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Research article

Effects of some environmental stresses on nutrients concentration of *Phragmites australis* and use it as fodder

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Abstract

This study has been conducted to assess and analyze the nature and environmental characteristics of Baher Al-Najaf depression (BAND) and their effect on nutrients Concentration of Phragmites australis as responses to Environmental Stresses and use it as fodder, has been studied for 12 month in four different sites. Samples were collected monthly for the period February, 2015 to January 2016, taken from four selected sites in (BAND), Iraq.The environmental factors of water studied include: Temperature, Electrical Conductivity (EC), Salinity, Water pH, Total Dissolved Solids (TDS), Turbidity, Total Suspended Solids (TSS), Dissolved Oxygen (DO), Total Hardness (TH), ions, Total Nitrogen (TN), Total Phosphorus (TP), Bicarbonate (HCO_3^{2-}), Sulfate (SO_4^{2-}), Chloride (Cl^{-1}), and sodium (Na^{1+}) ions. Results of water quality have proved the highest values of environmental factors were in autumn and summer while, least environmental factors were in winter and spring. Environmental factors were gradients significantly high at site as follows S2 > S3 > S4 > S1.The studied factors of climate are : Air Temperature, Relative Humidity, Intensity of Solar Radiation , Precipitation Rates, Day Length and Evaporation Rate. Results have shown that climatic factors affected water resources and salinity level in (BAND). The changes in the nutrient cycling and/or accumulation are in most cases unpredictable, and that is why detailed description of the local structure and state of within-stand development are necessary. The ability and translocation are important, especially in changing environments with varying supply of resources. Ionic contents Na^+ and Cl^- significantly increased, whereas K^+, TP (Total Phosphor) and TN (Total Nitrogen) decreased with increasing levels of environmental stresses in each site and season. In general it can be use Phragmites australis as fodder in suitable environmental factors and it cannot be used as fodder in stress environmental factors due to decrease in nutrients concentration of Phragmites australis.

Keywords: Phragmites australis, Environmental stress, Total Phosphor, Total Nitrogen

Introduction

The efficiencies of nutrient utilization by macrophytes are varied in environmental conditions, where the availability of resources is changing (1) Variations in resource availability in the different phases of succession directly affect the growth and production abilities and determine the species composition of the dominant taxa in any specific habitat. The total amount and availability of nutrient resources are only a narrow determinant in controlling the success of competitive plants. Morphological and physiological adaptations include specific modifications in the growth and direction of rooting systems towards the best resources (2). The main objectives strategies in the growth and production under nutrition stress were as follows:

1- Concentration of Nitrogen (TN)

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It has been reported that nutrient retention causes either an increase in the TN contents and high protein content in some glycophytic plants or increase in soluble proteins (3). The Number of N-containing compounds accumulating in plants subjected to environmental stress (4).

2-Concentration of Total Phosphorus (TP)

Phosphorus is the second important nutrient required by plants. It is an essential component of nucleic acids, phosphorylated sugars, lipids and proteins, which control all life processes. The requirement of phosphorus for optimal growth is in the range of 0.3 to 0.5% of the plant dry matter. The toxicity may occur if the tissue concentration is more than 1% in the dry matter (5). Inorganic form of phosphorus is usually available for plant roots in soil.

3-Concentration of Potassium (K^+) and (Na^+).

K^+ uptake is impaired by stress; higher K^+ levels in tissue are required for shoot growth. While, increases in leaf-Na^+ concentrations may help to maintain plant turgor, Na^+ cannot completely substitute for K^+, which is specifically required for protein synthesis and enzyme activation (6). High K^+ concentrations in the stroma are necessary for the maintenance of optimum photosynthetic capacity under stress conditions (7).

4-Concentration of Chloride (Cl -)

Chlorine is one of the essential micronutrient elements in plants. Chloride is mainly involved in the photolysis of water by photosystem II. Chloride may act either as a bridging ligand for stabilization of the oxidized state of manganese, or as a structural moiety of the extrinsic protein. Chlorine plays an important role in the stomatal movement (5). The genus Phragmites is one of family Phocaea comprises of the most common perennial, rhizomatous, stoloniferous and tall (2.0–6.0 m) grasses, of temperate and tropical wetlands all over the world. Studies show that *Phragmites australis* grows in soils of different pH, salinity, fertility and textures, and attains high productivity under different climatic conditions. Recent studies have shown that can be used reed as green fodder and it can be successfully utilized by farm animals (8). (9) Stated that growing Barki lambs fed rations formulated from ensiled reed plants with olive cake or whole date meals showed normal growth rate. There are few studies on effects of Environmental stress on this plant and Baher Al-Najaf depression. In the present study, a sub-acute experiment was conducted to examine the combined effects of Environmental stresses on *Phragmites australis* by testing nutrient concentrations to identify their potential role as fodder.

Materials and Methods

Ethical approval

The Animal Ethical Committee of Veterinary Medicine College, University of Al-Qadisiyah, Iraq, has approved the present study under permission No: 436

Determination of BAND

The BAND, located in the province of Najaf in Iraq, Shape (1). It is separated from Euphrates River only 15km with a width about 16 km southeast. However, at the middle of depression, it shrinks 10 km categorically 40 km North West of Najaf to the south west of the city of Herra. While bounded on east, road Mashkhab - Najaf, and on the west line that connects the strategic Iraqi oil from the south to the north-west (10). Four stations in the BAND we are studying.

