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Analysis of plant communities resulting from change of land-use in the natural habitats in Egypt

Abstract

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The soil seed bank and standing vegetation were investigated in nineteen stands (public gardens, in Lower and Upper Egypt). One hundred nineteen species were recorded. Vegetation analysis indicates the dominance of *Cynodon dactylon, Echinochloa colona, Digitaria sanguinalis, Portulaca oleracea, Cyperus rotundus, Solanum nigrum, Amaranthus lividus, Conyza bonariensis, Pluchea dioscoridis, Bidens pilosa, Plantago major, Sonchus oleraceus, Euphorbia prostrata and Symphiotrichum squamatum.* The classification of stands according to the TWINSPAN technique resulted in five vegetation clusters at level three. These clusters are named after the dominant species as follows: *Setaria verticillata*, *Amaranthus viridis*, *Plantago major, Centaurea calcitrapa - Plantago lagopus - Amaranthus graecizans - Phragmites ausrtralis - Artemisia monosperma* and *Eleusine indica.* Soil variables in the present study are not effective in characterizing the vegetation clusters.

Introduction

Weed science is the scientific discipline studtying plants that interfere with human activities. Robbins et al. (1952) defined the weeds as plants which are harmful, and which interfere with agriculture operations, increase labour input, add to costs and reduce crop yields. According to the Terminology Committee of the Weed Science Society of America (Anonymus 1956) a weed is defined as a plant growing where it is not desired, i.e. out of place. In the present study the term weed is used to define the plant growing where it is not desired or a plant out of place. Due to the rapid growth of the Egyptian human population, more and more cultivated land, used to promote tourism to raise public gardens. During the last few decades, many public gardens have taken place in provinces of Egypt. Soil was transported from agricultural land in the Nile Valley to raise public gardens. The transported soil acted as a seed bank of weeds (Shaltout & Post 1993).

The seeds of the transported soil, which was spread in the gardens, provided the origin of weed flora in these areas. The increasing population in Egypt is leading to overcrowding. Changes in environmental conditions result in a continuous change of the native plant cover. Some native plants that were once common are becoming rare or almost extinct due

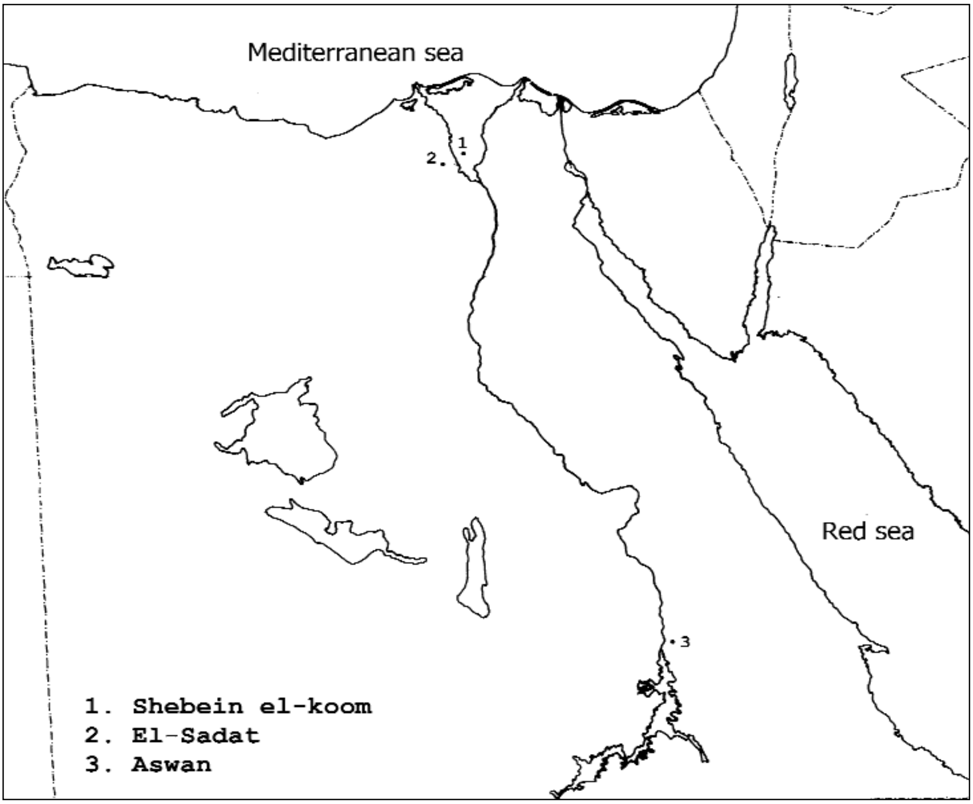

Fig. 1. MAp of Egypt showing locations of the studied sites.

to impact of human activities and several exotic species are now naturalized.

The present study focuses the attention towards the changes of the native vegetation with monitoring the invasive species due to change of land-use in the natural habitats in Egypt.

Materials and Methods

Nineteen public gardens were surveyed for weeds during September 2000-November 2002. (Each public garden concerned as stand) 13 public gardens in Menufiya Province (8 in Shebin El kom city and 5 in El-Saadat city) and 6 in Aswan Province. (Map.1, Table 6)). Nomenclature of plants in Täckholm (1974), is updated following Boulos (1995, 1999, 2000, 20002) and El-Hadidi & Fayed (1994-1995). Floristic categories (FC) are from Zohary (1966, 1972), Feinbrun-Dothan (1978, 1986) and El-Hadidi and Kosinová (1971).

