

**The ERWDA Herbarium
and its Role in Biodiversity Conservation
in Abu Dhabi Emirate**



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1. Introduction

A herbarium is a collection of properly identified, dried and pressed plants that are mounted on sheets of stout paper. Each sheet can hold one or several specimens of a single species, and a label provides information on various aspects of the specimen. In professional herbaria, the sheets are stored in special, insect-proof cupboards, and are usually arranged according to the country in which they were collected, followed by family, genus and species. In this manner, it is possible to store plants for substantial periods of time, using a minimum amount of space. Furthermore, storing plants in a systematic manner allows specimens to be easily accessed and retrieved.

Herbarium specimens can be used for a variety of purposes, most commonly though for identification, as described in more detail below. As specimens may be up to several hundreds of years old, collections of plants can give detailed insight into prevailing environmental conditions in the past, especially if the labels on the sheets contain adequate information. One of the more 'exotic' uses of herbarium specimens is to compare pollution levels in the past with those of the present day. This technique has, for instance, been successfully applied to comparing past and current

heavy metal concentrations in the environment.

2. History of the ERWDA Herbarium

A first collection of plant species from the UAE under the auspices of ERWDA (then NARC) was initiated by Benno Böer in 1994. The specimens, representing 249 species, were deposited in Sweihan at NARC. The identification of many of these plants was confirmed (or carried out, as in the case of unknown species) by a number of internationally renowned experts. There were no elaborate facilities available to process and store plants at the time, and with the move to the Maqta Bridge site, it proved impossible to store the plants effectively and prevent damage to them by insects. There were also no funds available to finance manpower to maintain the collection. Sadly, the entire valuable collection was devoured by insects and therefore lost (Böer, oral communication).

In 2001, a small herbarium was re-established by TERC at ERWDA HQ in a small room that doubles up as a laboratory. Proper storage cabinets were purchased, and funds were made available to obtain necessary consumables. Ms. Sabitha Sakkir has been responsible for the everyday running of the ERWDA Herbarium since 2001.

3. Main objectives of the ERWDA Herbarium

The primary objective of the ERWDA Herbarium is to serve as a reference collection to aid in plant identification, a vital function in biodiversity conservation given the lack of a proper flora for the region and the general paucity of floristic knowledge. The scientifically reliable identification of specimens is essential to a number of major projects being carried out in ERWDA, mainly by TERC, MERC and also NARC. This is not just necessary for identifying individual plants, but for assessing the vegetation of specific areas.



Fig. 1. Only by collecting 'critical' species such as *Tribulus terrestris* s.l. for herbaria will their precise identity be unravelled one day.

Information obtained from the ERWDA Herbarium also played a key role in the review process of the book "Wildflowers of the UAE" which was recently published by ERWDA (Fig. 2).

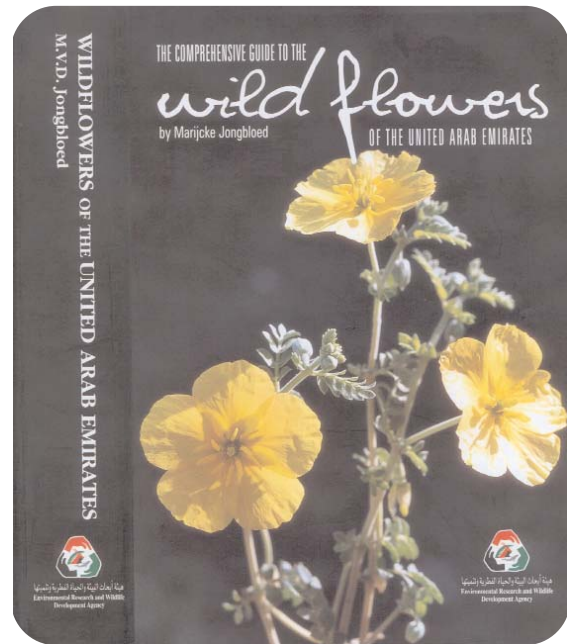


Fig. 2. Herbaria provide a wealth of vital information for the preparation of floras and wildflower guides, including this one!

Other objectives of the ERWDA Herbarium can be summarised as follows:

- to develop identification tools for species in the Emirate;
- to document species collected in specific locations of interest;
- to gain insight into plant diversity and distribution of species within the Emirate;
- to obtain information on the threat status species for the development of a UAE Red List of endangered plants.

In view of the limited amount of floristic information from the Emirate, the specific activities to which the herbarium directly contributes relate predominantly to **Goal 5** in the Environmental Strategy and Action Plan of ERWDA, especially to Steps **5.1**.

