

A survey study of soil salinity and pH in some agricultural areas within the Al-Najaf Governorate

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Abstract

This survey study was aimed to estimate salinity, acidity, sodium, potassium, and calcium elements in some areas of Najaf. Seven samples were collected by using the cross-diameter method and from 20 cm depth of the soil surface from several agricultural areas planted with different economic crops such as wheat, eggplant, pepper, cucumber and tomato in Najaf Governorate. The salinity and alkalinity results indicated that the highest salinity was recorded in the Abbasiya area planted with wheat, which was 18.43 dsm^{-1} , followed by Al-Brakiya, Al-Wahbi and Maysan areas, while the lowest salinity level was recorded in the greenhouses of the College of Agriculture, which was 1.78 ds m^{-1} . Results of pH showed that in the greenhouses of the College of Agriculture, was 8.36, while the lowest pH was recorded in the Al-Baraka region, which was 5.63. The results of the survey indicated that the highest concentration of sodium ions in the soil of the Al-Mashkhab area reached 49.57 mg. L^{-1} , and the highest concentration of potassium ions were recorded in the greenhouse of the College of Agriculture, reaching 67.30 mg.L^{-1} , meanwhile, the concentration of potassium ions recorded its highest concentration in the Maysan region, reaching 518 mg. L^{-1} .

Kew words: Soil salinity, pH

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Introduction

Agricultural soil represents the upper layer of the soil. It is a natural, dynamic body that has its own entity, and it is composed of organic and mineral materials that originated mainly from the disintegration, decomposition of rocks and their difference from organic residues, meaning that the soil has natural, chemical, and biological properties that are distinguished to horizons(1).

Iraq is located in a semi-arid and arid region, and the sedimentary soils of Iraq suffer from great variation in their chemical, physical, hydrological, and topographical properties due to the nature of these soils, the succession of floods on them, and the sedimentation they add annually, as well as the prevailing agricultural system and irrigation methods, And other agricultural methods, and the lack of natural or artificial drainage, all of this led to the emergence of the problem of soil salinity.

The issue of soil salinity in Iraq is one of the major problems that the agricultural sector suffers, and salinized soils constitute a large proportion of the lands of central and southern Iraq, as they directly and indirectly affect the production of plants, and consequently the national economy (8).

Saline soils contain 5-2% of sodium chloride, and it is characterized by a high dissolving rate, which increases the toxicity of the plant. the acidity of the soil occurs as a result of continuous rainfall (2), and the amount of water in the soil increases, so the hydrogen ion increases in the soil solution, which leads to its replacement of sodium on the exchange surfaces.

Soil acidity, or the degree of soil reaction, is one of the important and influential factors in soil fertility and plant nutrition, due to its great relationship to the soil's ability to supply the correct proportion of nutrients needed by the growing plant.

Materials and working methods:

Sampling method:

Samples were collected by using the method of the intersection of diameters from 20 cm depth of the surface of the soil from different agricultural areas planted with many economic crops such as wheat, eggplant, peppers, cucumbers, tomatoes in Najaf Governorate.

Sampling areas:

The samples were brought from agricultural areas as follow: the plastic house of the College of Agriculture / University of Kufa on (11/11/2019), the plastic house in the Wahhabi area on (12/11/2019), the open fields in the Al-Brakiya area on

(13/11/2019) and the fields in the Abbasiya area on December 15, 2019, and the agricultural areas in the AlMilad on November 18, 2019, the planted nurseries in the Maysan area on November 21, 2019 and the agricultural areas in the Mashkhab area on November 25, 2019. The samples were placed in plastic bags with the dates of sampling written on them and brought to the laboratory at the Faculty of the Agriculture / University of Kufa.

Sample preparation:

100 gm of soil were selected randomly, the soil samples were dried aerobically in the laboratory, then passed through a sieve with holes diameter of 2 mm, and chemical analyses were carried out.

Chemical analyses

Electrical conductivity: EC

The electrical conductivity of the soil extract with water (1:1) was estimated using an EC-meter according to the method mentioned in Page *et al.* (11).

Reaction degree: pH

The degree of interaction in the soil sample extract with water was estimated (1:1) using a pH meter and according to the method mentioned in Page *et al.*, (11).

