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Studies on the flora of Jordan

4. On the desert flora north-east of Aqaba

LOUTFY BOULOS & JAMIL LAHHAM

Résumé

Boulos, L. & J. Lahham (1977). Etude de la flore de Jordanie 4. Flore du désert au nord-est d'Aqaba. *Candollea* 32: 81-98. En anglais.

Les auteurs énumèrent 250 espèces de plantes vasculaires récoltées en 1974 et en 1975 entre Wadi Yutum et Wadi Rum, en y joignant à l'occasion des remarques d'écologie, de phénologie et de répartition.

Abstract

Boulos, L. & J. Lahham (1977). Studies on the flora of Jordan 4. On the desert flora north-east of Aqaba. *Candollea* 32: 81-98. French abstract.

The authors enumerate 250 species of vascular plants collected, mainly in 1974 and 1975, in the area between Wadi Yutum and Wadi Rum. Occasional notes on ecology, phenology and distribution are added.

The area covered in the present study is defined from the north by the paved junction to Wadi Rum Rest House from the Amman–Aqaba highway at about 50 km N.E. of Aqaba, and from the east by the track to Wadi Rum Police Station, which joins the highway at Khirbet Kithara, some 15 km N.E.E. of Aqaba. At Khirbet Kithara, Wadi Yutum downstream extends to the west for about 6 km, while upstream ends at about 15 km N.N.E. of Khirbet Kithara.

Our area is located within the basement complex that is a part of the Arabian Shield. The rocks are mainly granodioritic and granitic, with numerous dikes of diabase and aplite granite. In the northern part, Cambrian sandstone overlies the Precambrian basement complex. The soil varies from sandy to sandy-clayey, with gravels in some areas.

The mean annual rainfall at Wadi Rum Police Station is 75.2 mm. The highest observed rainfall in 24 hours is 34.5 mm (March 1972). The mean maximum air temperature is 34.6°C in July. The mean minimum air temperature is 4.6°C in January. The altitude is 952 m.

The following is a list of the localities from which collections were made (see map, fig. 1).

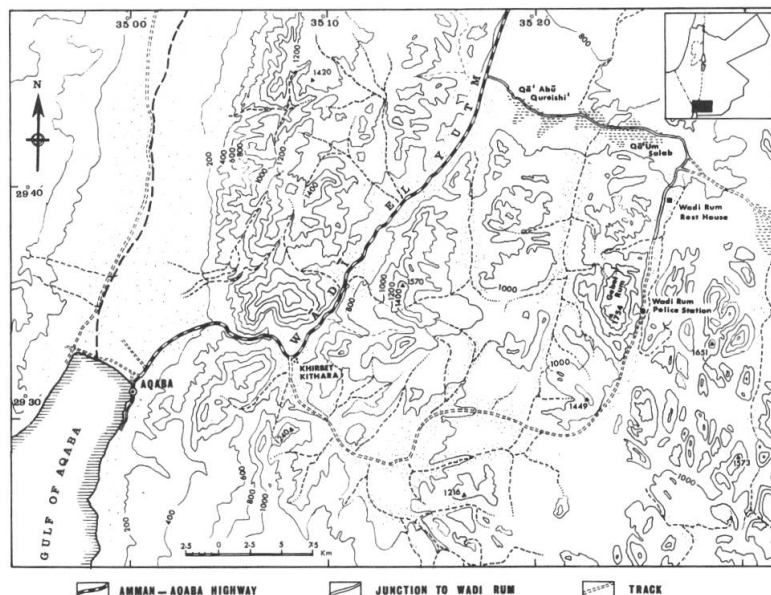


Fig. 1. – Map of the area N.E. of Aqaba, Jordan.

- 6085-6117: 6 km N. of Aqaba, 13.3.1974, *B.*, *A-E.* & *J.*¹
 163-166: *idem*, *J.*
 6118-6202: 10-12 km N. of Aqaba, 13.3.1974, *B.*, *A-E.* & *J.*
 152-162: *idem*, *J.*
 6203-6217: Wadi Rum, near the Rest House, 14.3.1974, *B.*, *A-E.* & *J.*
 178-181: *idem*, *J.*
 6218: 5 km W. of Wadi Rum Rest House, 14.3.1974, *B.*, *A-E.* & *J.*
 6650-6695: 9 km N. of Aqaba, 5.4.1974, *B.*, *J.* & *L.*
 316-325: *idem*, *J.*
 167-177: 9 km N. of Aqaba, 13.3.1974, *J.*
 7445-7505: Wadi Yutum upstream, 15 km N. of Aqaba, 21.3.1975, *B.*, *J.*, *L.* & *A-H.*
 251-252: *idem*, *L.*
 50-55: *idem*, *T.*

¹Collectors' names are abbreviated as follows: *A.* = D. Addis; *A-E.* = D. Al-Eisawi; *A-H.* = M. A. Abu-Hmaidan; *B.* = L. Boulos; *J.* = W. Jallad; *L.* = J. Lahham; *Q.* = M. Qumsiyeh; *T.* = M. Z. Tarabeih.