Soil samples were collected from each of the public gardens at depths of 0-25 cm. Each sample was screened in 2 mm sieve, and the gravel content was estimated and discarded.

The 2 mm fractions were kept for mechanical and chemical analyses. In the mechanical analysis, soil texture was determined using the pipette method (Kilmer & Alexander, 1949). pH and conductivity of soil samples were determined in a soil / distilled water suspension (1:5 wt./vol.) by pH and conductivity meters; chlorides by titrating 5 ml of the 1:5 soil /distilled water extract against 0.01 N silver nitrate solution using potassium chromate (1%) as indicator; carbonates and bicarbonates by titrating 5 ml of the 1:5 soil / distilled water extract aganist 0.01 N HCl using phenolphthalein and methyl orange indicators (Jackson, 1962); calcium and magnesium by titration aganist 0.01 N versenate solution; and organic matter by the loss on ignition at 450 C for 24 hours.

Two-Way Indicator Species Analysis (TWINSPAN), as a classification technique, and Detrended Correspondence Analysis (DCA), as an ordination technique, were applied to the presence estimates of 119 species in 19 stands (public gardens) according to the computer programs of Hill (1979 a, b). Species richness (alpha-diversity) of each vegetation cluster was calculated as the average number of species per stand and species turnover (beta-diversity) as the ratio between the total species recorded in a certain vegetation cluster and its alpha-diversity (Pielou 1975; Shaltout 1985).

The Sorenson,s quotient of Similarity (Sorenson 1948) was calculated to assess the degree of similarity between the species composition of the pairs of the sites:

ISs= 2C X 100

A+B

C= number of weed species common to both sites, A= number of weed species in the first site, B= number of weed species in the second site.

Results and Discussion

The number of weed species and composition of weed communities have changed as a result of the agricultural practices aiming to intensify the crop production of agro-ecosystems, especially in the last decades when major changes in the structure of weed communities were taking place. These changes may be attributed to altered standards of crop rotation and higher efforts in fertilizing and crop protection measures (Mahn 1984). In the present study 119 species belonging to 99 genera and 34 families are recorded, of which 35 species are monocots (29.4%) and 84 species are dicots (70.6%). These species represent about 25.3% of the total weed flora of Egypt (El-Hadidi & Fayed 1994-1995). *Gramineae* represent the largest family (29 species=24.4 %), followed by *Compositae* (13 species=10.9 %), *Leguminosae* (10 species=8.4%), *Solanaceae* (6 species=5.04 %) and *Euphorbiaceae* (6 species=5.04 %). In the present study, therophytes are the most common (70 species =58.8%) (Table 1) which reflects the composition of the Egyptian flora (HASSIB, 1951), 32 species are pantropical (26.89%), 22 species are cosmopolitan (18.48 %), 15 species are palaeotropical (12.61%), 10 species are Sudano-Zambezian and Saharo-Sindian (8.40 %), 2 species are Saharo-Sindian (1.68%), 4 species are Mediterranean (3.36%), and 6 species are Sudano-Zambezian (5.04 %), 17 species are Mediterranean and Irano-Turanian (14.29 %), 4 species are Saharo-Sindians and Irano-Turanian(3.36%), 2 species are Mediterranean and Irano-Turanian and Sudano-Zambezian (1.68%), one species is Saharo-Sindians and Mediterranean (0.84%), 2 species are Saharo-Sindians and

Table1. Weed species recorded in 19 surveyed public gardens in Menoufia and Aswan Provinces . Ph,phanerophytes; Ch, Chamaeophytes; G, Geophytes; Hy&H,Helophytes and Halophytes; He, Hemicryptophtes; Th, Therophytes; P%, presence percentage; FC, floristic categories; PAN, Pantropical; COSM, Cosmopolitan; PAL, Palaeotropical; SZ, Sudano-Zambezian; SASI, Saharo-Sindian; IR, Irano-Turanian and ME, Mediterranean.

