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Vegetation and Soil Conditions of Phytogenic Mounds in Subiya Area Northeast of Kuwait

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ABSTRACT

Phytogenic mounds, nabkas, or hillocks are stabilized dunes formed around many perennial plants growing in desert and salt marsh, sabkha, habitats. The present study aims to analyze the vegetation structure and soil conditions of phytogenic mounds formed around two dominant perennial plants; *Haloxylon salicornicum* representing desert Nabkas and *Nitraria retusa* representing sabkha nabkas. Twenty sites were randomly chosen in the study area for vegetation measurements, soil sampling, and human activities description. Fifty surface soil samples were taken from the phytogenic mounds and interspaces for physical and chemical analysis. Signs of human impacts in the study area were also considered. Nabkas play crucial roles in soil fixation and limiting dunes migration. They are considered islands of fertile soil that are richer in organic matter, and silt and clay contents than soils of the interspaces. In addition, phytogenic mounds provide important niches for many types of animals and birds. Climatic conditions, soil salinity, and soil fine fractions are the main environmental gradients controlling the distribution of *Haloxylon salicornicum* and *Nitraria retusa*. Human impacts are the main threats affecting the health and abundance of phytogenic mounds causing land degradation and species loss. Management and conservation plan for phytogenic mounds should rely on the understanding of the potential and status of the vegetation structure and soil conditions.
Keywords: Coastal habitats, Human impacts; phytogenic mounds; salt marshes; vegetation; Size structure; Kuwait.

INTRODUCTION

Phytogenic mounds or nabkas are stabilized dunes formed around desert and sabkha perennial plants (Al-Dousari *et al*., 2008). Several terms have been used to refer to this aeolian landform, such as bush-mounds, shrub-coppice dunes, knob dunes, hummock, and phytogenic hillocks (e.g. Batanouny and Batanouny, 1968; Cooke *et al*., 1993; Langford, 2000; El-Bana *et al*., 2003). Geomorphological characteristics of nabkhas and their significance to plant diversity, wind erosion and land degradation in arid ecosystems have been studied by several authors (e.g. Batanouny and Batanouny, 1968; Bornkamm *et al*., 1999; Dougill and Thomas, 2002; Wang *et al*., 2006; El-Bana *et al*., 2007).

Geomorphology of phytogenic mounds in Kuwait has been considered in several studies (e.g. Khalaf *et al*., 1995; Brown and Porembski, 2000; Brown, 2003; Al-Dousari *et al*., 2008). On the other hand little attention has been given to study the interaction among dominant plants, formation and soil conditions of phytogenic mounds. El-Ghareeb *et al.* (2006) investigated the plant diversity along the coastal salt marshes of Kuwait and the importance of active sand deposition and process of hummock formation (Nabkas). Al-Dousari *et al*. (2008) studied sediment characteristics of desert and saline (sabkha) nabkhas formed around different types of desert and halophyte plants. They concluded that the Haloxylon salicornicum from open desert environment and Nitraria retusa from sabkha environment are the most efficient plant species in trapping mobile sand.

Vegetation of Kuwait is composed of sparse shrubs, sub-shrubs, perennial herbs, and annuals (Boulos and Al-Dousari, 1994). According to Halwagy *et al*. (1982) and Omar *et al.* (2001), vegetation of Kuwait is characterized by dominance of few number plant communities including *Haloxylon salicornicum*, *Cyperus conglomerates*, *Panicum turgidum, Rhanterium epapposum*, and *Nitraria retusa*. Al-Dousari *et al*. (2008) provide a list of perennial plant species that form nabkas in Kuwait.

Assessment of vegetation has been considered as one of the important indicators of land degradation in arid ecosystems (Abd El-Wahab, 2008). Although the importance of phytogenic mounds in spatial distribution of plant and soil resources, and in controlling wind erosion and sand storms problems in Kuwait, they have been threatened due to human activities (Omar *et al*., 2000). Due to the importance of phytogenic mounds, this study aimed to analyze the vegetation structure and soil conditions of phytogenic mounds in desert and sabkha habitats dominated by *Haloxylon salicornicum* and *Nitraria retusa*, respectively. In addition, the study aimed to compare between soil quality of nabkas and interspaces.

MATERIALS AND METHODS

Site Description

Kuwait is located at the north-west corner of the Arabian Gulf. To the north and west, it is bordered by Iraq, and to the south and south-west by Saudi Arabia. On the east, it has a coastline of 290 km on the Arabian Gulf. Kuwait has gravelly and sandy desert topography

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of low to moderate relief (El Baz and Al Sarawi, 2000). More than 50 percent of Kuwait desert is covered by aeolian sand, reflecting the action of wind on the loose desert deposits and the aridity of the area.

