*4.RESULTS AND DISCUSSION

4.1. Soil Chemical properties :-

The distance between Edko lake and the different sources of irrigation water may affect soil properties . Therefore it is important to study the chemical properties of water and properties of soils irrigated with such water sources.

The important chemical parameters studies in this study are soluble salts (EC) ; sodium adsorption ratio (SAR) ; individual distribution of soluble cations , and status of ion exchange .

4.1.1. Soil Reaction

In general , the pH values of the soils under consideration are sligtly alkaline and ranged between 7.55 and 8.8 . The pH mean values of soil profiles are in the ranges of 7.86-8.48 ; 7.63-8.47 ; and 7.78- 8.16 for the transects I, II and III as respectively . From these results, it is evident that the soil profiles of transect I have the highest mean values of pH. Although the difference of mean values of different transects are not significant.

4.1.2.Total soluble salts (ECe)

The total salts , as expressed by electrical conductivity (EC) , were measured in saturated soil past and the results are shown in (Table 3 and Fig . 1). The data show that , the mean values of total soluble salts are in the range of 5.05 to 16.17; 1.90 to 5.49 ; and 1.25 to 3.89 dSm^{-1} for the soil transects I, II and III as respectively . It is cleary evident from these data , the soil of

*4.RESULTS

Table (3): Total soluble salts and individual distribution of soluble cations and anions (measured in soil paste)

Transect I														
Prof. No	Soil Depth (cm)	Sp %	pH	EC dSm^{-1}	Anions, meq/l				Cations, me/l				SSP	SAR
					$CO_3^{=}$	HCO_3^{-}	CL^{-}	$SO_4^{=}$	Ca^{++}	Mg^{++}	Na^{+}	K^{+}		
1	0-30	81.00	7.95	8.61	-	3.31	66.56	17.93	8.80	12.56	66.00	0.44	75.19	20.20
	30-60	90.00	7.88	10.09	-	2.70	86.49	12.08	8.01	10.56	82.00	0.70	80.97	26.97
	60-90	83.00	7.75	18.05	-	1.70	156.46	25.08	10.59	20.95	150.00	1.70	81.86	37.78
	Mean	84.67	7.86	12.25	-	2.57	103.17	18.36	9.13	14.69	99.33	0.95	79.33	28.32
2	0-30	75.00	8.00	13.80	-	7.00	120.00	44.50	26.00	21.00	122.50	2.00	71.43	25.26
	30-60	76.00	8.40	16.70	-	4.10	115.00	100.70	26.00	22.00	168.50	3.30	78.67	34.39
	60-90	78.00	8.10	18.00	-	1.00	147.50	83.40	26.00	29.00	172.50	4.40	74.39	32.89
	Mean	76.33	8.17	16.17	-	4.03	127.50	76.20	26.00	24.00	154.50	3.23	74.16	30.85
3	0-30	58.00	8.50	3.20	-	1.00	20.00	11.32	7.00	3.00	22.00	0.32	68.07	9.84
	30-60	62.00	8.80	4.50	-	1.00	39.50	5.75	7.00	2.90	35.80	0.55	77.41	16.09
	60-90	73.00	8.00	7.50	-	1.20	65.50	9.16	8.00	7.00	60.20	0.66	79.36	21.97
	Mean	64.33	8.43	5.05	-	1.07	41.67	8.74	7.33	4.30	39.33	0.51	74.95	15.97
4	0-30	79.00	8.40	3.80	-	1.50	25.50	12.00	7.00	5.00	23.50	3.50	60.26	9.59
	30-60	72.00	8.50	6.00	-	0.80	30.00	19.24	11.00	4.50	34.20	0.34	68.35	12.30
	60-90	72.00	8.55	5.49	-	2.15	28.75	16.57	12.00	3.75	29.85	1.87	62.88	10.63
	Mean	74.33	8.48	5.10	-	1.48	28.08	15.94	11.33	4.41	29.18	1.90	63.83	10.84
5	0-30	83.00	8.20	7.70	-	1.10	66.50	11.29	8.00	10.00	60.00	0.89	76.06	20.00
	30-60	76.00	8.20	6.15	-	1.00	58.50	5.09	7.00	13.00	43.70	0.89	67.66	13.83
	60-90	76.00	8.20	7.20	-	1.20	60.50	11.59	9.00	13.20	50.20	0.89	68.50	15.07
	Mean	78.33	8.20	7.02	-	1.10	61.83	9.32	8.00	12.07	51.30	0.89	70.74	16.30

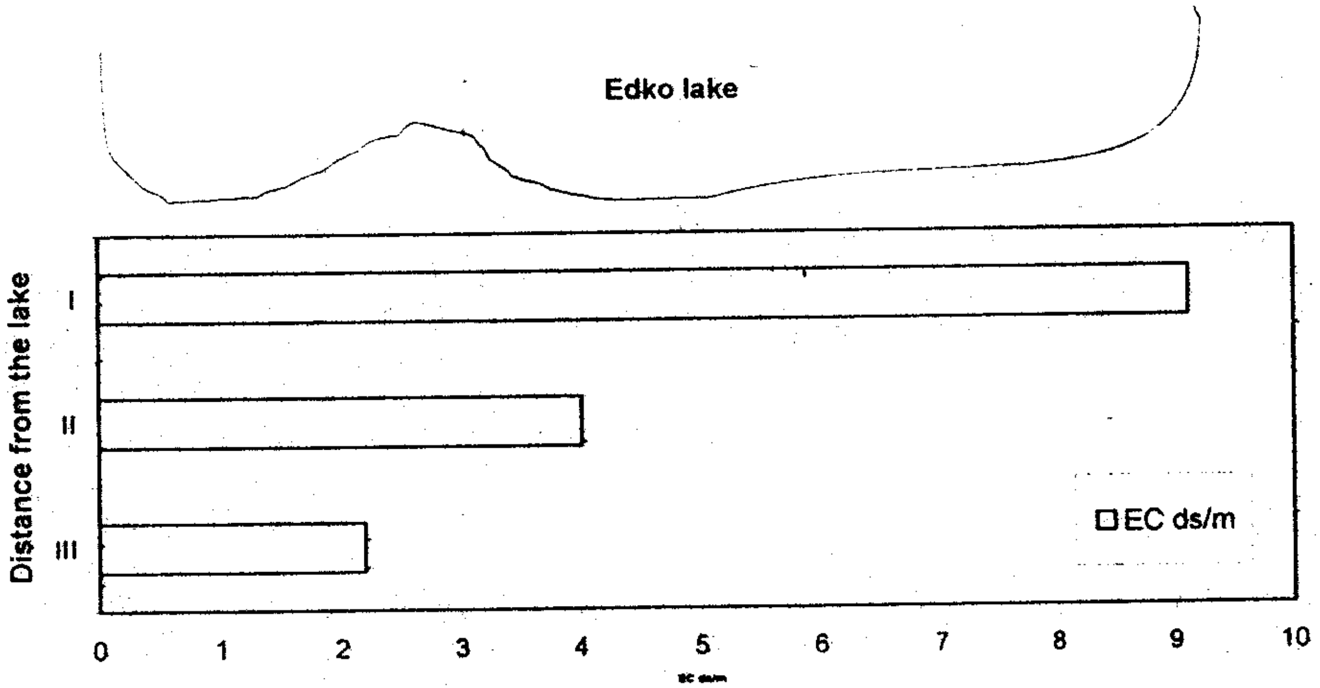

Fig. (1): General mean of soil salinity of the area of the study transect I has the hiegest values of total soluble salts , while the lowest ones are found in the soil transect III .

This distribution of total soluble salts of the soils under consideration is partly related to the distance from the Edko take and partly to the quality of irrigation water. The fathest the distance from lake and the highest the quality of irrigation water , the lowest are the total soluble salt values.

The distribution of soluble salts within soil profiles show two opposite patterns . The first pattern is represented by the nearer soil profiles to Edco lake i.e. the soil profiles of transects land II . In this distribution pattern , the total soluble salts are generally tend to increae at the deepest layers. This distribution pattern is most probably related to the higher level of saline water table in these soil The second opposite pattern is represented by the farthest soil profiles to Edko lake i.e. soil profiles of transect III. In this latter pattern the total soluble salts exhibit higher values at the surface rather than the deeper layers . This is mostly related to the lower level of water table and , upperword movement of soil water and active evapotranspiration.

4.1.3. Soil soluble Ions:-

The distribution of individual soluble cations of the investigated soils is shown in (Table 3 and Fig 2) Concerning the relative presence of the soluble cations , it is shown that the soluble sodium is the dominant soluble cations in all different profiles of transects under study . The souble sodium percentage

Table (3) :Cont.

Transect II														
Prof. No	Soil Depth (cm)	Sp %	p H	EC dSm^{-1}	Anions , meq/l				Cations ,me/l				SSP	SAR
					$CO_3^{=}$	HCO_3^{-}	CL^{-}	$SO_4^{=}$	Ca^{++}	Mg^{++}	Na^{+}	K^{+}		
6	0-30	80.00	7.75	3.47	-	4.00	19.44	12.61	6.72	8.80	20.00	0.53	55.48	7.18
	30-60	75.00	7.85	3.56	-	3.10	24.39	6.67	4.13	4.52	25.40	0.51	73.50	12.21
	60-90	96.00	8.15	4.89	-	3.10	35.22	9.40	6.37	7.02	33.83	0.50	70.84	13.07
	Mean		7.92	3.97	-	3.40	26.35	9.56	5.74	6.78	26.41	0.51	66.62	10.82
7	0-30	92.00	8.10	4.15	-	4.40	21.38	16.47	3.36	5.29	33.00	0.60	78.11	15.86
	30-60	96.00	8.15	4.55	-	3.30	28.67	12.80	2.32	4.80	37.00	0.65	82.64	19.61
	60-90	98.00	8.15	7.76	-	3.20	57.67	14.93	2.84	6.06	66.00	1.10	86.84	31.29
	Mean		8.13	5.49	-	3.63	35.97	14.77	2.84	5.38	45.33	0.78	82.53	22.25
8	0-30	85.00	7.95	5.80	-	3.20	22.81	32.41	8.52	6.74	43.00	0.19	73.57	15.57
	30-60	60.00	8.15	3.40	-	2.80	12.99	21.11	3.87	3.76	29.00	0.27	78.59	14.84
	60-90	50.00	8.10	3.09	-	2.72	17.01	12.40	4.91	2.47	24.50	0.26	76.23	12.75
	Mean		8.07	4.10	-	2.91	17.60	21.97	5.77	4.32	32.17	0.24	76.13	14.39
9	0-30	90.00	7.55	4.95	-	4.30	6.32	38.69	13.92	6.50	28.60	0.49	57.77	8.93
	30-60	75.00	7.70	4.45	-	1.65	6.32	38.86	25.05	12.59	8.60	0.59	18.36	1.98
	60-90	75.00	7.65	4.45	-	2.98	6.32	36.89	22.99	13.26	9.40	0.54	20.35	2.21
	Mean		7.63	4.62	-	2.98	6.32	38.21	20.65	10.78	15.53	0.54	32.16	4.37
10	0-30	77.00	8.50	1.50	-	0.80	7.50	6.70	3.00	2.50	8.90	0.60	59.33	5.36
	30-60	79.00	8.30	1.60	-	0.90	7.50	7.68	4.00	2.10	9.70	0.28	60.32	5.55
	60-90	77.00	8.60	2.60	-	0.70	15.00	10.07	10.20	4.98	10.30	0.29	39.97	3.75
	Mean		8.47	1.90	-	0.80	10.00	8.15	5.73	3.19	9.63	0.39	53.21	4.89

Table (3) : Cont.

Transect III														
Prof. No	Soil Depth (cm)	Sp %	p H	EC dSm^{-1}	Anions, meq/l				Cations ,me/l				SSP	SAR
					$CO_3^{=}$	HCO_3^-	CL^-	$SO_4^{=}$	Ca^{++}	Mg^{++}	Na^+	K^+		
11	0-30	88.00	7.85	1.62	-	4.00	9.23	5.46	6.46	3.46	8.40	0.39	44.90	3.78
	30-60	90.00	7.90	1.46	-	4.00	4.86	5.69	4.65	4.00	5.80	0.10	39.86	2.80
	60-90	85.00	8.00	1.02	-	3.90	6.37	1.80	4.13	1.46	6.40	0.08	53.02	3.83
	Mean	87.66	7.92	1.43	-	3.97	6.82	4.32	5.08	2.97	6.87	0.19	45.93	5.14
12	0-30	90.00	8.10	2.81	-	3.70	10.69	13.94	3.20	1.43	23.50	0.20	82.95	15.56
	30-60	988.00	8.25	3.20	-	3.31	9.72	19.72	4.13	2.99	25.50	0.13	77.86	13.56
	60-90	98.00	8.05	2.35	-	3.50	8.75	12.92	1.55	2.01	21.50	0.11	85.42	16.17
	Mean	95.33	8.13	2.79	-	3.50	9.72	15.53	2.96	2.14	23.50	0.15	82.08	15.10
13	0-30	56.00	7.95	1.52	-	4.10	5.83	7.66	5.42	3.73	8.20	0.23	46.64	3.84
	30-60	58.00	8.00	1.88	-	4.10	7.78	8.29	6.46	2.95	10.40	0.36	51.56	4.81
	60-90	60.00	7.98	1.77	-	4.10	7.29	7.14	6.20	2.15	9.85	0.33	53.16	4.83
	Mean	58.00	7.98	1.72	-	4.10	6.97	7.70	6.03	2.94	9.48	0.31	50.45	4.49
14	0-30	78.00	8.05	0.84	-	3.62	2.92	4.63	2.07	4.04	4.90	0.16	43.87	2.81
	30-60	83.00	8.15	1.41	-	4.25	4.37	8.05	2.07	3.02	11.40	0.19	68.35	7.16
	60-90	84.00	8.30	1.50	-	4.00	3.89	10.05	2.58	1.74	13.40	0.22	74.69	9.17
	Mean	81.66	8.16	1.25	-	3.96	3.73	7.58	2.24	2.93	9.90	0.19	82.30	6.38
15	0-30	90.00	7.75	4.33	-	4.10	10.20	29.19	9.04	10.04	24.00	0.42	55.17	7.78
	30-60	93.00	8.00	3.83	-	3.90	10.20	24.77	3.36	5.29	30.00	0.23	77.16	14.92
	60-90	98.00	8.10	3.51	-	3.12	9.23	22.99	2.84	4.28	28.00	0.22	79.23	14.89
	Mean	93.66	7.78	3.89	-	3.71	9.88	25.65	5.08	6.54	27.33	0.25	70.52	12.53

