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## Weeds of Eastern Sinai coastal area

### Abstract

Danin, A.: Weeds of Eastern Sinai coastal area. - *Willdenowia* 11: 291-300. 1981. - ISSN 0511-9618.

A list of weeds recorded in April and July 1981 in E Sinai, with comments on their origin and ecological notes. 14 species are new for the area.

### 1. Introduction

Human impact on plant life of eastern Sinai was mainly destruction of the local vegetation through overgrazing by goats and cutting of lignified plants for fuel (Bailey & Danin 1981). In areas where water is available from springs or wells, irrigated agriculture was developed long ago supporting an interesting weed flora. A previous study of the weed flora of Sinai by Hadidi et al. (1970) enumerates the weeds of the gardens near the monastery of St. Chatherine. These gardens were surveyed also by the team of the Department of Botany of the Hebrew University, Jerusalem, and a report was given by Danin (1973). The weed flora near El'Arish and Yammit (northern Sinai) was studied by Weinstein and Karschon (1981).

The new Israeli settlements of Neviot (near Nuweiba), Di-Zahav (near Dahab) and Ofira (near Sharm el Sheikh) created new habitats that never existed in the area. Planting of ornamental plants near the houses and constant irrigation of various crops since the seventies enabled many weeds to penetrate these habitats. Some of the weeds are new records for the flora of Sinai (not included in Täckholm (1974) who summarized all the botanical findings in Sinai until 1973).

In the present article a list of weeds recorded in April and July 1981 in the plots of ornamental plants and in agricultural areas is presented. Comments on the origin of the weed plants are given as well. The ecological notes on the weeds are based on many years of observations by the author in Israel and Sinai.

### 2. Environmental conditions

The study area lies in an extreme desert. The mean annual rainfall is less than 30 mm and the mean annual temperature is 23°-26° C (Atlas of Israel 1970; Ganor et al. 1973).

Neviot and Di-Zahav are built on the alluvial fans of Wadi Watir and Wadi Dahab accordingly. Ofira is built on fossil coral reef. The coral reef of Ofira was devoid of any vegetation before the establishment of the town. The irrigation of ornamental plants plots started in Ofira during 1976. The irrigation

of the three places was by the trickle pipes method, i. e. plastic hoses with small apertures that supply water to garden plants during long hours of dripping.

The alluvial fan of Neviot was covered sparsely by *Hammada salicorica* (Moq.) Iljin, *Acacia tortilis* (Forsskál) Hayne, *A. raddiana* Savi, *Hyoscyamus muticus* L. The coastal parts of the fan are populated with date palms, *Hyphaene thebaica* (Del.) Martius, and some hydrohalophytes. Much of the annual vegetation that occurs sporadically in rainy years is consumed by the goats of the dense Bedouin population of Nuweibat el Mzeina and Nuweibat el Tarabin.

The alluvial fan of Di-Zahav is even poorer in vegetation. Apart from occasional *Hyoscyamus boveanus* (Dunal) Asch. & Schweinf. plants that are toxic to most animals and to man - nearly nothing grows in the area. Date palms are planted along this coast too.

### 3. Enumeration

The plants have been collected by the author in April and July 1981. Specimens are deposited in the herbarium of the Hebrew University, Jerusalem (HUJ).

#### *Amaranthaceae*

*Amaranthus gracilis* Desf.: Ofira and Neviot.

Not recorded by Hadidi et al. (1970). It may be conspecific with *A. ascendens* Lois. recorded by Täckholm (1974) from Sinai.

#### *Asclepiadaceae*

*Calotropis procera* (Aiton) Aiton fil.: Neviot.

Not recorded by Haididi et al. (1970).

*Pergularia tomentosa* L.: Di-Zahav.

Not recorded by Hadidi et al. (1970).

#### *Chenopodiaceae*

*Atriplex semibaccata* R. Br.: Neviot.

A new record for Sinai.

*Bassia muricata* (L.) Asch.: Ofira.

*Chenopodium album* L.: Ofira.

Not recorded as a weed by Hadidi et al. (1970).

*Ch. murale* L.: Ofira, Di-Zahav and Neviot.

*Kochia indica* Wright: Ofira.

Not recorded by Hadidi et al. (1970).

*Suaeda monoica* Forsskål ex H. F. Gmel.: Di-Zahav.

Spontaneous germination of seeds from shrubs planted as ornamentals.

