International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 05, 2020
ISSN: 1475-7192

Effect of Environmental Parameters on Soil Salinity on Plant

Safaa M. Almudhafar*, B.A. Almayahi and Hanan H. Jawad

Abstract--- *This study consisted of the determination of the trace metals and physiochemical properties in plant samples (eggplant, chard plant, palm fronds, alfalfa, tarfa and mung plant) in summer season and (chard, dill, wheat, palm fronds, alfalfa, spinach) in winter season from the al-heera region in najaf city of the republic of iraq, where plants samples are not treated before it is consumed. the purpose was to ascertain the quality of plants from these sources. it was taken from ten sampling points and analyzed for the following (EC, TDS, Na, Ca, Mg, K, CL, and SO4) using the procedure outline in the photometer method (flame absorption spectrometer) was used for analyzing the samples. the contamination by heavy metals in plants one of the major issues to be faced throughout the world and requires attention because heavy metals above their normal ranges are extremely threatened to both plant and animal life. it was therefore of interest to conduct study to estimate levels of heavy metals in plants. plants samples were analyzed separately for their root, stem and leaves. the data showed the variation of the investigated parameters in plants. the concentrations of most of the investigated parameters in the plants samples from al-heera region were above the permissible limits of the world health organization.*

Keywords--- *Salinity on Plant, Effect of Environmental, Health Organization.*

I. INTRODUCTION

Soil salinity from the plant point of view increased the concentration of salts in the area of the roots of the plant to the extent that affects its growth and lack of yield with symptoms similar to the drought caused by lack of irrigation such as dryness of leaves and dwarf plants or the emergence of the color contrary to its normal nature such as dark and blue or brown. Salinity-tolerant plants are growing in some salt environments in Iraq in general and the study area in particular and can be utilized by multiplying them and cultivating them with saline-affected lands to provide green areas or green belts to preserve the environment. For field and vegetable crops, they still suffer from the lack of salt-tolerant varieties. Toxicity of salinity is an agricultural and environmental problem worldwide. Salt stress is one of the most important biological stresses faced by plants that negatively affect their productivity. Salt stress reduces crop yield and changes in plant metabolism, including reduced water potential, ionic imbalances and toxicity. Sometimes severe salt stress may threaten oxidative stress in plants. The studied plants have adapted to live in these high salt media through an effective defense system with antioxidant enzymes. Attempts to reduce oxidative damage under saline stress conditions have included manipulating clean enzymes through gene transfer technology within these plants. It is important that farmers work hard to find ways to increase the productivity of these plants in a dry and semi-arid environment.

Safaa M. Almudhafar, University of Kufa, Faculty of Arts, Department of Geography, Najaf, Iraq. E-mail: almudhfars@gmail.com*
B.A. Almayahi, Department of Environment, Faculty of Science, University of Kufa, Najaf, Iraq. E-mail: basim.almayahi@uokufa.edu.iq
Hanan H. Jawad, University of Kufa, Faculty of Arts, Department of Geography, Najaf, Iraq.

DOI: 10.37200/IJPR/V24I5/PR2020140
Received: 08 Mar 2020 | Revised: 26 Mar 2020 | Accepted: 04 Apr 2020

They are described as environments that require human and physical effort in cultivating them so that they can provide solutions to the food and environmental problems experienced by the residents of the study area. The problem of salinization of soils is one of the most important and serious problems experienced by soils in the Iraqi territory in general and the study area (the area of confusion) in particular. Soil salinity is known as salinity is one of the environmental pressures, which is expanding worldwide. Where the qualitative and quantitative accumulation of dissolved salts occurs in the area of root spread to the extent that hinders the ideal growth of the plant and turn the soil sector to an unfavourable environment for the spread of roots [1]. The aim of the study is to determine the ability of the cultivated plants to grow in the saline soils in the study area and on the plants that can grow in high salt concentrations during the summer and winter season. The study area is located in the north-eastern part of Al-Najaf between latitude: 31-48-32.00N, longitude: 44-16-44.28E, elevation: 31 m. The geographical location of the study area is bounded by the north and northeast, northwest and west and southwest center Najaf district, and east Al-Manathira district center, and from the south and southeast of Al-Mishkhab district and Al-Qadisiyah district (Fig. 1).