Subiya area lies at the northeast of Kuwait between latitudes 29° 22' and 29° 40' N and longitudes 47° 46' and 48° 05' E (Fig. 1). Landforms characterizing Subiya area include gravel plain, shallow depressions, sand plains, slopes, variety of forms of coastal sand dunes, and coastal sabkha. The main geomorphologic feature in the area is Jal Al-Zor escarpment, which is 145 m above sea level.

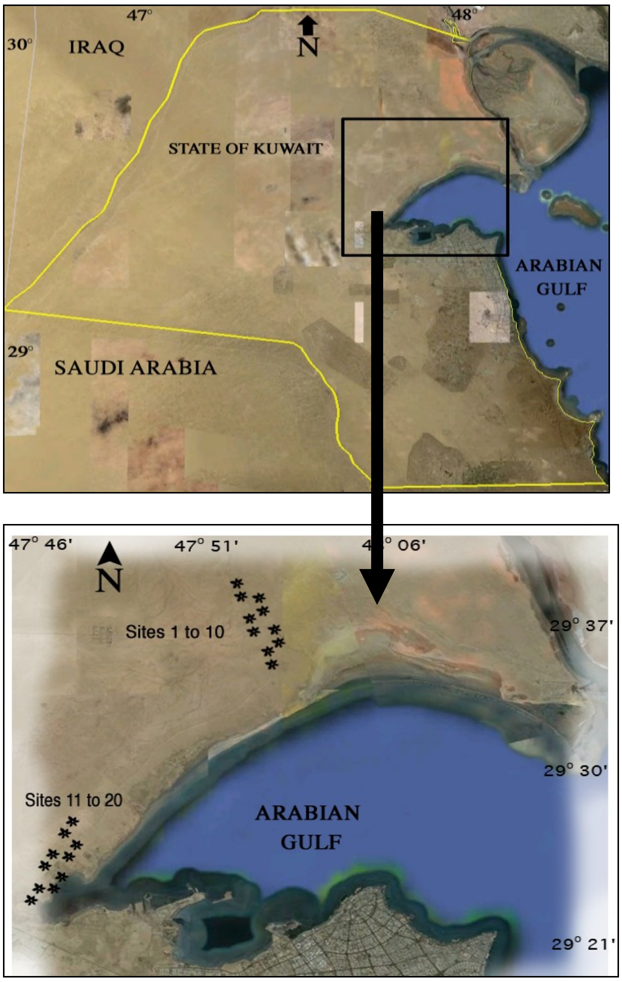

Figure (1): Location Map of Subiya area, north east of Kuwait showing the selected 20 sites: 1 to 10 in desert habitat, and 11 to 20 in sabkha habitat.

In general, Kuwait has a typical desert climate; hot and dry in summer, and warm and sometimes rainy in winter. There is a wide variation of temperature, ranging from 45 °C in summer to 8 °C in winter (Fig. 2a). Rainfall is extremely low, with a mean of 128 mm per year for the period of 1985 till 2002. Most rainfall occurs between November and April (Fig. 2b). Precipitation amount decreases from north to south. Relative humidity reaches 60% in winter and 20% in summer (Fig. 2c). Wind is mostly north-west with speed that reaches 60 km per hour during cold weathers. Dust and sand storms prevailing over the area primarily originate from southwest of Iraq. Dust storm in Kuwait can occur during any month of the year, but are most common between March and August (Fig. 2d). About 50% of dust storms occur during June and July (El-Baz and Al Sarawi, 2000; Al-Yamani *et al.*, 2004).

