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Effect of Human Activities on Vegetation Diversity in Siwa Oasis

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Abstract

The effect of four human activities (burning, grazing, continuation of cultivation and the waste products flow from the olive factories) are studied. These human activities inhibit the vegetation diversity, performance of the plants, height, sociability life forms and phonological states. Overgrazing was the most activities affect on vegetation diversity and floristic composition of the stands studied. These human activities causes disappearance of some species compared with the control stands. Salinity was the important factor limits the species diversity.
Key words*:* vegetation, species diversity, fire, overgrazing, continuation of cultivation, waste products, performance, sociability, life forms, phonological state.

Introduction

Biodiversity represents an important renewable natural resource with scientific, agricultural, medical, pharmaceutical, educational, cultural and ecological values. The development activities which may affect biodiversity include, over-exploitation, pollution, war, habitat destruction and degradation by physical and chemical means are causing significant and often irreversible loss of biodiversity (Hegazy, 1999). The landscape, vegetation and flora of the Mediterranean have been subjected for thousands of years to change on a scale not yet seen on any other continent. Deforestation, transhumance, grazing, agriculture, fire, plantation forestry, introduction of exotic species, urban and industrial development, tourism and population growth and movements have dramatically altered the face of the

Mediterranean (Heywood, 2000). Siwa Oasis is one of the depression located in the northern part of the Western Desert of Egypt between long 25° and 26° E and Lat. 29° and 30° N.

Zahran (1972) recorded 23 perennial species and one annual species in Siwa oasis, while El-Khouly and Khedr (2000) recorded 34 perennial species and 7 annuals in the oasis.

In the last twenty years, many of human activities occurred in Siwa Oasis as a result of increase of development activities and growth of population such as: 1) burning of the old growth of the grassland (unpalatable) e.g. *Juncus rigidus* to increase the area of new sprouts fresh, fleshy and palatable grasses, 2) overgrazing of the new growth and new sprouts of the range plants, 3) the increase of cultivation area and continuation of cultivation causes the increase of fallow lands due to irrigation by saline water from the springs of the oasis and 4) the increase in the industrial activities causes increases in waste products which drained in the lands of the oasis.

The objectives of this study were to: 1) study the effect of these human activities on plant diversity and 2) study the changes in the habitats due to the changed human activities.

Materials and Methods

Four human activities were studied in Siwa Oasis as follows: 1) burning the old growth unpalatable and use the new growth as range plants, 2) grazing, 3) continuation of cultivation causing increase the fallow lands and 4) lands polluted by waste products of olive industry.

In burning lands, 5 stands burnt and 5 stands unburnt were selected. In grazing lands, 4 stands grazed and 4 stands ungrazed were studied. In fallow lands, 3 stands were selected and studied and 3 stands (cultivated lands) adjacent to the fallow lands in the same habitat were studied as control. In the waste products lands, 3 stands were studied and 3 stands adjacent to the above three stands selected as control.

In each stand selected in the four cases, a list of species was recorded and 15 randomly quadrates (2 x 1 m) were made. According to Muller-Dombois and Ellenberg (1974), species density was calculated per unit area, frequency and the plant cover as percentage of ground surfaces. Plant cover was determined by the line intercept method. The importance value (IV) for different species were calculated according (Ludwig & Reynolds, 1988). The height of ten individuals representing the recorded species in each stand is measured starting the soil surface up to the top of plant's above ground parts (during winter). The life form of the species present were distinguished in the stands studied according to Ellenberg and Mueller-Dombois (1976b). The vigor (performance) and sociability of the species were estimated according Braun-Blanquet (1965) and Muller-Dombois & Ellenberger (1974). The phonological status of plant

species in all stands was recorded during winter. Taxonomic nomenclature followed TacKholm (1974), updated by Boulos (1995). Three soil samples (0 – 20 cm depth) were collected from each stand and were mixed together to form one composite Effect of sample. All samples were air dried and sieved through a 2 mm sieve to get rid of debris and coarse gravel. These samples were analyzed for determination of soil texture, pH, electric conductivity (EC), organic carbon and calcium carbonates according to (Jachson, 1967; Piper, 1950). In the waste product lands, the soil samples analyzed also for NO3, NO4, Fe, Pb, Zn, Cu, Co and Mn (all the elements were determined by using Unicam 929 atomic absorption spectrometer). The diversity measures that applied here are according to Ludwig and Reynolds (1988) and Magurran (1988).

Results

Effect of burning

Some of species growing in the burnt stands were able to resprout and grow after fire .Two species were increase in their importance value (IV), the percentage of increase was 21.9% in *Juncus rigidus*, while in *Cressa cretica* was 94.4%(Table 1) . Some of species can not resprout and regrowth such as *Phoenix dactylifera*, *Arthrochnemon machrostachyum* and *Inula chrithmoides*, where their importance value decrease, the percentage of decreasing was 91.4, 76.5 and 38.9% respectively. Two species relatively were not changed in its importance value, these species were *Phragmitis australis* and *Tamarix nilotica*.

