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EFFECT OF SOME SOIL AMENDMENTS AND COMPOST ON SOME SOYBEAN VARIETIES PRODUCTIVITY AND SOIL PROPERTIES UNDER SALT AFFECTED SOILS

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ABSTRACT

A field experiment was conducted during the two successive summer seasons of 2012 and 2013 at the experimental farm of Sakha Agric. Res. Station, Kafr EL-Sheikh Governorate. This study was conducted to investigate the effects of gypsum, sulphur and organic fertilizer (rice straw compost) on soybean yield, its chemical composition and soil chemical properties under three levels of soil salinity5.00, 9.00and 13.00 dS/m. The experiments were laid in split plot design, where the main plots, were allocoted for soil amendments: control treatment,-Rice straw compost at rate of 4 ton fed^{-1}, sulphur at rate of 800 kg fed^{-}and gypsum at level of 4tonfed^{-1} while the sub plots were allotted for soybean cultivars; Giza111, Dr 101, Giza35, Giza82, Giza83, Toano and Holyday. The treatments were replicated four times.

The results can be summarized as follows:-

1- The soybean yield and its components were significantly affected by salinity, soil amendments and soybean cultivars

2- The highest soybean seed yield were obtained by Giza 35 and Giza83 under application of gypsum treatment at three levels of soil salinity

3- The maximum values of N, P and K contents in the seeds were obtained by Giza111 .Giza 35 andGiza82 under gypsum treatment

4- The highest straw yields were recorded from Toano and Holyday, cultivars

5-Soil salinity decreased as follows gypsum>sulphur>compost>control in the soil at the end of experiments

6- Availability of N, P and K of soil after harvesting of soybean plants were increased at S1and S2 especially with application of compost comparing to control

7-The seed yield as affected by cultivars which can be arranged according to tolerance for salinity as follows: Giza83 = Giza35= Giza111=Dr101= Holyday =. Toano > Giza 82) at S1. (Giza83 = Giza35> Giza111. =Dr101= Holyday = Toano > Giza82) at s2 and Giza83 = Giza35> Giza111. =Dr101> Holyday = Toano > Giza82) at S3 under gypsum treatment respectively

INTRODUCTION

Soybean (*Glycine Max L.*) a healthy food, is a cheap source of oil and protein. Sulphur considered of special importance for oil plants due to its essentiality in amino and nucleic acids formation and protein metabolism (Mohamed et al, 2001). Sulphur reduces soil pH resulting in higher nutrient availability and better physical conditions (Agrisnet: Manures, 2011). Therefore the regular addition of compost is the best way for enhancing soil organic and, which helps to build a fertile soil structure. Such a soil structure makes better use of water and nutrients. It easier to till and, overall, is better able to achieve optimum yields on a long term basis(Rangarajan et al., 2000) demonstrated through a filed study that organic fertilizers significantly increased N and K uptake and yield of legume crop. Application of gypsum is a common recommendation as a source of calcium to replace exchangeable sodium and to reduce alkalinity and improve physical and chemical properties of the soil (Ayers and Westcot, 1985). In the Nkwalini, Various amendments like gypsum, sulphur, acids, press mud and farm yard manure (FYM) may be used for reclamation of these soils (Muhammad 1990,Sharma *et al*. 1996, Biggar 1996, Haq *et al*., 2001).The use of gypsum as a source of Ca_2+ is a well established practice for the amelioration and management of sodium saturated water/soils (Bresler, *et al., 1982).* Being easily available and cheap source of calcium, gypsum is commonly used in Pakistan .Because of low solubility of gypsum and calcareous nature of soils its efficiency is reduced. However, its effect on the amelioration process continues for few months until the whole of gypsum reacts with the exchangeable sodium (Na) of the soil.

Soil salinity is one of the most important environmental factors affecting the growth and yield of most field crops, especially in arid and semi-arid regions as in Egypt. Saline soil is wide-spread in the northern part of the country especially in Kafr El-Sheikh Governorate. The problem of salinity received much attention in Egypt in both old cultivated and newly reclaimed areas. Effects on growth and yield may be due to ionic imbalances which can be caused by high salt concentration and soluble salts which depress the water potential of nutrient medium and hence restrict water uptake by plant roots. Salinity causes reduction in crop yield on about 10Mha of world irrigated land (Rhoades and Loveday, 1990). One of the major reasons of low productivity of crops grown under saline sodic conditions is the

Salt toxicity. The management of salt affected soil requires a good understanding of crop- salinity relations, particularly under field condition.

It is common that field crop differ greatly in their tolerance to salinity and the differences in salt tolerance often occur between different varieties of a given species. Actual, response to salinity varies also according to stage of plant growth (Jefferies, 1988).

