.5 mm. long, acutely 3-lobed, with truncate base,  $1.25 \times 1.25$  mm., the base and purple-tinged sutures beset with long spreading hairs. Seeds oblong-conical, acutely 4-angled,  $1 \times 0.5$  mm., grey-brown, with numerous distinct transverse ridges and grooves. Fig. 78/2, p. 422.

UGANDA. Toro District: Fort Portal, 20 Nov. 1931, *Hazel* 151; Teso District: Serere, Dec. 1931, *Chandler* 2151; Mengo District: Kampala, Makerere University Hill, 9 Apr. 1970, *Lye* 5190!

KENYA. Machakos District: Makindu, Hunter's Lodge, 5 Apr. 1971, *Bally & Carter* 14135!; S. Kavirondo District: Kisii, Sept. 1933, *Napier* 2951 in *C.M.* 5263!; Kilifi District: Jilori, 26 Nov. 1961, *Polhill & Paulo* 854!

TANZANIA. Lushoto District: Mkomazi, July 1955, *Semsei* 2340!; Ulanga District: Mahenge, 3 Apr. 1932, *Schlieben* 2041!; Mbeya, 14 May 1956, *Milne-Redhead & Taylor* 10240!; Zanzibar I., Mazizini, 10 Aug. 1963, *Faulkner* 3252!

DISTR. **U** 2-4; **K** 1, 4, 5, 7; **T** 1-4, 6-8; **Z**; **P**; introduced from the West Indies, a common weed throughout the tropics and subtropics

HAB. Disturbed ground in gardens, cultivated land and by roadsides especially in dry sandy soil; 0-2040 m.

**10. *E. diminuta* S. Carter** in K.B. 39: 646 fig. 1 E-H (1984). Type: Kenya, Northern Frontier Province, 32 km. E. of Wajir, *Gillett* 21319 (K, holo., EA, iso.)

Branching prostrate annual herb, with branches to 13 cm. long, usually much less ( $\pm 5$  cm.), sparsely hairy on the upper surface, glabrous beneath. Leaves obovate, to  $8 \times 4$  mm., base very obliquely rounded, apex rounded, margin distinctly toothed especially round the apex, usually glabrous, occasionally sparsely hairy on both surfaces; petiole to 0.3 mm. long; stipules free, filamentous, 0.3 mm. long. Cyathia solitary on peduncles to 0.4 mm. long, terminal and pseudoaxillary on short leafy shoots,  $0.8 \times 0.8$  mm., with cup-shaped involucre; glands 4, minute, transversely elliptic, with minute deeply 2-3-lobed pink or white appendages; involucre lobes minute, triangular, ciliate. Male flowers few:



