

## The genus *Euphorbia* L. in Egypt

### I. — Section *Anisophyllum* Roep.

by

M. Nabil El Hadidi (\*)

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The genus *Euphorbia* L. is one of the largest genera represented in the Egyptian flora. Recently a number of species was added to those previously known. This happened partly in connection with the exploration of some of the less known phytogeographical regions, partly in connection with plant introductions from abroad when many weeds of foreign origin found their way to Egypt.

The earliest records of *Euphorbia* species in Egypt date back to 1775, when Forskål described *Euphorbia granulata* and *E. retusa* from this country. Thirty-eight years later, Delile (1813) added *Euphorbia calendulaefolia*, *E. parvula* and *E. punctata* to the previously known species. Towards the end of the nineteenth century, when *Euphorbia* was treated by Boissier (1875-1879), the number of the Egyptian *Euphorbia* species increased to about a dozen. An extensive exploration work was afterwards carried out on the Egyptian flora, mainly by German botanists, resulting in the valuable publications of Ascherson & Schweinfurth (1887, 1889), Sickenberger (1901) and Muschler (1912). Here half a dozen new species were added to the previous ones, among these some New World weeds: *E. geniculata* and *E. hirta*, whose presence Sickenberger ascribed to the introduction of new crops. Since 1925, great efforts took place for exploring the country botanically and collecting all available data. This resulted in the addition of another dozen of *Euphorbia* species to the Egyptian flora. Täckholm (1956) enumerates about 33 species; among these *E. isthmia* V. Täckholm is new to science.

(\*) M. Nabil El Hadidi, Cairo University, Faculty of Science, Botany Department, Giza, Cairo (Egypt). — Manuscript received January 28, 1972.

It seems that still more species remain to be discovered. The geographical distribution of certain species in neighbouring countries suggests a possible occurrence in Egypt also. Furthermore, a critical revision of the collected material may reveal that some species have been confused with allied ones.

It was felt that a study of the Egyptian *Euphorbia* was needed, particularly in relation to some morphological, anatomical and cytological investigations which are now carried out and will be published in the near future (Fayed 1973).

The following revision is based upon the collections kept in the following herbaria : BR, CAI, G, K, M, PR, PRC and W (abbreviations after the Index Herbariorum), which were visited by the author, who in addition got material on loan from B, BM, FI and S; he consulted also several types in LINN. The author is greatly indebted to the directors of these institutes for all facilities given to him.

The revision was carried out from October 1970 to March 1971, during a stay in Munich, which was made possible by a grant from the Alexander von Humbolt-Stiftung. The author wants to express his gratitude, not only to this institution, but also to the staff of the Institute of systematic botany in Munich, in the first hand to Prof. Dr. H. Merxmüller, who gave him all possible help and valuable advice. Thanks are also due to Prof. Dr. V. Täckholm, Cairo University and Mr. A. R. Smith, Kew Herbarium, for revising the manuscript.

The species included in the present revision are arranged according to the system followed by Boissier (1862-1866). This system still remains the foundation for the treatment of the genus *Euphorbia* as originally constituted by Linnaeus. With admirable care, Boissier succeeded in describing and arranging the immense mass of species spread all over the world. In doing this, he retained as subdivisions of the genus certain taxa which were considered as genera by previous authors, e.g. Haworth (1812). Boissier's system was also used with few modifications by Pax & Hoffmann (1931) in their monograph of the genus.

The species which are dealt with in this revision belong to the following sections of Boissier :

- ser. I. *Appendiculatae* Boiss.
- sect. 1. *Anisophyllum* Roep.

- ser. II. *Exappendiculatae* Boiss.  
sect. 2. *Poinsettia* (Grah.) Boiss.  
sect. 3. *Tirucalli* Boiss.  
sect. 4. *Lyciopsis* Boiss.  
sect. 5. *Pseudocalypha* Boiss.  
sect. 6. *Diacanthium* Boiss.  
sect. 7. *Tithymalus* (Scop.) Boiss.

Most of the Egyptian species belong to sect. *Anisophyllum* and *Tithymalus*. This account will deal only with *Anisophyllum*, but it is planned to continue later with the other sections.

The herbarium abbreviations are those proposed in the Index Herbariorum.

The abbreviations used for the phytogeographical regions of Egypt are the same as in Täckholm (1956 : 12) :

- N Nile region (Nd, Nile delta; Nv, Nile valley; Nf, Nile Faiyum)  
O Oases of the Lybian desert  
M Mediterranean coastal strip from El-Sollum to Rafah (Mma, Western coastal region; Mp, Eastern coastal region)  
D Deserts (Da, Arabian desert, divided into a Northern (sept) and a Southern (mer) parts; Di, isthmic desert; Dl, Libyan desert)  
GE Gebel Elba  
S Sinai proper.

An exclamation mark (!) denotes that the specimen has been seen by the author.

sect. 1. *Anisophyllum* Roep.  
in DUBY, Bot. Gall. ed. 2. 1 : 412 (1828)

*Herbs.* Leaves opposite, base usually unequal; stipules well developed. *Cyathia* in axillary or terminal cymes, sometimes reduced to 1 only. *Involucres* minute, glands 4-5, generally with petaloid or membraneous appendages. *Seeds* without caruncle.

Ten species recorded from Egypt. In addition, the author has seen recently specimens of *E. hyssopifolia* L. : Zohria Botanical Gardens, Cairo, May 1971, Chrtek & Kosinová (CAI !); Qaliubia province,

Ikiad, Aug. 1971, *Imam* (CAI !). This plant might be of recent introduction.

The habit in most of the *Euphorbia* species is rather variable, while the characters of capsule and seeds are almost constant. Such characters are proved to be useful for accurate determination, and will therefore be taken in consideration in this treatment.