*Traganum nudatum* Del.: Di-Zahav.

Not recorded by Hadidi et al. (1970).

### **Compositae**

*Aster subulatus* Michaux: Ofira and Neviot.

A new record for Sinai.

*Conyza bonariensis* (L.) Cronq.: Ofira and Neviot.

*C. canadensis* (L.) Cronq.: Neviot.

A new record for Sinai.

*Launaea capitata* (Sprengel) Dandy: Neviot.

*Pulicaria crispa* (Forsskål) Oliver: Di-Zahav and Neviot.

Not recorded by Hadidi et al. (1970).

*Sonchus oleraceus* L.: Ofira, Di-Zahav and Neviot.

### **Cruciferae**

*Brassica tournefortii* Gouan: Neviot.

Not recorded by Hadidi et al. (1970).

*Sisymbrium irio* L.: Ofira.

*Zilla spinosa* (L.) Prantl: Neviot.

Not recorded by Hadidi et al. (1970).

### **Cyperaceae**

*Cyperus distachyus* All.: Ofira, Di-Zahav and Neviot.

Not recorded by Hadidi et al. (1970).

*C. rotundus* L.: Ofira and Neviot.

*Holoschoenus vulgaris* (L.) Fritsch: Di-Zahav.

Not recorded by Hadidi et al. (1970).

### **Euphorbiaceae**

*Euphorbia hirta* L.: Ofira.

A new record for Sinai.

*E. maculata* L.: Ofira and Neviot.  
A new record for Sinai.

*E. nutans* Lagasca: Ofira.  
A new record for Sinai.

*E. peplis* L.: Ofira and Neviot.

*E. prostrata* Aiton: Ofira and Neviot.  
A new record for Sinai.

*Ricinus communis* L.: Di-Zahav.  
Locally escaped from ornamental plots.

### Gramineae

*Avena sterilis* L.: Neviot.

*Cenchrus echinatus* L.: Neviot.  
A new record for Sinai.

*Cutandia memphitica* (Sprengel) Benth.: Neviot.  
Not recorded by Hadidi et al. (1970).

*Cynodon dactylon* (L.) Pers.: Ofira, Di-Zahav and Neviot.

*Dactyloctenium aegyptium* (L.) P. Beauv.: Di-Zahav and Neviot.  
A new record for Sinai.

*Digitaria sanguinalis* (L.) Scop.: Ofira, Di-Zahav and Neviot.  
A new record for Sinai.

*Echinochloa colona* (L.) Lind.: Ofira and Neviot.

*Eleusine indica* (L.) Gaertner: Ofira and Neviot.  
Not recorded by Hadidi et al. (1970).

*Eragrostis cilianensis* (All.) Vign.: Neviot.  
Not recorded by Hadidi et al. (1970).

*Imperata cylindrica* (L.) P. Beauv.: Ofira and Neviot.  
Not recorded by Hadidi et al. (1970).

*Lolium rigidum* Gaudin: Neviot.

*Phragmites australis* (Cav.) Trin.: Ofira, Di-Zahav and Neviot.  
Not recorded by Hadidi et al. (1970).

*Polypogon monspeliensis* (L.) Desf.: Ofira, Di-Zahav and Neviot.

*P. viridis* (Gouan) Breistr.: Ofira and Neviot.

*Setaria verticillata* (L.) P. Beauv.: Ofira and Neviot.

*Sorghum halepense* (L.) Pers.: Neviot.  
A new record for Sinai.

*Tricholaena teneriffae* (L. fil.) Parl.: Neviot.

### **Juncaceae**

*Juncus arabicus* (Asch. & Buch.) Adams: Neviot.  
Not recorded by Hadidi et al. (1970).

### **Labiatae**

*Mentha longifolia* L.: Ofira.

### **Liliaceae**

*Asparagus stipularis* Forsskål: Neviot.  
Not recorded by Hadidi et al. (1970).

### **Malvaceae**

*Malva nicaeensis* All.: Ofira.  
Not recorded by Hadidi et al. (1970).

*M. parviflora* L.: Neviot.  
Not recorded by Hadidi et al. (1970).

### **Papilionaceae**

*Alhagi maurorum* Medikus: Neviot.  
Not recorded by Hadidi et al. (1970).

*Lotus halophilus* Boiss. & Spruner: Ofira.  
Not recorded by Hadidi et al. (1970).

*Lotus peregrinus* L.: Ofira.  
A new record for Sinai.

