

Weed Flora of the Date Palm Orchards in Eastern Saudi Arabia

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Abstract. The present study deals with the weed flora of the date palm plantations in Al-Hasa Oasis, Eastern Saudi Arabia. A list of 118 species belonging to 91 genera, and 37 families are given. This figure represents about 20% of the flora of Eastern Saudi Arabia. Thirty-five species cause severe infestations and hence they could be considered as troublesome weeds. Some other species, recorded in the neglected farms, are typically halophytic. They represent the major components of the saline desert flora.

Introduction

Robbins *et al* [1] defined the weeds as plants which are harmful, and which interfere with agriculture operations, increase labor input, add to costs and reduce crop yields. According to the Terminology Committee of the Weed Science Society of America [2], a weed is defined as a plant growing where it is not desired, i.e. out of place.

The weed problems in Saudi Arabia differ from those prevailing in temperate areas. The weeds grow more vigorously and regenerate more quickly since there is plenty of heat and sunshine. In addition, the development of irrigated agriculture in different Saudi regions, and the application of fertilizers (manures and chemicals) enriched the soil and improved crop growth, as well as intensifying the weed problem [3].

The date palm (*Phoenix dactylifera* L.) is considered the most adapted and significant fruit tree in Saudi Arabia. It is concentrated in different oases all over the country and is usually intercropped with other fruit trees, vegetables and alfalfa. Plantations which are intercropped either lack weed control practices or have some hand weeding [3].

Studies on the weed flora of Saudi Arabia, particularly on the weeds of date palms, are still limited. The publications of Chaudhary and Zawawi [4], Saghir and Chaudhary [3], and Chaudhary and Akram [5] are the most relevant to this topic. The present study aims at surveying the weed flora of date palm plantations in Al-Hassa oasis (Eastern Province), the major date palm producer in Saudi Arabia [6].

It is an attempt towards filling the gap in the information required to analyze the weed problem in the orchards of this important tree in the Eastern Province of Saudi Arabia.

Al-Hassa Oasis is situated in the Eastern Province of Saudi Arabia, about 60 km west of the Arabian Gulf. It is L-shaped and slightly sloped to the north and east with the town of Al-Hofuf (150 m above sea level) at the south western corner. Plantations, although sometimes interrupted by stretches of sand dunes, red beds and sabkhas, extend from Al-Hofuf to approximately 30 km north and 20 km east (Fig. 1). The cultivated area of the Oasis (approximately 8000 ha, of which 5800 ha are cultivated with date palms) has been supplied since 1972 with a modern irrigation and drainage system. The total length of the irrigation channels is 2638 km, and that of the drainage channels is 1276 Km (Hassa Irrigation and Drainage Authority, unpublished data).

East of Al-Hassa Oasis is the flat of Al-Jafurah desert floor, sloping with a very low gradient towards the Gulf coastal plain. To the west, the foremost escarpment of Assumman plateau is found, which rises to about 270 m above sea level [7]. Geologically, this oasis lies in the Eastern Sedimentary Basin that covering about 73% of Saudi Arabia. This Basin includes the most important water formations. Sedimentary formations start with the Cambrian and include all the geological sequences ending in recent deposits with an average thickness of over 5000 m [8]. The climatic and soil conditions of this region are summarized in Table 1 and Table 2 respectively.

Species Collection and Identification

Forty farms in 11 locations in Al-Hassa oasis (Fig. 1) were surveyed during four visits in 1990. These farms were either cultivated (i.e. well maintained) or neglected farms. Samples from the recorded species were collected and prepared as herbarium specimens for identification. The following references were consulted: Täckholm [9], Migahid [10], Collenette [11], Chaudhary and Akram [5] and Chaudhary [12]. A new species (*Agriophyllum montasiri*) was identified according to El-Gazzar [13]. The voucher specimens have been deposited in Biology Department Herbarium, King Faisal University, Al-Hassa, Saudi Arabia.

