Zeitschrift: Candollea : journal international de botanique systématique = international journal of systematic botany
Herausgeber: Conservatoire et Jardin botaniques de la Ville de Genève
Band: 42 (1987)
Heft: 1

Artikel: A contribution to the Flora of Kuwait
Autor: Boulos, Loutfy
DOI: https://doi.org/10.5169/seals-879945

A contribution to the Flora of Kuwait

LOUTFY BOULOS

RÉSUMÉ

BOULOS, L. (1987). Une contribution à la flore du Kowait. *Candollea* 42: 263-275. En anglais, résumé français.

Une brève histoire des voyages de récoltes et des collections faites par l'auteur en Arabie depuis 1973 est fournie avec les références des herbiers où elles sont conservées. 22 espèces de phanérogames nouvelles pour la flore du Kowait sont présentées dont 20 sont des adventices des cultures et 2 des plantes désertiques. Trois familles et 13 genres sont signalés du Kowait pour la première fois.

ABSTRACT

BOULOS, L. (1987). A contribution to the Flora of Kuwait. *Candollea* 42: 263-275. In English, French abstract.

A brief history of the collecting trips and collections made by the author in Arabia since 1973 is given including reference to the herbaria where the collections are kept. 22 species of flowering plants are reported new to the flora of Kuwait of which 20 are weeds in cultivated ground and 2 are desert plants. Notes on the taxonomy and nomenclature of another 10 species are given. Three families and 13 genera are recorded from Kuwait for the first time.

Introduction

I have been interested in the flora of Arabia especially since I visited Kuwait in February 1973 and collected in the Ahmadi area, courtesy of my colleague and friend Professor Riad Halwagy, eminent ecologist, Kuwait University, who kindly offered field facilities and identified my specimens (unpublished) which are deposited in the Herbarium of the University of Jordan, Amman. Later on, I collected in Qatar in March-April 1977, courtesy of H. E. Issa Ghanim El-Kawwari, Minister of Information, State of Qatar, who kindly invited me to the country. The top set of my collections from Qatar is kept in K, with duplicates in CAI, E, G, FI, (BOULOS, 1978).

In May 1980 I visited Saudi Arabia and collected in the Asir Mountains, courtesy of the Faculty of Science authorities, King Abdul Aziz University, Jeddah, who generously financed my trip and offered field facilities and transportation. The two top collections are kept in CAIRC and the Botany Department Herbarium, Faculty of Science, King Abdul Aziz University, Jeddah. Duplicates are in CAI, CAIM, E, K, KTUH. As a result of this trip four papers were published: BOULOS (1983, 1985a, 1985b), BOULOS & WOOD (1983).

In September 1984, I joined the staff of the Botany and Microbiology Department, Faculty of Science, Kuwait University. From January 1985 extensive collections were made in Kuwait and other Gulf States with my colleague and friend Dr. Redha Al-Hasan in order to enrich our herbarium (KTUH) with specimens from Arabia, especially the Gulf region.

In 1985 the Research Unit of Kuwait University kindly supported my research on the Flora of the Gulf Region by the Research Grant SO 029 which enabled me to continue my field studies and collecting trips with Dr. Al-Hasan to Bahrain in April 1985 and to the United Arab Emirates (UAE) in February-March 1986.

During the summers of 1985 and 1986 I visited the herbaria of the Royal Botanic Garden, Edinburgh (E) and Royal Botanic Gardens, Kew (K); both trips were financed by the Research Grant

CODEN: CNDLAR
ISSN: 0373-2967
42(1) 263 (1987)

SO 029 from Kuwait University and courtesy of the Directors and Staff of both British Institutions who generously offered facilities to work on my collections using their rich herbaria and libraries.

At present a special emphasis is put on weeds and work is in progress towards the preparation of a "Weed Flora of Kuwait" (BOULOS, in press). The need for such a flora arises from the fact that not as much attention has been given during the last two decades to the study of weeds in Kuwait as has been given to desert plants. This weed flora is intended to complement the main "Flora of Kuwait", of which volume one has been recently published (DAOUD & AL-RAWI, 1985) and in which the weed-species are not fully covered. BOULOS & AL-HASAN (1986) reported ten species new to the Flora of Kuwait and Bahrain, of which seven are weeds new to Kuwait.

In the following pages 22 species of flowering plants are reported new to the flora of Kuwait, of which 20 are weeds and 2 are desert plants. Taxonomic and nomenclatural notes are also given for another 10 species. The families *Amaranthaceae, Oxalidaceae* and *Urticaceae* are reported new to the flora of Kuwait. The following 13 genera are also recorded new to the flora: *Amaranthus, Stellaria, Telephium, Digitaria, Eragrostis, Imperata, Sorghum, Scorpiurus, Oxalis, Polygonum, Datura, Solanum* and *Urtica.*

All taxa are alphabetically arranged by family with citations of specimens and other notes.