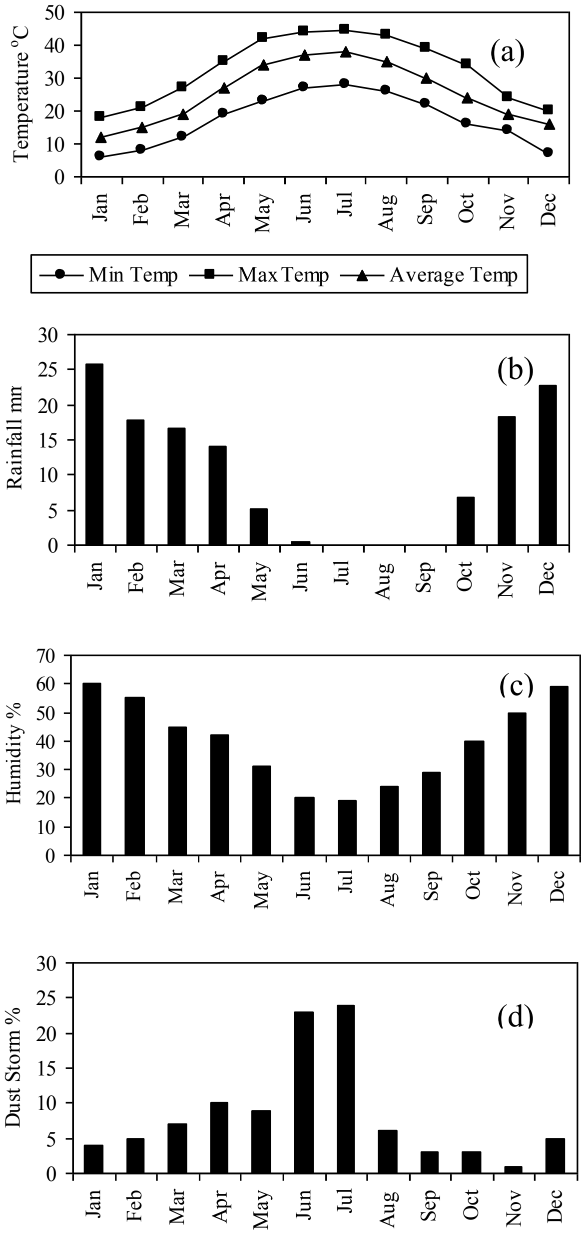

Figure (2): Annual variations of meteorological data of Kuwait: (a) maximum, minimum and mean air temperature, (b) mean rainfall, (c) percentage of relative humidity, and (d) percentage of dust storms (after El-Baz and Al Sarawi, 2000; Al-Yamani *et al.*, 2004).

Vegetation and Soil Sampling

Vegetation survey was carried out in two main habitats in Subiya area; desert and coastal salt marsh. At desert habitat, 10 sites characterized by dominance of

Haloxylon salicornicum were selected for vegetation measurements and soil sampling. Twenty surface soil samples (0-20 cm depth) were collected; two samples at each site from undercanopy and interspace. Ten sites also were selected at salt marsh habitats supporting *Nitraria retusa.* In these sites, thirty soil samples were collected, three soil samples at each site, two from the undercanopy "top and bottom" and one from the interspace. Field measurements include recording geographic location using GPS receiver "Trimble model", measuring dimension and height of dominant plants and phytogenic mounds. Vegetation cover as a canopy cover was measured using restricted random fashion plots 10X10 m in desert habitats and 20X20m in coastal salt marsh habitat (Barbour *et al.*, 1987). Identification of plant species was according to Boulos (1988), Boulos and Al-Dousari (1994), and Omar *et al*., (2000). Nature of soil surface (Hausenbuiller, 1985) and human activities were considered.

Soil Analysis

Soil samples were air-dried and sieved through 2 mm sieve to obtain representative sub-samples for chemical and physical analyses and to exclude gravels that are relatively less reactive. Soil fraction analysis using dry sieving (particle-size distribution) and hygroscopic moisture were measured (Klute, 1986). Soil pH was measured in 1:2.5 soil water extract using "YSI pH 100 Environment". Soil electric conductivity (EC) and soil salinity were measured in 1:1 soil water extract using "Handheld EC/TDS HI 8033 Meter". Soil organic matter (SOM) was estimated by loss in ignition method (Sparks *et al*., 1996).

Data Treatment

Statistical analysis of the data including descriptive statistics, Pearson correlation, regression analyses, and analysis of variance (ANOVA) were carried out (Zar, 1984) using SPSS software (Statistical Package for Social Sciences, version 11.5).

RESULTS

Subiya area is characterized by diversity of landfoms including gravel plains with sand sheets, slopes, gravel channels, coastal sand dunes and coastal salt marshes. The first four landforms constitute desert habitats and are characterized by dominance of *Haloxylon salicornicum* and *Panicum turgidum*. The associated species in desert habitats include *Citrullus colocynthis, Moltikiopsis ciliate, Lotus halophilus, Astragalus spinosa, Ephedra alata, Stipagrostis plumose,* and *Schismus barbatus.* The total plant cover varies from 4.93% to 16.20% as a canopy cover with average reaches 8.54%. The coastal salt marsh habitat is dominated with *Nitraria retusa* and *Tamarix auchiriana*. The associated species include *Lycium shawii,* and *Zygophyllum qaterense.* The total plant cover varies from 6.29% to 27.07% with average reaches 13.67%. Signs of human impacts that affecting the phytogenic mounds habitats are more noticed in desert habitats dominated by *H. salicornicum* than sabkha habitats dominated by *N. retusa*. Human impacts include urbanization, camping, off road vehicles, overcollection and overcutting of woody plants as fuel wood for cooking and heating. Grazing in the study area has been prohibited by law since 1995. Most of the noticed grazing signs are mainly related to wild animals.

Soil Properties of Phytogenic mound and Interspace

Variations in measured soil properties of nabkas and interspaces in desert habitat dominated by *H. salicornicum* and salt marsh habitat dominated by *N. retusa* are presented in table 1. In general, except pH, all variables measured showed highly significant variation between desert and salt marsh habitats. Soils of nabkas are higher in fine fractions and lower in pH, salinity and EC than soils of interspaces in both desert and sabkha habitats (Fig. 3 and 4).