From the results in Table (1), the richness and Shannon value was similar in burnt and undurnt stands, while the Hill's numbers and Evenness values were more increase in unburnt stands than in burnt stands, that is reflect the decease in the number of abundant and common species in the burnt stands.

Figure (1) showed that the percentages of most families were more increase in the burnt stands than in the unburnt stands. Family Leguminosa is disappered in the burnt stands. The percentages of Cryptophyts and Chamaephytes species were decrease, while the Phanerophyts were increased after fire. Two species are disappeared in the burnt stands, although most of the other species recorded increased in its presence than in the unburnt stands.

The results indicated that the percentage of species have height less than 100 cm are decrease in burnt stands, while the species have height over than 100 cm are increased. Most of the species were very feeble ,feeble or normal, while the species which have very vigor performance are disappeared (Fig. 1). After fire most of the species were in green foliage state and grow in single or small patches .

The analysis of soils indicated that the percentages of clay, salinity and $CaCO_3$ were lower in burnt stands than in unburnt stands, while the percentage of sand was higher in the burnt stands than in unburnt stands (Table 2).

Effect of grazing

Although the importance value of *Alhagi graucorum* and *Phragmitis australis*, which are the palatable species to the grazed animals were increase in the grazed stands, the richness, Shannon index and Hill's numbers (1.8 and 0.34 respectively) were decreased in the grazed stands (Table 1). It means that the ungrazed stands is more diverse than the grazed stands. The evenness values were high in the grazed stands (1.25 and 0.91) than in the ungrazed stands (0.99 and 0.78). Four species disappeared in the grazed stands. These species are: *I. chrithmoides, J. rigidus, P. dactylifera* and *Z. coccineum*. The importance value of *A. macrostachyum* was increased from 3.4 in the ungrazed stands to 18.6 in the grazed stands, while *Tamarix nilotica* decreased from 9.0 in the ungrazed stands to 2.2 in the grazed stands. Eight species belong to eight families are recorded in ungrazed stands compared with four species belong to four families were recorded in the grazed stands (Fig. 2). There is no change in the percentages of life forms of species in the grazed and ungrazed stands. The percentage of species in green foliage state in the ungrazed stand was less than in the grazed stands, while the percentage of species in fruiting stage in ungrazed stands was more than in the grazed stands. There is no species in flowering stage in the grazed stands. It is noticed from figure (2) that most of species in the ungrazed stands were in normal and vigour performance, while in the grazed stands most of species were in very feeble and feeble performance. The species grown in complete patches disappeared in the grazed stands, whereas most of species were in a single state (62.5%). It is noticed that the presence value of *A. grocourum* and *T. nilotica* decreased in grazed stands compared with ungrazed stands .Approximatly there is no change in the most of edaphic characteristics between the grazed percentage of salinity is decreased (49.1 ml.mohs/cm) in the grazed stands compared with 58.8 ml.mohs/cm in the ungrazed stands (Table 2).

Effect of continued cultivation

It is noticed from table (1) that three perennial species in addition to all the annuals are disappeared in the fallow lands. These perennial species are: *Cressa cretica, Sonchus maritimus* and *Zygophyllum coccineum*. Two species are appeared in the fallow lands, these species

were *I. chrithmoides* and *Scirpus litaralis*. The importance value (IV) of three species are increased in the fallow land stands, these species were: *P. australis*, *J. rigidis*, and *Imperata clyndrica* . The importance value of *Alhagi graucorum* decreased from 58.8 in control stands to 12.3 in the fallow land stands.

The values of richness, Shannon's and Hill's numbers in fallow land stands (5.7, 1.06 and 2.95 respectively) were less than in the control stands (7.0, 1.31 and 3.87 respectively), that indicate to the fallow land stands were less divers than the control stands. The evenness values were relatively similar in the fallow land and control stands due to the similarity in importance values of the abundant species.

