Journal

J. Biol. Chem.
Environ. Sci., 2010,
Vol. 5(2): 357-368
www.acepsag.org

STATUS OF DIFFERENT FORMS OF CALCIUM, MAGNESIUM AND SODIUM IN SOME SOILS OF SOUTH SINAI.

Abd Alla, A.M.; M.H. Khider and M.H. Riad.

Soils, Water and Environment Research Institute, Agriculture Research Center, Giza, Egypt.

ABSTRACT

The current work has been performed to study the status of different forms of calcium, magnesium and sodium in ten soil profiles varying in their characteristics in some soils of South Sinai.

The obtained results show that total, exchangeable and acid soluble Ca were ranged from 590-12000 ppm, 1.3-18 meq./100g soil and 4.61-152.72 ppm, respectively. Also, it is found that total Ca content depends to a large degree on $CaCO_3$.

Exchangeable Ca is affected by the clay and silt contents. The profiles Nos.5 and 6 that contain the lowest value of acid soluble Ca exhibit the lowest average values of EC.

Data also indicate that total, exchangeable and acid soluble Mg forms were differed from 500-9500 ppm, 0.35-4.95 meq./100g soil and 1.05-29 ppm respectively. The highest values of total Mg are accompanied by the highest values of EC, while the lowest ones accompanied by the lowest ones of EC. Exchangeable Mg values are generally lower than exchangeable Ca in the studied profiles.

On the other hand the values of total, exchangeable and ammonium nitrate soluble Na were ranged from 1220-10000 ppm, 0.15-2.15 meq./100g soil and 2.65-3000 ppm respectively. The highest values of total and extractable are due to the highest values of EC.

Statistical analysis shows significant correlations between different forms of Ca, Mg & Na and some soil properties.

INTRODUCTION

All soils contain Ca and Mg cations (positively charged ions) attracted to the negative exchange sites on clay and organic matter. The amount and relative proportion usually reflect the soils parent materials. Ca and Mg are plant essential nutrients and the ionic forms of each held on the soil exchange sites is the form taken up by plants (Sawyer, 2003). Since the base cations on cation-exchange sites are to large degree available to growing plants, it follows that the availability of Ca, Mg and Na is in varying lower in acidic soils than neutral or alkaline soils. In strongly alkaline soils, those with pH values above 8.5 sodium is in varying the dominant cation on the exchange sites, because Ca is precipitated as carbonate before such high pH values are reached (Cresser et al., 1993). i.e.:

$$Ca^{2+} + CO_2 \rightarrow CaCO_3 + 2\ H^+$$

Soil Ca exists principally in two forms, as carbonate and as exchangeable Ca in association with organic and inorganic colloids. Too much lime reduces the availability of Fe, P, Mn, Cu and Zn. Plants deficient in Ca show characteristic symptoms of this deficiency (Abdel Gawad, 1972). Also, Nadia (1998) showed that the presence of Ca in the soils reduces uptake of Mg and K. Mg is an essential constituent of green molecule of plant chlorophyll where it contain 2.7 % Mg and characteristic chlorosis is developed by plant when Mg is insufficient.

Sodium uptake in a given environment depends on the salinity resistance strategy in a genotype (Asch et al., 1999). Na^+ compounds are widely distributed in a nature and all organic materials contain Na but the major sources of Na in soils are salts and inorganic minerals (Tan, 2005). Sodium affected soils usually occur in arid, semiarid and sub-humid climates where rainfall insufficient to leach soluble salts from the soils (Ranttan, 2006).

The main objective of this work is to study total, exchangeable and soluble content of calcium, magnesium and sodium in different profiles at El-Qaa plain soils of South Sinai.

MATERIALS AND METHODS

Forty seven soil samples from ten soil profiles were collected from some locations of El-Qaa plain in South Sinai, Egypt. These soil samples that varying in their chemical and physical properties were determined by Abdel Gaffar (2004) and shown in Table (1). Particle size distribution, calcium carbonate content, electrical conductivity (EC) and pH were determined according to Page et al., (1982). Organic matter content (O.M) was determined according to the method given by Walkley and Black (1947).