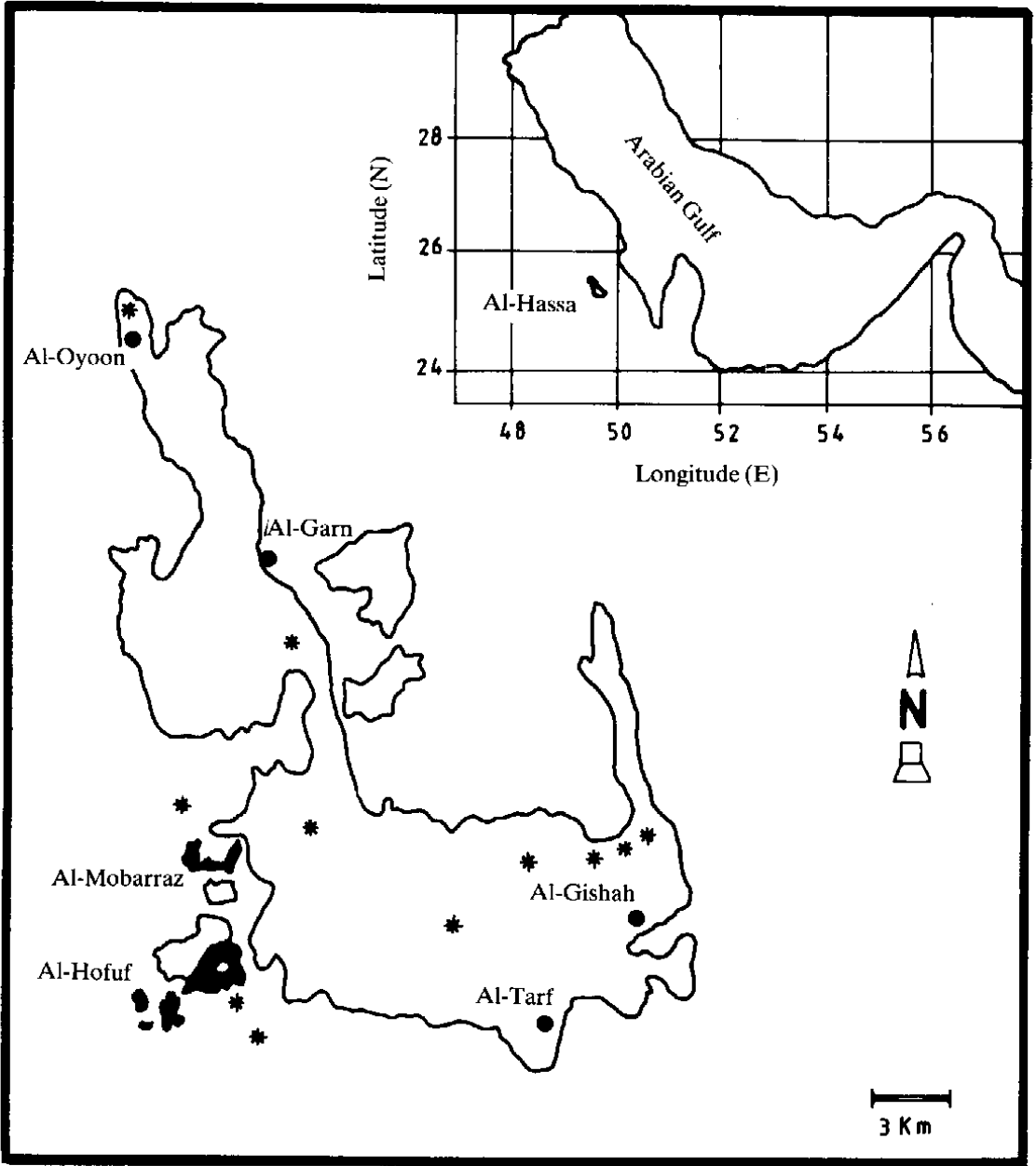


Fig. 1. Location map of the sampling sites (*) in Al-Hassa oasis

Table 1. General climatic features of Al-Hassa Oasis (Hofuf Agriculture Research Center, as quoted by Dreaver *et al.*, [15]. PET: Potential evapo-transpiration (Penman's Formula).

| Climatic variable | Mean (annual) | Minimum (monthly) | Maximum (monthly) |
|--------------------------------|------------------|----------------------|----------------------|
| Rain fall (mm) | 66.6 | 0.0 | 21.5 |
| Humidity (%) | 42.1 | 25.5 | 64.9 |
| Evaporation (mm) | 3310.0 | 124.6 | 464.4 |
| PET (mm) | 2367.6 | 83.7 | 313.1 |
| Wind speed (km/hr) | 13.0 | 10.0 | 17.0 |
| Pressure (mm Hg) | 755.0 | 737.0 | 860.0 |
| Sun-shine (hrs) | 4434.0 | 207.0 | 325.0 |
| Radiation (10 ³ LY) | 176.1 | 9.9 | 18.6 |
| Temperature (°C) | 25.3 | 8.0 | 43.0 |

