



العدد الثامن - يوليو 2016

Environmental Studies On Derianah Salt Marsh

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دراسات بيئية على سبخة دريانه

الملخص

نبتاتى الزيتا والغدام *Tamarix aphylla* and *Juncus acutus* ينمون بشكل طبيعى فى سبخة دريانه والتى تتميز تربتها بمكونات خاصة تؤثر على كفاءة النمو فى تلك الأوساط. لذا تم إجراء هذه الدراسة لإلقاء الضوء على كيفية العلاقة بين تلك النباتات الملحية فى إتجاه التأقلم لهذه البيئات. قدر محتوى كلاً من النباتين من كمية الكالسيوم, الماغنسيوم, كمية الرماد الكلى ونسبة المادة الجافة وكذلك تم تقدير كمية الكالسيوم, الماغنسيوم و نسبة المادة العضوية فى التربة النامى بها نوعى النبات على مدار الفصول الأربعة. مثل هذه المعلومات تجعل من الممكن فهم اليه السلوك الفسيولوجى لهذه النباتات نحو التأقلم لبيئاتها المتطرفة.

كلمات مفتاحية: المناخ، المقاومة، المحتوى الكيميائى، التأقلم، النباتات الملحية، الموطن.

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Abatract

Tamarix aphylla and *Juncus acutus* species naturally colonizing Derianah salt marsh in Libya which is characterized by marked soil chemical composition variations affecting species tolerance. So this study concerned with identifying the relationship between these two halophytes and their habitat Amount of calcium and magnesium, dry matter percentage, total ash and organic matter. Determination the varied in the two species and the associated soil samples during four seasons. Such information has made possible to understand the physiological behavior of these species towards their local environment.

Key words: Environment, Tolerance, Chemical composition, Adaptation, Halophytes, Habit.

العدد الثامن - يوليو 2016

Introduction

Derianah salt marsh occupies a great of Libyan northern costal. Soil of Derianah salt marsh has characterized by silty soil mixed with sand and little of clay and lamination of gypsum ($\text{Ca SO}_4 \cdot 2\text{H}_2\text{O}$) throughout the profile Abologma (1997) & Lama (2002).

Mean air temperature ranges from 11 C° in January to 32 C° in August and the average annual rainfall is about 46mm Lama (2002).

Salinity is one of the main edaphic factors which limits the distribution of plant communities in their natural is causing increasingly severe problems within the study area.

Halophytes are unique in their ability to grow and reproduce in saline environments. These environments are normally dominated by NaCl but may contain a variety of other salts like calcium (Ca), magnesium (Mg), potassium (K), magnesium sulphate (MgSO_4) and calcium sulphate (Ca SO_4) are pounded which caused rising in soil pH toward alkalinity (El-Gedidy 1986 ; El Malki *et, al* 2007).

In the present investigation we discussed physiological behavior of two halophytes species (*Tamarix aphylla* and *juncus acutus*) in Derinah salt marash invironment. Ca, Mg, dry matter and ash content, % organic matter (OM) in different soil depth were included as well as the degree of biomass.

MATERIALS AND METHODS

Nine location were selected in the study area (Derinah salt marash), soil samples were taken from three different depth (0-5, 5-25, 25-50 cm) during four seasons and packed in paper bags to be ready for chemical analysis. Soil texture was determined according to Allison *et, al* (1954).

Ca and magnesium were calculated by titration method using E.D.T.A. reagent according to Allison *et al* (1956). Values were expressed as mg/l. Total organic matter determinate as described by Allison *et, al* (1956) and the values were expressed as percentage (%).

Collected plant samples thoroughly cleaned and fresh weight were determinate, then oven-dried with circulating air at 80 C for 24 h to determine dry weight. Biomass was determined according to Kent and Paddy (1992). Total ash content of plant materials was determinate according to Abdallh *et, al* (1993). Values were expressed as percentage (%).

Results obtained were treated statistically by applying analysis of variance one and two way ANOVA.

