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Article

Agricultural exploitation and physiographic location in the availability of nutrients to the soil of Diyala Governorate

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ABSTRACT

The study area was chosen to include three physiographic sites on the Diyala River, as it is located in the village of Umm Al-Azam between longitudes 33.71785 east and latitudes 44.6185 north. There are four pedons in each A physiographic unit, two of which are in cultivated sites and the other two are in unexploited agricultural sites, so the total of the studied pedons is twelve. The results of laboratory analysis showed that the lowest content of available nitrogen for the cultivated sites was in the soils of river levees and the highest content in the soils of the river basins, while in the abandoned soil sites, it was the lowest content in the soils of the river basins and the highest content in the soils of depressions, and that the variance of the available nitrogen content in the soils of the cultivated pedons sites was moderate. The results indicated that the available phosphorous content in the sites of cultivated pedons soils ranged between 17.25 – 40.24 mg kg^{-1} as it was the lowest content in river levee and the highest in the depressions soils, while the available phosphorous content in the soils of the abandoned pedons sites ranged between 19.19 - 43.00 mg kg^{-1} as it was the lowest content in river basins and the highest content in depressions soils, while the variance of phosphorus in the cultivated soils pedons was of slight variation available. The available potassium content in the soils of the planted pedons sites ranged between 175.60 - 255.17 mg kg^{-1}, as it was the lowest content in the river levee and the highest in the soils of the river basins. The available potassium content in the soils of the abandoned pedons sites ranged between 170.64 - 257.45 mg kg^{-1}, where the lowest content of the available potassium was in the river levee soils, and the highest was in the depressions soils. Also, the variance of the available potassium in the pedons' soils was very little. As for the effect of the interaction between agricultural exploitation and physiographic sites and horizons in the characteristics of the study area, the results of the statistical analysis indicated that all study indicators represented by sites, type of use, horizons and their interactions did not have a significant effect of increasing nitrogen in the soil of the study area, as well as phosphorous and potassium.

Keywords: N, P, K, nutrients, physiographic location, agricultural exploitation.

INTRODUCTION

Soil is one of the important economic resources, especially in the agricultural fields, and it is in various forms. It is studied and diagnosed by a specialist in soil management. Here, it is necessary to know the existence of these soils in the area or geographical location designated by the specialists in surveying and classifying soils, as sedimentary soils occupy the areas adjoining Rivers, flood basins, rivers, river deltas and valleys are composed of movable soil materials. These soils have had an important role in the development of agriculture since ancient times and before the advent of the fertilization system, so they had a prominent role in the emergence of civilizations, as the newly formed sedimentary soils have a short period of action of soil-forming factors. So time is available. It is not sufficient for forming developed soils and horizons that we perceive morphologically [1]. Agricultural land use is key to environmental change in all natural ecosystems. As a result, these changes affect soil management methods and change the soil's physical, chemical and fertility properties.

In view of the civilized development and the rapid increase of human growth, which led to a greater or intensive use of agricultural land, as soil systems and their variations are related to the type and duration of agricultural exploitation, which affects its important physicochemical and biological characteristics required in management and land use planning, especially the site Physiographic, which indicates the nature of the topography of large areas in terms of their heights vary completely and the geographical forms that result from the gathering of a number of them to form one physiographic unit and the different characteristics of the soils of those units according to their heights, and in order to identify the methods of soil management and the impact of agricultural exploitation of the soil units Physiographic in Diyala Governorate, especially in the sedimentary soils as they represent the widest agricultural lands in Iraq and the many problems that these methods will lead to improvement or deterioration of the soil qualities and the impact of the physiographic location on the characteristics of these soils and the importance of their agricultural exploitation and the importance of this pedological and geomorphological approach to reveal the nature Recipes and impact of the exploitation of these physiographic units and their importance in the work of soil survey research directed to know the effect of agricultural exploitation and the physiographic location on the avialability of nutrients, as well as the effect of the physiographic location on the avialability of nutrients and the effect of the interaction between agricultural exploitation and physiographic location in the content Soil of the study area of those elements**.**