(Conduct a quantitative baseline survey of the location and distribution of natural wildlife resources in the Emirate), **5.2.** (Identify hot-spots for high priority conservation efforts), **5.3.** (Develop a Red List of Endangered Plants and Animals), **5.4.** (Ecosystem Monitoring), **5.5.** (Manage and develop Protected Areas), **5.6.** (Develop and apply action plans for Flagship species requiring specific actions), **5.9.** (Invasive species) and **5.11.** (Research).

It should be emphasised that it is not the aim of the ERWDA Herbarium to establish a fully comprehensive collection of plants from the Emirate comprising numerous specimens of each species as a tool for carrying out taxonomic research. This should be left to academic institutes with the appropriate financial, space and human resources.

4. Current size of the ERWDA Herbarium

The ERWDA Herbarium currently houses a collection of about 600 sheets. 286 plant species belonging to 50 dicot and 7 monocot families are represented in the herbarium. A list of these species is given in Appendix A.

5. Collection and processing of specimens for the ERWDA Herbarium

5.1. Collection of specimens

Plant specimens are usually collected during the course of various projects that involve fieldwork. Only in rare cases though are specific plant collecting trips organised, as this is currently not one of the main focuses of TERC work. Specimens collected in the field are kept in tightly sealed plastic bags in a coolbox until they can be processed. Notes are made on the precise collecting locality (with GPS coordinates), as well as on details of the plant that may become indistinct after pressing (e.g. petal colour).

In addition, the herbarium receives specimens from people outside of ERWDA. A large number of mounted sheets were recently received from Marijcke Jongbloed, a former resident of Dubai, who collected extensively over many years. We also hope to involve more actively interested persons from the Emirates Natural History Group in Abu Dhabi to assist in collecting, especially on their regular field trips.

Recently, we have begun cooperating more intensely with external institutions involved in similar work. For instance, since 2003, we are now working with scientists from the Zayed Complex for Herbal Research and Traditional Medicine who

also maintain a herbarium. In this manner, we are able to exchange information and plant specimens, and therefore use the limited financial and manpower resources at our disposal more efficiently to achieve our specific objectives.

5.2. Pressing and drying of specimens

On returning to the laboratory, the specimens are carefully pressed between sheets of newspaper in a plant press (see Fig. 3). It is advisable to put sheets of blotting paper and cardboard between the plants to ensure that air can circulate effectively, and the specimens dry reasonably quickly. This also limits the risk of fungal attack. Drying is best performed at temperatures between about 30 °C and 40 °C, and takes up to two to three weeks. Rapid drying at high temperatures in an oven is



Fig. 3. Herbarium press.

not recommended, as it can lead to specimens becoming too brittle. High temperatures applied to the plants when they are

still fresh may result in them becoming stewed.

5.3. Mounting

Once pressed and dried, the plant specimens are mounted with labels on special archival 11x17 inch paper. The mounting process involves careful work with attention to detail, to ensure that all identifying characteristics are highlighted. A mounted herbarium specimen is shown in Fig. 4. Each herbarium sheet is furnished with a label (Fig. 5) which gives precise information on the name of the species, collection locality, habitat, date of collection, along with some brief ecological data. In addition,



Fig. 4. Typical herbarium sheet with *Reseda aucheri*. The label in the bottom right-hand corner gives important details on the plant (see Fig. 5).

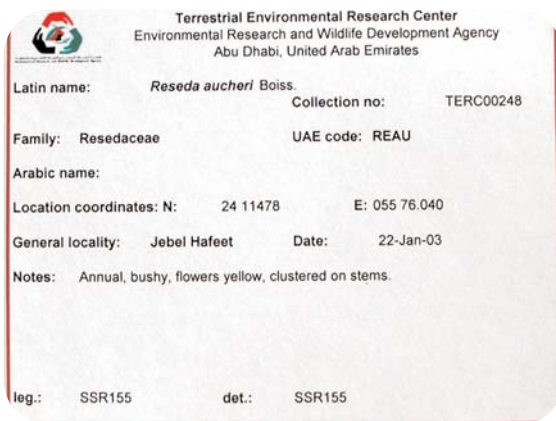


Fig. 5. Label on the herbarium sheet shown in Fig. 4 giving important details.

the name of the person who identified the species is clearly stated. This is standard practice, because should any queries arise as to the identity of a particular species at



Fig. 6. Herbarium cabinet containing herbarium sheets in protective folders. These are stored according to family, genus and species allowing easy retrieval.

a later date (e.g. due to changes in nomenclature, taxonomic status, misidentification), the views of the original person who carried out identification can be taken into account and assessed.