1. Leaves narrowly linear, up to 2 mm broad . . . . . 4. *E. arabica*
1. Leaves ovate-oblong, over 3 mm broad :
  2. Leaves over 1.5 cm long, 0.5-2 cm broad :
    3. Seeds up to 0.7 mm long . . . . . 1. *E. hirta*
    3. Seeds over 1 mm long . . . . . 2. *E. hypericifolia*
  2. Leaves less than 1.5 cm long, 0.5 cm broad :
    4. Seeds up to 3 mm long, rounded in cross section . . . . . 3. *E. peplis*
    4. Seeds hardly over 1.5 mm long, 4-angled in cross section :
      5. Seeds rugulose, 0.9-1.5 mm long :
        6. Cyathia solitary . . . . . 6. *E. chamaesyce*
        6. Cyathia in axillary or terminal clusters :
          7. Cyathia glabrous :
            8. Perennial shrublet; capsules 0.8 mm diam.; carpels rounded . . . . . 5c. *E. granulata* var. *turcomanica*
            8. Annual herb; capsules over 1 mm diam.; carpels keeled . . . . . 8. *E. inaequilatera*
          7. Cyathia hairy :
            9. Leaves glabrous above, thinly pubescent beneath . . . . . 5b. *E. granulata* var. *glabrata*
            9. Leaves hairy on both sides :
              10. Leaves entire . . . . . 5a. *E. granulata* var. *granulata*
              10. Leaves toothed :
                11. Plant scarcely hairy; appendages scarious, narrow; capsules up to 1.5 mm diam. . . . . 7. *E. forskoolii*
                11. Plant densely hairy; appendages petaloid, wide; capsules up to 2 mm diam. . . . . 9. *E. scordifolia*
          5. Seeds transversely wrinkled, up to 0.8 mm long . . . . . 10. *E. prostrata*

subsect. a. *Hypericifoliae* Boiss.

in A. DC., Prodr. Syst. Nat. 15 (2) : 20 (1862)

1. *Euphorbia hirta* L., Sp. Pl. ed. 1 : 454 (1753); N. E. Br. in Dyer, Fl. Trop. Afr. 6 (1) : 496 (1911); Andrews, Fl. Pl. Anglo-Egypt. Sudan 2 : 71 (1952). — Fig. 1, a.

*Chamaesyce hirta* (L.) Millsp., Field Mus. Publ. Bot. 2 : 303 (1909).

*E. pilulifera* Auct. non L.; Boiss. in A. DC., Prodr. Syst. Nat. 15 (2) : 21 (1862); Täckholm, Stud. Fl. Egypt : 250 (1956).

Annual *herb* up to 40 cm high; branches erect or decumbent, simple or dichotomously branching with spreading yellow hairs on

the upper parts. *Leaves* opposite, up to 3 cm long, 2 cm broad, obliquely lanceolate to rhombic, sparsely hairy above, with adpressed hairs beneath; base unequal; apex acute; margin finely serrate; petiole short, up to 4 mm long; stipules minute, triangular. *Cyathia* in dense terminal or lateral pedunculate clusters (cymules), each consisting of numerous shortly pedicellate cyathia; involucre campanulate 0.6-0.9 mm diam., sparingly hairy outside; glands 4 (rarely 5), orbicular, with white narrow entire appendages; lobes 5, deltoid and fringed. *Capsules* 1-1.5 mm diam., sharply 3-angled, shortly strigose. *Seeds* the smallest of this group, up to 0.7 mm long, oblong, 4-angled with slight rugosities, light red.

*Type* : India, specimens 630. 5, 6 and 7 (LINN !).

*Distribution* : Common weed in cultivations particularly in Upper Egypt (Nv). Less common northwards in Nd and Mma.

In Egypt, it seems to have been introduced in the course of the last 50 years, as far as the records of CAI indicate (Maadi near Cairo, Dec. 1926, G. Täckholm !). Earlier accounts on the flora of Egypt (Forskål 1775, Ascherson & Schweinfurth 1889, Sickenberger 1901, Muschler 1912 and Ramis 1929) have not mentioned this species.

According to Wheeler (1939 : 67), this species is native to the New World. It is now known all over the world between 30 °N and 30 °S.

In the New World from Florida, Arizona and Guatemala southwards all over tropical America. In Africa everywhere in the tropics, South Africa and northwards in Ethiopia, Sudan and Egypt. Also in tropical Asia, Philippines, New Guinea, New Zealand and the islands of the Atlantic and Pacific (K !).

*Note* : *E. pilulifera* L. [type : specimen 630. 8 (LINN !)] is a synonym of the following species. The name was erroneously applied to *E. hirta* since Jacquin [(1787-1795 : tab. 478 (1789))]; this has been sufficiently explained by N. E. Brown [(1911-1913 : 497 (1911))] and Wheeler (1939 : 72).

2. *Euphorbia hypericifolia* L., Sp. Pl. ed. 1 : 454 (1753); N. E. Br. in Dyer, Fl. Trop. Afr. 6 (1) : 498 (1911).

*E. pilulifera* L., Sp. Pl. ed. 1 : 454 (1753).

*E. decumbens* Forsk., Fl. Aeg.-Arab. : 92 (1775).

*E. indica* Lam., Enc. Méth., Bot. 2 : 423 (1788); Muschler, Man. Fl. Egypt : 601 (1912); Ramis, Bestimmungstab. Fl. Aeg. : 129 (1929); Andrews, Fl. Pl. Anglo-Egypt. Sudan 2 : 71 (1952); Täckholm, Stud. Fl. Egypt : 250 (1956).

*Tithymalus piluliferus* (L.) Moench, Suppl. : Meth. Pl. 283 (1802).

*Anisophyllum piluliferum* (L.) Haw., Syn. Pl. Succ. : 162 (1812).

Annual *herb* up to 50 cm high; branches erect or decumbent, starting near the base, sometimes simple, puberulous or glabrous. *Leaves* opposite, 2-3 cm long, 0.5-1 cm broad, oblong, linear-oblong, elliptic or ovate, glabrous or slightly hairy on both surfaces; base oblique; apex subulate to rounded; margin minutely serrate; petiole short; stipules minute, variable. *Cyathia* in axillary pedunculate cymes, peduncle up to 2 cm long, terminating by a pair of leaflets subtending the cyathia; involucre cup-shaped, 1 mm diam., puberulous outside; glands 4, minute, orbicular to elliptic; appendages white, up to 0.5 mm broad, entire; lobes 5, deltoid and ciliate. *Capsules* up to 2 mm diam.; carpels globose and pubescent. *Seeds* 1.2 mm long, ellipsoid, 4-angled, slightly transversely rugose, reddish brown.

*Type* : Specimens 630. 4 and 8 (LINN !).

For the typification of the Egyptian material, I have seen in Dec. 1970 the following specimens in LINN : 630. 3 *E. hypericifolia*, 630. 4 *E. maculata* (annotated *hypericifolia* by J. E. Smith) and 630. 8 *E. pilulifera*.

