

Effect of soil gypsum content and water quality on the gypsum distribution and some ions in horizontal soil column under unsaturated flow conditions

Isam K. Al-Hadithi Akram A. Al-Hadethi Bassam Al-D Al-K Husham

Abstract

A laboratory experiments were conducted to study the gypsum distribution and Cl⁻, Na⁺, Ca²⁺, SO₄²⁻ ions inside Soil column, soil samples with different gypsum content (117.8, 316.8, 515.8 gm.Kg⁻¹) where used to determined horizontal flow with water solution (EC5.0 SAR0, EC5.0 SAR15) under the continuous and dual addition were chosen to estimate gypsum content and ions concentration along soil columns in accordance with the methods proposed by American Salinity Laboratory.

The results showed that Cl⁻ and Na concentration increased with decrease the soil gypsum content and it decreased with increasing in distance. Cl⁻ and Na concentration increased with SAR increasing. Ca²⁺ and SO₄²⁻ concentration increased with increasing in soil gypsum content and it decreased with increasing in distance, during dual addition but it decreased under continuous addition system. The

soil gypsum content increased with distance for all treatments, and it decreased with increasing in SAR under dual addition comparing with continuous addition system.

(¹⁻ . 2.6)

(Gypsiferous Soil)
% 20 ² 88

.(1)

(3) . (2)

.¹⁻ . 2

(4) :

(5)

(5)

(4)

⁰ 40

(6)



(Piston Flow)

(EC)

.()

(SAR)

(30-0)

1

(Sodium

(Electrical Conductivity)(EC)

CaCl₂ NaCl

Adsorption Ratio)(SAR)

EC_{0.5} SAR₀ :(A)

EC_{5.0} SAR₀ :(B1) -

EC_{5.0} SAR₁₅ :(B2) -

:

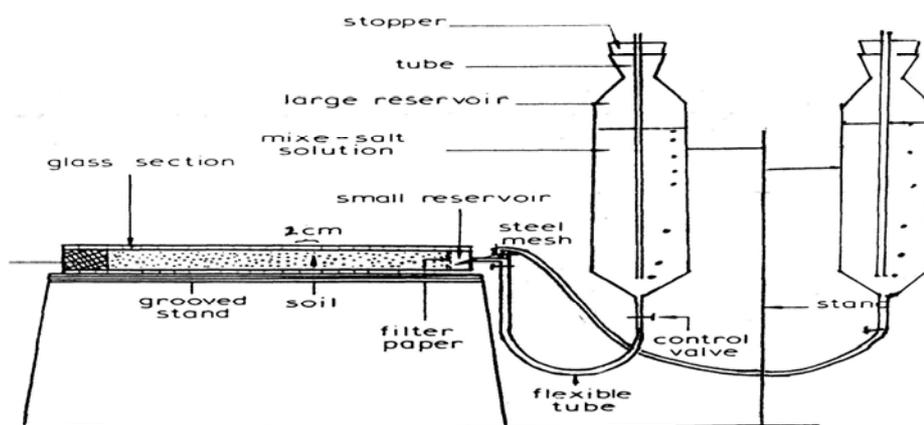
EC_{5.0} SAR₁₅ EC_{5.0} SAR₀

: -

$EC_{5.0} SAR_{15}$ $EC_{5.0} SAR_0$: -
 $EC_{0.5} SAR_0$

11 (2002) (7)
 3.17 4 (Plexus Glass)
 (8) 2 1
 (9) 20
 ($^0 50$)
 (Coefficient of Variation)
 (10) %2

B2 B1
 10 $EC_{5.0} SAR_0$, $EC_{5.0} SAR_{15}$
 T $EC_{0.5} SAR_0$
 20 1



1

نسبة الجبس %			وحدة القياس	الصفة
51.58	31.68	11.78		
766.52	637.24	495.51	الغرين	
196.89	279.31	367.41	الطين	
36.58	83.46	137.08	صنف النسجة	
Loamy Sand	Sandy Loam	Loam		
1.32	--	--	ميكروغرام م ³⁻	الكثافة الظاهرية
2.37	2.47	2.58		الكثافة الحقيقية
0.4304	0.4534	0.4767	%	المسامية
0.6101	0.1794	0.1362	مايكرو متر	معدل نصف قطر المسام الفعال