Species	**Life form**	**Family**	**I**	**II**	**III**	**IV**	**V**	**P%**	**FC**
Cynodon dactylon (L.) Pers.	G	*Gramineae*	100	100	100	100	50	94.7	PAN
Echinochloa colona (L.) Link	Th	*Gramineae*	100	100	83.3	100	50	89.5	PAN
Digitaria sanguinalis Scop.	Th	*Gramineae*	100	83.3	83.3	33.3	100	78.9	PAN
Portulaca oleracea L.	Th	*Portulacaceae*	50	100	66.6	100	50	78.9	PAL
Cyperus rotundus Benth.	G	*Cyperaceae*	50	100	66.6	33.3	100	73.7	PAN
Solanum nigrum L.	Th	*Solanaceae*	50	83.3	66.6	33.3	100	68.4	COSM
Amaranthus lividus L.	Th	*Amaranthaceae*	50	33.3	100	66.6	50	63.2	PAL
Conyza bonariensis (L) Cronqist	Th	*Compositae*	50	83.3	66.6	66.6	0.0	63.2	COSM
Pluchea dioscoridis (L.) DC.	Ph	*Compositae*	50	66.6	83.3	66.6	0.0	63.2	SASZ
Bidens pilosa L.	Th	*Compositae*	0.0	33.3	100	66.6	50	57.9	PAN
Plantago major L	He	*Plantaginaceae*	0.0	50	100	33.3	50	57.9	COSM
Sonchus oleraceus L.	Th	*Compositae*	50	66.6	66.6	66.6	0.0	57.9	COSM
Euphorbia prostrata Aiton	Th	*Euphorbiaceae*	50	50	83.3	33.3	50	57.9	PAN
Symphiotrichum squamatus (Spreng.) G.L. Nelson	Ch	*Compositae*	50	100	33.3	66.6	0.0	57.9	COSM
Oxalis corniculata L.	G	*Oxalidaceae*	50	83.3	50	0.0	50	52.6	COSM
Imperata cylindrica (L.) P. Beauv.	G	*Gramineae*	50	33.3	66.6	33.3	100	52.6	PAN
Setaria verticillata (L.) P. Beauv.	Th	*Gramineae*	50	100	16.7	33.3	0.0	47.4	ME
Chenopodium murale L.	Th	*Chenopodiaceae*	50	50	33.3	66.6	50	47.4	COSM
Setaria pumila (Poir.) Roem. & Schult.	Th	*Gramineae*	0.0	100	33.3	33.3	0.0	47.4	ME
Convolvulus arvensis L.	He	*Convolvulaceae*	50	50	33.1	66.6	0.0	42.1	PAN
Dichanthium annulatum (Ashe) LeBlond	G	*Gramineae*	50	0.0	83.3	66.6	0.0	42.1	PAL
Panicum coloratum L.	G	*Gramineae*	50	83.3	33.3	0.0	0.0	42.1	COSM
Euphorbia peplus L.	Th	*Euphorbiaceae*	0.0	50	50	0.0	50	36. 8	COSM
Malva parviflora L.	Th	*Malvaceae*	50	0.0	50	33.3	50	31.6	PAN
Amaranthus viridis L.	Th	*Amaranthaceae*	o.o	100	0.0	10	0.0	31.6	COSM
Euphorbia heterophylla L.	Th	*Euphorbiaceae*	0.0	66.7	16.7	33.3	0.0	31.6	COSM
Sorghum virgatum Stapf.	Th	*Gramineae*	0.0	16.7	50	66.6	0.0	31.6	S-Z
Cenchrus ciliaris L.	He	*Gramineae*	0.0	0.0	50	100	0.0	31.6	SASZ, ME,IR
Euphorbia indica Lam.	Th	*Euphorbiaceae*	50	0.0	66.6	33.3	0.0	31.6	COSM
Dactyloctenium aegyptium (L.) P. Beauv.	Th	*Gramineae*	0.0	0.0	50	33.3	50	26.3	PAN
Corchorus olitorius L.	Th	*Malvaceae*	50	33.3	33.3	0.0	0.0	26.3	PAL
Eragrostis cilianensis (All.) Janch.	Th	*Gramineae*	0.0	0.0	66.6	33.3	0.0	26.3	PAN
Brachiaria eruciformis (Sm.) Griseb.	Th	*Gramineae*	0.0	16.7	33.3	33.3	50	26.3	PAL
Sida alba L.	Th	*Malvaceae*	0.0	16.7	50	33.3	0.0	26.3	COSM
Lotus glaber Greene	He	*Leguminosae*	50	50	16.7	0.0	0.0	26.3	ME,IR

Table1. Continued.