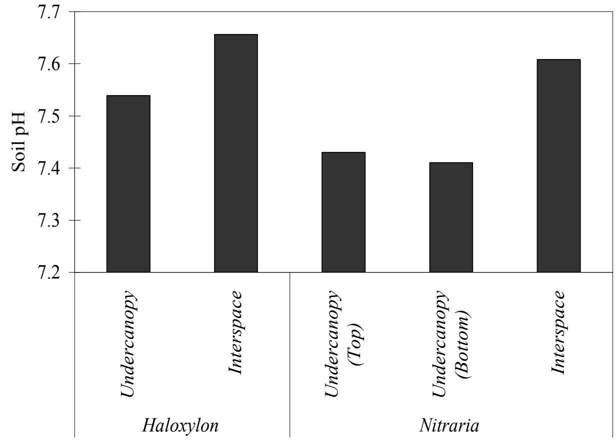

Figure (3): Soil pH (1:2.5) at desert and sabkha nabkas dominated by *Haloxylon* and *Nitraria* "undercanopy and interspace".

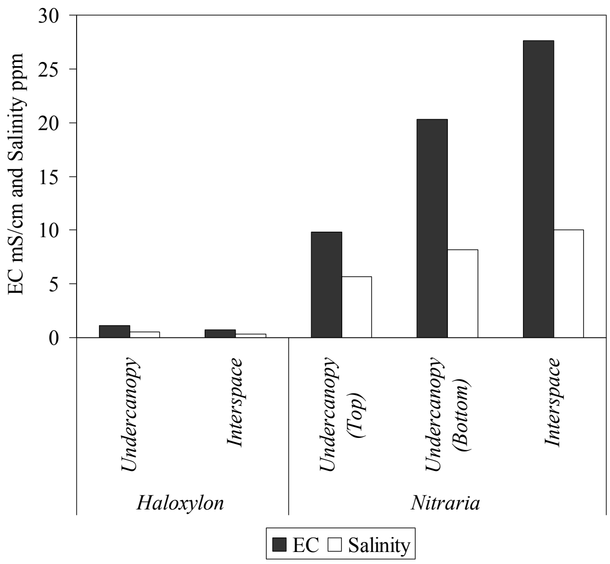

Figure (4): Soil Electric conductivity and salinity (1:1) at desert and sabkha nabkas dominated by *Haloxylon* and *Nitraria* "undercanopy and interspace".

Table (1): Mean and standard deviation of soil variables in desert and sabkha nabkas; undercanopy and interspace. Differences in term of *F* values along with their significance *p* values are also given. Mean values of each variable with similar letters indicate no significant variation according to Duncan's multiple range test.

Variable	Desert Nabka		Sabkha Nabka			*F*	*p*
	Undercanopy	Interspace	Top	Bottom	Interspace		
Hyg. Moisture %	0.50 ± 0.25[a]	0.62 ± 0.25[a]	1.36 ± 0.76[ab]	1.67 ± 0.58[b]	2.68 ± 2.23[c]	6.49	< 0.001
Coarse Sand %	3.83 ± 3.94[ab]	10.43 ± 7.39[c]	0.51 ± 0.53[a]	0.40 ± 0.43[a]	5.45 ± 3.54[b]	10.3	< 0.001
Medium Sand %	10.49 ± 6.97[a]	17.45 ± 7.94[a]	19.39 ± 12.48[a]	10.39 ± 8.60[a]	48.50 ± 24.40[b]	13.27	< 0.001
Fine Sand %	17.12 ± 8.72[a]	16.53 ± 9.00[a]	36.26 ± 14.77[b]	34.71 ± 13.19[b]	25.49 ± 15.40[ab]	5.56	0.001
very fine sand %	30.75 ± 10.20[bc]	21.02 ± 3.40[ab]	26.07 ± 7.08[b]	36.56 ± 16.77[c]	13.16 ± 9.83[a]	7.42	< 0.001
silt %	35.62 ± 9.33[b]	32.37 ± 8.46[b]	16.95 ± 14.64[a]	17.32 ± 9.90[a]	8.70 ± 7.90[a]	12.12	< 0.001
clay %	1.73 ± 0.98[b]	1.75 ± 0.66[b]	0.42 ± 0.39[a]	0.30 ± 0.28[a]	0.26 ± 0.57[a]	15.4	< 0.001
pH	7.54 ± 0.33[ab]	7.66 ± 0.31[b]	7.43 ± 0.11[a]	7.42 ± 0.09[a]	7.61 ± 0.18[ab]	2.25	0.078
Salinity ppm	0.55 ± 0.38[a]	0.32 ± 0.31[a]	5.67 ± 11.74[b]	8.18 ± 3.67[bc]	10.01 ± 5.50[c]	18.66	< 0.001
EC mS cm^{-1}	1.13 ± 0.70[a]	0.74 ± 0.65[a]	9.83 ± 28.65[ab]	20.34 ± 14.04[bc]	27.61 ± 19.41[c]	10.7	< 0.001
SOM %	0.98 ± 0.31[ab]	0.84 ± 0.27[a]	1.53 ± 0.86[bc]	1.96 ± 0.81[c]	1.45 ± 0.63[bc]	5.2	0.002