Salinity seriously constrains crop yield in irrigated agriculture throughout the world. Nearly one third of the world's irrigated agricultural land is saline, (Shannon, 1984) and estimates salt-affected soil by about 400-950 x 10^6 ha. Saline and alkaline soils are the major problem which affects productivity of common bean in arid and semi-arid regions such as Egypt. It has bean generally recorded that salinity adversely affects seed germination and seedling growth as well as relevant metabolic processes of some glycophytic plants (Ahmed *et al*., 1983; Drossopoulos *et al.*, 1987). As glycophyte (Hasegawa *et al.,* 2000). Salt affected soils are characterized by excessively high levels of water-soluble salts, including sodium chloride (NaCl), sodium sulfate (Na_2SO_4), calcium chloride ($CaCl_2$) and magnesium chloride ($MgCl_2$), among others. The physical, chemical and biological properties of salt affected soil are improved by the application of gypsum and/or FYM as remediation for sustainable land usage and crop productivity, leading to enhanced plant growth and development (Chaudhry, (2001).

MATERIALS AND METHODS

A field experiment was carried out at Sakha Agriculture Research Station farm using soybean (*Glycine max L*.) during the two successive summer seasons of 2012and 2013. The soil of the experimental field was clayey in texture as shown in Tables (2)and (3),some, soil chemical analysis are determined according to Page (1982) before planting 2012 and after harvesting 2013 and physical properties of the soil were determined according to Klute (1986).

Split plot design was assigned by four treatments. The main plot 1-control treatment 2-rice straw compost at rate of 4 tonfed^{-1}, 3 sulphur at rate of 800 kg fed^{-}1 4-gypsum at rate of 4 Tonfed^{-1} The sub plots were allotted to seven soybean cultivars, cultivars Giza111, Dr 101, Giza35, Giza82, Giza83, Toano and Holyday. The treatments were replicated four times for each. Each replicate had 7 plots randomly assigned to the 7 genotypes. Each plot consisted of 5 ridges three meters length with 60 cm between ridges. Sowing took place as to rows/ridge, in double seeded hills, 20cm apart. At harvest the mid three ridge/plot were harvested where the plot area was 5.4 m^2 All treatments were fertilized with N fertilizer as urea at level of 15 kg Nfed^{-1}, super phosphate (22.5kg pfed^{-1}) and potassium sulphate (24 kg k_2Ofed^{-1}) .The other recommended agriculture practices were done.

Table (1): Pedigree origin and growth habit of the studied soybean genotypes

Cod	Genotypes	Pedigres	origin	Growth habit
1	Giza 111	Crawford xcelest	Egypt	Indeterminate
2	Dr 101	Selected from Elgin(f4 selection from the populationp6)	Egypt	Determinate
3	Giza35	Crawford xcelest	Egypt	Indeterminate
4	Giza82	Crawford x M-presto	Egypt	Indeterminate
5	Giza83	Select from MBB-123-9	Egypt	Indeterminate
6	Toano	Worex Essax	USA	Determinate
7	Holyday	N77-179x Johnston	USA	Determinate

Studied characters:

1-Yield and its components:, Biological yield, seed yield and .straw yield (ton/fed) Harvest index: seed yield /biological yield and 100-seed weight (g)

2-Some mineral composition of soybean seed: i.e., nitrogen, Phosphorus and potassium were determined according to method introduced by Jackson (1967). Protein percentage was calculated by multiplying the total nitrogen% by 5.71 according to (FAO/WHO.1973).

3- Salinity, nutrient contents (Available N, P and K) of representative of soil content after soybean harvesting were determined according to the standard methods (Page, 1982) following: The objective of the present work is to investigate the effects of soil amendment sulphur, gypsum and compost on soybean yield and its chemical composition, rather for seed contents of N, P and K for sustainable agriculture and soil chemical properties

Table (2): Some Chemical analyses of soil* (0—60cm) before planting (2012)

Treatment	Salinity levels	ECe dS/m	Soluble cations, meq /L				Soluble anions, meq/L				Total N%	Available ppm	
			Ca^{+2}	Mg^{+2}	Na^{+}	K^{+}	CO_3^{-}	HCO_3^{--}	CL^{-}	SO_4^{--}		P%	K
Gypsum	S1	5.32	16.1	7.2	28.02	1.96	..	10.0	14.5	28.78	0.11	0.40	290
sulphur	S1	5.03	15.8	7.1	25.4	2.00	..	9.8	16.0	24.50	0.11	0.40	290
control	S1	5.13	16.0	7.2	26.1	1.99	..	9.9	16.2	25.19	0.11	040	290
compost	S1	5.58	16.1	7.3	25.2	198	..	9.8	16.1	24.68	0.11	040	290
Gypsum	S2	9.65	30.02	19.1	45.2	2.20	..	13.1	41.8	41.62	0.10	035	300
sulphur	S2	9.94	31.0	20.1	46.2	2.10	..	14.1	42.6	42.70	0.10	035	300
control	S2	9.84	30.1	18.2	48.1	2.10	..	12.6	43.2	42.70	0.10	035	300
compost	S2	9.64	30.2	18.0	46.1	2.10	..	12.8	42.2	41.40	0.10	035	300
Gypsum	S3	13.4	36.2	22.1	72.5	3.2	..	13.5	68.4	52.1	0.08	0.38	338
sulphur	S3	13.47	36.8	23.1	71.5	3.3	..	15.4	68.2	51.1	0.08	0.38	338
control	S3	13.57	36.7	23.1	72.5	3.4	..	15.2	68.1	52.4	0.08	0.38	338
compost	S3	13.0	36.6	23.2	71.1	3.5	..	15.1	68.2	46.7	0.08	0.38	338