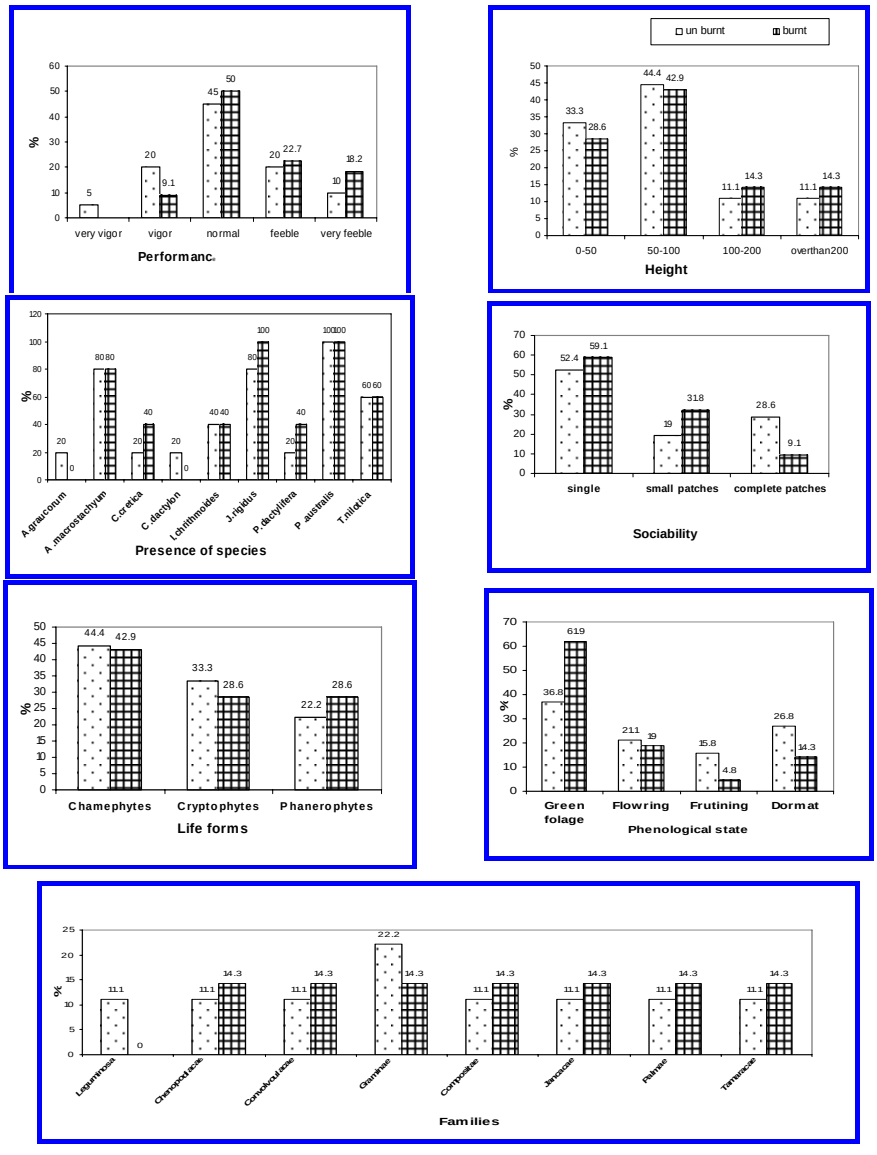
Table (1): Importance value and diversity indices of plant species in human activities and control stands in Siwa Oasis

Species	Effect of Burning		Effect of Grazing		Effect of Continuation of cultivation		Effect of waste products	
	Unburnt stands	Burnt stands	Ungrazed stands	Grazed stands	Control stands	Fallow land stands	Control stands	waste products stands
Alhagi graucorum	1.4	0.0	130.4	180.2	53.8	12.3	29.6	86.5
Arthrocnemon macrostacy	45.9	10.8	3.4	18.6	2.2	10.4	0.0	0.2
Cressa cretica	0.5	7.0	-	-	32.5	0.0	-	-
Cynanchum acutum	-	-	-	-	18.9	10.6	-	-
Cynodon dactylon	0.5	0.0	-	-	12.5	9.0	-	-
Imperata clyndrica	-	-	-	-	2.9	55.1	-	-
Inula chrithmoides	13.1	8.0	5.4	0.0	0.0	4.3	-	-
Juncus rigidus	16.5	211.3	42.7	0.0	62.1	70.6	13.3	0.0
Phoenix dactylifera	3.5	0.3	2.4	0.0	3.1	2.5	5.8	0.0
Phragmities australis	64.1	57.1	83.2	98.2	91.1	124.1	148.4	149.4
Scirpus litoralis	-	-	-	-	0.0	2.5	-	-
Sonchus maritimus	-	-	-	-	0.2	0.0	-	-
Tamarix nilotica	5.9	4.8	9.0	2.2	3.1	3.7	87.0	60.0
Zygophyllum coccineum	-	-	23.6	0.0	0.2	0.0	15.4	3.6
Annuals								
Apium graveolens	-	-	-	-	+	-	-	-
Cyperus difformis	-	-	-	-	+	-	-	-
Chenopodium mural	-	-	-	-	++	-	-	-
Portulaca oleraceae	-	-	-	-	++	-	-	-
Mesembryanthemum nodiflorum	-	-	-	-	++	-	-	-
Spergularia diandra	-	-	-	-	++	-	-	-
Senicio desfontiani	-	-	-	-	++	-	-	-
Diversity indices								
Richness	4.4	4.4	3.5	1.8	7.0	5.7	4.0	3.7
Shannon's (H)	0.87	0.83	0.8	0.34	1.31	1.06	0.9	0.8
Hill's numbers								
N1	2.44	2.34	2.47	1.49	3.87	2.95	2.6	2.2
N2	1.98	1.58	2.11	1.42	3.3	2.19	2.1	1.9
Evenness								
E1	0.66	0.57	0.99	1.25	0.67	0.61	0.7	0.6
E2	0.63	0.54	0.78	0.91	0.54	0.53	0.7	0.6