The specimen 630. 3 was assumed by Dandy & Milne-Redhead (1950) not to be in the Linnean Herbarium in 1753. It was collected by Patrick Browne in West Indies (probably Jamaica) and was named *E. hypericifolia* by Solander (not Linnaeus). Wheeler (1939 : 73) believed that its characters match with the West Indian and Mexican species known as *E. lasiocarpa* Klotzsch. This specimen is characterized by its heavy vesture [(see also statement of N. E. Brown 1911-1913 : 498 (1911)], and the cymes consist of few large cyathia. None of the Egyptian material agrees with this Linnean specimen.

The specimen 630. 4, bearing the inscription *maculata* in Linnaeus handwriting, was claimed by Dandy & Milne-Redhead (1950) to be the type of *E. hypericifolia*, assuming that the epithet *maculata* was written by Linnaeus by mistake for *hypericifolia*. Some of the Egyptian specimens agree with this Linnean specimen.

The specimen 630. 8 *E. pilulifera* matches much better with most of the Egyptian material, which is usually known (Täckholm 1956 : 250) as *E. indica* Lam. Wheeler (1939 : 77) applied the name *E. pilulifera* to a New World species to which he later (loc. cit. : 78) gave the name *E. glomerifera* (Millsp.) Wheeler.

Burch (1966 : 160) considered *E. hypericifolia* L., *E. pilulifera* L. and *E. glomerifera* (Millsp.) Wheeler to belong to one and the same entity. This entity includes tropical and subtropical plants which are rarely pubescent, with glomerulate cyathia and small capsules.

The specimens 630. 4 and 8 are very similar and seems to represent the same species, viz. *E. hypericifolia*. The application of this name is so firmly established that it would be very much against the interests of stability of nomenclature to consider making any further change.

*Distribution* : In Egypt, a weed in cultivated lands of Nv : Luxor, sandy soil, Sept. 1928, *Shabetai* (CAI !); Assiut, Univ. ground, May 1962, V. Täckholm (CAI !). Rare northwards in Nd.

Widely distributed in the tropics and subtropics of Asia and Africa. *E. indica* Lam., which is reported by Smith & Tutin (1968 : 213) as a casual alien in S. Europe may belong to this species.

Several records in BR !, K !, PRC !, W ! under *E. hypericifolia* and *E. indica* from various localities are in need of critical revision; they may belong to some closely related species.

subsect. b. *Chamaesyceae* Boiss.

in A. DC., Prodr. Syst. Nat. 15 (2) : 27 (1862).

3. *Euphorbia pepelis* L., Sp. Pl. ed. 1 : 455 (1753); Boiss., Fl. Orient. 4 : 1086 (1879); Aschers. & Schweinf., Mém. Inst. Egypt. 2 : 137 (1887) et 772 (1889); Sickenberger, Mém. Inst. Egypt. 4 : 275 (1901); Muschler, Man. Fl. Egypt : 599 (1912); Ramis, Bestimmungstab. Fl. Aeg. : 129 (1929); Vindt, Trav. Inst. Sc. Chérif. 6 : 27 (1953); Täckholm, Stud. Fl. Egypt : 250 (1956). — Fig. 1, b.

Annual prostrate *herb.* branches near the base up to 30 cm long, glabrous or slightly hairy. *Leaves* opposite, 1-1.5 cm long, 0.5 cm broad, ovate to oblong; base strongly unequal; apex obtuse or emar-

ginate; margin entire; petiole short, up to 2 mm long; stipules minute, subulate. *Cyathia* axillary, solitary; pedicel short, up to 2 mm long; involucre campanulate, about 1.5 mm diam., glabrous outside; glands 4, elliptic, with narrow white entire or lobed appendages; lobes 5; triangular, with ciliate margins. *Capsules* 1.5-3 mm diam., glabrous, ovoid, with rounded carpels. *Seeds* up to 3 mm long, rounded in cross section, testa smooth, greyish white.

*Type* : Narbonne (S. France) — Spain, on the sea; specimen 630. 18 (LINN !).

*Distribution* : In Egypt, restricted to the maritime sand along the Mediterranean coasts : auf den Dünen zwischen el Dakhela und Kap Agimi westlich von Alexandrien, Feb. 1907, *Hartmann* (CAI !); on sand dunes, Baltim, Aug. 1968, *El Hadidi* (CAI !); sandy dunes, Rafah, Aug. 1951, *V. Täckholm et al.* (CAI !). In addition, I have seen few specimens which were collected southwards in the Nile region. The oldest and most to the south is : ad Beni Suef, in agris, 1821, *E. Ehrenberg* *Iter Orientale* 31 (S !), also mentioned by Boissier [(1875-1879 : 1086 (1879)]. Beni Suef is located about 300 km south of the Mediterranean and belongs phytogeographically to Nv region. The other 2 records are more recent viz. : Tanta, in agris, 1906, *Muschler* (K !) and Cairo, in palmetis, 1904, *Muschler* (K !); both localities belong to the Nd. The author is aware of the fact that some of Muschler's records are mere falsifications (see Schweinfurth 1915); it is however most probable that the prevailing conditions at the time of collection were in favour of the growth of this plant; during the last century, vast areas of neglected land were commonly met with, among the cultivations of the Nile region; such neglected areas were more or less salty soils or marshes where many halophytes were frequently recorded. Most of these neglected areas are now reclaimed and converted into cultivated land, consequently most of these halophytes have disappeared from the Nile region.

Known from all countries around the Mediterranean, also from Canary and Azores Islands; also Black Sea (BR !, K !).

4. ***Euphorbia arabica*** Hochst. & Steud. ex Boiss. in A. DC., *Prodr. Syst. Nat.* 15 (2) : 33 (1862); Boiss., *Ik. Euphorb.* : 12, tab. 10 (1866); N. E. Br. in Dyer, *Fl. Trop. Afr.* 6 (1) : 513 (1911); Andrews, *Fl. Pl. Anglo-Egypt. Sudan* 2 : 71 (1952); Täckholm, *Stud. Fl. Egypt* : 250 (1956).



Annual *herb* or *shrublet* up to 40 cm high; branches slender, lax and glabrous. *Leaves* opposite, up to 4 cm long and 2 mm broad, narrow linear, glabrous on both surfaces; base obtuse, apex acute; margin entire; petiole short; stipules subulate, as long as the petioles. *Cyathia* in groups of 2-3 subtended by a pair of leaflets on an axillary peduncle which is about 1 cm long; sometimes a solitary cyathium is present in the fork between the peduncle and the stem; involucre campanulate, up to 1.5 mm diam., glabrous outside; glands 4 minutes, transverse, without appendages; lobes 5, subulate and ciliate. *Capsules* up to 2 mm diam., glabrous. *Seeds* about 1.2 mm long, oblong acute, 4-angled, smooth or faintly rugose, light red.