MATERIALS AND METHODS:

Location

The study area was chosen to include three physiographic sites on the Diyala River, which is located in the village of Umm Al-Azam, between longitudes 33.71785 east and latitudes 44.6185 north, located in the northeast of Baghdad governorate and located 60 km northwest of Baghdad governorate. As in Figure (1):

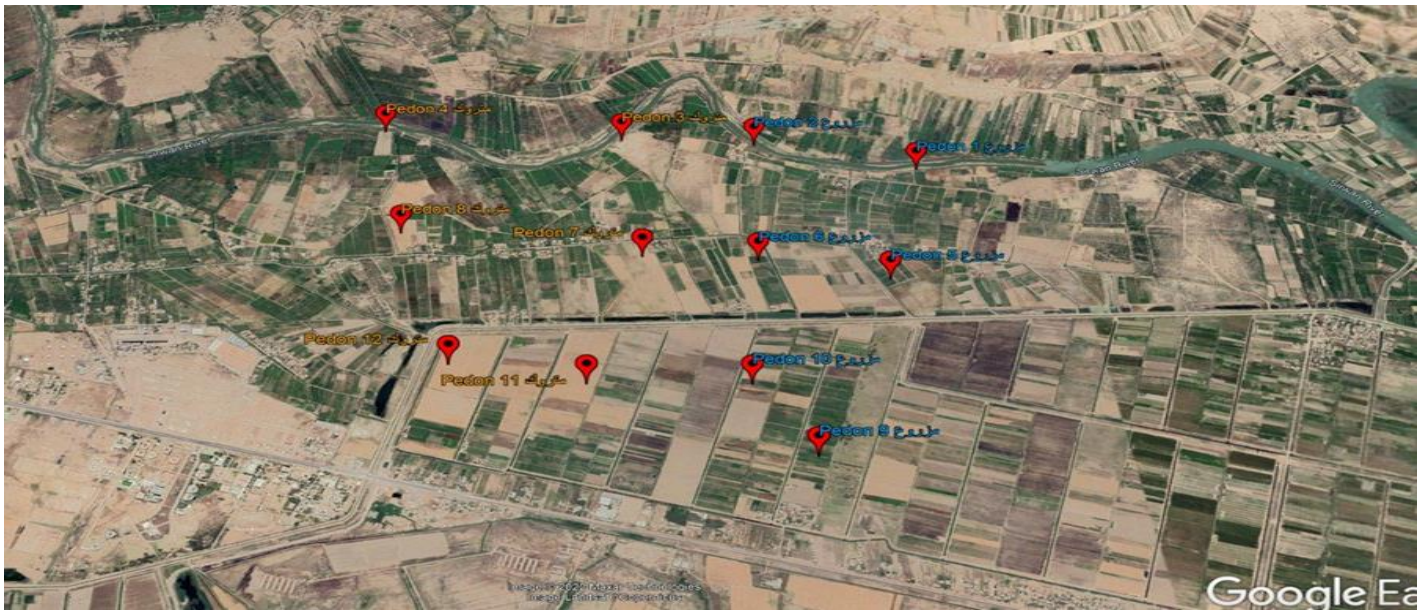

Figure 1. The locations of the pedons that represent the study area

Geology of the study area:

The study area's lands are characterized by sedimentary origin, consisting of river sediments, with flat to semi-level topographical sediments interspersed with relatively low areas. The processes and the emergence of layers of modern sediments that express the Quaternary era in Iraq [2].

Natural plant and land use:

The biological factor is an important dynamic factor in soil formation, by which it is possible to distinguish soil boundaries [3]. Through the field observations of the study area, the presence of types of natural plants that tolerate salinity, including tarragon, sage, thistle, thyme, sedge, and soils planted with citrus, as well as cereal crops such as wheat and barley, and there are abandoned uncultivated sites due to the spread of the salinity phenomenon in them.

Laboratory analyses:

Available nitrogen concentration in soil (mg kg^{-1} soil):

The prepared nitrogen was extracted with a solution of 2M-KCl, and the ammonium ion was estimated using Mgo by distillation using a micro-dal device and nitrate ion reduction using Devarde alloy) according to the method of [4] described in [5].

