Zagazig J. Agric. Res., Vol. 43 No. (2) 2016

http:/www.journals.zu.edu.eg/journalDisplay.aspx?Journalld=1&queryType=Master

AVAILABLE AND EXCHANGEABLE K IN SOILS OF SHARKIA GOVERNORATE, EGYPT, AND THEIR RELATIONSHIPS WITH K POTENTIAL

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ABSTRACT

Such research was conducted aiming to evaluate soil fertility of 43 locations in Sharkia Governorate, Egypt through determination available and exchangeable K and their relationships with K potential. Main physical and chemical properties, as well as water soluble K, available K, exchangeable K, potassium potential, the potential buffering capacity and the activity ratio of potassium were determined. Sand content ranged from 14.0 to 95.6%. Clay content ranged from 2.4 to 61.9%. Calcium carbonate ranged from 1.14 to 64.76 g kg^{-1} and organic matter ranged from 2.69 to 22.83 g kg^{-1}. Soluble potassium ranged from 5.60 to 89.06 mg kg^{-1}. The highest was in Ezbet Elgendy which is characterized with high salinity and the lowest was in Ezbet Abd-Elraaof soil. Exchangeable K ranged between 29.28 and 636.31 mg/ kg^{-1}, the highest was in Elfaddadna soil and the lowest was in Abd-Elraaof soil. Available K ranged from 34.88 to 678.4 mg kg^{-1} soil. Potassium potential ranged between 2.10 to 2.63. High values were in soils characterized with light texture such those of Geta and Elmahawda. Low values were in soils of Ezbet Abd-Elraaof. Most of the soils have fairly adequate potassium content.

Key words: Available K, exchangeable K, potassium potential.

INTRODUCTION

Potassium is an essential macro nutrient for plants. The average content of potassium in the earth crust is 2.6%, making it the seventh most abundant element and the fourth most mineral in the lithosphere, and reflects the parent material of the soil (Munson, 1985; Stewart, 1987 ; Tisdale *et al.,* 1990). In the upper 20 cm of the soil surface, 98% of total K is in mineral insoluble form (Bertsch and Thomas, 1985).

Four K forms in soil include soluble K, exchangeable K, fixed or non-exchangeable K, and structural K, with the last being the highest fraction, followed by exchangeable and non-exchangeable K (Sparks and Huang, 1985). Soluble K is readily available for soil microorganisms and plants and its content in soil solution ranges between 2 to 5 mg K L^{-1} (Haby *et al*., 1990) and is part of the equilibrium and kinetic reactions of soil K (Sparks, 2000). Its content depends on the degree of replenishment from non-exchangeable K (Hay *et al.,* 1976). Buffering of soil affects solution K, and highly buffered clays containing mica and vermiculite maintain high solution K (Parfitt, 1992).

Exchangeable K is adsorbed on soil colloidal exchange sites and is readily available to plants. It is held by different bonds on clay colloids, which can be planer or on edges or the negative charges of carboxylic and phenolic groups of humus colloids (Kirkman *et al.,* 1994). Kinetic and thermodynamic factors affect K^+ held by clay minerals at exchange sites (Parfitt, 1992). Other factors which affect exchangeable K include affinity of exchange sites for K^+ and the relative proportion of K to other cations (Barber, 1984).

Fixed non-exchangeable K is held snuggle between tetrahedral layers (of dioctahedral and trioctahedral micas, vermiculites, and intergrade

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clay minerals such as chloritized vermiculite) so that it is not accessible for exchange but sparingly available (Sparks, 1987 ; Goulding, 1987).

Structural K is the native, matrix, unweathered inert K (Metson, 1980), and constitutes the bulk of soil K. K-bearing primary minerals rich in K include muscovite, biotite and feldspars (Sparks and Huang, 1985). Structural K is covalently bonded within the crystal structure of K-bearing minerals (Metson, 1968). The order of K-availability to plant from K-bearing minerals is biotite > muscovite > orthoclase > microcline ; and the ease of availability depends on the degree of weathering (Sparks 1987).

The objective of the current study is to determine content available and exchangeable K forms in Sharkia soils and their relationships with some potential.

MATERIALS AND METHODS

The study was carried out on soils from 43 different locations in Sharkia Governorate. Samples were taken from the upper 30 cm soil surface, air dried, ground and sieved to pass through a 2-mm sieve and subjected to the following analyses as described by Black *et al.* (1965):

1. Particle size distribution was carried out by the pipette method.
2. pH by glass electrode pH-meter in the soil : water (1:2.5 *W/V*).
3. EC by a conductivity bridge in paste extract.
4. Calcium carbonate using the calcimeter.
5. Organic matter using the Walkley and Black method.
6. Solution ions in paste extract by titration (for Ca^{++} and Mg^{++}), flame photometer (Na^+ and K^+), titration CO_3^{-2} and HCO_3^-, sulfate was determined by the difference between cations and anions.
7. Forms of K were determined as follows:

Water soluble K was determined in the 1:5 soil water extract after shaking for 30 minutes and allowing to stand overnight.

