

## A relationship Between Phosphorous Images and some chemical properties in the Middle and the South of Iraq

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**Abstract :** Soil samples were collected from calcareous soil fertilized with phosphate fertilizers for many years from different regions of central and southern Iraq and from two depths surface 0-30 and subsurface 30-60 cm. Forms of soluble, ready available, organic and total phosphorus were extracted. Through statistical analysis of different phosphorus forms with soil composition of the studied soils, there was a positive and significant correlation between ready phosphorus, OM and active and total calcium carbonate. The simple correlation coefficient ( $r = 0.495$ ) and active calcium carbonate ( $r = 0.539$ ) were weak and significant. ( $r = 0.292$ ) since calcium carbonate has to do with the adsorption of phosphorus and the formation of metals more stable and stable and less ready readiness Also there was a significant correlation ( $P < 0.05$ ) between organic phosphorus and cation exchange capacity and the simple correlation coefficient ( $r = 0.426$ ).

### I. INTRODUCTION

Phosphorus is an essential component of plant growth, so maintaining a sufficient amount of phosphorus in soil is extremely important for the purpose of sustaining different crop cultivation systems, especially the strategy ones. And this happens through the application of a fertilization program by adding organic and / or inorganic fertilizers (Sharpley et al., 1994).

The level of readiness of phosphorous and other forms may change in soil due to the different continuous phosphate fertilization in the long term (Lai et al., 2003, Fan et al., 2003). Knowing different phosphorous forms in soil is so important to investigate the availability of available phosphorous in soil for plants. In most parts of soil, inorganic phosphorus is found in slightly low concentrations in soil solution when a large rate of it is strongly related to various soil minerals. This is in addition to the possibility of adsorption of phosphate ions on the surfaces of various minerals such as Oxide minerals, iron and aluminum hydroxides minerals as well as a group of minerals with ions in alkaline soils, inorganic phosphorus ( $\text{pi}$ ) is the dominant image in soil (Jiang and Gu., 1989) (the possibility of dividing  $\text{pi}$  into different parts such as Ca-P (extracted with hydrochloric acid), Fe-P, and Al-P). Uncovered -Fe and Al-bound), and phosphorous covered (Chang and Jackson. 1957 and Solis and Torrent., 1989)

However in calcareous soils. Most phosphorous is found in different forms with calcium. There is a significant difference in the availability of P between the forms of calcium phosphate. For better conversions,  $\text{Pi}$  uses sequential extraction based on availability and solubility. Quantitative Characterization of Different Phosphorous Images in Agricultural Soil and Environment Various extraction methods have been widely used to assess the bioavailability of phosphorous and characterize soil reserves thereof. As phosphorous is found in many inorganic materials in soil. Inorganic phosphorus includes abate minerals and secondary deposits consisting of Ca, Fe and Al and free phosphate ions ( $\text{PO}_4^{-3}$ ,  $\text{HPO}_4^{-2}$ ,  $\text{H}_2\text{PO}_4^{-1}$ ) all here attached to the absorption surfaces or dissolved in soil water. The target is a relationship between phosphorous and some traits (organic matter, total and active carbonates, reciprocal capacity, positive ions) .

## II. MATERIALS AND METHODS

Soil samples were taken randomly in the middle and south of Iraq. Soil samples were collected from twenty two different locations. The selection of sites based on the soil being fertilized with phosphate fertilizers for many years. Soil samples were collected from a depth of 0-30cm and a depth of 30-60cm.

After soil samples were dried aerobically, they were ground and sifted with a sieve with a diameter of 2 mm holes for the purpose of performing some of the following chemical and physical analyzes according to the methods presented And others (1982). So soil samples used in this study were analyzed to find the volume distribution of soil minutes as mentioned in Black 1965. Degree of soil conductivity (electrical conductivity EC) (PH) we extract soil: water (1: 1) as described in Page et al. 1982). The organic matter was estimated in the way of digestion as stated in (Walkley and Black, 1934).