Withania somnifera (L.) Dunal	Ch	*Solanaceae*	50	50	16.7	0.0	0.0	26.3	PAL
Tribulus terrestris L.	Th	*Tribulaceae*	0.0	0.0	50	66.6	0.0	26.3	PAN
Bromus catharticus Vahl	Th	*Gramineae*	50	16.7	33.3	33.3	0.0	26.3	ME-IR
Phoenix dactylifera L.	Ph	*Palmae*	0.0	0.0	33.3	66.6	0.0	21.1	SASZ
Phragmites australis (Cav.) Steud.	Hy & H	*Gramineae*	0.0	33.3	0.0	66.6	0.0	21.1	PAN
Apium leptophyllum M. Gomez	He	*Umbelliferae*	50	50	0.0	0.0	0.0	21.1	ME, IR
Poa annua L.	Th	*Gramineae*	50	50	0.0	0.0	0.0	21.1	ME, IR
Coronopus didymus (L.) Sm.	Th	*Cruciferae*	0.0	0.0	16.7	0.0	100	15.8	COSM
Amaranthus hybridus L.	Th	*Amaranthaceae*	50	33.3	0.0	0.0	0.0	15.8	PAN
Ziziphus spina-christi Willd.	Ph	*Rhmanceae*	0.0	0.0	50	0.0	0.0	15.8	ME, IR
Lycopersicon esculentum Mill.	Th	*Solanaceae*	0.0	16.7	16.7	33.3	0.0	15.8	COSM
Panicum repens L.	G	*Gramineae*	50	33.3	0.0	0.0	0.0	15.8	COSM
Paspalidium geminatum Stapf.	G	*Gramineae*	100	16.7	0.0	0.0	0.0	15.8	PAN
Acacia laeta R. Br.	Ph	*Leguminosae*	0.0	0.0	33.3	0.0	50	15.8	SZ
Cynanchum acutum L.	Ph	*Asclepidaceae*	0.0	33.3	0.0	33.3	0.0	15.8	ME, IR
Rumex dentatus L.	Th	*Polygonaceae*	0.0	33.3	0.0	33.3	0.0	15.8	PAN
Chloris virgata Sw.	Th	*Gramineae*	0.0	0.0	33.3	33.3	0.0	15.8	PAN
Phyla nodiflora (L.) Greene	He	*Verbenaceae*	100	0.0	16.7	0.0	0.0	15.8	PAN
Tamarix nilotica (Ehrenb.) Bunge	Ph	*Tamaricaceae*	0.0	16.7	16.7	33.3	0.0	15.8	SASZ, IR,ME
Bassia indica (Wight) A.J.Scott	Th	*Chenopodiaceae*	0.0	0.0	16.7	66.6	0.0	15.8	SASZ
Amaranthus graecizans L.	Th	*Amaranthaceae*	0.0	0.0	0.0	66.6	0.0	10.5	PAL
Sesbania sesban (L.) Britton	Ph	*Leguminosae*	0.0	16.7	16.7	0.0	0.0	10.5	PAL
Eleusine indica (L.) Gaertn.	Th	*Gramineae*	0.0	0.0	0.0	0.0	100	10.5	PAL
Euphorbia hirta L.	Th	*Euphorbiaceae*	0.0	0.0	33.3	0.0	0.0	10.5	SZ
Melilotus indicus (L.) All.	Th	*Leguminosae*	0.0	16.7	16.7	0.0	0.0	10.5	COSM
Vossia cuspidata Griff.	G	*Gramineae*	0.0	16.7	16.7	0.0	0.0	10.5	PAL
Launaea nudicaulis Hook.f.	He	*Compositae*	50	0.0	0.0	33.3	0.0	10.5	SASZ, IR
Alhagi maurorum Medik.	He	*Leguminosae*	0.0	0.0	16.7	33.3	0.0	10.5	PAN
Brassica nigra (L.) W.D.J.Koch	Th	*Cruciferae*	0.0	0.0	0.0	0.0	100	10.5	COSM
Leptadenia arborea (Forssk.) Schweinf.	Ph	*Asclepidaceae*	0.0	0.0	33.3	0.0	0.0	10.5	SZ
Hyphaene thebica Mart.	Ph	*Palmae*	0.0	0.0	33.3	0.0	0.0	10.5	SZ
Artemisia monosperma Delile	Ch	*Compositae*	0.0	0.0	0.0	66.6	0.0	10.5	SASZ, ME
Plantago lagopus Bunge	Th	*Plantaginaceae*	0.0	0.0	0.0	66.6	0.0	10.5	ME, IR
Centaurea calcitrapa L.	Ch	*Compositae*	0.0	0.0	0.0	66.6	0.0	10.5	SASZ
Pulicaria crispa (Cass.) Oliver & Hiern	Ch	*Compositae*	0.0	0.0	0.0	66.6	0.0	10.5	SASZ
Datura innoxia Mill.	Th	*Solanaceae*	0.0	0.0	16.7	0.0	50	10.5	PAN
Calotropis procera (Aiton) W.T.Aiton	Ph	*Asclepidaceae*	0.0	0.0	16.7	0.0	50	10.5	SASZ
Pennisetum glaucum (L.) R. Br.	Th	*Gramineae*	0.0	0.0	16.7	0.0	50	10.5	ME, IR
Trianthema portulacastrum L.	Th	*Aizoaceae*	50	0.0	16.7	0.0	0.0	10.5	PAN
Chenopodium album L.	Th	*Chenopodiaceae*	0.0	16.7	0.0	0.0	50	10.5	COSM
Cichorium endivia L.	Th	*Compositae*	0.0	16.7	0.0	0.0	50	10.5	ME

Table1. Continued.