*Syntype* : Wadi Djara (Arabia), 1820-1826, *Ehrenberg* (K !).

*Distribution* : In Egypt, restricted to the desert plains and highlands of Da mer and GE : Gebel Elba region, Jan. 1929, *G. Täckholm* (CAI !), Elba region, Wadi Rabdeit, Jan. 1933, *Shabetai* (K !); Wadi El Faraied along the Red Sea coast, Feb. 1962, *V. Täckholm et al.* (CAI !). Southwards in the Red Sea province of Sudan (BM !, W !), Ethiopia, Somalia, Eritrea, and Kenya (BR !, K !). In Arabia known from Hedjaz : *Schimper* 765, Aden, Hadramaut and Dhofar (K !).

Specimens from Mozambique : 1897, *Schlechter* 11736 (BR !, PR !, W !) are more robust than the type, with larger and broader leaves; they may prove to constitute a distinct taxon.

Specimens from Aden : 1888, *Schweinfurth* in memoriam divi Forskalii 18 (G !, K !) belonging to var. *brevifolia* Boiss., deserve to be a distinct species. It differs from Egyptian material *sensu* Täckholm (1956 : 250).

**5. *Euphorbia granulata*** Forsk., Fl. Aeg-Arab. : 94 (1775); Boiss., Fl. Orient. 4 : 1087 (1879); Aschers. & Schweinf., Mém. Inst. Egypt. 2 : 137 (1887); Sickenberger, Mém. Inst. Egypt. 4 : 275 (1901); Muschler, Man. Fl. Egypt : 600 (1912); N. E. Br. in Dyer, Fl. Trop. Afr. 6 (1) : 502 (1911); Ramis, Bestimmungstab. Fl. Aeg. : 129 (1929); Andrews, Fl. Pl. Anglo-Egypt. Sudan 2 : 72 (1952); Vindt, Trav. Inst. Sc. Chérif. 6 : 28 (1953); Täckholm, Stud. Fl. Egypt : 250 (1956).

*E. fragilis* Decne, Ann. Sc. Nat. ser. 2, 2 Bot. : 241 (1834).

*E. forskaolii* J. Gay var. *hirtula* J. Gay in Webb & Berthel., Hist. Nat. Iles Canaries 3 (2, sect. 3) : 240 (1847).

*Anisophyllum forskaolii* (Gay) Klotzsch & Garcke, Phys. Abhandl. Preuss. Akad. Wiss. 1859 : 31 (1860).

*A. granulatum* (Forsk.) Schweinf., Beitr. Fl. Aeth. : 34 (1867).

— **var. granulata.** — Fig. 1, c.

Annual or biennial, greyish velvety *herb*; branches spreading on the ground, up to 25 cm long, sometimes erect, up to 20 cm high; internodes yellowish, thickened at the nodes, brittle, covered with short spreading hairs. *Leaves* opposite, about 1 cm long and 2-4 mm broad, oblong to oblong-ovate, puberulous on both sides with adpressed or spreading hairs; base unequal; apex rounded or obtuse; margin entire; petiole short; stipules minute and inconspicuous. *Cyathia* in axillary racemes, each cyathium subtended by a pair of leaflets; involucre campanulate or funnel-shaped, up to 0.8 mm diam., covered with minute curved hairs; glands 4, rarely 3, transverse, with an entire or 2-3 lobed petal-like appendages; lobes 5, deltoid and ciliate. *Capsules* up to 1.5 mm diam., covered with adpressed or spreading hairs. *Seeds* up to 1 mm long, 4-angled, slightly rugose, greyish to pale red.

*Type* : Lohajae, Hadie, 1763, *Forskål* (C).

*Distribution* : In Egypt, mainly in sandy plains of Da, particularly southwards in Wadis along Red Sea in Da mer. and GE : Cairo, June 1879, *Sickenberger* (K !); zwischen Kena und Kosseir, Juni 1867, *Schweinfurth* 890 (K !); Gebel Elba region, Feb. 1933, *Fahmy & Hassib* (CAI !). Less common in DL, with few records along Cairo-Alexandria desert road : 85 km N. of Cairo, July 1970, *Ibrahim & Mahdi* (CAI !); and Jebel Uweinat : Vallée des coloquintes, Oct. 1968, *J. Léonard* 4794 (BR !); Wadi Abs El Malach, Nov. 1968, *J. Léonard* 4886 (BR !).

In Africa widely distributed in North African Sahara, Nubia, Somalia Eritrea and Ethiopia.

In Asia known from Arabia, Palestine, Iraq, Iran, Afghanistan, W. Pakistan and Punjab.

*Note* : *Forskål*'s description (1775 : 94) and all the above mentioned citations and synonyms of *E. granulata* match this variety.

- **var. glabrata** Boiss. in A. DC., Prodr. Syst. Nat. 15 (2) : 34 (1862); Boiss., Fl. Orient. 4 : 1087 (1879); N. E. Br. in Dyer, Fl. Trop. Afr. 6 (1) : 503 (1911).

Annual greyish *herb*; branches prostrate or procumbent; internodes slender, non-brittle, longer than in var. *granulata*, giving a more lax appearance. *Leaves* glabrous on the upper surface, thinly pubescent beneath. *Involucre* and *capsule* thinly pubescent; appendages of glands more petaloid than in var. *granulata*.

*Syntype* : Mascat, *Aucher* 5304 (K !).

*Distribution* : In Egypt, along Cairo-Suez road and southwards in Da mer, also GE : Aegypto 1827, commun. *J. Radi* (W !); Red Sea coast, Wadi Ghadir, Feb. 1961, *V. Täckholm et al.* (CAI !).

In Africa with the type variety throughout the North African Sahara and Nubia.

In Asia only records from Arabia, including Hedjaz, Aden, Mascat, Bahrain and Kuwait (K !).

- **var. turcomanica** (Boiss.) Hadidi stat. nov.

*E. turcomanica* Boiss., Cent. Euphorb : 13 (1860); Boiss., Fl. Orient. 4 : 1087 (1879).

Perennial *shrublet*; branches woody, prostrate; internodes yellow, glabrous, not thickened at the nodes. *Leaves* more or less glabrous on both surfaces. *Involucre* sparingly hairy; glands with narrow, entire or lobed white appendages. *Capsules* glabrous.

