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Physiochemical Behavior of Some Shura and Sabkha Soils Derived from Sedimentary Calcareous Soils

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Abstract
This study was conducted in order to know the relationship of the time duration and amount of the water required for leaching Shura soil and Sabakh soil with the view of comparing the two soils.To achieve this purpose, Shura soil was collected during the commencement of the Agricultural Delmach project in Wasit city / AL-Ahrar region, and Sabakh soil during the final stages of the same project above with depth of (0 - 30)cm. The two soils were leached using drain water (EC 3.7 dsm^{-1}) and distilled water as a control unit using Miscible Displacement method, then the soils were leached for ten times durations, each one lasting (15 min.), thus the total time of duration is (150 min.), every time stage determined by extracting the p^H and EC.Results showed : the duration (150)min and the required amount of water (150 ml) for leaching Shura soil to decrease EC under 4 dsm^{-1} compared with Sabakh soil which require amount of water (60 ml) with time stage (60) min for decreasing EC under 4 dsm^{-1} with significantly different between the two soils (L.S.D/0.05). And p^H decreased at every time stage with the decrease of EC until it reached the stable stage pertaining to the final time stages of the leaching operation .
Key words: Shura ,Sabkha ,Calcareos soil ,Miscible displacement ,Drain water .

1. Introduction
The alluvial salty soils of Iraq in the present time cover large areas that amount up to (60 – 70 %) of the agricultural lands areas. Most researchers believe that this problem of salts and salty soil is not only of today but it goes back to ancient Mesopotamian times. It only increased during the last fifty years because of agriculture cultivation and the expansion of irrigation (Buringh, 1960) as well as the effect of salts in Iraq on the chemical properties within salty soils and soda salty according to the classification of American Salt laboratory, and that within Solonjac soils according to Russian classification. Most researchers , who have studied salty soils in Iraq , have not shown the presence of soda soils in Iraq because of its content of more amount of gypsum which supplies the soil with solution of calcium ion and which displays sodium from exchange of complex preciptation of sodium carbonate at its formation from calcium carbonate (AL-Zubaidi, 1976; Dieleman, 1963; Delever, 1960; Buringh ;1960 ; Goncalves *etal*.,2006). Limited sources showed the probable presence of soils similar to solonitiz, especially with the decreases in a limited amount in the middle and south areas of Iraq (Ali, 1955; Binnie et al, 1956; Harris, 1955).Buringh (1960) divided the salty soils in Iraq into Shura soils and Sabakh soils, each soil having its special condition and qualities. The purpose of conducting this experiment is to know the time stages and amounts of water that are required for leaching every type of these two soils. The results of this experiment indicate the water quantity sufficient to remove saltaization and to solve the problem of saltaization in sedimentary soils that is found all over the area of Mesopotamia so as to achieve high productivity with minimum water required to leach the salts.

Materials and Methods
Two different alluvial locations were selected from the agricultural Delmach project / AL-Ahrar region /Wasit province with a depth of (0-30 cm) , some physical and chemical properties are shown in Table (1).
The two locations were selected on the basis of the essential difference of the salty content : the Shura soil was taken from the soil found at the front edge of the project area, while the Sabakha soil was from the rear area of the project.

Table (1) Some of physical and chemical properties of salty alluvial soils and drain water used in this study

Samples	Soil separates gm.kg $^{-1}$			PH	EC ds .m^{-1}	soluble ions (Meq/l)					
	sand	silt	Clay			Ca^{++}	Mg^{++}	Na^{+}	CL^{-}	CO_3	SO_4
Shura soil	350	275	375	8.6	76.5	2.0	1.77	135.0	21.00	00	113
Sabakh soil	375	230	395	8.0	26.8	90.5	70.30	55.00	22.00	00	0.01
Drain water (Meq / L^{-1})	---	----	----	8.0	3.70	10.22	8.21	12.22	15.30	0.4	2.14

Drain water samples were collected from the drains of Delmach project. The p^H and EC of the water was 8 and 3.7 dsm^{-1} respectively Analysis of sediment samples

The pH of the sediments was measured in 1:1 sediment to water ratio (Conyers and Davey, 1988). Electrical conductivity was measured in saturation extract of sediments using an EC meter and organic matter was measured according to Page et al., (1982). Texture of sediments was measured by used the Pipette method (Black, 1965).

Some physical an d chemical properties were determined according to (Page etal. ,1982, Pansu etal., 2006) .