Table 2. Physico-chemical properties of the date palm soils in Al-Hassa oasis (calculated from data presented in Khafaji *et al.*[6].

| Soil variable | 0 - 30 cm | | 30 - 60 cm | |
|----------------------------|-----------|------------|------------|------------|
| | Range | Mean ± SE | Range | Mean ± SE |
| Sand | 49.0-79.0 | 65.9 ± 3.2 | 47.0-91.0 | 66.2 ± 4.5 |
| Silt | 13.0-28.0 | 19.8 ± 2.0 | 4.0-26.0 | 16.4 ± 2.6 |
| Clay | 10.0-28.0 | 14.3 ± 1.5 | 7.0-33.0 | 17.4 ± 2.8 |
| CaCO ₃ | 11.4-31.4 | 20.8 ± 2.1 | 6.2-32.1 | 19.0 ± 2.7 |
| Gypsum | 0.3- 1.2 | 0.6 ± 0.1 | 0.1- 1.1 | 0.5 ± 0.1 |
| EC (mmhos / cm) | 1.5- 7.8 | 4.0 ± 0.7 | 1.6- 8.2 | 3.6 ± 0.7 |
| pH | 7.7- 8.4 | 8.1 ± 0.1 | 7.3- 8.4 | 8.0 ± 0.1 |
| O.M. % | 0.7- 2.2 | 1.5 ± 0.2 | 0.2- 1.6 | 0.9 ± 0.1 |
| Total N (mg / gm) | 0.3- 1.2 | 0.8 ± 0.1 | 0.1- 0.9 | 0.5 ± 0.1 |
| <i>Available nutrients</i> | | | | |
| P | 0.6-69.1 | 16.0 ± 6.5 | 3.1-18.3 | 7.2 ± 1.4 |
| Fe | 2.2-10.5 | 5.0 ± 0.8 | 1.6- 9.0 | 4.0 ± 0.7 |
| Mn | 1.9- 6.7 | 4.0 ± 0.5 | 1.1- 6.1 | 3.3 ± 0.5 |
| Cu | 0.5- 0.7 | 0.6 ± 0.0 | 0.4- 0.7 | 0.6 ± 0.0 |
| Zn | 1.2- 3.0 | 1.6 ± 0.2 | 0.9- 1.6 | 1.2 ± 0.1 |

List of the Collected Species

This list includes 118 noncultivated species belonging to 91 genera, and 37 families. Thirty-one of them belong to the Monocotyledoneae and 87 ones belong to the Dicotyledoneae. Thirty-five species occurred abundantly in both the cultivated

and/or neglected farms. This number of species represents about 20% of the flora of Eastern Saudi Arabia [14]. Thirty-eight species were recorded in cultivated farms, 48 in neglected farms, and 32 in both the cultivated and neglected farms. The three most represented families are Graminae (23.7%), Chenopodiaceae (14.4%), and Compositae (11.0%). Some species with abundant occurrences in the neglected farms (e.g. *Zygophyllum qatarense*, *Anabasis setifera* and *Suaeda monoica*) are typically halophytic. They represent the major components of the saline desert flora. In general, 35 species (12 in cultivated farms, 7 in neglected farms and 16 in the both types of farms) cause severe infestations and hence they could be considered as troublesome weeds (Table 3).

Table 3. The common weed species in the cultivated and neglected farms in the date palm orchards in Al-Hassa Oasis.

| Cultivated farms | Neglected farms | Cultivated and neglected farms |
|--------------------------------|------------------------------|---------------------------------|
| <i>Erucastrum arabicum</i> | <i>Anabasis setifera</i> | <i>Anagalis arvensis</i> |
| <i>Euphorbia peplus</i> | <i>Cressa cretica</i> | <i>Chenopodium glaucum</i> |
| <i>Flavaria trinervia</i> | <i>Oligomeris linifolia</i> | <i>Chenopodium murale</i> |
| <i>Malva parviflora</i> | <i>Salsola baryosma</i> | <i>Convolvulus arvensis</i> |
| <i>Picris cyanocarpa</i> | <i>Suaeda monoica</i> | <i>Cynodon dactylon</i> |
| <i>Plantago lanceolata</i> | <i>Suaeda volkensis</i> | <i>Dactyloctenium aegyptium</i> |
| <i>Polygonum bellardii</i> | <i>Zygophyllum qatarense</i> | <i>Imperata cylindrica</i> |
| <i>Polypogon monspeliensis</i> | | <i>Launaea nudicaulis</i> |
| <i>Ranunculus muricatus</i> | | <i>Melilotus indica</i> |
| <i>Rumex dentatus</i> | | <i>Phoenix dactylifera</i> |
| <i>Samolus valerandi</i> | | <i>Phragmites australis</i> |
| <i>Stelaria media</i> | | <i>Portulaca oleracea</i> |
| | | <i>Reichardia tingitana</i> |
| | | <i>Setaria verticillata</i> |
| | | <i>Setaria viridis</i> |
| | | <i>Sonchus oleraceus</i> |

Monocotyledoneae

Alliaceae

Allium sphaerocephalum L., rare, in cultivated farms.