*Type* : Turcomania, 1834, *Karelin* (G-DC).

*Distribution* : In Egypt, few records, restricted to Da : Mittelägyptische Wüste, Arabische Seite, 1877, *Schweinfurth* 260; bei Suez, 1868, *Schweinfurth* 143; prope Rhamses, 1877, *Ball* (K !); Gebel Angabia along Cairo-Suez road, 1945, *Davis* 8535 (K !); Upper Egypt, 1848, *Kralik* (G-BOISS !).

According to Rechinger & Schiman-Czeika (1964 : 17) this variety is known from Caucasus, Iran, Turcomania, Afghanistan, Karakorum, Tian-schan and Pamiro-alaj; it is likely to occur in Arabia but overlooked.

*Note* : Rechinger & Schiman-Czeika (1964 : 17) pointed out that *E. granulata* and *E. turcomanica* are closely allied species. According to these authors the differences between the 2 species as given by Boissier (1875-1879 : 1088 (1879)) are not satisfactory. They claimed that typical *E. granulata* has densely-hairy leaves, while typical *E. turcomanica* is more or less glabrous.

They assumed that var. *glabrata* is an intermediate form between these 2 extremes and recommended field and culture studies to draw a conclusion about the relationships between these 2 species.

I have had the opportunity to examine the authentic material in Boiss. and DC. herbaria in Genève, also those in Kew. The differences between these 2 species are in reality too little to consider them as distinct species. *E. turcomanica* is merely a perennial glabrous form of the more typical *E. granulata*. The character of the leaf apex being slightly denticulate in *E. turcomanica* and not in *E. granulata*, is not constant. Therefore, *E. turcomanica* is treated here as a variety of *E. granulata*.

**6. *Euphorbia chamaesyce* L.**, Sp. Pl. ed. 1 : 455 (1753); Boiss., Fl. Orient 4 : 1088 (1879); Vindt, Trav. Inst. Sc. Chérif. 6 : 30 (1953). — Fig. 1, d.

*E. massiliensis* DC., Fl. Franç. ed. 5 : 357 (1815).

Annual procumbent *herb*; branches filiform, up to 30 cm long, glabrous or villous. *Leaves* opposite, up to 1 cm long, 2-5 mm broad, assymmetrically ovate, suborbicular to oblong, sparsely hairy to canescent on both sides; base oblique; apex obtuse to emarginate; margin entire or obscurely serrate near the apex; petiole short; stipules minute, subulate, often with a small thorn at the base. *Cyathia* solitary, axillary, shortly pedicellate; involucre campanulate, 0.6-0.9 mm diam., glabrous or sparingly hairy outside; glands 4, transverse, wax-coloured; appendages as broad as the glands, 3-lobed, white; lobes 5, 3-angular, finely ciliate. *Capsules* about 1.5 mm diam., deeply sulcate, smooth, glabrous to densely pubescent. *Seeds* about 1.2 mm long, broadly ovoid, 4-angular, irregularly tuberculate-rugulose, greyish-white.

*Type* : Southern Europe and Siberia, specimen 630. 15 (LINN !).

*Distribution* : In Egypt, only few certain records along the Cairo-Alexandria desert road in DI (CAI !). Also few others in European herbaria : Egypte, 1836, *Aucher-Eloy* (G-DC !); Orto bot. di Cairo,

1867, *Figari* (FR !); aus Aegypten in agris grossipinis as *E. canescens*, s.d., *Sieber* 41, 48, 49, 50 (PRC !).

Widely distributed in North African Sahara, including Morocco, Algeria and Libya. Eastwards in Palestine, Syria, Lebanon, Iraq, Iran, Caucasus, Turcomania, Afghanistan, Pakistan and Arabia. Also in the Mediterranean islands and Mediterranean countries of Europe.

*Note* : There have been much contradictions about the occurrence of this species in Egypt. Ascherson & Schweinfurth (1889 : 772) and Sickenberger (1901 : 275) mentioned this species in their accounts on the flora of Egypt, as a recently introduced and naturalized weed in gardens around Cairo.

None of the specimens collected by these authors or on which their accounts are based were available for this revision.

On the other hand, most of the records of *E. chamaesyce* from Egypt which I have seen or revised proved to belong to other species, e.g. : Egypte sup., *Aucher-Eloy* 2033 (G !) (correctly *E. forskaoalii* J. Gay); Aegypt. sup., 1837, *Kotschy* 943 (G !) (revised as *E. forskaoalii* J. Gay by A. Hässler); between Cairo and Suez, 1861, *Samaritani* 41 (FR !) (correctly *E. granulata* Forsk.); Sukhna desert, *Sieber* (PRC !) (correctly *E. forskaoalii* J. Gay); Cairo, in palmetis, 1904, *Muschler* and Rosette, in inundatis, 1906 (K !) (both correctly *E. prostrata* Ait.).

This may explain why Täckholm (1956 : 250) has not included *E. chamaesyce* among the species growing in Egypt. She gave the name *E. chamaesyce* as a synonym under *E. prostrata*, with a notice that the Egyptian records are not *E. chamaesyce*. This can be simply explained by the fact that the epithet *chamaesyce* has been misapplied by several authors (see discussion under *E. prostrata*) who considered it a synonym and prior to *E. prostrata*.

The geographical distribution of *E. chamaesyce* is in favour of an occurrence in Egypt, as its northern limit includes the Mediterranean region. A precise revision of the material in CAI proved its existence among other specimens in the folders of *E. granulata* and *E. forskaoalii* (= *E. aegyptiaca*). The close similarity between these 2 species and *E. chamaesyce* was always the source of erroneous determinations not only of the Egyptian material, but also of other specimens present in several herbaria abroad. This also explains why its presence in Egypt remained uncertain up to the present time.

7. ***Euphorbia forskaoii*** J. Gay in Webb & Berthel., Hist. Nat. Iles Canaries 3 (2, sect. 3) : 240 (1847). — Fig. 1, e, 2, a.

*E. burmanniana* J. Gay in Webb & Berthel., Hist. Nat. Iles Canaries 3 (2, sect. 3) : 239 (1847).