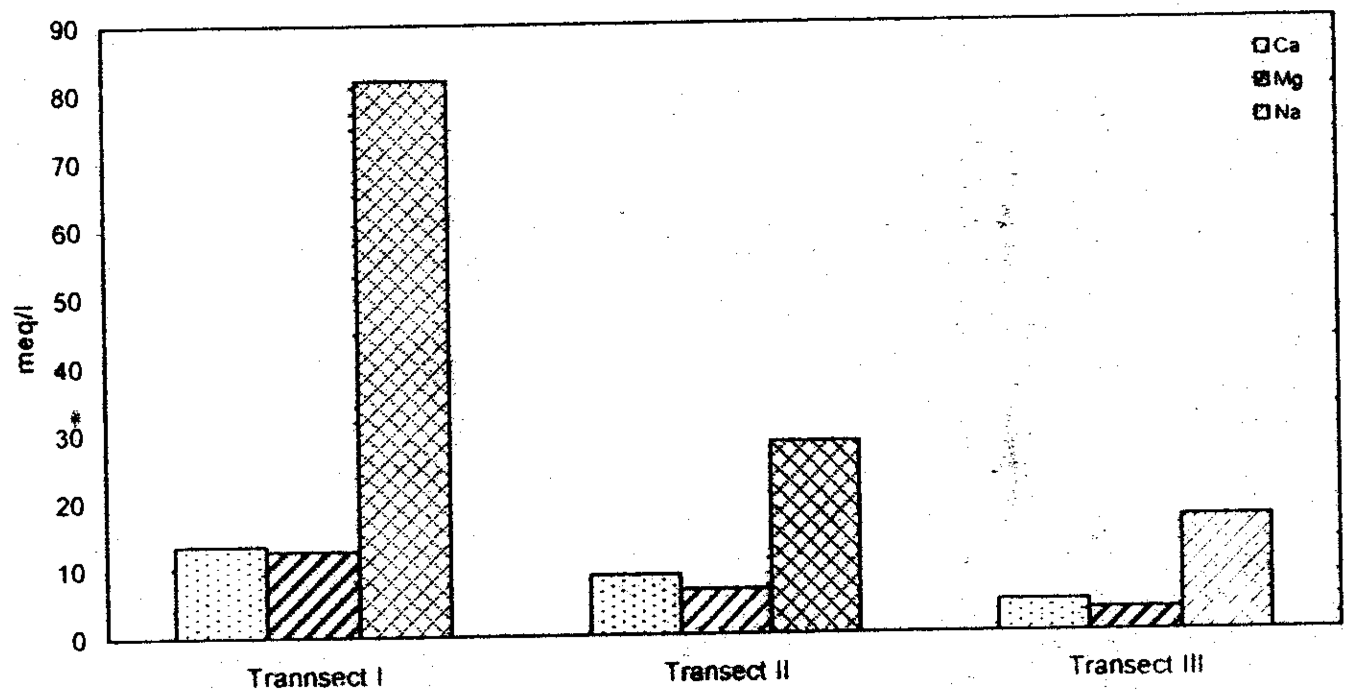

Fig. (2) : Soluble Ca++; Mg++ and Na+ asmeq/L.

(SSP) ranges between 63.8 –79.3 %; 32.2 –82.5 % and 45.9-82.1% for the mean soil profiles of transect I ; II and III, respectively.

The soluble sodium is the dominant soluble cations followed by soluble Ca and Mg , while the soluble K represents the lowest souble cation.

On the other hand , the SSP in most of the investigated profiles shows a tendency to increase with depth , This may be due to the effect of low quality of irrigation water especially at transect I and II which is rich in particulaity sodium and chloride ions.

Generally , the data reveal that , normal distribution of soluble cations in relation to the profile locations and / or the distance from the lake for the transect III , but these are not true in the second and first line in which the soluble cations increase gradually towards the lake shore . Also , all soluble cations tend to increase with increasing of drainage water ratio and reach their maximum values at the transect I the soils of which its are irrigated with a large portion of drainage water.

The distribution of soluble anions (Table 3) shows that , the soluble chloride is dominant followed by sulphate whereas the soluble bicarbonate always exhibit lower values . It seem that chloride follows the same distribution of the sodium ion indicating that it may be mostly in the form of sodium chloride. In the transect I which lie in the very northern part of the investigated area which is supposed to be affected by two factors

*, i.e., the saline lake water and low quality of its irrigation water. led to these factors an increase in the chlorde ions and hence the chloride ion predominates the other soluble anions.

From the previous results it is evidant that, the increasing of the portion drainage water in irrigation water affected the profiles location resulting in an appreciable increasing of soluble choloride and sulphate .

4.1.4. Sodium Adsorption Ratio (SAR)

The (SAR) values of the soils under investigation are shown in (Table 3 and Fig 3) . In general the (SAR) values of the soils randed between 1.98 and 37.78. The (SAR) mean values of soil profiles are in the ranges of 10.84-30.85 ; 4.37-22.25 ; and 4.49-15.10 for the transects I,II and III as respectively . It is clearly evident from these data that , the soil of transect I has the higest values of the sodium adsorption ratio, while the lowest ones are found in the soil transect III.

This distribution of (SAR) of the soil under consideration is partly related to the distance from Edco lake and partly to the quality of irrigation water.

4.1.5. Base Exchange

The general base exchange characteristics of the soil under consideration are shown in table (4). Data indicate that all the soil profiles under investigation are characterized by rather values of cation exchange capacity (CEC) , which ranged from 33.17 to 50.71 m.e./100 g soil . The exchange capacity of the

*4.RESULTS

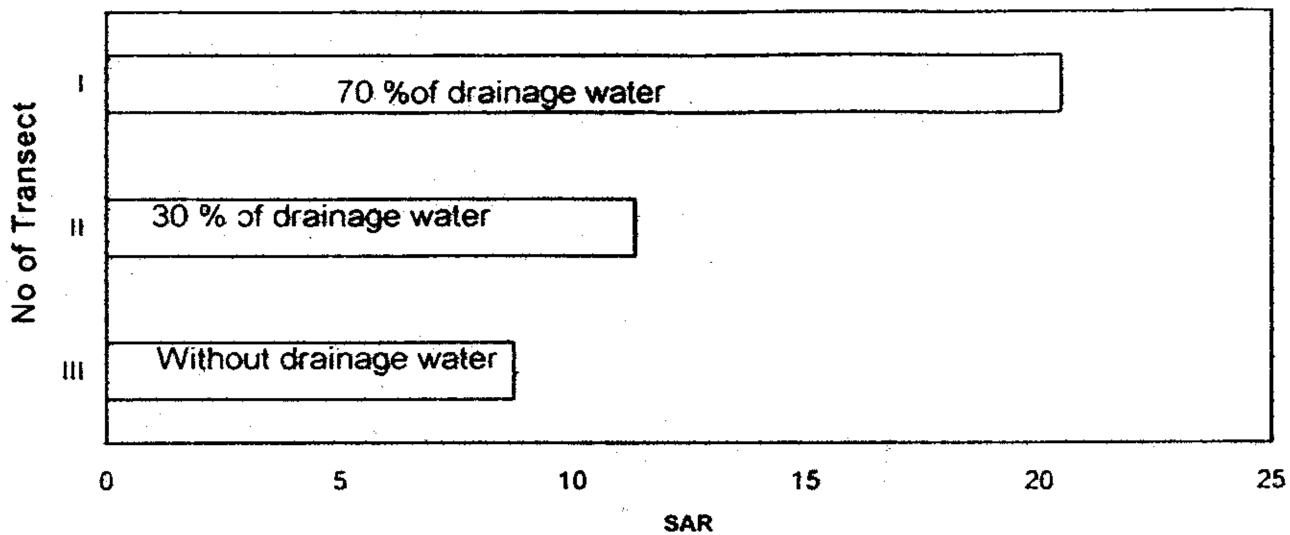

Fig. (3): General mean of SAR as affected by the distance from the lake and the quality of irrigation water.

Table (4):Cation exchange capacity and exchange cations of the investigated soils

Transect I

Prof. No.	Soil Depth (cm)	CEC me/100 g	m.e. /100 g soil				Exchangeable cations percentages			
			Ca^{2+}	Mg^{+2}	Na^{+}	K^{+}	Ca^{2+}	Mg^{+2}	Na^{+}	K^{+}
1	0-30	34.21	11.72	9.64	11.50	1.35	34.26	28.18	33.62	3.95
	30-60	35.43	13.28	9.38	12.90	1.87	37.48	26.47	36.41	5.28
	60-90	36.68	8.96	7.16	18.30	2.26	24.43	19.52	49.89	6.16
	Mean	35.44	11.32	8.73	14.23	1.83	32.06	24.72	39.97	5.13
2	0-30	35.21	6.26	13.60	13.75	1.60	17.78	38.63	39.05	4.54
	30-60	36.39	4.03	7.16	23.80	1.40	11.07	19.68	65.40	3.85
	60-90	37.52	2.53	7.44	26.30	1.25	6.74	19.83	70.10	3.33
	Mean	36.37	4.27	9.40	21.28	1.42	11.86	26.05	58.18	3.91
3	0-30	33.81	1.90	9.85	21.01	1.05	5.62	29.13	62.14	3.11
	30-60	34.55	1.85	9.25	21.70	1.75	5.35	28.77	62.81	5.07
	60-90	37.02	1.80	7.90	25.80	1.52	4.86	21.34	69.69	4.11
	Mean	35.15	1.85	9.00	22.84	1.44	5.28	25.41	64.38	4.10
4	0-30	33.95	2.12	8.60	21.85	1.38	6.24	25.33	64.36	4.06
	30-60	34.03	2.80	7.10	23.11	1.02	8.23	20.86	67.91	3.00
	60-90	36.11	2.46	7.85	20.60	1.20	6.81	21.74	57.05	3.32
	Mean	34.7	2.46	7.85	21.85	1.20	7.09	22.64	63.11	3.46
5	0-30	33.17	2.40	14.07	15.50	1.20	7.24	42.42	46.73	3.62
	30-60	34.26	1.90	13.70	16.86	1.80	5.55	40.00	49.21	5.25
	60-90	34.89	2.65	13.79	16.95	1.50	7.60	39.52	48.58	4.30
	Mean	34.11	2.32	13.85	16.44	1.50	6.84	40.65	48.17	4.39

Table (4) :Cont.

Transect II

Prof. No.	Soil Depth (cm)	CEC me/100 g	m.e. /100 g soil				Exchangeable cations percentages			
			Ca^{2+}	Mg^{+2}	Na^{+}	K^{+}	Ca^{2+}	Mg^{+2}	Na^{+}	K^{+}
6	0-30	38.92	12.66	18.26	7.4	0.6	32.53	46.92	19.01	1.54
	30-60	40.49	12.2	18.64	8.3	1.35	30.13	46.04	20.5	3.33
	60-90	44.15	12.26	21.96	8.5	1.45	27.77	49.74	19.59	3.28
	Mean	41.19	12.37	19.62	8.07	1.13	30.14	47.57	25.02	2.72
7	0-30	41.57	12.16	16.81	10.4	2.2	29.25	39.24	29.34	5.29
	30-60	41.92	10.14	16.6	12.3	2.88	24.19	39.6	28.8	6.87
	60-90	44.09	12.2	15.54	12.7	3.65	27.67	35.25	27.72	8.28
	Mean	42.53	11.5	16.32	11.8	2.91	27.04	38.03	21.89	6.81
8	0-30	40.58	12.8	17.12	8.8	1.86	31.54	42.19	21.89	4.58
	30-60	41.66	14.78	14.8	10.4	1.68	35.48	35.53	24.96	4.03
	60-90	45.26	14.58	15	14	1.68	32.21	33.14	30.93	3.71
	Mean	42.5	14.05	15.64	11.07	1.74	33.08	36.95	25.93	4.11
9	0-30	40.46	15.64	16.4	7.22	1.2	38.66	40.53	17.84	2.3
	30-60	40.6	16	13.67	9.76	1.17	39.41	33.67	24.04	2.88
	60-90	42.27	18.82	14.04	7.98	1.45	44.52	33.22	18.83	3.43
	Mean	41.11	16.82	14.7	8.31	1.27	40.86	35.81	20.24	2.87
10	0-30	40.06	11.33	14.7	12.25	1.78	28.28	36.69	30.58	4.44
	30-60	40.53	11.63	15.2	12.3	1.4	28.69	37.5	30.35	3.45
	60-90	41.12	10.82	16.9	11.9	1.5	26.31	41.1	28.94	3.65
	Mean	40.57	11.26	15.6	12.15	1.56	27.76	38.43	29.96	3.85

Table (4) Cont.