1- Site 1 contains various chemicals from the southern tributary of feeder (detergent from households and pesticides from agricultural).

2- Site 2 contains different chemicals from industry and composite municipal wastewater.

3- Site 3 water has allot off amount of salts from ground wells.

4- Site 4 is located near the oil strategic line.

Sample collections:

Water samples were collected monthly from February/2015 to January/2016. Where samples were collected from a depth of 30

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cm below walls surface for each of studies stations and using polyethylene containers for physical and chemical analysis of water and used glass bottles 250 ml transparent and the other opaque to measure dissolved oxygen (DO) water temperature (C°), pH, Electrical Conductivity (EC), Salinity and Dissolved Oxygen (DO), were measured by using Multi Lab pilot V 4.4 (5.03), turbidity by using a nephelometer Lamotte (WTW)U.S.A 1979 . TDS(Total dissolved solids), TSS (Total suspended solids), Calcium (Ca^{+2}), Magnesium (Mg^{+2}), Chlorides (Cl^{-1}), Sulphate (SO_4^{-2}), Carbonates(CO_3^{-3}), bicarbonates (HCO_3^{-2}), total nitrogen, total phosphate Ions using adopted methods of American Public Health Association (11).The climatological features of the sites included mean annual precipitation (mm/m2), mean annual temperature (C°).

Plant materials

Plant materials were harvested in four different site on each locality. Plants were harvested seasonally fourth time during the study. Sample collected in an ice bucket and in the shortest possible time brought to the laboratory. Plant samples were cleaned with tap water and distilled water, Fresh plant material (fully expanded and undamaged leaves), was separated from whole plants and kept in cool place 4C°for studies.

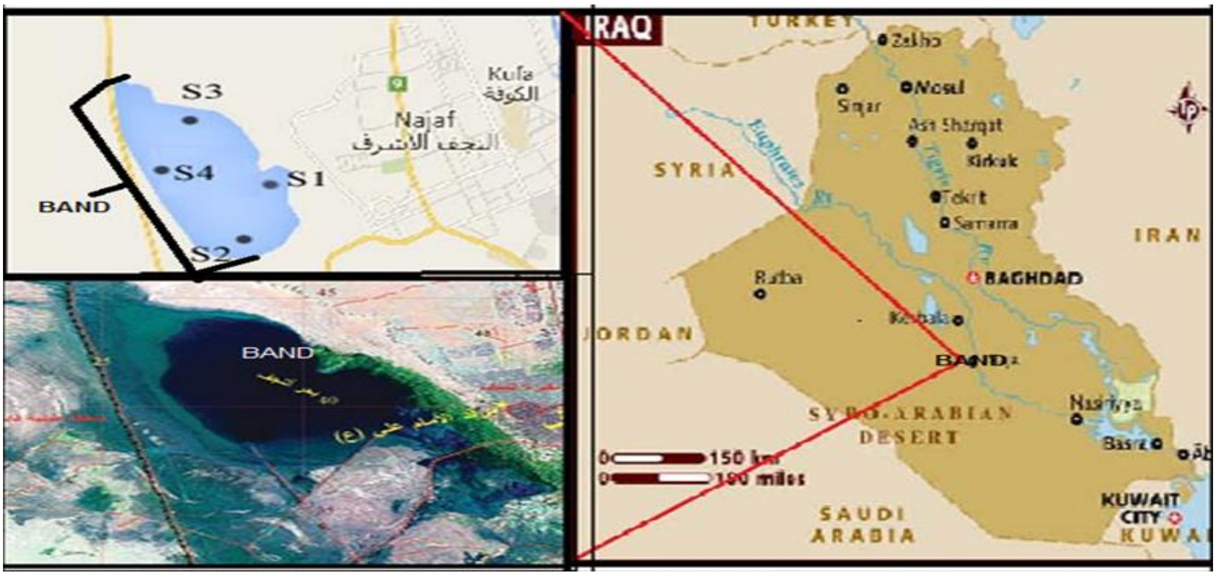

Figure (1) location and site map of BAND reservoir

Mineral Estimation in Plants

1-Samples Digestion

Dry samples were ground with a mortar before being put through a wet digestion procedure according to (12).

2-Nitrogen (TN) Determination in Plants

Nitrogen was determined using Micro-Kjeldahl method according to Al-Sahhaf (1989) from (13). Grinded, dried plants leaves were taken off distillation

3-Phosphorus (TP) Determination in Plants

Phosphorus (TP) concentration was determined according to (14) by using the digested plants sample solution mixed with the reagent (see appendix) at a ratio of (1:1).Test tubes closed and incubated in the dark at 37^{0}C for (1.5-2) h. Thereafter, the light absorbance for samples, blank, and standards were read at 750 nm using spectrophotometer. The standard curve was made in the range of 50-350 nmoles phosphate.