AMARANTHACEAE (not in DAOUD & AL-RAWI (1985)

Amaranthus lividus L., Sp. Pl., ed. 1, 990 (1753). New to the flora of Kuwait.

Kuwait: Omariya Agricultural Research Station, widespread weed in cultivated ground, 11 September 1985, *Boulos 15700* (KTUH); University Campus at Shuwaikh, a weed in the garden, 27 September 1985, *Boulos 15709* (KTUH).

BORAGINACEAE

DAOUD & AL-RAWI (1985) enumerate two species of *Arnebia* Forssk. from Kuwait: *Arnebia decumbens* (Vent.) Coss. & Kralik and *Arnebia tetrastigma* Forssk.

Careful study of specimens collected from Kuwait and deposited in KTUH, as well as field observations by the writer during the last two years show that two distinct varieties are distinguished in Kuwait within *Arnebia decumbens:* var. *decumbens* and var. *macrocalyx* Cosson & Kralik, as well as a third species new to the flora: *Arnebia linearifolia* DC. The name *Arnebia tetrastigma* Forssk. given by DAOUD & AL-RAWI, l.c., is a *nomen nudum* and should be replaced by *Arnebia tinctoria* Forssk.

As a result of the present study, the genus *Arnebia* in Kuwait comprises the following taxa:

1a. Arnebia decumbens (Vent.) Cosson & Kralik, Bull. Soc. Bot. France 4: 402 (1857), var. **decumbens**

= *A. decumbens* (Vent.) Cosson & Kralik, var. *microcalyx* Cosson & Kralik, Bull. Soc. Bot. France 4: 402 (1857), nom. illeg. (cit. typus Ventenatii).
= *Lithospermum decumbens* Vent., Deser. Pl. Jard. Cels: tab. 37 (1801).
= *L. cornutum* Ledeb., Icon. Pl. Fl. Ross. 1: 7, t. 29 (1829).
= *Arnebia cornuta* (Ledeb.) Fischer & C. A. Meyer, Index Sem. Hort. Petrop. 1: 22 (1835).
= *Echium minutiflorum* Bornm. in Notizbl. Bot. Gart. Berlin-Dahlem 7: 22 (1917).

Kuwait: Khibret Al-Awazim, 10 April 1972, *Daoud 807-72* (KTUH); Runoff along the coastal highway to Al-Nuwaisib, facing Al-Ahmadi Port, loose sandy soil, altitude 20 m, 29°05'N, 48°05'E, 7 March 1985, *Boulos & Al-Hasan 15308* (KTUH).

1b. Arnebia decumbens (Vent.) Cosson & Kralik var. **macrocalyx** Cosson & Kralik, Bull. Soc. Bot. France 4: 403 (1857).

= *A. macrocalyx* (Cosson & Kralik) Boulos in Candollea 32: 102 (1977).
= *A. decumbens* subsp. *macrocalyx* (Cosson & Kralik) Riedl in Österr. Bot. Z. 109: 65 (1962).

Kuwait: Al-Wafra, main road, 26 March 1981, *Al-Rawi 439* (KTUH); 122 km S.W. of Kuwait City, along the highway to Saudi Arabia, near Al-Salmi border station, sandy and calcareous soil, altitude 280 m, 29°05'N, 46°45'E, 21 February 1985, *Boulos & Al-Hasan 15023* (BR, KTUH).

2. Arnebia linearifolia DC, Prodr. 10: 95 (1846). New to the flora of Kuwait.

Kuwait: Jraishan Road, 10 April 1972, *Daoud 782-72* (KTUH); 4 km south of Al-Shagaya, 2 km east of Wadi Al-Batin, on the edge of the Wadi, 14 April 1983, *Al-Rawi 12, 378* (KTUH).

3. Arnebia tinctoria Forssk., Fl. Aeg.-Arab. 63 (1775).
= *A. tetrastigma* Forssk., Fl. Aeg.-Arab. 62 (1775), nom. nud.

Arnebia tetrastigma Forssk. is the name used by DAOUD & AL-RAWI (1985).

The following key separates the above taxa of *Arnebia* and may replace that of DAOUD & AL-RAWI, l.c., p. 203.

Key

1. Corolla bluish-violet, almost glabrous ..... **A. tinctoria**
1a. Corolla yellow, hairy 2
2. Stigmas 4, mature fruiting calyx 8-18 × 0.5-2 mm; base indurate, crested at angles **A. decumbens** s.l.
2a. Stigmas 2, mature fruiting calyx 15-28 × 3-5 mm; base inflated, not crested at angles **A. linearifolia**
3. Mature fruiting calyx 8-12 × 0.5-1 mm, lobes with conspicuous midrib **A. decumbens** var. **decumbens**
3a. Mature fruiting calyx 12-18 × 1.2-2 mm, with less conspicuous midrib **A. decumbens** var. **macrocalyx**

Echium rauwolfii Del., Fl. Eg. 195, t. 19. f. 3 (1813-1814).