5.4. Storage of specimens

Once the specimens are properly mounted, they are placed into folders to protect them against abrasive damage. These folders are then stored in a metal cabinet (Fig. 6) with sealed doors to prevent insects from entering. The folders are arranged alphabetically according to family and genus.

5.5. Other storage methods

Some species, or individual organs of plants, cannot be pressed or stored effectively in a herbarium. Examples include members of the broomrape family (e.g. *Cistanche tubulosa*), with their fleshy stems that turn brown on drying (Fig. 7). Often, it is more convenient, or indeed the



Fig. 7. *Cistanche tubulosa*, a fleshy parasitic species, does not press well and is more conveniently stored in spirits.

only method, to preserve such specimens in spirits (**Fig. 8**).



Fig. 8. Species or particular organs of plants that do not press well are often best preserved in spirits.

5.6. Decontamination of specimens

Long-term preservation of herbarium specimens involves constant attention to protect them from damage by pests. Most commonly, dried plants become infested with small beetles, and these can cause great damage to specimens within a short period of time. For this reason, it is important that specimens are routinely checked for the presence of insect pests, and are decontaminated at regular intervals. Rather than use chemical agents, which may be harmful to human health, we use the simple, but effective method of freezing. For this purpose, bundles of dried specimens are placed in sealed plastic bags and left in a freezer at $-18\text{ }^{\circ}\text{C}$ for two days. Following this treatment, they are

returned to room temperature for five days, after which they are refrozen for a further two days. Only then are specimens placed back in the cabinets.

6. Identification of specimens

Identification of specimens is an important process that requires skill and experience. Specimens can often be identified before they are pressed with appropriate identification aids, such as floras, manuals and monographs. However, as already stated, there is no definitive work on the plants of the UAE, and so we are reliant on literature from adjacent regions (including NE Africa and the Mediterranean) for identification. The recent acquisition of a high-quality stereo microscope mounted on a special stand to enable the easy viewing of



Fig. 9. A stereo microscope is an indispensable piece of equipment for identification purposes. Mounting it on a cross boom allows herbarium sheets to be conveniently examined. The external cold light source (left) provides illumination of a similar spectrum to that of daylight, and does not heat the specimens.

specimens on herbarium sheets (**Figs. 9 & 10**) will greatly facilitate our task of providing an identification service to meet ERWDA's needs.



Fig. 10. Close-up of the Zeiss SV6 stereo microscope recently obtained for the ERWDA herbarium.

7. Outlook

When sufficient specimens have been collected, it may prove advisable to send certain 'difficult' groups to appropriate specialists for confirmation of their identity. In this manner, we will receive feedback on our identification success, the presence of possible new species, as well as an update on recent taxonomic developments.

At present, we are able to cope with the number of species and the amount of time required to maintain the herbarium. As it increases in size though, it may prove necessary to employ further manpower, possibly on a part-time basis, especially if the one member of staff currently responsible for running the herbarium is assigned to duties on other projects.

Now that most major items of equipment have been purchased, the actual running of the herbarium requires little in the way of financial resources. These are needed mainly for purchasing consumables, such as mounting paper, blotting paper, glue, etc. However, a further metal storage cabinet may be required next year to house additional specimens. Furthermore, a suitable camera would be a valuable asset, in order that specimens can be photographed, digitised and made accessible on the ERWDA web site and Environmental Database. A CD ROM version of the Index Kewensis, an alphabetical listing of all plant names with bibliographic references to the place of their first publication, would be a useful tool for checking the correct names of species.

Later in the year, we will be liaising with the IT Department of ERWDA to create a proper database entry form, so that information on the herbarium specimens can be inte-

grated into the ERWDA Environmental Database.

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Appendix A overleaf.

Appendix A. List of plant species in the ERWDA Herbarium (30.6.2003). Plants are listed according to family, genus and species.