- 7506-7534: Wadi Yutum, on the slopes along the road, 9 km N. of Aqaba, 21.3.1975, B., J., L. & A-H.
 253: idem, L.
 56-57: idem, T.
 7535-7561: Wadi Yutum, on the roadside, 12 km N. of Aqaba, 21.3.1975, B., J., L. & A-H.
 7562-7576: 30 km S.W. of Rum Police Station, along the track to Aqaba, 23.3.-1975, B., J., L. & A-H.
 7577-7596: 15-16 km S.E. of Rum Police Station, along the track to Aqaba, 23.3.1975, B., J., L. & A-H.
 7597-7669: 6-7 km S. of Wadi Rum Rest House, 23.3.1975, B., J., L. & A-H.

Some of the species recorded from this locality are halo- and hydrophytes, e.g.: *Mentha longifolia* subsp. *typhoides*, *Zannichellia palustris*, *Juncus bufonius* and *Samolus valerandi*. These plants grow in and around a small water pool. The site could easily be seen from a distance, due to the presence of a large *Acacia gerrardii* var. *negevensis* tree on the western side of the wadi at a few hundred metres up the hilly slopes.

Another microclimate is created due to the presence of a protected area within eroded rocks near the pool, which forms an open cave with a large shelf as a shelter. This supports the growth of some shade-loving plants, e.g.: *Adiantum capillus-veneris*, some mosses, and shade forms of several desert species. The drooping branches of *Capparis spinosa* are also typical of such habitats; the latter species forms a conspicuous part of the shrub vegetation.

- 7670-7709: 4 km S. of Wadi Rum Rest House, along the road to Rum Police Station, 23.3.1975, B., J., L. & A-H.
 7710-7750: 3-4 km W. of Wadi Rum Rest House (c. 18 km from the main road to Aqaba), 23.3.1975, B., J., L. & A-H.
 7751-7791: vicinity of Wadi Rum Rest House, 23.3.1975, B., J., L. & A-H.
 7812-7821: 7 km S. of Wadi Rum junction, 4.4.1975, B. & J.
 7822-7826: 2 km S. of Wadi Rum Rest House, 4.4.1975, B. & J.
 8545: 10 km N. of Aqaba, 1.5.1976, B., A. & Q.

The number of taxa recorded from the area is 256, which includes 250 species and 6 varieties belonging to 45 families. The largest families are: *Compositae*: 41 species; *Cruciferae*: 24 species and 1 variety; *Gramineae*: 23 species, and *Leguminosae*: 20 species and 2 varieties. It is remarkable that out of about 80 species of *Umbelliferae* known from Jordan, only 1 species is recorded from our area. The main centre of distribution of this family in Jordan seems to be in the N.W.

Specimens of the above-mentioned collections were deposited in the Herbarium, Faculty of Science, University of Jordan, Amman, Jordan. Duplicates were distributed to the following herbaria: AAU, ATH, ATHU, BM, C, CAI, E, G, H, K, LD, RNG, S and ZT.

The following is an alphabetically arranged list of the families, with the genera and species related to them. The numbers refer to the localities from which the specimens were collected. The abbreviations used in the text are:

- fl. = flowering specimen
 fr. = fruiting specimen
 ster. = sterile specimen, without flowers or fruits.

Acanthaceae

Blepharis ciliaris (L.) B. L. Burtt
 7532 (seedlings, ster.).

Aizoaceae

Aizoon canariense L.
 6106 (fl., fr.) – 6681 (fl., fr.).

Amaranthaceae

Aerva persica (Burm. fil.) Merr.
 6141 (fl.) – 6664 (fl.) – 7557 (fl.).
 Fairly common shrublet, often with thicker growth in protected parts.

Asclepiadaceae

Caralluma cf. **aaronis** (Hart) N. E. Br.
 7750 (young fr.). Locally fairly common in sheltered fissures facing southeast.

Pergularia tomentosa L.
 6183 (fl.) – 6655 (fl., fr.) – 7556 (fl., fr.).

Periploca angustifolia Labill.
 7653 (fl., fr.).

Boraginaceae

Anchusa aegyptiaca (L.) DC.
 7501 (fl., fr.) – 7661 (fl., fr.).

Asperugo procumbens L.
 7598 (fl., fr.).

Echium longifolium Delile
 6095 (fl.).

Gastroctyle hispida (Forsskål) Bunge
 6158 (fl.) – 6211 (fl.) – 7657 (fl., fr.) – 7676 (fl., fr.) – 7774 (fl., fr.).
 Common annual in sandy and alluvial soils.

Heliotropium arbainense Fresen.
 6654 (fl.) – 7503 (fl.).

Heliotropium ramosissimum (Lehm.) DC.
 6123 (fl.).

Lappula spinocarpos (Forsskål) Ascher-son
 6121 (fl.) – 6207 (seedlings, ster.) – 7473 (fl., fr.) – 7618 (fl., fr.) – 7693 (ster.) – 7769 (fl., fr.).

Onosma orientalis L.
 7653 (fl.).

Paracaryum intermedium (Fresen.) Lipsky
 6126 (fl., fr.) – 6670 (fl., fr.) – 7481 (fl.) – 7542 (fl., fr.) – 7605 (fl., fr.) – 7691 (fl., fr.) – 7726 (fl., fr.) – 7785 (fl., fr.) – 7816 (fl.).
 Delicate small annual, common.

Paracaryum rugulosum (DC.) Boiss.

7681 (fl., fr.). Perennial, rare.

Trichodesma africanum (L.) R. Br. var. **heterotrichum** Bornm. & Kn.

6162 (fl.) – 7553 (fl.) – 7680 (fl.).