3.60	3.31	3.02	1-	
7.24	7.26	7.30		
25	95	190	.	
515.8	316.8	117.8		
6	10.8	16.2		
6.3	---	---	1-	
61.2	51.4	37.8	.	
4.8	5.6	8.6		
1.6	2.3	3.2		
0.7	1.5	2.5		
--	--	--		
2.3	4.8	6.2		
19.0	17.4	14.8		
28.4	21.2	13.4		

(11)

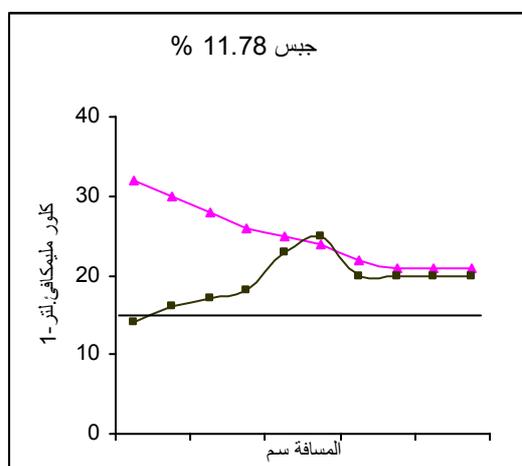
2

15-0 SAR

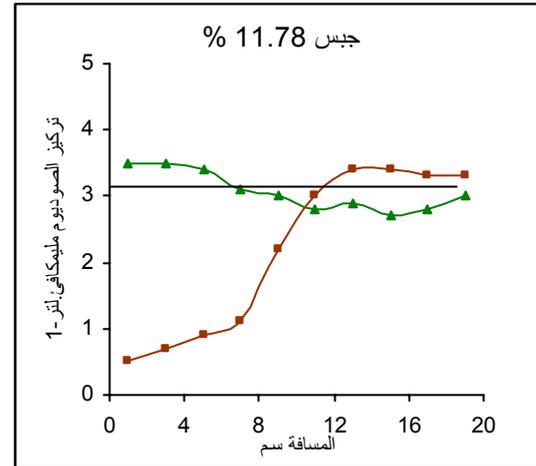
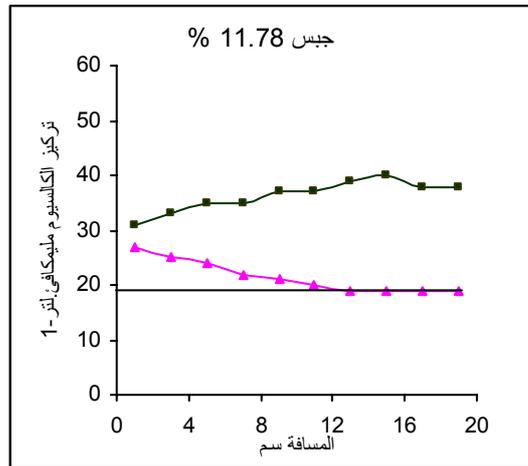
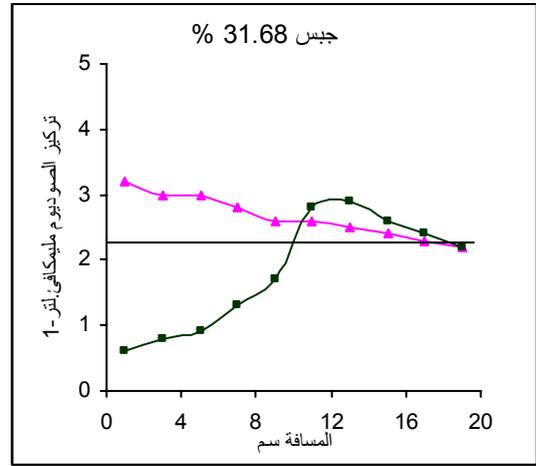
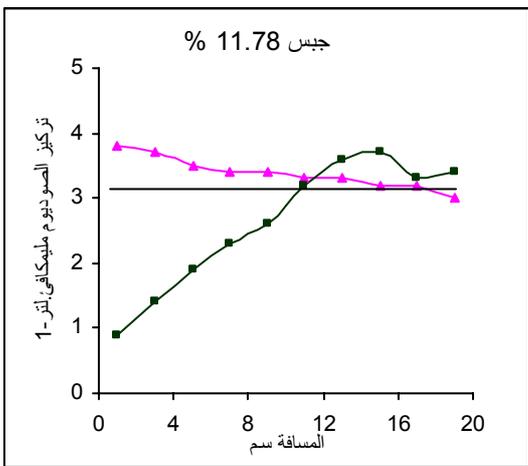
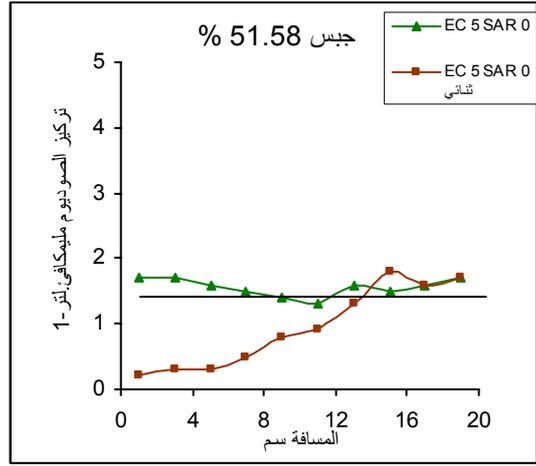
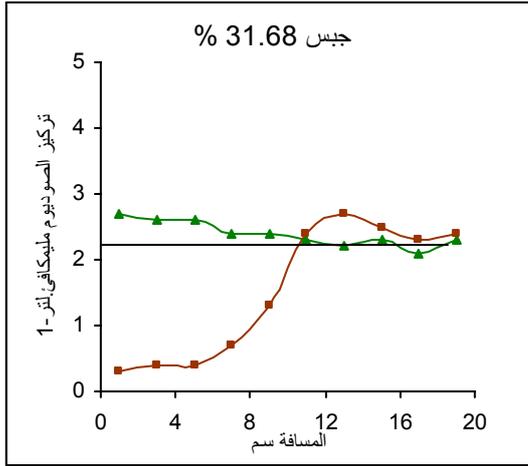
EC