Table (2): Average of edaphic characteristics in human activities and control stands in Siwa Oasis

Edaphic Characteristics	Effect of Burning		Effect of Grazing		Effect of Continuation of cultivation		Effect of waste products	
	Unburnt stands	Burnt stands	Ungrazed stands	Grazed stands	Control stands	Fallow land stands	Control stands	waste products stands
Gravel %	9.0	7.8	6.1	7.1	3.9	1.3	9.1	7.8
Sand %	66.9	78.2	74.2	77.7	74.8	87.5	70.4	63.0
Silt %	4.9	4.4	5.9	5.8	6.2	3.4	6.1	8.5
Clay %	20.7	9.2	13.1	9.5	14.1	7.6	14.3	20.6
PH	7.4	7.6	7.4	7.6	7.9	7.9	7.9	7.6
Ec (ml mohs/cm)	83.6	66.1	58.8	49.1	26.8	31.7	40.8	70.9
Organic carbon %	0.01	0.01	0.01	0.01	0.02	1.04	0.01	0.08
Ca CO_3 %	14.2	7.6	28.6	26.1	26.5	33.5	38.6	55.4
NO_3	-	-	-	-	-	-	210.0	216.0
NH_4	-	-	-	-	-	-	105.0	108.0
Fe	-	-	-	-	-	-	11.4	165.4
Mn	-	-	-	-	-	-	24.8	2.9
Zn	-	-	-	-	-	-	6.3	1.7
Pb	-	-	-	-	-	-	0.015	0.009
Co	-	-	-	-	-	-	0.002	0.001
Cu	-	-	-	-	-	-	1.5	1.1
Cd	-	-	-	-	-	-	Traces	Traces

Fig. 1. Comparison between the vegetation of Burned and Unburned stands in Siwa Oasis.



The comparison between the floristic composition of fallow lands and control stands indicated that, two families are disappeared in the fallow land stands. These families were Cyperaceae and Zygophyllaceae (Fig. 3). Most of the plant life forms in the fallow land stands relatively similar with the control stands. The percentage of the species which have height (0 – 100 cm) represent 66.7 % in the control stands, while 54.6% of the plants in the fallow land stands had height over than 100 cm. Also, third of the plants (33.3%) in the control stands were feeble or very feeble, while third of the plants (35.2 %) in the fallow lands were vigour and very vigour. The percentage of plants which grow in a single state decreased from 71.4 % in the control stands to 47.1% in the fallow land stands. The species in complete patches state was appeared in the fallow land stands (11.8 %). It is noticed from figure (3) that the percentage of the plants in green foliage stage in the fallow land stands were low (29.4 %) compared with in control stands (57.1 %). Also, the plants in fruiting stage are appeared in the fallow lands (23.5 %). The presence of three species is decreased in the fallow land stands, these species were

A. graucorum, C. acutum and *P. dactylifera*, while the presence of *J. rigidus* is increased.

The average of sand, salinity, organic carbon and $CaCO_3$ are increased in the fallow land stands compared with the control stands, while the percentage of clay is decreased (Table 2).

Effect of waste products

The importance value of *A. graucorum* is increased (86.5) in the waste products stands more than in the control stands (29.6), while the importance value of *T. nilotica* and *Z. coccineum* are decreased (Table 1). Two species (*J. rigidus* and *P. dactylifera*) are disappeared in the waste products stands, while *A. macrostachyum* is appeared.

The average of richness, Shannon's and Hill's numbers of the species in the waste products stands relatively lower than in the control stands (Table 1). The average of the evenness values are increased in the waste products stands (E1 = 0.60, E2 = 0.60) more than in the control stands (E1 = 0.50, E2 = 0.58) due to the increase of the distribution of the abundant species.

Five species belong to five families are recorded in the waste products stands, while six species belong to six families are recorded in the control stands (Fig. 4). The percentages of all families are recorded in the waste products stands are increased more than in the control stands. The Chaemophytes plants in the waste products stands are increased (60 %) while the cryptophytes and Phanerophytes are decreased (20 % and 20 %). Also, the short plants (0 – 50 cm) are increased (60 %). The performance of the plants in the waste products stands became relatively stronger than in the control stands.