Abutilon pannosum (G.Forst.) Webb	Ch	*Malvaceae*	0.0	0.0	33.3	0.0	0.0	10.5	SASZ
Lantana camara L.	Ph	*Verbenaceae*	0.0	0.0	33.3	0.0	0.0	10.5	PAN
Ipomoea eriocarpa R.Br.	Th	*Convolvulaceae*	0.0	16.7	0.0	0.0	0.0	5.3	PAL
Parietaria alsinefolia Delile	Th	*Urticaceae*	0.0	16.7	0.0	0.0	0.0	5.3	SASZ, IR
Senna occidentalis (L.) Link	Ch	*Leguminosae*	50	0.0	0.0	0.0	0.0	5.3	PAN
Torilis nodosa (L.) Gaertn.	Th	*Umbelliferae*	0.0	16.7	0.0	0.0	0.0	5.3	ME, IR
Cyperus laevigatus L.	G	*Cyperaceae*	0.0	0.0	0.0	33.3	0.0	5.3	PAN
Tephrosia purpurea (L.) Pers.	Ch	*Leguminosae*	0.0	0.0	0.0	0.0	50	5.3	SASZ
Spinacia oleracea L.	Th	*Cruciferae*	0.0	0.0	0.0	0.0	50	5.3	SASZ, IR
Orobanche ramosa L.	Th	*Orobanchaceae*	0.0	0.0	0.0	0.0	50	5.3	ME, IR
Trigonella hamosa L.	Th	*Leguminosae*	0.0	0.0	0.0	0.0	50	5.3	ME, IR
Lamium amplexicaule L.	Th	*Labiatae*	0.0	0.0	0.0	0.0	50	5.3	ME, IR
Argemone mexicana L.	Th	*Papveraceae*	0.0	0.0	0.0	0.0	50	5.3	PAN
Echinochloa crus-galli (L.) P. Beauv.	Th	*Gramineae*	0.0	0.0	0.0	0.0	33.3	5.3	PAN
Medicago polymorpha L.	Th	*Leguminosae*	0.0	0.0	16.6	0.0	0.0	5.3	COSM
Bassia muricata All.	Th	*Chenopodiaceae*	0.0	0.0	0.0	33.3	0.0	5.3	SASZ, IR
Hibiscus trionum L.	Th	*Malvaceae*	0.0	0.0	0.0	33.3	0.0	5.3	PAN
Datura stramonium L.	Th	*Solanaceae*	0.0	16.7	0.0	0.0	0.0	5.3	ME, IR
Coronopus squamatus (Forssk.) Asch.	Th	*Cruciferae*	0.0	16.7	0.0	0.0	0.0	5.3	ME, IR
Eruca sativa (L.) Mill.	Th	*Cruciferae*	0.0	0.0	16.7	0.0	0.0	5.3	SASI, IR
Hyoscyamus muticus L.	He	*Solanaceae*	0.0	0.0	0.0	33.3	0.0	5.3	SASI, IR
Dinebra retroflexa Panz.	Th	*Gramineae*	0.0	16.7	0.0	0.0	0.0	5.3	PAL
Leptochloa fusca Kunth	G	*Gramineae*	0.0	0.0	0.0	33.3	0.0	5.3	PAN
Ricinus communis L.	Ph	*Euphorbiaceae*	0.0	0.0	0.0	33.3	0.0	5.3	PAN
Canna indica L.	G	*Cannaceae*	0.0	0.0	16.7	0.0	0.0	5.3	*ME, IR*
Cenchrus biflorus Roxb.	Th	*Gramineae*	0.0	0.0	16.7	0.0	0.0	5.3	*SZ*
Gnaphilum luteo-album L.	Th	*Compositae*	0.0	16.7	0.0	0.0	0.0	5.3	*COSM*
Pulicaria incisa DC.	He	*Compositae*	0.0	0.0	0.0	33.3	0.0	5.3	*SASZ*
Lactuca serriola L.	Th	*Compositae*	0.0	0.0	16.7	0.0	0.0	5.3	*ME, IR, SZ*
Mentha longifolia subsp. *typhoides* (Briq.) Harley	Ch	*Labiatae*	0.0	0.0	0.0	0.0	50	5.3	*ME, IR, SZ*
Boerhaavia repens L.	Ch	*Nyctaginaceae*	0.0	0.0	16.7	0.0	0.0	5.3	*PAL*
Zygophyllum simplex L.	Th	*Zygophyllaceae*	0.0	0.0	0.0	33.3	0.0	5.3	*SASZ*
Typha domingensis Pers.	Hy & H	*Tyhaceae*	0.0	0.0	0.0	33.3	0.0	5.3	*PAN*
Ammi majus L.	Th	*Umbelliferae*	0.0	0.0	0.0	0.0	50	5.3	*ME, IR*
Eragrostis minor Host	Th	*Gramineae*	0.0	16.7	0.0	0.0	0.0	5.3	*PAL*
Apium graveolens L.	He	*Umbelliferae*	0.0	0.0	0.0	0.0	50	5.3	*COSM*
Indigofera hochstetteri Baker	Th	*Leguminosae*	0.0	0.0	16.7	0.0	0.0	5.3	*SASZ*
Polycarpon tetraphyllum L.	Th	*Caryophyllaceae*	0.0	0.0	0.0	33.3	0.0	5.3	*SASI, ME, IR*
Polypogon viridis (Gouan) Breistr.	He	*Gramineae*	0.0	0.0	16.7	0.0	0.0	5.3	*ME, IR*
Emex spinosa (L.) Campd.	Th	*Polygonaceae*	0.0	0.0	0.0	0.0	50	5.3	*PAN*
Arundo donax L.	Ch	*Gramineae*	0.0	16.7	0.0	0.0	0.0	5.3	*ME, IR*
Glinus lotoides L.	Th	*Molluginaceae*	0.0	0.0	0.0	0.0	50	5.3	*PAL*

Table 2. Life form spectra (%), total species, species richness (species/stand), and species turnover of the five vegetation clusters identified after the application of TWINSPAN.

Character	Vegetation clusters					Total (%)
	I	II	III	IV	V	
Phanerophytes	2.86	7.27	14.9	8.8	5.26	10.1
Chamaephytes	8.57	5.45	5.9	5.3	5.26	9.2
Hemicryptophytes	14.29	7.27	10.4	14.04	5.26	10.1
Geophytes	22.85	14.54	11.9	10.53	10.53	10.1
Hydrophytes & Halophytes	0.0	1.8	0.0	3.51	0.0	1.7
Therophytes	51.4	63.6	56.7	57.9	73.68	58.8
Total species	35	55	67	57	38	119
Species richness	20.5	25	27.5	28.0	22.5	25.5
Species turnover	1.7	2.2	2.4	2.0	1.7	4.7

Sudano-Zambezian and Irano-Turanian and Mediterranean (1.68%),one species is Saharo-Sindian and Mediterranean and Irano-Turanian (0.84%), one species is Saharo-Sindian and Sudano-Zambezian and Irano-Turanian(0.84%). The total number of species per garden varied from 7 (Children garden N°.3) to 38 (Rose garden N° 13). The high-species diversity at some gardens may be related to a large seed bank in the transported soil and / or to neglecting the weeding practices. On the other hand, the low-species diversity of weeds may be partially related to active weeding practices than in some other gardens. Comparable results are reported by Shaltout & El-Sheikh (1993).