3

SAR



2



3

4

EC5.0 SAR0

1- 515.8

SAR

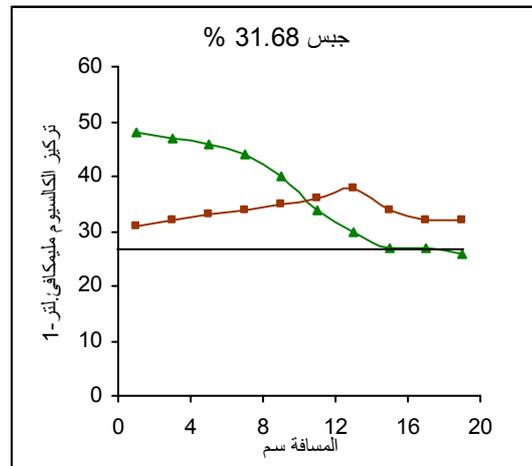
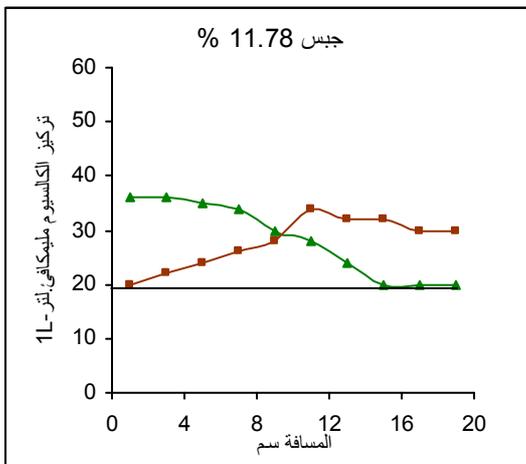
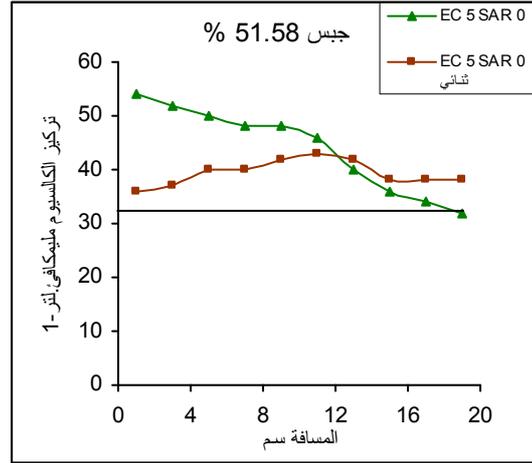
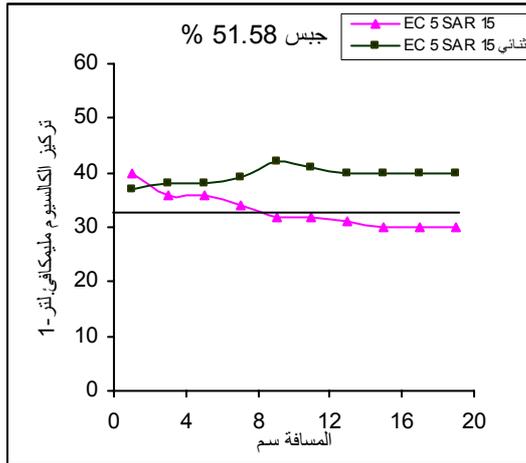
1- 48