*Capparaceae***Capparis spinosa** L.

7636 (ster.). The species concept and nomenclature of this and other related *Capparis* species are discussed by several authors, e.g.: Zohary (1960, 1966), Bočancev (1964b), St John (1965), Täckholm & Boulos (1974).

*Caryophyllaceae***Gymnocarpus decandrum** Forsskål

52 (fl.) – 55 (fl.) – 7704 (fl.) – 7747 (fl.). Common shrub.

Gypsophila arabica Barkoudah

56 (ster.).

Gypsophila viscosa Murr.

7606 (fl.).

Herniaria hirsuta L.

6153 (fl.) – 6673 (fl., fr.).

Minuartia picta (Sibth. & Sm.) Bornm.

6203 (fl.) – 7671 (fl., fr.) – 7771 (fl., fr.).

Paronychia arabica (L.) DC.

7609 (fl.).

Paronychia sinaica Fresen.

6193 (fl., fr.) – 7712 (fl., fr.). The above two species of *Paronychia* are generally restricted to the southern

desert in Jordan. They are replaced by the common *Paronychia argentea* Lam. in the north.

Polycarpaea repens (Forsskål) Ascher-son & Schweinf.

6187 (fl.).

Robbairia delileana Milne-Redhead

50 (fl.) – 54 (fl.) – 57 (fl.) – 6085 (fl., fr.) – 6173 (fl., fr.) – 6678 (fl.) – 7570 (fl., fr.) – 7587 (fl., fr.) – 7689 (fl.) – 7710 (fl.) – 7753 (fl., fr.). One of the commonest desert species in southern Jordan.

Silene colorata Poiret subsp. **oliveriana** (Otth) Rohrb.

6148 (fl.) – 7579 (fl.) – 7623 (fl.) – 7789 (fl.).

Silene conoidea L.

7619 (fl.).

Silene villosa Forsskål

7581 (fl.).

In Jordan *Silene* L. is represented by 25 species, mostly distributed in the temperate, rather than the warmer parts of the country. Zohary (1973), deals with *Silene* species of Palestine and the Middle East, with special emphasis on their geographical distribution, endemism, ecology, etc.

Spergularia diandra (Guss.) Heldr. & Sart.

7603 (fl., fr.).

Telephium sphaerospermum Boiss.

51 (fl., fr.) – 7686 (fl.) – 7714 (fl., fr.).

*Chenopodiaceae***Atriplex dimorphostegia** Kar. & Kir.

6210 (ster.) – 7649 (ster.) – 7755 (ster.) – 7808 (fl., fr.).

Bassia latifolia (Fresen.) Ascherson & Schweinf.

7751 (fl.) – 7810 (fl.).

Bassia muricata (L.) Murr.

6091 (fl.) – 6152 (fl., fr.) – 6206 (seedlings) – 7644 (fl.) – 7761 (fl.) – 7811 (fl., fr.).

Chenopodium murale L.

7475 (fl.).

Halogeton alopecuroides (Delile) Moq.

7737 (ster.).

Haloxyton persicum Bunge

6218 (fl.) – 7791 (fl.). Shrub or small tree up to 4 m high. Unfortunately the larger specimens are becoming rare as the Bedouins cut them down for fuel.

*Cistaceae***Helianthemum kahiricum** Delile

7510 (fl.) – 7734 (fl.).

Helianthemum ledifolium (L.) Miller

7600 (fl., fr.) – 7759 (fl., fr.).

Helianthemum lippii (L.) Dum.-Courset

6200 (fl.) – 7703 (fl.) – 7736 (fl., fr.).

Helianthemum ventosum Boiss.

7496 (fl., fr.).

*Cleomaceae***Cleome amblyocarpa** Barratte & Murb.

6159 (fl., fr.) – 6665 (fl., fr.) – 7486 (fl., fr.) – 7522 (fl., fr.) – 7573 (fl.).

Cleome arabica L.

6137 (fl., fr.) – 7484 (fl., fr.) – 7517 (fl., fr.) – 7571 (fl., fr.). The nomenclature of the above two species is discussed by Bočancev (1964a, 1968) and Kers (1966).

Cleome droserifolia (Forsskål) Delile

6197 (fr.) – 7519 (fr.).

*Compositae*¹**Aaronsohnia faktorovskyi** Warburg & Eig

6119 (fl., fr.) – 7728 (fl., fr.).

Anthemis deserti Boiss.

6695 (fl.).

Anthemis melampodina Delile

6154 (fl.).

Anthemis sp.

7778 (fl.).

Artemisia inculta Delile

= *A. herba-alba* Asso

6174 (fl.) – 6677 (ster.).

Artemisia judaica L.

7593 (fl., fr.) – 7821 (fl., fr.). Three species are known from Jordan: *Artemisia judaica* is restricted to the southwestern desert; *A. inculta*, a very com-

¹ See Täckholm (1974), and Davis (1975).

mon desert shrublet, is dominant in many regions forming the *Artemisietum herbae-albae* association (Zohary 1962, 1973); *A. monosperma* Delile seems to be rare, and was only collected once by Boulos, Al-Eisawi & Jallad from Ras en Naqb area in 1974.

Asteriscus graveolens Less.

7475 (fl.) – 7527 (fl.).

Asteriscus pygmaeus (DC.) Cosson & Durieu

6125 (fl.) – 6684 (fl.).