Transect III

Prof. No.	Soil Depth (cm)	CEC me/100 g	m.e. /100 g soil				Exchangeable cations percentages			
			Ca^{2+}	Mg^{+2}	Na^{+}	K^{+}	Ca^{2+}	Mg^{+2}	Na^{+}	K^{+}
11	0-30	45.12	27.76	14.84	1.76	0.76	61.52	32.89	3.90	1.68
	30-60	47.11	25.54	18.54	2.20	0.83	54.21	39.35	4.70	1.76
	60-90	47.51	24.94	19.34	2.40	0.83	52.49	40.70	5.05	1.75
	Mean	46.58	26.08	17.57	2.12	0.81	56.07	37.65	4.55	1.73
12	0-30	45.88	19.54	15.38	9.50	1.46	42.59	33.52	20.71	3.18
	30-60	47.85	20.68	15.92	9.90	1.35	43.22	33.27	20.69	2.82
	60-90	48.69	15.40	20.84	10.10	1.35	31.63	42.80	20.74	2.77
	Mean	47.47	18.54	17.38	9.83	1.39	39.15	36.53	20.71	2.92
13	0-30	45.82	20.60	15.06	8.50	1.66	44.96	32.87	18.55	3.62
	30-60	48.19	20.62	15.90	9.70	1.96	42.80	33.00	20.13	4.07
	60-90	50.71	22.36	16.59	9.94	1.31	46.00	32.72	19.60	2.58
	Mean	48.24	21.36	15.85	9.38	1.64	44.59	32.86	19.43	3.42
14	0-30	46.44	24.98	13.50	6.64	1.32	55.94	29.07	14.30	2.84
	30-60	49.22	24.74	17.62	5.40	1.46	50.26	35.80	10.97	2.97
	60-90	49.84	22.92	17.76	7.50	1.66	45.99	35.63	15.05	3.33
	Mean	48.50	24.21	16.29	6.51	1.48	50.73	33.50	13.44	3.05
15	0-30	45.14	21.06	13.66	8.50	1.91	46.65	30.26	18.83	4.23
	30-60	48.85	22.60	14.52	8.98	2.75	46.26	29.72	18.38	5.63
	60-90	49.25	25.33	14.12	7.62	2.18	51.43	28.67	15.47	4.43
	Mean	47.75	23.00	14.10	8.37	2.28	48.11	29.55	17.56	4.76

soils under consideration relate mainly to the great content of colloidal fractions namely clay and organic matter.

Within soil profile, the cation exchange capacity of the investigated soil profiles show no specific characteristics concerning the distribution pattern and tending to be slightly increased with depth within the soil profile. These results may reflect the ability and capacity of soil to adsorb and exchange different cations in significant amounts greatly varying according to their clay and organic matter contents.

The distribution of exchangeable cations percentages values in relation to the distance of the examined profiles from the lake shore and the quality of water used in irrigation show different patterns in the three studied transects.

The distribution of the exchangeable cations in regard to the profiles of transect I which are the nearest to the lake and receiving the lowest quality of irrigation water (Table 4 fig 4) show that relatively higher of exchangeable sodium percentage than soils of the other transects.

The order of the 3 main exchangeable cations percentages (Na , Mg , and Ca) in soils at transect I are as follows by Exchangable Na percent (E NaP) > exchangeable Mg percent (E Mg P) > exchangeable Ca percent (E Ca p), where the mean values of are 54.86 ; 27.89 and 12.62 me /100g respectively.The dominance of Na and Mg over Ca in the soil profiles of transect I, may be a direct results of the low quality of irrigation water and also to the possibility of the soils having been originally submerged under sea water.

A different trend was obtained concerning the exchangeable cation percentages at transect II (Table 4 Fig 4) The order of exchangeable cations are E Mg P > E Ca P > E Na P . These results may be attributed to the posibility of the profiles of having been originally submerged under sea water , as well as the low quality of irrigation water.

For the transect III , The data of (Table 4 and Fig 4) reveal that the priorety for the exchangeable calcium compared to other exchangeable cations. The order of exchangeable cations in the soils of transect III are : ECa P > E Mg P > E Na P . reflecting the good water quality for irrigation.

The data reveal that , dominant order of exchangeable calcium percentage is accompained with increasing the distance to the lake shore also with decreasing the mixing ratio of drainage water in this transect which have reflected in the low values of exchangeable sodium percentage. The data reveal that , in the soil's irrigated with canal irrigation water , the exchangeable calcium is generally the dominant cation.

In soils irrigated with low quality of irrigation water , the distribution of exchangeable cations is exchangeable sodium and magnesium , generally , are the dominant cations.

From the previous results it is evident that the values of exchangeable tend to gradually decrease with increasing of

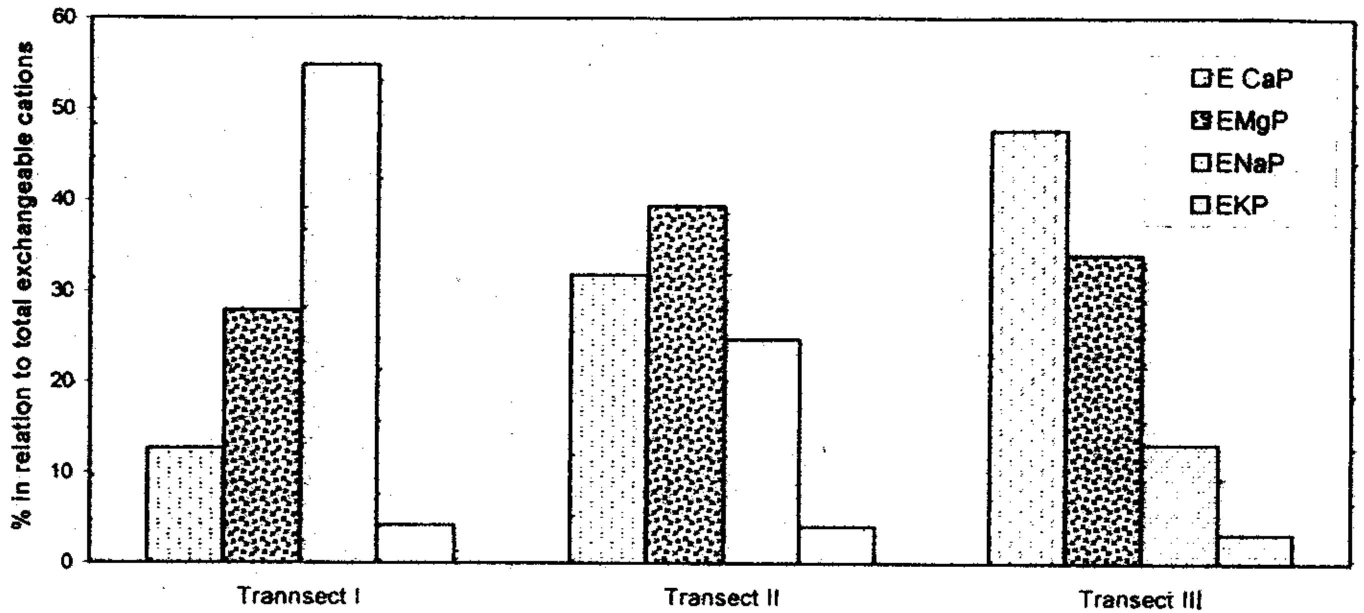

Fig .(4) General mean of exchangeable cations expressed as percentages of total exchangeable cations in soil profiles under investigation of Idko lake.

drainage water ratio , and the nearest profiles from the Edko lake.

4.2.Soil physical properties

4.2.1. Soil organic matter

From the data in Table (5) it is revealed that the soil organic matter content values are generally low , ranging between 0.36 % and 2.60 % throughout the whole soil profiles. The highest mean values of organic matter content are found in the transect III which shows the highest average of clay contents. The organic matter content values tend to be in order : Transect III >Transect II > T ransect I.

As the investigated soils lie in a semiarid climate , it is characterized by a low content of organic matter. which accumulates mainly the surface and decreases with depth. This distribution is found in all the studied profiles and iss due to the higher decomposition rate of organic matter . in such climate. The presence of relatively higher amounts of organic matter in the surface is due to the continuous additions of the organic manures and plant residues especially at transect III, The data of Table (5) reveal that the organic matter. distribution follows the same pattern as that of the clay content. It increases with increasing the clay content and vice versa. This result was in agreement with that of Kononova (1966) who attributed this relaion to the effect of the clay protecting the added organic matter from mineralization. This suggestion is clearified by the

Table (5): Particle size distribution , Calcium carbonate and organic matter contents of the investigated soils.

transect I								
Prof. No.	Soil Depth	Sand %		Silt %	Clay %	$CaCO_3$ %	OM %	Texture class
		Coarse	Fine					
1	0-30	1.20	18.14	25.06	55.64	6.80	1.02	Clay
	30-60	0.65	18.74	28.66	57.55	5.40	0.91	Clay
	60-90	0.64	12.54	32.42	59.05	5.00	0.82	Clay
	Mean	0.83	15.81	28.71	57.41	5.73	0.92	Clay
2	0-30	0.86	9.16	30.10	57.38	6.90	0.66	Clay
	30-60	0.86	9.15	32.22	59.36	5.96	0.42	Clay
	60-90	0.65	8.24	33.17	61.34	3.82	0.36	Clay
	Mean	0.79	8.85	31.16	59.36	5.56	0.48	Clay
3	0-30	0.56	18.22	24.11	55.11	6.30	1.23	Clay
	30-60	0.42	17.06	26.72	57.80	5.85	1.55	Clay
	60-90	0.40	14.25	26.63	60.72	5.60	1.33	Clay
	Mean	0.46	16.51	25.15	57.88	5.92	1.37	Clay
4	0-30	0.42	18.00	25.52	54.66	12.12	1.65	Clay
	30-60	0.36	17.22	27.34	55.18	7.25	1.54	Clay
	60-90	0.32	17.53	27.93	58.62	6.02	1.55	Clay
	Mean	0.37	17.58	26.60	56.15	8.46	1.58	Clay
5	0-30	0.44	18.56	26.12	52.88	10.39	1.87	Clay
	30-60	0.32	17.23	27.67	54.78	9.56	1.09	Clay
	60-90	0.30	17.90	30.11	54.83	8.22	1.48	Clay
	Mean	0.35	17.90	27.97	54.16	9.39	1.48	Clay

Table (5) : Con.

Transect II								
Prof. No.	Soil Depth	Sand %		Silt %	Clay %	$CaCO_3$ %	OM %	Texture class
		Coarse	Fine					
6	0-30	0.28	12.08	21.84	58.30	5.20	2.00	Clay
	30-60	0.24	12.82	25.68	65.26	5.20	1.90	Clay
	60-90	0.22	12.91	26.40	65.47	4.56	1.20	Clay
	Mean	0.25	12.60	24.64	63.01	4.99	1.70	Clay
7	0-30	0.25	8.89	23.37	66.49	3.90	2.23	Clay
	30-60	0.25	8.89	23.95	66.91	3.21	1.87	Clay
	60-90	0.15	5.26	24.43	71.16	3.06	1.40	Clay
	Mean	0.22	7.68	23.92	68.19	3.39	1.83	Clay
8	0-30	0.80	9.00	20.85	64.35	4.40	2.12	Clay
	30-60	0.77	8.93	24.25	66.05	3.90	1.82	Clay
	60-90	0.63	8.01	25.81	70.55	3.10	1.56	Clay
	Mean	0.73	8.65	23.64	66.98	3.80	1.80	Clay
9	0-30	0.73	10.61	24.87	62.79	4.50	2.06	Clay
	30-60	0.77	10.40	25.47	63.40	3.20	1.79	Clay
	60-90	0.70	9.51	26.67	65.12	2.86	1.58	Clay
	Mean	0.73	10.17	25.67	63.77	3.52	1.81	Clay
10	0-30	0.29	12.65	23.72	61.34	3.81	2.33	Clay
	30-60	0.22	12.44	25.51	62.83	3.42	1.99	Clay
	60-90	0.16	12.18	27.92	63.74	3.10	1.75	Clay
	Mean	0.22	12.42	25.72	62.64	3.38	2.02	Clay

Table (5) : Cont

Transect III								
Prof. No.	Soil Depth	Sand %		Silt %	Clay %	$CaCO_3$ %	OM %	Texture class
		Coarse	Fine					
11	0-30	1.33	12.37	17.74	62.46	5.40	2.07	Clay
	30-60	1.25	11.72	17.73	66.41	3.60	2.00	Clay
	60-90	1.16	11.06	16.38	67.33	2.50	1.92	Clay
	Mean	1.24	11.72	17.28	65.40	3.83	1.99	Clay
12	0-30	1.55	10.84	19.55	63.06	3.70	2.10	Clay
	30-60	1.44	9.74	19.19	67.63	3.70	1.76	Clay
	60-90	1.31	9.33	18.91	67.95	3.00	1.74	Clay
	Mean	1.43	9.97	19.22	66.21	3.47	1.87	Clay
13	0-30	1.64	8.71	22.10	64.15	5.00	2.35	Clay
	30-60	1.23	8.27	20.43	66.07	3.93	1.81	Clay
	60-90	1.13	7.98	18.30	68.59	2.70	1.46	Clay
	Mean	1.33	8.32	20.28	66.27	3.88	1.87	Clay
14	0-30	1.83	7.82	19.33	65.02	3.30	2.54	Clay
	30-60	1.73	6.95	17.58	68.69	2.40	2.32	Clay
	60-90	1.40	6.38	17.44	69.78	2.00	1.56	Clay
	Mean	1.65	7.05	18.12	67.83	2.57	2.14	Clay
15	0-30	1.73	7.21	20.87	63.19	3.20	2.60	Clay
	30-60	1.15	7.40	18.17	68.40	2.50	2.42	Clay
	60-90	1.10	6.51	17.43	68.96	2.35	1.75	Clay
	Mean	1.33	7.04	18.82	66.65	3.02	2.26	Clay

positive and highly significant correlation coefficient ($r=0.667^{**}$) between the organic matter . and the clay content of the investigated profiles.

4.2.2. Calcium Carbonate content

The calcium carbonate content (data in table 5) is generaly high value in all soil profiles of transect I comparing with the carbonate content values of transect II and III.

Also carbonate contents tend to be higher in soils near the lake than in soils far from the lake. Values were 3.82-12.12 % in transect 1 ; 2.86 - 5.20 % in transect II; and 2.00 –5.40 % in transect III.

Generally , the carbonate content tends to be higher in the surface layer rather than the deeper ones .

The data of (Table 5) reveal that the $CaCO_3$ content reaches its maximum value soils of in the surface layer of transect I the nearest one to the lake. This may have been due to the presence more shell fragments in these soil as affected by the lake also the proximity of the transformation of soluble calcium bicarbonate, (usually found in irrigation water and soil solution) to calcium carbonate **(Zein El Abedine et al , 1964).**

4.2.3. Particle size distribution

The mechanical analysis is the methoid of determining the amounts at various separates in the soil. Data in Table (5) show the detailed textural classes of various soil profiles under study , the textural classes of all soil profiles under investigation are clay and clay content ranged from 52.88 to 71.16 % . Generally fraction ranged between 9.64 and 18.25 ; 7.90 and 12.85 ; 9.70 and 12.96 for transect I ; transect II and transect III , respectively . Ranges of content, of silt in the 3 transects were 24.11 to 33.17 % ;21.08 to 27.92 ; and 16.38 to 22.10 % for transects I , II and III respectively.