No.	Species	Family
1	<i>Blepharis ciliaris</i> (L.) B.L. Burtt	Acanthaceae
2	<i>Adiantum capillus-veneris</i> L.	Adiantaceae
3	<i>Cheilanthes pteridioides</i> (Richard) C. Chr.	Adiantaceae
4	<i>Onychium divaricatum</i> (Poir.) Alston	Adiantaceae
5	<i>Aizoon canariense</i> L.	Aizoaceae
6	<i>Mesembryanthemum nodiflorum</i> L.	Aizoaceae
7	<i>Sesuvium verrucosum</i> Raf.	Aizoaceae
8	<i>Trianthema</i> cf. <i>portulacastrum</i> L.	Aizoaceae
9	<i>Zaleya pentandra</i> (L.) C. Jeffrey	Aizoaceae
10	<i>Achyranthes aspera</i> L.	Amaranthaceae
11	<i>Aerva javanica</i> (Burm. F.) Juss. Ex Schult.	Amaranthaceae
12	<i>Amaranthus albus</i> L.	Amaranthaceae
13	<i>Amaranthus graecizans</i> L.	Amaranthaceae
14	<i>Amaranthus hybridus</i> L.	Amaranthaceae
15	<i>Amaranthus lividus</i> L.	Amaranthaceae
16	<i>Amaranthus viridis</i> L.	Amaranthaceae
17	<i>Pistacia khinjuk</i> Stocks	Anacardiaceae
18	<i>Nerium oleander</i> L.	Apocynaceae
19	<i>Nanorrhops ritchieana</i> (Griffith) Aitch.	Arecaceae
20	<i>Calotropis procera</i> (Aiton) W.T. Aiton	Asclepiadaceae
21	<i>Glossonema varians</i> (Stocks) J. D. Hook.	Asclepiadaceae
22	<i>Leptadenia pyrotechnica</i> (Forssk.) Decne.	Asclepiadaceae
23	<i>Pentatropis spiralis</i> (Forssk.) Decne.	Asclepiadaceae
24	<i>Pergularia tomentosa</i> L.	Asclepiadaceae
25	<i>Periploca aphylla</i> Decne.	Asclepiadaceae
26	<i>Rhazya stricta</i> Decne.	Asclepiadaceae
27	<i>Asphodelus tenuifolius</i> (Cav.) Baker	Asphodelaceae
28	<i>Aegopordon berardoides</i> Boiss.	Asteraceae
29	<i>Anthemis odontostephana</i> Boiss.	Asteraceae

30	<i>Anvillea garcinii</i> (Burm. F.) DC.	Asteraceae
31	<i>Blumea bovei</i> (DC.) Vatke	Asteraceae
32	<i>Calendula arvensis</i> L.	Asteraceae
33	<i>Centaurea pseudosinaica</i> Czerep.	Asteraceae
34	<i>Centaurea wendelboi</i> Wagen.	Asteraceae
35	<i>Conyza bonariensis</i> (L.) Cronq.	Asteraceae
36	<i>Echinops</i> sp.	Asteraceae
37	<i>Filago desertorum</i> Pomel	Asteraceae
38	<i>Flaveria trinervia</i> (Spreng.) Mohr	Asteraceae
39	<i>Helichrysum makranicum</i> (Rech. F. & Esfand.) Rech. F.	Asteraceae
40	<i>Ifloga spicata</i> (Forssk.) Sch. Bip.	Asteraceae
41	<i>Iphiona aucheri</i> (Boiss.) A. Anders	Asteraceae
42	<i>Iphiona scabra</i> Decne.	Asteraceae
43	<i>Lactuca serriola</i> L.	Asteraceae
44	<i>Launaea capitata</i> (Spreng.) Dandy	Asteraceae
45	<i>Launaea massauensis</i> (Fres.) Chiov.	Asteraceae
46	<i>Launaea mucronata</i> (Forssk.) Muschl.	Asteraceae
47	<i>Launaea nudicaulis</i> (L.) Hook. F.	Asteraceae
48	<i>Launaea procumbens</i> (Roxb.) Ram. & Raj.	Asteraceae
49	<i>Pentanema divaricatum</i> Cass.	Asteraceae
50	<i>Phagnalon viridifolium</i> Decne.	Asteraceae
51	<i>Pluchea arabica</i> (Boiss.) Kaiser & Lack	Asteraceae
52	<i>Pluchea dioscoridis</i> (L.) DC.	Asteraceae
53	<i>Pseudognaphalium luteoalbum</i> (L.) Hill. & Burt	Asteraceae
54	<i>Pulicaria arabica</i> (L.) Cass.	Asteraceae
55	<i>Pulicaria edmondsonii</i> Gamal-Eldin	Asteraceae
56	<i>Pulicaria glutinosa</i> Jaub. & Spach	Asteraceae
57	<i>Rhanterium epapposum</i> Oliv.	Asteraceae
58	<i>Seriphidium herba-alba</i> (Asso) Y.R.Li	Asteraceae
59	<i>Sonchus oleraceus</i> L.	Asteraceae
60	<i>Sonchus tenerrimus</i> L.	Asteraceae
61	<i>Urospermum picroides</i> (L.) F.W. Schmidt	Asteraceae
62	<i>Vernonia arabica</i> F.G. Davies	Asteraceae
63	<i>Vernonia cinerea</i> (L.) Less.	Asteraceae
64	<i>Avicennia marina</i> (Forssk.) Vierh.	Avicenniaceae
65	<i>Tecomella undulata</i> (Roxb.) Seem	Bignoniaceae
66	<i>Anchusa aegyptiaca</i> (L.) DC.	Boraginaceae