4-Sodium (Na+1) and Potassium (K+1) Determination in Plants: Sodium (Na), Potassium (K) by using Flame photometer (Perkin-Elmer 5000 (USA).

Statistical analysis

Analysis of variance was performed using SAS version 9.1(SAS Institute Inc., Cary, NC,

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USA). The data were presented as the means for each treatment. Means were compared using the LSD test at the 0.05 probability level.

Results

In order to establish the nature and extent of physico-chemical stress on the *Phragmites australis* macrophytes parameters of water and climate were compared among the four contaminated stations. The spatial and temporal changes of the physico-chemical parameters of BAND water are illustrated in Table (1). Detergent from households and pesticides from agricultural runoff from the southern tributary of feeder to Site 1 contains various chemicals. The composite municipal wastewater used in Site 2, also contains different chemicals from industry. Site 3 water has allot off mount of salts from ground walls. Site 4 is located near the oil strategic line, Thus the trend Site 2 > Site 3 > 4>1, was found for all physico-chemical parameters. Due to high temperature and evaporation the DO, EC, TDS, TSS and SAL were high in Autumn in all the four sites and due to heavy rainfall in winter the water got diluted so all those components were lowered down. The same pattern was also seen in $HCO_3^{=}$, CO_3^{-}, Cl^{-}, $SO_4^{=}$ ions and pH concentrations (Table 1).While DO, $PO_4^{=}$, $NO_3^{=}$ ions was arise in winter and decreases in spring due to thrive plants in spring. The one way ANOVA was executed based on the physico-chemical parameters to reveal the differences between four sites. The COND, TDS, TSS, SAL, $HCO_3^{=}$, CO_3^{-} , Cl^{-}, $SO_4^{=}$ and pH were higher in Site 2 than the other sites Table (1).

Table (1): Temporal variation of physic-chemical parameters of water in four stations in BAND by mean value of four seasons

Season	Winter				Spring				Summer				Autumn			
Station / parameters	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
Water temperature	16.400	16.800	16.633	16.533	24.967	24.433	24.067	23.833	30.533	31.767	30.200	29.833	23.633	23.93	23.400	22.333
pH	7.257	7.963	7.767	8.400	8.667	8.967	9.067	8.867	6.313	6.657	6.210	6.000	8.177	8.257	8.500	8.590
(EC)	9.970	41.600	28.733	18.153	15.003	38.933	33.133	16.767	42.190	67.950	62.467	39.200	36.910	72.933	46.357	26.807
(TDS)	7304.000	48080	19194	8885.3	11960.0	37749.3	32824.6	16374.0	67670.0	101350	75823.3	35684.0	32564.6	87583.3	55250.6	25926.6
(TSS)	11.867	43.433	22.167	19.300	13.200	26.967	44.400	18.200	69.600	133.500	72.633	48.933	91.220	170.867	201.200	93.533
Total nitrogen	3.460	0.953	2.221	0.314	0.568	1.981	1.463	1.864	4.074	0.962	0.827	1.392	4.333	2.835	1.300	0.251
Total Phosphate	0.010	0.010	0.010	0.010	0.010	0.017	0.021	0.021	0.010	0.020	0.020	0.020	0.009	0.010	0.010	0.010
Water hardness	32666.66	20700	26033	17333	51866.6	97333.3	76933.3	67333.3	42000.0	44000.0	40266.6	46000.0	34933.3	28433.3	17433.3	33566.6
(Cl^{-1})	5531.61	4198.8	3548.9	2499.2	6964.50	14762.0	12729.3	5831.5	8622.32	4581.91	5873.17	4398.63	3332.30	7031.40	4481.94	3882.13
(CO_3^{-3})	2.222	2.222	4.444	26.667	0.000	0.000	0.000	0.000	22.222	22.222	0.000	24.444	11.111	22.222	17.778	0.000
(HCO_3^{-2})	10662.22	228.88	1384.4	315.55	20666.6	12933.3	9466.66	7466.66	15755.5	16488.8	10200.0	11684.4	16777.7	8111.11	7371.11	5422.22
(SO_4^{-2})	1025.908	1323.3	1270.3	1083.5	962.408	1076.89	1032.41	1002.57	1081.78	1200.21	1161.63	1070.83	1163.06	1353.25	1196.56	1129.57
(DO)	9.300	8.417	8.110	7.533	3.357	2.630	2.970	3.177	1.530	0.440	0.850	1.800	0.000	0.000	0.000	0.000
turbidity	4.243	7.140	7.400	9.433	8.687	5.467	6.300	7.197	23.707	14.433	7.710	12.233	20.767	25.200	14.767	19.667
Salinity	5.567	26.367	17.433	6.667	8.800	24.867	20.767	9.900	28.050	48.050	43.400	25.200	23.667	72.933	30.767	10.867

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Climatic Parameters in BAND

Table (2) showed that BAND climate from February 2015 to January 2016 is hot and dry Summers and cool, rainy Winter with the longest day in Summer and shorter day in winter and increased evaporation rates and the relative humidity in Summer. Further seasons of the year are unequal in the number of months, summers longest season and the winter shorter season.