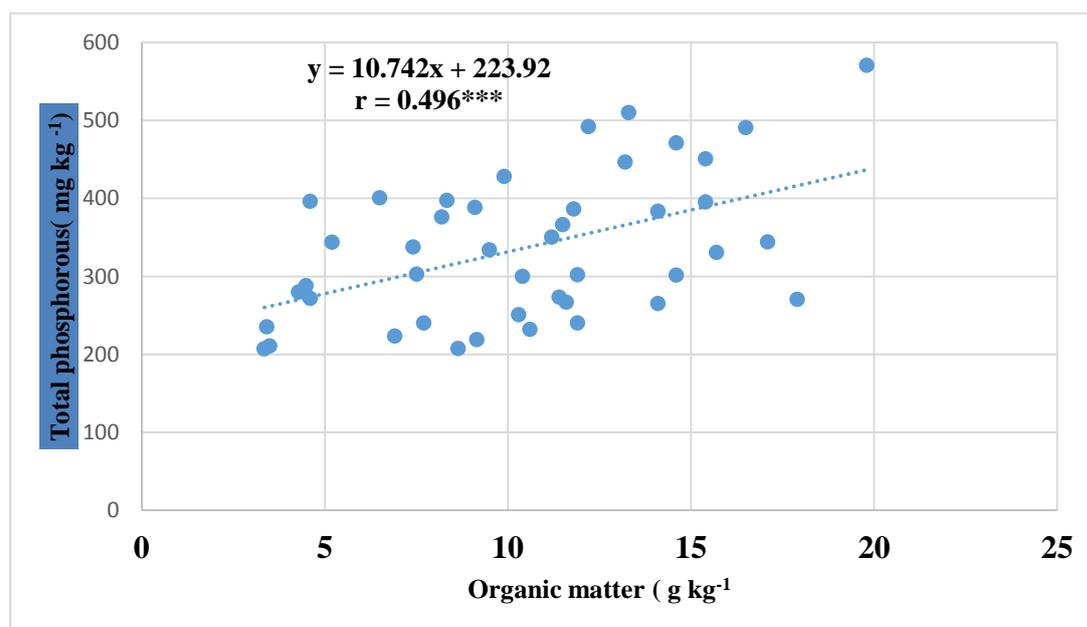
The cation exchange capacity (CEC) was estimated using a solution of sodium acetate 1 (molar) as in the method of Papanicolaou (1976). Total calium carbonate equivalent (TCCE) was estimated using hydrochloric acid using the phenol naphthalene guide as stated in Jackson (1958) active calium carbonates equivalent were estimated (ACCE) using ammonium oxalate with potassium permanganate according to the method of Galet and Drouineau 1972). Available phosphorus A-p and the color phase were estimated with ammonium molybdate and ascorbic acid and then estimated using the Spectro photometer at wavelength (882 nm) as reported in Page et al. 1982)). Organic phosphorus, Or-p, was estimated as the sulfuric acid digestion method as reported in Page et al. 1982).

Total phosphorus T-P by digesting with perchloric acid (HClO<sub>4</sub>) and then estimated using the spectrophotometer as mentioned in Page et al. 1982).

## III. RESULTS AND DISCUSSION

- **The relationship between total phosphorous and organic matter**

The different soil components of organic matter, clay minerals, carbonates, and iron oxides have an effect on the level of phosphorous in different soils. Relationships have been found between different phosphorous forms and soil content of different minerals and organic matter. It has been found that a significant positive relationship between total phosphorous and organic matter in the level of  $P < 0.001$  of the study soils. A part of the phosphorous may be associated with the organic matter through the calcium ions prevalent in calcareous soils, and this relationship is not a causal relationship .



**Figure 1: The relationship between total phosphorous (mg kg<sup>-1</sup>) and organic matter (g kg<sup>-1</sup>)**

As well as a direct correlation between total phosphorous and calcium carbonate active and the value of the simple correlation coefficient  $r = 0.675$  while the relationship was between the total phosphorous and total calcium carbonate and the value of the simple correlation coefficient  $r = 0.515$ . This indicates the effect of the active calcium carbonate and its association with phosphorous ions and the formation of petite minerals. As the effectiveness of carbonate minerals depends on the surface area and the active calcium carbonate is the most effective part of the lactate and precipitation of phosphorus in Iraqi limestone soils (Al-Qaisi, 1999). Therefore, the amount of proven phosphorous increases with increasing lime by increasing the effective positions for adsorption and precipitation of phosphorus 1979, Jasim), Al-Zubaidi and Al-Sammak, 1992 ).