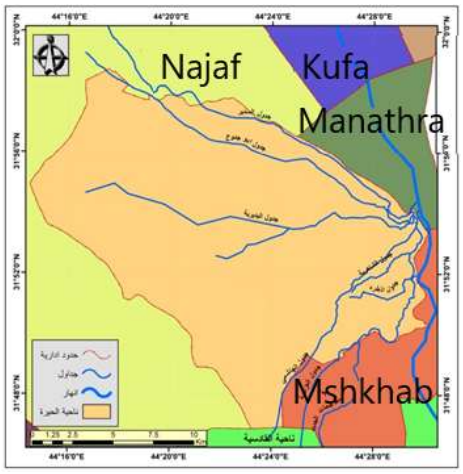

Fig. 1: Administrative map of Najaf province

II. MATERIALS AND METHODS

10 samples of plants were collected from different areas of Najaf province on 29/8/2018 to 15/2/2019. The GPS device was used for the purpose of locating models. Plants were collected in plastic bags and recorded with details. The samples were dried in an electric oven at 75 ° C. The plants were grinded and then acidic chemicals were added for the purpose of obtaining trace concentrations in the plant solution. Dilution and filtration of samples was performed before analysis. A light flame apparatus from a British origin was used which estimated Na and K elements in plant samples [2]. Electrical conductivity in plants was measured using a TDS device. The samples are analyzed in the laboratories of Soil and Water Sciences, Faculty of Agriculture, University of Kufa.

DOI: 10.37200/IJPR/V24I5/PR2020140
Received: 08 Mar 2020 | Revised: 26 Mar 2020 | Accepted: 04 Apr 2020

III. RESULTS AND DISCUSSION

Table 1 shows the physical and chemical properties of plants in Al-Heera area for summer season. The results showed that minimum and maximum values of EC found to be between 4.73 (Eggplant)-35.8 (Tarfa). The minimum and maximum values of TDS found to be between 2518.8 (Alfalfa)- 8483.2 (Mung plant). While the minimum and maximum values of Na, Ca, Mg, K+, CL, and SO4 found to be between 151.36 (Eggplant)-1145.6 (Tarfa), 146.40 (Eggplant)- 1296 (Tarfa), 163.68 (Mung plant)-7776 (Tarfa), 1184.47 (Eggplant)-1678.6 (Chard plant), 228.6 (Eggplant)-11340 (Tarfa), 153.87 (Char)- 935.6 (Tarfa), respectively. The eggplant has lower value of Na, Ca, K+, and CL. The eggplant has higher value of Na, Ca, Mg, CL, and SO_4.

Table 1: Physical and chemical properties of plants

Sample Code	EC Ds/m	TDS(ppm)	Na(ppm)	Ca(ppm)	Mg(ppm)	K^+(ppm)	CL(ppm)	SO_4(ppm)
Eggplant	4.7	4162.4	151.3	146.40	878.4	1184.4	228.6	252.5
Mung plant	9.6	8483.2	308.4	272.80	163.6	1375.9	238.7	470.5
Tarfa	35.8	3150.4	1145.6	1296	7776	1396.2	1134	935.6
Chard plant	17.4	2531.2	556.8	892	535.2	1678.6	780.5	153.8
Alfalfa	17.2	2518.8	552.3	436.80	262.0	1673.1	382.2	753.4

Table 2 shows permissible Limits for Concentration of Electrical Conductivity in the Plant According to American Salinity Laboratory. While rest of the metals were recorded higher than the recommended limits in all the plants.

Table 2: Permissible Limits for Concentration of Electrical Conductivity [4]

Sample Code	EC Ds/m
Eggplant	7
Mung plant	9.1
Tarfa	22
Chard plant	8
Alfalfa	10.3
Wheat	13
Spang	8
Dill	8
Palm	18

Table 3 shows the permissible Limits of Chemical Concentrations in Plant

The mung plant is a summer crop belonging to the legume family. This plant is an herbaceous or semi-standing height ranging between (125-25) cm and covered with fluff and leaves triple compound characterized by short life cycle of (90-70) days and characterized by a relatively tolerant to drought needs a moderate hot atmosphere and withstand all temperatures except the flowering period. Suitable for soil mixture and not cultivated in saline and

DOI: 10.37200/IJPR/V24I5/PR2020140
Received: 08 Mar 2020 | Revised: 26 Mar 2020 | Accepted: 04 Apr 2020

waterlogged land and the number of irrigations needed by this plant from (14-10) irrigation and cut off water from the crop when they begin to ripen [3].