Fig. 2: comparison between the vegetation of grazed and ungrazed stands in Siwa Oasis.

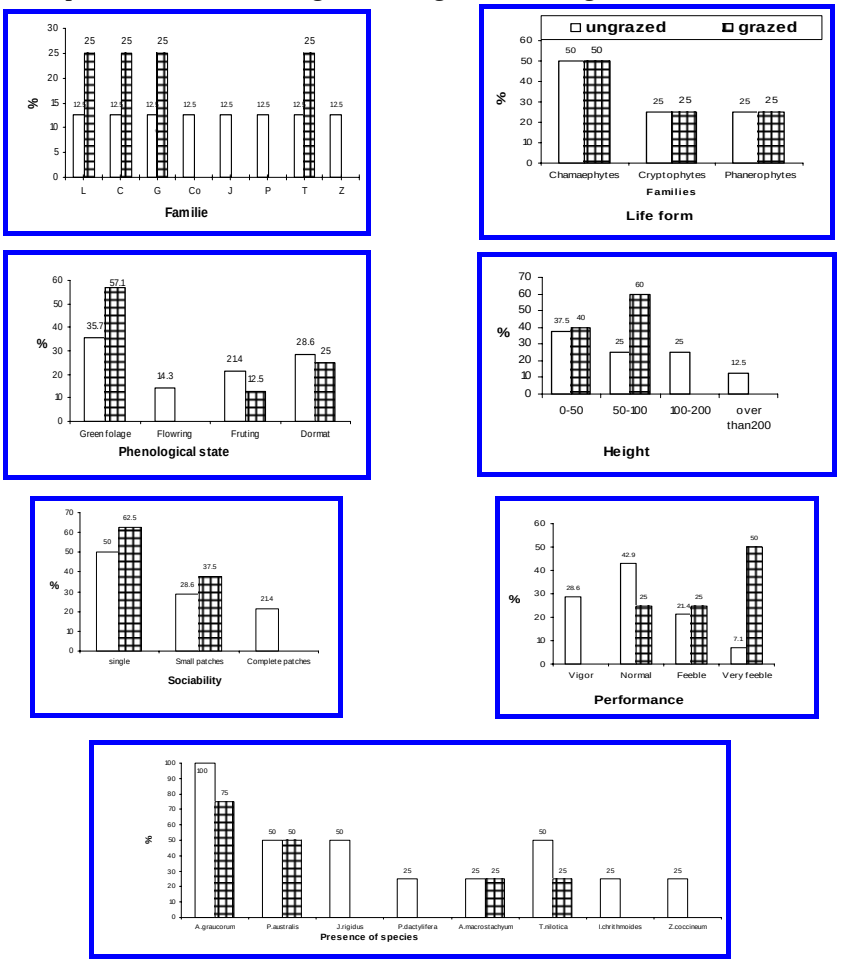
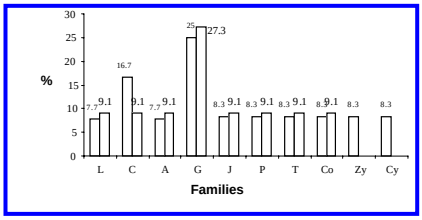
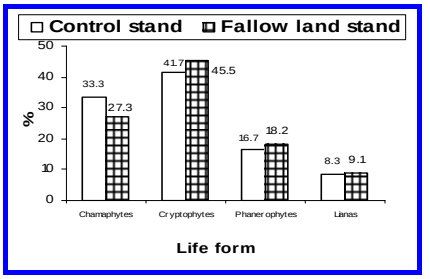
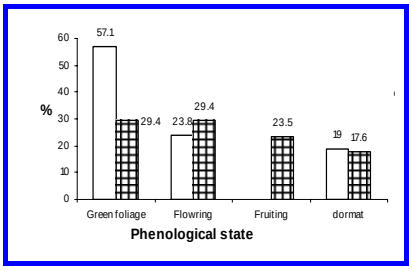


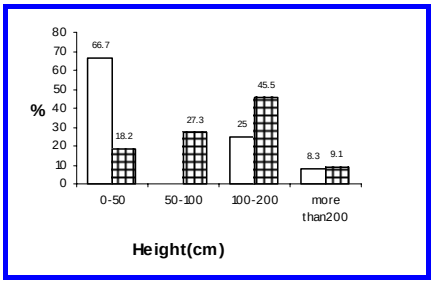
Fig.3: Comparison between the vegetation of fallow lands and control stands in Siwa oasis.