Table (2) Climatic parameters in BAND in different months from February 2015 to January 2016 (mean value)

No.	Month	Evaporation rates/ mm	Precipitation rates / mm	relative humidity %	average temperature ˚C	Day length / h
1	February 2015	112.4	18.7	70.3	12.5	11.5
2	March 2015	187. 6	15.4	56	17.5	12
3	April 2015	321	11.3	46	22.7	12.3
4	May 2015	435. 2	0.07	40.2	28.6	13.5
5	June 2015	535. 6	0	36.3	33.4	14.5
6	July 2015	605.2	0	25.2	36.5	13.6
7	August 2015	613.2	0	23.5	37.3	13.6
8	September2015	396.3	0	25.6	32.4	13.02
9	October2015	238.7	0	35.3	30.2	12.5
10	November2015	196.3	18.1	50.7	25.3	11.6
11	December2015	121.3	11.8	65.6	18.4	10
12	January2016	84.6	102.7	62.6	12.1	10.2
13	annual rate	32.2	14.8	44.7	25.6	12.3

Mineral estimation in *Phragmites australis* in different seasons in study sites

1- Total Nitrogen (TN) Contents

Phragmites australis leave (TN) content progressively and significantly increase in spring in S1 and S3 while, in S2 and S4 in summer. The (TN) content significantly decrease in winter and autumn more than other seasons at all sites. Spring showed the highest value in S1 while, S4 showed lowest value in Winter Figure (2).

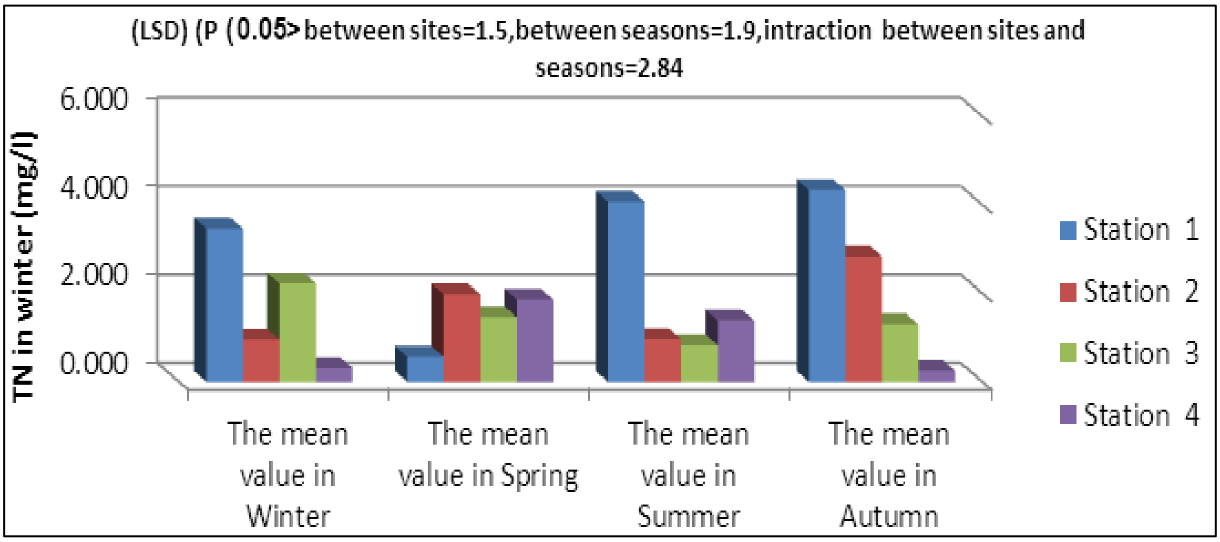

Figure (2) variations in TN concentration mg/g in *Phragmites australis* in different seasons and stations

2-Total Phosphorus (TP) Contents

Phragmites australis leaves (TP) content gradually and no significantly ($P<0.05$) decrease in S1, S2, S3 and S4 in all seasons in each sites. (TP) content from S2 and S4 showed consistent reduction in leave (TP)

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value, but the impact was not significant in different seasons Figure(2).While S1 showed significantly decrease with other sites. The highest decrease in this parameter in autumn in S1 as compared to other sites in all seasons. Figure (3). Winter showed the lowest decrease at all sites and in all seasons.