67	<i>Anchusa hispida</i> Forssk.	Boraginaceae
68	<i>Arnebia hispidissima</i> (Lehm.) DC.	Boraginaceae
69	<i>Arnebia linearifolia</i> DC.	Boraginaceae
70	<i>Cordia sinensis</i> Lam.	Boraginaceae
71	<i>Echiochilon kotschyi</i> (Boiss. & Hohen.) I.M.Johnst.	Boraginaceae
72	<i>Echiochilon persicum</i> (Burm. F.) I.M.Johnst.	Boraginaceae
73	<i>Heliotropium bacciferum</i> Forssk.	Boraginaceae
74	<i>Heliotropium calcareum</i> Stocks.	Boraginaceae
75	<i>Heliotropium curassavicum</i> L.	Boraginaceae
76	<i>Heliotropium digynum</i> (Forssk.) Asch. Ex C. Chr.	Boraginaceae
77	<i>Heliotropium europaeum</i> L.	Boraginaceae
78	<i>Heliotropium lasiocarpum</i> Fisch. & C.A. Mey.	Boraginaceae
79	<i>Heliotropium ramosissimum</i> (Lehm.) DC.	Boraginaceae
80	<i>Moltkiopsis ciliata</i> (Forssk.) I.M. Johnst.	Boraginaceae
81	<i>Ogastemma pusillum</i> (Coss.& Dur.) Brum.	Boraginaceae
82	<i>Trichodesma ehrenbergii</i> Schweinf. ex Boiss.	Boraginaceae
83	<i>Trichodesma eretotrichum</i> R.R. Mill	Boraginaceae
84	<i>Cardaria draba</i> (L.) Desv.	Brassicaceae
85	<i>Coronopus didymus</i> (L.) Sm.	Brassicaceae
86	<i>Diplotaxis harra</i> (Forssk.) Boiss.	Brassicaceae
87	<i>Eremobium aegyptiacum</i> (Spreng.) Boiss.	Brassicaceae
88	<i>Eruca sativa</i> Mill.	Brassicaceae
89	<i>Erucaria hispanica</i> (L.) Druce	Brassicaceae
90	<i>Farsetia aegyptia</i> Turra	Brassicaceae
91	<i>Farsetia linearis</i> Decne. ex Boiss.	Brassicaceae
92	<i>Farsetia longisiliqua</i> Decne.	Brassicaceae
93	<i>Farsetia stylosa</i> R. Br.	Brassicaceae
94	<i>Morettia parviflora</i> Boiss.	Brassicaceae
95	<i>Notoceras bicornis</i> (Aiton) Amo	Brassicaceae
96	<i>Physorrhynchus chamaerapistrum</i> (Boiss.) Boiss.	Brassicaceae
97	<i>Sisymbrium erysimoides</i> Desf.	Brassicaceae
98	<i>Zilla spinosa</i> (L.) Prantl	Brassicaceae
99	<i>Capparis cartilaginea</i> Decne.	Capparaceae
100	<i>Capparis spinosa</i> L.	Capparaceae
101	<i>Cleome austroarabica</i> ssp. <i>mascatensis</i> Cham. & Lam.	Capparaceae
102	<i>Cleome noeana</i> Boiss.	Capparaceae
103	<i>Cleome quinquenervia</i> DC.	Capparaceae