Cyperaceae

Cyperus conglomeratus Rottb., rare, in cultivated farms.

Cyperus rotundus L., rare, in cultivated farms.

Gramineae

Aeluropus lagopoides (L.) Trin ex Thwaites, rare, in neglected farms.

Aeluropus littoralis (Gouan) Parl., rare, in cultivated farms.

Avena fatua L., rare, in cultivated farms.

Cynodon dactylon (L.) Pers., very common, in both the cultivated and neglected farms.

Dactyloctenium aegyptium (L.) P. Beauv., common, in both the cultivated and neglected farms.

Digitaria sanguinalis (L.) Scop., rare, in cultivated farms.

Echinochloa colonum (L.) Link., rare, in cultivated and neglected farms.

Eleusine indica (L.) Gaertn., rare, in cultivated farms.

Eragrostis barrelieri Dav., rare, in cultivated farms.

Hordeum leporinum Link., rare, in neglected farms.

Imperata cylindrica (L.) Beauv., common, in cultivated and neglected farms.

Lasiurus hirsutus (Forssk.) Boiss, rare, in neglected farms.

Lolium perenne L., rare, in cultivated and neglected farms.

Lolium rigidum Gaudin, rare, in cultivated farms.

Ochthochloa compressa (Forssk.) Hilu, rare, in neglected farms.

Panicum turgidum Forssk., rare, in neglected farms.

Pennisetum divisum (Gmel.) Henr., rare, in neglected farms.

Phalaris minor Retz., rare, in cultivated farms.

Phragmites australis (Cav.) Trin. ex Steud., very common, in cultivated and neglected farms.

Polypogon monspeliensis (L.) Desf., common, in cultivated farms.

Schismus barbatus (L.) Thell., rare, in neglected farms.

Setaria verticillata (L.) Beauv., common, in cultivated and neglected farms.

Setaria viridis (L.) Beauv., common, in cultivated and neglected farms.

Sporobolus spicatus (Vahl) Kunth., rare, in neglected farms.

Stipagrostis ciliata (Desf.) de Winter, rare, in neglected farms.

Juncaceae

Juncus rigidus C.A.M., rare, in neglected farms.

Palmae

Phoenix dactylifera L., common, in cultivated and neglected farms.

Dicotyledoneae**Aizoaceae**

Aizoon canariense L., rare, in neglected farms.

Amaranthaceae

Amaranthus graecizans L., rare, in cultivated and neglected farms.

Apocynaceae

Trachomitum venetum ssp. *sarmatiense* (L.) Woodson, rare, in cultivated farms.

Asclepiadaceae

Cynanchum acutum L., rare, in cultivated farms.

Boraginaceae

Heliotropium bacciferum Forssk., rare, in neglected farms.

Heliotropium digynum (Forssk.) Asch. ex C. Christens, rare, in neglected farms.

Heliotropium europaeum L., rare, in cultivated farms.

Caryophyllaceae

Silene linearis Decne., rare, in cultivated farms.

Spergularia diandra (Guss.) Heldr. et Sart., rare, in cultivated farms.

Spergularia marina (L.) Griseb., rare, in cultivated and neglected farms.

Stellaria media (L.) Vill., common, in cultivated farms.

Chenopodiaceae

Agriophyllum montasiri El-Gazzar, rare, in neglected farms.

Anabasis setifera Moq., common, in neglected farms.

Bassia eriophora (Schrad.) Asch., rare, in cultivated and neglected farms.

Beta vulgaris L., rare, in cultivated farms.

Chenopodium sp., rare, in cultivated farms.

Chenopodium glaucum L., common, in cultivated and neglected farms.

Chenopodium murale L., common, in cultivated and neglected farms.

Cornulaca monocantha Del., rare, in neglected farms.

Kochia indica Wight, rare, in neglected farms.

Salsola baryosma (Roem. et Schult.) Dandy, common, in neglected farms.