According to DAOUD & AL-RAWI (1985), the genus *Echium* L. is represented in Kuwait by the perennial species *E. sericeum* Vahl. However, the specimens of *Echium* collected from Kuwait by the present author as well as all those deposited in KTUH proved to belong to the annual species *E. rauwolfii.*

The identification of *Echium* specimens from Kuwait to *E. sericeum* is not only erroneous but also synonymous to *E. angustifolium* Miller, Gard. Dict. ed. 8, No. 6 (1768). Although DAOUD & AL-RAWI, l.c., cite "Flora of Turkey" 6: 323 (1978) in their account, they use the inappropriate name *E. sericeum,* which is correctly cited as a synonym by EDMONDSON *in* DAVIS, "Flora of Turkey" 6: 324 (1978). Moreover, the geographical distribution as given by EDMONDSON, l.c., which reads: "N. Africa, Greece, Aegean, Cyprus, Palestine, E. Medit. element" (almost the same distribution is given by DAOUD & AL-RAWI, l.c.) clearly shows that Kuwait is separated from this geographical area by the entire Arabian peninsula. Indeed *E. angustifolium* Mill. (*E. sericeum* Vahl), which is a coastal perennial East Mediterranean element, is not known from Arabia. DICKSON & MACKSAD (1973) correctly enumerate *Echium rauwolfii* in their list "Plants of Kuwait", with no mention of any other *Echium* species.

CARYOPHYLLACEAE

Spergularia marina (L.) Griseb., Spicil. Fl. Rumel. 1: 213 (1843). New to the Flora of Kuwait (Fig. 1).

KING & KAY (1984) as well as DAOUD & AL-RAWI (1985) enumerate *Spergularia diandra* (Guss.) Heldr. & Sart. as the only representative of the genus *Spergularia* (Pers.) J. & C. Presl in Kuwait. *Spergularia marina* (L.) Griseb. is, however, a widespread plant in saline soils and salt marshes in Kuwait.