Generally , the silt fraction content tend to increase with depth throught the different soil profiles under study . Clay fraction represents the major content for all soils under study and ranges between 57.0 % to 66.5% as a mean value , the relativly lowest values of clay content are found in the soil profiles at transect I which the nearest to Edko lake shore. For transect III which is the farthest from the lake shore , the highest values of clay content > (66.5 %) are found in soil profiles of transect III.

Similar results were reported by **El Naggar ,(1986) ; Toukhy (1987)** and **Fayed (1988)** who reported that contents of clay particles increased in soils of North of the Delta than those south of it.

4.2.4. Soil aggregates and aggregate size distribution

Both water retention and workability of soil depend to a large extent, upon the basic texture of the soil. Soil structure can be evaluated by determining the extent of aggregation , stability of the aggregates , and the natuer of the pore space. These characteristics change with tillage practices and cropping systems. They play a significant role in affecting water -soil - plant relationships (**Baver et al ,1976**)

4.2.4.1. Total stable aggregates (T S A)

Maintenance of soil stability is an important aspect of agricultural management . Poor aggregate stability ; clay dispersion and low infiltration are often aggravated in arid soils by chemical conditions such as high exchangeable Na.

The stability of structure refers to the resistance of soil aggregate to disintigrate by water and / or mechanical manipulation .

The aggregate size distribution , total stable aggregate (TSA) or aggregat stability state and aggregation indices , i.e. mean weight diameter (MWD) ; coarse aggregate percentage (CAP) ; medium aggregate percentage (MAP) and fine aggregate percentage (FAP) of different soil profiles under consideration are shown in (Table 6).

The mean values of aggerate state , i.e. the total stable aggregates between a minimum of 35.26 in profile 3 of transect I and a maximum of 81.12 in profile 15 of transect III. The investigated profiles varied in their total stable aggregate depending on their distance from the lake shore and the quality of water used in irrigation . transect I , the total stable aggregate (TSA) show a decreasing tendency since the profiles are more closer to the lake compared to other transects, that are far from the lake shore. These results indicate that , with the increase in soil salinity a decrease in aggregate stability. A verage EC of soils of transect I was 9.12 dSm^{-1} with (TSA) of 42.22 % ; average EC of soils of transect III was 2.22 dSm^{-1} with TSA of

Table (6) : Aggregate state ; distribution and aggregation indices of the investigated soils.

Transect I												
No.	Profile Depth (cm)	Soil	Aggregate size distribution					Aggregate Indices				FAP
		8–2 mm	2–1 mm	1-0.5 mm	0.5-0.25 mm	0.25-0.125 mm	0.125-0.063 mm	T.S.A	MWD	CAP >1.0 mm	MAP 1-0.25 mm	< 0.25 mm
1	0-30	3.82	6.74	8.89	8.78	9.55	5.73	43.21	0.41	24.44	40.89	35.36
	30-60	3.40	7.64	8.68	10.28	10.01	6.06	46.06	0.41	23.97	41.18	34.87
	60-90	4.80	9.60	10.85	10.91	12.05	7.23	35.46	0.54	25.96	39.24	34.76
	Mean	4.01	7.99	9.47	9.99	10.54	6.34	48.24	0.45	24.12	40.43	35.00
2	0-30	3.57	7.68	8.03	10.87	8.93	5.36	44.44	0.42	25.32	42.53	32.16
	30-60	1.63	4.36	3.66	7.50	10.75	3.95	31.85	0.23	18.81	35.04	46.15
	60-90	1.50	3.65	5.25	6.85	11.46	4.26	32.97	0.22	15.62	36.70	47.68
	Mean	2.23	5.23	5.65	8.41	10.38	4.52	36.42	0.29	19.92	38.09	42.00
3	0-30	2.68	6.22	10.17	8.98	4.66	4.02	36.73	0.34	24.23	52.14	23.63
	30-60	1.60	4.88	8.51	6.30	10.17	3.64	35.10	0.26	18.46	42.19	39.34
	60-90		3.67	6.86	7.12	9.20	5.51	33.94	0.23	15.47	41.19	43.34
	Mean	1.95	4.92	8.51	7.47	8.01	4.39	35.26	0.28	19.39	45.17	35.44
4	0-30	3.42	6.67	7.95	7.90	8.55	5.13	39.62	0.38	25.47	40.01	34.53
	30-60	2.36	4.75	6.35	9.50	5.69	8.90	37.55	0.29	16.73	42.21	38.85
	60-90	5.76	9.52	9.96	11.73	5.12	8.64	50.73	0.57	30.12	42.76	27.12
	Mean	3.85	6.98	8.09	9.71	6.45	7.56	42.63	0.41	27.84	41.66	33.50
5	0-30	4.23	10.12	9.10	10.50	12.50	6.30	52.70	0.50	27.23	37.19	35.67
	30-60	3.81	7.62	9.05	9.90	9.53	7.84	47.75	0.43	23.94	39.69	36.38
	60-90	4.10	6.97	7.64	9.54	10.05	6.90	45.20	0.43	24.49	38.01	37.50
	Mean	4.05	8.24	8.60	9.98	10.69	7.01	48.55	0.45	25.22	38.30	36.52

TSA : total stable Aggreagate ; MWD : mean weight - diameter ; CAP : Coarse aggregate percent;

MAP : medium aggregate percent ; FAP : fine aggregate percent.

Table (6) : Con.

Transect II												
No.	Profile Depth (cm)	Soil 8–2 mm	Aggregate size distribution 2–1 mm	1-0.5 mm	0.5-0.25 mm	0.25-0.125 mm	0.125-0.063 mm	Aggregate Indices T.S.A	MWD	CAP >1.0 mm	MAP 1-0.25 mm	FAP < 0.25 mm
6	0-30	9.98	10.38	12.94	11.65	9.57	5.52	69.04	0.82	33.91	40.96	25.13
	30-60	9.08	12.53	10.29	11.49	10.92	8.31	63.04	0.79	34.28	34.55	30.50
	60-90	10.43	14.83	8.06	11.89	11.75	8.94	65.90	0.88	38.33	30.27	31.40
	Mean	9.83	12.53	10.43	11.68	10.75	7.59	62.99	0.83	35.51	35.26	29.01
7	0-30	7.19	9.86	8.49	12.09	11.94	4.95	54.52	0.64	31.27	37.75	30.98
	30-60	7.82	8.43	9.89	10.59	13.67	5.18	55.58	0.66	29.24	36.85	33.92
	60-90	8.13	11.33	10.31	12.55	12.69	5.01	60.02	0.73	32.42	38.09	29.49
	Mean	7.71	9.87	9.56	11.74	12.77	5.05	56.71	0.68	30.98	37.56	31.46
8	0-30	9.28	7.01	11.53	11.40	10.99	5.32	55.53	0.72	29.34	41.29	29.37
	30-60	10.28	9.81	12.36	11.26	9.71	6.40	59.82	0.82	33.58	39.49	26.93
	60-90	10.14	10.20	13.01	10.66	9.57	6.20	59.80	0.82	34.01	39.58	33.83
	Mean	9.90	9.01	12.30	11.11	10.09	5.97	58.38	0.79	32.31	40.12	30.04
9	0-30	9.91	10.19	4.68	11.49	13.56	6.50	61.35	0.80	32.76	34.51	32.73
	30-60	9.50	12.93	11.68	12.61	13.81	5.93	66.46	0.83	33.75	36.55	29.70
	60-90	10.30	12.66	12.80	12.00	13.22	5.20	66.18	0.87	34.82	36.78	28.41
	Mean	9.90	11.93	11.39	12.03	13.54	5.88	64.66	0.86	33.78	35.95	30.28
10	0-30	8.68	10.08	7.33	11.31	10.62	5.20	53.22	0.71	35.25	35.02	29.73
	30-60	8.87	10.54	9.57	10.88	9.15	6.58	55.59	0.74	34.92	36.79	28.30
	60-90	11.56	9.34	9.99	10.65	5.12	6.66	53.32	0.85	39.20	38.71	22.71
	Mean	9.70	9.99	8.96	10.95	8.30	6.15	54.71	0.77	36.46	36.84	29.50

Table (6) : Con.

Transect III												
No.	Profile Depth (cm)	Soil	Aggregate size distribution					Aggregate Indices				FAP
		8--2 mm	2--1 mm	1- 0.5 mm	0.5-0.25 mm	0.25-0.125 mm	0.125-0.063 mm	T.S.A	MWD	CAP >1.0 mm	MAP 1-0.25 mm	< 0.25 mm
11	0-30	14.17	13.17	17.89	14.80	7.59	5.06	72.68	1.11	37.62	44.98	17.41
	30-60	15.69	14.12	17.26	15.17	7.85	5.23	75.32	1.20	39.56	43.06	17.34
	60-90	16.56	17.57	20.07	18.93	8.06	6.76	87.95	1.30	38.81	44.34	16.85
	Mean	15.47	14.95	18.41	16.30	7.83	5.68	78.65	1.21	83.67	44.13	17.20
12	0-30	12.12	11.47	13.39	9.99	4.89	3.26	55.12	0.93	42.80	42.42	14.79
	30-60	10.12	9.42	11.51	10.12	4.88	3.49	49.54	0.78	39.44	43.66	16.90
	60-90	12.36	11.52	14.48	11.59	5.62	3.66	59.23	0.96	40.32	44.01	15.67
	Mean	11.53	10.80	13.13	10.27	5.13	3.47	54.63	0.89	40.85	43.36	15.79
13	0-30	14.98	12.87	17.07	13.35	8.02	5.35	71.66	1.13	38.86	42.45	18.66
	30-60	17.58	15.46	19.58	14.12	8.57	6.12	81.43	1.33	40.57	41.39	18.04
	60-90	19.16	16.17	19.60	13.74	9.86	7.03	85.56	1.42	41.29	38.97	19.74
	Mean	17.24	14.83	18.75	13.74	8.82	6.17	79.55	1.29	40.24	40.94	18.81
14	0-30	15.17	14.09	17.34	15.17	7.58	5.42	64.35	1.18	42.19	46.88	18.75
	30-60	16.02	14.87	18.30	16.59	8.58	5.75	80.11	1.24	38.56	43.55	17.89
	60-90	16.94	15.73	19.36	16.94	8.47	6.05	83.49	1.31	39.13	43.48	17.39
	Mean	16.04	14.90	18.33	16.23	8.21	5.74	77.65	1.24	39.96	40.64	18.01
15	0-30	15.54	14.43	17.76	16.23	8.33	5.55	75.15	1.20	39.88	41.65	18.47
	30-60	17.00	15.86	19.52	17.08	8.54	6.10	84.10	1.32	39.07	43.52	17.41
	60-90	17.05	15.83	19.40	17.00	7.92	6.90	84.10	1.32	39.10	43.28	17.62
	Mean	16.53	15.37	18.81	15.87	8.26	6.18	81.12	1.32	39.35	42.82	17.83

74.32 %. This was noticed in both the surface and subsurface soil layers.

Generally , data revel that the amount of total stable aggregates is greater in the soil of transect III than that of transect I . Transect III shows mean values of 67.79 % and 80.07 % in the surface and the deepest layers, respectively , whereas the transect I show mean values of 43.29 % and 39.66 % for the surface and deepest layers respectively . This pattern distribution is parallel to that of clay and organic matter as well as soluble and exchangeable calcium and magnesium . It may be concluded that the greater total stable aggregate content is usually accomponied by the presence of relatively greater clay and organic matter content with a greater soluble and exchangeable calcium and magnesium and lower soluble and exchangeable sodium . With respect to the different soil profiles of each type of irrigation water , the results show that the highest values of sodium adsorption ratio (SAR) of (20.46 , 11.34 and 8.73 are in correspondence with the values of aggregate stability (TSA) of (42.22 ,59.49 and 74.32) for the of transect I , transect II and transect III , respectively. Therefore high (SAR) corresponds to low (TSA) The same trend is obvious for the relation between total stable aggregate (TSA) and exchangeable sodium percent (ESP) . Thus the mean values of exchangeable sodium percent for profiles of transects I,II and III were 54.8 , 24.69 and 15.14 % respectively and coincided to the values of aggregate stability of : 42.22 ; 59.49 and 74.32 % for the transect I,II, and III , respectively.

*From the previous discussion it is noticed that , the differences due to locations of profiles , are reflected in aggregation due to effects of total soluble salts , soluble sodium , soluble magnesium , cation exchange capacity exchangeable cations and content of clay +silt.

The statistical data Table 7 and Fig.5 indicate that there are highly significant possitive correlations between total stable aggregate, (TSA) and each of CEC ($r=0.871^{**}$) , exchangeable calcium ($r=0.923^{**}$) , exchangeable magnesium ($r=0.679^{**}$) , clay content ($r=0.743^{**}$) and organic matter content ($r=0.673^{**}$).

On the other hand ,negative correlations were obtained between stable Agrregates (TSA) and each of soil salinity EC ($r=-0.645^{**}$) , soluble sodium ($r=-0.619^{**}$) , SAR ($r=-0.638^{**}$) , exchangeable sodium ESP ($r=-0.893^{**}$) , silt content ($r=-0.810^{**}$) and $CaCO_3$ % ($r=-0.638^{**}$) .

Regression equations were obtained using the multiple regression analysis relating TSA with (clay , silt , organic matter "O.M.), and ($CaCO_3$) , :- and which are fromulated as follows:

% TSA = 38.88 +1.03 clay −1.87 silt % with $R^2 = 0.500$

.% TSA= 38.24+19.12 O.M. % - 2.47 $CaCO_3$ % with $R^2 = 0.527$.