Available K was determined by extraction with 1.0M NH_4OAc.

Exchangeable K was calculated by (available K- water soluble K). The exchangeable potassium determined by subtracting water soluble K from the NH_4OAc extractable K.

K Parameters

The quantity/intensity (Q/I) parameter developed by Beckett (1964), as a parameter measuring soil buffering capacity of soil for K and its ability to supply of K was determined.

The method modified by Acquaye and Maclean (1966) and Singh *et al.* (1978) was used by equilibrating 10 g porfrons of soil with 50 ml of 0.002 M $CaCl_2$ of ranges of concentrations of KCl of 0.05, 0.075, 0.1, 0.2, 0.4 and 0.6 mM. Each was shaken for two hours and allowed to equilibrate overnight. The supernatant solution was filtered and analyzed for K, Ca and Mg and the activity coefficients were calculated using the Debye - Hekel formula:

$$- \text{Log } \gamma i = (0.509)\, Z_i^2 (I)^{1/2}$$

Where:

γ = activity coefficient

I = ionic strength

Z = valance of the ion

C = concentration in molality

The ionic sheng being as follows:

$$I = 1/2 \sum_{e}^{i} CiZ_1^2$$

Where:

Ci = concentration in moles l^{-1} of various ions and Zi = valance of the ion

The activity ratio for K "AR_K". The equation is as follows:

$$AR_K = aK/\sqrt{a(Ca + Mg)}$$

Where a is activity of ion in the solution. For each solution AR_K was calculated. ΔK, the difference between the amount of K added and recovered in the final solution, was also calculated. The AR_K was plotted against ΔK to obtain a Q/I relationship curve. A curve with a linear upper part and a curved lower part would result for most soils. It is given that AR_{Ke} represents the equilibrium activity ratio where ΔK is zero. Negative values of ΔK represent the amount of potassium held in the soil on basal sites or surfaces. The potential buffering capacity for K (PBC^K) was calculated from the slope of the linear part of the curve (dQ /dI).

Potassium potential was also determined, calculated by relating the negative logarithm of potassium activity to the negative logarithm of the sum of calcium and magnesium. The equation is:

Potassium Potential = pK - 0.5 p (Ca + Mg).

RESULTS AND DISCUSSION

Main Features of Soils of the Study

Table 1 presents the main properties of the soils of the current study including calcium carbonate, organic matter, pH, EC and soluble ions. The data indicate that the soils are sand content ranged from 14.0 to 95.6 percent. The highest sand content occurred in the Elkhatara soil and the lowest content was in the Elboha soil. The data also show that the clay content ranges from 2.4 to 61.9 percent. The highest clay content was in the Saft Zriek soil and the lowest clay was in the Wadi Elmollake 2 soil. Calcium carbonate content ranged from 1.14 to 64.76 g kg^{-1}. The lowest value of calcium carbonate was in the Elkoreen 2 soil and the highest was in the Elabbasa soil. Organic matter content ranges from 2.69 to 22.83 g kg^{-1}. The lowest value of organic matter was in Elkoreen 1soil and the highest value was in Bordien soil. All soils have rather low organic matter content. Clayey soils which were under cultivation for a long time tend to have relatively higher organic matter content. This is in contrast to sandy soils which were brought under cultivation rather recently; such soils are the poorest as far as the organic matter content is concerned. The soils pH range from 7.72 to 8.97. The lowest value is at Abo-Elakhdar soil sample and the highest value at Prmkiem soil sample.

Forms of Potassium in Soils

Table 2 shows water soluble, exchangeable and available potassium in the investigated soils.

Water Soluble Potassium

The data in Table 2 show that water soluble potassium ranged from 5.60 to 89.06 mg kg^{-1} with an average of 36.72 mg kg^{-1}. The highest value was found in Ezbet Elgendy Village which is characterized by high salinity. The lowest value was found in Ezbt Abd-Elraaof soil. The obtained values for soluble soil potassium ranged between 3.34 to 80.72 % of the exchangeable potassium content. Such results of soluble K are not very different from those obtained by Awad (1975), Mohammed (1980) and Hassan (1995) in Sharkia soils. Awad (1975) reported ranges of 27.3 to 175.5 mg kg^{-1} and Hassan (1995) reported ranges 11.7 to 35.1 mg kg^{-1}. Low values may indicate a decreased potassium contents due to intensive cultivation.