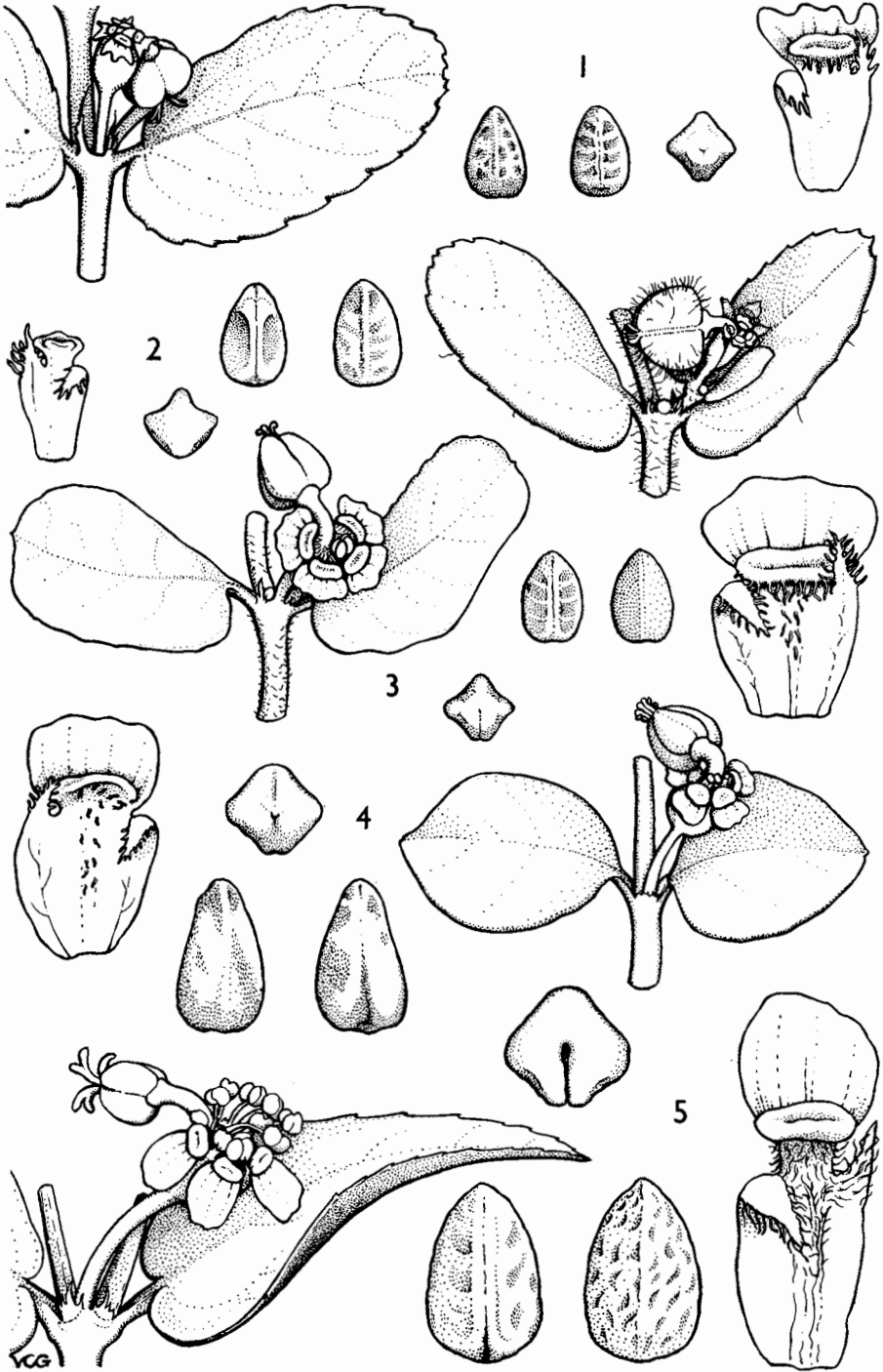


FIG. 78. *EUPHORBIA* subgen. *CHAMAESYCE* sect. *CHAMAESYCE*. Cyathium and leaves (bracts),  $\times 6$ , involucre gland and lobes,  $\times 16$ , seeds,  $\times 12$  of 1, *E. inaequilatera*, 2, *E. prostrata*, 3, *E. mossambicensis*, 4, *E. rivae*, 5, *E. zambesiana*. 1, from Richards 24905; 2, from Glover & Samuel 2993; 3, from Richards 16037; 4, from Bally 7659; 5, from Verdcourt 2806A. Drawn by Victoria Gordon-Friis.

bracteoles filamentous; stamens 0.8 mm. long. Female flower: ovary pedicellate; styles 0.2 mm. long, erect, bifid almost to the base. Capsule exerted on a reflexed pedicel 2 mm. long, acutely 3-lobed, with truncate base,  $1.2 \times 1.2$  mm., glabrous. Seeds conical,  $0.8 \times 0.5$  mm., pinkish brown, with shallow wrinkles.

KENYA. Northern Frontier Province: 19 km. from Garissa on Dadaab road, 11 May 1974, *Gillett & Gachathi* 20597!; Turkana District: 40 km. SW. of Lodwar, 12 May 1953, *Padwa* 141!; Tana River district: Thika-Garissa road, 4 km. E. of Namorumat Drift, 10 June 1974, *R.B. & A.J. Faden* 74/778!