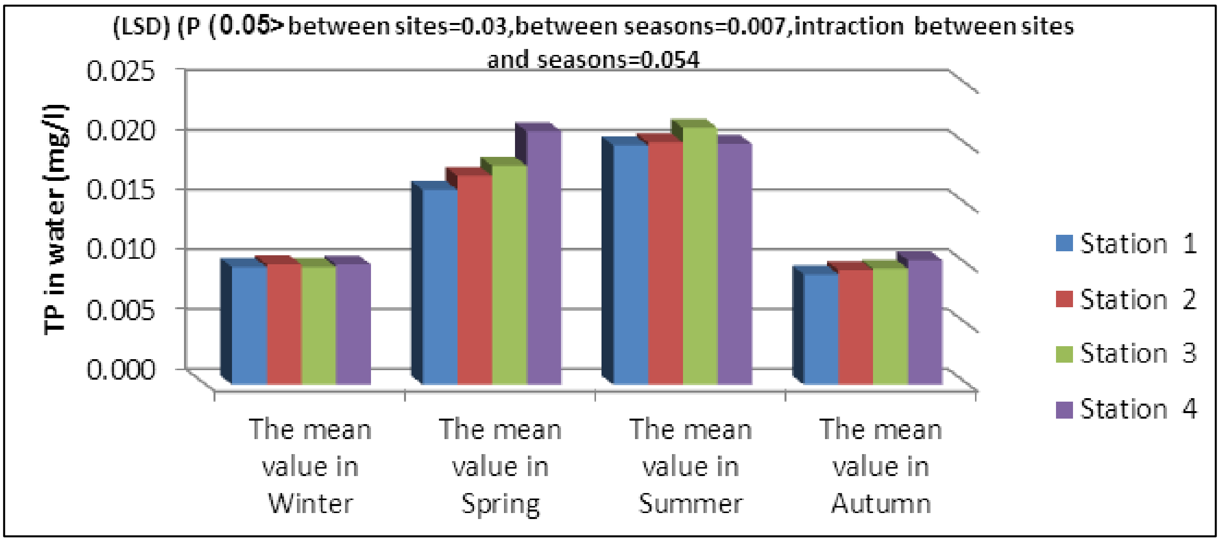

Figure (3) variations in TP concentration mg/l in *Phragmites australis* in different seasons and stations

3-Potassium (K^{+1}) contents

There was a gradual but significant (P<0.05) reduction in leaves K^+ at all sites and seasons with increasing the stress factors. The greatest reduction in leaves K^+ was observed in autumn in S2 as compared to other site Figure (4). The S1 in summer accumulated the highest leaves K^+ content, which was followed by S2 in summer then S3 and S4 in summer. On the other hand, the S1 showed the highest increase in this parameter as compared to other sites in all seasons. Figure (4). Autumn showed the lowest value at all sites and in all seasons.

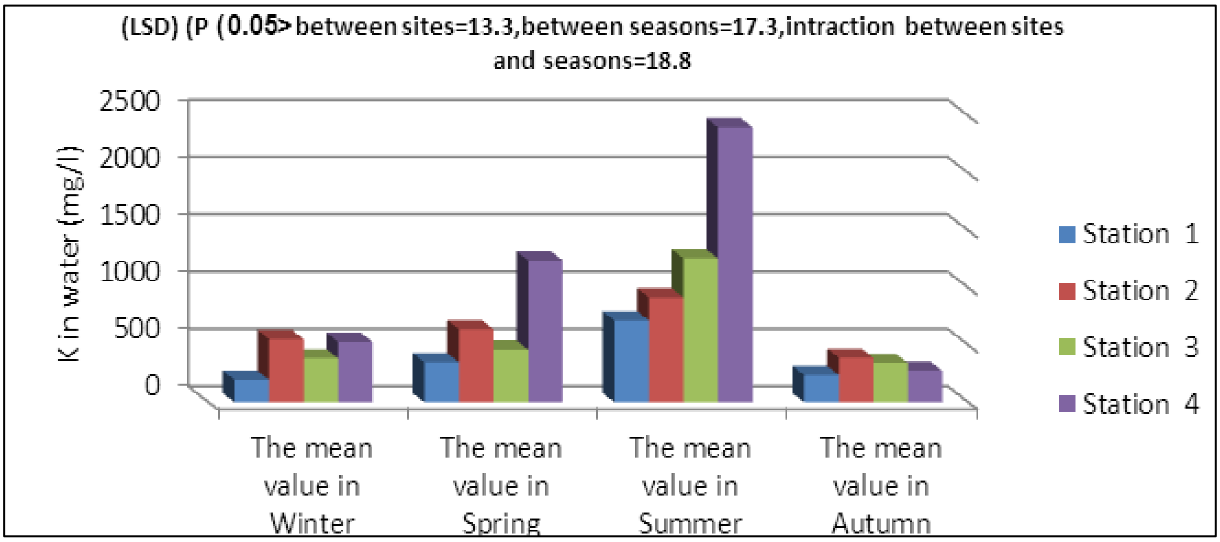

Figure (4) variations in K+ concentration mg/l in *Phragmites australis* in different seasons and stations

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4-Sodium (Na^{1+}) Content

There was a progressive and significant ($p<0.05$) increase in leaves Na^+ content in all study sites and in all seasons of *Phragmites australis* along with increasing stress factors. The S4 in autumn accumulated the highest leaves Na^+ content, which was followed by S2 in autumn then S3 in summer. On the other hand, the S1 showed the least increase in this parameter as compared to other sites. Figure (5). Winter showed the lowest value at all sites in all seasons.