Concerning the involving dealing the soil salinity , the multiple regression equation as follow:

% TSA = 73.59-1.38 EC −0.58 SAR , with $R^2 = 0.619$

For the cation exchange capacity (CEC) and exchangeable cation percentage , exchangeable sodium percent

*4.RESULTS

Table (7) : Values of correlation coefficient(r) relating aggregate stability indices and some of different soil parameters.

	8--2 mm	2--1 mm	1-0.5 mm	0.5--0.25 mm	0.25-0.125 mm	0.125-0.063 mm	T.S.A.	MWD	CAP >1.0 mm	MAP 1-0.25 mm	FAP < 0.25 mm
(a) Soil salinity parameters (in the soil paste extract)											
EC	-0.714**	-0.686**	-0.645**	-0.590*	-0.316	-0.111	-0.645	-0.703**	-0.765**	-0.281	-0.772**
Cl^-	-0.737**	-0.687**	-0.648**	-0.606**	-0.348	-0.093	-0.671	-0.789**	-0.789**	-0.218	-0.769**
Ca^{++}	-0.483	-0.449	-0.500**	-0.426	-0.207	-0.052	-0.433	-0.539*	-0.539*	-0.397	0.616*
Mg^{++}	-0.563*	-0.480	-0.536*	0.427	-0.125	-0.028	-0.465	-0.625**	-0.625**	-0.414	-0.699**
Na^+	-0.658**	-0.641**	-0.594*	-0.554*	-0.228	-0.240	-0.619	-0.717**	-0.717**	-0.209	-0.708**
SSP	-0.42	-0.476	-0.341	-0.428	-0.341	-0.299	-0.475	-0.372	-0.372	0.172	0.278
SAR	-0.667**	-0.657**	-0.580*	-0.574*	-0.304	-0.291	-0.638	-0.882**	-0.682**	0.107	0.638**
(b) Cation exchange capacity and exchangeable cations percentage											
	8--2 mm	2--1 mm	1-0.5 mm	0.5--0.25 mm	0.25-0.125 mm	0.125-0.063 mm	T.S.A.	MWD	CAP >1.0 mm	MAP 1-0.25 mm	FAP < 0.25 mm
CEC	0.951**	0.878**	0.888**	0.821**	0.740**	-0.206	0.871**	0.943**	0.928*	0.328	-0.933**
ECaP	0.945**	0.920**	0.916**	0.915**	0.844**	-0.108	0.923**	0.949**	0.885**	0.306	-0.891**
EMgP	0.708**	0.724**	0.523*	0.595*	0.519*	0.008	0.679**	0.705**	0.821**	-0.267	-0.648**
ESP	-0.857**	-0.908**	-0.774**	-0.856**	-0.787**	-0.068	-0.893**	-0.881**	-0.882**	0.006	0.784**
(c) Soil separatesparameters contents of sand; silt ; clay organic matter (OM); and $CaCO_3$											
	8--2 mm	2--1 mm	1-0.5 mm	0.5--0.25 mm	0.25-0.125 mm	0.125-0.063 mm	T.S.A.	MWD	CAP >1.0 mm	MAP 1-0.25 mm	FAP < 0.25 mm
Silt %	-0.868**	-0.822**	-0.880**	0.791**	-0.629**	0.099	-810**	-0.864**	-0.852**	0.515*	0.941**
Clay %	-0.805**	0.693**	0.685**	0.689**	0.649**	-0.302	0.734**	0.792**	0.799**	0.121	-0.726**
aCO_3	-0.720**	-0.629**	-0.592*	-0.597*	-0.592*	0.406	-0.638**	-0.707**	-0.717**	-0.103	0.656**
O.M. %	0.661**	0.755**	0.630**	0.625**	0.367	0.199	0.673**	0.697**	0.757**	0.194	-0.734**
Sand %	-0.098	-0.029	0.145	-0.745**	-0.132	0.279	-0.073	-0.084	-0.132	0.528	-0.113

TSA: total stable aggregate ; MWD :mean weight - diameter; CAP: coarse aggregate percent MAP : medium aggregate percent ' FAP : fine aggregate percent.

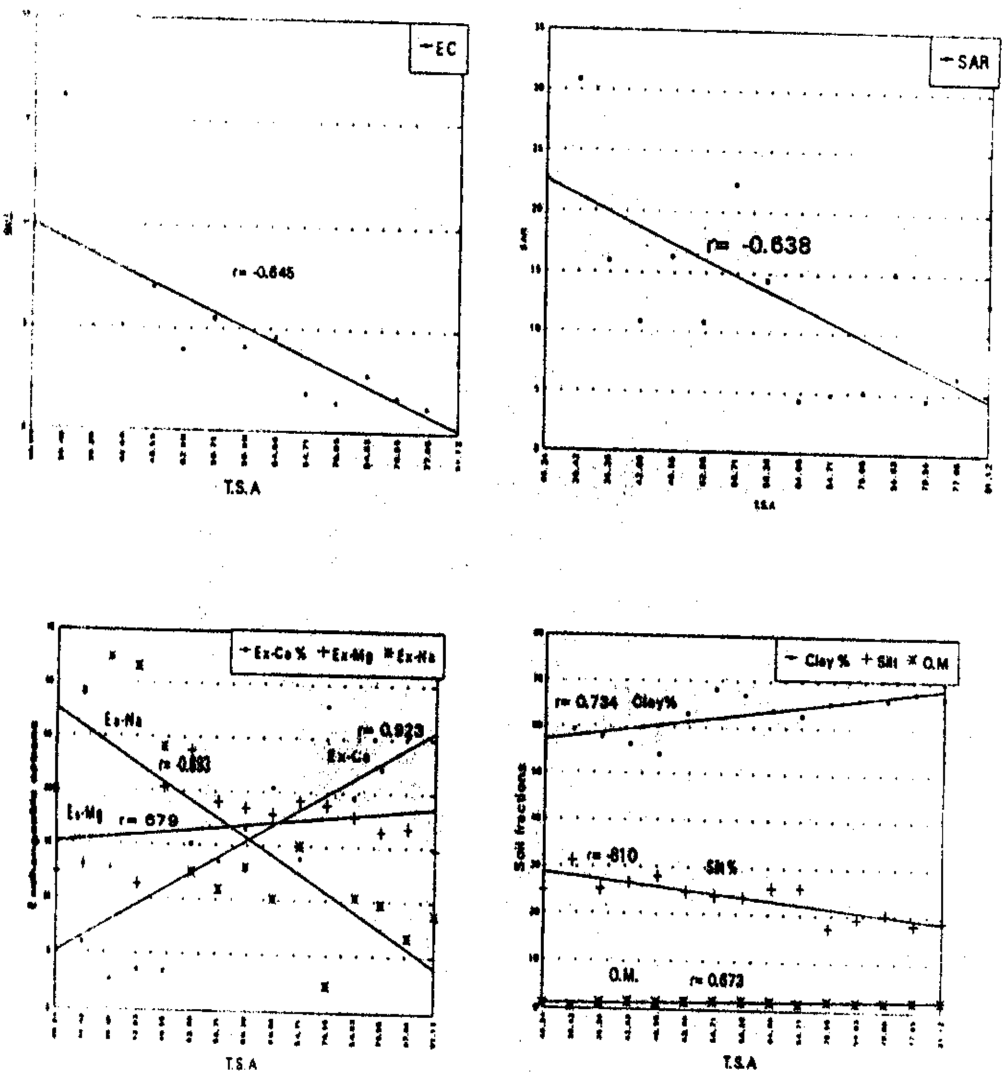

Fig (5)Relationship between total stable aggregates (TSA) and different soil parameters

(ESP) , exchangeable calcium percent (ECa P), and exchangeable magnisium percent (Emg P) the regression analysis shows the following equation :

$$\% TSA = - 12.43 + 0.18 CEC + 1.65 E Ca P. \text{ with } R^2 = 0.846$$

$$\% TSA. = -45.53 +2.32 CEC +0.054 EMg P. \text{ with } R^2 = 0.757$$

$$\% TSA. = 51.57 +1.28 CEC - 3.76 ESP \quad \text{ with } R^2 = 0.846.$$

4.2.2.2.Mean Weight Diameter (MWD) :

Data in Table (6) and Fig (6) represent the mean weight diameter (MWD) values in the investigated soil profiles . The study of the data show that:

Mean of (MWD) for profiles show ranges of 0.28 –0.45 with a an averall mean value of 0.38 for transect I , 0.68- 0.86 with an averall mean value of 0.79 for transect II , and 0.89-1.28 with an averall mean value of 1.18 transect III . Moreover , it was found that the MWD was greater in the subsurface layers than in the surface ones in most of the studied profiles , specially those of transect II and III.

The previous results indicate that the MWD was greater in the more heavy textured soils of transects II , III compared to those of transect I . Such trends are observed in the three studied transects and could be explained in relation to the distance from the Edko lake shore , it can be generally concluded that the MWD values being low in the profiles that are more close to the lake shore and vice versa.

Dealing with MWD values in relation to the quality of irrigation water it is obvious that the MWD values are high in the profiles under irrigation with high water quality such as those of transect III . Medium MWD values occurred with the profiles irrigated with medium water quality (transect II) and finally low values of MWD for profiles in transect I where the soils are irrigated with water of poor quality.

The statistical analysis (Table 7) indicate that there are a highly significant positive correlation between the MWD and each of clay content ($r=0.792^{**}$), organic matter content ($r= 0.694^{**}$), cations exchange capacity ($r = 0.871^{**}$), exchangeable calcium percent ($r= 0.949^{**}$) and exchangeable magnesium percent ($r=0.679^{**}$) . On the other hand the MWD values exhibited highly significant negative correlations with each of silt content ($r=-0.864^{**}$) , EC , ($r=-0.703^{**}$), soluble sodium percent ($r=-0.655^{**}$), SAR ($r=-0.638^{**}$), $CaCO_3$ % ($r= -0.707^{**}$) , exchangeable sodium, ($r=-0.893^{**}$) as well as a significant negatively corrleation with soluble magnesium ($r=-0.543^{*}$)

Regression equations relating MWD with contents of clay, silt , organic matter "OM" and $CaCO_3$ were developed using multipl regression analysis as follow :

MWD = 0.16 +0.027 clay % -0.045 silt % ; with R^2 0.806

MWD = 0.37 +0.44 O.M. % -0.07 $CaCO_3$ %; with R^2 = 0.600

Concerning the relation dealing with the main paramters of soil salinity , the regression equation is:

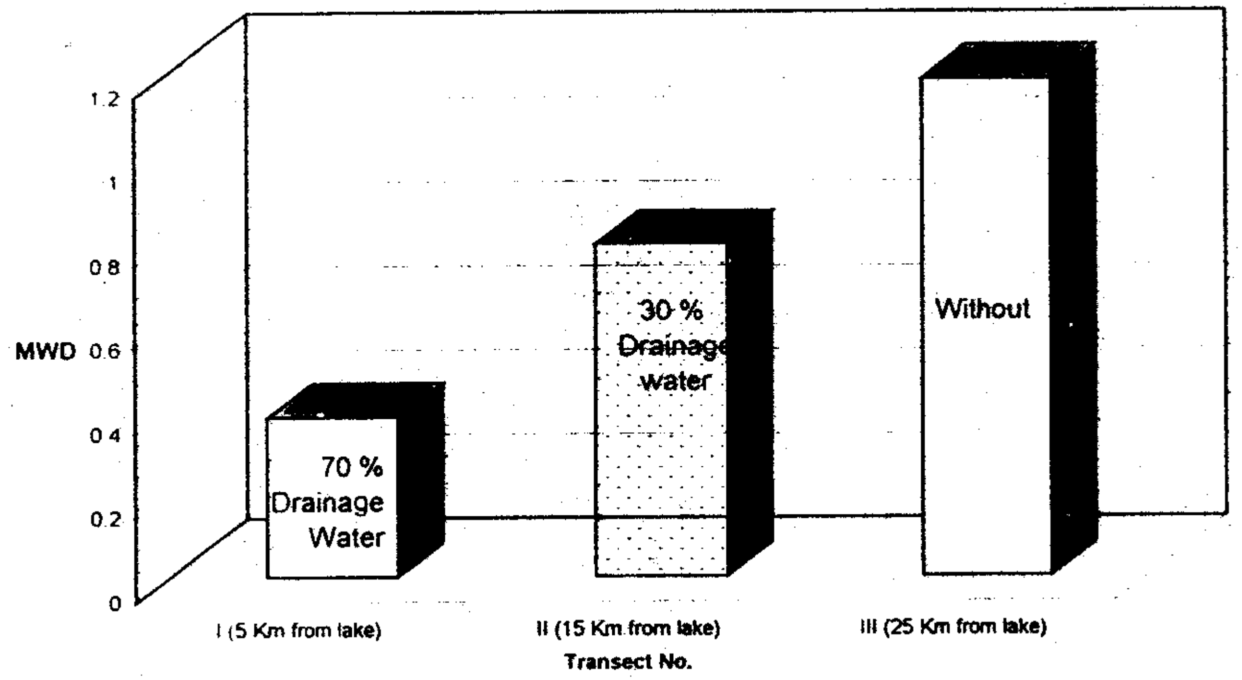

Fig. (6) Mean weigh diameter (MWD) values as affected by the distance from the lake and the quality of irrigation water

*MWD =135.14 –0.04 EC –9.93 SAR. with R^2 =0.504

By focusing the cation exchange capacity (CEC) and exchangeable cation percentage , the regression analysis led to the following equations :

MWD = - 0.86 + 0.032 CEC +0.023 E Ca P with R^2 =0.93

MWD = - 0.88 + 0.062 CEC +0.023 E Mg P with R^2 =0.94

MWD = - 0.89 + 0.046 CEC –0.020 E SP with R^2 =0.94

From the previous discussion it is noticed that the relation between mean grain diameter as one of the main aggregation indices and the different soil chemical and physical properties , is more pronounced with exchangeable cations of Ca, Mg and Na , followed by soil sepearetes and soil salinity .