DISTR. K 1, 2, 7; not known elsewhere

HAB. On sandy soil in open *Acacia-Commiphora* bushland, usually in shade; 210–550 m.

NOTE. The disjunct distributions of the Garissa-Wajir area and Turkana suggest that this very insignificant little species should also occur in dry areas between.

**11. E. mossambicensis** (*Klotzsch & Garcke*) *Boiss.* in DC., *Prodr.* 15(2): 36 (1862); N.E. Br. in F.T.A. 6(1): 509 (1911), both as '*E. mozambicensis*'; S. Carter in K.B. 39: 644 (1984). Type: Mozambique, Rios de Sena, *Peters* 33 (B, holo. †, K, fragment!)

Much-branched prostrate annual herb, with branches to 35 cm. long, the upper surface covered with short, adpressed hairs, the lower surface glabrous. Leaves obovate, to  $14 \times 8$  mm., base very obliquely rounded, apex rounded and entire, obscurely toothed or minutely apiculate, glabrous or rarely with a few scattered hairs around the margin; petiole to 0.5 mm. long; stipules free, linear to 0.4 mm. long, sometimes 2–3-toothed at the broader base. Cyathia solitary on peduncles 0.5–1 mm. long, terminal and pseudoaxillary on short leafy shoots,  $\pm 1.25 \times 1.25$  mm., with cup-shaped involucre; glands 4, transversely elliptic, to almost 1 mm. wide but usually much less, reddish, with distinct white or pinkish lobed appendages, to  $0.6 \times 1.5$  mm.; involucre lobes minute, triangular with ciliate margins. Male flowers: bracteoles lacinate; stamens 1.25 mm. long. Female flower: ovary pedicellate; styles minute (0.3 mm. long), erect, bifid to halfway. Capsule exerted on a reflexed pedicel to 3 mm. long, acutely 3-lobed with truncate base,  $1.6 \times 1.6$  mm., usually glabrous, occasionally with a few long spreading hairs. Seeds ovate-conical, sharply 4-angled,  $0.9 \times 0.5$  mm., pinkish brown, with a few very obscure ridges and grooves. Fig. 78/3.

TANZANIA. Shinyanga, 1938, *Koritschoner* 2118!; Mpanda District: Katabi Plain, 16 Feb. 1971, *Sanane* 1572!; Iringa District: Mtera, 31 Jan. 1962, *Polhill & Paulo* 1299!

DISTR. T 1, 3, 4, 7, 8; Mozambique, Malawi, Zambia and Zimbabwe

HAB. On sandy, gritty soils in open bushland and grassland; 500–1220 m.

SYN. *Anisophyllum mossambicense* Klotzsch & Garcke in Klotzsch, *Nat. Pfl. Tric.*: 30 (1860)

*Euphorbia mozambicensis* (Klotzsch & Garcke) *Boiss.* var. *nyasica* N.E. Br. in F.T.A. 6(1): 510 (1911). Types: Malawi, Nyika Plateau, Nymkowa, *McClounie* 169 & Mt. Malosa, *Whyte* (both K, syn.!).

VAR. The slightly larger size and occasional increased pubescence of N.E. Brown's var. *nyasica* is easily encompassed within the variation shown by the wide distribution of the species, and is influenced by local environmental conditions.

**12. E. allocarpa** S. Carter in K.B. 39: 644, fig. 1/J–L (1984). Type: Tanzania, Kilosa District, Ruaha Gorge, *Bally & Carter* 16418 (K, holo.!, EA, iso.!).