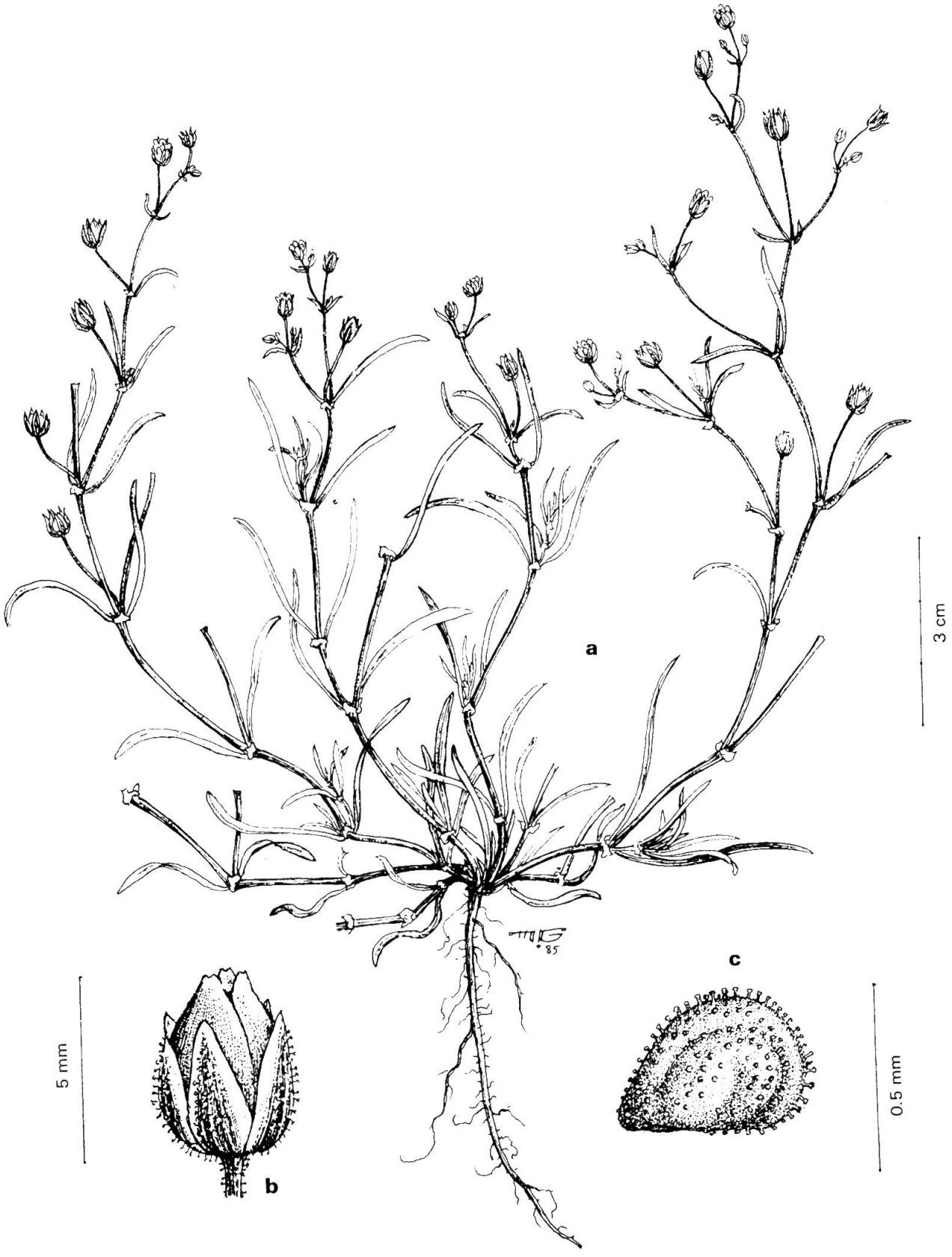

Fig. 1. — *Spergularia marina* (L.) Griseb.
a, entire plant; **b**, capsule with persistent calyx lobes; **c**, seed.

Kuwait: Close to Al-Sobiyah sea-shore, near the Police Station, 1 April 1980, *Al-Rawi* s.n. (KTUH); Al-Wafra, sandy cultivated soil, farm of Khaled Al-Fozan, altitude 120 m, 28°35'N, 48°E, 29 March 1985, *Boulos & Al-Hasan 15563* (CAIRC, E, KTUH).

The following key separates the species.

Key

1. Capsule ca. 5 mm long, exceeding the calyx; inflorescence lax, few flowered **S. marina**

1a. Capsule ca. 3 mm long, almost as long as the calyx; inflorescence dense, many-flowered **S. diandra**

Stellaria media (L.) Vill., Hist. Pl. Dauph. 3: 615 (1789). New to the flora of Kuwait

KING & KAY (1984) in their work on the *Caryophyllaceae* of the Arabian Peninsula, and DAOUD & AL-RAWI (1985) give no mention of the genus *Stellaria* L. in Kuwait.

Kuwait: Omariya Agricultural Research Station, a weed in cultivated ground, in shade under a tree, 27 March 1986, *Boulos 16168* (KTUH).

Telephium sphaerospermum Boiss., Diagn. ser. 1, 10: 12 (1849). New to the flora of Kuwait.

According to KING & KAY (1984), the genus *Telephium* is represented in Arabia by one species: *T. sphaerospermum* Boiss. which is known from Saudi Arabia, Yemen Arab Republic and Oman. This desert species is also not mentioned by DAOUD & AL-RAWI (1985) from Kuwait.

Kuwait: 10 km west of Al-Jahra, along the highway to Saudi Arabia, sandy soil, altitude 100 m, 29°20'N, 47°35'E, 21 February 1985, *Boulos & Al-Hasan 15071* (KTUH).

CHENOPODIACEAE

Chenopodium album L., Sp. Pl., ed. 1, 219 (1753). New to the flora of Kuwait.

Kuwait: Al-Wafra, in a farm, 18 December 1986, *Boulos 16367* (KTUH).

Suaeda aegyptiaca (Hasselq.) Zohary, J. Linn. Soc. Lond. Bot. 55: 635 (1957).
= *Schanginia aegyptiaca* (Hasselq.) Aellen, in Rechinger, Fl. Lowland Iraq: 195 (1964).

DAOUD & AL-RAWI (1985) treat the above species under the genus *Schanginia* C. A. Mey.; however, it is now widely accepted under *Suaeda* Forssk. ex. Scop. In their key to the genera (l.c. p. 135), they group both genera together without any means to separate them.

CONVOLVULACEAE

Convolvulus arvensis L., Sp. Pl., ed. 1, 153 (1753). Not in DAOUD & Al-RAWI (1985).

Convolvulus arvensis is one of the most widespread weeds in the country and is listed by DICKSON & MACKSAD (1973).

Kuwait: Al-Wafra, sandy cultivated soil, farm of Khaled Al-Fozan, altitude 120 m, 28°35'N, 48°E, 29 March 1985, *Boulos & Al-Hasan 15571* (CAIRC, KTUH); University Campus at Shuwaikh, a weed in the garden, 4 October 1986, *Boulos 16198* (KTUH).

CRUCIFERAE

Farsetia aegyptia Turra may replace **Farsetia aegyptiaca** Turra in DAOUD & AL-RAWI (1985).