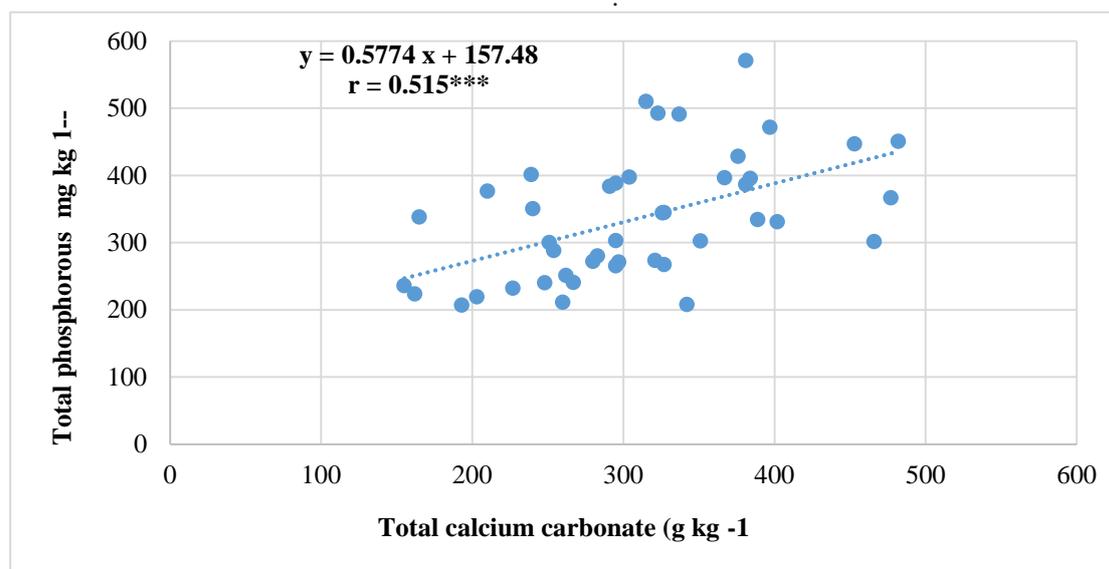


Figure 2: The relationship between total phosphorous ( $\text{mg kg}^{-1}$ ) and total calcium carbonate ( $\text{g kg}^{-1}$ )