4.2.4.3.Aggregate size distribution:

To facilitate the study of aggregate size distribution in the different soil profiles under consideration it is cnvenient to classify the water stable aggregates according to their size , into three categories , i.e. coarse (> 1.0 mm diameter) medium (1-0.25 mm diameter) and fine (0.25-0.036 mm diameter). Values for coarse aggregate percent (CAP) ,medium aggregate percent (MAP) , and fine aggregate percent (FAP) were calculated

Data in Table (6) and Fig (7) represent the aggregate size distribution (as a percent of total aggregates). From these data , it is evident that the profile means of coarse aggregates in the transect 1 between 19.39 – 25.22 % with an averall mean value of 22.8, and between 30.98 and 36.49 % with an averall mean

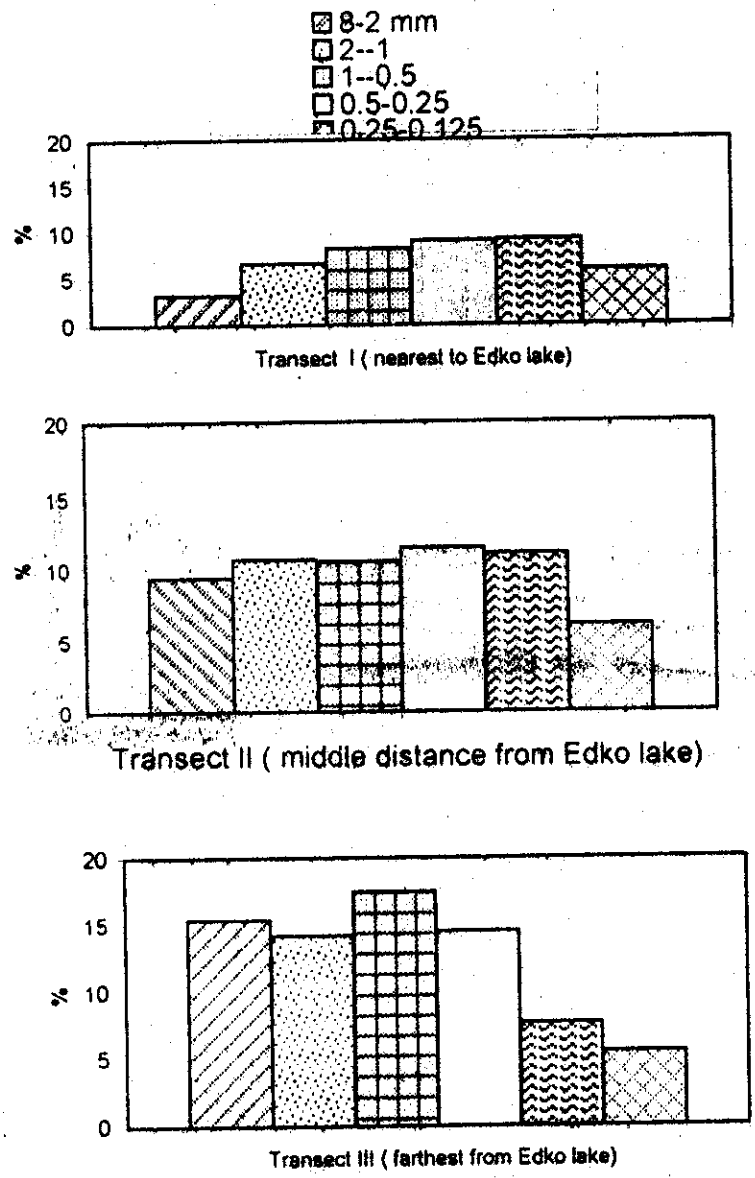

Fig (7): Aggregate size distribution in soils
of transects I, II , III

value of 33.8|.Values for transect III ranged between 38.7and 40.9 % with an averall mean value of 39.8 %.

In relation to the quality of irrigation water ,it can be stated that the percent of coarse aggregates are relatively high values in the profiles that are receivied good quality of irrigation water as the case in transect III and relatively low values for profiles in transect I which received low quality irrigation water which contained drainage water.

This order of coarse aggregate disribution is in correspondence with the distribution of clay and organic matter content which are 56.9 , 64.9 and 66.5 % for clay content in transect I,II and III respectively, corresponding to 1.12 , 1.83 and 2.03 % for organic matter respectively.

However , the improved effect of exchangeable calcium and magnesium on coarse aggregate is pronounced in soil profiles especially at transect III and II where the exchangeable sodium is low The data reveal that exchangeable (Ca + Mg) percent are 81.8 ; 71.1 and 40.5 % for transect III , II and I, respectively , an opposite trend was obtained for ESP which amounted to 15.14 ; 24.61 and 54.61, in the same transects mentioned above

The statistical analysis (Table 7 and Fig 8) indicate the presence of a significant positive correlation between the coarse aggregate (CAP) and each of clay % ($r=0.792^{**}$) , organic matter ($r=0.757^{**}$) , cation exchange capacity (r=0.799**) , excheable Ca^{2+} ($r= 0.885$) and exchangeable Mg^{2+} ($r=0.821^{**}$)

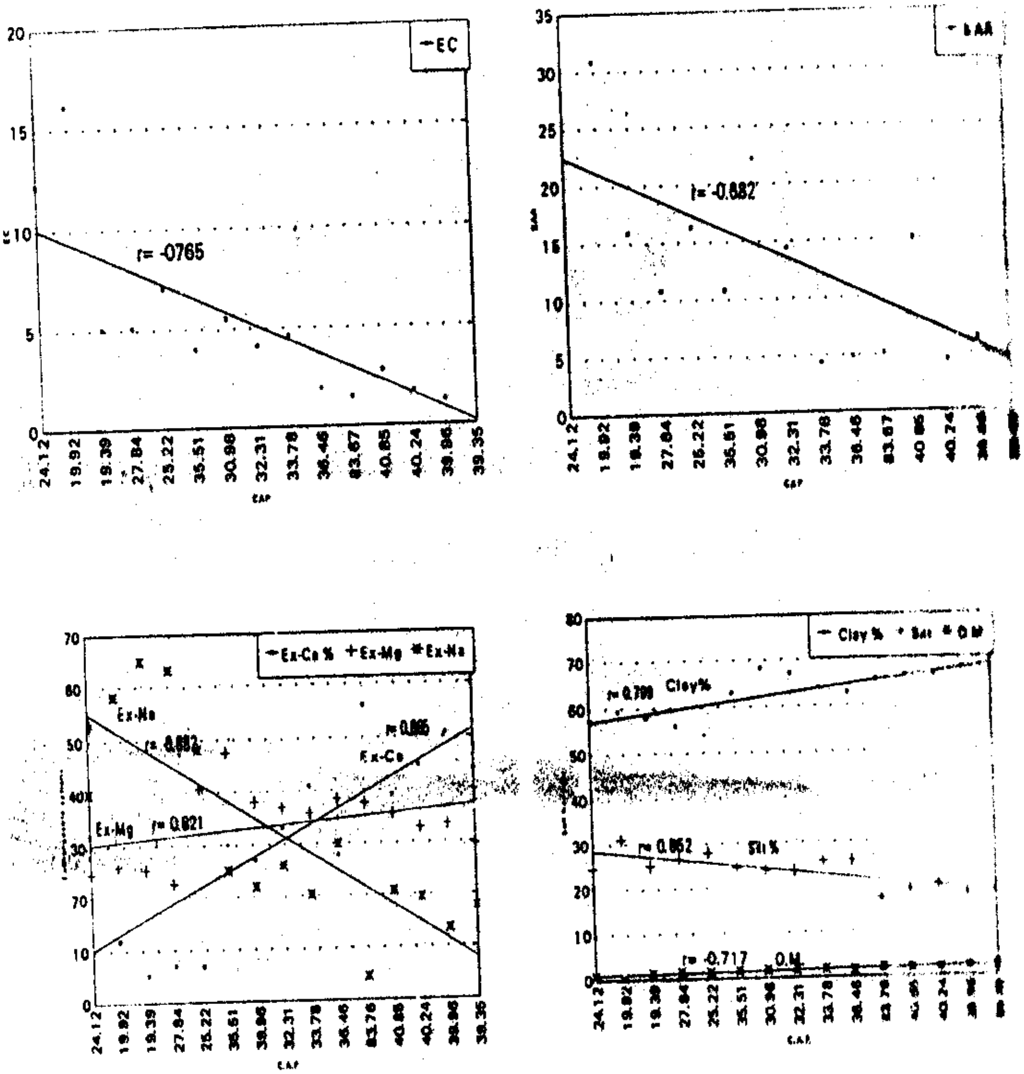

Fig (8)Relationship between coarse aggregates percent (CAP) and different soil parameters

*On the other hand , data exhibit highly significant negative corrlelation between (CAP) and each of silt % ($r=-0.852^{**}$) , $CaCO_3$ % ($r=-0.0717^{**}$) soil salinity "EC" ($r=-0.765^{**}$), soluble sodium ($r=-0.717^{**}$) , soluble magnesium ($r=-0.623^{**}$) and SAR ($r=-0.682^{**}$) . There was significant negative correlation with soluble calcium ($r=-0.539^{*}$). and exchangeable sodium ($r=-0.882^{**}$).

A regression equation was obtained using the multiple regression analysis and can be formulated relating CAP with silt , clay , organic matter (OM) and $CaCO_3$as follow :-

CAP = 14.39 + 0.63 clay % - 0.9 silt % with R^2 = 0.798

CAP = 21.39 +10.32 O.M. % -1.40 $CaCO_3$ % R^2 =0.623

Concerning the relation with soil EC and SAR, the regression equation is follows :

CAP =37.72 +1.28 EC +0.07 SAR with multiple R^2 =0.790.

Regarding the cation exchange capacity (CEC) and exchangeable cations percent , the regression analysis shown the following equations :

CAP =-16.38 +1.11 CEC +0.17 ECa P. with R^2 =0.880

CAP =-20.24 +1.03 CEC +0.67 EMg P. with R^2 =0.930

CAP =-18.16 +0.58 CEC +0.83 ENa P. with R^2 =0.902.

Hence , it is concluded that the higher of macro stable aggregates are usually accompained by the presence of relatively higher clay and organic matter contents with a higher soluble and exchangeable calciam and magnesium and lower exchangeable and soluble sodium .

Similar results were reported by **Kemper et al. (1966), Frenkel et al (1978)** and , **Goldberg et al (1988)**

- Regarding the data of fine aggregates (0.25 -0.063 mm diameter) size distribution , (Table 6 and Fig 9) show that the FAP values of profile means of transect I are average meaninig of fine aggregates comprise about 35.00 ,42.00 , 35.42 , 33.50 and 36.52 % with an averall mean of 36.4 % comparable values for transect II 29.01 , 31.46 , 30.04 , 30.28 and 26.71 % with an averall mean of 29.50 %. Finaly the corresponding values for transect III are 17.2 0, 15.79 , 18.81 ,18.01 and 17.83 % with an averall mean of 17.5 %.

The previous finding indicates that the proprtion of fine aggregates (0.25-0.063 mm size group) increases with increasing the soil salinity , soluble sodium and magnesium . The same trend was obtained with exchangeable sodium and calcium carbonate content.

From the previous description , it can be said that the highest values of coarse aggregates are in correspondence with the lowest values of soil salinity , soluble sodium ,exchangeable sodium , silt content and carbonate content.

A reverse trend is attained for the fine aggregates which are positively related to exchangeable sodium and total soluble salts while they are inversely related to exchangeable calcium and magnesium.

*This is clarified by the positive and significant relationships between fine aggregate percent (FAP) and the soil salinity EC, ($r = 0.772^{**}$), soluble sodium ($r=0.699^{**}$), soluble magnesium ($r=0.616^{**}$) and exchangeable sodium percent ($r=0.784^{**}$). The same positive and significant relationships are found between fine aggregate percent and silt content ($r=0.941^{**}$) and calcium carbonate content ($r= 0.656^{**}$).

A reverse trend is clarified by the negative and significant relationships found between the fine aggregate percent and cation exchange capacity ($r=-0.933^{**}$), exchangeable calcium percent ($r=-0.891^{**}$), exchangeable magnesium percent ($r=-0.648^{**}$) clay content (-0.726^{**}) and finally, organic matter content ($r=-0.734^{**}$).

A regression equation was developed using the multiple regression analysis. which can be formulated relating (FAP) soil with salinity ; and SAR as follows :

$FAP = 20.3 + 1.79\ EC - 0.12\ SAR$ with multiple $R^2 = 0.610$

Concerning the soil separates , the regression equations are

$FAP = 2.89 - 0.18\ clay\ \% + 1.51\ silt$ with $R^2 = 0.892$

$FAP = 40.81 - 11.38\ O.M.\ \% + 1.3\ CaCO_3$ with $R^2 = 0.700$

Concerning the relation with (CEC) and exchangeable cation percent, the regression analysis are shown by the following equations :-