Extraction of total Ca, Mg, and Na was performed by digestion of soil samples according to Jackson (1958). Determination of total Ca and Mg was carried by Atomic absorption spectrometer and total Na by flame photometer according to Page et al., (1982). Exchangeable cations (Ca, Mg and Na) and acid soluble Ca and Mg were determined according to Page et al., (1982). Extractable Na was determined using ammonium nitrate solution according to Faithfull (2002).

RESULTS AND DISCUSSION

Data in Table (1) show the main chemical and physical properties of the studied soil profiles obtained from South Sinai (Abdel Gaffar, 2004). It is clearly that the studied soil profiles are characterized by different texture grades (sandy loam to extremely gravelly sand).

1. Calcium forms in soils:

1.1. Total calcium form:

Data in Table (2) reveal that total calcium content depends to a large degree on soil calcium carbonate (Table 1) as a general trend the highest values of total calcium are associated with soils (except sample (0-100 cm) and (100-130 cm) depth of profile 8) attained the relatively high content of $CaCO_3$. These results agree with those obtained by Abd Alla and Mohamed (2001). Surface layer (0-100 cm) and subsurface one (100-130cm) of profile No.8 characterized by the highest values of total calcium (11000 and 12000 ppm, respectively), this may be attributed to the very high EC values of these samples (206 and 210 ds/m, respectively). The lowest value (590 ppm) of total calcium is located in profile No.5 (5-100 cm depth).Statistical analysis (Table 4) shows a highly significant negative correlation between total Ca and PH ($r = -0.608^{**}$) ,highly significant positive correlation with both of EC ($r = 0.720^{**}$) and O.M ($r=0.604^{**}$) and significant positive correlation with $CaCO_3$ ($r = 0.367^{*}$) . These results agree with those obtained by Abd Alla and Mohamed (2001).

1.2. Exchangeable calcium form:

Data in Table (3) show that the exchangeable calcium was varied widely from 1.3 to 18.0 meq./100g soil. The lowest value is detected in profile No.7 (47-60 cm depth) while the highest one is present in profile No.1 (0-25 cm depth). The highest value of exchangeable calcium is mainly attributed to the relative high value replacing power on exchangeable sites of the relatively high content of clay in this sample (Table 1). The lowest value of exchangeable calcium, in the sample of depth 47-60 cm of profile No.7, is mainly due to the lowest content of clay (Table 1) which affects the exchangeable calcium. Statistical analysis (Table 4) shows a highly significant positive correlation between exchangeable Ca and both of clay (r = 0.957**) and silt contents (r = 0.976**) and a highly significant negative correlation with sand content (r = -0.973**).

1.3. Acid soluble calcium:

Results in Table (2) indicate that acid soluble Ca varies from 4.61 to 152.72 ppm. The lowest value is detected in profile No.4 (9-26 cm depth), while the highest one is present in profile No.1 (70-110 cm depth). The present data in Table (2) indicate that the lowest average values of acid soluble Ca are present in profiles Nos. 4 and 5 (4.85 and 4.73 ppm respectively). The lowest value may be attributed to the lowest average values of EC (Table 1) in these profiles (the average values of EC in profiles Nos. 4 and 5 are 1.48 and 1.15 ds/m, respectively). The highest value of acid soluble Ca (Table 2) may be due to the affect of low pH value (Table 1), relatively high EC and high amount of $CaCO_3$ at the same time. Statistical analysis (Table 4) shows a highly significant negative correlation between soluble Ca and PH (r = -0.591**) and highly significant positive correlation with each of EC (r = 0.787**) and O.M content (r=0.636**).

2. Magnesium forms in soils:

2.1 Total Magnesium form:

Table (2) indicates that the values of total Mg varies widely from 500 to 9500 ppm. These results agree with those obtained by Abdel Gawad (1972). The highest value is detected in profile No.8 (100-130 cm depth), while the lowest one is found in profile No.5 (10-15 cm depth). Results indicate that total Mg is affected to a large extent by EC (Table 1). The highest value of total Mg is accompanied by the highest value of EC (210 ds/m) as shown in Table (1), while the lowest one exhibits the lowest content of EC (0.62 ds/m).