Exchangeable Potassium

The data in Table 2 show that the exchangeable potassium in the soil of Sharkia Governorate ranged between 29.28 and 636.31 mg kg^{-1} with an average of 177.89 mg kg^{-1}. The highest value was found in Elfaddadna soils while the lowest value was in Ezbt Abd-Elraaof soil. Exchangeable potassium content of the soils under study is lower than those reported by Awad (1975) for soils of Sharkia ranged between 42.9 and 1821.3 mg kg^{-1}. Hassan (1995) reported that exchangeable potassium content in Sharkia soils varied between 117 and 1209 mg kg^{-1}.

Available Potassium

Values of available potassium are presented in Table 2. The data show a range of 34.88 to 678.4 mg kg^{-1} soils with an average of 214.61 mg kg^{-1}. There is a trend of a positive relationship between available potassium and clay content of the soil. However, there is a very highly significant correlation between available and exchangeable K (Fig. 1).

Potassium Potential

Values of potassium potential of the investigated soils are shown in Table 3 and Fig. 3. The range is from 2.10 to 2.63. High values were obtained from soils which are characterized by light texture such those of Geta and Elmahawda. Low values were obtained in

Table 1. Some physical and chemical properties of the investigated soil samples

No.	Location	Soil particle distribution				$CaCO_3$ ($g\ kg^{-1}$)	Organic matter ($g\ kg^{-1}$)	pH	EC dSm^{-1}	Soluble ions ($mmol_C\ L^{-1}$)							
		Sand (%)	Silt (%)	CLay (%)	Texture					Na^+	K^+	Ca^{2+}	Mg^{2+}	CO_3^{2-}	HCO_3^-	Cl^-	SO_4^{2-}
1	Eltahra	46.4	25.6	28.0	lC	28.95	10.07	7.99	6.27	10.62	0.58	37.44	14.04	nil	7.20	6.48	49.00
2	Abo-Elakhdar	36.0	32.8	31.2	lC	43.05	16.12	7.72	6.15	7.20	2.26	35.36	16.64	nil	6.40	5.76	49.30
3	Eliraqiway	25.6	19.2	55.2	hC	44.57	18.47	7.86	6.09	7.67	0.81	25.35	27.04	nil	7.80	6.24	46.83
4	Wadi Elmollak 1	87.6	0.8	11.6	LS	45.71	6.38	7.92	8.78	4.40	2.82	57.20	23.40	nil	4.00	12.00	71.82
5	Wadi Elmollak 2	94.0	3.6	2.4	S	6.19	3.36	8.38	4.00	6.50	1.00	22.75	9.75	nil	10.00	6.00	24.00
6	Elkoreen 1	69.6	11.2	19.2	SCL	23.33	2.69	8.35	5.84	5.60	0.84	39.00	13.00	Nil	8.00	7.20	43.24
7	ElaSdia village	79.2	8.0	12.8	SL	2.38	3.69	8.08	6.24	4.60	3.24	36.40	18.20	nil	8.00	12.00	42.44
8	Elkoreen 2	69.6	13.6	16.8	SCL	1.14	5.04	8.05	4.80	1.80	2.00	26.00	18.20	nil	4.00	7.20	36.80
9	Elmesalamia	28.0	30.4	41.6	lC	54.29	13.43	7.93	7.21	8.06	1.48	35.49	27.04	nil	7.80	26.52	37.75
10	Eledwa village	43.2	23.2	33.6	lC	40.00	10.41	8.37	5.59	7.20	2.90	22.88	22.88	nil	6.40	9.60	39.86
11	Abo-Amr island	85.2	7.2	7.6	LS	0.95	3.69	8.13	4.36	6.20	1.04	20.80	15.60	nil	12.00	9.60	22.04
12	El-faddadna	36.8	16.8	46.4	hC	48.57	7.05	8.49	5.97	8.32	2.35	40.56	8.45	nil	7.80	9.36	42.52
13	Fakoos	48.8	9.6	41.6	lC	37.14	7.05	8.40	4.75	9.52	1.55	16.38	20.02	nil	8.40	8.40	30.67
14	Akiad	65.6	7.2	27.2	SC	30.29	10.75	8.51	5.73	11.70	1.12	23.40	21.06	nil	10.80	10.80	35.68
15	AminPashavillage	80.8	5.6	13.6	SL	4.19	10.41	8.59	3.58	0.80	1.22	18.20	15.60	nil	8.00	4.80	23.02
16	Elkhatara	95.6	1.2	3.2	S	1.52	3.69	9.11	4.90	9.00	1.03	19.50	19.50	nil	10.00	12.00	27.03
17	Abo Shalabi	83.2	4.8	12.0	SL	0.38	4.03	8.22	2.84	7.00	0.64	10.40	10.40	nil	8.00	7.20	13.24
18	Elaslogy	38.4	24.0	37.6	lC	13.33	11.75	8.16	4.18	5.76	0.66	20.80	14.56	nil	6.40	5.76	29.62
19	Bordien	15.2	23.2	61.6	hC	46.86	22.83	8.39	3.72	9.75	0.40	18.59	8.45	nil	7.80	6.24	23.15
20	Arab Elbiadia	36.8	29.6	33.6	CL	51.43	16.45	8.14	2.93	5.44	0.99	12.48	10.40	nil	6.40	5.76	17.15
21	Miet-Rabiaa	33.6	28.8	37.6	lC	40.76	13.43	8.01	9.62	7.04	1.78	60.32	27.04	nil	3.20	9.60	83.38

Table 1. Cont.