- **Soil under study surrounded by research buildings from three sides and fourth sides was limited by mean drain. So, the drainage was restricted.**

RESULTS AND DISCUSSION

Effect of soil amendment and compost on soil properties after soybean harvesting

Soil salinity:

Effects of different soil **amendment** treatments with sulphur gypsum and compost on soil salinity comparing control after harvesting soybean plants are shown in Table 3. Data show that addition of gypsum amendments decreased soil salinity from(5.32,5.03,5.13,5.58), (9.65,9.94,9.84,9.64) and (13.4,13.47,13.57,13.0)dS/m to(3.61,4.10,5.06,6.98), (3.47,2.94,7.31,7.22) and(3.39,7.30,7.21,8.95) dS/m at amendment gypsum, sulphur, control and compost, respectively. This may be due to the dissolving action of replacing calcium place sodium resulted from sulphur oxidation by microbial activity which react with $CaCO_3$ and calcium phosphates and ends up with the formation of $CaSO_4$, total salinity is thus increased. The same conclusions were reported by (Abd-Allahh,1998).

Available soil macronutrients content:

Data in Table (3) revealed that the Soil amendment and compost affects on the availability of N, P and K after harvesting soybean plants.

N%, available P and K content in soil were increased up to 0.11%.0.40%.290,.10.0%.35%.300,and 0.09%.0.40%.315 mg/kg before planting at s1,s2 and s3 in the two seasons respectively to (0.12%.0.46%.320), (0.12%.0.46%.320) and (0.13%.0.48%.320mg/kg) at the end of experiments with gypsum .sulphur and compost at s1 and s2.while NPK decreased comparing before planting at s3 because the nodules of soybean affects with soil salinity. It was noticed that soil available nutrients contents resulting from the application of composted rice straw .This may be due to the short time growth period of soybean in which reflect residual of nutrients from, OM decomposition. Thus highly levels were interpreted by many others, Metwally, and Khamis, (1998). Stated that organic maturing plays role in increasing the N availability through microorganism activity besides decreasing N losses by leaching and volatilization. The increase in the availability of soluble P from additions of compost which has an effect that described as resulting from phosphors humic complexes that minimize immobilization processes, anion replacement of phosphate by humid ions, and coating of sequie oxides particles by humus to form a cover which reduces the phosphate fixating capacity Rechcigl, (1995)Concerning the increasing of available K^+ after addition of compost, Tan (1993) found that humid and fulvic acids are capable for dissolving very small amounts potassium from the soil minerals by chelating complex reaction or both with released amounts of K being increased by time

Table (3): Some chemical analyses of soil* (0—60cm) after end of the experiments

Treatment	Salinity levels	ECe dS/m	Soluble cations, meq/L				Soluble anions, meq/L				Total N%	Available ppm	
			Ca^{+2}	Mg^{+2}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^{-}	CL^{-}	SO_4^{--}		P%	K
Gypsum	S1	3.61	13.86	7.39	13.46	1.39	-	8.4	9.8	17..89	0.12	0.46	320
sulphur	S1	4.10	14.78	8.97	15.87	1.39	-	7.2	14.0	19..8	0.12	0.46	320
control	S1	5.06	15.18	7.06	25.47	1.96	-	9.6	13.5	26..56	0.11	0.46	300
compost	S1	6.98	21.78	9.57	36.6	1.86	-	6.9	42.0	20..91	0.13	0.48	330
Gypsum	S2	3.47	15.1	6.73	11.85	1.03	..	6.6	11.2	16.9	0.11	0.44	330
sulphur	S2	2.94	13.86	6.14	8.85	.52	..	3.6	8.64	17.13	0.11	0.44	330
control	S2	7.31	25.74	12.8	32.6	2.0	..	7.2	42.0	23.94	0.10	0.40	280
compost	S2	7.22	25.08	12.07	33.2	1.78	..	6.9	25.0	40.22	0.11	0.44	340
Gypsum	S3	3.39	11.88	8.58	11.78	1.63	..	7.9	14.0	11.96	0.08	0.40	320
sulphur	S3	7.30	23.66	7.92	39.6	1.86	..	9.0	35.0	29.03	0.08	032	320
control	S3	7.21	22.72	11.16	36.3	1.86	….	7.5	25.0	39.53	0.07	033	290
compost	S3	8.95	29.04	17.82	40.6	2.00	..	13.2	41.6	34.66	0.09	0.20	355

Biological yield

Analysis of variance showed high significantly effect of soil amendment treatments on Biological yield ton/fed in the two seasons .It could be noticed from Table4 caused a markedly positive The highest Biological yield was obtained by Giza83 and Giza35 under gypsum treatment followed by sulphur and compost comparing with control at three levels of soil salinity respectively.