2.2. Exchangeable magnesium form:

Data in Table (3) show that the values of exchangeable magnesium varied from 0.35 to 4.95 meq. /100g soil. The highest value is found in profile No.1 (0-25 cm depth), the highest value of exchangeable magnesium is attributed to the relative high replacing power on the exchangeable sites of the relatively high clay and silt content in this sample (Table 1).The lowest value of exchangeable magnesium that detected in profile No.7 (47-60 cm depth) may be attributed to the lowest clay content (0.7 %). Because Mg compounds are very soluble and because this element adsorbed by soil colloid, its deficiency in soil is most probable. Statistical analysis (Table 4) shows a highly significant positive correlation between exchangeable Mg and each of clay (r = 0.779**) , silt(r = 0.750**)and $CaCO_3$ (r = 0.396*) contents and a highly significant negative correlation with sand content (r = -0.765**).

2.3. Acid soluble magnesium:

Table (2) indicates that acid soluble magnesium differed widely from 1.05 to 29.0 ppm. The highest value was found in profile No.8 (100-130 cm depth), probably due to high value of EC (Table 1). The lowest value was detected in profile No.5 (15-25 cm depth), this sample characterized by the lowest values of EC. Generally, the profiles Nos. 5, 6 and 7 characterized by the lowest values of acid soluble Mg as an average (1.33, 2.4 and 2.56 ppm, respectively), while profile No.8 represent the highest value of acid soluble Mg as an average (17.2 ppm). Statistical analysis (Table 4) shows a highly significant negative correlation between soluble Mg and PH (r = -0.426**) and highly significant positive correlation with each of EC (r = 0.873**) and O.M content (r=0.820**).

3. Sodium forms in soils:

3.1. Total sodium form:

Data in Table (2) indicate that the values of total sodium content varied widely from 1220 to 10000 ppm. The highest value located in profile No.8 (100-130 cm depth) may be attributed to the highest value of EC. This profile exhibit the highest value of total sodium as an average compared with the other profiles. The lowest value was detected in profile No.2 (20-30 cm depth), this sample contain low value of EC. Statistical analysis (Table 4) shows a highly significant negative correlation between total Na and PH (r = -0.676**) and a highly significant positive correlation with both of EC (r = 0.879**) and O.M (r=0.683**).

3.2. Exchangeable sodium form:

The results in Table (3) indicate that the exchangeable sodium range from 0.15 to 2.15 meq./100g soil. Data in Tables 2 and 3 indicate that the highest values of exchangeable sodium are present in sample characterized by high contents of both clay and silt contents, while the lowest ones are located in samples exhibit low contents of both clay and silt. These results agree with those obtained by Abd Alla and Mohamed (2001). The highest value of exchangeable sodium is located in profile No.1 (0-25 cm depth), while the lowest one is present in profile No.7 (47-60 cm depth). Statistical analysis (Table 4) shows a highly significant positive correlation between exchangeable Na and each of clay (r = 0.664**) , silt(r = 0.633**)and $CaCO_3$ (r = 0.339*) contents and a highly significant negative correlation with sand content (r = -0.656**) and PH (r =-0.386**).

3.3. Ammonium nitrate extractable sodium:

The values of ammonium nitrate extractable sodium varied widely from 2.65 to 3000 ppm (Table 2). The lowest value was detected in profile No.5 (10-15 cm depth) and the highest one was found in profile No.8 (100-130 cm depth). The results of ammonium nitrate extractable sodium indicate a very big difference between low and high values and the data in tables 2 and 3 reveal the high effect of EC on ammonium nitrate extractable sodium. The highest value of extractable sodium exhibits the highest value of EC. Statistical analysis (Table 4) shows a highly significant negative correlation between extractable Na and PH (r = -0.350*) and highly significant positive correlation with each of EC (r = 0.938**) and O.M content (r=0.971**).

Table (1): Some physical and chemical properties of the studied soil profiles.