Results and Discussion

Soil characteristics in the study area exhibit a slight variation throughout the different depths (table 1). Notable variations were in Mg content. However, soil Mg was significantly

العدد الثامن - يوليو 2016

highest during summer constituted 2671.52mg/l while the lowest 1527.18 mg/l during winter this due to drought stress and salt accumulation (fig 1). The data obtained shows that highest value of Mg in *Tamarix aphylla* was 90.74 mg/l during winter while the lowest was 32.27 mg/l during spring. On the other hand highest Mg content in *Juncus acutus* was 196.09 mg/l during winter while the lowest value was 42.1 mg/l during autumn (table 2). This indicated that the two species have highest level of Mg during winter these result are in agreement with abdel-Rahman (1973) who reported that the increment in Mg soil content during winter is mainly attributed to raising in soil moisture. The result are also in agreement with Adam (1990) who reported that halophytes need Mg for growth and development. However, concerning with the percentage of soil calcium cations, the highest value during summer 2000.89 mg/l and the lowest was during winter 1263mg/l (table 1 & fig2).

In plant analysis , the highest value of Ca recorded in both plants tamarix and juncus was also during winter which has also been suggested by Abdel-Rahman (1973) that soil moisture induced Ca accumulation in plants (table 2). The results given in table 1 & fig 3 indicate that organic matter highest value 4.80 % was recorded during summer while the lowest value 2.48 recorded during winter. Organic matter content varied significantly ($p<0.05$) throughout the four seasons. However, different soil depths show no difference in organic matter content. In general, organic matter content in the study area was low(fig 3), this data are in agreement with the findings of Bolous (1995) who reported that salt marshes organic matter content very low, which might be attributed to the accumulation of salts and decreases in soil nitrogen and phosphorus content.

This study illustrated that halophytes species follows several mechanical activities to adapt with circumstances of highly salts such as accumulated ash. The total ash percentage in both Tamarix and juncus varied throughout the four seasons, this coincides with Khan and Ungar (1996) who reported that the total ash content of halophytes varied. Highest value of ash content was in tamarix and juncus 45.12 & 77.20 % respectively recorded in summer, while the lowest value 19.1 & 22.21 % respectively recorded during autumn (table 3) this may indicate that the two species is subjected to accumulate of concentration of salinity, especially Na, Ca, Mg and Cl during drought Faria *et.al* (1996), Adam (1990). Value of biomass in both species were quit significant ($p<0.05$) during winter this mainly attributed to the highly winter rainfalls, which in turn increased the soil moisture and plant fresh weight. It has been demonstrated by Donovan & Gallagher (1985) and El Malki *et al* (2007), that the increase in the biomass of halophytes species promoted by high levels of salt which are confined to saline habitats. However, the lowest content of may be due to slightly increased temperatures which in turn increased plant metabolic activity, following with decreasing in fresh weight and that associated with an decreased in biomass.