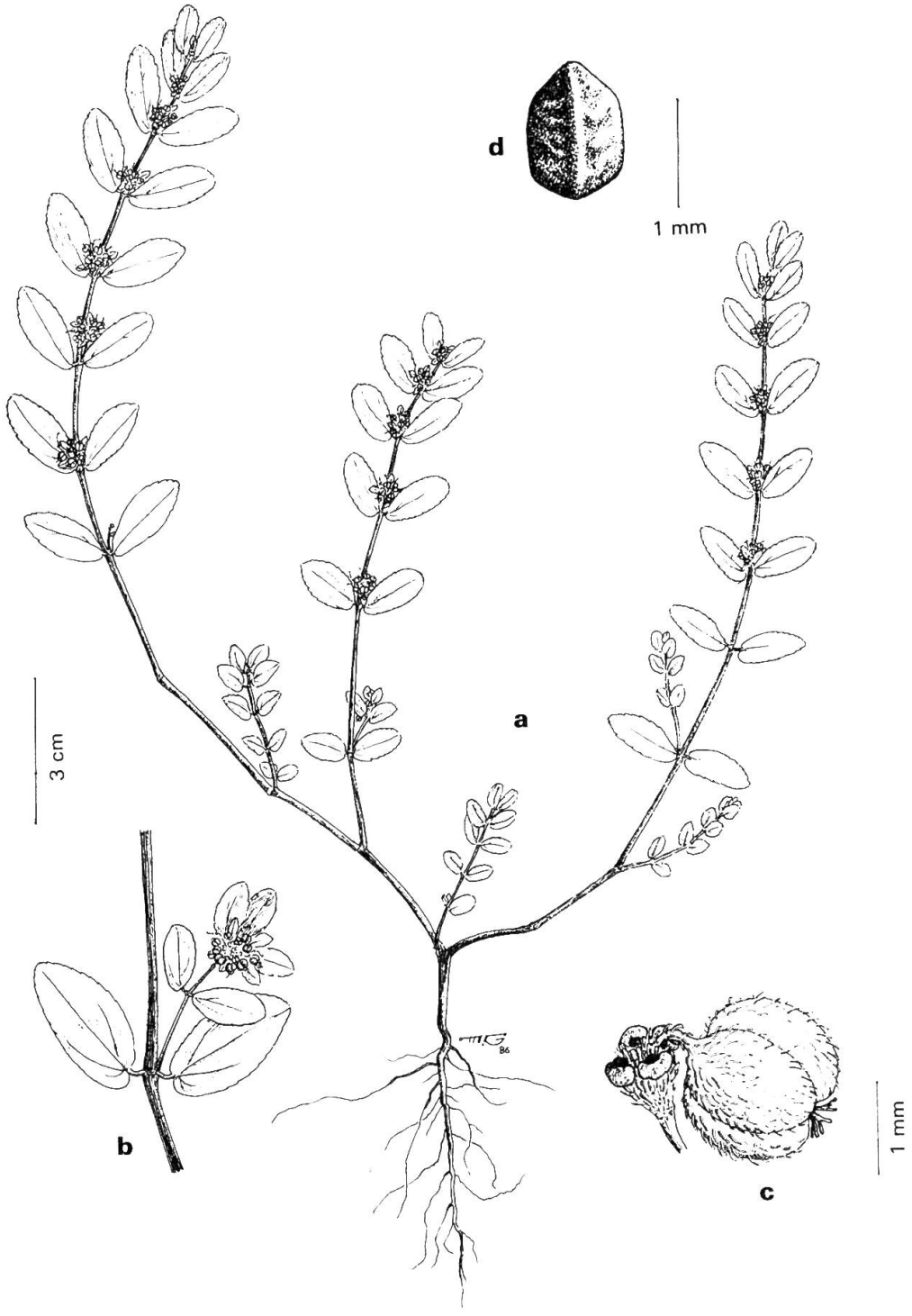

Fig. 2. — *Euphorbia indica* Lam.
a, entire plant; **b,** branchlet with large leaves on plants growing in moist habitats; **c,** cyathium; **d,** seed.

Fig. 3. — *Dichanthium annulatum* (Forssk.) Stapf.
Parts of a flowering plant.

EUPHORBIACEAE

Euphorbia grossheimii (Prokh.) Prokh., in Fl. URSS 14: 391 (1949).
= *Tithymalus grossheimii* Prokh., in Bull. Jard. Bot. Princ. URSS 29: 551 (1930).
= *Euphorbia isthmia* V. Täckh., Svensk Bot. Tidskr. 26: 374 (1932).

The name *Euphorbia isthmia* V. Täckh. used by DAOUD in DAOUD & AL-RAWI (1985) is a synonym of *Euphorbia grossheimii* (Prokh.) Prokh.