*Medicago sativa* L.: Neviot.

*Melilotus indicus* (L.) All.: Ofira.

*Tephrosia apollinea* (Del.) Link: Neviot.  
Not recorded by Hadidi et al. (1970).

#### **Polygonaceae**

*Polygonum equisetiforme* Sibth. & Smith: Neviot.  
A new record for Sinai.

#### **Portulacaceae**

*Portulaca oleracea* L. subsp. *oleracea*: Ofira and Neviot.

*Portulaca oleracea* L. subsp. *granulato-stellulata* (Poelln.) Danin & H. G. Baker: Ofira.  
A new record for Sinai (cf. Danin, Baker & Baker 1978).

#### **Scrophulariaceae**

*Kickxia acerbiana* (Boiss.) Taechh. & Boulos: Neviot.  
Not recorded by Hadidi et al. (1970).

#### **Solanaceae**

*Hyoscyamus boveanus* (Dun.) Asch. & Schweinf.: Di-Zahav.

*H. muticus* L.: Neviot.  
Not recorded by Hadidi et al. (1970).

*Solanum nigrum* L.: Ofira, Di-Zahav und Neviot.

#### **Tamaricaceae**

*Tamarix nilotica* (Ehrenb.) Bunge: Ofira and Neviot.  
Not recorded by Hadidi et al. (1970).

#### **Typhaceae**

*Typha australis* Schum. & Thonn.: Neviot.  
Not recorded by Hadidi et al. (1970).



*Umbelliferae**Ammi majus* L.: Ofira.*Zygophyllaceae**Peganum harmala* L.: Neviot.*Tribulus bimucronatus* Viv.: Neviot.

Not recorded by Hadidi et al. (1970).

*Zygophyllum coccineum* L.: Ofira, Di-Zahav and Neviot.

Not recorded by Hadidi et al. (1970).

*Zygophyllum simplex* L.: Ofira.

Not recorded by Hadidi et al. (1970).

**4. Discussion**

The weeds of ornamental gardens and irrigated agricultural crops in eastern Sinai grow in habitats that never existed before in the area. Some of these weeds are plants from the local flora of the region. Among them are plants which are typical to ruderal habitats in deserts such as *Sisymbrium irio*, and make use of environmental conditions which are similar to their typical niche, and other species such as *Imperata cylindrica* which are normally confined to desert springs. Mostly they have wind dispersed diaspores that reach the constantly irrigated plots and establish themselves there. Species such as *Hyoscyamus boveanus* grow regularly in desert wadis and establish themselves at the margins of irrigated plots where it is not too wet.

Many of the weeds were derived from nurseries and other agricultural areas in Israel where the plants, seeds, manure and agricultural equipment came from (cf. Dafni & Heller 1980). These species represent two groups in regard to their origin. Newly arrived adventive species may be regarded as one group. Such species were named xénophytes by Greuter (1971). This term means a species that was introduced and established at a certain country far away from the natural area of its distribution. Old introductions, such as *Portulaca oleracea* subsp. *oleracea* in the old world, form the second group and may be regarded at present as part of the spontaneous flora of the regions (Danin, Baker & Baker 1978). The boundary between these two categories is artificial.

The species found in the study area are listed in Table 1 according to the five ecological groups discussed above. The data of this table show that 50.0% of the weed flora is derived from nurseries in Israel from where the ornamental plants were introduced. The second largest group is from the local flora of desert habitats that can withstand the new environment. These species grow in the relatively dry microhabitats near the fields or establish themselves in the abandoned fields. The fields of Di-Zahav once irrigated were abandoned in 1980 and by summer 1981 mostly species of desert habitats had occupied the area. The number of weeds derived from nurseries in Israel in the fields of Di-Zahav is very small and the only habitat where some of them continue to exist is the irrigated lawns and plots of ornamental plants where artificial irrigation is still functioning.