Prostrate branching annual, with branches  $\pm 15$  cm. long covered in curved adpressed hairs which are absent on the under surface of at least the lower half of the branches. Leaves subsessile, obovate, to  $10 \times 6$  mm., base very obliquely rounded, apex rounded, margin obscurely denticulate around the apex, glabrous, the lower surface tinged red; stipules free, broadly triangular,  $0.4 \times 0.4$  mm., deeply toothed. Cyathia solitary on peduncles 1 mm. long, terminal and pseudoaxillary on leafy shoots,  $1.5 \times 1.5$  mm., with cup-shaped involucre; glands 4, transversely elliptic,  $\pm 0.8$  mm. wide, with 4–6-lobed white appendages, 0.4 mm. wide; involucre lobes minute, triangular, ciliate. Male flowers: bracteoles lacinate; stamens 1.5 mm. long. Female flower: ovary pedicellate; styles 0.3 mm. long, erect, bifid to halfway with thickened apices. Capsule exerted on a reflexed pedicel 3.5 mm. long, 3-lobed,  $1.8 \times 1.8$  mm., somewhat constricted about the middle, the lower half with a row of very short adpressed hairs along each side of the sutures and a fleshy hollow swelling between them. Seeds contained in the lower half of the capsule, conical,  $0.8 \times 0.6$  mm., pinkish brown, with a few very obscure transverse ridges and grooves.

TANZANIA. Kilosa District: Ruaha Gorge, 35 km. E. of Mbuyuni, 12 Feb. 1968, *Robertson* 875! & 3 Feb. 1974, *Bally & Carter* 16418!

DISTR. T 6; known only from this one locality

HAB. Exposed stony slopes and sandy soil with deciduous bushland, in shade; 600 m.

NOTE. Known so far only from this one locality, this otherwise insignificant species should be easily recognised from its strangely distorted capsule.

**13. *E. fischeri* Pax** in E.J. 19: 117 (1894). Type: Tanzania, Dodoma District, Ugogo, Unyangwira [Nganguina], *Stuhlmann* 386 (B, syn. †) & Saranda [Salanda], *Fischer* 32 (B, syn. †, part in K!)

Much-branched, prostrate, annual herb with branches to 25 cm. long covered with long, spreading white hairs. Leaves obovate to  $10 \times 5$  mm., base very obliquely rounded, apex rounded and very obscurely toothed, glabrous or with a few scattered hairs on both surfaces; petiole to 0.5 mm. long; stipules filamentous, 0.4 mm. long. Cyathia solitary on peduncles to 0.75 mm. long, terminal and pseudoaxillary, crowded on leafy shoots,  $1.25 \times 1.25$  mm., with cup-shaped involucre; glands 4, transversely elliptic,  $\pm 0.6$  mm. wide, with large white, lobed appendages  $\pm 0.6 \times 1.5$  mm.; involucre lobes minute, triangular, ciliate. Male flowers: bracteoles filamentous; stamens 1.25 mm. long. Female flower: ovary pedicellate; styles 0.75 mm. long, spreading, bifid to nearly halfway, with obviously thickened apices. Capsule exerted on a reflexed pedicel to 2.5 mm. long, acutely 3-lobed,  $1.25 \times 1.25$  mm., with a few long scattered hairs or occasionally glabrous. Seeds oblong-conical,  $0.8 \times 0.4$  mm., pinkish brown, with numerous shallow wrinkles.

TANZANIA. Dodoma District: 30 km. E. of Manyoni, 23 Apr. 1964, *Greenway & Polhill* 11713!; Iringa District: Ruaha National Park by ferry over Great Ruaha R., 19 Jan. 1966, *Richards* 21003! & near River opposite Lunda, 17 May 1968, *Renvoize* 2201!

DISTR. T 5, 7; not known elsewhere

HAB. In open *Brachystegia* woodland on sandy soil; 800–1430 m.

SYN. *E. mozambicensis* (Klotzsch & Garcke) Boiss. var. *fischeri* (Pax) N.E. Br. in F.T.A. 6(1): 510 (1911)

NOTE. The completely different pubescence of the branches, much longer, deeply bifid styles, and slightly smaller, more obviously wrinkled seeds serve to separate this taxon as a species distinct from *E. mossambicensis*. It appears to be confined to a small area in central and southern Tanzania.