Euphorbia indica Lam., Dict. Bot. 2: 423 (1786). Det. A. Radcliffe-Smith 1986. New to the flora of Kuwait (Fig. 2).

Kuwait: Garden of the Embassy of the United Arab Emirates, 10 February 1986, *Boulos 15714* (E, K, KTUH).

Euphorbia peplus L., Sp. Pl. ed. 1, 456 (1753). New to the flora of Kuwait.

Kuwait: Omariya Agricultural Research Station, 27 March 1986, *Boulos 16165* (E, K, KTUH).

Both *Euphorbia indica* and *E. peplus* are not enumerated by DAOUD in DAOUD & AL-RAWI (1985).

FUMARIACEAE

Fumaria parviflora Lam., Encycl. Method. 2: 567 (1788).

BURTT & LEWIS (1949, p. 282) enumerate *Fumaria parviflora* Lam. among the plants collected from Kuwait by Dickson in 1936. DICKSON (1955) cites the same species from Kuwait. DICKSON & MACKSAD (1973) enumerate *Fumaria parviflora* in their list of the plants of Kuwait. DAOUD & AL-RAWI (1985) give no mention of this species. I have seen and examined the specimens deposited in K *(Dickson 284A* and *284B)* collected from Failaka Island, Kuwait.

GRAMINEAE

Dichanthium annulatum (Forssk.) Stapf, in Prain, Fl. Trop. Afr. 9: 178 (1917). New to the flora of Kuwait (Fig. 3).

According to COPE (1985), the genus *Dichanthium* Willem. is represented in Kuwait by one species: *D. foveolatum* (Del.) Roberty. The author reported *D. annulatum* from Kuwait by the following specimen:

Kuwait: University campus at Khaldiya, a weed in the garden, 27 March 1986, *Boulos 16174* (E, K, KTUH).

Digitaria sanguinalis (L.) Scop., Fl. Carn. ed. 2, 1: 52 (1771). Det. T. A. Cope, 1986. New to the flora of Kuwait.

According to COPE (1985), the genus *Digitaria* Haller is not represented in Kuwait, the present specimen confirms its occurrence in the country.

Kuwait: University Campus at Shuwaikh, a weed in the garden, 29 September 1985, *Boulos 15706* (K, KTUH).

Eragrostis barrelieri Daveau in Morot, Journ. Bot. 8: 289 (1894). Det. T. A. Cope, 1986. New to the flora of Kuwait.

This is the first species of the genus *Eragrostis* N. M. Wolf to be recorded in Kuwait (see COPE, 1985).

Kuwait: Omariya Agricultural Research Station, a weed on cultivated ground, 11 September 1985, *Boulos 15703* (K, KTUH).

Fig. 4. — *Panicum antidotale* Retz.
a, basal stiff culm with prop roots and rhizome; **b**, inflorescence.

Imperata cylindrica (L.) Raeuschel, Nom. Bot. ed. 3: 10 (1797). New to the flora of Kuwait.

COPE (1985) did not list Kuwait among the countries of Arabia where *Imperata cylindrica* occurs.

Kuwait: Jaber Al-Ali Farm, Umm Al-Rimam, 10 April 1980, *Al-Rawi & al. 279* (KTUH); University Campus at Khaldiya, 8 October 1986, *Boulos & Al-Hasan 16206* (KTUH).

Panicum antidotale Retz., Obs. Bot. 4: 17 (1786). Det. T. A. Cope, 1986. New to the flora of Kuwait (Fig. 4).

According to COPE (1985), the only species of *Panicum* L. known from Kuwait is *P. turgidum* Forssk.

Kuwait: Omariya Agricultural Research Station, a weed in cultivated ground, 11 September 1985, *Boulos 15705* (KTUH).

Poa annua L., Sp. Pl., ed. 1, 68 (1753). Det. T. A. Cope, 1986. New to the flora of Kuwait.

According to COPE (1985), the cosmopolitan annual weed *Poa annua* was not previously recorded from Kuwait.

Kuwait: Omariya Agricultural Research Station, a weed in cultivated ground, 27 March 1986, *Boulos 16167* (E, K, KTUH).

Setaria verticillata (L.) P. Beauv., Ess. Agrost. 51, 178 (1812). Det. T. A. Cope, 1986. New to the flora of Kuwait.

Setaria verticillata is known from all countries of the Arabian Peninsula except Kuwait (COPE, 1985); its occurrence in Kuwait is now confirmed.

Kuwait: Omariya Agricultural Research Station, a weed in cultivated ground, 11 September 1985, *Boulos 15701* (K, KTUH).

Sorghum halepense (L.) Pers., Syn. Plant., 1: 101 (1805). Det. T. A. Cope, 1987. New to the flora of Kuwait.