104	<i>Cleome rupicola</i> Vicary	Capparaceae
105	<i>Cleome scaposa</i> DC.	Capparaceae
106	<i>Dipterygium glaucum</i> Decne.	Capparaceae
107	<i>Cometes surattensis</i> L.	Caryophyllaceae
108	<i>Gymnocarpos decandrus</i> Forssk.	Caryophyllaceae
109	<i>Gypsophila bellidifolia</i> Boiss.	Caryophyllaceae
110	<i>Polycarpaea repens</i> (Forssk.) Asch. & Schweinf.	Caryophyllaceae
111	<i>Polycarpaea spicata</i> Wight ex Arn.	Caryophyllaceae
112	<i>Sclerocephalus arabicus</i> Boiss.	Caryophyllaceae
113	<i>Spergula fallax</i> (Lowe) E.H.L. Krause	Caryophyllaceae
114	<i>Spergularia marina</i> (L.) Bessler	Caryophyllaceae
115	<i>Casuarina equisetifolia</i> J.R.& G.Frost	Casuarinaceae
116	<i>Anabasis setifera</i> Moq.	Chenopodiaceae
117	<i>Arthrocnemum macrostachyum</i> (Moric.) Mor. & Del.	Chenopodiaceae
118	<i>Atriplex leucoclada</i> Boiss.	Chenopodiaceae
119	<i>Bassia eriophora</i> (Schrad.) Asch.	Chenopodiaceae
120	<i>Chenopodium album</i> L.	Chenopodiaceae
121	<i>Chenopodium murale</i> L.	Chenopodiaceae
122	<i>Cornulaca arabica</i> Botsch.	Chenopodiaceae
123	<i>Cornulaca monacantha</i> Delile	Chenopodiaceae
124	<i>Halocnemum strobilaceum</i> (Pall.) M. Bieb.	Chenopodiaceae
125	<i>Halopeplis perfoliata</i> (Forssk.) Bunge ex Asch.	Chenopodiaceae
126	<i>Haloxylon persicum</i> Bunge	Chenopodiaceae
127	<i>Haloxylon salicornicum</i> (Moq.) Bunge ex Boiss.	Chenopodiaceae
128	<i>Salicornia europaea</i> L.	Chenopodiaceae
129	<i>Salsola drummondii</i> Ulbr.	Chenopodiaceae
130	<i>Salsola imbricata</i> Forssk.	Chenopodiaceae
131	<i>Salsola rubescens</i> Franch.	Chenopodiaceae
132	<i>Seidlitzia rosmarinus</i> Ehrenb.ex Bunge	Chenopodiaceae
133	<i>Suaeda aegyptiaca</i> (Hassel.) Zoh.	Chenopodiaceae
134	<i>Suaeda vermiculata</i> Forssk. ex J.F.Gmel	Chenopodiaceae
135	<i>Helianthemum lippii</i> (L.) Dum.Cours.	Cistaceae
136	<i>Convolvulus arvensis</i> L.	Convolvulaceae
137	<i>Convolvulus cephalopodus</i> Boiss.	Convolvulaceae
138	<i>Citrullus colocynthis</i> (L.) Schrad.	Cucurbitaceae
139	<i>Cynomorium coccineum</i> L.	Cynomoriaceae
140	<i>Cladium mariscus</i> (L.) Pohl	Cyperaceae

141	<i>Cyperus arenarius</i> Retz.	Cyperaceae
142	<i>Cyperus conglomeratus</i> Rottb.	Cyperaceae
143	<i>Cyperus rotundus</i> L.	Cyperaceae
144	<i>Eleocharis geniculata</i> (L.) Roem. & Schult.	Cyperaceae
145	<i>Fimbristylis bisumbellata</i> (Forssk.) Buban.	Cyperaceae
146	<i>Fimbristylis ferruginea</i> (L.) Vahl	Cyperaceae
147	<i>Schoenus nigricans</i> L.	Cyperaceae
148	<i>Scabiosa olivieri</i> Coult.	Dipsacaceae
149	<i>Chrozophora oblongifolia</i> (Delile) Spreng.	Euphorbiaceae
150	<i>Chrozophora plicata</i> (Vahl.) Juss. ex Spreng.	Euphorbiaceae
151	<i>Euphorbia granulata</i> Forssk.	Euphorbiaceae
152	<i>Euphorbia hirta</i> L.	Euphorbiaceae
153	<i>Euphorbia larica</i> Boiss.	Euphorbiaceae
154	<i>Alhagi graecorum</i> Boiss.	Fabaceae
155	<i>Argyrolobium roseum</i> (Camb.) Jaub. & Spach	Fabaceae
156	<i>Crotalaria aegyptiaca</i> Benth.	Fabaceae
157	<i>Hippocrepis constricta</i> Kunze	Fabaceae
158	<i>Hippocrepis unisiliquosa</i> L.	Fabaceae
159	<i>Indigofera arabica</i> Burm. f.	Fabaceae
160	<i>Indigofera argentea</i> L.	Fabaceae
161	<i>Indigofera articulata</i> Gouan	Fabaceae
162	<i>Indigofera colutea</i> (Burm.f.) Merrill	Fabaceae
163	<i>Indigofera intricata</i> Boiss.	Fabaceae
164	<i>Indigofera oblongifolia</i> Forssk.	Fabaceae
165	<i>Lotononis platycarpa</i> (Viv.) Pic.-Serm.	Fabaceae
166	<i>Lotus garcinii</i> DC.	Fabaceae
167	<i>Medicago polymorpha</i> L.	Fabaceae
168	<i>Rhynchosia schimperii</i> Hochst. & Boiss.	Fabaceae
169	<i>Senna italica</i> Mill.	Fabaceae
170	<i>Taverniera glabra</i> Boiss.	Fabaceae
171	<i>Taverniera lappacea</i> (Forssk.) DC.	Fabaceae
172	<i>Tephrosia apollinea</i> (Delile) DC.	Fabaceae
173	<i>Tephrosia nubica</i> (Boiss.) Bak.	Fabaceae
174	<i>Erodium glaucophyllum</i> (L.) L'Her.	Geraniaceae
175	<i>Erodium malacoides</i> (L.) L'Her.	Geraniaceae
176	<i>Monsonia nivea</i> (Decne.) Webb	Geraniaceae
177	<i>Juncus rigidus</i> Desf.	Juncaceae