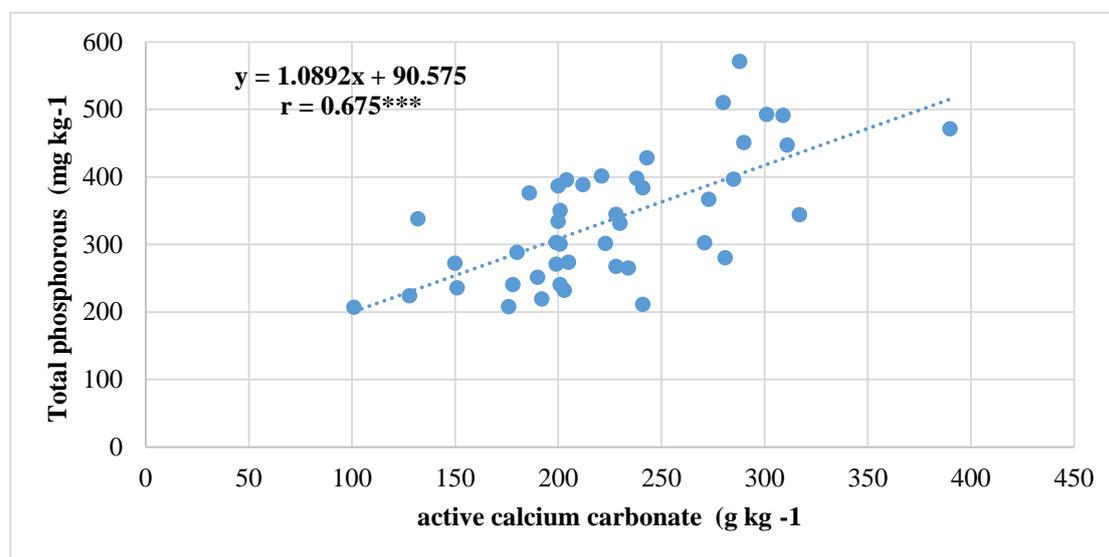


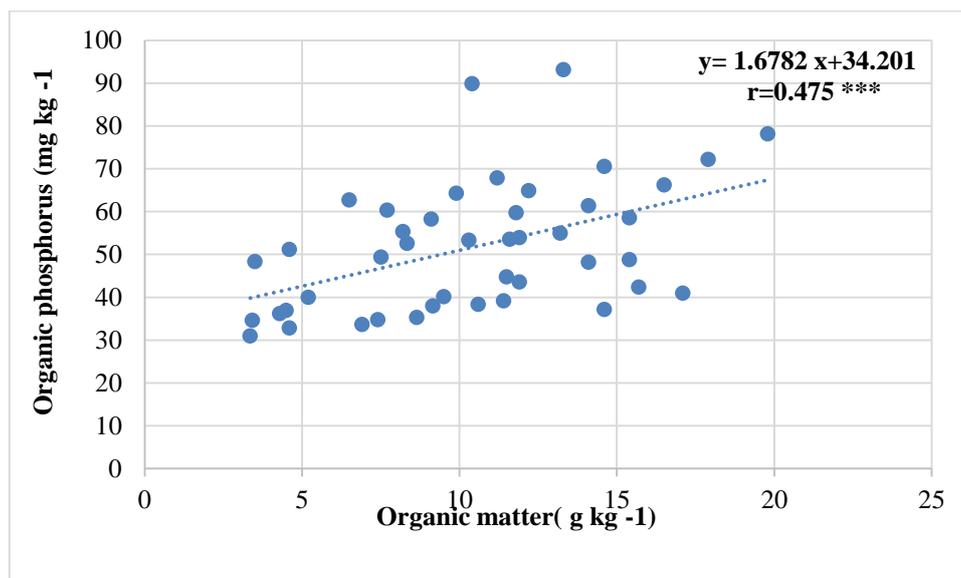
Figure 3: The relationship between total phosphorous ( $\text{mg kg}^{-1}$ ) and active calcium carbonate ( $\text{g kg}^{-1}$ ).

Which turns out that when the values of the degree of soil reaction increase and that there is an abundance of calcium ions with an amount of calcium carbonate, it leads to a decrease in phosphorus due to the formation of calcium carbonate minerals that adsorb phosphorus on its external surfaces, Al-Zubaidi and Al-Samak 1992) This increase may be attributed to the correlation of added

calcium ions with the bicarbonate present in the soil, forming the calcium carbonate minerals that adsorb phosphorous on their external surfaces, or the direct correlation of calcium ions with the added or originally found phosphorus in the soil (Sposito 1984 )

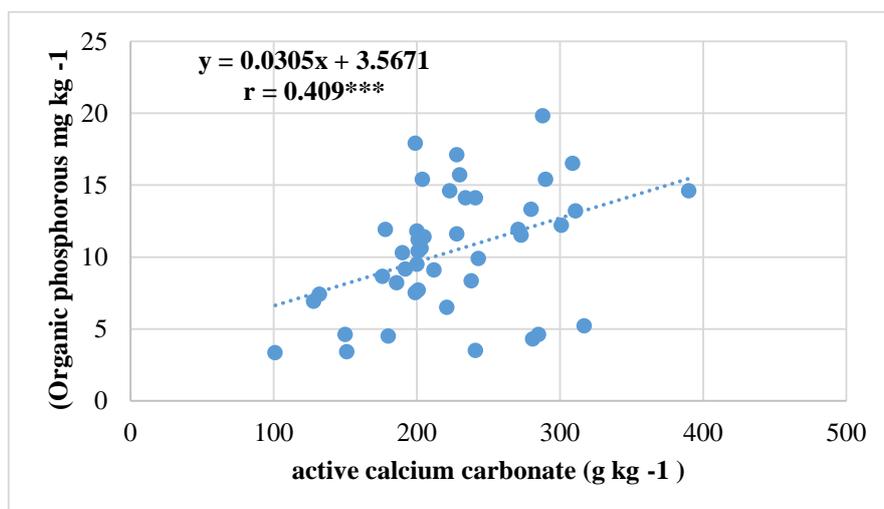
**The relationship between organic phosphorus and organic matter**

The results of organic phosphorus indicate a direct correlation with the organic matter. The value of the simple correlation coefficient  $P < 0.001$ ) was  $0.475 r =$ . In general, the organic matter increased the amount of the released phosphorous. This may be due to the effect of the organic material in increasing the readiness of the added phosphorus by decomposing it by microorganisms, and then the release of nutrients, including phosphorus, to the soil solution in PRISM (2006)



**Figure 4: The relationship between organic phosphorus (mg kg<sup>-1</sup>) and organic matter (g kg<sup>-1</sup>)**

As well as a direct correlation between organic phosphorous and calcium carbonate active and the value of the simple correlation coefficient  $r = 0.409$  while the relationship was between the organic phosphorous and total calcium carbonate and the value of the simple correlation coefficient  $r = 0.547$ . Mereno (2001), that the organic matter forms complexes with calcium ions in calcareous soils, which leads to an increase in phosphorous in the soil solution, and works to form phosphorous complexes dissolved in the soil solution, preventing it from being fixed.