Prof. No.	Depth (cm)	Particle size distribution			Textural class	pH	EC ds/m	Organic matter %	$CaCO_3$ %
		sand	silt	clay					
1	0-25	74.2	13.2	12.6	Sandy loam	7.9	9.4	0.14	31.70
	25-50	90.4	4.3	5.3	Gravelly sand	7.7	27.5	0.07	18.60
	50-70	92.5	3.3	4.2	Gravelly sand	7.5	35.0	0.06	19.90
	70-110	93.3	2.7	4.0	Very gravelly sand	7.4	44.8	0.11	25.40
2	0-20	89.0	5.8	5.2	Very gravelly sand	8.0	4.3	0.07	29.7
	20-30	94.0	3.0	3.0	Gravelly sand	8.5	1.0	0.09	5.10
	30-47	93.2	2.4	4.4	Very gravelly sand	8.1	3.5	0.07	26.0
	47-110	91.8	3.6	4.6	Very gravelly sand	8.2	2.8	0.09	28.3
3	0-10	82.4	8.8	8.8	Gravelly loamy Sand	7.7	45.6	0.10	28.3
	10-50	95.1	2.4	2.5	Very gravelly and	7.7	54.2	0.12	21.9
	50-85	88.1	6.0	5.9	loamy sand	7.7	42.0	0.13	24.8
	85-110	91.2	4.3	4.5	Gravelly sand	8.0	30.5	0.12	22.9
4	0-9	94.6	2.6	2.8	Very gravelly sand	8.4	1.42	0.01	6.60
	9-26	95.1	2.4	2.5	Gravelly sand	8.5	1.50	0.01	8.20
	26-47	96.1	2.0	1.9	Very gravelly sand	8.8	1.20	0.01	4.30
	47-80	93.6	3.2	3.2	Extremely gravelly sand	8.0	1.54	0.01	8.20
	80-120	96.7	1.9	1.4	Very gravelly sand	8.7	1.75	0.01	2.90
5	0-10	94.7	3.1	3.2	Gravelly sand	8.7	2.2	0.02	8.4
	10-15	94.5	2.7	2.8	Very gravelly sand	8.9	0.62	0.03	7.4
	15-25	95.1	2.0	2.1	Very gravelly sand	8.9	0.76	0.02	8.2
	25-50	96.9	1.5	1.6	Gravelly sand	8.8	1.10	0.02	7.2
	50- 100	95.6	2.2	2.2	Very gravelly sand	8.1	1.06	0.01	5.3
6	0-10	94.1	3.0	2.9	Sand	7.9	10.4	0.02	6.40
	10-30	94.5	2.6	2.9	Sand	7.8	31.3	0.03	6.80
	30-60	94.3	2.8	2.9	Sand	7.5	44.9	0.03	6.60
	60-110	92.9	3.4	3.7	Sand	7.7	28.0	0.03	8.20
7	0-5	90.4	4.2	4.9	Sand	8.0	3.86	0.03	11.70
	5-18	95.8	2.1	2.1	Gravelly sand	8.1	2.6	0.02	8.00
	18-37	97.9	1.1	1.0	Very gravelly sand	7.4	18.2	0.02	5.80
	37-47	97.3	1.2	1.1	Sand	7.6	26.2	0.04	6.80
	47-60	98.4	0.9	0.7	Gravelly sand	7.5	20.0	0.04	3.90
	60-100	92.3	3.8	3.9	Sand	7.7	17.1	0.07	8.80
8	0-100	95.4	2.4	2.2	Very gravelly sand	7.0	206.0	0.80	1.60
	100-130	94.8	2.5	2.6	Extremely gravelly sand	7.5	210.0	0.10	3.50
	130-175	95.7	2.2	2.1	Extremely gravelly sand	7.8	51.5	0.11	2.30
	175-245	95.3	2.5	2.2	Very gravelly sand	7.8	33.4	0.04	1.40
	245-250	90.6	5.0	4.4	Extremely gravelly sand	7.5	42.7	0.01	2.70
	250-300	90.3	5.4	4.3	Extremely gravelly sand	7.7	25.6	0.06	1.40
9	0-20	92.7	3.6	3.7	Gravelly sand	7.8	25.0	0.05	14.60
	20-33	85.4	7.0	7.6	very gravelly loamy sand	7.4	50.0	0.12	8.20
	33-50	94.8	2.7	2.5	Extremely gravelly sand	7.3	30.7	0.07	3.30
	50-66	93.2	3.3	3.5	Very gravelly sand	7.2	26.1	0.05	3.00
	66-110	84.7	7.7	7.6	very gravelly loamy sand	7.3	78.8	0.16	6.80
10	0-40	85.3	7.4	7.3	Loamy sand	8.0	7.3	0.08	21.50
	40-50	66.9	17.5	15.6	Gravelly sand loam	7.3	6.65	0.09	5.80
	50-70	91.1	4.6	4.3	Gravelly sand	7.8	8.4	0.07	3.10
	70-110	89.0	5.4	5.6	Very gravelly sand	7.8	25.7	0.04	4.50

Table (2): Total contents of Ca^{++}, Mg^{++} and Na+, acid soluble Ca^{++} and Mg^{++} and extractable Na^{+} in the studied soil profiles.