Table 4: Effect of soybean cultivars on biological yields (ton/fed) under three levels of soil salinity (means of two seasons).

varieties	**Bioloical yield(ton /fed)**				
	S1				
	gypsum	**sulphur**	**compost**	**control**	**mean**
Giza111	3.54 ab	3.53 bc	3.40 ab	2.34 a	3.20
Dr 101	3.62 a	3.64 b	3.36 ab	2.57 a	3.30
Giza35	3.69 a	3.71 b	3.40 ab	2.45 a	3.19
Giza82	2.98 b	3.05 c	2.84 b	2.45 a	2.83
Giza83	3.34 ab	3.53 bc	3.58 a	2.47 a	3.23
Toano	3.63 a	3.62 b	3.54 a	2.47 a	3.32
Holyday	3.83 a	3.62 a	3.40 ab	2.40 a	3.31
Mean	3.52	3.53	3.36	2.45	3.21
S2					
Giza111	2.89 d	2.85 c	2.42 d	2.07 e	2.56
Dr 101	2.91 c	2.8 e	2.37 e	2.04 f	2.53
Giza35	3.18 a	2.94 b	2.65 a	2.19 c	2.74
Giza82	2.6 c	2.4 a	2.3 f	1.84 c	2.29
Giza83	3.02 b	2.72f	2.38 e	2.23 g	2.59
Toano	3.03 b	2.82 d	2.45 c	2.31 g	2.65
Holyday	3.02 b	2.97 a	2.62 b	2.12 d	2.68
Mean	2.95	2.79	2.46	2.11	2.58
S3					
Giza111	2.45 f	2.52 c	2.77 a	1.77 e	2.38
Dr 101	2.49 e	2.41e	2.18 e	1.77 e	2.21
Giza35	2.7 a	2.49 d	2.42 b	1.89 c	2.38
Giza82	2.37 g	2.1 f	2.18 e	1.66 f	2.08
Giza83	2.68 b	2.4 e	2.2 d	1.84 d	2.28
Toano	2.61 c	2.59 a	2.34 c	1.93 b	2.37
Holyday	2.55 d	2.55 b	2.33c	2.31a	2.44
Mean	2.55	2.44	2.35	1.88	2.30

Seed yield:

Analysis of variance showed high significant effect of soil amendment treatments on seed yield in the two seasons .It could be noticed from Table (5) that gypsum treatment caused a marked positive effect on seed yield (1.67, 1.34and1.06 tonfed^{-1}) and. (1.65.1.33and1.04) with Giza83 and Giza35 at three levels respectively, as compared with sulphur, compost and control treatment which recorded the lowest values (.1.03 ..83and 0.72 tonfed$^{-1)}$, at three soil salinity levels respectively with Giza82. The trend obtained for seed yield was similar to these obtained for biomass yield. Data in Table (5) show high significant effect on seed yield by soybean cultivars .The seed yield as affected by cultivars can be arranged as follow : Giza83 = Giza35> Giza111.>Dr101> Holyday >. Toano > Giza82) at S1. (Giza83 = Giza35> Giza111.>Dr101> Holyday >. Toano > Giza82) at S2 and Giza83 = Giza35> Giza111.>Dr101> Holyday >. Toano > Giza82) at S3 three levels of soil salinity, respectively, .This result proves that soybean Giza83 and Giza35 cultivars were superior to the others in the two seasons. The interaction between soil amendment treatments and soybean cultivars had high significant effect on soybean seed yield in both seasons. The highest seed yield was obtained by Giza83 and Giza35 under gypsum treatment followed by sulphur and compost comparing with control at three levels, of soil salinity respectively. Chaudhry (2001) also concluded that gypsum application to rice and wheat enhanced the paddy and grain yield by 18 and 17%, respectively.