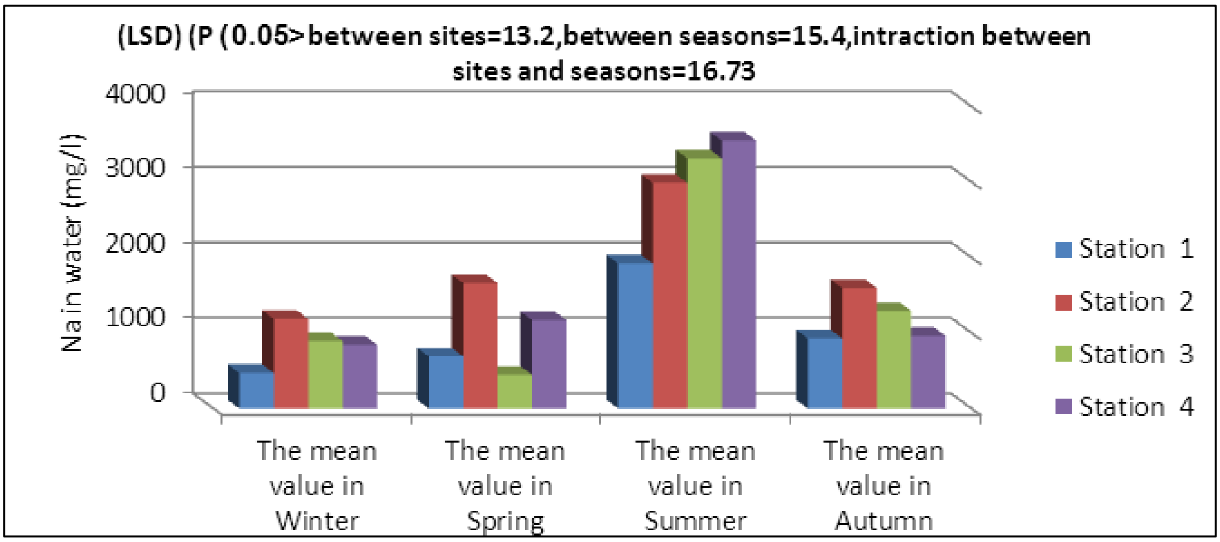

Figure (5): variations in Na+ concentration mg/l in *Phragmites australis* in different seasons and stations

5-Chloride (Cl^{-1}) Content

Phragmites australis leave Cl^{-1} content progressively and significantly increases at all sites and in all seasons as salt increased in BAND .The (Cl^{-1}) content significantly decreases in Winter more than other seasons at all sites. In autumn, it showed the highest value in S1 and S2 while, S3 showed higher value in spring; in S4 Summer showed higher value Figure (6).

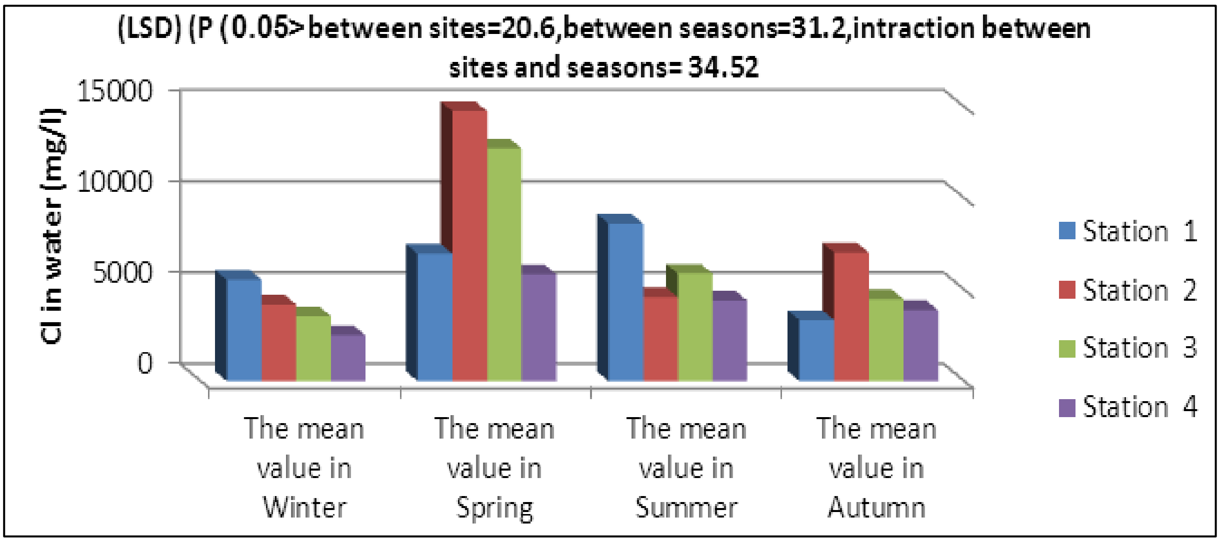

Figure (6): variations in Cl- concentration mg/l in *Phragmites australis* in different seasons and stations