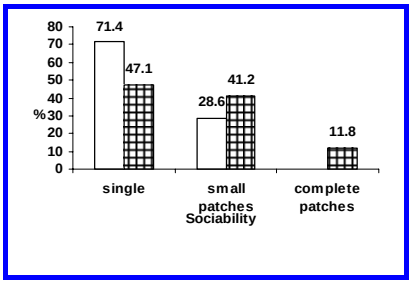


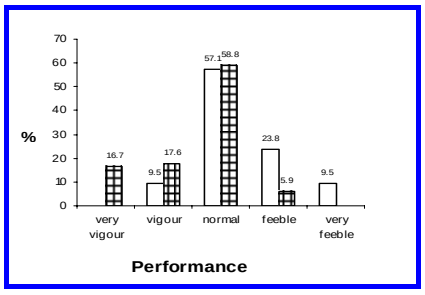
L=Leguminosae, C=Chenopodiaceae, Asclepidaceae, G=Graminae, J=Juncaceae, P=Palmae,T= Tamaraceae Co=Compositae, Cy=Cyperaceae and Zygophyllaceae

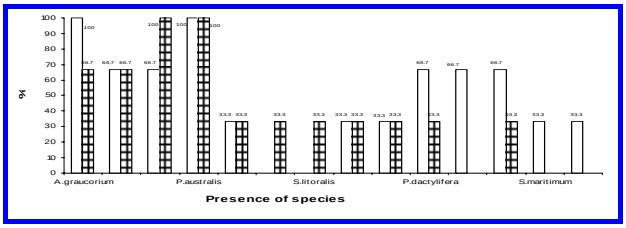












The plants in the flowering state are decreased (18.2 %) in the waste products stands less than in the control stands (33.3 %), while the percentage of the plants in the dormant state are increased (27.3 %). There is similarity in the sociability state of the plants in the waste products and control stands except the disappearance of the complete patches state of the plants in the waste products stands . The presence of *A. graucorum* is increased (100 %) in the waste product stands compared with 66.7 % in the control stands. The presence of *Z. coccineum* is decreased (33.3 %) in the waste products stands compared with 66.7 % in the control stands.

The waste products stands distinguished by high salinity and $CaCO_3$ (70.9 mmohs/cm and 55.4 %, respectively) in the soils compared with 40.8 mmohs/cm and 38.6 % in the soils of the control stands (Table 2). Also, the percentages of very small particles (silt and clay) are increased in the waste products stands versus decreasing in the percentages of gravel and sand. The average percentage of the organic carbon relatively increased in the waste products stands (0.08 %) more than in the control stands (0.01 %). The results indicated that the amount of nitrate, nitrite and iron are increased in the waste products stands than those in the control stands, while the other elements are decreased.

Discussion

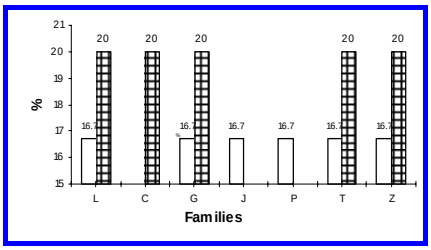
In the Mediterranean type ecosystems, fire is recognized as an important factor determining vegetation dynamics (Wilgen, Bond, and Richardson, 1992; Moremo and Oechel, 1994). In the last five decades, some human-caused fires have

occurred. However, there is increasing fire risk as a consequence of long drought periods, and it is important to know the ability of these communities to regenerate after Ahmed Abdel burning (Whelan, 1995). In Siwa Oasis the inhabitants used fire in the grassland habitat to regenerate the vegetation cover and to use the new sprouts as a range resources. Two species were increase in the importance value (IV) after fire. Regenerative mechanisms that allow populations to recover after fire are widespread in Mediterranean type vegetation (Gill,1981 and Trabaud, 1987).These mechanism include fire-stimulated germination, or resprouting from stumps, lignotubers, or burls (Janes, 1989). Secondary succession after fire is an unsatisfactory term for the rapid vegetative and reproductive of the same individuals, even with a shift in generation through germination of certain species already present before the fire (Naveh, 1967). Most of species, which are disappered in the burning stands were short plants such as *A. graucorum* and *C. dactylon*. The effect of plant size on the resprouting response is important at the population dynamics level. If young, small plants are more likely to die than adult large ones (Rundel *et al.*, 1987; Brandstock and Myerscough, 1988) high fire frequency will tend to deplete populations. The ability of resprounting is associated with the presence of lignotubers and burls or shallow roots in