Table (5): Effect of soybean cultivars on seeds yields Ton/fed) under three levels of soil salinity (means of two seasons)

varieties	**seed yield(ton /fed)**				
		S1			
	gypsum	**sulphur**	**compost**	**control**	**mean**
Giza111	1.67 a	1.56 b	1.57 a	0.7 b	1.38
Dr 101	1.66 a	1.6 a	1.52 b	0.72 a	1.38
Giza35	1.65a	1.6 a	1.56 a	0.73 a	1.39
Giza82	1.03 c	1.01 c	1.01 d	0.64 c	0.92
Giza83	1.67 a	1.61 a	1.58 a	0.74 a	1.40
Toano	1.52 b	1.48 d	1.51 b	0.73 a	1.31
Holyday	1.64 a	1.46 d	1.5 b	0.74 a	1.34
Mean	1.55	1.47	1.46	0.71	1.30
			S2		
Giza111	1.12 c	1.09 ab	0.71 b	0.61 a	0.88
Dr 101	1.14 c	1.07 ab	0.77 ab	0.62 a	0.90
Giza35	1.33a	1.13 a	0.83 a	0.63 a	0.98
Giza82	0.83 d	0.65 d	0.46 d	0.42 b	0.59
Giza83	1.34 a	1.11 b	0.73 b	0.64 a	0.96
Toano	1.08 c	0.89 c	0.63 c	0.57 a	0.79
Holyday	1.11 c	0.93 c	0.7 b	0.56 a	0.83
Mean	1.14	0.98	0.69	0.58	0.85
			S3		
Giza111	0.83 b	0.86 a	0.65 b	0.43 bc	0.69
Dr 101	0.82 bc	0.77 b	0.55 c	0.47 b	0.65
Giza35	1.04 a	0.87 a	0.7 c	0.52 c	0.78
Giza82	0.72 d	0.53 d	0.47 d	0.3 d	0.51
Giza83	1.06 a	0.85 a	0.71 a	0.53 a	0.79
Toano	0.79 c	0.77 b	0.43 d	0.4 c	0.60
Holyday	0.78 c	0.71 c	0.46 d	0.37 d	0.58
Mean	0.86	0.77	0.57	0.43	0.66

straw yield:

Data in Table 6 revealed that the soybean cultivars were different significantly in straw yield in the two seasons. Holyday, Toano and Giza35 cultivars had the highest values (2.19, 2.11and 2.04), (1.91, 1.95 and.1.85.) and (1.77, 1.82 and 1.70) ton/fed at three soil salinity levels respectively with gypsum treatment and the lowest values of (1.67, 1.68 and 1.62 ton/fed) were recorded with **giza83** cultivar at three soil salinity levels respectively. These differences may be due to the differences in the genetic structure of the used cultivars which led to different responses salinity and soil amendment treatments

Table 6: Effect of soybean cultivars on straw yield (ton/fed) under three levels of soil salinity (means of two seasons)

varieties	Straw yield(ton /fed)				
	S1				
	gypsum	sulphur	**compost**	**control**	**mean**
Giza111	1.87 e	1.97 d	1.83 c	1.64 c	1.83
Dr 101	1.96 d	2.04 c	1.84 c	1.85 a	1.92
Giza35	2.04 c	2.11 b	1.85 c	1.72 b	1.93
Giza82	1.95 d	2.04 c	1.84 c	1.81 a	1.91
Giza83	1.67 f	1.92 e	1.83 c	1.73 b	1.79
Toano	2.11 b	2.14ab	2.1 a	1.74b	2.02
Holyday	2.19 a	2.16a	2.03 b	1.66 c	2.00
Mean	1.97	2.05	1.88	1.74	1.91
S2					
Giza111	1.77 d	1.76 d	1.71 c	1.46 d	1.68
Dr 101	1.77 d	1.73 e	1.7 c	1.42 e	1.66
Giza35	1.85 dc	1.81 c	1.82 b	1.52 c	1.75
Giza82	1.77 d	1.75 de	1.84 b	1.42 e	1.70
Giza83	1.68 e	1.67 f	1.65d	1.39e	1.60
Toano	1.95 a	1.93 b	1.91a	1.74 a	1.88
Holyday	1.91 b	2.04 a	1.92 a	1.56 b	1.86
Mean	1.81	1.81	1.79	1.50	1.73
S3					
Giza111	1.62 d	1.66 b	1.62 c	1.34 cd	1.56
Dr 101	1.67 c	1.64 b	1.63 c	1.3 d	1.56
Giza35	1.66 c	1.62 b	1.72 b	1.37 c	1.59
Giza82	1.65 cd	1.57 c	1.71 b	1.36 c	1.57
Giza83	1.62 d	1.55 c	1.51 d	1.31 d	1.50
Toano	1.82 a	1.82 a	1.91 a	1.53 a	1.77
Holyday	1.77b	1.84 a	1.87 a	1.44 b	1.73
Mean	1.69	1.67	1.71	1.38	1.61

100-seed weight:

Data in Table (7) revealed that the soybean cultivars were different significant 100-seed weight(g) in the two seasons Giza35 cultivar had the highest values 14.27,14.17,14.33 and 13.17g,13.03,12.07,11.47 and 10.17 and 12.63,12.40,11.50 and 11.40 g under S1,S2 and S3, treatment, respectively,While genotype Toano had the lowest values.1.2.11.7.11.17and 10.8.9.38.9.2.9.02and 8.93 g .9.06.8.73.8.50 and 8.33g underS1.S2and S3 treatment, respectively .Data in Table (7) showed that gypsum treatment caused markedly positive effect on 100-seed weight(g) at three levels of soil salinity respectively followed by sulphur and compost.