The classification of stands according to the TWINSPAN technique resulted in five vegetation clusters at level three. The five clusters of level three are named after the dominant species as follows: *Setaria verticellata, Amaranthus viridis, Plantago major, Centaurea calcitrapa - Plantago lagopus - Amaranthus graecizans - Phragmites australis - Artemisia monosperma* and *Eleusine indica*. (Fig. 2)

The most common weeds (P:> 50%) were *Cynodon dactylon, Portulaca oleracea, Amaranthus lividus, Echinochloa colona, Cyperus rotundus, Imperata cylindrica, Solanum nigrum, Conyza bonariensis, Pluchea dioscoridis, Bidens pilosa, Plantago major, Sonchus oleraceus, Euphorbia prostrata, Symphiotrichum squamatum* and *Oxalis corniculata*. Most of these weeds are native to the pantropical region, while *Portulaca oleracea* and *Amaranthus lividus* are palaeotropical. *Pluchea dioscoridis* is Saharo-Sindian and Sudano-Zambezian, *Solanum nigrum, Conyza bonariensis, Plantago major, Sonchus oleraceus Symphiotrichum squamatum* and *Oxalis corniculata* are cosmopolitan. Weeds of moderate occurrence (P: 25-50%) are *Setaria verticillata, Chenopodium murale, Setaria pumila, Convolvulus arvensis, Dichanthium annulatum, Panicum coloratum, Euphorbia peplus, Malva parviflora, Amaranthus viridis, Euphorbia heterophylla, Sorghum virgatum, Cenchrus ciliaris, Euphorbia indica, Dactyloctenium aegyptium, Corchorus olitorius, Eragrostis cilianensis, Brachiaria eruciformis, Sida alba, Lotus glaber, Withania somnifera, Tribulus terrestris* and *Bromus catharticus*. *Convolvulus arvensis, Malva parviflora, Dactyloctenium aegyptium, Eragrostis cilianensis* and *Tribulus terrestris* are pantropical, while *Dichanthium annulatum, Corchorus olitorius, Brachiaria eruciformis* and *Withania somnifera* are Palaeotropical. *Panicum coloratum, Chenopodium murale, Euphorbia peplis Amaranthus viridis, Euphorbia heterophylla, Euphorbia indica* and *Sida*

Table 3. Sorenson's quotient of similarity (%) between the 19 public gardens (upper half of matrix) based on weed species composition , and number of species occurring in each pair of public gardens (lower half of the matrix): 1,Principal water pump station ; 2, The Ideal garden ; 3, Children garden ; 4, Secondary Girls School; 5, Kid Club garden; 6, Stadium garden; 7, Hospital (El Kasr El Eni); 8, Faculties of Science &Commerce); 9, Faryal garden; 10, El Shalal ; 11, Dorrat El Nile garden; 12 ,Cataract Hotel garden ; 13, Roses garden;14, El Salam Garden; 15, First Station beside Faculties(El Sadat city); 16, Second Station inside garden; 17,Third Station ; 18, Fourth Station; and 19, Fifth Station. T= total number of species recorded in each public garden.

Garden No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	-	52.2	27.8	56.0	70.6	58.26	63.5	65.6	48.9	28.1	44.92	43.5	41.82	42.3	62.54	35.72	54.53	58.14	36.73
2	12	-	41.7	63.2	61.53	0.5	39.2	46.21	36.42	22.22	7	29.4	5.517.	25	2.328.	2.723.	3.39.1	0	2.414.
3	5	5	-	35.7	4.555.	30.3	24.4	9	6.127	2.8	14.8	16.7	823.7	20	642.8	520.8	27.64	25	829.3
4	14	12	5	-	8	55.36	47.3	50	36.83	24.5	19.5	26.3	33.34	27.3	56.14	36.72	4.141.	37	28.62
5	18	12	5	12	-	2.5	64.3	70.25	3.332	20	33.3	30.7	0.638.	35.6	9.263.	2.632.	347.9	58.2	6.129.
6	16	13	5	13	15	-	50	5.7	35.3	25.92	30.4	32.5	938.4	28.6	757.1	825.8	52.83	47.5	636.4
7	20	10	5	13	18	15	-	52.2	-	5.825.	40.7	27.5	37	31.6	39.22	23.3	3.9	56.7	27.88.
8	21	12	4	14	20	17	18	-	5	422.7	29.1	26.9	27.3	34.5	8.643.	18.2	21.53	61.8	2
9	11	6	3	5	7	7	8	9	9	-	50	36.4	37.9	41	644	21.2	8.525.	40.8	25
10	8	5	4	6	5	7	8	8	6	6	25	31.1	40	15.7	54.85	22.7	9	26.2	10.8
11	11	5	2	4	7	7	11	8	10	7	-	43.2	-	37.2	1.7	33.8	48	45.3	24.13
12	10	5	2	5	6	7	7	7	8	9	8	-	18	35	-	40	40	40	7.236.
13	14	7	4	7	10	13	14	14	10	4	11	11	20	59	14	45.2	72.23	50.7	434
14	11	5	3	6	8	7	9	10	5	9	8	7	11	-	26	-	7.5	46.4	38.63
15	20	11	6	12	16	15	22	20	9	5	12	11	18	15	27	12	-	79.4	7.7
16	10	5	4	5	9	6	10	8	10	7	5	5	18	10	10	10	23	33.3	-
17	18	9	2	8	13	13	17	19	5	8	11	7	7	12	35	8	11	65.7	20
18	18	10	5	10	16	14	19	21	16	2	12	10	38	13		27	37	-	
19	9	6	2	6	6	6	8	10		28	5	2		8				10	
T	29	17	7	21	22	26	34	35			20	17		23				33	

Table 4. Correlation coefficients between soil variables and DCA axes (1,2 and 3). :p 0.05; :P 0.01; :p 0.001.