*E. aegyptiaca* Boiss., Gent. Euphorb. : 13 (1860); Boiss., Fl. Orient. 4 : 1088 (1879); Aschers. & Schweinf., Mém. Inst. Egypt. 2 : 137 (1887); Sickenberger, Mém. Inst. Egypt. 4 : 275 (1901); Muschler, Man. Fl. Egypt : 602 (1912); N. E. Br. in Dyer, Fl. Trop. Afr. 6 (1) : 507 (1911); Ramis, Bestimmungstab. Fl. Aeg. : 129 (1929); Andrews, Fl. Pl. Anglo-Egypt. Sudan 2 : 73 (1952); Täckholm, Stud. Fl. Egypt : 25 (1956).

*Anisophyllum forskaoii* (J. Gay) Klotzsch & Garcke, Phys. Abhandl. Preuss. Akad. Wiss. 1859 : 25 (1860).

*A. burmannianum* (J. Gay) Klotzsch & Garcke, Phys. Abhandl. Preuss. Akad. Wiss. 1859 : 25 (1860).

*A. aegyptiacum* (Boiss.) Schweinf., Beitr. Fl. Aeth. : 34 (1867).

Annual *herb*; branches spreading on the ground, 10-25 cm long, puberulous all around with minute scarcely spreading hairs. *Leaves* opposite, about 1 cm long, 0.5 cm broad, oblong, puberulous or pubescent on both surfaces, occasionally glabrous above; base strongly unequal; apex rounded or obliquely subulate; margin slightly toothed, rarely entire; petiole short; stipules minute, 2-3-lobed. *Cyathia* in axillary racemes or clusters, each consisting of few cyathia (2-4), cyathium usually subtended by a pair of leaflets; involucre campanulate, 0.8-1.1 mm diam., covered with curved hairs outside; glands 4, elliptic, with narrow entire or slightly lobed appendages; lobes 5, fringed. *Capsules* 1.5-1.7 mm diam., pubescent with adpressed hairs all over, carpels sub-globose. *Seeds* about 1.4 mm long, 4-angular, rugulose, greyish red.

*Type* : Upper Egypt, 1836 or earlier, *Aucher-Eloy* 2033 (G !, K !).

*Distribution* : In Egypt, in desert plains : Kalabshah, Nubia in alluvial, Jan. 1848, *Kralik* (BR !); and as a weed in cultivations close to the deserts in both of Nd and Nv : Assouan, île du Sirdar, Jan. 1909, *Schweinfurth* (CAI !). Rare in O : Kharga near the town, Jan. 1928, G. *Täckholm* (CAI !); Mma and S.

Widely spread through tropical South and South-West Africa and Cape Verde Islands.

In Asia only known from Arabia, Syria and Palestine.

8. *Euphorbia inaequilatera* Sond., *Linnaea* 23 : 105 (1850); N. E. Br. in Dyer, *Fl. Cap.* 5 (2) : 246 (1915); Andrews, *Fl. Pl. Anglo-Egypt. Sudan* 2 : 72 (1952); Täckholm, *Stud. Fl. Egypt* : 250 (1956). — Fig. 1, f, 2, b.

*Anisophyllum inaequilaterum* (Sond.) Klotzsch & Garcke, *Phys. Abhandl. Preuss. Akad. Wiss.* 1859 : 22 (1860).

*E. sanguinea* Hochst. & Steud. ex Boiss. in A. DC., *Prodr. Syst. Nat.* 15 (2) : 35 (1862); Boiss., *Fl. Orient.* 4 : 1088 (1879); N. E. Br. in Dyer, *Fl. Trop. Afr.* 6 (1) : 508 (1911).

Annual *herb*; branches prostrate or decumbent, glabrous. *Leaves* opposite, up to 1 cm long, 2-5 mm broad, oblong to obliquely elliptic, glabrous on both sides; base oblique; apex obtuse; margin entire or toothed to the base at least along one side; petiole short; stipules minute. *Cyathia* as in *E. forskalii*; involucre campanulate, 1 mm diam., glabrous outside; glands 4, transverse; appendages narrow, 2-3-lobed; lobes 5, 3-angular. *Capsules* 1-2 mm diam., glabrous, sharply 3-angled. *Seeds* 1.2 mm long, 4-angled, slightly transversely rugose, pale red.

*Type* : Port Natal (= Durban) (South Africa), *Gueinzius* 167.

*Distribution* : Rather rare in Egypt, but may be confused with the closely allied species *E. forskalii* and *E. granulata* var. *glabrata*. I have seen in CAI several specimens from GE which have the aspect of this species, but agree in most of their characters with *E. granulata* var. *glabrata*. The locality and habitat of these records are in favour of *E. inaequilatera*, but they may as well represent an intermediate form between these 2 species. According to Täckholm (1956 : 250), it is only recorded from Aga in Nd. I have seen another single record, viz. Aegyptus, *Fischer* (BR !).

This species seems to be rare in North Africa; only one record [Agadir, 1937, *Erik Wall* 195 (S !)] is known to the author. Widely distributed in highlands of tropical and South Africa. Eastwards through tropical Arabia to Afghanistan and India.

9. *Euphorbia scordifolia* Jacq.,  *Ic. Pl. Rar.* 3 : tab. 476 (1794) et *Coll. Bot.* 5 : 113 (1797); Boiss in A. DC., *Prodr. Syst. Nat.* 15 (2) : 36 (1862); N. E. Br. in Dyer, *Fl. Trop. Afr.* 6 (1) : 510 (1911); Andrews, *Fl. Pl. Anglo-Egypt. Sudan* 2 : 73 (1952); Täckholm, *Stud. Fl. Egypt* : 251 (1956). — Fig. 2, c.

*E. tomentosa* Pers., Syn. Pl. 2 : 13 (1807).

*Anisophyllum scordifolium* (Jacq.) Klotzsch & Garcke, Phys. Abhandl. Preuss. Akad. Wiss. 1859 : 35 (1860).

*E. thymifolia* Auct. non L.; Forsk., Fl. Aegypt.-Arab. 94 (1775).

Annual tomentose *herb* with densely spreading hairs all over; branches decumbent or prostrate, about 20 cm long. *Leaves* opposite, 0.5-1.0 cm long, 3-8 mm broad, oblong to elliptic-oblong; base semi-cordate unequal; apex obtuse or rounded; margin finely serrate; petiole short; stipules minute. *Cyathia* crowded along leafy axillary branchlets, 1-3 cyathia arising at each internode, subtended by a small leaf; involucre cup-shaped, 0.9 mm diam., densely hairy; glands 4, transverse, oblong; appendages petal-like, white, toothed; lobes 5, subulate and ciliate. *Capsules* up to 2 mm diam., densely hairy. *Seeds* 1.2 mm long, ovoid, acute, slightly pitted-rugose, whitish grey.