Table 7: Effect of soybean cultivars on -100 seed (g) under three levels of soil salinity (means of two seasons)

varieties	weight 100-seed(g)				
	S1				
	gypsum	sulphur	compost	control	mean
Giza111	13 c	12.87 c	13.03 c	10.87e	12.44
Dr 101	14.9 a	14.76 a	15.00a	13.37a	14.83
Giza35	14.27 b	14.17b	14.33b	13.17b	14.27
Giza82	10.4 g	10.30g	10.40g	10.10f	10.40
Giza83	11.6 e	11.37e	11.47e	11.03d	11.60
Toano	11.2 f	11.07f	11.17f	10.80e	11.20
Holyday	12.07 d	11.97d	12.17d	11.20 c	12.07
Mean	12.49	13.82	13.03	10.87	12.40
S2					
Giza111	12.4b	12.03b	11.03b	10.1bc	11.39
Dr 101	13.17a	12.80a	10.9b	10.43a	12.04
Giza35	13.03a	12.07b	11.47g	10.17ab	11.69
Giza82	9.93a	9.63e	9.03d	9.06d	9.41
Giza83	10.80d	10.46d	10.23c	10.03bc	10.50
Toano	9.38f	9.20f	9.02d	8.93d	9.13
Holyday	11.19c	11.03c	10.4c	9.83c	10.61
Mean	11.41	10.74	10.30	9.62	10.68
S3					
Giza111	11.83b	11.56b	10.30b	10.17b	10.97
Dr 101	10.83c	10.40c	10.23b	9.86c	10.33
Giza35	12.63a	12.40a	11.50a	11.40a	11.98
Giza82	9.63e	9.50e	9.27d	9.13d	9.38
Giza83	10.26d	10.17d	10.01c	9.90c	10.09
Toano	9.06f	8.73f	8.50e	8.33c	8.66
Holyday	10.26d	10.17d	10.06c	10.10c	10.12
Mean	10.64	10.42	9.98	9.83	10.22

Harvest index %:

Data in Table(8) revealed that the soybean cultivars were different significant effect on harvest index% .The highest_Harvest index **%** was obtained by Giza83 and Giza35 under gypsum treatment followed by sulphur and compost comparing with control at three levels of salinity, respectively.

Table (8) harvest index as affected by salinity level, amendment type and soybean varieties

varieties	S1				S2				S3			
	gypsum	sulphur	compost	control	gypsum	sulphur	compost	control	gypsum	sulphur	compost	control
Giza111	47.17	44.19	46.17	29.91	38.75	38.24	29.33	29.46	33.87	34.12	23.46	24.29
Dr 101	45.85	43.95	45.23	28.51	39.17	38.21	31.17	30.39	32.93	31.95	25.22	26.55
Giza35	44.17	43.12	45.88	29.79	41.83	38.43	31.32	28.76	38.51	34.93	28.92	27.51
Giza82	34.56	33.11	35.56	35.35	46.89	27.68	20.00	22.82	30.37	25.23	21.55	18.07
Giza83	50.00	45.60	41.34	29.95	44.37	38.60	30.67	36.05	39.55	35.41	31.98	28.80
Toano	51.50	46.88	42.65	29.55	35.64	31.56	24.80	24.67	30.26	29.72	18.37	20.75
Holyday	42.81	40.33	44.11	30.83	36.75	45.58	26.71	26.41	30.58	27.84	19.79	37.66

Nitrogen content of seeds:

Soil amendment had highly significant effect on N% and protein% of soybean seeds in both seasons (Table 9).Nitrogen % as affected by can be arranged as follow, gypsum>sulphur > compost > control at s_1.

Table 9: Nitrogen percentage of seeds and protein content (%) in the seeds under three levels of soil salinity(S1,S2and S3)