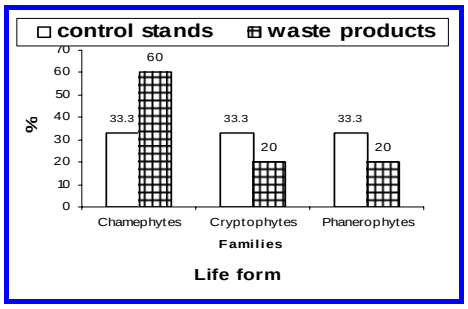
many species (James, 1984; Canadell and Zedler, 1995 and Lloret *et al.*, 1999). Most of species can be resprout in Siwa Oasis after fire were rhizomatus species. In Siwa Oasis the percentage of feeble and very feeble plant increased after fire. In the surviving plants, plant size arises as an important factor explaining the resprouting vigor (number and biomass of resprouts) (Rundel *et al.*, 1987; Canadell, Lloret and L**Ó**pez-Soria, 1991). After fire, the dominant species in Siwa Oasis are affected by the fire and resprouted, so they showed in green foliage stage and grew in single state. In many species, the probability of flowering is also size dependant, so that only plants larger than some critical threshold size with produce any floweres at all (Werner, 1975 and Waite,1980). Kassas (1992) stated that the shrub-grass cyclic replacement change may be part of the natural ecology of the steppe vegetation, especially where fire is a prevalent factor.

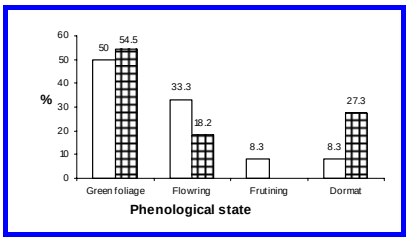
Overgrazing represent the second harmful & human use after crop expansion in the deserts (Le Houerou & Gillet 1999). In Siwa Oasis, the range resources is little, so the grazed animals graze the medium and low platable species such as the new growth of *P. australis*, *A. graucorum* and *J. rigidus*. The decreasing of the species diversity in the grazed stands due to the loss of four species(Table 3). The disappearance of some species may be due to the mechanical damage by the man and animals. The increase of the fertilization through sheep and goat excrements, which increase the nutrient availability compotation with the dominant grazed species (*P. australis* and *A. graucorum*). Krahulec, *et al.* (2001) found that the increase in the availability of nutrients causes increasing in cover of the range species after grazing. The disappearance of four species after grazing caused increased in the percentages of Leguminosae, Tamarixaceae and Chenopodiaceae, whereas these families represent the recorded species after grazing. The browsing animals remove buds and twigs and so can dramatically affect the shapes of the plants they browse (Crawley, 1986). Heneidy, *et al.*(2002) observed that variations in height of the perennial range species as a result of different grazing pressares. In this study the percentage of feeble and very feeble plants are increased in the grazing stands, also the tall plants (over than 100 cm) are disappeared. The disappearance of flowering plants and the decrease of percentage in the fruiting plants due to the overgrazing, which not permit to the plant to produce flowers and fruits.

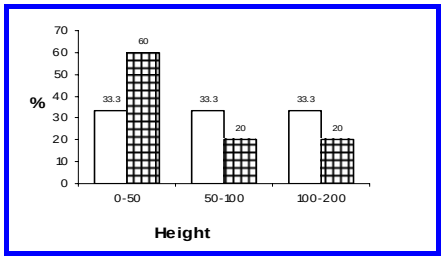
Fig. 4: Comparison between the vegetation of control and waste products stands in Siwa oasis.

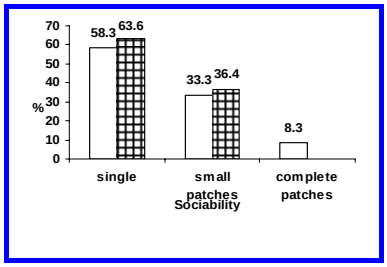


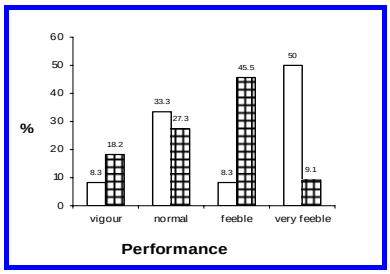
L=Leguminosae, C=Chenopodiaceae, G=Graminae, J=Juncaceae, P=Palmae, T= Tamaraceae and Z=Zygophyllaceae











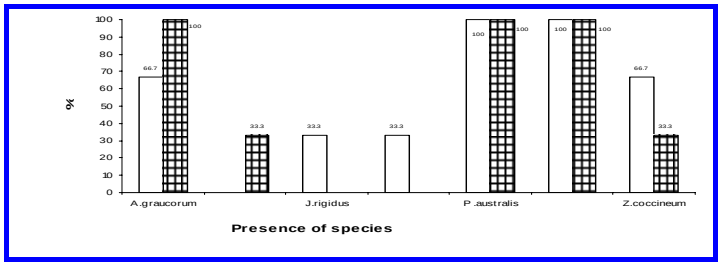


Table (3): The change in the number of species disappeared and appeared as a result of the human activities in Siwa Oasis