*Type* : Senegal, Sieber 17 (K !).

*Distribution* : In Egypt, restricted to the desert plains and elevations of Da mer and GE ; Mersa Halaib, at the shore of the Red Sea, Jan. 1929, G. Täckholm (CAI !); Gebel Elba region, Feb. 1933, Fahmy & Hassib (CAI !). Its occurrence in DI, particularly the northern extensions of the Sudanese Nubia and Kordofan is probable.

Widely spread all over tropical Africa and eastwards to tropical Arabia.

**10. *Euphorbia prostrata*** Ait., Hort. Kew. ed. 1, 2 : 139 (1789); Boiss. in A. DC., Prodr. Syst. Nat. 15 (2) : 47 (1862) et Ic. Euphorb. : tab. 17 (1866); N. E. Br. in Dyer, Fl. Trop. Afr. 6 (1) : 510 (1911); Täckholm, Stud. Fl. Egypt : 250 (1956). — Fig. 1, g, 2, d.

*Anisophyllum prostratum* (Ait.) Klotzsch & Garcke, Phys. Abhandl. Preuss. Akad. Wiss. 1859 : 26 (1860).

*Tithymalus prostratus* (Ait.) Bub., Fl. Pyren. 1 : 116 (1897).

*Chamaesyce prostrata* (Ait.) Small, Fl. Southeast. U. S. : 713, 1333 (1903).

*E. chamaesyce* Auct. non L.; Wheeler, Rhodora 43 : 265 (1941).

Annual *herb*; branches prostrate or decumbent, up to 20 cm long. *Leaves* opposite, 5-7 mm long, 2-4 mm broad, oblong to elliptic, glabrous above, slightly hairy beneath; base mostly unequal; apex obtuse, margin entire or obscurely serrulate; petiole short; stipules minute, deltoid. *Cyathia* mostly solitary, axillary, on short peduncles



subtended by a pair of leaflets; sometimes in axillary racemes or clusters, each consisting of 2-4 cyathia; involucre campanulate, about 0.4 mm diam., glabrous or very thinly pubescent; glands 4, minute, ovate to orbicular; appendages narrow or obsolete; lobes 5, 3-angular, hairy. *Capsules* about 1 mm diam, sharply 3-angled, pubescent with spreading hairs about the acute angles. Seeds about 0.8 mm long, 4-angled, transversely wrinkled, pale reddish.

*Type* : Native of West Indies, cultivated in Kew by Philip Miller (BM ?). LINN contains 3 specimens viz. 630. 15, 16 and 17 which are concerned with the typification of this species as well as *E. chamaesyce* L. Specimens 630. 15 and 17 bear the inscription *chamaesyce* in Linnaeus handwriting. Specimen 630. 15 can be taken as the type of *E. chamaesyce*, while specimen 630. 17 is something different. This was clear for J. E. Smith who added the sign « ? » in pencil. Later, N. E. Brown wrote the following notice : *E. chamaesyce* ? of the Linnaeus Herbarium is *E. prostrata* Ait. The abbreviation « Br » attached to it, indicates that it was collected by Patrick Browne in Jamaica. It is interesting, because *E. prostrata* was described from plants grown at Kew, raised from West Indian seeds, signed « N. E. Brown, March 9. 1910 ». Linnaeus (1738 : 198) gave the following distribution for *E. chamaesyce* : Sicilia, Italia, Gallia, Narbonensis et Jamaica. This was restricted later (1753 : 455) to : Europa australis et Sibiria. It is therefore clear that Linnaeus has rejected his earlier concept and typified *E. chamaesyce* as an Old World species.

Despite of this fact, Wheeler (1941 : 265-270) used erroneously the epithet *chamaesyce* for *prostrata*. His misapplication was based on Linnaeus's earlier account on *E. chamaesyce* (1737 : 198) that this species occurs also in the New World. He used as a type a photograph of LINN 630. 17 *chamaesyce* ?. He admitted however (loc. cit. : 265, 269) that he had no opportunity to see or examine any authentic material; consequently specimen 630. 15 *chamaesyce* was not known to him.

According to Burch (1966 : 164), Wheeler accepted the use of the name *E. prostrata* in the correct sense in a supplement to the second edition of Kearney & Peebles « Arizona Flora » published in 1962.

*Distribution* : In Egypt, a weed and a lawn plant in Nv, Nd, and Mma : répandu dans la campagne de Guiza près du Caire, Aug. 1907, Hartmann (CAI !); Aswan on the Nile banks, Dec. 1964, Boulos (CAI !).

A native of tropical America, whence it has probably been introduced in various parts of the Old World. Widely spread in the tropics and subtropics of the Old World, including Australia. Less common northwards in Europe and Asia.