The weed flora of eastern Sinai has a rather low similarity with the weed flora of the mountainous southern Sinai. Of the 156 species found in the latter by Hadidi et al. (1970) and the 70 found in the present study only 24 are common. The index of similarity is therefore

$$100 \times \frac{24 \times 2}{156 + 70} = 21.2\%$$

The low similarity reflects the different ecological conditions prevailing in each of the areas and the different source of weeds. The high elevations of Sinai are cooler and wetter than eastern Sinai. A phytogeographical analysis of the flora of the upper massif of Sinai (Danin 1981) shows that 22.6% are Irano-Turanian species, 18.9% are Saharo-Arabian, 12.0% are Sudanian and 5.4% are Mediterranean species. The rest are bi-regional or pluriregional species. The coastal plain of eastern Sinai has 31.6% Saharo-Arabian species, 26.9% Sudanian, 4.7% Irano-Turanian and 1.7% Mediterranean species. Thus, the floras of the two areas are different and this becomes evident in each habitat including also the weeds of irrigated fields. The other prominent reason for the low similarity is the source of weeds. The principal source of weeds for eastern Sinai are the nurseries and the roadside flora of Israel. Having a very intensive irrigated agriculture and large areas influenced by human activity the adventive flora of Israel is rather rich. The irrigation of the fields and ornamental plants of eastern Sinai with the same methods of the Israeli agriculture enabled many weeds to establish there. The new records, altogether 14 species, form considerable additions to the flora of Sinai (ca. 900 species) within less than 10 years of irrigated agriculture.

The future of this adventive flora depends on human activity. If the area is not irrigated most of the weeds will disappear as they ceased in the area of Di-Zahav.

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Table 1. Ecological preferences of the 69 weed species found in irrigated ground at Ofira, Di-Zahav and Neviot 1981.

desert ruderals	species of desert springs	species of other desert habitats	common weeds derived from nurseries in Israel	newly arrived xenophytes of Israel
<i>Chenopodium murale</i>	<i>Cyperus distachyus</i>	<i>Calotropis procera</i>	<i>Amaranthus gracilis</i>	<i>Atriplex semibaccata</i>
<i>Sonchus oleraceus</i>	<i>Holoschoenus vulgaris</i>	<i>Pergularia tomentosa</i>	<i>Chenopodium album</i>	<i>Kochia indica</i>
<i>Sisymbrium irio</i>	<i>Imperata cylindrica</i>	<i>Bassia muricata</i>	<i>Cyperus rotundus</i>	<i>Aster subulatus</i>
<i>Malva parviflora</i>	<i>Phragmites australis</i>	<i>Suaeda monoica</i>	<i>Euphorbia peplus</i>	<i>Conyza bonariensis</i>
<i>Hyoscyamus muticus</i>	<i>Polygonum monspeliensis</i>	<i>Traganum nudatum</i>	<i>Ricinus communis</i>	<i>Conyza canadensis</i>
<i>Peganum harmala</i>	<i>Juncus arabicus</i>	<i>Launaea capitata</i>	<i>Avena sterilis</i>	<i>Euphorbia hirta</i>
	<i>Mentha longifolia</i>	<i>Pulicaria crispa</i>	<i>Cynodon dactylon</i>	<i>Euphorbia maculata</i>
	<i>Alhagi maurorum</i>	<i>Brassica tournefortii</i>	<i>Dactyloctenium aegyptium</i>	<i>Euphorbia nutans</i>
	<i>Tamarix nilotica</i>	<i>Zilla spinosa</i>	<i>Digitaria sanguinalis</i>	<i>Euphorbia prostrata</i>
	<i>Typha australis</i>	<i>Cutandia memphitica</i>	<i>Echinochloa colona</i>	<i>Cenchrus echinatus</i>
		<i>Tricholaena teneriffae</i>	<i>Eleusine indica</i>	<i>Portulaca oleracea</i> subsp.
		<i>Asparagus stipularis</i>	<i>Eragrostis cilianensis</i>	<i>granulato-stellulata</i>
		<i>Lotus halophilus</i>	<i>Lolium rigidum</i>	
		<i>Tephrosia apollinea</i>	<i>Polygonum viridis</i>	
		<i>Kickxia acerbiana</i>	<i>Setaria verticillata</i>	
		<i>Hyoscyamus boveanus</i>	<i>Sorghum halepense</i>	
		<i>Tribulus bimucronatus</i>	<i>Malva nicaeensis</i>	
		<i>Zygophyllum coccineum</i>	<i>Lotus peregrinus</i>	
		<i>Zygophyllum simplex</i>	<i>Medicago sativa</i>	
			<i>Melilotus indicus</i>	
			<i>Polygonum equisetiforme</i>	
			<i>Portulaca oleracea</i> subsp. <i>oleracea</i>	
			<i>Solanum nigrum</i>	
			<i>Ammi majus</i>	
			34.3	15.7
Percents: 8.6	14.3	27.1		