Soil properties of desert habitat

Soils of nabkas and interspaces in desert habitats have low content of hygroscopic moisture with non significant variation (0.5 and 0.62%, respectively). Variations in grain size analysis between soils of nabkas and interspaces were also non significant except percentage of coarse sand (Table 1). Soils of nabkas have high percentages of silt and very fine sand (35.62 and 30.75%, respectively), followed by the percentages of fine sand and medium sand (17.12 and 10.49%, respectively), and low percentages of coarse sand and clay (3.83 and 1.73%, respectively). Soils of interspaces are coarser in grain size than soils of nabkas. Nabkas soils have higher percentages of very fine sand than soils of the interspaces (30.75 and 21.02%, respectively), whereas soils of interspaces were higher in coarse sands than nabkas (10.43 and 3.83%, respectively).

Soils of nabkas and interspaces were close to each other in the rest of measured properties; pH (7.54 and 7.66, respectively), EC (1.13 and 0.74 mS cm^{-1}, respectively), salinity (0.55 and 0.32 ppm, respectively), and organic matter (0.98 and 0.84%, respectively).

Soil properties of salt marsh habitat

Soil properties measured in salt marsh habitat showed highly significant variations between nabkas soils either from top or bottom and soils of interspaces in salt marsh habitat except pH that showed non significant variation (Table 1). On the other hand, soil properties variations between top and bottom sediments of nabkas were not significant, except percentage of very fine sand that showed higher accumulation at the bottom of nabkas than top (36.56 and 26.07%, respectively). In general, nabkas bottom soils were higher than top soils in salinity, electric conductivity, and organic matter content (Table 1).

Soils of interspaces were higher than soils of either top or bottom of nabkas in percentages of hygroscopic moisture (2.68, 1.36, and 1.67%, respectively), coarse sand (5.45, 0.51, and 0.40, respectively), medium sand (48.50, 19.39, and 10.39%, respectively), pH (7.61, 7.43, and 7.42), salinity (10.01, 5.67, 8.18 ppm, respectively), and EC (27.61, 9.83, 20.34 mS cm^{-1}, respectively). On the other hand, soils of nabkas were higher than soils of interspaces in percentages of fine sand, very fine sand, silt, clay, and organic matter (Table 1).

Size Structure of phytogenic mounds

The measured size structure parameters of phytogenic mounds include diameter, height, cover, volume, and size index. These parameters were measured for nabkas, the accumulated sediments, and for the plants trapping these sediments at desert and salt marsh habitats. Variations in morphological parameters are presented in table 2.

In general, all morphological parameters of *Nitraria retusa* nabkas (sediments and plants) were higher than *H. salicornicum* nabkas (Table 2). The average plant diameter and height of *H. salicornicum* were 1.03 m and 0.44 m, respectively, whereas *N. retusa* diameter and height were 4.55 m and 0.97 m, respectively. The average plant cover and volume of *H. salicornicum* were 0.98 m^2 and 0.47 m^3, respectively. On the other hand, *N. retusa* cover and diameter were 19.45 m^2 and 19.21 m^3, respectively. Plant size index was 0.73 for *H. salicornicum* and 2.76 for *N. retusa* (Table 2).

The average morphological characteristics of nabka sediments under *H. salicornicum* were as follow: diameter 0.89 m, height 0.3 m, cover 0.84 m^2, volume 0.47 m^3, and size index 0.73. These parameter were much high in case of *N. retusa*. The average sediments height and volume under *N. retusa* were 1.22 m and 90.41 m^3 (Table 2).

Statistical analysis in terms of skewness and kurtosis showed high values for *H. salicornicum* than those of *N. retusa* (Table 2). Variations and interferences of

Table (2): Descriptive statistical analysis of plant size and Nabka size of *Haloxylon salicornicum* and *Nitraria retusa*.