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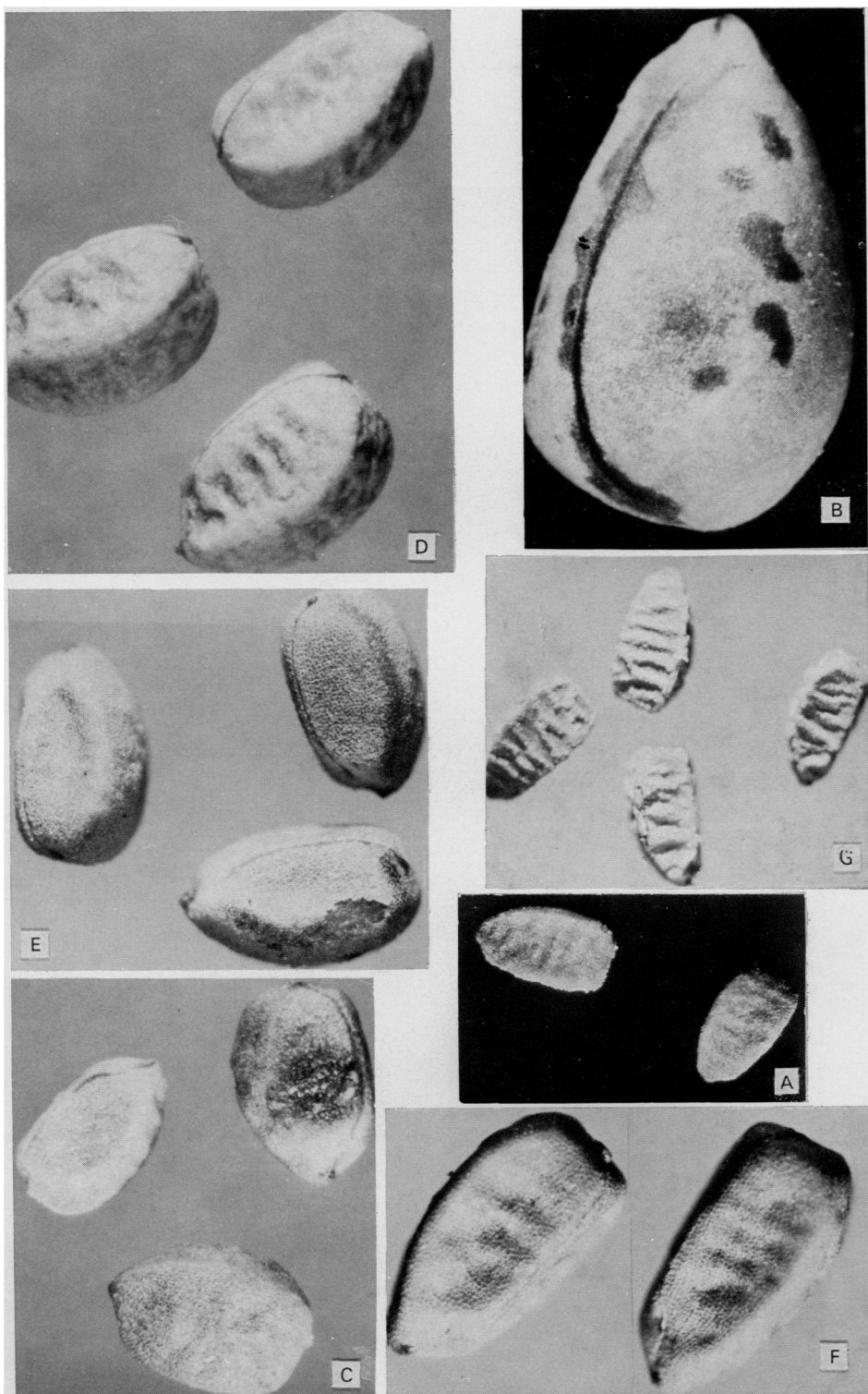


Fig. 1. — Seeds of *Euphorbia* L. species in Egypt ( $\times 30$ ): a, *E. hirta* L., the smallest in this group, testa with slight rugosities; b, *E. peplis* L., the largest in this group, testa smooth; c, *E. granulata* Forsk. var. *granulata*, testa rugose; d, *E. chamaesyce* L., testa irregularly or transversely rugose; e, *E. forskalii* J. Gay, testa rugose; f, *E. inaequilatera* Sond., testa slightly transversely rugose; g, *E. prostrata* Ait., testa transversely wrinkled.

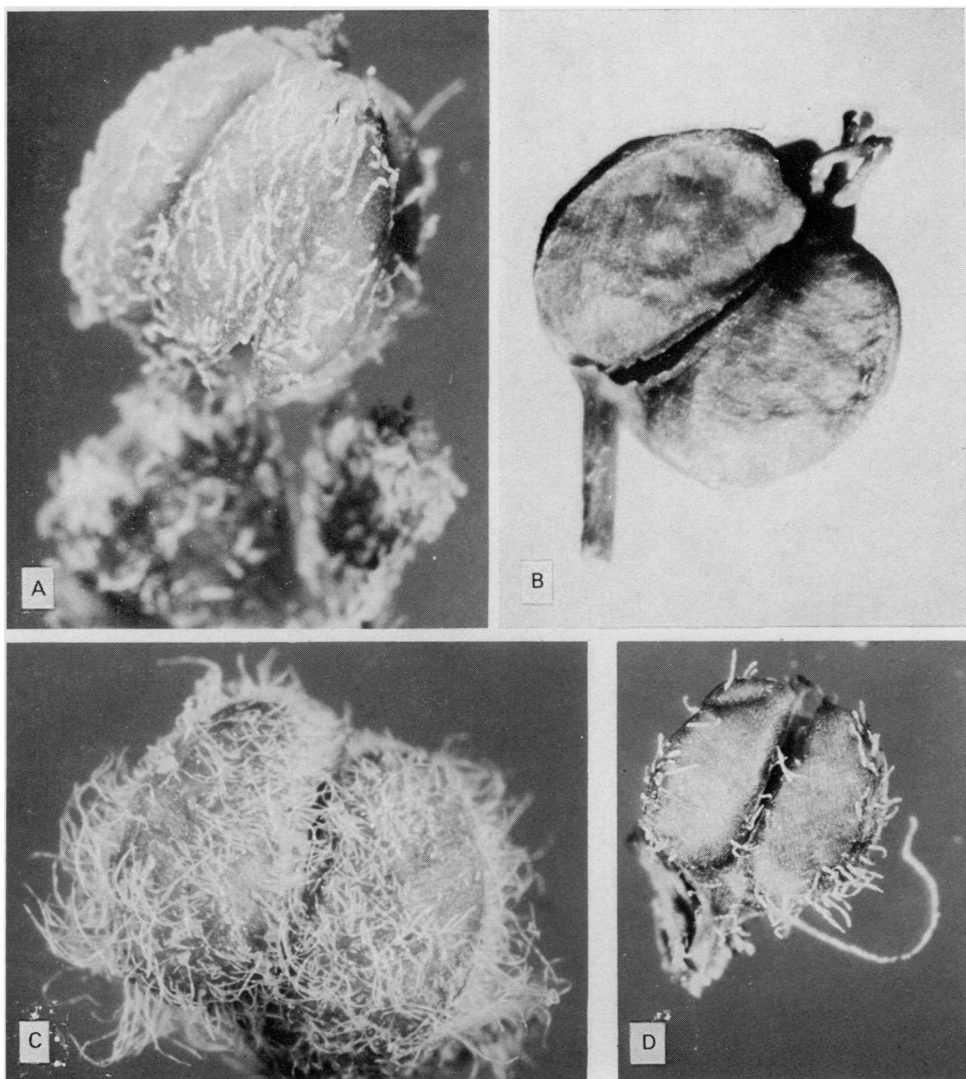


Fig. 2. — Capsules of *Euphorbia* L. species in Egypt ( $\times 15$ ): a, *E. forskalii* J. Gay, adpressed hairs all over; b, *E. inaequilatera* Sond., glabrous; c, *E. scordifolia* Jacq., densely hairy; d, *E. prostrata* Ait., spreading hairs along the acute angles only.