**Figure A- The relationship between organic phosphorous (mg kg<sup>-1</sup>) and active calcium carbonate (g kg<sup>-1</sup>)**

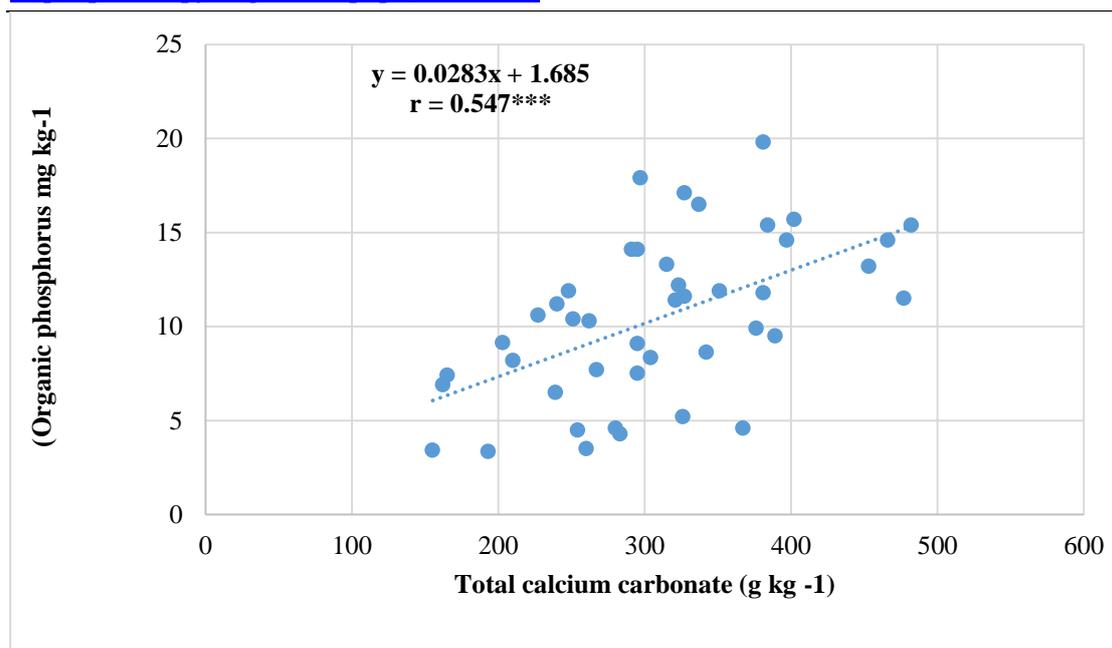


Figure 5: b- The relationship between organic phosphorus ( $\text{mg kg}^{-1}$ ) and total calcium carbonate ( $\text{g kg}^{-1}$ )

- **The relationship between available phosphorous and organic matter**

The results of the available phosphorus indicate the presence of a direct correlation with the organic matter, and the value of the simple correlation coefficient  $r = 0.495$ , that the increase of ready phosphorous in the soil as a result of the presence or addition of the organic matter in the soil (Wandruszka, 2006). Ohno et al. 2005) who showed that adding organic matter increases the readiness of phosphorus in the soil and attributed this to the decomposition of organic matter by reviving the micro-soil which leads to an increase in dissolved organic carbon, which leads to the inhibition of the adsorption process of phosphorus and increase its readiness and thus ease of washing With wash water. There was a significant relationship between ready phosphorus and the soil content of clay minerals and the value of the simple correlation coefficient  $r = 0.341$ .