Available phosphorous concentration in soil (mg^{-1} kg soil):

The prepared phosphorous was estimated using sodium bicarbonate with a reaction degree of pH = 8.5. The color of the extract was developed using ammonium

molybdate and ascorbic acid using a spectrophotometer at a wavelength of 882 nm according to the method of [6] mentioned in [5].

Available potassium concentration in soil (mg^{-1} kg soil):

The prepared potassium was extracted using ammonium acetate and estimated using a flame photometer according to the method in [5].

RESULTS

Effect of agricultural exploitation and physiographic locations on ready nitrogen in soil.

The results of the statistical analysis in Table (1) indicated that there is no significant effect of increasing nitrogen in the soils of the study area. There was no significant effect of the factor of the study site T. Its highest value was at site 1 river levee, which amounted to 42.20 mg N kg^{-1} Soil, followed by site 3 depressions valued at 42.17 mg N kg^{-1} soil. In contrast, site 2 river basins gave the lowest value for available nitrogen in the soil, which was 40.08 mg N kg^{-1} soil, and there was no significant effect of the type of use in available nitrogen in the soil. The different horizons did not significantly increase the available nitrogen in the soil mg N. Also, the binary interactions of the different study factors, whether between site T and horizons C or site T and type of use D or type of use and horizons, had no significant effect on the available y nitrogen in soil (mg N kg^{-1} soil).

As for the triple interaction of the study factors represented by the site and type of use and prospects, It had a significant effect in increasing the character of available nitrogen in the soil (mg N kg^{-1} soil and its highest value was at the triple interaction represented by horizon soil Ap for soils of abandoned depressions, which amounted to 50.85 mg N kg^{-1} soil as it did not differ significantly from horizon soil C1 for the soil of the levee of the abandoned rivers, which was a value of 3453 mg N kg^{-1} soil, with an increase of 47.26%.

Average -T	T*D	the horizon: C				type of use :D	T: Location
		C3	C2	C1	Ap		
42.20	42.97	42.66	45.33	38.64	38.91	**cultivated soil 1**	1
	41.42	37.58	43.17	46.82	44.47	**abandoned soil 2**	
40.08	42.45	40.73	39.73	37.71	44.40	**cultivated soil 1**	2
	37.71	35.30	45.17	37.40	40.52	**abandoned soil 2**	
42.17	45.62	34.53	38.80	42.16	45.89	**cultivated soil 1**	3
	38.73	43.03	46.96	36.19	50.85	**abandoned soil 2**	
LSD: T=5.644	LSD:T*D= 6.778	LSD: T*C*D =15.966				**LSD value**	
--						**C x T**	
LSD: T*C =10.419		40.37	45.64	43.99	36.66	**1**	
		40.10	38.96	40.23	41.05	**2**	
		44.49	43.52	38.77	44.02	**3**	
Average D						**C x D**	
43.68		45.10	45.28	41.28	43.06	**cultivated soil 1**	
39.29		38.21	40.13	39.31	39.50	**abandoned soil 2**	
LSD: D =4.608			LSD: D*C =8.102			**value LSD**	
-----		41.65	42.70	40.29	41.28	-----	**Average C**
		LSD: C =6.518				**value LSD**	

Table (1) Effect of the horizon, location and agricultural use overlap on available nitrogen (mg N kg^{-1} soil)

Effect of agricultural exploitation and physiographic locations on available phosphorous in soil:

The statistical analysis results in Table (2) showed that the study site T, type of use D, and horizons C did not significantly affect the available phosphorus in soil (mg P kg^{-1}) soil. Soil and its highest value was at site 3 for soils of depressions. The amount of 31.09 mg P kg^{-1} soil compared to sites 1 and 2 for the soils of rivers and river basins, which amounted to 30.05 and 27.54 mg P kg^{-1} soil, and the results in this Table indicated that the type of soil use differed in the values of available phosphorus in the soil and that. The value of the left soil was 30.24 mg P kg^{-1} as a measurement In cultivated soils, the value of which was 28.87 mg P kg^{-1} soil, and there was no significant effect of horizons on the value of avialable phosphorus in soil, and that its highest value was at the C3 horizon, where its value was 30.22 mg P kg^{-1} soil, and its lowest value was at Horizon C1 with a value of 28.98 mg P kg^{-1} soil, as indicated by the results Statistical analysis indicated that all the binary interactions of the study soils had no significant effect on the value of avialable phosphorous in the soil, as it is noted from the same Table that the different study factors represented by the triple interaction of the location and type of use had a significant effect in increasing the values of ready phosphorus in the soil mg P kg^{-1} soil and that The highest value of it was at horizon C3 for the soils of the cultivated river basins, which had a value of 36.17 mg P kg^{-1} soil, while the horizon soil Ap for the soils of cultivated river levee gave the lowest value of phosphorous avialable in the soil, with a value of mg P kg^{-1} soil, with an increase of 79.05%.

Average-T	T*D	Horizon :C				type of use :D	T: Location
		C3	C2	C1	Ap		
27.54	25.38	29.10	29.84	26,15	20.20	cultivated soil 1	1
	29.70	25.66	21.90	37.89	29.58	abandoned soil 2	
30.05	29.06	36.17	29.41	30.16	32.26	cultivated soil 1	2
	31.03	31.62	31.34	26.20	23.22	abandoned soil 2	
31.09	32.19	26.19	23.20	35.10	33.71	cultivated soil 1	3
	30.0	36.44	34.38	22.27	37.47	abandoned soil 2	
LSD: T=5.215	LSD:T*D= 7.449	LSD :T*C*D=14.752				LSD value	
-----						C x T	
LSD: T*C =9.687		23.78	33.73	29.47	23.17	1	
		31.48	24.71	32.79	31.21	2	
		35.41	29.87	24.69	34.40	3	
Average D						C x D	
28.87		29.20	30.09	27.84	28.72	cultivated soil 1	
30.24		31.24	28.79	30.48	30.47	abandoned soil 2	
LSD: D =4.258			LSD: D*C=9.131			value LSD	
-----		30.22	29.44	28.98	29.59	Average C	
		LSD : C =6.022				value LSD	

Table 2. The effect of the interactions of site, horizon and agricultural use on ready phosphorus (mg kg^{-1})

Effect of agricultural exploitation and physiographic locations on Available potassium in soil:

The results of the statistical analysis in Table (3) showed that for all the study indicators represented by the different sites, the type of soil use (planted and abandoned) and the different horizons, their effects were not individually significant on the ready potassium in the soil (mg K kg^{-1}) soil, as the effect of the sites was not significant in This adjective and that higherIts value was at site 3 for lowland soils, which amounted to 222.98 mg K kg^{-1} soil, followed by site 2 for river basin soils, which had a value of 220.32 mg K kg^{-1} soil, while the lowest value of ready potassium was at site 1 for river levee soils, which amounted to 212.60 mg K kg^{-1} soil, as the type of use for soil and horizons are differentIt had no significant effect on potassium prepared in soil (mg K kg^{-1} soil). The results of the Table indicated that the binary interactions between site T and the type of application D, as well as between site T and the horizons C and between the type of use D and the C horizons, all had no significant effect on the ready potassium in soil (mg K kg^{-1} soil), as it is noted from the same Table that For the effect of triple interference for different sites T and type The use of soil D and horizons C all had a significant effect on the increase of available potassium in the soil and that the highest value of it was at the triple interaction at the horizon C2 for the soil of the abandoned river basins, which amounted to 250.18 mg K kg^{-1} soil, while the triple interaction of the horizon Ap gave the soil of the river basins The planted value was 247.45 mg Kkg^{-1} soil. The lowest value was at the triple overlap of the site, type of use and horizons at the horizon Ap for the soils of the abandoned river basins, which amounted to 185.47 mg K kg^{-1} soil.