Prof. No.	Depth (cm)	Total contents (ppm)			Acid soluble (ppm)		Extractable (ppm)
		Ca^{++}	Mg^{++}	Na^{+}	Ca^{++}	Mg^{++}	Na^{+}
1	0-25	7964	1955	2630	20.97	7.14	34.8
	25-50	6410	1068	4520	53.15	4.00	138.0
	50-70	6545	1168	4800	83.41	5.10	158.2
	70-110	6631	1300	5010	152.72	4.95	210.5
2	0-20	6810	1900	1620	10.12	4.5	7.50
	20-30	903	850	1220	6.84	4.15	3.60
	30-47	6650	1700	1530	13.13	3.57	4.22
	47-110	6790	1600	1590	11.12	4.10	4.95
3	0-10	6795	1600	4780	72.70	7.44	136.50
	10-50	6590	1168	5030	73.20	5.84	299.50
	50-85	6600	1700	4930	73.80	3.55	185.0
	85-110	6595	1180	4850	61.25	4.08	145.0
4	0-9	856	750	1510	7.50	4.40	3.95
	9-26	984	854	1670	4.61	5.15	4.50
	26-47	610	600	1520	4.95	3.95	3.85
	47-80	1010	990	1920	7.99	4.95	4.65
	80-120	600	526	1990	6.69	4.05	6.50
5	0-10	1478	1009	1670	7.85	1.36	4.70
	10-15	590	500	1520	3.65	1.15	2.65
	15-25	630	610	1640	3.85	1.05	3.10
	25-50	833	740	1540	4.75	1.15	3.15
	50- 100	590	495	1700	3.60	1.96	4.25
6	0-10	4990	1100	2700	12.60	1.53	34.70
	10-30	6200	1290	4700	25.40	1.26	166.50
	30-60	7100	4191	5300	33.20	2.49	219.5
	60-110	5805	2641	4400	29.80	4.36	120.80
7	0-5	4300	950	2200	9.83	1.46	15.50
	5-18	1100	1000	1800	4.63	1.21	8.00
	18-37	2700	1186	3000	15.26	1.30	53.50
	37-47	3930	1600	4200	27.95	3.27	91.50
	47-60	3000	1500	4100	21.70	2.50	72.50
	60-100	2550	1200	4250	20.50	3.06	81.50
8	0-100	11000	8500	9500	120.90	27.68	2500
	100-130	12000	9500	10000	144.80	29.00	3000
	130-175	7982	4200	5500	80.60	14.00	290
	175-245	5177	2550	5017	32.80	6.16	210
	245-250	6510	3110	6250	67.50	10.16	350
	250-300	3875	1500	4100	10.50	16.20	185
9	0-20	4875	1500	4470	22.50	1.40	131
	20-33	4750	4000	5000	81.50	9.20	247
	33-50	4650	1100	3800	56.90	8.16	71
	50-66	4030	1050	3650	50.60	3.90	67
	66-110	10000	5500	5300	107.12	19.34	310
10	0-40	6700	950	1800	22.12	1.59	8.52
	40-50	1030	640	1790	28.55	1.85	8.60
	50-70	1302	995	2000	21.60	1.30	14.95
	70-110	3985	1400	4400	33.95	1.90	130

Table (3): Exchangeable cations of Ca^{++}, Mg^{++} and Na^{+} of the Studied soil profiles.