	Desert (*H. salicornicum*)			Sabkha (*N. retusa*)		
Variable	Mean	Skewness	Kurtosis	Mean	Skewness	Kurtosis
Plant Size						
Diameter	1.03 ± 0.45	1.12	1.67	4.55 ± 2.11	-0.03	-0.32
Heihgt	0.44 ± 0.11	0.00	1.27	0.97 ± 0.26	0.20	0.20
cover	0.98 ± 0.93	2.50	9.02	19.54 ± 15.54	0.94	0.45
volume	0.47 ± 0.50	2.31	7.14	19.21 ± 14.53	0.45	-1.22
size index	0.73 ± 0.25	0.87	0.87	2.76 ± 1.09	-0.28	-0.26
Nabka Size						
Diameter	0.89 ± 0.53	1.87	6.22	8.11 ± 3.51	-0.60	0.28
Heihgt	0.30 ± 0.23	0.45	-1.48	1.22 ± 0.59	-0.20	0.15
cover	0.84 ± 01.25	4.89	31.94	60.71 ± 41.37	0.39	-0.98
volume	0.26 ± 0.47	4.45	25.53	90.41 ± 78.93	0.90	-0.06
size index	0.59 ± 0.29	1.41	4.51	4.67 ± 2.00	-0.69	0.36

morphological characteristics of *H. salicornicum* nabkas were higher than those of *N. retusa* nabkas (Fig. 5).

There was a highly significant direct relationship between size structure parameters of nabkas sediments and size structure of the plants in desert and salt marsh habitats (Table 3 and 4). Linear regression analysis indicates high significant direct relationships between nabkas diameter and plant size index in both plants (Fig. 6). The r^2 values were 0.75 for *H. salicornicum* and 0.83 for *N. retusa*.

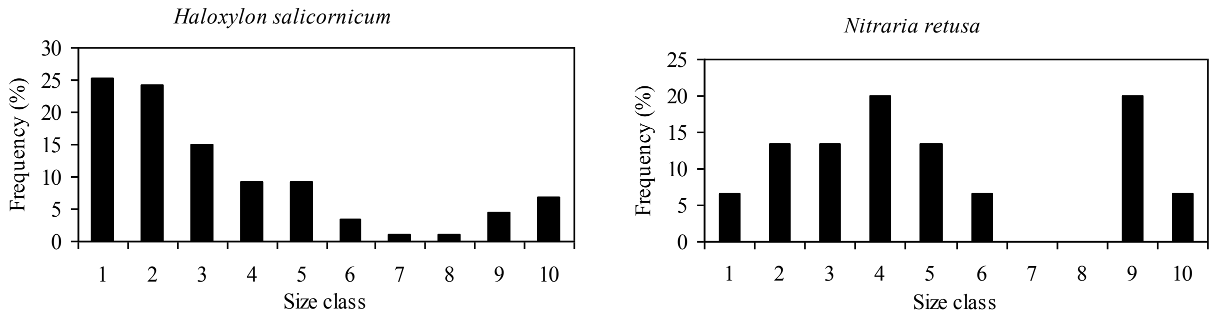

Figure (5): Size structure of *Haloxylon salicornicum* and *Nitraria retusa* in Subiya area, northeast of Kuwait.

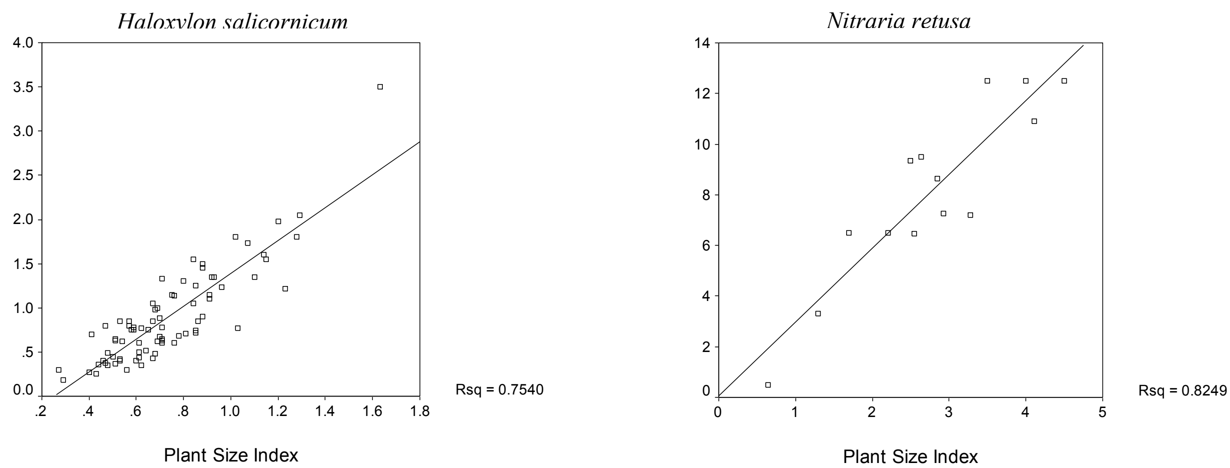

Figure (6): Linear regression between Nabka diameter and plant size index of *Haloxylon salicornicum* and *Nitraria retusa*.