Kuwait: a lane off Amman Street, growing on sewage water, 30 September 1986, *Boulos 16195* (KTUH); in a garden at Rumaithiya, 16 July 1986, *Al-Yahya 140* (KTUH).

LEGUMINOSAE

Medicago laciniata (L.) Mill., Gard. Dict., ed. 8, No. 5 (1768), var. **brachyacantha** Boiss., Diagn. ser. 1, 9: 10 (1849).
= p.p. *M. aschersoniana* Urb., Verh. Bot. Ver. Prov. Brandenb. 15: 77 (1873).

The above may replace the nomenclature given by DAOUD & AL-RAWI (1985), p. 22 and the comment p. 23 where they write: "Also mentioned: Dickson, Wld. Fls. Kuwait (1955) *M. aschersoniana* Urb.".

Scorpiurus muricatus L., Sp. Pl., ed. 1, 745 (1753) emend. Lam., Fl. Franç., ed. 1, 2: 582 (1778). New to the flora of Kuwait.

Kuwait: Rumaithiya, in a garden, 18 March 1987, *Al-Yahya 145* (KTUH).

OXALIDACEAE (not in DAOUD & AL-RAWI, 1985)

Oxalis corniculata L., Sp. Pl., ed. 1, 435 (1753). New to the flora of Kuwait.

Kuwait: University Campus at Khaldiya, 10 April 1985, *Rashad & Ibrahim,* s.n. (E, KTUH).

PLANTAGINACEAE

Plantago lanceolata L., Sp. Pl., ed. 1, 113 (1753).

DAOUD (1975) and DAOUD in DAOUD & AL-RAWI (1985) did not report *Plantago lanceolata* L. from Kuwait although it is known from all neighbouring regions: Iraq (specimens in E! K!), Central and Eastern Saudi Arabia (CHAUDHARY & ZAWAWI, 1983) and Iran (PATZAK & RECHINGER, 1965). CHAUDHARY & ZAWAWI, l.c. report *Plantago lanceolata* as one of the most serious weeds in the region, while in Kuwait I have observed that it is rather widespread in cultivated ground, especially lawns. Most probably what DAOUD in DAOUD & AL-RAWI (1985) refer to as *Plantago lagopus* L. is a misidentification for *P. lanceolata* L.

Kuwait: University Campus at Khaldiya, a weed in the garden, 27 March 1986, *Boulos 16169* (KTUH); Shuwaikh, under Al-Ghazali Bridge, 16 September 1985, *Al-Yahya 8* (KTUH).

POLYGONACEAE

Polygonum patulum M. Bieb., Fl. Taur.-Cauc. 1: 304 (1808). New to the flora of Kuwait.

The genus *Polygonum* L. is not treated by DAOUD in DAOUD & AL-RAWI (1985) in his account of the family *Polygonaceae,* l.c., pp. 130-134.

Kuwait: at the Jahra Pool, Sheikh Abdulla Jaber's Plantation, salty well irrigated soil, altitude 16 m, 8 March 1982, *Rawi, Jalili & Armer 10916* (KTUH); Al-Wafra, weed in cultivated land, farm of Mandil El-Gahs, altitude 120 m, 28°35'N, 48°E, 28 March 1985, *Boulos & Al-Hasan 15559* (E, KTUH).

SOLANACEAE

Datura innoxia Mill., Gard. Dict., ed. 8, No. 5 (1768). New to the flora of Kuwait.

Kuwait: Omariya Agricultural Research Station, 28 September 1986, *Boulos 16194* (KTUH).

Solanum nigrum L., Sp. Pl. ed. 1, 186 (1753). New to the flora of Kuwait.

Kuwait: Omariya Agricultural Research Station, a weed in cultivated ground, 19 October 1986, *Ibrahim s.n.* (KTUH).

URTICACEAE (not in DAOUD & AL-RAWI, 1985)

Urtica urens L., Sp. Pl., ed. 1, 984 (1753). New to the flora of Kuwait.

Kuwait: Omariya Agricultural Research Station, a weed in cultivated ground, 27 March 1986, *Boulos 16166* (KTUH).

ZYGOPHYLLACEAE

Zygophyllum qatarense Hadidi, in Boulos, Materials for a flora of Qatar, Webbia 32: 394-395 (1978).