Profile No.	Depth (cm)	Exchangeable cations (meq. / 100 g soil)		
		Ca^{++}	Mg^{++}	Na^{+}
1	0-25	18.00	4.90	2.15
	25-50	4.00	2.50	0.50
	50-70	4.15	2.35	0.85
	70-110	2.90	1.05	0.95
2	0-20	7.11	2.85	1.05
	20-30	3.55	2.23	0.98
	30-47	4.01	1.75	1.05
	47-110	6.25	2.12	0.55
3	0-10	9.95	4.80	1.05
	10-50	2.95	1.90	0.59
	50-85	7.71	3.01	1.06
	85-110	4.25	2.05	0.95
4	0-9	3.61	2.70	0.60
	9-26	2.29	1.65	0.35
	26-47	1.82	1.02	0.20
	47-80	4.73	1.25	0.21
	80-120	2.29	1.45	0.21
5	0-10	3.36	1.65	0.22
	10-15	3.81	1.00	0.21
	15-25	2.69	0.95	0.19
	25-50	3.09	0.90	0.32
	50- 100	3.65	1.20	0.40
6	0-10	4.90	1.95	0.85
	10-30	3.38	1.95	0.25
	30-60	3.75	1.85	0.30
	60-110	5.67	2.15	0.90
7	0-5	7.27	2.12	1.80
	5-18	2.97	1.10	0.26
	18-37	2.82	0.99	0.35
	37-47	2.27	0.95	0.80
	47-60	1.30	0.35	0.15
	60-100	4.31	2.21	1.10
8	0-100	2.76	1.15	1.05
	100-130	3.94	1.50	0.60
	130-175	3.10	1.45	0.95
	175-245	3.61	1.95	0.85
	245-250	6.15	2.55	0.51
	250-300	6.35	2.51	0.65
9	0-20	4.43	2.25	1.50
	20-33	9.52	3.90	1.95
	33-50	3.15	2.59	0.35
	50-66	4.19	1.30	1.02
	66-110	9.49	4.32	1.15
10	0-40	10.64	1.15	0.65
	40-50	27.00	4.00	1.85
	50-70	5.95	2.32	1.50
	70-110	9.04	2.10	0.12

Table (4): Simple correlation coefficient among soil properties and each of Calcium, Magnesium and Sodium status.

Parameter (Y)	Parameter (X)						
	PH	EC	O.M	$CaCO_3$	Clay	Silt	Sand
Total Ca	-0.608**	0.720**	0.604**	0.367*	0.221	0.166	-0.194
Exch. Ca	-0.253	-0.073	0.004	0.257	0.957**	0.976**	-0.973**
Sol. Ca	-0.591**	0.787**	0.636**	0.140	0.137	0.094	-0.115
Total Mg	-0.481**	0.921**	0.848**	-0.185	-0.004	0.000	0.002
Exch. Mg	-0.268	0.031	-0.002	0.396**	0.779**	0.750**	-0.765**
Sol. Mg	-0.426**	0.873**	0.820**	-0.193	0.023	0.048	-0.036
Total Na	-0.676**	0.879**	0.683**	-0.100	-0.035	-0.037	0.035
Exch. Na	-0.386**	0.112	0.137	0.339*	0.664**	0.633**	-0.656**
Sol .Na	-0.350*	0.938**	0.971**	-0.188	-0.128	-0.112	0.119

** Indicate significant at 1% probability level and * indicate significant at 5% probability level

The data indicate that the effect of EC on the values of total Mg, the same results were obtained by Abd Alla and Mohamed (2001). Statistical analysis (Table 4) shows a highly significant negative correlation between total Mg and PH (r =-0.481**) and a highly significant positive correlation with both of EC (r = 0.921**) and O.M (r = 0.848**).

REFERENCES

Abd Alla, A.M. and Nadia, A. Mohamed (2001): Status of calcium, Magnesium and sodium in some soils of El-Fayoum Gov. as related to their contents in certain grown plants. Fayoum J. Agric., Res.& Dev., Vol.15, No.2.

Abdel-Gaffar, M.,K.2004. Environmental geology of coastal soils, Southern Sinai, Egypt. Ph.D. Thesis, Faculty of Science, Cairo Univ.

Abdel Gawad, F.M. (1972): Physico-chemical studies on determination of some major and trace elements in relation to soil extracts. M.Sc. Thesis, Fac. of Sci., Cairo Univ., Egypt.

Asch, F.; Ding Kuhn, M.; Wittstock, C. and Doerffling, K. (1999): Sodium and potassium uptake of rice panicles as affected by salinity and season in relation to yield and yield components. Plant and soil, 207:133-145.

Cresser, M.; Killham, K. and Edwards, T. (1993): Soil chemistry and its applications. Printed in Great Britain at the Univ. Press, Cambridge.

Faithfull, N.T.(2002): Methods in Agriculture chemical analysis: A practical Handbook. CABI publishing , Wallingford xxii 266 pp.