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Discussion

Physical and chemical factors of a water body if exceeds the threshold level causes some stress to its biome. Many chemicals (15) often cause the imbalance between production and elimination of the active oxygen. Water quality of the BAND (studied stations) is degraded due to the detergent from households and pesticides from agricultural runoff from the southern tributary of feeder to Site-1 contains various chemicals. The composite municipal wastewater used in Site 2, also contains different chemicals from industry. Site 3 water has allot off mount of salts from ground wells. Site 4 is located near the oil strategic line. So, the factors such as EC, TDS, TSS, SAL are significantly high in Site 2 > Site 3 > 4 Site >1 Site, that mean the composite municipal wastewater and industry pollutants are higher effect than other pollutants, and higher concentration of salts in site 3 are the second stress, then oil pollutant from site 3, at last Detergent from households and pesticides from agricultural of site 1. In addition, the higher concentration of pollutants in the contaminated sites effected nutrient concentrations in the *Phragmites australis* plants (Figures 1, 2, 3, 4, 5). The solubility of oxygen and other gases will decrease as temperature increases. This means that colder lakes and streams can hold more dissolved oxygen than warmer waters. If water is too warm, it will not hold enough oxygen for aquatic organisms to survive, also seam in annual precipitations and pH. Whereas, DO, TP and NO_3^{-2} showed negative correlation. As it is the annual precipitations related to water intensity and diluted concentration of environmental factors to water determinant are directly related to salinity, making it determines the distribution of organisms in the body of water (16). Day length gives start light to growth hormone and that related with vegetative and reproductive growth. Thrive or senescence of plants and that related to enzyme activity, accumulation of mineral and pigment formation. Under low nitrogen availability, leaf area, chlorophyll content, photosynthesis rate, and biomass production in *Phragmites australis* significantly decreased that agree with (17). At the beginning of nitrogen deficiency, the older leaves show chlorosis when compared to the younger leaves because of the high mobility of nitrogen through phloem. Nitrogen deficiency induces the chloroplast disintegration and loss of chlorophyll. Necrosis occurs at later stages and if nitrogen deficiency continues, it ultimately results in stunted growth and plant death Wetland soils are usually poor in P content. This is mainly, because at low and high pH of these soils, respectively. Plants have two major mechanisms to increase phosphorus efficiency: Normal P usage and enhanced P uptake: Plant growth rate is reduced and phosphorus is remobilized. Phosphate and organic acid production are increased, root structure is modified and by producing more root hair, root surface area is increased (18) found that plant growth is limited because of the unavailable form of P in the soil. Cellular injury also has shown a significant positive correlation with Na^+ and a negative correlation with K^+ and grain yield (19) .As accumulation of excess in Na^+ ions may reduce the stability of PSII function (20), salt-tolerant cultivars here could avoid this harmful effect by maintaining lower leaf Na^+ content, higher K^+ versus Na^+ through selective ion transport from the soil to leaf . On other hand plants, response to the increasing concentration of chlorine due to salinity stress causes increased respiration rate, ion toxicity, growth retardation, mineral distribution, and membrane instability by sodium resulting from calcium displacement (21). Nutrient imbalance due to Na^+ and Cl^- toxicities and ionic imbalances that are acting on metabolic components of plant growth (6). Salinity causes nutrient disproportions due to the competition of Na^+ and Cl^- with mineral nutrients such as K^+, Ca_2^+, Mn_2^+, and

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NO_3^- and reduces their uptake (22). N uptake also decreases in two ways (i: under saline conditions when Na^+ interacts with NH_4^+) and (ii: when Cl^- interferes with NO_3^-). Both these situations ultimately reduce the growth and yield of crops (23). The availability of (P) reduces in saline soils due to low solubility of Ca-P minerals (24) due to salinity stress. Results showed that Salinity causes nutritional disorders in plant species. Salinity decreases nutrient uptake and accumulation of nutrients into plants. Ionic contents Na^+ and Cl^- significantly increased, whereas K^+, TP (Total Phosphor) and TN (Total Nitrogen) decreased with increasing levels of environmental stresses in each site and season that agree with (25). On other hand plants, response to the increasing concentration of chlorine due to salinity stress causes increased respiration rate, ion toxicity, growth retardation, mineral distribution, and membrane instability by sodium resulting from calcium displacement (21). Nutrient imbalance due to Na^+ and Cl^- toxicities and ionic imbalances that are acting on metabolic components of plant growth (6). Salinity causes nutrient disproportions due to the competition of Na^+ and Cl^- with mineral nutrients such as K^+, Ca_2^+ ,Mn_2^+, and NO_3^- and reduces their uptake (26) (24) (22). N uptake also decreases in two ways (i: under saline conditions when Na^+ interacts with NH_4^+) and (ii: when Cl– interferes with NO_3^-). Both these situations ultimately reduce the growth and yield of crops (23). The availability of (P) reduces in saline soils due to low solubility of Ca-P minerals (24) due to salinity stress .Salinity causes nutritional disorders in plant species. Salinity decreases nutrient uptake and accumulation of nutrients into plants (25) .According to them, the present study indicates that nutrients concentration change due to higher concentration of pollutants Figures (1, 2, 3, 4, 5). This clearly indicates that the environment stress greatly affects the stored nutritional value and thus reduces its effectiveness as feed.

References

1-Van der Veen A. Competition in coastal sand dune succession. Cause or mechanism Doctoral dissertation. University of Groningen Rijksuniversiteit Groningen, (2000); p.126.

2-Aulio K. Strategies in growth of the common reed (*Phragmites australis*) as related to successional stages in a rapidly varying estuary. Research J. Biol. (2014); 2: 11-17.

3-Shaddad MA, Ismail AM, Azooz MM, Abdel- Latef A. Effect of salt stress on growth and some related metabolites of three wheat cultivars. Assuit Univ. J. Bot. (2005); 34: 477-491.