Table (3): Pearson correlation between size structure parameters of *Haloxylon salicornicum* and nabkas at desert habitat.

		Plant				Nabka				
		Diameter	Size Index	Volume	Area	Height	Diameter	Size Index	Volume	Area
Plant	Height	0.406**	0.585*	0.506**	0.341**	0.289*	0.246*	0.334**	0.196	0.188
	Diameter		0.979**	0.941**	0.966**	0.202	0.898**	0.892**	0.797**	0.807**
	Size Index			0.950**	0.935**	0.246*	0.868**	0.883**	0.768**	0.775**
	Volume				0.969**	0.192	0.878**	0.870**	0.871**	0.875**
	Area					0.185	0.903**	0.891**	0.894**	0.895**
Nabka	Height						0.04	0.420**	0.265*	0.05
	Diameter							0.924**	0.856**	0.927**
	Size Index								0.880**	0.862**
	Volume									0.944**

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table (4): Pearson correlation between size structure parameters of *Nitraria retusa* and nabkas at salt marsh habitat.

		Plant				Nabka				
		Diameter	Size Index	Volume	Area	Height	Diameter	Size Index	Volume	Area
Plant	Height	0.226	0.328	0.391	0.072	0.135	0.422	0.39	0.107	0.341
	Diameter		0.993**	0.928**	0.967**	0.941**	0.887**	0.916**	0.923**	0.862**
	Size Index			0.945**	0.944**	0.927**	0.908**	0.933**	0.905**	0.875**
	Volume				0.918**	0.807**	0.856**	0.869**	0.907**	0.893**
	Area					0.887**	0.807**	0.838**	0.959**	0.839**
Nabka	Height						0.811**	0.858**	0.837**	0.729**
	Diameter							0.996**	0.873**	0.961**
	Size Index								0.888**	0.950**
	Volume									0.927**

** Correlation is significant at the 0.01 level (2-tailed).

In desert habitat, *H. salicornicum* height has low significant correlation with nabkas height and diameter and has non significant correlation with nabkas volume and area (Table 3). The height of nabkas in salt marsh habitat showed highly significant direct correlation with *N. retusa* diameter (Fig. 7), volume, size index, and area of *N. retusa* (Table 4). *Nitraria retusa* height has no significant correlation with any parameter of the nabkas size structure (Table 4). High disturbance including grazing and cutting in desert and sabkhas habitats may be the main reason for disturbing this relationship.

DISCUSSION

Haloxylon salicornicum and *Nitraria retusa* are two land marks characterizing the Arabian deserts and coastal salt marshes, respectively (Brown and Porembski, 1997; Shaltout *et al*., 2003; El-Ghareeb *et al*., 2006; Abd El-Wahab, 2008). In the present study, vegetation analysis showed that the average plant cover of *H. salicornicum* and *N. retusa* are 8% and 14%, respectively. These results are in agreement with Brown (2003) and El-Ghareeb *et al.* (2006). Plant community of *H. salicornicum* is more diverse in associated species than community of *N. retusa*. Diversity in topography and microclimate of desert nabkas in addition to their abundance of soil moisture encourage high plant diversity. Many authors stress the importance of water availability for species diversity in desert ecosystems (Whittaker, 1972; Moustafa and Zayed, 1996; Abd El-Wahab, 2008). On the other hand, high salinity conditions are considered the most limiting factor controlling the plant life in coastal salt marsh habitats, which characterized by dominance of halophytes including *N. retusa* (Halwagy *et al*., 1982; Shaltout *et al*., 2003; El-Ghareeb *et al*., 2006).

In general, *H. salicornicum* and *N. retusa* are the most efficient species in trapping sediments and forming phytogenic mounds in deserts and sabkhas habitats of Kuwait, respectively. Similar finding has been indicated by Brown (2003) and Al-Dousari *et al.* (2008). However, phytogenic mounds of *H. salicornicum* were smaller and less stable than those of *N. retusa* (Brown, 2003). Due to the height of the canopy and narrow spacing between branches of *N. retusa* shrubs, they are effective in trapping large body of sediment. About ten men can be totally unseen if they hide behind one of *N. retusa* nabka.

The results of soil analysis of nabkas and interspaces in deserts and sabkhas indicate that phytogenic mounds play a crucial role in providing islands of fertile soils, which encourage diversity in both plant and wild life. Nabka soils are richer in fine-grained particles, organic matter and nutrients than soils of interspaces. In addition, salinity conditions were lower in nabka soils than interspaces, which indicate the importance role of nabkas in improving soil conditions and water availability. Results from seed bank studies carried out by Brown (2003) support this finding, with about six to eight times more seedlings emerging from nabka soils than from the interspace soils. Except percentage of very fine sand fraction, variation in statistical parameters between soils from top and bottom of sabkha nabkas is non significant. Al-Dusari *et al*. (2008) found that variation in statistical parameters between surface and root zone sediments is very limited. More researches are still needed for better understanding and evaluating the micro-spatial heterogeneity of nabka sediments.