Average -T	T*D	the horizon: C				type of use :D	T: Location
		C3	C2	C1	Ap		
212.60	210.50	213.47	235.73	197.69	195.78	cultivated soil 1	1
	214.72	199.27	195.17	248.45	215.32	abandoned soil 2	
220.32	225.41	243.24	218.56	202.68	247.45	cultivated soil 1	2
	215.23	214.71	250.18	200.32	185.47	abandoned soil 2	
222.98	224.20	212.84	187.21	240.54	231.40	cultivated soil 1	3
	221.77	240.51	232.49	193.20	245.70	abandoned soil 2	
LSD: T=17.173	LSD:T*D= 28.714	LSD: T*C*D =48.572				LSD value	
						C x T	
LSD: T*C =35.947		197.22	231.89	224.60	196.73	1	
		232.44	192.89	230.90	225.06	2	
		236.50	219.45	200.02	235.97	3	
D: Average						C x D	
220.03		225.95	215.50	213.83	224.88	cultivated soil 1	
217.24		218.16	213.99	223.18	213.63	abandoned soil 2	
LSD: D =14.022			LSD: D*C =34.193			value LSD	
-----		222.05	214.74	218.50	219.25	Average C	
		LSD: C =19.829				value LSD	

Table 3. Effect of interaction between horizon, location and agricultural use on ready potassium (mg kg^{-1})

DISCUSSION

The reason for the discrepancy in the values of available nitrogen in the soil is the fact that nitrogen is a determining factor for soil fertility and the cultivation of crops due to its direct impact on the growth and various vital activities of plants, as it is one of the necessary elements for the growth of plants, which is needed in quantities It is significant and has an impact on increasing the production of various crops, as its deficiency negatively affects the quality and quantity of the crop. Also, the nitrogen element is a determining factor for soil fertility and productivity. It varies from one site to another, as well as according to the type of use of the soil, which is represented by the cultivated soils and the abandoned soils, depending on the conditions of the soil site as well as the operations of loss and washing, which work on the loss of nitrogen from the soil, which affects the fertility of the soil[7]. Besides that, increasing the element of nitrogen through fertilizing with nitrogen fertilizers reduces the value of the interaction of the soil and the degree of electrical conductivity in addition to improving some other chemical, physical and fertility characteristics [8] as well as the variation in the values of the available nitrogen

element in the soil, as we notice an increase in its available quantities in the soil in the surface horizons represented by the Ap horizon, which indicates an increase in the content of organic matter in the surface horizons and the type of use of the soil planted with different crops, and that These results are in agreement with the findings [8].

The reason for the decrease of available-made phosphorus in the soil is by increasing the depths because phosphorus is adsorbed and fixed within the clay minerals. Its readiness decreases with increasing depths and in different locations. Phosphorous also determines soil fertility and crop cultivation because it is important for plant growth. What is present in the soil is subject to a lot of sedimentation and adsorption processes that reduce its readiness, which was noticed as we went deeper into the soil body. Moreover, since the study area contains high amounts of minerals, Calcium carbonate is considered calcareous base soil that raises the soil pH and decreases the readiness of the phosphorous element. Therefore, it works on the adsorption of phosphorus and the formation of precipitated compounds that increase in the different soil depths [9, 10].

The variation in the values of available potassium in the soil and according to the different factors of the study represented by the location, type of use and horizons in order to increase the available potassium in the depths and in different locations and types of use, as potassium is a determining factor for soil fertility and crop cultivation, and that its content in the study soil has affected the soil texture, as Soils with a high percentage of sand have less potassium fixation than soils that contain a high percentage of clay. The good content of the exchange capacity of positive ions in the study area increased potassium availability, especially in sites with different types of crops, which add a substance membership. When. When decomposed by microorganisms, it increases potassium availability in the soil [11].

CONCLUSION

This study found that the triple interaction of the study factors represented by the location, type of use and horizons was significant in increasing the character of ready nitrogen in the soil (mg N kg-1 soil). As for phosphorus, it did not significantly affect the ready-made phosphorous in soil (mg P kg-1), and it also had no significant effect on potassium ready-made in soil (mg K kg-1 soil).

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