4-Kuznetsov AV. Inter natsionalizatsiya rossiyskoy ekonomiki: investitsionniy aspekt (Internationalization of the Russian Economy: Investment Aspects), Moscow. (2007).

5-Pessarakli M, Haghighi M, Sheibanirad A. Plant responses under environmental stress conditions. Adv. Plants Agric. Res. (2015); 2(6): 73.

6-Plaut Z, Edelstein M, Ben-Hur M. Overcoming salinity barriers to crop production using traditional methods. Crit. Rev. Plant Sci., (2013); 32: 250-291.

7-Luo Q, Yu B, Y Liu. Differential sensitivity to Chloride and Sodium ions in seedlings of *Glycine max* and *G. soja* under NaCl stress. J. Plant Physiol., (2005); 162: 1003- 1012.

8-Ahmed ME, Shata EI, Soliman AA, FathiaAI, Hagag MEH.Nutritional evaluation of reed .maize mixed silage by goat. Proceedings of the 1st annual science conference on animal fish production,V. 85 , Sep. (2002); 24-25 , 2002, Mansora ,Egypt ,pp; 193-203.

9-Shwerab AM, Kalel MS, Hasan AA, Hammad AR.Effect of addition of some of untradionale of nutritive value of common reed silage for sheep feeding Siwa oasis, Egypt, J. Nut. Feed, (2012); 13:37-51

10-Al-Fartusi Abdul Hadi. An eye on the history of the Sea of Najaf, a search of the Internet on the websitehttp://www.alsabaah.com. (2007).

11-American Public Health Association (APHA). Standard Methods for the Examination of Water and Wastewater. 14 th ed.Washington, DC. (2003).

12-Cresser MS, JW Parsons. Sulphuric perchloric acid digestion of plant material for the determination of Nitrogen, Phosphours, Potassium, Calcium and magnesium Analytric chemical Acta. (1979); 109; 43-436.

13-Jackson C, Dench J, Moore AL, Halliwell B, Foyer CH, Hall DO. Subcellular localisation and identification of Superoxide Dismutase in the leaves of higher plants. European J. of bioche., (1978); 91(2):339-344.

Al-Qadisiyah Journal of Veterinary Medicine Sciences
(P-ISSN 1818-5746/ E-ISSN 2313-4429)
www.qu.edu.iq/journalvm

14-Chen Jr, Toribara PS, Warner H. Micro determination of phosphorus. Analytical chemistry, (1956); 28(11):1756-1758.
15-Xiong L, Wang RG, Mao G, Koczan JM. Identification of drought tolerance determinants by genetic analysis of root response to drought stress and abscisic acid. Plant Physiol. (2006); 142: 1065-1074.
16-Schat H, Llugany M, Viojs R, Hartley-Whitaker J, Bleeker PM.The role of phytochelatiins in constitutive and adaptive heavy metal tolerance in hyper accumulator and non-hyper accumulator metallophyte. J. of Experimental Botany, (2002); 53: 2381-2392.
17-Zhao D, Reddy KR, Kakani VG, Reddy VR. Nitrogen deficiency effects on plant growth, leaf photosynthesis, and hyper spectral reflectance properties of sorghum. European J. of Agronomy (2005); 22: 391-403.
18-Abel S, Ticconi CA, Delatorre CA. Phosphate sensing in higher plants. Physiologic Planetarium (2002); 115: 1-8.
19-Farooq S, Azam F. Salt tolerance in Triticeae. Czech J. Genet. Plant Breed. (2005); 41: 252- 262.
20-Watson J. Theory of human caring. In M.E. Parker (Ed.), Nursing theories and nursing practice, Philadelphia, (2001); p: 343-354.
21-Nawaz T, Hameed M, Ashraf M, Al-Qurainy F, Ahmad MSA, Younis A, Hayat M. Ecological significance of diversity in leaf tissue architecture of some species/cultivars of the genus *Rosa* L. Pak. J. Bot., (2011);43: 873-883.
22-Ashraf M, Orooj A. Salt stress effects on growth, ion accumulation and seed oil concentration in an arid zone traditional medicinal plant ajwain (*Trachyspermum ammi* L.). J. Arid. Environ. (2006); 64: 209-220.
23-Kafi M, Rahimi Z. Effect of salinity and silicon on root characteristics, growth, water status, Proline content and ion accumulation of Purslane (*Portulaca oleracea* L.). Soil Science and Plant Nutrition (2011); 57: 341-347.
24-Qadir M, Schubert S. Degradation processes and nutrient constraints in sodic. Soils. Land Degrad. Dev., (2002); 13: 275-294.
25-Rogers ME, Grieve CM, Shannon MC. Plant growth and ion relations in lucerne (*Medicago sativa* L.) in response to the combined effects of NaCl and P. Plant Soil, (2003); 253: 187-194.
26-Karimi G, Ghorbanli M, Heidari H, Khavarinejad RA, Assareh MH.The effects of NaCl on growth, water relations, osmolytes and ion content in *Kochia prostrata*. Biol. Plant., (2005); 49: 301-304.