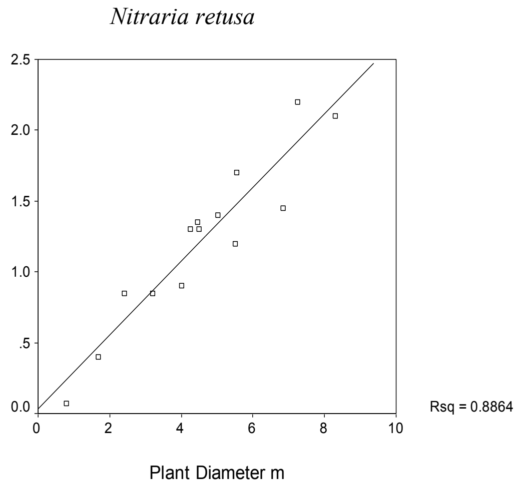

Figure (7): Linear regression between Nabka height and *Nitraria retusa* diameter at salt marsh habitat.

CONCLUSIONS AND RECOMMENDATIONS

As noted by several authors (e.g. Khalaf, 1989; Omar, 1991; Brown, 2003), Kuwait desert ecosystems have suffered severe land degradation in recent decades due to human impacts. The main threats affecting the phytogenic mounds habitats in the study area include urbanization, camping, off road vehicles, overcollection and overcutting of woody plants as fuelwood for cooking and heating. The aridity conditions make the ecosystem fragile and sensitive to human impacts (Batanouny, 1983), which aggravate the deterioration effects of aeolian processes (Abd El-Wahab, 2008). The rehabilitation of these degraded lands should rely on conservation of nabkas habitats by removing the human impacts, such as off road vehicles and overcollection, and restoring the vegetation using common native plants that have wide ecological distribution and efficient at mobile sand control such as *Haloxylon salicornicum, Panicum turgidum* and *Lycium shawii* for open desert environment, and *Nitraria retusa* and *Tamarix aucheriana* for sabkha environment.

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الكساء الخضرى وخصائص التربة للأكمات النباتية فى منطقة الصبية شمال شرق الكويت

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الملخص العربي

تعتبر الأكمات النباتية كثبان رملية مستقرة تكونت حول عدد من النباتات البرية المعمرة النامية فى البيئات الصحراوية والسبخات الملحية. تهدف الدراسة الحالية إلى تحليل الكساء الخضرى وخصائص التربة المميزة للأكمات النباتية لاثنين من النباتات المعمرة وهما : الأكمات النباتية لنبات الرمث ممثلاً للأكمات النباتية الصحراوية ، والأكمات النباتية لنبات الغرقد ممثلاً للأكمات النباتية فى السبخات الملحية. تم اختيار عدد عشرون موقعاً بطريقة عشوائية فى منطقة الدراسة وذلك للقياسات الحقلية الخاصة بالكساء الخضرى وجمع عينات التربة ووصف التأثيرات الإنسانية. تم جمع خمسون عينة تربة من منطقة الدراسة من الأكمات النباتية ومن المناطق البينية لإجراء التحاليل الطبيعية والكيميائية. أكدت النتائج على الأدوار الهامة للأكمات النباتية فى تثبيت التربة والحد من تحرك الكثبان الرملية. وكذلك على تميز تربة الأكمات النباتية بوفرة من الطمى والطين وخصوبة التربة ووضح ذلك عند مقارنتها بخصائص التربة فى المناطق البينية والتى تكاد تخلو من النباتات مما يؤكد على أن الأكمات النباتية يمكن اعتبارها جزر من التربة الخصيبة فى البيئة الصحراوية والسبخات الملحية. بالإضافة إلى ذلك فإن الأكمات النباتية توفر مواطن وملاذات أمنة للعديد من النباتات المصاحبة والحيوانات والطيور. تعتبر الظروف المناخية وملوحة التربة ونسبة الطمى والطين من العوامل البيئية المؤثرة فى توزيع عشائر نباتى الرمث والغرقد. تعتبر التأثيرات الإنسانية من التهديدات الرئيسية لكفاءة ووفرة الأكمات النباتية مما يؤدى إلى تدهور الأراضى وفقدان الأنواع. وتوصى الدراسة بضرورة وضع استراتيجيات وطنية لصون وإدارة الأكمات النباتية تعتمد على تفهم أهميتها وطبيعة تركيب الكساء النباتى وخصائص التربة لهذه المواطن البيئية.