Asteropterus leyseroides (Desf.) Rothm.

6149 (fl., fr.) – 7544 (fl., fr.) – 7630 (fl., fr.) – 7732 (fl., fr.). A rather common annual in shallow soils. For synonyms, see Täckholm (1974).

Atractylis carduus (Forsskål) C. Chr.

7575 (fl., fr.) – 7781 (fl.).

Calendula arvensis L.

7620 (fl., fr.) – 7767 (fl., fr.). According to Heyn & al. (1974), our specimens may be referred to the *Calendula arvensis* complex. For synonyms, chromosome records, and relationships see Heyn & al., l.c.

Carthamus cf. glaucus M.B.

7707 (ster.).

Centaurea cf. araneosa Boiss.

7787 (fl.).

Centaurea calcitrapella Bornm. & Dinsm.

7633 (fl., fr.) – 7813 (fl., fr.).

Centaurea eryngioides Lam.

7740 (fl.).

Centaurea laxa Boiss. & Hausskn.

7678 (fl.).

Centaurea pallescens Delile

6104 (fl., fr.) – 6133 (fl.) – 6688 (fl., fr.) – 7543 (fl.) – 7631 (fl.).

Filago desertorum Pomel

6176 (fl.) – 6675 (fl.) – 6694 (fl., fr.) – 7447 (fl., fr.).

Filago sp.

7537 (fl., fr.). A tiny ephemeral, 1-5 cm. Specimens collected c. 5 km S.E. of Aqaba, Boulos 5396, may refer to this species; see Boulos & Lahham (1977).

Ifloga spicata (Forsskål) Schultz Bip.

6092 (fl., fr.) – 6157 (fl., fr.) – 6663 (fl., fr.) – 7452 (fl., fr.) – 7604 (fl., fr.) – 7768 (fl., fr.). Common small annual, in shallow sandy soils.

Iphiona mucronata (Forsskål) Ascherson & Schweinf.

7746 (ster.). Another species: *Iphiona scabra* DC. is recorded from a desert wadi 8 km S. of Aqaba (Boulos & Lahham 1977). Both species are restricted to the S.W. corner of Jordan, which is the hottest desert in the country. Zohary (1962), cites *Iphiona* Cass. among other genera such as *Cleome* L., *Caralluma* R. Br., *Trichodesma* R. Br., etc., in the "Flora palaestina" as being of Sudanian or tropical origin.

Jasonia montana (Vahl) Botsch.

7555 (ster.).

Koelpinia linearis Pallas

7562 (fl., fr.) – 7607 (fl., fr.) – 7776 (fl., fr.).

Lasiopogon muscoides (Desf.) DC.

6146 (fl., fr.) – 6204 (fl.) – 7679 (fl., fr.).

Lasiospermum brachyglossum DC. (det. C. Jeffrey)

7455B (fl., fr.). Native of S. Africa, new to Jordan.

Launaea capitata (Sprengel) Dandy

6672 (fl., fr.).

Launaea mucronata (Forsskål) Muschler

6094 (fl.) – 6175 (ster.) – 7588 (fl.).

Launaea nudicaulis (L.) Hooker fil.

6163 (fl., fr.) – 7520 (fl., fr.) – 7551 (fl., fr.) – 7730 (fl., fr.).

Launaea spinosa (Forsskål) Schultz Bip.

6171 (ster.) – 7498 (fr.). The genus *Launaea* Cass. is represented in Jordan by the above four species.

Phagnalon rupestre (L.) DC.

7650 (fl., fr.) – 7720 (fl.).

Picris asplenioides L.

= *P. radicata* Forsskål; *P. lyrata* Delile; *P. pilosa* Delile

6098 (fl., fr.) – 6135 (fl., fr.) – 6682 (fl., fr.).

Picris babylonica Hand.-Mazz.

7779 (fl., fr.) – 7817 (fl., fr.).

Picris longirostris Schultz Bip.

= *P. damascena* Boiss. & Gaill.; *P. blancheana* Boiss.; *P. desertorum* Nábelék

7464 (fl., fr.) – 7694 (fl., fr.).

Pulicaria undulata (L.) Kostel.

6101 (fl., fr.) – 6132 (fl., fr.) – 6674 (fl., fr.) – 7497 (fl., fr.) – 7508 (fl., fr.).

Reichardia tingitana (L.) Roth

6120 (fl., fr.) – 6686 (fl., fr.) – 7462 (fl., fr.) – 7744 (fl., fr.) – 7782 (fl., fr.).

Scorzonera mollis M.B.

7683 (ster.).

Scorzonera pseudolanata Grossh.

7698 (fl., fr.).

Senecio coronopifolius Desf.

6156 (fl., fr.) – 7450 (fl., fr.) – 7576A (fl., fr.) – 7675 (fl., fr.).

Senecio flavus (Decne) Schultz Bip.

6090 (fl., fr.) – 6151 (fl., fr.) – 6683 (fl., fr.) – 7460 (fl., fr.) – 7541 (fl., fr.) – 7645 (fl., fr.).

Tripleurospermum auriculatum (Boiss.) Rech. fil.

= *Chamaemelum auriculatum* Boiss.

7455A (fl., fr.).

Urospermum picroides (L.) F. W. Schmidt

7647 (fl., fr.).

*Cruciferae*¹**Biscutella didyma** L.