**14. *E. granulata* Forssk.**, Fl. Aegypt.-Arab.: 94 (1775); N.E. Br. in F.T.A. 6(1): 502 (1911); F.P.S. 2: 72 (1952); E.P.A.: 447 (1958). Type: Yemen, *Forsskål* (C, holo., K, photo.!)

Prostrate annual herb, with branches to 15 cm. long, the whole plant puberulous with short straight hairs, or more sparsely covered with long spreading hairs and the upper surface of the leaves glabrous. Leaves obovate or oblong-ovate, to  $8 \times 4.5$  mm., base obliquely rounded to subcordate, apex rounded, margin entire or toothed; petiole to 1 mm. long; stipules to 1.5 mm. long, usually deeply divided into 2–4 linear teeth. Cyathia solitary on peduncles to 0.5 mm. long, terminal and pseudoaxillary on short leafy shoots, scarcely  $1 \times 1$  mm., with cup-shaped involucre; glands 4, minute, transversely elliptic, with very small obscurely lobed pink or white appendages; involucre lobes minute, triangular, ciliate. Male flowers few: bracteoles filamentous; stamens 1 mm. long. Female flower: ovary pedicellate; styles minute (0.2 mm. long), spreading, bifid to halfway. Capsule exerted on a reflexed pedicel 1.5 mm. long, acutely 3-lobed,  $1.5 \times 1.5$  mm. Seeds oblong-conical, acutely 4-angled,  $1 \times 0.5$  mm., pinkish brown, with numerous shallow transverse wrinkles.

var. ***glabrata* (Gay) Boiss.** in DC., Prodr. 15(2): 34 (1862); N.E. Br. in F.T.A. 6(1): 503 (1911); F.P.S. 2: 72 (1952); E.P.A.: 448 (1958). Types: Oman, Muscat, *Aucher* 5304 (K, syn.!) & Arabia, *Schimper* 754 (K, syn.!) & *Botta* (P, 2 syn.) & Sudan, Kordofan, *Kotschy* 69 (P, syn., K, syn. partly!)

Pubescence sparse, with long spreading hairs. Leaves obovate to  $6 \times 4$  mm., base obliquely rounded, margin entire; upper surface glabrous; stipules to 1 mm. long, with 2–3 linear teeth. Gland appendages pink or white.

KENYA. Northern Frontier Province: Lokori, 29 July 1968, *Mwangangi & Gwynne* 1046! & Suguta valley, 29 May 1970, *Mathew* 6467!; Turkana District: Lodwar, 13 May 1953, *Padwa* 156!

DISTR. K 1, 2; Arabian Peninsula, Egypt and NE. Africa

HAB. In exposed sandy gritty soils; 300–800 m.

SYN. *E. forskalii* Gay var. *glabrata* Gay in Webb & Berth., Phyt. Canar. 3(3): 243 (1847)

NOTE. A. Radcliffe-Smith, in *Fl. Iraq* 4: 335 (1980), considered var. *glabrata* to be an extreme form of a variable species, placing it in synonymy. However, in Kenya, the varietal distinction is constant, NW. Kenya being the most southerly point of its distribution. The typical variety extends over the same area as far south as the Kordofan region of the Sudan and northern Somalia and eastwards from Arabia to Pakistan. It differs by being more densely pilose, including both surfaces of the leaves, and with shorter hairs.

var. *dentata* N.E. Br. in *F.T.A.* 6(1): 503 (1911); *E.P.A.*: 448 (1958). Type: Ethiopia, *Ellenbeck* 724 (B, syn.†) & Kenya, Lake Turkana [Lake Rudolph], *Wellby* (K, syn.!)

As for var. *glabrata*, but more laxly branched; hairs confined to branches, capsules and occasionally the lower surface of the leaves. Leaves oblong-ovate, to  $8 \times 4.5$  mm., base obliquely subcordate, margin toothed at least near the apex; stipules to 1.5 mm. long with 3–4 teeth. Gland appendages a little more noticeable, white.

