Minufiya J. Agric. Res. Vol. 34 No.4:1679-1712 (2009) "http://www.mujar.net"

EFFECT OF JOJOBA AND CASTOR BEAN SEED RESIDUES AS SOIL AMENDMENTS ON SOME CHEMICAL PROPERTIES AND PRODUCTIVITY OF SOILS

M. El-D. El-Sodany, E.I. El-Maddah and K.A. Khatab

Soil, Water and Environment Research Inst. Agric. Res. Center, Giza, Egypt.

(Received: Apr. 8 , 2009)

ABSTRACT: *Two successive cultivation seasons (summer season 2007 and winter season 2007/2008) were conducted in field experiments on silty clay loam soil at El-Gemmeiza Agricultural Research Station, El-Gharbia Governorate to evaluate the effect and residual effects of seed residues of jojoba and castor bean on improving some soil chemical properties, total macronutrients and the productivity of yield and yield components of maize and wheat plants. Furthermore, economical analysis was done by calculating the net income for every treatment to determine the economical treatment. The rate of jojoba and castor bean seed residues were 0.0, 1 and 2 ton/fed for each one and added only before maize sowing in the first season while mineral fertilizer rates were 0.0, 0.5 and 1.0 of the recommended dose for each crop.*

The experiments were conducted in a split-split plot in randomized complete block design with three replicates. The obtained results can be summarized as follows:-

1-Seed residues of jojoba and/or castor bean slightly decreased the soil reaction (pH). Furthermore, all treatments increased leaching the soluble salts and decreased soil salinity (EC), total soluble salts (TSS) and sodium adsorption ratio (SAR) values in both of the two soil layers, except with increasing the rates of mineral fertilizers.

2-All residues clearly enhanced total nutrient statues of the soil.

3-Organic carbon (O.C.,%) and the C/N ratio were slightly increased in surface and subsurface soil layers as a result of the added residues of jojoba and/or castor bean seeds.

4-The yield quantity and quality positively responded to the added residues. Increases in maize grains ranged between 17.88 and 109.12% over the control (untreated soil) in the first season, the highest grain yield of maize plants reached to 4.1560 ton/fed. While, the increases in the wheat grains and straw yield ranged from 18.65 and 124.66% and from 21.61 to 123.78% respectively over the control in the second season. The highest grain and straw yield of wheat reached to 3.1104 and 4.9572 ton/fed, respectively.

5-Economical analysis indicated that adding 1 ton/fed. from residues of jojoba seeds with 1 ton/fed. of castor bean seed residues with half of the recommended dose of mineral fertilizers was the best treatment compared

the other treatments, since it gave the highest net income (11569.45 L.E/fed.).

6-Therefore, it is more useful to use those treatments (jojoba and/or castor bean seed residues) with 0.5 of recommended dose of mineral fertilizers to get a markedly improve in both chemical properties and nutrients which reflect on higher yield incorporated with high net income, as well as to substitute a part of chemical fertilizers by the organic residues to minimize the pollution resulted from the intensive use of it.

Key words: *Seed residues of jojoba and castor bean, Soil amendments, some chemical properties, Maize and wheat plants, Yield components.*

INTRODUCTION

According to the statistics, the continuous increasing in fertilizers demand will reach 6.6, 2.2 and 7.0 million ton of N, P and K fertilizers in the 2025. Also, the excessive use of agrochemical fertilizers linked to the huge seepage losses which contribute to chemical pollution of ground water which represent the major source of soil salinity (Environmental Action plan of Egypt, 1992). Thus, it is beneficial to use organic materials on a large scale in agriculture, especially with the recent rises in prices of chemical fertilizers which have affected the agricultural production throughout the world, and had a violent impact on Egypt. Besides infiltration of some chemical fertilizers with drainage water has been considered responsible for the pollution of the natural ground water.

In Egypt, a great attention has been baid in the last years for increasing production of crops to cover the gap between local production and consumption. So, it is important to study factors maximizing the yield of crops through improvement the soil physical and chemical properties. However, the organic matter content in Egyptian soils gradually decreased and in order to increase it, the use of different source of organic residues, i.e., jojoba and castor bean seed residues become necessary.