$FAP = 74.98 - 1.2\ CEC + 0.21\ ECaP$ $R^2 = 0.969$

$FAP = 91.51 - 1.56\ CEC + 0.09\ EMgP$ $R^2 = 0.855$

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*4.RESULTS

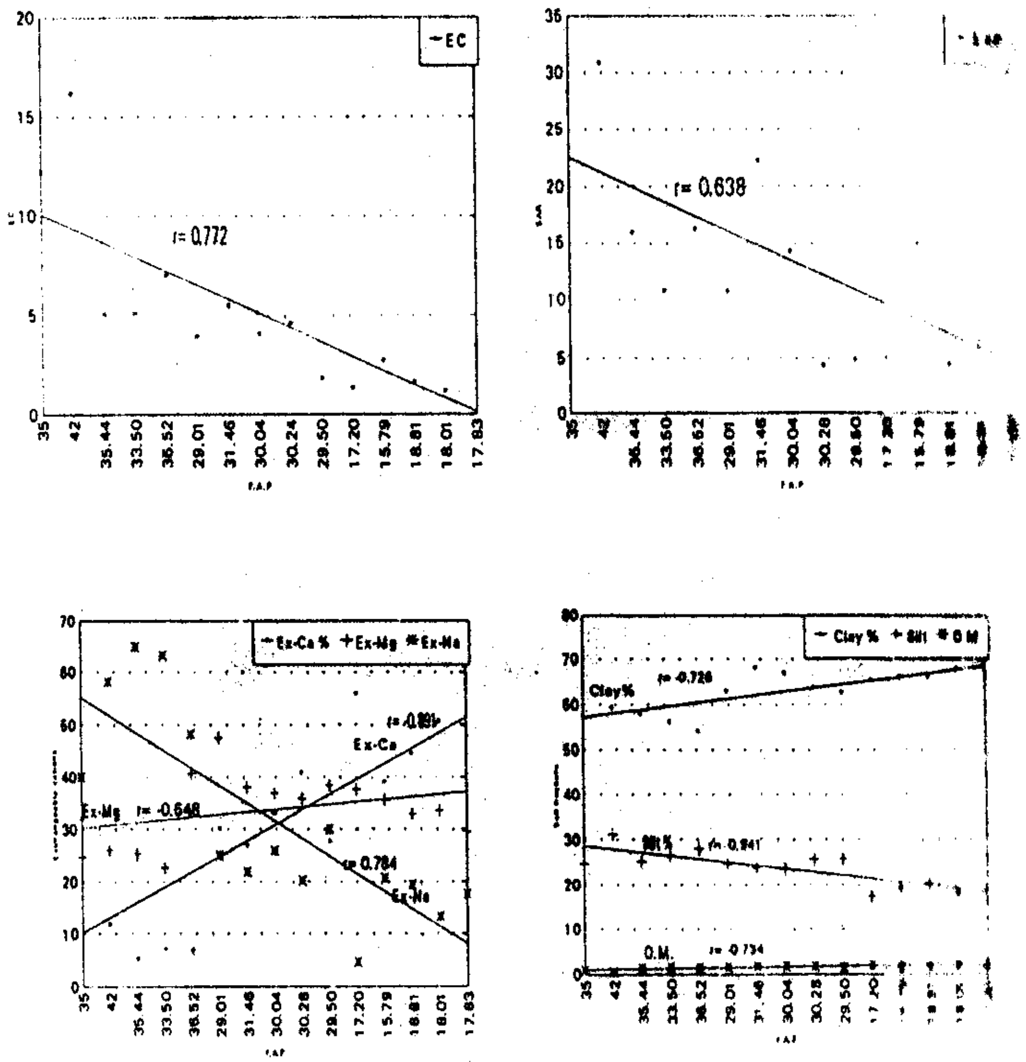

Fig (9)Relationship between fine aggregates percent (FAP)and different soil parameters

*FAP =84.94 − 1.41 CEC + 0.13 ENa P R^2 = 0.855

4.2.5. Soil porosity , pore size distribution and soil moistue constants

The soil aerotion is dependent largely upon the volume fraction of air –filled pores . The impediment of aeration through the soil profiles from poor drainage waterlogging , or from destruction of soil structure can strongly inhibit crop growth and soil water –plant relationships.

4.2.5.1.Total Porosity

The results of both total porosity and pore size distribution of the soils under consideration are illustrated by Table 8 and Fig 10 .

The soil total porosity is represented by 0.001 atm. saturation percentage. From the data of (Table 8) it is seen that the mean total porosity values range between 59.8 % and 68.6 % with a general mean of 64.1 % through the soil profiles of transect I ; and between 59.9 and 73.8 % through the soil profiles of transect II with a general mean of 67.9 % ; and between 63.5 and 73.8 % with a general mean of 68.4 % through the soil profiles of transect III.

The total porosity exhibit relatively higher values in the heavier soil of transect III than in those of transects I and II in subsurface layers.

The distribution of total porosity is governed mainly by the presence of clay , organic matter , calcium carbonate and their consistency the cation exchange capacity.

Transect III							
Prof. No.	Soil Depth (cm)	T.P %	Pore size distribution %				
			Q D P	S D P	VDP	WHP	FC
11	0-30	63.48	11.71	5.55	17.26	21.86	24.36
	30-60	65.95	12.10	4.70	16.80	23.25	25.90
	60-90	70.30	15.35	5.11	20.46	23.56	26.28
	Mean	66.58	13.05	5.12	18.17	22.89	25.51
12	0-30	63.02	9.60	6.76	16.36	22.07	24.59
	30-60	66.72	12.69	3.97	17.66	23.08	26.38
	60-90	69.93	14.39	5.34	19.73	23.69	26.51
	Mean	66.56	12.23	5.36	17.58	23.15	25.83
13	0-30	67.39	14.16	5.76	19.92	22.45	25.02
	30-60	72.14	14.73	8.51	23.24	23.12	25.78
	60-90	73.36	14.69	7.82	22.41	24.20	26.75
	Mean	70.96	14.49	7.36	21.86	23.26	25.85
14	0-30	64.66	10.12	6.42	16.54	22.76	25.36
	30-60	67.13	10.78	5.51	16.29	29.04	26.80
	60-90	67.54	10.62	5.28	15.90	24.43	27.21
	Mean	66.44	10.51	5.74	16.24	25.41	26.46
15	0-30	68.72	13.53	8.43	21.96	22.12	24.64
	30-60	72.40	12.73	9.05	21.78	23.94	26.68
	60-90	73.78	13.14	8.81	21.95	24.94	26.89
	Mean	71.63	13.13	8.76	21.90	23.67	26.07

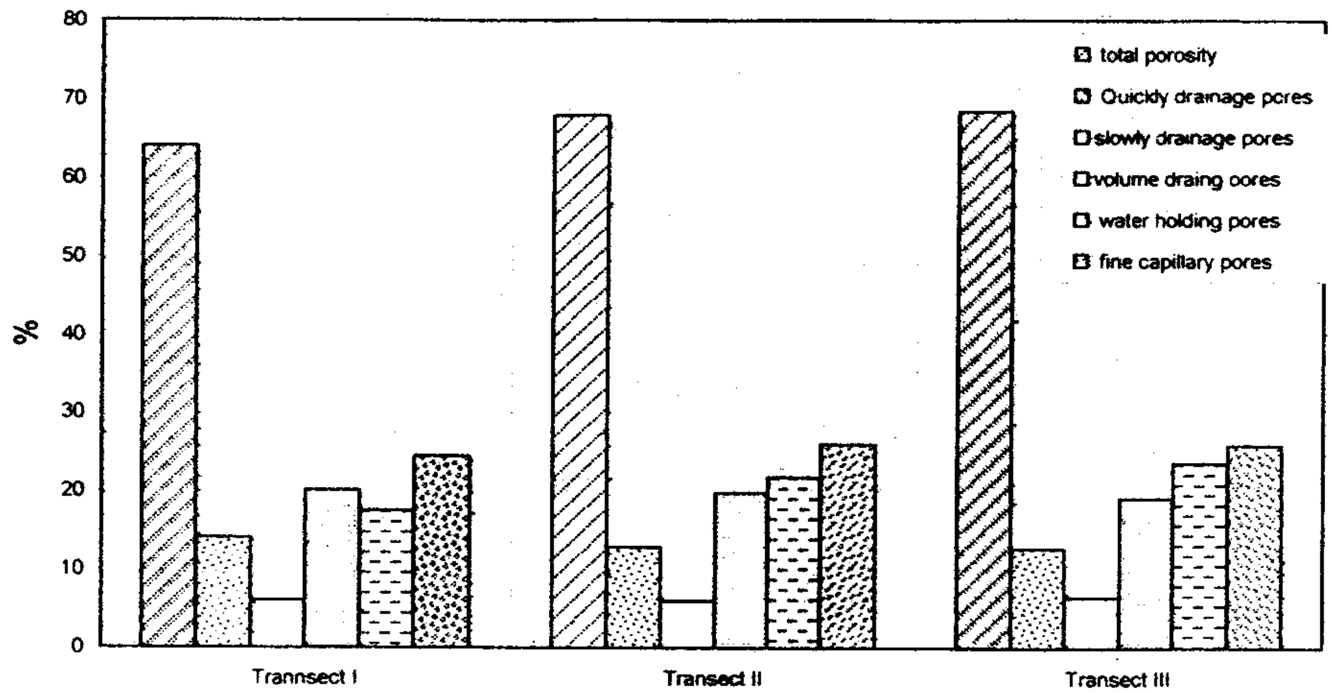

Fig. (10) : Total Porosity and pore size distribution of soil profiles under investigation

Moreover , it can be said that relatively lower total porosity values of the surface layers are due to the compaction which results from machines and cultivation practices.

The relationship between the total porosity and soil components were calculated statistically are presented in Table (9) and Fig. 11.The results indicate that clay and organic matter exhibit positive and significant correlation with the total porosity ($r = 0.644^{**}$ and $r = 0.457^{*}$ respectively). Also there are positive and significant correlation between total poroosity and cation exchange capacity , as well as exchangeable calcium percent ($r=0.576^{*}$ and $r=0.599^{*}$, respectively.

On the other hand, the data reveal that each of exchangeable sodium percent (ESP) and $CaCO_3$ % exhibit a negative correlation with total porosity, with the correlatin coefficents of $r=-0.511^{*}$ and $r= -0.597^{*}$ respectively .

The regression equations can be written as as follows :

% Total porosity=32.69+0.52 clay%+0.06 silt %with $R^2 = 0.480$

%Total porosity=70.63+0.39O.M%-0.95$CaCO_3$%with $R^2 = 0.360$

Concerning reations of total porosity the cation exchange capacity (CEC) and exchangeable calcium perrcentage (ECaP) and exchangeable sodium percent (ESP) and exchangeable magnesium percent (EMgP), the regression equations are been the following :

% Total porosity= 59.66 +0.11 CEC +0.19 ECaP with $R^2 = 0.335$

% Total porosity= 46.29 +0.73CEC-0 70 EMgP with R^2 - 0.340

% Total porosity = 54.74 + 0.31 CEC -0.07ESP with R^2 = 0.337

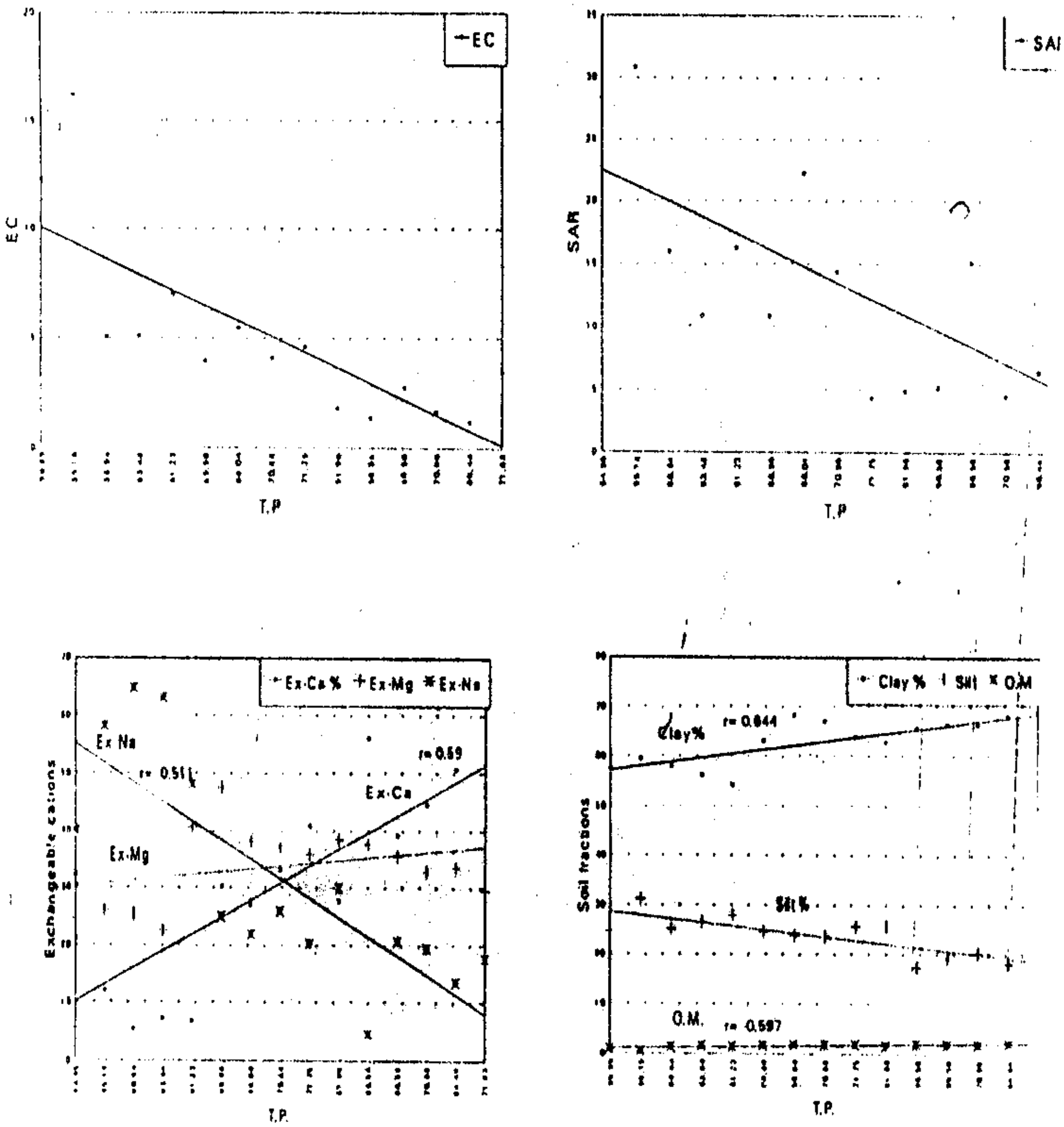

Fig (11)Relationship between total porosity and different soil parameters

4.2.5.2. Pore size distribution

Pore space is one of the features that plays an important part in soil and water management of heavy clay soil. The relative distribution of the various pores is more important than total porosity .

Classes of pore size fractions may be as follows drainable pores , which are responsible for air voids of large size (V.D.P.) and water holding pores (W.H.P.) which are responsible for moisture holding capacity of small size , out of which are called micropores or fine capacity pores (F.C.P). The volume of drainable pores (V.D.P.) the sum of qualickly- drainage pores (Q. D. P) (> 28.8 micron μ φ) i.e. macropores and slowly drainable pores (28.8-8.62 μ φ) .The water holding pores are the sum of moisture holding pores (8.62-0.19 μ φ) , i.e. micropores and fine capillary pores.