No.	Location	Soil particle distribution				$CaCO_3$ (g kg-^{1})	Organic matter (g kg^{-1})	pH	EC dSm^{-1}	Soluble ions (mmol$_C$ L^{-1})							
		Sand (%)	Silt (%)	Clay (%)	Texture					Na^+	K^+	Ca^{2+}	Mg^{2+}	CO_3^{2-}	HCO_3^-	Cl^-	SO_4^{2-}
22	**Ezbt Abd-Elraaof**	59.8	20.1	20.1	SCL	18.10	9.74	8.17	7.69	6.48	0.22	39.78	30.42	nil	7.20	8.64	61.06
23	**Anshas Elraml**	64.0	16.1	19.9	SCL	19.81	8.40	7.80	9.02	5.04	0.92	51.48	32.76	nil	3.60	8.64	77.96
24	**Ezbt Elgendy**	26.2	17.9	55.9	hC	61.90	20.15	8.31	8.32	17.81	6.24	28.73	30.42	nil	7.80	20.28	55.12
25	**Kafr Elseaidy**	28.2	31.8	40.0	lC	21.14	22.83	8.25	3.43	3.38	0.53	15.21	15.21	nil	5.20	4.68	24.45
26	**Koom Hleen**	26.0	23.9	50.1	hC	33.90	19.81	8.09	5.27	5.33	1.69	27.04	18.59	nil	5.20	6.24	41.21
27	**Hood Elgawafra**	39.9	8.1	52.0	hC	46.10	16.79	8.19	9.71	25.35	2.50	40.56	28.73	nil	2.60	10.92	83.62
28	**Elzankalon**	27.8	16.1	56.1	hC	45.71	22.16	8.13	4.77	6.76	2.11	23.66	15.21	nil	7.80	3.12	36.82
29	**Menia Elkamh**	38.3	13.9	47.8	hC	36.19	20.48	8.18	4.62	6.76	0.52	21.97	16.90	nil	5.20	6.24	34.71
30	**Elkenaiat**	24.1	23.8	52.1	hC	52.00	16.45	8.22	5.21	12.87	2.09	18.59	18.59	nil	7.80	7.80	36.54
31	**Ezbt Abohegab**	34.3	21.7	44.0	lC	45.33	20.82	8.48	4.45	9.49	1.21	16.90	16.90	nil	7.80	7.80	28.90
32	**FersieS village**	40.2	15.9	43.9	lC	44.19	21.16	8.58	4.32	6.76	2.63	16.90	16.90	nil	7.80	7.80	27.59
33	**Saft Zriek**	22.1	16.0	61.9	hC	72.38	22.83	8.13	4.54	12.61	0.70	13.52	18.59	nil	7.80	7.80	29.82
34	**Prmkiem**	33.9	8.2	57.9	hC	75.24	21.16	8.97	4.90	13.60	0.76	14.59	20.05	nil	8.41	8.41	32.17
35	**Dpeag**	44.1	11.7	44.2	lC	45.71	20.15	8.02	4.92	4.94	1.98	20.28	21.97	nil	5.20	3.12	40.85
36	**Kafr Sakr**	36.0	9.8	54.2	hC	42.86	22.83	7.77	6.38	5.07	1.31	33.80	23.66	nil	5.20	3.12	55.52
37	**Elmhawda**	31.8	30.1	38.1	lC	32.00	13.10	8.01	6.88	5.44	0.96	35.36	27.04	nil	6.40	3.84	58.56
38	**Elboha village**	14.0	36.5	49.5	hC	59.05	20.15	8.20	5.16	9.10	0.29	25.35	16.90	nil	5.20	4.68	41.76
39	**Ezbt Rashed**	32.1	10.2	57.7	hC	57.14	19.48	8.35	5.81	15.08	0.81	20.28	21.97	nil	5.20	14.04	38.90
40	**Elsalhia Elkdima**	76.1	8.1	15.9	SCL	7.43	10.41	7.98	5.76	4.80	0.84	31.20	20.80	nil	8.00	4.80	44.84
41	**Elmongah Elkbra**	81.6	12.1	6.3	SL	2.67	8.40	8.40	5.64	3.60	3.44	28.60	20.80	nil	4.00	7.20	45.24
42	**Soaod**	50.2	18.0	31.8	lC	20.57	12.09	8.27	6.46	9.90	0.92	30.42	23.40	nil	7.20	6.48	50.96
43	**Elkabisha**	85.8	4.2	10.0	L	6.67	5.04	8.00	3.46	2.20	1.24	18.20	13.00	nil	4.00	4.80	25.84