Salsola imbricata Forssk., rare, in neglected farms.

- Salsola vermiculata* L., rare, in cultivated farms.
Salsola volkensis Asch. & Schweinf., rare, in neglected farms.
Suaeda aegyptiaca (Hasselq) Zoh., rare, in cultivated and neglected farms.
Suaeda monoica Forssk., common, in neglected farms.
Suaeda vermiculata Forssk., rare, in cultivated farms.
Suaeda volkensis C.B. Cl., rare, in cultivated farms, common in neglected ones.

Compositae

- Aster squamatus* (Spr.) Hieron, rare, in neglected farms.
Carthamus oxyacantha Boiss., rare, in neglected farms.
Conyza bonariensis (L.) Cronq., rare, in cultivated and neglected farms.
Conyza bovei DC., rare, in cultivated and neglected farms.
Flaveria trinervia (Spreng.) Mohr., common, in cultivated farms, rare in neglected ones.
Lactuca saligna L., rare, in cultivated farms.
Launaea capitata (Spreng.) Dandy, rare, in neglected farms.
Launaea mucronata (Forssk.) Muschl., rare, in neglected farms.
Launaea nudicaulis (L.) Hook f., common, in cultivated and neglected farms.
Picris cyanocarpa Boiss., common, in cultivated farms, rare in neglected ones.
Reichardia tingitana (L.) Roth., common in cultivated and neglected farms.
Sonchus asper (L.) Hill., rare, in neglected farms.
Sonchus oleraceus L., very common, in cultivated and neglected farms.

Convolvulaceae

- Convolvulus arvensis* L., very common, in cultivated and neglected farms.
Convolvulus pilosellifolius Desr., rare, in cultivated farms.
Cressa cretica L., rare, in cultivated farms, common in neglected ones.

Cruciferae

- Eruca sativa* Mill., rare, in neglected farms.
Erucastrum arabicum Fisch. et Mey., common, in cultivated farms.
Lepidium aucheri Boiss., rare, in neglected farms.
Savignya parviflora (Del.) Webb, rare, in neglected farms.

Cuscutaceae

- Cuscuta campestris* Yuncker., rare, in cultivated and neglected farms.

Euphorbiaceae

Euphorbia peplus L., very common, in cultivated farms.

Ricinus communis L., rare, in cultivated farms.

Frankeniaceae

Frankenia pulverulenta L., rare, in neglected farms.

Gentianaceae

Centaurium pulchellum (Sw.) Druce., rare, in neglected farms.

leguminosae

Alhagi maurorum Medik., rare, in neglected farms.

Astragalus hauarensis Boiss., rare, in neglected farms.

Astragalus tribuloides Del., rare, in cultivated farms.

Lotus halophilus Boiss. et Sprun. in Boiss., rare, in neglected farms.

Melilotus indica (L.) All., very common, in cultivated and neglected farms.

Prosopis farcta (Banks & Sol.) Macbr., rare, in neglected farms.

Prosopis Juliflora (Sw.) DC., rare, in neglected farms.

Malvaceae

Malva parviflora L., common, in cultivated farms, rare in neglected ones.

Orobanchaceae

Cistanche phelypaea (L.) Cout., rare, in neglected farms.

Plantaginaceae

Plantago major L., rare, in cultivated and neglected farms.

Plantago lanceolata L., common, in cultivated farms.

Plantago ovata Forssk., rare, in neglected farms.

Polygonaceae

Polygonum bellardii All., common, in cultivated farms.

Calligonum comosum L'Hèr., rare, in neglected farms.

Rumex dentatus L., common, in cultivated farms.

Rumex vesicarius L., rare in cultivated farms.

Portulacaceae

Portulaca oleracea L., common, in cultivated and neglected farms.

Primulaceae

Anagallis arvensis L., common, in cultivated and neglected farms.

Samolus valerandi L., common, in cultivated farms.

Ranunculaceae

Ranunculus muricatus L., common, in cultivated farms.

Resedaceae

Oligomeris linifolia (Vahl) Macbr., common, in neglected farms.

Rhamnaceae

Ziziphus spina-christi (L.) Willd., rare, in cultivated and neglected farms.

Rutaceae

Haplophyllum tuberculatum (Forssk.) A. Juss., rare, in neglected farms.

Scrophulariaceae

Veronica anagallis-aquatica L., rare, in cultivated farms.

Solanaceae

Datura innoxia Mill., rare, in cultivated farms.

Solanum nigrum L., rare, in neglected farms.