Soil variable	DCA 1	DCA2	DCA3
Sand %	0.348	-0.470	0.550
Silt %	-0.668	0.316	-0.487
Clay %	0.868	0.261	0.097
pH	0.039	-0.730	0.684
EC (µmohs/cm)	-0.669	-0.227	-0.510
Cl (mg/100 gm)	-0.705	-0.166	-0.492
HCO3 (mg/100 gm)	0.445	0.477	0.472
Ca (mg/100 gm)	-0.677	-0.342	-0.423
Mg (mg/100 gm)	-0.672	-0.313	-0.438
O.M. %	0.326	0.699	-0.255

alba are Cosmopolitan. *Sorghum virgatum* belongs to the Sudano-Zambezian region. *Setaria verticillata* and *Setaria pumila* are Mediterranean while *Lotus glaber* and *Bromus catharticus* are Mediterranean and Irano-Turanian. *Cenchrus ciliaris* belongs to the Saharo-Sindian - Sudano-Zambezian- Mediterranean and Irano-Turanian.

The most frequent life forms are therophytes (58.8%) and phanerophytes (10.1%). The percentage of these two life forms vary considerably from one cluster to another. The

Table 5. The mean ± standard deviation of the soil variables of stands supporting the five clusters resulting after the application of TWINSPAN classification.

No	Gardens	Localities
1	Waterworks garden	Shebien El-Koom
2	Typical garden	Shebien El-Koom
3	Children garden	Shebien El-Koom
4	Girls secondary school garden	Shebien El-Koom
5	Children club garden	Shebien El-Koom
6	Stadium garden	Shebien El-Koom
7	Public hospital garden	Shebien El-Koom
8	Faculty of Science garden	Shebien El-Koom
9	Ferial garden	Aswan
10	Waterfall garden	Aswan
11	The Nile jewel garden	Aswan
12	Cataract garden	Aswan
13	Rose garden	Aswan
14	Peace garden	Aswan
15	Public garden	El-Sadat City
16	Sandy waste land in the public garden	El-Sadat City
17	Genetic engineering institute garden	El-Sadat City
18	Faculty of veterinary medicine garden	El-Sadat City
19	Drain in the public garden	El-Sadat City

Table 6. The studied public gardens (stands) and their localities.

Soil variable	Vegetation clusters					Total mean
	I	II	III	IV	V	
Sand %	63.99±0.410	50.31±11.24	60.42±11.73	62.1±24.2	64.5±19.8	60.97± 5.93
Silt %	19.95±0.49	33.1±14.97	21.96±13.37	26.2±23	16.9±18.8	10.4± 5.23
Clay %	15.24±1.09	14.67±3.56	16.01±4.01	11.2±1.77	17.15±1.344	20.4± 3.38
pH	8.05±0.78	7.78±0.355	7.82±0.127	7.47±0.156	7.62±0.163	7.59± 0.42
EC (µmohs/cm)	301±36.8	1718±1868	439.7±210.2	2414±3435	527.5±98.3	4730± 5364
Cl (mg/100 gm)	8.0±1.27	154.7±184.4	17.57±14.84	212±339	16.3±14.5	495± 690
HCO3 (mg/100 gm)	54.9±8.63	45.66±14.2	53.9±24.0	32.54±15.36	47.3±28	26.2±10.6
Ca (mg/100 gm)	12.03±8.51	59.8±68.8	15.06±7.2	112.9±171.2	20.04±2.83	206.9±236.9
Mg (mg/100 gm)	6.1±0.0	23.7±24.46	6.89±2.94	40.5±59.7	9.12±7.74	29.6± 29.6
O.M. %	7.95±2.08	10.06±4.0	8.19±3.29	6.21±4.79	8.37±3.43	8.16± 3.52

therophytes attain a maximum of 73.68% in the cluster V and a minimum of 51.4% in cluster I. On the other hand, the phanerophytes have the highest value in cluster III (14.9%) and the lowest in cluster I (2.86%). The highest species richness is that of cluster IV (28.0 species/stand), followed by cluster III (27.5%). On the other hand, cluster I has the lowest species richness (20.5 species / stand). (Table 2).

The species richness is higher in clusters III and IV than in cluster I may be related to the large seed bank in the transported soil and / or to neglecting the weeding practices. On the other hand, the low-species richness of weeds may be partially related to active weeding practices in some other clusters. Comparable results are reported by Shaltout & El-Sheikh (1993); Shaltout & Post (1993).

The similarities between the floristic composition of the 19 public gardens range between 8.2% (10&19) and 79.4% (15&18) (Table 3). The low similarities between the floristic composition of some gardens may be due to utilizing different weeding practices and / or due to edaphic and climatic differences. Shaltout & Post (1993) reported comparable results on diversity and production of weeds in crop-less fields. The difference in the establishment time of these public gardens may be another factor bringing for this dissimilarity.