S : sand.. LS : loamy sand .. SL: sandy loam .. L: loam .. SCL: sandy clay loam .. CL: clay loam.. SC: sandy clay .. lC: light clay .. hC : heavy clay (Texture class according to the "International Soil Texture Triangle" refer to Farshad 1984) { Farshad, A. 1984. Some notes on soil sampling and profile description.

Table 2. Potassium forms (soil soluble K, exchangeable K and available K) as mg kg^{-1} in the investigated soils

No.	Location	Soluble K (mg kg^{-1})	Exchangeable K (mg kg^{-1})	Available K (mg kg^{-1})
1	Eltahra	11.90	160.26	172.16
2	Abo-Elakhdar	53.66	209.70	263.36
3	Eliraqiway	21.85	175.59	197.44
4	Wadi Elmollak 1	56.12	188.68	244.8
5	Wadi Elmollak 2	14.00	65.68	79.68
6	Elkoreen 1	16.45	99.07	115.52
7	ElaSdia village	62.27	115.65	177.92
8	Elkoreen 2	38.88	172.96	211.84
9	Elmesalamia	42.58	175.02	217.6
10	Eledwa village	68.43	609.97	678.4
11	Abo-Amr island	19.25	131.15	150.4
12	El-faddadna	70.89	636.31	707.2
13	Fakoos	43.81	189.79	233.6
14	Akiad	23.60	182.80	206.4
15	AminPashavillage	24.55	137.05	161.6
16	Elkhatara	14.45	73.87	88.32
17	Abo Shalabi	11.75	97.37	109.12
18	Elaslogy	14.10	158.06	172.16
19	Bordien	10.55	148.49	159.04
20	Arab Elbiadia	23.95	545.65	569.6
21	Miet-Rabiaa	42.58	119.34	161.92
22	EzbtAbd-Elraaof	5.60	29.28	34.88
23	AnshasElraml	19.05	49.11	68.16
24	EzbtElgendy	89.06	192.22	281.28
25	Kafr Elseaidy	16.05	89.23	105.28
26	KoomHleen	49.96	96.60	146.56
27	Hood Elgawafra	75.81	107.23	183.04
28	Elzankalon	61.04	150.16	211.2
29	MeniaElkamh	16.55	117.53	134.08
30	Elkenaiat	61.04	332.56	393.6
31	EzbtAbohegab	35.19	89.61	124.8
32	FersieS village	77.04	95.44	172.48
33	SaftZriek	18.40	83.68	102.08
34	Prmkiem	22.07	96.23	118.30
35	Dpeag	58.58	95.66	154.24
36	Kafr Sakr	40.12	189.96	230.08
37	Elmhawda	21.50	163.46	184.96
38	Elboha village	7.85	130.71	138.56
39	EzbtRashed	24.70	218.18	242.88
40	ElsalhiaElkdima	14.25	140.63	154.88
41	ElmongahElkbra	67.20	166.08	233.28
42	Soaod	19.40	217.72	237.12
43	Elkabisha	23.85	140.63	164.48
	Mean	36.72	177.89	214.61