Calcium ions:

Calcium ions were determined for soil samples in paste extract saturated and saturated with 0.01 N ($\text{Na}_2\text{-EDTA}$) according to Jackson (9).

Sodium potassium ions:

Sodium and potassium ions were estimated for samples by using a Flame photometer according to Jackson (9).

Statistical analysis of the data:

The results of the experiment were analyzed by applying the complete random design (CRD) and Duncan test at a probability level of 5% to compare the results (7) was used, the statistical program Genstat and Microsoft Excel were used to analyze the data.

Results and discussion

It is clear from the results of the field survey of the most important agricultural areas within the province of Najaf, which are planted with different economic crops, such as tomatoes, peppers, cucumbers, eggplants, and wheat to estimate the proportions of salinity, acidity, and elements of sodium, potassium, and calcium, that there are significant differences between the areas covered by the study, as shown in Table (1).

The highest salinity level was recorded in the Abbasiya area planted with wheat,

which was 18.43, followed by Al-Brakiya, Al-Wahbi, and Maysan, Almellad, and fields of the College of Agriculture, and the lowest level of salinity was recorded in the greenhouses of the College of Agriculture which was 1.78 dm.L⁻¹.

The results of the survey also indicated that there are no significant differences in sodium concentration in agricultural soils between the areas investigated in the survey, and the highest percentage of the presence of this element was recorded in the soil of the Al-Mishkhab area, followed by the Almellad area, then Al-Wahbi, Maysan, Al-Baraka area, and the fields of the Faculty of Agriculture, Then the fields of the Abbasid area.

The concentration of calcium in studied agricultural soils, clarified in the table (1) and showed that there are significant differences in the concentration of this element within the areas studied, and the highest percentage of the presence of this element in the soil was recorded in the Maysan region, where the percentage of its

presence in the soil 518, and the lowest percentage of its presence in the soil of the Mashkhab area, which amounted to 133.

Table (1) showed that the highest level of soil acidity within the most important agricultural areas in Najaf governorate is in the fields of the College of Agriculture and it reached 8.36, as it became clear that there are clear moral differences in terms of the effect of this percentage between this area and other areas covered by the survey, in When the lowest acidity rate was recorded in Al-Barakia area, it was 5.63.

The results of the survey also indicated, that the hBarakaighest potassium in the soil was in the fields of the College of Agriculture, and it amounted to 67.30, and it was found that there are significant differences in the percentage of potassium in the soil between this region and the other areas covered by the study, while recorded Al-Mishkhab area has the lowest percentage of this element in its agricultural soil, and the percentage of its presence is 11.34.

Table (1) salinity and acidity, and the percentages of calcium, sodium and potassium elements in the most important agricultural areas within the Najaf Governorate.

Regions	Salinity dSm ⁻¹	Soil PH	Na ⁺	Ca ⁺⁺ mgL ⁻¹	K ⁺ mgL ⁻¹
Al-Barakia	12.09	5.63	31.97	276	17.72
Faculty of Agriculture	1.78	8.36	20.67	287	67.30
AlAbbasia	18.43	7.38	18.40	423	19.81

Almellad	4.06	7.52	45.13	337	24.98
Wahhabi	6.67	6.01	42.49	417	54.35
Maysan	6.00	6.96	33.23	518	22.40
AlMashkhab	5.76	6.70	49.57	133	11.34
L.S.D	1.913	1.574	55.21	117.1	8.21

Conclusions:

It was found that the highest salinity rate was recorded in the Abbasiya area planted with wheat, followed by Al-Barakiyah, Al-Wahbi, and Maysan areas, while the lowest salinity was recorded in the greenhouses affiliated to the College of Agriculture. The highest percentage of acidity appeared in the greenhouses of the College of Agriculture, while the lowest percentage appeared in Al-Baraka area. The highest percentage of calcium was in the Maysan region, the greenhouses of the Faculty of Agriculture recorded the Highest Concentration of potassium, and Al-Mashkhab recorded the Highest Concentration of sodium. The elements that the AlMashkhab area recorded the lowest percentage of calcium and potassium, while the lowest Concentration of sodium was recorded in the Abbasia area.

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