Zygophyllum qatarense Hadidi was described from Qatar and is also known from Oman, United Arab Emirates, Eastern Saudi Arabia (the Gulf region), Bahrain, Kuwait, Southern Iraq and the Gulf region of Western Iran. On the other hand, *Zygophyllum coccineum* L. is known from North-West Saudi Arabia, Southern Palestine, Sinai and the Eastern Desert of Egypt. In other words, *Z. qatarense* and *Z. coccineum* occupy entirely different geographical regions which do not

even overlap and are separated by a great natural barrier represented by the vast and hyperarid desert of Rub Al-Khali and its extensions northwards. The species may be separated by the following differences:

Zygophyllum coccineum	*Zygophyllum qatarense*
Plant green, glabrous	Plant olive-green, glandular
Branches whitish-green	Branches purplish
All leaves 2-foliolate	Most leaves 1-foliolate, upper frequently 2-foliolate
Leaflets oblong, 10-30 mm long	Leaflets clavate or obconical, 4-7 mm long
Petiole longer than leaflets	Petiole as long as leaflets
Sepals glabrous	Sepals glandular
Petals white or pink	Petals yellowish-green
Capsule cylindrical, 10-12 mm long	Capsule slightly obconical, about 8 mm long
Habitat hot deserts, sandy gravelly	Habitat saline depressions and salt marshes

Taking into consideration the above morphological and ecological differences as well as the different geographical areas both species occupy, it is proposed that *Zygophyllum qatarense* Hadidi may replace *Z. coccineum* L. in the flora of Kuwait.

ACKNOWLEDGEMENTS

This work has been carried out under the auspices of the Research Grant SO 029 from the Research Management Unit of Kuwait University. I also wish to thank the Regius Keeper of the Royal Botanic Garden, Edinburgh and the Keeper of the Herbarium, Royal Botanic Gardens, Kew, for allowing me to work on my collections during the summers of 1985 and 1986; the help offered by the members of staff of both Institutions is kindly acknowledged. Thanks are also due to Mrs. Vivienne Armer for her kind help throughout the preparation of this work and especially for bringing to my attention the specimens of *Arnebia linearifolia* in KTUH. I also wish to thank Mr. Y. Al-Yahya for presenting his specimen of *Scorpiurus muricatus* to KTUH, a new record to the flora of Kuwait. The four plates were drawn in Edinburgh and Kew by Mr. Magdy El-Gohary to whom I am most grateful.

REFERENCES

BOULOS, L. (1978). Materials for a flora of Qatar. *Webbia* 32: 369-396, 1 map, 9 figs.

BOULOS, L. (1983). Sonchus saudensis, a new species of Compositae from Western Saudi Arabia and Northern Yemen. *Arab Gulf J. Sci. Res.* 1: 21-27, 1 map, 2 figs.

BOULOS, L. (1985a). A contribution to the Flora of the Asir mountains, Saudi Arabia. *Arab Gulf J. Sci. Res.* 3: 67-94, 5 colour figs.

BOULOS, L. (1985b). Is Rosa arabica identical to R. abyssinica? *Candollea* 40: 389-390.

BOULOS, L. (1986). The Weed flora of Kuwait. Poster exhibit, Second symposium on the plant life of S.W. Asia. *Proc. Roy. Soc. Edinburgh* 89B: 309.

BOULOS, L. & R. AL-HASAN (1986). Ten species new to the flora of Kuwait and Bahrain. *Arab Gulf J. Sci. Res.* 4: 437-447.

BOULOS, L. & J. R. I. WOOD (1983). A new Senecio (Compositae) from Southwest Arabia. *Kew Bull.* 38: 491-492, 1 fig.

BURTT, B. L. & P. LEWIS (1949). On the flora of Kuweit: I. *Kew Bull.* 1949: 273-308.

CHAUDHARY, S. A. & M. A. ZAWAWI (1983). *A manual of weeds of Central and Eastern Saudi Arabia.* National Herbarium, Regional Agric. & Water Res. Center, Riyadh.

COPE, T. A. (1985). A key to the grasses of the Arabian Peninsula (studies on the Flora of Arabia XV). *Arab Gulf J. Sci. Res. Special Publ.* 1: 1-82.

DAOUD, H. S. (1975). The Genus Plantago in Kuwait. *J. Univ. Kuwait (Sci.)* 2: 35-58.

DAOUD, H. & A. AL-RAWI (1985). *Flora of Kuwait 1.* KPI. London, Boston & Melbourne; Kuwait University.

DICKSON, V. (1955). *The wild flowers of Kuwait and Bahrain.* George Allen & Unwin Ltd. London.

DICKSON, V. & A. MACKSAD (1973). *Plants of Kuwait.* Ahmadi Nat. Hist. Field Studies Group, Kuwait.

KING, R. A. & K. J. KAY (1984). The Caryophyllaceae of the Arabian Peninsula: a checklist and key to taxa (Studies in the Flora of Arabia XII). *Arab Gulf J. Sci. Res.* 2: 391-414, 3 figs.

PATZAK, A. & K. H. RECHINGER (1965). Plantaginaceae. *In:* RECHINGER, K. H. (ed.), *Flora Iranica.* Graz.

Address of the author: Department of botany and microbiology, Faculty of science, Kuwait University, P. O. Box 5969, 13060 Safat, Kuwait.