Table 3. Potassium quantity - intensity parameters of the studied soils

No.	Location	p^K -0.5p (Ca+Mg)	-ΔK (meq/100gm soil)	AR_K *10^{-3} $(M/L)^{1/2}$	PBC^K
1	Eltahra	2.48	0.848	3.45	246.0
2	Abo-Elakhdar	2.44	0.630	1.842	342.0
3	Eliraqiway	2.39	0.738	3.44	214.2
4	Wadi Elmollak 1	2.54	0.370	1.659	223.0
5	Wadi Elmollak 2	2.48	0.169	1.17	144.4
6	Elkoreen 1	2.32	0.474	2.82	167.7
7	ElaSdia village	2.39	0.641	3.50	183.1
8	Elkoreen 2	2.43	0.939	7.63	123.1
9	Elmesalamia	2.31	0.673	3.49	192.8
10	Eledwa village	2.42	0.195	1.27	153.5
11	Abo-Amr island	2.44	0.436	2.78	156.8
12	El-faddadna	2.41	0.688	3.38	203.2
13	Fakoos	2.46	0.189	1.23	153.7
14	Akiad	2.46	0.881	7.53	117.0
15	AminPashavillage	2.51	0.190	1.28	148.4
16	Elkhatara	2.21	0.178	1.22	145.9
17	Abo Shalabi	2.33	0.486	2.71	179.0
18	Elaslogy	2.27	0.685	3.44	199.1
19	Bordien	2.47	0.734	3.40	215.9
20	Arab Elbiadia	2.29	0.653	3.36	194.0
21	Miet-Rabiaa	2.23	0.459	2.76	165.9