Experiments of leaching the salty soils following Quite Miscible Displacement method using drain water

Classic columns were used with (20 cm) length and radius (5 cm), where classic cotton was put down the column with two replications; after that an amount of leaching industrial sand was put over the classic cotton, then a(100 gm) soil sample from the field with its natural form was added, allowing the leaching solution (drain water) to cross through the soil with a speed of (1ml/min) (Martin and Sparks,1985), keeping the liquid column height over soil surface stable at the level of (5 cm) during of leaching stage by the continuous adding of solution, and using the distilled water as a comparison unit .

The extractions were collected from the column down the soil on the basis of ten stage times, each one lasting for (15 min), with a total time duration of (150 min). The experiment was designed using the CRD Design.

Finally P^H and EC in every time stage was determined in leaching solutions and calculation the utilization of leaching water for the two studied alluvial soils in this experiment .

Results and Discussion :

Experiments of leaching of Shura soil using drain water and distilled water by Miscible Displacement method.

The results in table (2) and Figure (1) shows that rates of p^H and EC was decreased at every stage of time using large quantities of leaching solutions which ranged between (102- 44) ds m^{-1} in time stages (15 and 30) minutes respectively, but this decrease was less in the final time stage than the leach at the drain water or with the use of distilled water. These results led us to the following conclusion: solutions of leach are leach of soluble salts in the early time stages such sodium chlorides then start with exchangeable salts release in other time stages in order to reach the stable release stage for the soil .

Table (2) also shows that the P^H rate which decrease with EC decreasing at every time stage from the extractions then observed from the same rates in p^H in the first stages of the leaching operation because the beaver effect to $CaCO_3$ (AL-Hasni,1984; Delever,1960) and utilization (150) ml from leaching solutions to decrease EC from 102 to 4.3 dsm^{-1} and with total stage time (150)minutes for Shura soil in this study.

Table (2) Leaching of Shura soil with using drain water and distilled water by Miscible Displacement method

leaching solution	Time (minutes)																			
	15		30		45		60		75		90		105		120		135		150	
	p^H	EC	p^H	EC	p^H	EC	p^H	EC	p^H	EC	p^H	EC	p^H	EC	p^H	EC	p^H	EC	p^H	EC
Drain water	9	102	8.9	44	8.8	20	8.9	11	8.9	8.5	8.9	7	8.9	6	8.9	5.5	8.7	5.1	8.3	4.3
Distilled water	9.1	86	8.7	14	8.6	7	8.5	6.2	8.4	5.3	8.4	5	8.4	4.6	8.4	4.2	8.4	4.1	8.4	3

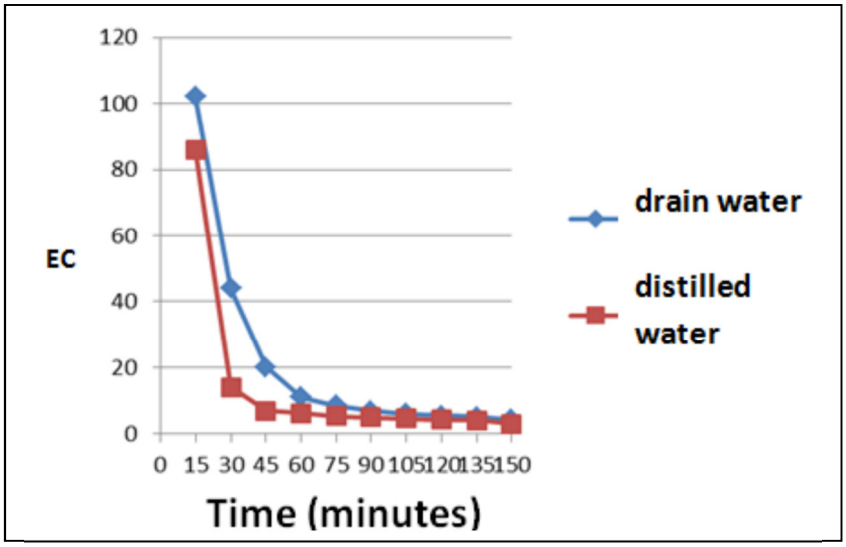

Figure (1) Leaching of Shura soil with using drain water and distilled water by Miscible Displacement method

Leaching of Sabakha soil using drain water and distilled water by Miscible Displacement method

The rate of p^H and EC at studied leaching time with drain water and distilled water which represent a control unit , where EC rate was more decreased at using drain water (from 24 to 5) dsm^{-1} in time of (15 and 30) minutes respectively , and (from 16 to 13.7) dsm^{-1} in time of (15 and 30) minutes respectively using distilled water table (3) figure (2), but this decrease was little in the final time stages such Shura soil ,as indicated on leaching salts of soluble calcium and magnesium chlorides in the first stages, then started a release of exchangeable ions of calcium and magnesium salts in the final stage of time in order to reach a stable release stage for each studied soil .