It is noted from the foregoing that most of these concentrations of salt elements in the mung plant are above the natural limit of the plant. These salts work to burn the edges of the leaf of the plant as well as to reduce its productivity. Mung plant are plants that tolerate salinity but not high salinity because they cause the soft and dry weight of the vegetative total for the plant. In addition, high salts affect many vital processes in the plant, including leaf area, number of branches and number of leaves. It is noted that all these elements are high and exceeded the global standard of natural limit, which must exist in this plant. Tarfa, in its physiological nature, absorbs salts from soils and grows in saline soils, but in such high concentrations it has effects on animals that depend on it for its food. Where it is unpalatable by them as well as be unable to absorb salts from the soil because the salt concentrations in the plant itself is high cannot add other salts. The concentration of (SO4) in chard leaves was (15387) ppm. Note that this concentration is higher than the global limit of (200) ppm as in Table (3). It was found to be higher than the global standard of salt elements in the plant. It affects the increased toxicity within the leave tissues [5].

Table 3: Permissible Limits of Chemical Concentrations [4, 6].

TDS	**Na**	**Ca**	**Mg**	**K^+**	**CL**	**SO_4**
2000	20-200	400	15-150	150 – 100	300	200

The salinity levels used caused a significant decrease in the majority of growth indicators before and after flowering in chard leaves and roots, causing a decrease in the total leaf area and the thickness of the continuous part of the stem and the soft weight of the vegetative and root groups and after the total height of these salts and its significant impact on the leaves of chard. Which bear the growth in saline soils but in quantities that do not reach the required level in the study area. These concentrations of all these elements are high and exceed the global limit as they do not affect the growth and shape of the plant or productivity, but its impact on the soil in that it is a natural fertilizer of the soil. After that, this characteristic fades as a result of the high salts in alfalfa plant as well as becomes unpalatable by animals when taken to these plants, in this way is not useful for humans, animals, the environment and soil in which they grow. Table (4) shows that the concentration of (EC) was 7.94 decimens/m and according to the international standard of salt elements in the plant of 8 decimens/m was found that the concentration of (EC) is within the limits allowed.

The results showed that minimum and maximum values of EC found to be between 2.12 (Wheat)-17.2 (Alfalfa). The minimum and maximum values of TDS found to be between 1290 (Chard plant)- 1866 (Wheat). While the minimum and maximum values of Na, Ca, Mg, K+, CL, and SO4 found to be between 149 (Wheat)- 321.4 (Alfalfa), 108 (Dill)- 441.5 (Alfalfa), 109.8 (Wheat)- 621.2 (Alfalfa), 115.5 (Wheat)- 432.1 (Alfalfa), 196.2 (Dill)- 271.2 (Alfalfa), 132.8 (Wheat)- 323.1 (Alfalfa), respectively. The wheat has lower value of Na, K+, and SO4. The alfalfa has higher value of Na, Ca, Mg, K+, CL, and SO4.

Table 4: Physical and Chemical characteristics of the studied plants in Al-Heera area for winter season

DOI: 10.37200/IJPR/V24I5/PR2020140
Received: 08 Mar 2020 | Revised: 26 Mar 2020 | Accepted: 04 Apr 2020

Sample Code	EC Ds/m	TDS	Na	Ca	Mg	K^+	CL	SO_4
Chard plant	4.8	1290	217	121	167	123.4	261.2	159.4
Dill	7.94	1811	188	108	126	117	196.2	157.3
Wheat	2.12	1866	149	123	109.8	115.5	243.7	132.8
Spinach	5.16	1830	204	109	154.8	121.2	249	221
Alfalfa	17.2	1623	321	441.5	621.2	432.1	271.2	323.1

In general, it is desirable that the soil is well drained and the best suitable soil types are yellow mud rich and good drainage. Palm can grow in saline soils up to 3%, but preferably not more than 1% salinity as it can grow in alkaline land or water and water level close to the surface [7].

Most of these concentrations are high and above the normal limit of the global standard in the concentration of salts in plants. As a result of the high salt concentrations in the parts and tissues of this plant, it has an important effect because alfalfa is a natural food widespread in the study area for most animals and thus be unpalatable by the animal. It shows from Table (5) that there is a spatial and temporal variation of the sites studied as it saw an increase in August for all sites and a decrease in January and this rise is due to the high temperature rise during the hot season. In addition to the high evaporation as well as the reduction of surface water level and high salt content in groundwater. The reason for the decrease in concentrations in January is due to the amount of rainfall during the winter, which worked to rid the soil of salts that became natural soil troughs and high surface water levels, all factors that helped to reduce the concentrations. All sites are higher than the international standard, while these concentrations decreased in January to reach (988.1-231-326-121) ppm respectively. When comparing these concentrations with the international standard, three sites are higher than the international standard. This increase in concentrations has significant effects on palm fronds as it causes significant decrease in leaves content of mineral elements such as (nitrogen, phosphorus, potassium and calcium). It also causes an increase in the amino acid proline found in palm fronds and that the reason for the high sodium in palm leaves is from irrigation water, which concentrates these salts. Despite the high tolerability of palm to soil salinity, this ability decreases with increasing salt concentration, causing the longitudinal growth of the root and vegetative total with increasing salt concentration in the growth medium. The saline water also has a negative effect on its nutrient content [8]. Table 5 shows that the calcium (Ca) concentration of the four sites during August was (1702.39 - 243.14 - 410 - 270) ppm, respectively. When comparing these concentrations with the aforementioned international standard of (400) ppm. Note that the first and third site is higher than the allowed standard. The higher value of EC, TDS, Na, Ca, Mg, K, CL, and SO4 found to be 21.8, 7498, 8307.6, 1702.3, 2889.6, 4214, 543.21, 576.32, respectively.