178	<i>Lavandula subnuda</i> Benth.	Lamiaceae
179	<i>Leucas inflata</i> Benth.	Lamiaceae
180	<i>Teucrium stocksianum</i> Boiss.	Lamiaceae
181	<i>Muscari longipes</i> Boiss.	Liliaceae
182	<i>Lawsonia inermis</i> L.	Lythraceae
183	<i>Acridocarpus orientalis</i> A. Juss.	Malpighiaceae
184	<i>Malva parviflora</i> L.	Malvaceae
185	<i>Acacia ehrenbergiana</i> Hayne	Mimosaceae
186	<i>Acacia tortilis</i> (Forssk.) Hayne	Mimosaceae
187	<i>Prosopis cineraria</i> (L.) Druce	Mimosaceae
188	<i>Prosopis juliflora</i> (Sw.) DC.	Mimosaceae
189	<i>Gisekia pharnaceoides</i> L.	Molluginaceae
190	<i>Limeum arabicum</i> Friedr.	Molluginaceae
191	<i>Limeum obovatum</i> Vicary	Molluginaceae
192	<i>Ficus salicifolia</i> Vahl	Moraceae
193	<i>Moringa peregrina</i> (Forssk.) Fiori	Moringaceae
194	<i>Neurada procumbens</i> L.	Neuradaceae
195	<i>Boerhavia elegans</i> Choisy	Nyctaginaceae
196	<i>Epipactis veratrifolia</i> Boiss.	Orchidaceae
197	<i>Cistanche tubulosa</i> (Schenk) Wight	Orobanchaceae
198	<i>Oxalis corniculata</i> L.	Oxalidaceae
199	<i>Plantago ciliata</i> Desf.	Plantaginaceae
200	<i>Plantago ovata</i> Forssk.	Plantaginaceae
201	<i>Dyerophytum indicum</i> (Gibs ex Wight) Kuntze	Plumbaginaceae
202	<i>Limonium axillare</i> (Forssk.) Kuntze	Plumbaginaceae
203	<i>Aeluropus lagopoides</i> (L.) Trin.	Poaceae
204	<i>Aristida abnormis</i> Chiov.	Poaceae
205	<i>Aristida adscensionis</i> L.	Poaceae
206	<i>Arundo donax</i> L.	Poaceae
207	<i>Brachypodium distachyon</i> (L.) P. Beauv.	Poaceae
208	<i>Bromus pectinatus</i> Thunb.	Poaceae
209	<i>Cenchrus ciliaris</i> L.	Poaceae
210	<i>Cenchrus echinatus</i> L.	Poaceae
211	<i>Cenchrus setigerus</i> Vahl	Poaceae
212	<i>Centropodia forsskalii</i> (Vahl) Cope	Poaceae
213	<i>Centropodia fragilis</i> (Guinet & Sauvage) Cope	Poaceae
214	<i>Chloris barbata</i> Swartz	Poaceae