KENYA. Northern Frontier Province: Lokori, 16 May 1970, *Mathew* 6236!; Masai District: 5 km. from Magadi on Nairobi road, 30 June 1962, *Glover & Samuel* 2993!; Tana River District: Galole, 18 Dec. 1964, *Gillett* 16410!

TANZANIA. Masai District: Lake Chala [Dschalla], 30 Mar. 1952, *Bally* 8112!

DISTR. K 1, 6, 7; T 2; Ethiopia

HAB. Dry stony soils, often on lava; 60–1000 m.

SYN. [*E. mossambicensis* sensu Agnew, *U.K.W.F.*: 222 (1974), *non* Boiss.]

NOTE. The few widely scattered gatherings from East Africa suggest this variety is more common than the number of available specimens suggest. Ethiopian specimens are less hairy and possess rather larger leaves with more distinctly toothed margins. They all, including the *Ellenbeck* syntype, which unfortunately appears no longer to exist, originate from higher altitudes towards the northeast around Addis Ababa, Awash and Harar. They may prove to represent a distinct taxon.

**15. *E. serratifolia*** S. Carter in *K.B.* 35: 413, fig. 1/A–D (1980). Type: Tanzania, Konda District, Chungai, *Polhill & Paulo* 1163 (K, holo.!, B, BR, EA, LISC, P, PRE, SRGH, iso.)

Annual herb, with spreading branches suberect to 25 cm. high, the whole plant often tinged red, very sparsely covered with long spreading hairs, the upper side of the branches in addition with shorter adpressed hairs. Leaves ovate to  $18 \times 12$  mm., base very obliquely subcordate, apex subacute, margin distinctly toothed, with the teeth apparently gland-tipped; petiole to 2 mm. long; stipules 0.75 mm. long, deeply divided into 2–3 linear teeth. Cyathia solitary, on peduncles to 2.5 mm. long, terminal and pseudoaxillary on leafy shoots,  $1 \times 1$  mm., with cup-shaped involucre; glands 4, transversely elliptic,  $\pm 0.3$  mm. wide, red, with obvious, deeply 3–6-lobed pink or red appendages; involucre lobes broadly triangular, margin ciliate. Male flowers: bracteoles linear, deeply divided; stamens 1 mm. long. Female flower: ovary pedicellate; styles 0.3 mm. long, spreading, bifid almost to the base. Capsule exerted on a reflexed pedicel 1.25 mm. long, 3-lobed, with broadly truncate base,  $1.5 \times 2$  mm. Seeds ovoid,  $1 \times 0.75$  mm., reddish brown, with 3 distinct transverse ridges.

TANZANIA. Dodoma District: 37 km. S. of Itigi on Chunya road, 17 Apr. 1964, *Greenway & Polhill* 11605!; Iringa District: Ruaha National Park, Magangwe, 18 May 1968, *Renvoize* 2237! & 8 Mar. 1972, *Björnstad* 1452!

DISTR. T 5, 7; Malawi

HAB. Open *Brachystegia* woodland on sandy stony soil; 1000–1400 m.

**16. *E. lissosperma*** S. Carter in *K.B.* 35: 414, fig. 1/E–H (1980). Type: Tanzania, Mwanza District, Bulingwa, *Tanner* 550 (K, holo.!)

Prostrate or suberect annual herb, with branches to 25 cm. long, longitudinally ridged, the whole plant glabrous or usually at least the lower branches, leaves and capsules sparsely covered with fairly short spreading hairs. Leaves ovate, to  $10 \times 7$  mm., base rounded to subcordate and markedly oblique, apex rounded, margin entire or very obscurely toothed near the apex, hairs (when present) noticeable around the margin; petiole to 1 mm. long; stipules linear to 1 mm. long, occasionally deeply divided into 2–3 teeth. Cyathia solitary on peduncles to 1 mm. long, terminal and pseudoaxillary on short leafy shoots, scarcely  $1 \times 1$  mm., with cup-shaped involucre; glands 4, minute, transversely elliptic, green to purplish, with small entire or shallowly lobed white appendages; involucre lobes minute, triangular, ciliate. Male flowers: bracteoles linear,