Table (4) shows that there are decrease in rates of p^H with the decrease of EC at every time stage until the p^H reached a stable stage concerning the final stage of time from the leaching (120 ,135, 150) minutes for both solutions (drain water, distilled water), also utilized about (60) ml from drain water for decreasing EC to less than 4 dsm^{-1} in sabakh soil which used in this study.

Table (3) Leaching of Sabakha soil using drain water and distilled water by Miscible Displacement method

leaching solution	Time stage (minutes)																			
	15		30		45		60		75		90		105		120		135		150	
	p^H	EC	p^H	EC	p^H	EC	p^H	EC	p^H	EC	p^H	EC	p^H	EC	p^H	EC	p^H	EC	p^H	EC
Drain water	8.8	24.0	8.8	5.0	8.6	4.0	8.5	3.4	8.5	3.3	8.4	3.2	8.3	3.0	8.3	3.0	8.3	3.0	8.3	3.0
Distilled water	8.5	16.0	8.0	13.7	8.0	6.2	8.0	4.7	8.0	4.0	8.0	3.4	8.0	3.3	8.0	3.0	8.0	2.4	8.0	2.3

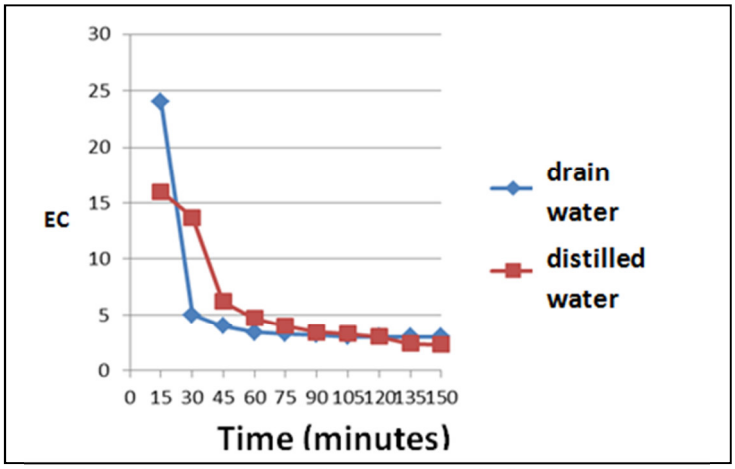

Figure (2) Leaching of Sabakh soil using drain water and distilled water by Miscible Displacement method

A comparison between leaching of Sabakha and Shura soil using drain water and distilled water by Miscible Displacement method

Table (4) shows that there are significant differences (L.S.D/0.05) between Shura and Sabakh soil in EC and the required time for leaching every soil and also the amount of utilization water for leaching each soil .

The results in table (4) shows that the Shura soil needed for the total time of (150) minutes for the leaching operation of salts for decreasing EC under 4 dsm^{-1} because this type of soil contains a high amount of carbonates and of sodium chlorides, beside of utilization more amount of water (150) ml for removing salts as compared with Sabakha soil with content of calcium and magnesium chlorides which needed less period of time (60) minutes for leaching of salts also utilizing less amount of water (60) ml for decreasing EC under 4 dsm^{-1} at the leach with drain water or distilled water . We believe the reason for dominant of sodium carbonates is characterized by few solubility and slow the leach in Shura soil as compared with that of Sabakha soil which is dominant by calcium chlorides and magnesium chlorides, which is characterized by speed solubility and the leach in same time (Dennis *etal.*, 2007). These results show more importance in recompilation of salty soils.

Table(4)comparison EC Values of Shura soil leaching and Sabakh soil by Miscible Displacement method with using water drain

soil type	**leaching stage (min)**									
	15	30	45	60	75	90	105	120	135	150
Shura	102.00	44.00	20.00	10.70	8.50	7.00	6.00	5.50	5.10	4.30
Sabakha	24.00	5.00	4.00	3.40	3.30	3.20	3.00	3.00	3.00	3.00
L.S.D /0.05										

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