The soil organic matter maintains favorable soil physical, chemical and biological properties and release nutrients to the soil mostly through plant residues decomposition (Kumar *et al.*, 2001). The decomposition of crop residues in soil and their carbon and nitrogen mineralization are largely influenced by the quality of plant materials, i.e., by their origin and composition (Heal *et al.*, 1997).

Castor meal - the residue obtained from castor cake by the solvent extraction process - is one of the most versatile natural manures. It is truly an organic manure which enhances the fertility of the soil without causing any damage or decay. It is enriched with the three big elements vital and conducive to the proper growth of crops - Nitrogen, Phosphorus and

Potassium. It also has traces of nutrients like Manganese, Zinc and Copper, thus making it a balanced fertilizer. Moreover, it helps to neutralize the detrimental effects of chemical fertilizers (Santhanam, 2008).

Jojoba or Hohoba (Simmondsia Chinensis L.) which represent a new raw material for industry in arid and semiarid lands is now being grown in Egypt, and its seed residues were produced by large amounts besides the residues of castor bean seeds.

Soil organic matter consisted of two types of compounds: non- humic substances, belonging to identifiable chemical compositions such as carbohydrates, and humic substances consisting of a series of brown to dark-brown, high molecular weight biopolymers (Quideau, 2002). Soil O.M. also plays a significant role as a buffer in soil against plant nutrients loss, particularly in the sandy soils or the soils having low cation exchangeable capacity (Olk *et al.*, 2000).

Soil pH slightly decreased with increasing rate of rice straw application in both water management treatments (Kongchum, 2005). El-Maddah *et al.* (2007) found that the crop residues, i.e., cotton stalks, rice straw and corn stalks as a complete structure placed in moles at 30 and 60 cm deep slightly decrease the soil pH and soil salinity (EC) and increased organic carbon and C/N ratio which enhanced the nutrient status of the soil either macro or micronutrients. Also, El-Sodany *et al.* (2007) added that the soluble salts and SAR decreased with the addition of saw dust, wheat straw, sugar cane residue and water hyacinth as the organic residues.

Barbaria and Patel (1980) pointed out that application of organic matter and sulphur at various soil moisture increased the availability of nutrients significantly as a result of increasing the exchangeable capacity of soils. El-Fayoumy *et al.* (2000) observed significant decreases in soil pH and increase in soil EC values by increasing the organic matter rate. Oguike and Mbagwu (2001) showed that exchangeable cations, CEC, OC, total nitrogen and available P were increased in water hyacinth amended soils relative to the control. Mostafa and El-Garhi (1995) pointed out that addition of organic manure caused a significant increase in K concentration of sorghum plants.

Sakr *et al.*, (1992) found that organic manure increased the N, P and K concentration and uptake of maize plants. Kaloosh *et al.*, (1989) found that addition of organic materials having wide C/N ratio such as cotton stalks and garbage favored N-immobilization and decreased the concentration of the mineral nitrogen. While, adding organic materials having narrow C/N ratio such as faba bean straw and orange residues favored mineralization and increased the concentration of the mineral nitrogen. Also, the addition of plant residues caused an increase in carbon dioxide evolution, total nitrogen and organic nitrogen.

Yousry *et al.* (1984) found that pH values were decreased and electrical conductivity values positively affected due to addition of organic matter.

Also. organic matter has a positive effect on increasing cations and anions exchangeable capacity and so keeping nutrients from being leached out.

Abdel-Latif and Abdel-Fattah (1983) reveal that the application of organic residues mixed with superphosphat significantly increased barley dry matter yield. while sugar cane residue application caused a significant reduction. Soliman and Monem (1995) stated that application of wheat straw at the rates of 1 and 2 % increased the dry matter yield of maize in a sandy soil by 13 and 22 %, respectively. El-Fayoumy *et al.* (2000) observed that grains and straw yield and 1000- seed weight of wheat and maize increased with increasing the rate of organic matter. Mostafa (2001) found that addition of poultry manure combined with olive cake residues increased dry matter yield. Barzegar *et al.*, (2002) found that application of organic materials (sugar cane bagasse residue and farmyard manure) significantly increased wheat yield. Darwish *et al.*, (2002) reported that organic manures as represented by jojoba and castor bean residues not only enhanced plant growth and production, but also, the high dose of (jojoba + castor bean) caused a high increase in growth parameters, grain and straw yield of wheat. Also, these treatments exerted beneficial economic plus its environmental impact. Phongpan and Mosier (2002) indicated that combined use of organic residues (rice straw) with urea did not decrease total N losses or increase crop yield, uptake of N compared to urea alone. El-Sodany *et al.*, (2007) and El-Maddah *et al.*, (2007) found that the yield and yield components positively responded to the added of crop residues where wheat grain and straw. rice grain and onion yield were increased.