The data show that , the simple change are found on values of VDP, FCP through the soil profiles at different locations . The average mean values of VDP are 20.1 , 19.8 and 19.2 % at transect I , II, III , respectively . For FCP the whole mean values in the order :24.4 , 25.9 and 25.9 for the same transects , respectively.

On the other hand , the data of water holding pores show relatively increase through the soil profiles at different locations and different quality of irrigation water .

*The previous trend may be due to the distribution of clay content and organic matter and coincide the highest values of EC soluble sodium and exchangeable sodium percent (ESP).

These results lead to suggest that VDP and WHP are proportionally related to exchangeable calcium, magnisium and organic matter and inversely to soil salinity (EC), exchangeable sodium and calcium carbonate percent.

These results were expected, since the exchangeable calcium and organic matter encourages to coarse aggregate formation, hence increases the macro rather than the micro pores.

On the other hand, the increases of soil salinity and soluble and exchangeable sodium values, which react as a dispersing agent, leads to overcoming the micro on the macro pores distribution.

The statistical relationships between the different pore size distribution and the different soil components were calculated and the results indicate that there are positive and negative corrlation but unsignificant relationships.

<u>4.2.5.3. Soil moisture contents</u>

Soil moisture contents depend upon the size and stability of soil pores. Soil and water mangement, tillage and crop rotation are among the factors influencing soil moisture contents through the soil profile. One of the striking features for clay soils is their high ability to retain moisture, not only at high tensions but also at low ones. The soil and water mangement

Table(9) : **Values of correlation coefficient "r" relating pore size parameter as well as soil moisture parameter with some soil properties**

(a) Cation exchange capacity and exchangeable cations.							
Soil		Pore size distribution			Moisture contents		
proprty	TP %	Q D P %	S D P %	T E P %	F C	W.P	AW
CEC	0.576*	-0.273	0.197	-0.186	0.734**	0.679*	0.880**
ECaP	0.599*	-0.123	0.243	-0.126	0.514*	0.557*	0.784**
EMgP	0.364	-0.224	0.064	-0.171	0.621*	0.537*	0.574*
ESP	-0.511*	0.135	-0.225	0.028	-0.448	-0.490*	-0.633**
(b) Soil Particles , $CaCO_3$ and organic matter							
Soil		Pore size distribution			Moisture contents		
proprty	TP %	Q D P %	S D P %	T E P %	FC	WP	AW
Sand %	-419	0.273	-0.256	0.153	-0.523*	-0.668**	-0.45
Silt %	-0.419	0.216	-0.133	0.156	-0.569*	-0.553*	-0.666**
Clay %	0.644**	-0.393	0.299	-0.258	0.810*	0.759**	0.919**
CaCO3 %	-0.597**	0.356	-0.210	0.280	-0.661**	-820**	-0.866**
O . M. %	0.457*	-0.233	-0.211	0.803*	0.520*	0.520*	-0.385
(C) Soil Salinity Indices							
Soil		Pore size distribution			Moisture contents		
proprty	TP %	Q D P %	S D P %	T E P %	FC	WP	AW
EC	-0.268	0.132	-0.013	0.124	-0.555*	-0.426	-0.425
Cl-	-0.414	0.049	-0.085	0.018	-0.614*	-0.491	-0.45
Ca^{++}	0.014	0.523*	-0.247	0.365	-0.258	-0.361	-0.399
Mg^{++}	-0.162	0.260	-0.065	0.290	-0.463	-0.448	-0.388
Na^{+}	-0.278	0.016	-0.044	-0.249	-0.45	0.341	-0.294
SSP	-0.268	-0.425	0.206	-0.292	-0.15	0.051	-0.003
SAR	-0.289	-0.169	0.091	-0.108	-0.426	-0.186	-0.242

TP Total porosity ; QDP: quickly drainable pores ; SDP: slowly drainable pores ,

F.C: Field capacity ; Wp wilting point ; Aw available water.

*improves and regimes . High water storge capacity and good soil -water relations may be achieved in clay soils . The amount of water contained in a unit mass (or unite volume) of soil and the energy state of its retention are important factors affecting the growth of plants. There are numerous soil which properties depend very strongly upon water content, such as compactibility , conistency , plasticity and penetribility.

Soil water , like other bodies in nature, can contain energy in different quantities and forms . Classical physics recognize two principale forms of energy , potential and kinetic. Potential energy , which is due to position or internal conditon , is of primary importance determing the state and movement of water in the soil **(Hillel, 1980)**.

Data in (Table 10) show the different forms of soil moisture constants , namely field capacity (FC) , wilting point percentage (WP) , and available capacity (AW) of the soil under consideration.

The averall means of the obviuous forms in the different transects are as follows 43.9 , 24.4 nd 19.5 % respectively for transect I ; 47.9 , 25.9 and 22.0 % respectively for transect II. 49.3 , 25.9 and 23.7 % respectively for transect III.

The highest value of available water capacity and also the highest values of the upper limits of soil moisture constants , i.e. field capacity are achieved by the soil profiles of transect III.

In relation to the different soil properties , both field capacity and wilting point are positively related to soil salinity as

Table (10): Soil moisture contents of the investigated soils.

Transect I					Transect II					Transect III				
Profile No.	Soil depth	F.C	WPP	AWC	Profile No.	Soil depth	F.C	WPP	AWC	Profile No.	Soil depth	F.C	WPP	AWC
1	0-30	42.39	23.37	18.92	6	0-30	43.14	23.32	19.82	11	0-30	46.22	24.36	21.86
	30-60	43.74	24.18	19.56		30-60	48.29	26.18	22.11		30-60	49.12	25.9	23.25
	60-90	44.88	28.8	24.8		60-90	48.47	26.19	22.28		60-90	49.84	26.28	23.56
	Mean	43.64	24.12	19.53		Mean	46.63	25.23	21.4		Mean	49.39	25.51	22.89
2	0-30	44.89	24.1	20.79	7	0-30	49.2	26.6	22.6	12	0-30	46.66	24.59	22.07
	30-60	46.78	24.93	21.85		30-60	49.54	26.76	22.78		30-60	50.06	26.38	23.68
	60-90	48.26	25.77	22.49		60-90	52.66	28.46	24.2		60-90	50.2	26.51	23.69
	Mean	46.64	24.93	21.71		Mean	50.47	27.27	23.19		Mean	48.97	25.83	23.15
3	0-30	43.54	23.15	20.39	8	0-30	47.62	25.74	21.88	13	0-30	47.47	25.02	22.45
	30-60	45.03	26.01	19.02		30-60	48.88	26.42	22.46		30-60	48.9	25.78	23.12
	60-90	47.96	27.32	20.64		60-90	52.21	28.22	23.99		60-90	50.95	26.75	24.2
	Mean	45.51	25.49	20.02		Mean	49.57	26.79	22.78		Mean	49.11	25.85	23.26
4	0-30	41.54	22.96	18.58	9	0-30	44.46	25.12	19.34	14	0-30	48.12	25.36	22.76
	30-60	41.95	24.28	17.67		30-60	46.92	25.36	21.56		30-60	50.84	26.8	29.04
	60-90	44.55	24.62	19.93		60-90	48.19	26.05	20.14		60-90	51.64	27.21	24.43
	Mean	42.68	23.95	18.73		Mean	46.52	25.51	20.35		Mean	50.2	26.46	25.41
5	0-30	40.19	22.21	17.98	10	0-30	45.39	24.54	20.85	15	0-30	46.76	24.64	22.12
	30-60	41.63	24.65	16.98		30-60	46.62	25.13	21.49		30-60	50.62	26.68	23.94
	60-90	42.22	24.13	18.09		60-90	47.36	25.5	21.86		60-90	51.83	26.89	24.94
	Mean	41.35	23.66	17.68		Mean	46.46	25.06	21.4		Mean	49.74	26.07	23.67

*expressed in the EC of soil water, exchangeable calcium percent and exchangeable magnesium percent.

Soil with the highest value of available water are those with the lowest values of EC , ESP , silt and $CaCO_3$ contents.

The opposite trend is attained for the available water content . In this trend the highest value of available water is coincide with highest values of CEC , exchangeable calcium percent, exchangeable magnesium percent , clay and organic matter contents.

To calarify the previous trend , the statiscal relationships between the field capacity values and soil properties were calculated . There are significant and positive correlations of FC with CEC (r = 0.734 **) , exchangeable calcium (r= 0.514*) ,exchangeable magnesium (r=0.621*), clay % (r= 0.810**) and organic content (0.603) as last one . On the other hand there are significant negative correlations with soil salinity expressed as "EC" (r= -0.555 *) , exchangeable sodium percent (r = 0.498*) , sand content (r =-0.523*) , silt content (r=-0.569 *) the $CaCO_3$ % (r=0.661 *) .as shown (Fig.12).

Regarding , available water (AW) , the statistical analysis shows that , there are significant and positive correlations between (AW) and each of CEC (r = 0.880 **) , exchangeable calcium percent (r = 0.784 **) , exchangeable magnesium percent (r= 0.574 *) clay content % (r=0.919 **) and organic matter content (r= 0.520*).

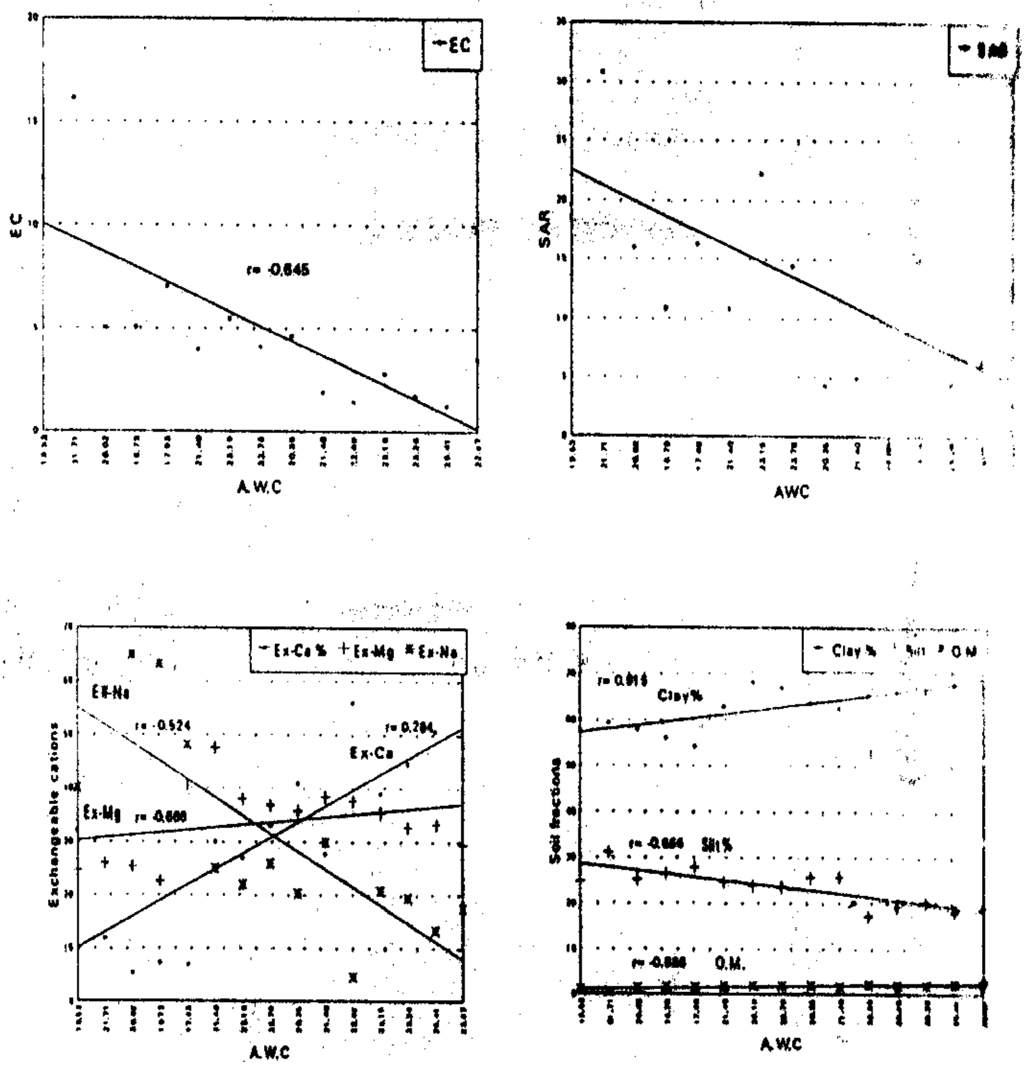

Fig (12):Relationship between available water capacity and different soil parameters

The above mentioned trends show the marked effect of clay and organic matter contents which are clring relation to the soil moisture retention by soils .This result agree with the fininding of **Gouda et al. (1993).**

On the other hand , there are significant and negative correlations between the available water and each of ESP ($r = -0.633^{**}$) , silt % ($r = -0.666^{**}$) and $CaCO_3$ % ($r = -0.866^{**}$)

.

The regression equations between relating field capacity (FC) to exchangeable cations can be written as follow :-

FC . = -7.00 +1.47 CEC +0.058 ECaP with R^2 =0.724

FC . = 22.2 +0.5 CEC + 0.240 EMgP with R^2 =0.558

FC . = 4.18 +0.92 CEC +0.320 ESP with R^2 =0.600

The regression equations between relatingavailable water and soil separeates parameters , soil salinity SAR and exchangeable cations can be written as the follows

AW = -2.58 + 0.39 clay % - 0.01 silt % with R^2 = 0.845

AW = 25.27 +0.31 O.M. % -0.87 $CaCO_3$ with R^2 = 0.578

AW = 23.12 – 0.44 EC +0.12 SAR with R^2 = 0.550

AW = 3.52 + 0.42 CEC – 0.05 ECaP with R^2 =0.780

AW = 38.76 –0.39 CEC –0.06 EMgP with R^2 = 0.780

AW = 2.8 +0.43 CEC +0.08 ESP with R^2 =0.794

SUMMARY AND CONCLUSION

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