7601 (fl., fr.) – 7690 (fl., fr.).

¹The following specimens belonging to this family were determined by W. Jallad, and most of the collections were made by him.

- Brassica tournefortii** Gouan
175A (fl., fr.).
- Clypeola jonthlaspi** L.
7696 (fl., fr.).
- Diplotaxis acris** (Forsskål) Boiss.
156B (fl., fr.).
- Diplotaxis harra** (Forsskål) Boiss.
156A (fl., fr.) – 161 (fl., fr.) – 175B (fl.) – 325 (fl., fr.) – 7489 (fl., fr.) – 7506 (fl., fr.). Specimens of this species kept together with *Cleome amblyocarpa* Barratte & Murb. in the same polyethylene bag during collection changed colour from yellow to purple; the new colour is still retained by the herbarium specimens. Boulos & Jallad (1975) report five species of *Diplotaxis* DC. in Jordan.
- Eremobium aegyptiacum** (Sprengel) Ascherson & Schweinf. ex Boiss. var. *lineare* (Delile) Zoh.
7566 (fl., fr.) – 7584 (fl., fr.).
- Eremobium diffusum** (Decne) Botsch.
179B (fl.) – 320 (fl., fr.).
- Erucaria boveana** Cosson
169 (fl., fr.) – 322 (fl., fr.).
- Farsetia aegyptia** Turra
152 (fl., fr.) – 7554 (fl., fr.) – 7663 (fl.).
- Isatis lusitanica** L.
170 (fl.) – 319 (fl., fr.).
- Leptaleum filifolium** (Willd.) DC.
7818 (fl., fr.).
- Malcolmia africana** (L.) R. Br.
181 (fl.).
- Maresia pygmaea** (Delile) O. E. Schulz
180 (fl., fr.).
- Matthiola longipetala** (Vent.) DC. var. *bicornis* (Sibth. & Sm.) Zoh.
160 (fl., fr.) – 165 (fl., fr.).
- Matthiola longipetala** (Vent.) DC. var. *longipetala*
172 (fl., fr.) – 323 (fl., fr.).
- Morettia canescens** Boiss.
154 (fl., fr.) – 166 (fl., fr.) – 167 (fl., fr.) – 171 (fl., fr.) – 317 (fl., fr.) – 7493 (fl., fr.) – 7733 (fl.).
- Morettia parviflora** Boiss.
7495 (fl., fr.) – 7513 (fl., fr.) – 7552 (fl., fr.) – 7569 (fl.).
- Notoceras bicornis** (Sol.) Caruel
158 (fl., fr.) – 173 (fl., fr.) – 178 (fl.) – 318 (fl., fr.) – 7814 (fl.).
- Schimpera arabica** Hochst. & Steudel ex Boiss.
7580 (fl.) – 7639 (fl., fr.).
- Sinapis arvensis** L. var. *arvensis*
467A (fr.).
- Sisymbrium bilobum** (C. Koch) Grossh.
7455 (fl., fr.).
- Sisymbrium erysimoides** Desf.
155 (fl., fr.) – 159 (fl., fr.) – 163 (fl., fr.) – 174 (fl., fr.) – 321 (fl., fr.).
- Sisymbrium irio** L.
7499 (fl., fr.) – 7610 (fl., fr.).
- Stigmatella longistyla** Eig
179A (fl.) – 7625 (fl., fr.).

Zilla spinosa (Turra) Prantl

153 (ster.) – 168 (fl., fr.) – 316 (fl., fr.) – 7467 (fl., fr.).

*Cucurbitaceae***Citrullus colocynthis** (L.) Schrader

6169 (ster.).

Cucumis prophetarum L.

6109 (fl.) – 6165 (fl., fr.) – 6679 (fl., fr.) – 7525 (fl., fr.).

*Cyperaceae***Scirpus holoschoenus** L.

7662 (fl.). In the vicinity of a water pool.

*Euphorbiaceae***Andrachne aspera** Sprengel

251 (fl., fr.) – 6190 (fl., fr.).

Andrachne telephioides L.

6195 (fl., fr.).

Chrozophora oblongifolia (Delile) A. Juss. ex Sprengel

253 (fl., fr.) – 6199 (fl., fr.).

Euphorbia chamaepeplus Boiss. & Gaill.

252 (fl., fr.) – 6196 (fl., fr.) – 6669 (fl., fr.) – 7715 (fl., fr.).

*Geraniaceae***Erodium deserti** (Eig) Eig

7448 (fl., fr.) – 7617 (fl., fr.).

Erodium glaucophyllum (L.) Aiton

6112 (fl., fr.).

Erodium hirtum Willd.

7483 (fl.) – 7702 (ster.).

Erodium laciniatum (Cav.) Willd. var. **laciniatum**

6130 (fl., fr.) – 6213 (fl., fr.) – 7577 (fl., fr.).

Erodium laciniatum (Cav.) Willd. var. **pulverulentum** (Cav.) Boiss.

7461 (fl., fr.) – 7611 (fl., fr.) – 7719 (fl., fr.) – 7757 (fl., fr.) – 7812 (fl., fr.).

Erodium oxyrhynchum M.B.

7692 (fl.).

Monsonia nivea (Decne) Decne

6103 (fl., fr.) – 7766 (fl., fr.).

*Gramineae***Aegilops caudata** L.