DOI: 10.37200/IJPR/V24I5/PR2020140
Received: 08 Mar 2020 | Revised: 26 Mar 2020 | Accepted: 04 Apr 2020

Table 5: Concentration of Saline Elements in Palm Fronds for the Study Area in Summer and Winter (ppm)

Elements	**The first site planted in an empty soil close to the region of Ain Imam Hassan (AS)**		**The second site is planted in marginal soils near the Bahhar Najaf area**		**The third site is planted in river basin soil near the Hashemi River**		**The fourth site is planted in soil on the bank of the Abu Jadhwa River**	
	August	January	August	January	August	January	August	January
EC	20.0	18.5	19.4	10.3	21.8	19.7	16	8
TDS	6431	4561	2243.1	1189.4	7498	3431	2498	1302
Na	8307.6	988.1	721.8	231	840	326	321	121
Ca	1702.3	864.3	243.1	141.3	410	351	270	132
Mg	2889.6	1442.1	143.2	132.4	405	152	211	108
K	4214	1236.6	3532	1546.0	1520	1211	1231	980
CL	481.6	356	543.2	354.1	507	385	303	254
SO_4	576.3	386.2	443.1	221.2	399	321	225	133

The reasons for the high concentrations of saline elements in the cultivated plants in the study area are:

1) The nature of saline soils in which plants grow

2) Excessive irrigation, high groundwater level and soil salinization

3) Climatic conditions represented by high temperatures during the summer and evaporation of water from the soil

4) Lack of human expertise in the disposal of these plants of concentrated salts through the work of experiments and important research in the field, as well as access to scientific research published to end this problem, since these modern methods require large amounts of money to spend to solve such problems

5) The use of puncture water to irrigate plants in the study area, especially during the summer for water scarcity, which entails increasing the salinity of the soil.

IV. CONCLUSIONS

It was found that there are some plants that have the ability to tolerate high salinity such as tarfa and alfalfa, but these plants may be saturated with salts and unpalatable by animals. Concentrations of saline elements are significantly higher in palm trees planted in river basin soils and within arid soils compared to low-salt river soils. High salt levels during July and low during January. The high salt concentrations in plants lead to the phenomenon of osmotic pressure in the case of absorption of salts after watering, which leads to the reduction of all liquids to the bottom of the soil and the concentration of salts in it and thus lead to the death of the plant gradually. All plants grown during the summer season are affected by the concentration of saline elements in their body and these salts significantly affect their growth and production. Some plants cultivated during the winter season are affected by some salt elements, but this effect is not clear on the growth of cultivated plants, although most of them are allowed.

DOI: 10.37200/IJPR/V24I5/PR2020140
Received: 08 Mar 2020 | Revised: 26 Mar 2020 | Accepted: 04 Apr 2020

ACKNOWLEDGMENTS

The authors acknowledge the financial support of the Kufa University, Iraq

REFERENCES

[1] Donahae M-S 1980 An Introduction to soil and plant growth. *Prentice Hall*, Englewooddiffs, New Jereym, 167.
[2] USDA 1960 *Definition and apprevlution for soil Description*, Californian, Berkeley, USA.
[3] Ali JH 2017 *Euph. J. Agricul. Scien.* 4: 1202.
[4] Brady N 1974 The Nature and property of soil U.S, 70-71.
[5] Intisar HM and Haider AA 2015 *Al-Qadisiya J.Pur. Scien.* 20: 4-5.
[6] FAO 1999 Guidelines for Irrigation Water Quality. *Ministry of environment human resource development and employment development of environment*. U.S.A.
[7] Mounir I 1999 Fruit of desert areas. Arab Publishing House, *Cairo University* 213-311.
[8] Hassan AI and Qasim JA 2016 *Univ. Basra J.* 2: 321.

DOI: 10.37200/IJPR/V24I5/PR2020140
Received: 08 Mar 2020 | Revised: 26 Mar 2020 | Accepted: 04 Apr 2020