215	<i>Chloris gayana</i> Kunth.	Poaceae
216	<i>Chloris virgata</i> Swartz	Poaceae
217	<i>Coelachyrum brevifolium</i> (Hochst.) Nees	Poaceae
218	<i>Coelachyrum piercii</i> (Benth.) Bor	Poaceae
219	<i>Cutandia memphitica</i> (Spreng.) Boiss.	Poaceae
220	<i>Cymbopogon schoenanthus</i> (L.) Spreng.	Poaceae
221	<i>Cymbopogon commutatus</i> (Steud.) Stapf	Poaceae
222	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae
223	<i>Dactyloctenium aegyptium</i> (L.) P. Beauv.	Poaceae
224	<i>Dichanthium foveolatum</i> (Delle) Roberty	Poaceae
225	<i>Digitaria sanguinalis</i> (L.) Scop.	Poaceae
226	<i>Echinochloa colona</i> (L.) Link	Poaceae
227	<i>Eragrostis barrelieri</i> Daveau	Poaceae
228	<i>Eragrostis cilianensis</i> (All.) Vign.	Poaceae
229	<i>Eragrostis ciliaris</i> (L.) R. Br.	Poaceae
230	<i>Hyparrhenia hirta</i> (L.) Stapf.	Poaceae
231	<i>Imperata cylindrica</i> (L.) Beauv.	Poaceae
232	<i>Lasiurus scindicus</i> Henrard	Poaceae
233	<i>Melanocenchris abyssinica</i> (R.Br.ex Fresen.) Hochst.	Poaceae
234	<i>Oryzopsis holciformis</i> (M.Bieb.) Haeckel	Poaceae
235	<i>Panicum antidotale</i> Retz.	Poaceae
236	<i>Panicum turgidum</i> Forssk.	Poaceae
237	<i>Pennisetum divisum</i> (J.F. Gmel.) Henrard	Poaceae
238	<i>Pennisetum orientale</i> Rich.	Poaceae
239	<i>Pennisetum setaceum</i> (Forssk.) Chiov.	Poaceae
240	<i>Phalaris canariensis</i> L.	Poaceae
241	<i>Phalaris minor</i> Retz.	Poaceae
242	<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	Poaceae
243	<i>Polypogon monspeliensis</i> (L.) Desf.	Poaceae
244	<i>Saccharum ravennae</i> (L.) Murr.	Poaceae
245	<i>Setaria verticillata</i> (L.) P. Beauv.	Poaceae
246	<i>Setaria viridis</i> (L.) P. Beauv.	Poaceae
247	<i>Sporobolus ioclados</i> (Nees ex Trin.) Nees	Poaceae
248	<i>Sporobolus spicatus</i> (Vahl) Kunth	Poaceae
249	<i>Stipa capensis</i> Thunb.	Poaceae
250	<i>Stipagrostis ciliata</i> (Desf.) de Winter	Poaceae
251	<i>Stipagrostis plumosa</i> (L.) Munro ex T. Anders.	Poaceae

252	<i>Tragus racemosus</i> (L.) All.	Poaceae
253	<i>Tricholaena teneriffae</i> (L.f.) Parl.	Poaceae
254	<i>Polygala erioptera</i> DC.	Polygalaceae
255	<i>Calligonum comosum</i> L'Her.	Polygonaceae
256	<i>Calligonum crinitum</i> Boiss. ssp. <i>arabicum</i> Sos.	Polygonaceae
257	<i>Emex spinosa</i> (L.) Campd.	Polygonaceae
258	<i>Portulaca oleracea</i> L. subsp. <i>oleracea</i>	Portulacaceae
259	<i>Ochradenus baccatus</i> Del.	Resedaceae
260	<i>Oligomeris linifolia</i> (Vahl) J.F. Macbr.	Resedaceae
261	<i>Reseda aucheri</i> Boiss.	Resedaceae
262	<i>Ziziphus spina-christi</i> (L.) Willd.	Rhamnaceae
263	<i>Gaillonia aucheri</i> (Guill.) Jaub. & Spach	Rubiaceae
264	<i>Kohautia caespitosa</i> Schinzl.	Rubiaceae
265	<i>Pseudogaillonia hymenostephana</i> (Jaub.&Spach) Lincz.	Rubiaceae
266	<i>Haplophyllum tuberculatum</i> (Forssk.) A. Juss.	Rutaceae
267	<i>Salvadora persica</i> L.	Salvadoraceae
268	<i>Lindenbergia indica</i> O. Kuntze	Scrophulariaceae
269	<i>Schweinfurthia papilionacea</i> (Burm. f.) Boiss.	Scrophulariaceae
270	<i>Scrophularia deserti</i> Delile	Scrophulariaceae
271	<i>Nicotiana plumbaginifolia</i> Viv.	Solanaceae
272	<i>Tamarix arabica</i> Bunge	Tamaricaceae
273	<i>Corchorus depressus</i> (L.) Stocks.	Tiliaceae
274	<i>Forsskaolea tenacissima</i> L.	Urticaceae
275	<i>Fagonia bruguieri</i> DC.	Zygophyllaceae
276	<i>Fagonia indica</i> Burm. f.	Zygophyllaceae
277	<i>Fagonia ovalifolia</i> Hadidi	Zygophyllaceae
278	<i>Seetzenia lanata</i> (Willd.) Bullock	Zygophyllaceae
279	<i>Tribulus arabicus</i> Hosni	Zygophyllaceae
280	<i>Tribulus macropterus</i> Boiss.	Zygophyllaceae
281	<i>Tribulus omanense</i> Hosni	Zygophyllaceae
282	<i>Tribulus pentandrus</i> Forssk.	Zygophyllaceae
283	<i>Tribulus terrestris</i> L.	Zygophyllaceae
284	<i>Zygophyllum mandavillei</i> Hadidi	Zygophyllaceae
285	<i>Zygophyllum qatarense</i> Hadidi	Zygophyllaceae
286	<i>Zygophyllum simplex</i> L.	Zygophyllaceae