7825 (fl., fr.).

Aegilops kotschyi Boiss.

7822 (fl.).

Aristida adscensionis L.

7480 (fl.).

Bromus tectorum L.

7624 (fl.) – 7758 (fl.).

Bromus sp.

7672 (fl.).

Cenchrus ciliaris L.

6198 (fl.) – 7454 (fl.).

Cutandia dichotoma (Forsskål) Trabut

7590 (fl.).

Cutandia memphitica (Sprengel)
Bentham

7613 (fl.) – 7786 (fl.) – 7826 (fl.).

Cynodon dactylon (L.) Pers.

7638 (fl.).

Enneapogon desvauxii Beauv.

6116 (fl.) – 7533 (fl.).

Enneapogon sp.

7528 (fl.).

Hordeum glaucum Steudel

7568 (fl.) – 7627 (fl.).

Lophochloa pumila (Desf.) Bor

7446 (fl.).

Poa bulbosa L.

7688 (fl.) – 7742 (fl.). A polymorphic species that needs revision in Jordan. Specimens from the above and other localities could be confused with *Poa sinaica* Steudel. Bor (1968) shows that in Iraq both species occur in almost separated geographical areas.

Schismus barbatus (L.) Thell.

6086 (fl.) – 6662 (fl., fr.) – 7515 (fl.) – 7545 (fl.) – 7565 (fl.) – 7597 (fl.) – 7773 (fl.). Täckholm & al. (1941), Täckholm (1974), consider *Schismus arabicus* Nees as a synonym of *S. barbatus*. Other authors consider it as a subspecies: *S. barbatus* (L.) Thell. subsp. *arabicus* (Nees) Maire & Weiller. Haines (1962, cited by Bor 1968), Bor (1964, 1968) and others consider both taxa as two distinct species. However, Bor (1968: 377) writes: "It is proposed in this work to retain them as distinct, mainly on the authority of Haines (in Agnew, Bull. Coll. Sci. Univ. Baghdad 6, suppl.: 87.

1962) who has had very considerable experience of this genus in the field. It is extremely likely that hybridisation occurs, since both these species grow together, and this may be the real reason for much of the difficulty". It is obvious that it is extremely difficult for a non-specialist to separate both 'taxa', especially when one deals with intermediate forms. It is proposed here to list *Schismus arabicus* Nees in the synonymy under *S. barbatus* (L.) Thell. unless future studies reveal distinct differences between them.

Sclerochloa woronowii (Hack.) Tzvelev

6209 (fl.).

Stipa capensis Thunb.

6088 (fl.) – 7474 (fl.) – 7784 (fl.).

Stipagrostis obtusa (Delile) Nees

6194 (fl.) – 7820 (fl.).

Stipagrostis plumosa (L.) Munro ex T. Anders.

6110 (fl.) – 6177 (fl.) – 7591 (fl.).

Stipagrostis sp.

7530 (fl.).

Tetrapogon villosus Desf.

7526 (fl.) – 7705 (fl.) – 7713 (fl.).

Trachynia distachya (L.) Link

6189 (fl.).

Tricholaena teneriffae (L. fil.) Link

6185 (fl.) – 7548 (fl.).

*Hypocoaceae***Hypocoum imberbe** Sibth & Sm.

7780 (fl., fr.).

Hypocoum pendulum L.

6161 (fl., fr.) – 7809 (fr.).

*Iridaceae***Iris sisyrinchium** L.

7594 (fl., fr.) – 7701 (fl.) – 7741 (fl., fr.).

*Juncaceae***Juncus bufonius** L.

7641 (fl.).

Juncus rigidus Desf.= *J. arabicus* (Ascherson & Buch) Adams7660 (fl., fr.). Both *Juncus* species were growing on the borders of a small water pool.*Labiatae***Ajuga chia** (Poiret) Schreber7608 (fl., fr.). Ball (in Tutin & al. 1972), treats this perennial species as a subspecies of the annual *Ajuga chamaepitys* (L.) Schreber.**Ballota undulata** (Sieb. ex Fresen.)
Bentham

7735 (ster.).

Lavandula stricta Delile

6139 (fl.) – 7500 (fl., fr.) – 7523 (fl.) – 7738 (fl.).

Mentha longifolia (L.) L. subsp. *typhoides* (Briq.)

7654 (fl.).

Micromeria myrtifolia Boiss. & Hohen.

7477 (fl.).

Micromeria sp.

7700 (ster.) – 7748 (ster.).

Salvia aegyptiaca L.

7456 (fl., fr.) – 7634 (fl., fr.).

Salvia deserti Decne

6201 (fl.) – 7470 (fl.) – 7511 (fl.).

Salvia lanigera Poiret

7458 (fl., fr.).

Stachys aegyptiaca Pers.

7664 (fl.).

Teucrium polium L.

6142 (ster.).

*Leguminosae*¹**Acacia gerrardii** Bentham subsp. *negevensis* Zoh.

7667 (fr.).

Argyrolobium crotalarioides Jaub. & Spach

7559 (fl.).

Astragalus acinaciferus Boiss.

7592 (fl., fr.).

Astragalus bombycinus Boiss.

7491 (fl., fr.) – 7512 (fl., fr.) – 7682 (fl., fr.).

Astragalus eremophilus Boiss.

6089 (fl., fr.).