varieties	%N seed (S1)									
	gypsum		sulphur		compost		control		mean	
	N%	proten%	N%	proten%	N%	proten%	N%	proten%	N%	proten%
Giza111	5.73a	32.72	5.83a	33.29	5.63a	32.15	4.20a	23.98	5.35	30.53
Dr 101	5.63ab	32.15	5.70ab	32.55	5.40ab	30.83	3.60bc	20.56	5.08	29.02
Giza35	5.77a	32.95	5.80a	33.12	5.20bc	29.69	3.70b	21.13	5.12	29.22
Giza82	5.33bc	30.43	5.40bc	30.83	4.80de	27.41	3.13de	17.87	4.67	26.64
Giza83	5.02cd	28.66	5.20cd	29.69	5.05cd	28.84	3.00e	17.13	4.57	26.08
Toano	4.26e	24.32	4.39e	25.07	4.20f	23.98	3.30cde	18.84	4.04	23.05
Holyday	4.88d	27.86	4.91d	28.04	4.60e	26.27	3.43bcd	19.59	4.46	25.44
Mean	5.23	29.87	5.32	30.37	4.98	28.45	3.48	19.87	4.75	27.14
S2										
Giza111	4.32bc	24.67	4.40bc	25.12	4.16b	23.75	3.13abc	17.87	4.00	22.85
Dr 101	4.24bc	24.21	4.20bc	23.98	4.06b	23.18	3.33a	19.01	3.96	22.60
Giza35	4.50b	25.70	4.46bc	25.47	4.00b	22.84	3.16ab	18.04	4.03	23.01
Giza82	4.86a	27.75	4.83a	27.58	4.63a	26.44	2.93bcd	16.73	4.31	24.62
Giza83	4.13c	23.58	4.40bc	25.12	4.13b	23.58	2.70d	15.42	3.84	21.93
Toano	4.03c	23.01	4.16c	23.75	3.96b	22.61	2.80cd	15.99	3.74	21.34
Holyday	4.50b	25.70	4.53ab	25.87	4.30b	24.55	2.79cd	15.93	4.03	23.01
Mean	4.37	24.94	4.43	25.27	4.18	23.85	2.98	17.00	3.99	22.77
S3										
Giza111	4.12ab	23.53	4.23b	24.15	4.03ab	23.01	2.80abc	15.99	3.80	21.67
Dr 101	4.11ab	23.47	4.10bc	23.41	3.86abc	22.04	2.93a	16.73	3.75	21.41
Giza35	4.16ab	23.75	4.66a	26.61	3.63c	20.73	2.86ab	16.33	3.83	21.86
Giza82	4.20a	23.98	4.26b	24.32	4.06a	23.18	2.76abc	15.76	3.82	21.81
Giza83	4.06ab	23.18	4.03bc	23.01	3.70bc	21.13	2.50c	14.28	3.57	20.40
Toano	3.83bc	21.87	4.03bc	23.01	3.73abc	21.30	2.56bc	14.62	3.54	20.20
Holyday	3.63c	20.73	3.80c	21.70	3.53c	20.16	2.48c	14.16	3.36	19.19
Mean	4.02	22.93	4.16	23.75	3.79	21.65	2.70	15.41	3.67	20.93

Phosphorus content of seeds:

Data in (Table10) show that a high significant effect of soil amendments treatments on P-content of soybean seeds in the two seasons can be arranged in decreasing order as follow, gypsum>sulphur > compost > control.

Table 10:phosphrous percentage (%) of seeds under three levels of soil salinity (S1, S2and S3)

varieties	seed P%				
	gypsum	sulphur	compost	control	mean
	S1				
Giza111	0.61cd	0.61c	0.52c	0.45b	0.55
Dr 101	0.68a	0.61c	0.51c	0.40d	0.55
Giza35	0.60d	0.63b	0.62a	0.42c	0.57
Giza82	0.65b	0.61c	0.61a	0.41cd	0.57
Giza83	0.69a	0.66a	0.43d	0.42c	0.55
Toano	0.51e	0.47d	0.37e	0.31e	0.42
Holyday	0.62c	0.61c	0.57b	0.47a	0.57
Mean	0.62	0.60	0.52	0.41	0.54
S2					
Giza111	0.58a	0.50b	0.50a	0.49a	0.52
Dr 101	0.57a	0.51ab	0.41c	0.38c	0.47
Giza35	0.52b	0.52ab	0.41c	0.34d	0.42
Giza82	0.53b	0.50ab	0.46b	0.44b	0.48
Giza83	0.50c	0.48c	0.40c	0.38c	0.44
Toano	0.42e	0.40d	0.40c	0.28e	0.38
Holyday	0.45d	0.41d	0.40c	0.38c	0.41
Mean	0.51	0.47	0.43	0.38	0.45
S3					
Giza111	0.47b	0.42c	0.41b	0.29b	0.40
Dr 101	0.47b	0.41bc	0.35e	0.31a	0.39
Giza35	0.33d	0.32e	0.38d	0.28b	0.33
Giza82	0.46b	0.43b	0.42bc	0.24c	0.39
Giza83	0.50a	0.51a	0.45a	0.31a	0.44
Toano	0.46b	0.41c	0.39cd	0.23c	0.37
Holyday	0.42c	0.37d	0.31f	0.29b	0.35
Mean	0.44	0.41	0.39	0.28	0.38

Potassium content of seeds:

The results in (Table 11) show a highly significant effect of soil amendment treatments on K content in seeds in the two seasons. The highest values gypsum>sulphur > compost > control at s_1, respectively