Jackson, M.L. (1958). Soils Chemical Analysis. Prentice-Hall, Inc., Englewood, N. J., USA.

Nadia, F. El-Asser (1998): Chemical composition of natural vegetation as indicator response to desert soil reclamation. Egypt J. soil Sci., 38(1-4): 453-466.

Page, A.L.; Miller, R.H. and Keeney, D.R. (1982). Methods of Soil Analysis, Part 2. 2nd ed. Agronomy. Am. Soc. of Agron., Inc., Madison, Wis. USA.

Ranttan, L. (2006): Encyclopedia of soil science. 2nd Edition Vol.2. Avenne, New York. Taylor and Francis Group LLC.

Sawyer, J.E.(2003): Soil calcium : magnesium ratios Integrated crop management. P.40-42 of the IC.490(5). April, 21(2003)issue.

Tan, K.(2005): Soil sampling, preparation and analysis. Taylor and Francis Group. 6000 Broken sound parkway NW.

Walkley, A. and Black, C.A. (1947). A critical examination of a rapid method for determining organic carbon in soils. Soil Sci. 63:251-264.

حالة الصور المختلفة للكالسيوم والماغنسيوم والصوديوم فى بعض أراضى جنوب سيناء،مصر.

علاء الدين مراد عبد الله ، و مجدى حسن خضر ومجدى حسين رياض

معهد بحوث الأراضى والمياه والبيئه- مركز البحوث الزراعيه- الجيزه-مصر.

ترجع اهمية هذه الدراسة الى أن عنصر الكالسيوم هام جدا حيث انه يقوم بتدعيم خلايا النبات، أما عنصر الماغنسيوم فانه يدخل فى مكونات الكلوروفيل وكذلك النسب العالية من الصوديوم تؤدى الى تقليل معدل امتصاص البوتاسيوم والعناصر الغذائية الأخرى. ومن ثم يهدف هذا البحث الى دراسة حالة الأشكال المختلفة للكالسيوم والماغنسيوم والصوديوم فى فى بعض أراضى جنوب سيناء،. لذلك تمت دراسة صور كل عنصر فى الحالة الكلية والمتبادلة والذائبة فى التربة وعلاقتها بخواص التربة الكيميائية والطبيعية.

وقد أوضحت نتائج الدراسة أن نسبة الكالسيوم الكلية والمتبادلة والذائبة فى الحمض المخفف فى الأراضى تحت الدراسة تتراوح بين 590-12000 جزء فى المليون للكلى و 1.3-18 ملليمكافئ/ 100 جرام تربة للمتبادل و 4.61-152.72 ملليمكافئ/ لتر للذائب. كما وجد أن الكالسيوم الكلي يعتمد الى حد كبير على كربونات الكالسيوم و أن الكالسيوم المتبادل يتأثر بمحتوى التربة من الطين والسلت. ووجد أن القطاعان رقم 5، 6 اللذان يحتويان على أقل قيم من الكالسيوم الذائب كمتوسطات أيضا يحتويان على أقل قيم للتوصيل الكهربائى.

وتين الدراسة أن الماغنسيوم الكلي والمتبادل والذائب فى الحمض المخفف فى الأراضى المدروسة تتراوح كميتة فى التربة مابين 500-9500 جزء فى المليون للكلى و 0.35-4.95 ملليمكافئ/ 100 جرام تربة للمتبادل 1.05-29.0 جزء فى المليون للذائب.

وبالنسبة الى عنصر الصوديوم أوضحت الدراسة أن الصوديوم الكلي والمتبادل والمستخلص بأستخدام نترات الأمونيوم تتراوح كميتة فى التربة مابين1220-10000 جزء فى المليون للكلى و 0.15-2.15 ملليمكافئ/ 100 جرام تربة للمتبادل بينما الصوديوم المستخلص فكانت كميتة تتراوح مابين 2.65-3000 جزء فى المليون وهذا المدى الكبير بين أعلى وأقل قيمة يرجع الى الأختلاف فى نسبة التوصيل الكهربائى بين أعلى وأقل قيمة.

وأضحت نتائج التحليل الأحصائى أن يوجد أرتباط معنوى بين الصور المختلفة للكالسيوم والماغنسيوم والصوديوم وبين بعض خواص التربة .