¹See Davis (1970), Zohary (1972), Townsend & Guest (1974) and Täckholm (1974).

Astragalus sparsus Delile ex Decne

6155 (fl.) – 7550 (fl.). Calyx reddish-brown, corolla greenish-yellow.

Astragalus spinosus (Forsskål) Mutschler

7482 (fl., fr.) – 7595 (fl.).

Astragalus tribuloides Delile var. *el-arishensis* Eig

6129 (ster.).

Astragalus tribuloides Delile var. *minus* (Boiss.) Boiss.

7725 (fl.).

Astragalus tribuloides Delile var. *tribuloides*

6131 (fl., fr.) – 6685 (fl., fr.) – 7536 (fl., fr.) – 7564 (fl.) – 7589 (fl., fr.) – 7752 (fl., fr.).

Cassia italica (Miller) Lam. ex Steudel

6652 (fl., fr.).

Crotalaria aegyptiaca Benth

6144 (fl., fr.) – 7560 (fl., fr.).

Lotononis platycarpa (Viv.) Pichi-Sermolli

6099 (fl., fr.) – 7502 (fl., fr.) – 7529 (fl., fr.) – 7538 (fl., fr.) – 7558 (fl., fr.).

Medicago laciniata (L.) Miller var. *laciniata*

6191 (fl.) – 7578 (fl., fr.) – 7615 (fl., fr.) – 7756 (fl., fr.).

Ononis natrix L.

7616 (fl.) – 7788 (fl.).

Ononis serrata Forsskål

7567 (fl.) – 7582 (fl., fr.) – 7724 (fl.) – 7754 (fl.).

Ononis sicula Guss.

6687 (fl., fr.).

Retama raetam (Forsskål) Webb & Berth.

7709 (fl.) – 7790 (fl.).

Tephrosia apollinea (Delile) Link

6143 (fr.).

Trigonella astroites Fischer & Meyer

7599 (fl., fr.) – 7824 (fl., fr.).

Trigonella cf. moabitica Zoh.

6691 (fl., fr.).

Trigonella stellata Forsskål

6102 (fl., fr.) – 6170 (fl., fr.) – 6215 (old fr.) – 7449 (fl., fr.) – 7546 (fl., fr.) – 7629 (fl., fr.) – 7718 (fl., fr.).

*Liliaceae***Asphodelus tenuifolius** Cav.

6105 (fl., fr.) – 6659 (fl., fr.) – 7487 (fl.) – 7572 (fl., fr.) – 7727 (fl., fr.) – 7783 (fl., fr.).

Bellevalia cf. zoharyi Feinbrun

7628 (fr.).

Bellevalia sp.

7670 (fr.).

Colchicum ritchii R. Br.

6216 (fl.) – 7656 (fr.) – 7685 (fr.) – 7739 (fr.).

Gagea reticulata (Pallas) A. & H. Schultes

6214 (fl.).

Urginea maritima (L.) Baker

7504 (ster.).

*Loranthaceae***Loranthus acaciae** Zucc.

7505 (ster.) – 8545 (fl.). Flowers bright crimson red; parasitic on *Acacia raddiana*, was not observed on *A. tortilis*.

*Malvaceae***Abutilon fruticosum** Guill. & Perr.

6178 (ster.) – 7520 (fl.).

Hibiscus micranthus L. fil.

6180 (ster.).

Malva parviflora L.

7468 (fl., fr.) – 7622 (fl., fr.) – 7765 (fl.).

Malvella sherardiana (L.) Jaub. & Spach

6179 (ster.).

*Moraceae***Ficus pseudosycomorus** Decne

6167 (ster.) – 7666 (fr.).

*Neuradaceae***Neurada procumbens** L.

7763 (fl., fr.).

*Nyctaginaceae***Boerhavia diffusa** L.

6653 (ster.).

Boerhavia repens L.

6118 (fl.) – 7472 (ster.) – 7534 (fl.).

*Orobanchaceae***Cistanche tubulosa** (Schenk) Wight

7596 (fl.).

*Papaveraceae***Papaver glaucum** Boiss. & Hausskn. ex Boiss.

6671 (fr.) – 7476 (fr.) – 7602 (fl., fr.) – 7674 (fr.). For distribution in Jordan see Boulos & al., 1975.

Roemeria hybrida (L.) DC.

7677 (fl., fr.) – 7716 (fl., fr.) – 7819 (fl., fr.).

*Plantaginaceae***Plantago afra** L.

6184 (fl., fr.) – 7445 (fl., fr.) – 7642 (fl., fr.) – 7722 (fl., fr.).

Plantago ciliata Desf.

6147 (fl.) – 6690 (fl., fr.).

Plantago coronopus L.

7815 (fl., fr.).

Plantago cylindrica Forsskål

6145 (fl.).

Plantago ovata Forsskål

6093 (fl., fr.) – 6693 (fl., fr.) – 7463 (fl.) – 7673 (fl., fr.) – 7717 (fl., fr.) – 7764 (fl., fr.).

*Polygonaceae***Emex spinosa** (L.) Campd.

6124 (fl.) – 6212 (ster.) – 7466 (fl., fr.).

Rumex cyprius Murb. emend. Sam.

6108 (fl.) – 6127 (fl.) – 6651 (fl., fr.) – 7695 (fl., fr.).

*Primulaceae***Samolus valerandi** L.

7643 (ster.).