Withania somnifera (L.) Dunal., rare, in neglected farms.

Tamaricaceae

Tamarix arabica Bge., rare, in neglected farms.

Tamarix passerinoides Del. ex Desv., rare, in neglected farms.

Tiliaceae

Corchorus olitorius L., rare, in cultivated farms.

Umbelliferae

Anethum graveolens L., rare, in cultivated farms.

Verbenaceae

Phyla nodiflora (L.) Michx., rare, in neglected farms.

Zygophyllaceae

Tribulus terrestris L., rare, in neglected farms.

Zygophyllum qatarense Hadidi., common, in neglected farms.

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References

- [1] Robbins, W.W.; Crafts, A.S. and Rayner, R.N. *Weed Control*. McGraw Hill, 1952.
- [2] Weed Science Society of America. Terminology Committee of the Weed Science Society of America, WSSA, USA, 1956.
- [3] Saghir, A.R. and Chaudhary, S.A. *Weed Control Handbook for Saudi Arabia*. Riyadh: Ministry of Agriculture and Water, Dept. Agri. Res. and RAWRC, 1986.
- [4] Chaudhary, S.A. and Zawawi, M.A. *A Manual of Weeds of Central and Eastern Saudi Arabia*. Riyadh: Ministry of Agriculture and Water, RAWRC, 1983.
- [5] Chaudhary, S.A. and Akram, M. *Weeds of Saudi Arabia and the Arabian Peninsula*. Riyadh: Ministry of Agriculture and Water, RAWRC, 1987.
- [6] Khafaji, M; Abdelhadi, Y. and Al-Barrak, S. "Study on the Nutritional Status of Some Soils under Date Palm Cultivation in Al-Hassa Oasis." *Proc. of the Second Symp. on the Date Palm in Saudi Arabia*, Date Palm Research Center, King Faisal University, Al-Hassa, Saudi Arabia. (1986), 205-215.
- [7] Elprince, A.M.; Mashhady, A.S. and Abu-Husayn, M.M. "The Occurrence of Pedogenic Poly-raskite (Attapulgitite) in Saudi Arabia." *Soil Sci.* 128, (1979), 211-217.
- [8] Abd El-Rahman, A.A. "The Deserts of the Arabian Peninsula." In *Hot Deserts and Arid Shrub Lands*: Evenari, M. et al. (eds.). Amsterdam: Elsevier Science Publishers, 1986.
- [9] Täckhlom, V. *Student's Flora of Egypt*. Egypt: Cairo Univ., 1974.
- [10] Migahid, A.M. *Flora of Saudi Arabia*. Riyadh: Riyadh University Publication, 1978.
- [11] Collenette, I.S. *An Illustrated Guide to the Flowers of Saudi Arabia*, No. 1. Riyadh: Flora Publication, Ministry of Defense and Civil Aviation, MEPA, 1985.

- [12] Chaudhary, S.A. *Grasses of Saudi Arabia*. Riyadh: Ministry of Agriculture and Water, RAWRC, 1989.
- [13] El-Gazzar, A. "Agriophyllum montasiri, a New Species of Chenepodiaceae from Eastern Arabia." *Mitt. Bot. Staatssamml. Munchen*. 27, (1988), 15-19.
- [14] Mandaville, J.P. *Flora of Eastern Saudi Arabia*. Kegan Paul International Limited, 1990.
- [15] Dreaver, K.R.; Asseed, M.S.; Makki, Y.M. and Turjoman, A.M. "Investigation of the Agroclimate and Model Formulation in Al-Hassa." *Proc. Saudi Biol. Soc.* 5, (1981), 35-48.

فلورة الأعشاب الضارة في مزارع النخيل بشرق الجزيرة العربية

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ملخص البحث. تهتم هذه الدراسة بفلورة الأعشاب الضارة المنتشرة في زراعات النخيل بواحة الإحساء بشرق الجزيرة العربية. تضمن البحث قائمة تشتمل على ١١٨ نوعاً نباتياً ينتمون إلى ٩١ جنساً و٣٧ فصيلة. يمثل هذا العدد ما يقرب من ٢٠٪ من فلورة شرق المملكة العربية السعودية. وقد لوحظ أن ٣٥ نوعاً تغزو المزارع بشدة، ولذا فإنها تعتبر من الأنواع المسببة للمتاعب. ومن الأنواع النباتية المسجلة في المزارع المهملة ما يعتبر نباتات ملحية حقيقية، حيث إنها تمثل مكونات المجتمعات المحلية بالمناطق الصحراوية.