117.8

1- 20

EC5.0 SAR0

1-



4

5

1- 515.8

1- 15.2

1- 6.0

5

1- 117.8

.SAR

6

SAR

SAR 15

EC

SAR 0

SAR

SAR0

SAR

.SAR 15

SAR 0

1-

37.5

SAR 15

SAR

CaCl₂

SAR 15

SAR 0

SAR0

Ksp

(13 12)

$$K_{sp} = (Ca^{+2}) (SO_4^{-2}) = 2.5 \times 10^{-5}$$

Ksp

NaCl

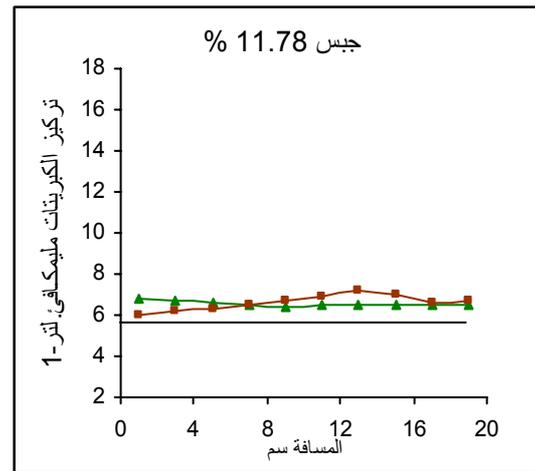
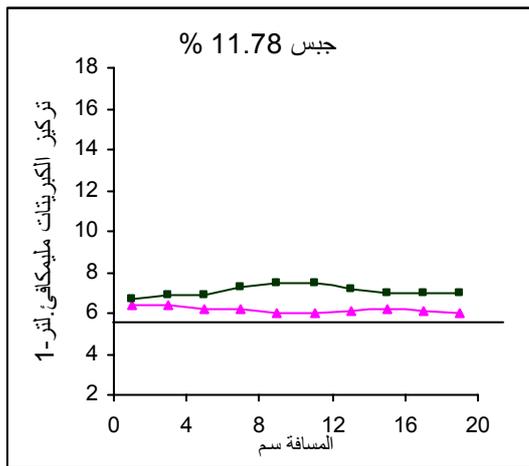
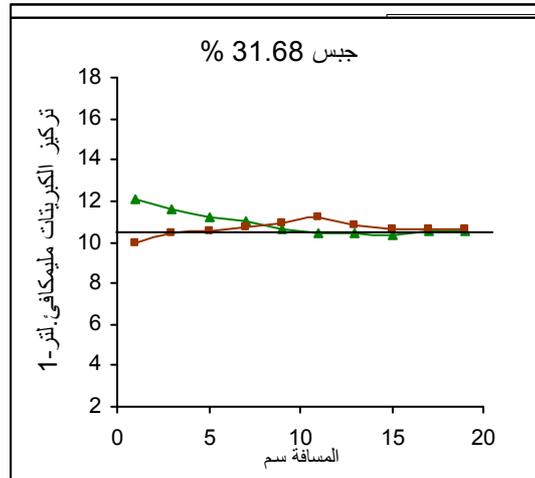
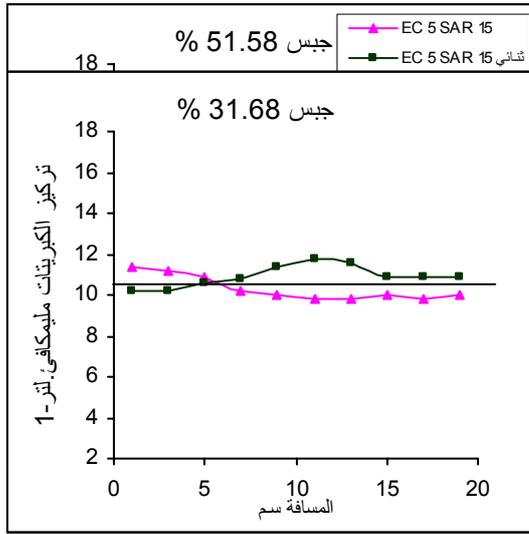
(SAR 15)