*Ranunculaceae***Ranunculus asiaticus** L.

7687 (fl.). Flowers scarlet red; in Jordan this seems to be the only colour for this species. The present locality is apparently the most southern for the species in Jordan. This may be attributed to the high altitude, c. 950 m. The species is mainly located in the northwest; but it is also found as far S. as the Amman area.

*Resedaceae***Caylusea hexagyna** (Forsskål) Green

6122 (fl., fr.) – 6676 (fl.) – 7488 (fl., fr.).

Ochradenus baccatus Delile

6689 (fl.) – 7531 (fl.) – 7632 (fl., fr.) – 7749 (fl.).

Oligomeris linifolia (Vahl) Macbride

5506 (fl., fr.).

Reseda arabica Boiss.

6097 (fl.).

Reseda decursiva Forsskål

6164 (fl.).

Reseda muricata C. Presl

6166 (fl.) – 6658 (fl.) – 7485 (fl.) – 7524 (fl.) – 7547 (fl.) – 7658 (fl.).

*Rubiaceae***Callipeltis cucullaris** (L.) Rothm. var. *aptera* (Boiss. & Buhse) Rech. fil. & Ehrend.

6128 (fl.) – 7721 (fl., fr.).

Crucianella herbacea Forsskål

6115 (ster.) – 6138 (ster.) – 7612 (fl.) – 7775 (ster.).

Galium canum Req.

7640 (ster.).

Galium setaceum Lam.

6188 (fl.) – 6667 (fl.) – 7453 (fl.) – 7535 (fl.).

*Scrophulariaceae***Kickxia acerbiana** (Boiss.) Täckh. & Boulos

7540 (fl.) – 7516 (fl., fr.).

Kickxia cf. commutata (Bernh. ex Reichenb.) Fritsch

6202 (fl.).

Kickxia floribunda (Boiss.) Täckh. & Boulos

6650 (fl.) – 7494 (fl., fr.) – 7684 (fl.) – 7711 (fl.).

Kickxia spartioides (Brouss.) Janchen

6134 (fl., fr.) – 7490 (fl., fr.).

Linaria haelava (Forsskål) Delile

6150 (fl., fr.) – 6205 (fl.) – 6668 (fl., fr.) – 7576B (fl., fr.) – 7585 (fl.).

Linaria simplex (Willd.) DC.

7823 (fr.).

Misopates orontium (L.) Rafin.
= *Antirrhinum orontium* L.

6666 (fl., fr.).

Scrophularia deserti Delile

6140 (fl.) – 7549 (fl.) – 7574 (fl., fr.).

Verbascum cf. schimperanum Boiss.

6656 (fl.) – 7561 (fl.).

Veronica anagallis-aquatica L.

7614 (fl., fr.). Growing on the edge of a small water pool.

Solanaceae

Hyoscyamus aureus L.

7646 (fl.).

Hyoscyamus pusillus L.

6111 (fl., fr.) – 6217 (fl.) – 6692 (fl.) – 7451 (fl., fr.) – 7586 (fl., fr.) – 7659 (fl., fr.) – 7760 (fl., fr.).

Lycium shawii Roemer & Schultes

7469 (fr.) – 7706 (ster.).

Solanum nigrum L.

7478 (fl., fr.) – 7563 (fl., fr.) – 7651 (fl., fr.).

Withania somnifera L.

7479 (ster.).

Umbelliferae

Anisosciadium isosciadium Bornm.

7637 (fl.).

Urticaceae

Forsskaolea tenacissima L.

6113 (fl.) – 6186 (fl.) – 6661 (fl.) – 7518 (fl.).

Parietaria alsinifolia Delile

6117 (fl.) – 6136 (fl., fr.) – 6660 (fl., fr.) – 7539 (fl., fr.) – 7723 (fl., fr.).

Zannichelliaceae

Zannichellia palustris L.

7669 (fr.).

Zygophyllaceae

Fagonia bruguieri DC. var. **bruguieri**

7509 (fl., fr.).

Fagonia bruguieri DC. var. **laxa** Boiss.

6172 (fl., fr.) – 7699 (fl.) – 7745 (fl.). Flowers pink, fading whitish.

Fagonia glutinosa Delile var. **grandiflora** Boiss.

7583 (fl., fr.) – 7626 (ster.) – 7697 (fl., fr.) – 7770 (ster.).

Fagonia mollis Delile var. **densiglandulosa** Hadidi

7655 (fl.) – 7743 (fl.).

Fagonia mollis Delile var. **mollis**

6160 (fl., fr.) – 6657 (fl., fr.) – 7492 (fl., fr.) – 7507 (fl., fr.).

Fagonia olivieri DC.

7509 (fl., fr.).

Peganum harmala L.

7648 (ster.).

Tribulus bimucronatus Viv.

7471 (fl., fr.) – 7514 (fl., fr.).

Tribulus terrestris L.

6100 (fl., fr.).

*Adiantaceae***Adiantum capillus-veneris** L.

7665 (fertile).

*Sinopteridaceae***Cheilanthes catanensis** (Cosent.) H. P.

Fuchs

7729 (fertile).

Cheilanthes fragrans (L.) Swartz

7731 (fertile).

*Ephedraceae***Ephedra alte** C. A. Meyer

7708 (male: fl.; female: fl.).

Ephedra peduncularis Boiss.

6168 (female: fl.).

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