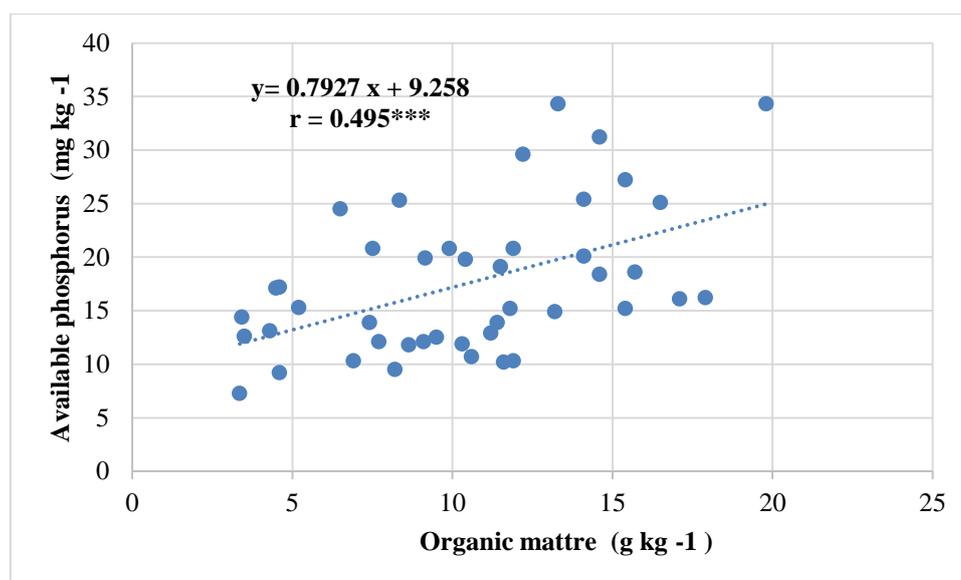


Figure 6: The relationship between Available phosphorous ( $\text{mg kg}^{-1}$ ) and organic matter ( $\text{g kg}^{-1}$ )

The results of the available phosphorus indicate a significant direct correlation between the available phosphorus and the active calcium carbonate. The value of the simple correlation coefficient

reached 0.539  $r =$  while the relationship was weak and less significant with the total calcium carbonate and the value of the simple correlation coefficient was  $r = 0.292$  .. And Al-Kurani mentioned (2000) Carbonate minerals have an important role in reducing the readiness of natural phosphorus and this is due to the direct formation of low-soluble calcium and magnesium phosphate compounds. Unclean minerals with a high specific surface work to retain more phosphate in the form of calcium phosphate. Carbonate minerals affect adsorption reactions in the soil. With the passage of time, the adsorbed or deposited phosphorus turns into more stable, stable, and less ready compounds, which reduces its liberated amount to the soil solution. Therefore, the first stages of phosphorus release were rapid compared to the later stages that the increase of phosphorous phosphorus collectively with time (Saad Allah and Al Qaisi 2003).

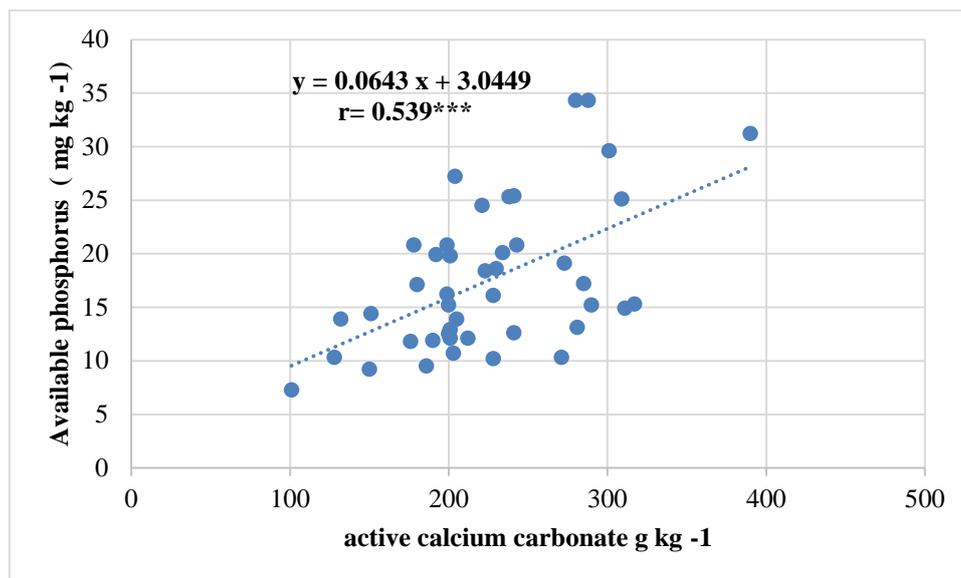


Figure 7a: The relationship between ready phosphorous (mg kg<sup>-1</sup>) and active calcium carbonate (g kg<sup>-1</sup>)