Activities	Species disappeared	Species appeared
Burning	2	-
Grazing	4	-
Continuation of cultivation	3	2
Pollution	2	1

The disappearance of three perennials and all the annuals in the fallow lands may be due to the low percentage of clay and high value of salinity, however the general practice in the cultivation lands is flood irrigation which, with inadequate drainage, results in increasing salinity of upper soil layers (El-Ghareeb and Rizk, 1989). These results agreement also with Khedr (1999) and El-Khouly (2001). The importance value of *J. rigidus, P. australis* and *I. clyndrica* were increased. The habitat of these species distinguishes by high salinity (Girgis, 1977). The continuation of the flow of springs which the main source of irrigation of the cultivated land in Siwa Oasis causes a swamp habitat common with *P. australis, Cynadon acutum* and *I. clyndrica*. The fallow lands were less diversity than the control stands (cultivated land) due to increase of salinity value in the fallow lands which irrigated by the saline water of the springs. Salinity has a negative indication on the plant species diversity (El-Khouly and Fakhry, 1999 and El-Khouly and Khedr, 2000). The geochemical changes in the surface deposits cuasue vegetation to change. Plant life in the extensive depression of Qattara (N.W. Egypt) provides evidence of change from dryland scrub (*Acacia raddiana*) to salt-tolerant scrub (*Tamarix* spp.), th halophytic thickets (*Nitraria retusa* or *Suaeda monoica*). As salinity increases and surface salt layers accumulate, the habitat becomes sterile (Kassas, 1992).

Over than half of the plants in fallow lands were over than 100 cm in height, also third of the plants were vigour and very vigour, that may be due to the presence of the favorable habitat of the swampy species such as *P. asutralis, C. acutum* and *I. clyndrica*. These species grow in small or complete patches in this habitat. On the other hand, these species consider as a harmful weed in the cultivated lands (control stands), so the farmers remove or cut these plants causing the feeble and very feeble performance of these plant.

Plants are far more sensitive to pollution than animals or man. Therefore, plants, among them algae, are also used as indicators. In this study the results indicated that salinity, $CaCO_3$, silt, clay, nitrate, nitrite and relatively organic carbon are increased in the waste products stands may be due to using the salts in the olive preservation industry, also as a result of presence of some organic remainders and materials in the waste solutions poured in waste product stands, these materials gave a black color to the soil surface. The accumulation of nitrogen in ecosystems as a result of human activities is potentially of great ecological significant. Nitrogen is required in

larger amounts by plants, and perhaps therefore much more frequently limits plant growth in semi natural ecosystems (Silvertown *et al.* 1998). The importance value and presence of *Alhagi graucorum* are increased in the waste products stands. The highest percentages of salinity were recorded in the communities of *A. graucorum* in the Egyptian Oases (El-Khouly and Zahran, 2002). *Alhagi graucorum* has a wide ecological amplitude (Ahmed and Girgis, 1979 and Abu Ziada, 1980). The appearance of *Arthrocnemon macrostachyum* and disappearance of *P. dactylifera* and *J. rigidus* in the waste product stands may be due to the high values of salinity, silt, clay and organic carbon, that is agreement with (Ahmed, 2002& El-Khouly and Khedr 2002and Khedr & Zahran, 2002).

Chamaephytes are the most abundant life form in the halophytic vegetation in Egypt (Zahran, 1982). Chamaephytes represent 40.6% while Creptophytes represent 37.5% in the halophytic vegetation of the Egyptian Oases (El-Khouly and Zahran, 2002). In this study the percentage of chamaephytes increased more than Cryptophytes. The short and feeble plants are increased in the waste products stands as a result of increase of salinity (Crawely, 1986) and /or increase of nitrate and nitrate deposition, however, this may not relate simply to differences in the competitive ability of the plants as directly influenced by increases in nitrogen supply (Silvertown, 1998). In general, the effect of human activities are studied in Siwa Oasis leaded to:

1) Reduced species diversity as a result of disappearance of some species. The overgrazing stands were more affected than the other stands subjected to human activities (Table 3)
2) Decrease in the percentage of Cryptophytes may be due to most of Cryptophytes grow near the soil which to be subjected to direct effect of the human activities especially grazing and burning.
3) All the plants were in feeble performance, short in height, grow in single or small patches and most of the plants were in green foliage state in the stands of grazing, burning and waste products versus those in the fallow land stands.
4) The percentage of presence of most species was lower than the control stands.

Siwa Oasis considers as promising location to development but it needs to conserve its plant genetic resources through:

1) rationalization of cultivation, 2) reduce of using the pollutants (fertilizers…etc.), 3) evaluate the range resources, 4) decrease the urbanization activities and 5) close the salt affected springs.

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