SO₄⁻² Ca⁺² Activity Coefficient

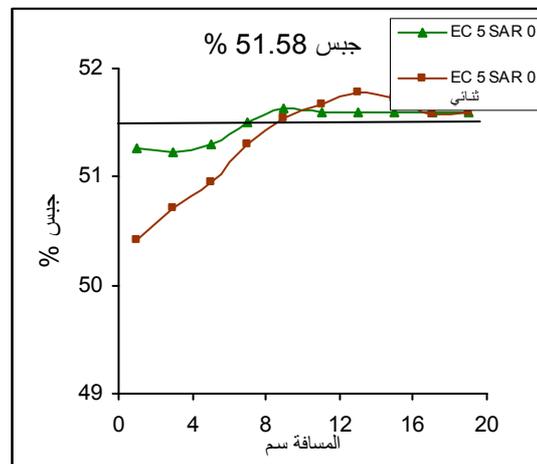
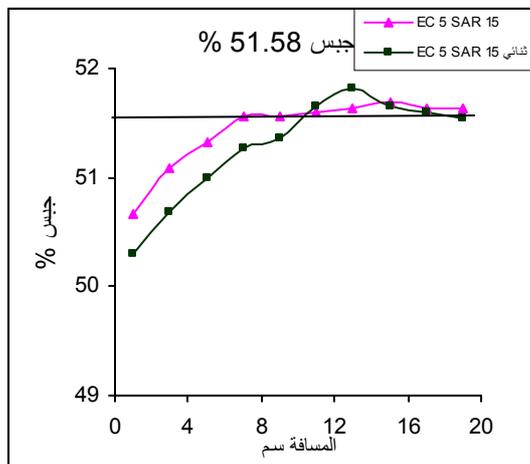
.(2)