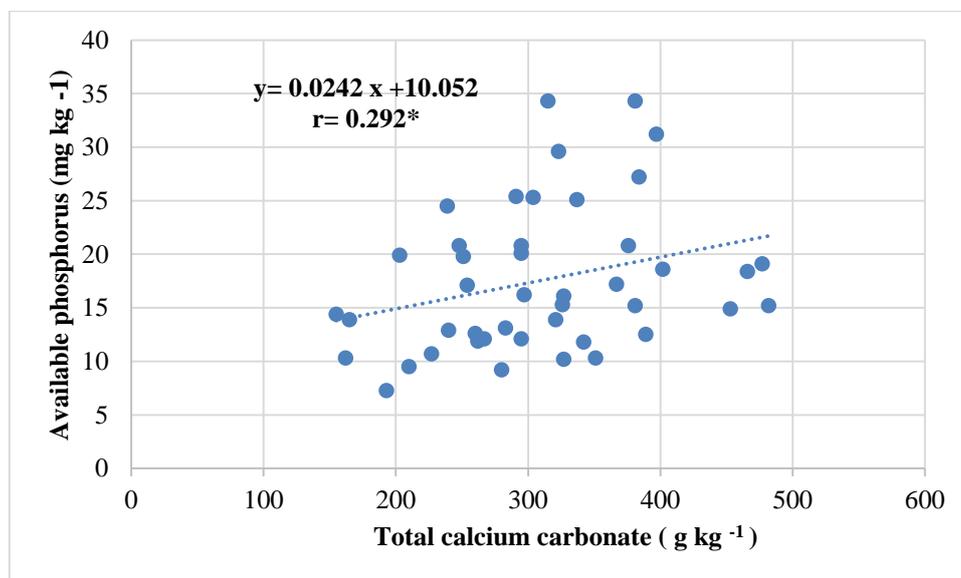


Figure 7b: The relationship between ready phosphorous (mg kg<sup>-1</sup>) and total calcium carbonate (g kg<sup>-1</sup>)

The results of the reciprocal amplitude of positive ions indicate that there was a significant direct relationship with the organic matter, and the value of the simple correlation coefficient  $r = 0.426$  of the level of  $P < 0.05$  between the organic matter CEC of the study soil, but there was no significant

relationship between the amount of clay CEC and this may be due to a difference in the quality of the prevailing minerals In study soils, this needs to be studied and determining the quality and quantity of different minerals in the soil .

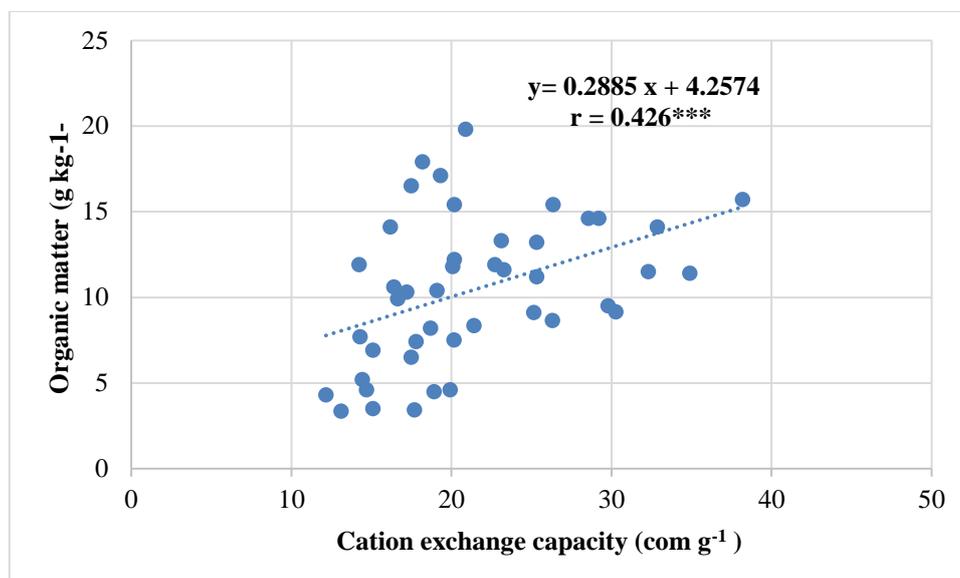


Figure 8: The relationship between The cation exchange capacity  $\text{cmol g}^{-1}$ ) and the organic matter ( $\text{g kg}^{-1}$ )