العدد الثامن - يوليو 2016

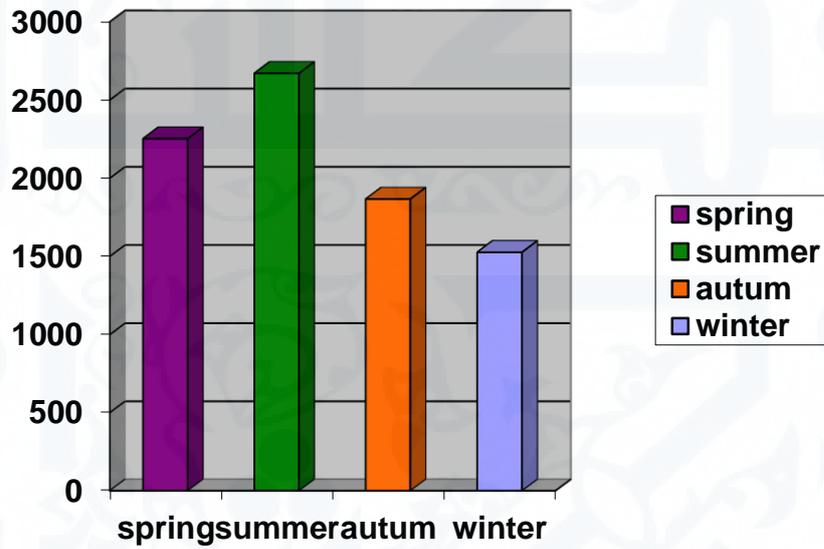


Fig1: Seasonal variation in magnesium mg/l of Derianah salt marsh soil

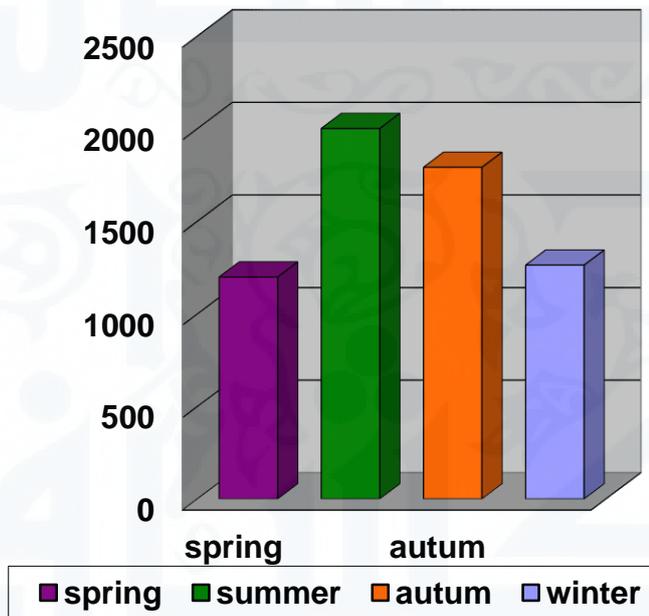


Fig 2: Seasonal variation in calcium (Ca) mg/l of Derianah salt marsh soil.

العدد الثامن - يوليو 2016

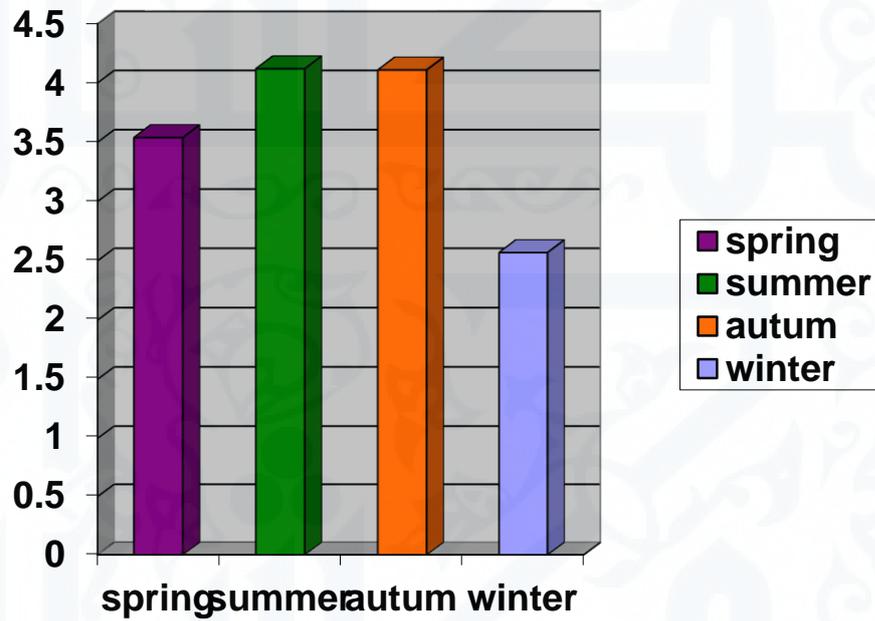


Fig 3: Seasonal variation in % organic matter of Derianah salt marsh soil.

Organic Matter Content

Calcium (mg/l)

Magnesium (mg/l)

Aut	Sum	Spr	Wit	Aut	Sum	Spr	Wint	Aut	Sum	Spr	Wit	Soil depths (cm)
3.25	5.73	4.67	2.14	2351.3	2507.89	1739.33	1394.89	2481.18	3989.11	3237.22	2294.11	5-0
	4.16	4.49	3.98	2.27	1769.11	942.18	1611.33	1545.11	2338.11	786.11	1713.55	25-5
3.29	4.19	3.83	3.03	1391.5	1725.67	915.22	785.22	1315.89	1687.33	2568.22	573.89	25-50
3.57	4.80	4.16	2.48	1925.1	2000.89	37657.41	1263.81	1780.73	2671.52	2197.18	1527.18	Mean

Table1: Seasonal variation in magnesium, calcium and organic matter content under different depths of Derianah salt marsh soil.

العدد الثامن - يوليو 2016

Ca g / l				Mg g / l				Plant species
Aut	Sum	Spr	Wit	Aut	Sum	Spr	Wit	
297.57	218.46	162.85	322.34	63.82	63.26	32.27	90.74	Tamarix aphylla
167.16	286.80	142.29	392.41	42.14	70.41	123.09	196.09	Juncus acutus

Table 2: Seasonal variation in magnesium (Mg) and calcium (Ca) content of *Tamarix aphylla* and *Juncus acutus* of Derianah salt mars

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العدد الثامن - يوليو 2016

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