22	EzbtAbd-Elraaof	2.63	0.453	2.72	160.0
23	AnshasElraml	2.51	0.473	2.36	200.0
24	EzbtElgendy	2.36	0.715	3.34	213.8
25	Kafr Elseaidy	2.20	1.163	5.59	208.1
26	KoomHleen	2.52	0.172	5.60	209.1
27	Hood Elgawafra	2.47	0.673	3.37	199.7
28	Elzankalon	2.57	0.733	3.36	218.2
29	MeniaElkamh	2.23	0.669	3.46	193.1
30	Elkenaiat	2.23	1.117	5.66	197.2
31	EzbtAbohegab	2.29	0.591	4.31	137.1
32	FersieS village	2.35	0.740	3.41	216.7
33	SaftZriek	2.24	0.444	2.72	162.9
34	Prmkiem	2.44	0.638	3.47	183.9
35	Dpeag	2.52	0.612	4.36	140.1
36	Kafr Sakr	2.21	0.611	4.30	141.9
37	Elmhawda	2.10	0.764	3.40	224.7
38	Elboha village	2.42	0.605	4.31	140.1
39	EzbtRashed	2.20	0.133	5.66	200.0
40	ElsalhiaElkdima	2.42	0.467	2.70	173.0
41	ElmongahElkbra	2.33	0.479	2.87	166.9
42	Soaod	2.48	0.457	2.71	168.3
43	Elkabisha	2.25	0.189	1.27	148.8
	Mean	2.37	0.561	3.38	180.1

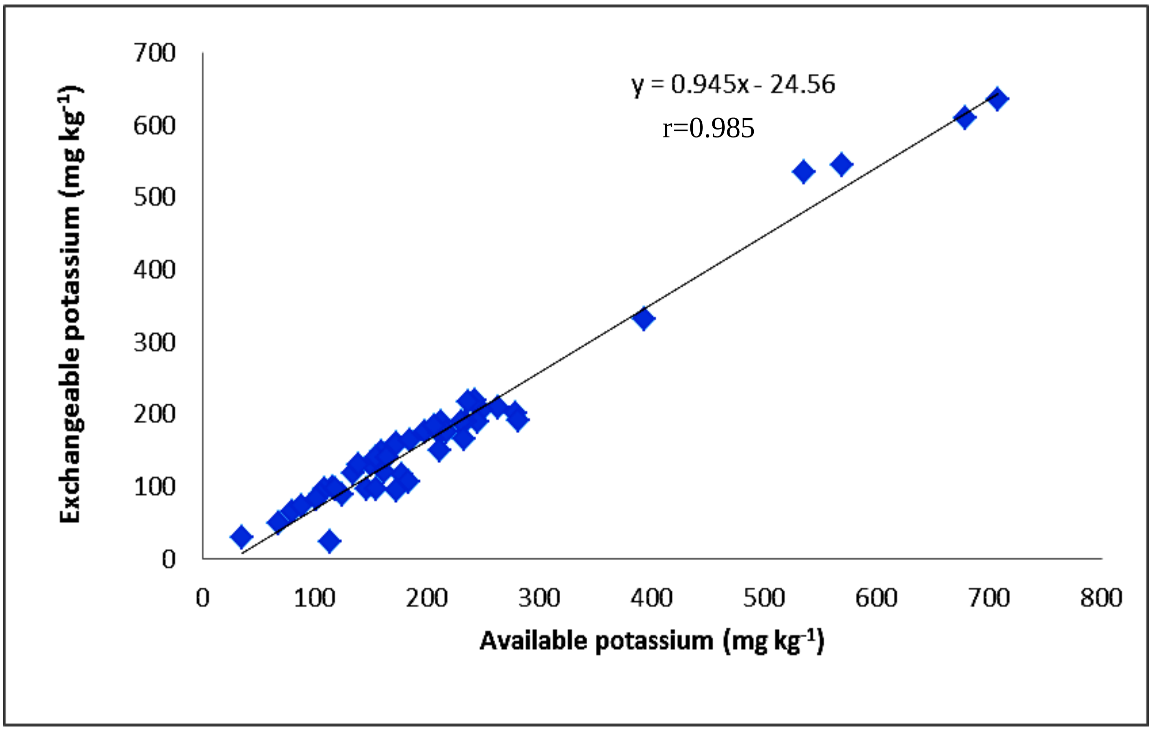
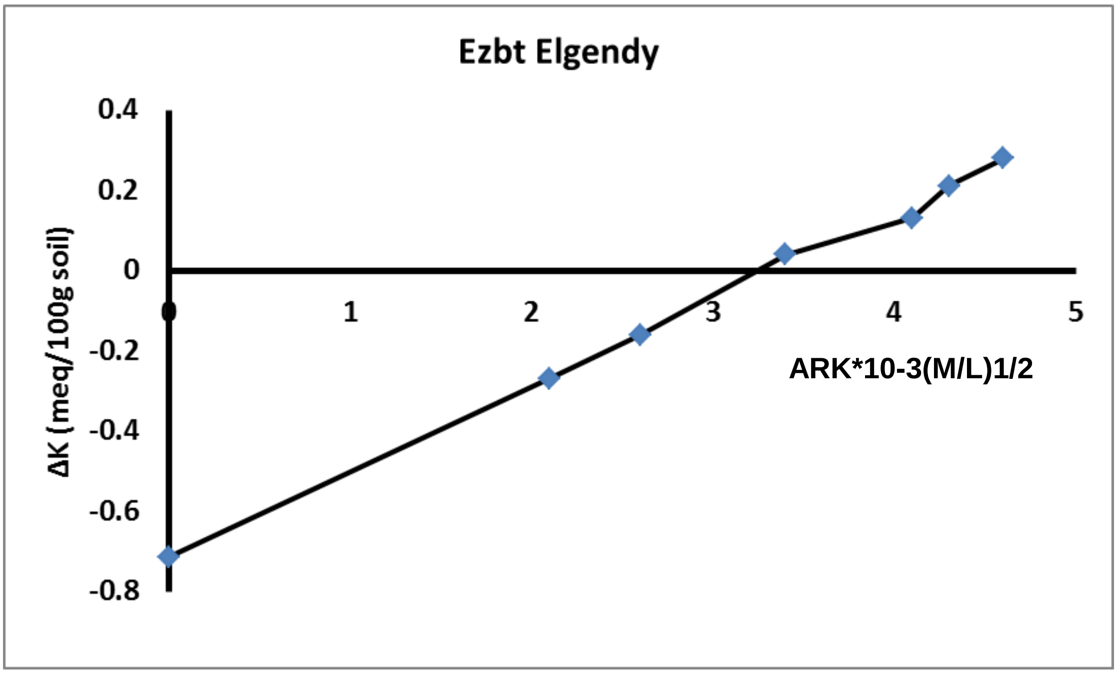