Table 1: Some chemical properties of soil

Soil NO	Soil samples location	Depth	T-P	OM	TCCE	ACCE	CEC	A-P	O-P
		Cm	mg kg <sup>-1</sup>	g kg <sup>-1</sup>			Cmol g <sup>-1</sup>	mg kg <sup>-1</sup>	
1	Baghdad	0- 30	450.5	15.4	482	290	20.18	15.2	58.5
		30-60	302.1	11.9	351	271	14.23	10.3	53.9
2	Alsowaera	0- 30	471.2	14.6	397	390	28.56	31.2	70.5
		30-60	350.2	11.2	240	201	25.34	12.9	67.8
3	Tagalden	0- 30	288.1	4.49	254	180	18.92	17.1	36.9
		30-60	235.5	3.42	155	151	17.70	14.4	34.6
4	Alshehemeya	0- 30	570.6	19.8	381	288	20.90	34.3	78.1
		30-60	270.7	17.9	297	199	18.20	16.2	72.1
5	Alzobaidea	0- 30	490.7	16.5	337	309	17.50	25.1	66.2
		30-60	265.0	14.1	295	234	16.19	20.1	61.3
6	Alnumania	0- 30	428.2	9.90	376	243	16.64	20.8	64.2
		30-60	240.3	7.70	267	201	14.29	12.1	60.3
7	Alahrar	0- 30	396.3	4.60	367	285	19.93	17.2	51.1
		30-60	210.9	3.50	260	241	15.11	12.6	48.3
8	Shik Saad	0- 30	343.9	5.20	326	317	14.44	15.3	39.9
		30-60	280.0	4.29	283	281	12.16	13.1	36.1
9	Technical Institute in Kut	0- 30	344.4	17.1	327	228	19.32	16.1	40.9
		30-60	232.0	10.6	227	203	16.40	10.7	38.3
10	Almoafakia	0- 30	337.8	7.41	165	132	17.80	13.9	34.7
		30-60	223.5	6.91	162	128	15.10	10.3	33.6
11	Alhay	0- 30	271.9	4.60	280	150	14.70	9.19	32.8
		30-60	206.9	3.35	193	101	13.12	7.28	30.9
12	Albashaer	0- 30	330.9	15.7	402	230	38.20	18.6	42.3
		30-60	273.2	11.4	321	205	34.90	13.9	39.1
13	Aldewania	0- 30	395.5	15.4	384	204	26.35	27.2	48.7

		30-60	240.1	11.9	248	178	22.72	20.8	43.5
14	Abo Almash	0- 30	383.4	14.1	291	241	32.88	25.4	48.1
		30-60	218.9	9.15	203	192	30.27	19.9	37.9
15	Refaeel	0- 30	301.5	14.6	466	223	29.22	18.4	37.1
		30-60	207.6	8.64	342	176	26.31	11.8	35.2
16	Alrefae2	0- 30	386.2	11.8	381	200	20.08	15.2	59.7
		30-60	251.0	10.3	262	190	17.21	11.9	53.3
17	Alfager	0- 30	510.0	13.3	315	280	23.12	34.3	93.1
		30-60	300.1	10.4	251	201	19.11	19.8	89.8
18	Almothana	0- 30	492.1	12.2	323	301	20.19	29.6	64.8
		30-60	400.9	6.50	239	221	17.5	24.5	62.7
19	Alsemawa distrect	0- 30	388.4	9.10	295	212	25.15	12.1	58.2
		30-60	376.2	8.20	210	186	18.70	9.50	55.3
20	Als Salman disstrect	0- 30	366.5	11.5	477	273	32.30	19.1	44.7
		30-60	334.1	9.50	389	200	29.80	12.5	40.1
21	Alkufa	0- 30	446.7	13.2	453	311	25.33	14.9	54.9
		30-60	267.0	11.6	327	228	23.29	10.2	53.5
22	Kerbala	0- 30	397.5	8.34	304	238	21.42	25.3	52.5
		30-60	302.9	7.51	295	199	20.17	20.8	49.3
Rate			335.9	10.42	309.1	225.2	21.3	17.5	51.7

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