Table (11):potassium percentage (%) of seeds under three levels of soil salinity

varieties	seed K%				
	gypsum	sulphur	compost	control	mean
	S1				
Giza111	1.7ab	1.72ab	1.65a	1.13a	1.55
Dr 101	1.63bc	1.70bc	1.61a	0.94b	1.47
Giza35	1.74a	1.78a	1.68a	0.95b	1.54
Giza82	1.65bc	1.63c	1.41c	0.83c	1.38
Giza83	1.61c	1.65bc	1.48bc	0.85c	1.40
Toano	1.65bc	1.64bc	1.42c	0.70d	1.35
Holyday	1.63bc	1.65bc	1.50b	0.71d	1.37
Mean	1.66	1.68	1.54	0.87	1.44
S2					
Giza111	1.63a	1.64 ab	1.51a	0.86a	1.41
Dr 101	1.60a	1.65 ab	1.44bc	0.85a	1.39
Giza35	1.65a	1.66 a	1.49ab	0.81ab	1.40
Giza82	1.63a	1.58 bc	1.48c	0.78b	1.37
Giza83	1.50b	1.55 c	1.37c	0.60b	1.26
Toano	1.48b	1.58bc	1.37c	0.61c	1.26
Holyday	1.45b	1.52c	1.29d	0.57c	1.21
Mean	1.56	1.60	1.42	0.73	1.33
S3					
Giza111	1.2bc	1.32a	1.29a	0.74b	1.14
Dr 101	1.16 bcd	1.35a	1.13cd	1.12a	1.19
Giza35	1.31 a	1.30ab	1.20bc	0.73b	1.14
Giza82	1.23 b	1.21c	1.21b	0.72b	1.09
Giza83	1.16bcd	1.23bc	0.93e	0.56c	0.97
Toano	1.10d	1.23bc	0.92e	0.53cd	0.95
Holyday	1.13d	1.25bc	1.06d	0.49d	0.98
Mean	1.18	1.27	1.11	0.70	1.06

CONCLUSION

IT can be concluded that the Giza 35 and Giza83 varieties were tolerant to soil salinity. Application of gypsum was found to be effective amendment for improving salt affected soils

Not only increase the yield of soybean but also improve soil properties which it reduces SAR value under more frequent of irrigation and with effective drainage which it allows leaching of salts out root zone

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تأثيربعض محسنات التربةوكمبوست قش الأرز على خواص التربةالملحية ومحصول بعض اصناف فول الصويا ومحتواها من العناصر

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أقيمت تجربة حقلية فى المزرعة البحثية بمحطة البحوث الزراعية بسخا- محافظة كفرالشيخ –مصر خلال الموسمين المتعاقبين 2012 و 2013بهدف دراسة تأثير الجبس و الكبريت والعضوى (كمبوست قش الأرز) على محصول فول الصويا ومكوناته وامتصاصة للنتروجين والفوسفور والبوتاسيوم وبعض خواص التربة الكيميائية.

أقيمت التجربة فى تصميم قطع منشقة مرة واحدة مع اربع مكررات تحت ثلاث مستويات مختلفة لملوحة التربة وهى: S_1 5.0dS/m,S_2 9.0 dS/m,$S_3$13.0 dS/m

على سبعة أصناف من فول الصويا حيث وضعت محسنات التربة في القطع الرئيسية وهي معاملة كنترول و كمبوست قش الارز4 طن/فدان و كبريت بمعدل 800كجم/فدان وجبس زراعى بمعدل4طن/فدان /فدان والمعاملات الشقية وهي اصناف فول الصويا وهي cultivars **Giza111, Dr 101, Giza35, Giza82, Giza83, Toano and Holyday**

وتتلخص النتائج كمايلى :-

1- تاثرمحصول فول الصويا ومكوناته تأثرت معنويا بكل من اضافة الجبس والكبريت والكمبوست وأيضا الأصناف وملوحة التربة

2-أعلى قيمة للمحصول الحيوى ومحصول الحبوب كانت مع اضافة الجبس تحت صنف جيزة35 وجيزة 83

3- تحصل علي اعلي محتوي للنتروجين والفوسفور والبوتاسيوم مع الاصناف جيزة 35 وجيزة 83 تحت معاملة الجبس

4- أانخفضت ملوحة التربة مع الجبس بالمقارنة مع الكبريت و,الكمبوست و الكنترول

5- زادت ذائبية النتروجين والفوسفور والبوتاسيوم بعد حصاد المحصول وذلك مع مستوي الملوحة الاول والثاني وانخفضت مع مستوي الملوحة الثالث

6- تحمل اصناف فول الصويا للملوحة اخذ الترتيب التاليعند مستوي الملوحة الاول

Giza83 = Giza35= Giza111=Dr101= **Holyday** =. **Toano** > **Giza82)**
Giza83 = Giza35> Giza111.=Dr101= **Holyday** =. **Toano** > **Giza82**), **عند المستوي الثاني and Giza83 = Giza35** Giza111.=Dr101> **Holyday** =. **Toano** > **Giza82)** عند المستوي الثالث تحت معاملة الجبس الزراعي