Fig. 1. Relationship between available potassium and exchangeable potassium in the investigated soils

r = 0.303

Fig. 2. Relationship between exchangeable potassium and potassium potential in the investigated soils



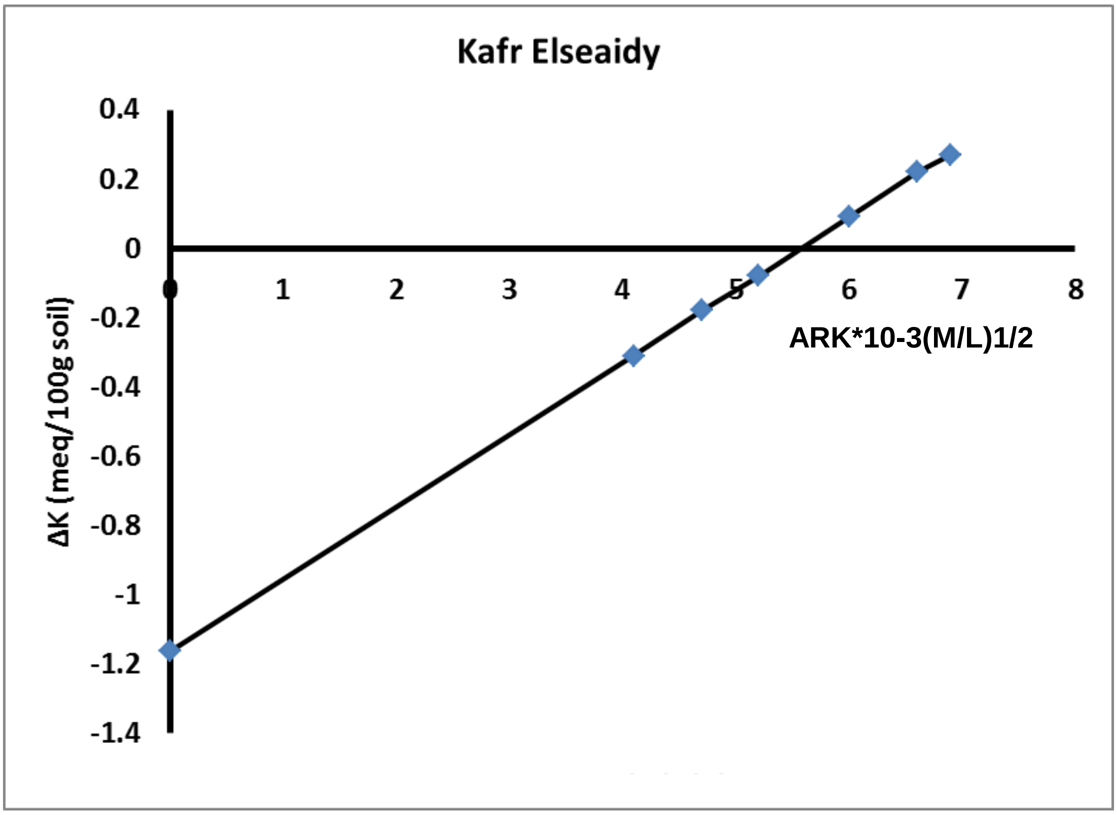


Fig. 3 The Q/I curve of Ezbt Elgendy and Kafr Elseaidy

soils of Ezbt Abd-Elraaof. Potassium potential values of this study are close to those reported by Abou El-Roos (1972) who found that the potassium potential in some Egyptian soils varied between 1.72 and 2.8. Mohammed (1980) reported values of potassium potential ranging between 2.5 to 3.5. Hassan (1995) found that the potassium potential in some soils of Sharkia varied between 1.8 and 2.93. The data obtained from the Q/I curves, for which Fig. 3 is given as an example, are listed in Table 3.

The potential buffering capacity (PBC^K) is a measure of the resistance of the concentration in soils to change (Beckelt, 1964). It is apparent that the values of potential buffering capacity (PBC^K) ranged between 117.0 and 342.0 with an average of 180.1.

The activity ratio of the investigated soils AR_{ke} was obtained from the Q/I curves, the values ranged between 1.17 and 7.63 × 10^{-3} $(M/L)^{1/2}$ with an average of 3.38 × 10^{-3} $(M/L)^{1/2}$.

Woodruff (1955) suggested that potassium potential values of 2.57, 2.2 and 1.47 indicate that potassium is deficient, adequate and excessive, respectively. Therefore, most of the studied soils have fairly adequate potassium content. Exceptional soils are those of Ezbt Abd-Elraaof and Elzankalon which show values indicating K deficiency. There is a trend of a negative relationship between exchangeable potassium and potassium potential.

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البوتاسيوم الميسر والمتبادل فى أراضى محافظة الشرقية بمصر وعلاقاتهما بجهد البوتاسيوم

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اجرى هذا البحث بهدف تقييم خصوبة أراضي ٤٣ موقع فى محافظة الشرقية بمصر من خلال تقدير البوتاسيوم الذائب واليسر والمتبادل وعلاقتهم بجهد البوتاسيوم ، قدرت الخصائص الطبيعية والكيمياوية الأساسية ، بالإضافة إلى البوتاسيوم الذائب والبوتاسيوم الميسر والبوتاسيوم المتبادل وجهد البوتاسيوم والسعة التنظيمية الكامنة ونسبة النشاط الكيماوي، تراوح محتوى الرمل بين ١٤.٠ إلى ٩٥.٦%، وتراوح محتوى الطين من ٢.٤ إلى ٦١.٩١%، وتراوح محتوى كربونات الكالسيوم من ١.١٤ إلى ٦٤.٧٦ جم/ كجم تربة، تراوح محتوى المادة العضوية من ٢.٦٩ إلى ٢٢.٨٣ جم/ كجم تربة ، تراوح البوتاسيوم الذائب من ٥.٦٠ إلى ٨٩.٠٦ مللجم/ كجم وكانت أعلى قيمة له فى أرض عزبة الجندي والذى تميزت بملوحتها المرتفعة وأقل قيمة فى أرض عزبة عبد الرؤوف، وتراوحت قيم البوتاسيوم المتبادل بين ٢٩.٢٨ - ٦٣٦.٣١ مللجم/ كجم ، وكانت أعلى قيمة له فى أرض الفدادنة واقل قيمة فى أرض عزبة عبد الرؤوف ، وتراوحت قيم البوتاسيوم الميسر بين ٣٤.٨٨ - ٦٧٨.٤ مجم/ كجم تربة ، تراوحت قيم جهد البوتاسيوم بين ٢.١٠ إلى ٢.٦٣ و كانت أعلى القيم فى الأراضى التى تميزت ببنائها الخفيف كأراضى غيتة والمهاودة، أقل القيم وجدت فى أراض عزبة عبد الرؤف، احتوت معظم الأراضى على قدر كاف من البوتاسيوم.

المحكمون :

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