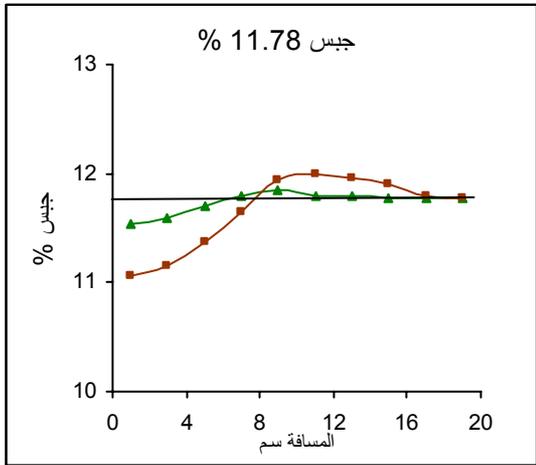
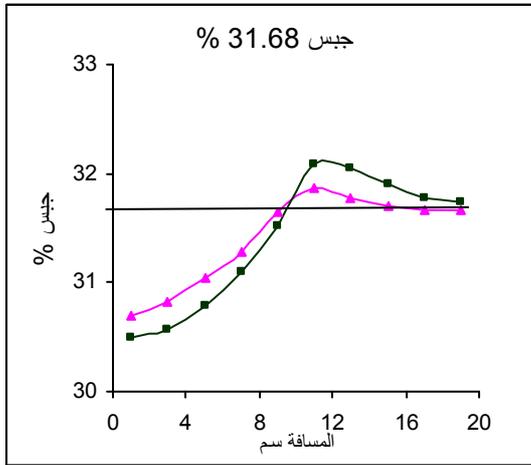
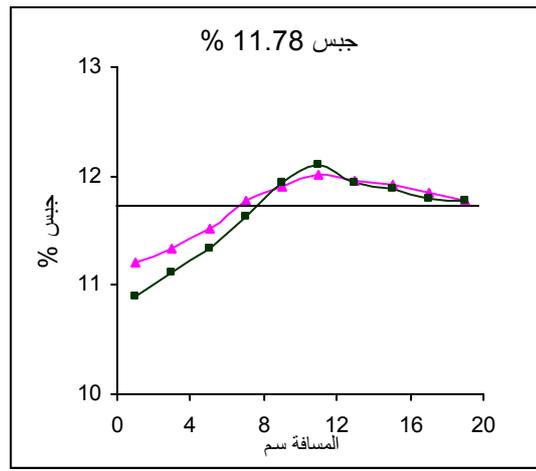
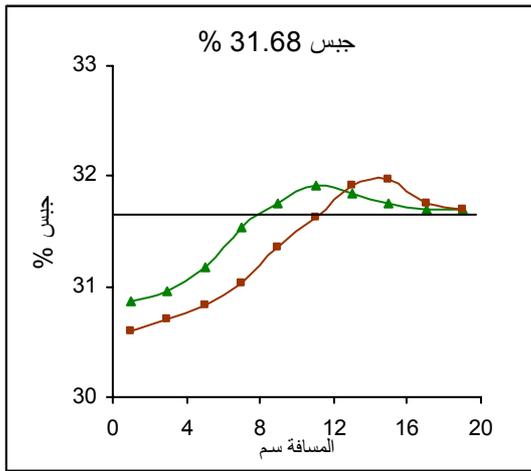
SAR 15

. Na₂SO₄



5





.6

% 30 - 25

%25

(15)

(14)

%30

.(13)

- .1986. -1
- 6-4.
- 2-FAO,1989.Water quality for agriculture irrigation and drainage paper 29
Rev.FAO.Rome.174 p.
- .1991. -3
- .70-61:2 23
- 4- James, A.N; and A.R.R.Lupton.1978.Gypsum and anhydrite in foundation of
hydraulic structure.Geotechnig.Vol.28,No.3,pp. 264-272.
- 5- Mikheev, V.; V. P. Fetrukhin; and V.A.Kronit.1973.Properties of saline soil used
in construction proceeding of 8th International Conference on Soil
Mechanics and Foundation Engineering,Vol.22,pp.133-138.
- 6- Ramiah,B.K.1982.Effect of chemical on compressibility and strength of Baghdad
silty clay-Building Research Center.R.P.70-82.
- 7- Bruce, R. R.; and A.Klute,1956.The measurement of soil moisture diffusivity. Soil
Sci.Soc.Am.Poc.20:458-462.
- 8- Nielsen, D. R; J. W. Bigger; and J.M.Davidson.1962.Experimental consideration
of diffusion analysis in unsaturated flow problems. Soil
Sci.Soc.AM.Proc.26:107-111.
- 9- Mailk, M.; M. A. Mustafa; and J.Lefty.1992.Effect of mixed Na/Ca solutions on
swelling, dispersion and transient water flow in unsaturated
montmorillonitic soils.Geoderma.52: 17-28
- 10- Nofziger, D. L; and D.Swartzendruber.1976.Water content and bulk. density
during wetting of bentonite -silt. column. Soil Sci. Soc. Am. proc.24:157-
160.
- 11- Richard, L. A. (ed)1954.Diagnosis and improvement of saline and alkali soils.
U.S. Dept. Agr. HB. No. 60.
- .1989. -12
- 13- FAO, 1990. Management of Gypsiferous soils. Soils Bulletin 62.FAO. Rome,
Italy.
- .1994. -14
- .25
- .45-38 :1
- 15- Van Alphen, J. G; and F. D. Rois Remero.1971.Gypsiferous soils. Notes on
characteristicsandmanagement.Bulletin12.11
LRI,Wageningen,Netherlands.