Many of the species recorded in the present study are common weeds in the winter and summer crops in the Nile region, e.g.: *Polypogon monspeliensis, Convolvulus arvensis, Chenopodium murale, Portulaca oleracea, Cynodon dactylon, Echinochloa colona, Cyperus rotundus, Phragmites australis, Eruca sativa, Sonchus oleraceus* in winter, and in Summer: *Echinochloa colona, Corchorus olitorius, Portulaca oleracea, Cyperus rotundus, Convolvulus arvensis, Cynodon dactylon,Sesbania sesban, Malva parviflora, Chenopodium murale, Phragmites australis, Echinochloa crus-galli.* These results agree with that recorded in the Nile region by Shaltout & al. (1992).

Upon changing the land system in the study area (e.g. the establishment of the public gardens), the dominance of the species changes, and previously rather inconspicuous plant species are able to dominate plant communities. At the same time, the native species of the desert flora start to disappear. Before the first weeding, a lot of desert species are still in the public gardens. By continuing the human impact (e.g cleaning, ploughing, etc.) many are eliminated. In contrast to typical weeds, desert species disappear after this new land use.

No correlations between the soil variables and DCA axes have been established (Table 4).

The sand is highest in cluster V (64.5%), and lowest in cluster II (50.31%). The silt attains highest in cluster II (33.1%) and lowest in cluster V (16.9%). The clay attains highest value in cluster V (17.5%) and lowest in cluster IV (11.2%). pH attains a maximum in cluster I (8.05) and a minimum in cluster IV (7.47). EC has a maximum in cluster IV (2421 mohs/cm) and a minimum in cluster I (301 mohs/cm). Cl- attains highest concentration in cluster IV (212 mg/100gm) and lowest concentration in cluster I (8.0 mg/100gm). HCO3- attains highest concentration in cluster I (54.9 mg/100gm) and lowest in cluster IV (32.54 mg/100gm). Ca+2 attains highest concentration in cluster IV (112.9 mg/100gm) and lowest concentration in cluster I (12.03 mg/100gm). Mg+2 attains highest concentration in cluster IV (40.5 mg/100gm) and lowest concentration in cluster I (6.1 mg/100gm). Organic matter % attains highest value in cluster II (10.06%) and lowest in cluster IV (6.21%). (Table 5).

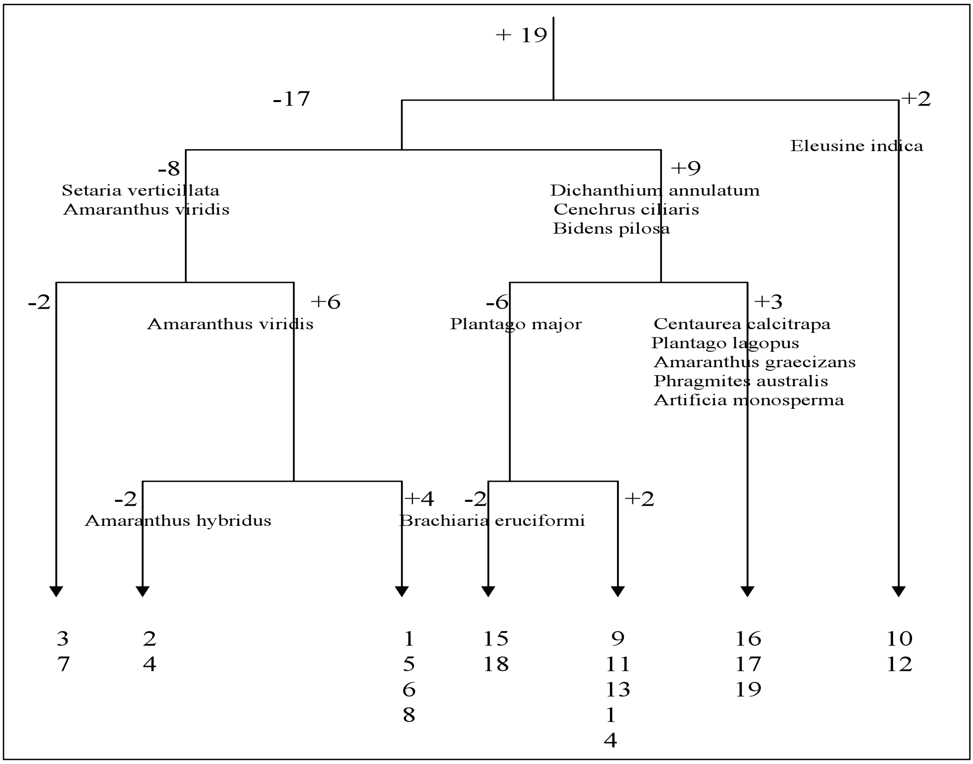

Fig. 2. Dendrogram of nineteen stands representing different weed clusters in the studied gardens.

The stratification of a transfered soil, however, occurred accidentally or periodically on the original one, leads to arising of new soils (neopedon), and previously unknown species often appear, and the old species, in buried layers of soils, live in the form of diaspores in anabiosis.

The weed problems in southern Egypt differ from those prevailing in the more temperate northern areas where weeds grow more vigorously and regenerate faster due to the excessive heat and sunshine.

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