The present experiments are conducted to evaluate the effect and residual effects of seed residues (jojoba and Castor bean residues) as compared with mineral fertilizers on some soil chemlcal properties, status of macronutrients and the productivity of crops. Moreover, substituting a part of chemical fertilization with organic residues to minimize the pollution resulted from the intensive application of it. Furthermore, the whole improvement of such soils are economically determined by calculating the net income for all experimental treatments.

MATERIALS AND METHODS

During two consecutive growing seasons (summer season 2007 and winter season 2007/2008), field experiments were conducted at El-Gemmeiza Agricultural Research Station, El-Gharbia Governorate to study the effect and residual effects of seed residues of jojoba and castor bean on improving some soil chemical properties. some macronutrients and the productivity of crops. Some soil properties of the experimental soil are presented in Table (1-a) and analysis results of the used seed residues are shown in Table (1-b).

Table (1-a) : Some physical and chemical properties of the used soil.

Soil depth, cm	0-20	20-40	Soil depth. cm	0-20	20-40
Soil physical properties					
Bulk density (Db. g cm^{-3})	1.33	1.38	Particle size distribution %		
Total porosity (E. %)	49.81	47.92	Sand	15.59	14.1
Void ratio (e)	0.99	0.92	Silt	49.72	45.66
Hydraulic conductivity (Kh, cm hr^{-1})	0.52	0.47	Clay	34.69	40.24
Saturation percentage (SP. %)	73.32	72.28	Texture class	* Si.C.L	* Si.C.L.
Soil chemical properties					
Soil pH. 1:2.5 (suspension)	7.75	7.98	Soil EC. dSm^{-1}	5.46	5.91
Soluble cations. meq l^{-1}			TSS, %	0.35	0.38
Ca^{++}	13.63	14.13	SAR	6.86	7.67
Mg^{++}	14.73	15.23	$CaCO_3$, %	3.42	3.28
Na^{+}	25.82	29.37	Organic matter (O.M.. %)	2.57	1.95
K^{+}	0.42	0.37	Organic carbon (O.C.. %)	1.49	1.13
Soluble anions. meq l^{-1}			Total nitrogen (T.N.. %)	0.142	0.118
CO_3	--	--	C/N ratio	10.49	9.58
HCO_3	5.83	6.46	Available N. mg Kg^{-1}	31.31	27.74
Cl.	36.67	37.59	Available P, mg Kg^{-1}	9.78	7.65
SO_4	12.10	15.05	Available K, mg Kg^{-1}	283.92	275.24

* Si C L. : Silty clay loam.

Table(1-b):Characteristics of different used oil seeds residues

Properties	Jojoba residues	Castor bean residues
Humidity, %	10.5	10.8
Ash, %	7.6	15.0
Oil content, %	5.5	5.4
Crude protein, %	32.5	23.9
Fibers, %	43.9	44.9
Organic matter, %	92.40	85.00
Total nitrogen, %	5.20	3.82
Organic carbon, %	53.60	49.30
C/N ratio	10.30	12.91
P, %	0.44	0.89
K, %	0.53	0.74

The factors involved in this study were mineral fertilizers (in the form of ammonium nitrate (33.5% N), mono-super phosphate (15.5 % P_2O_5) and potassium sulphate (48 % K_2O) with rates (0.0, 0.5 and 1.0 of the recommended dose for each crop) as the main plots, while castor bean seed residues with rates (0, 1 and 2 ton/fed.) was considered as sub-sub plots as well as the control (untreated soil). The plot area of the experiment was 6 m^2 (2 m in width and 3 m in length) with three replicates where the area of the experiment was divided into 81 plots using a split-split plot in randomized complete block design.

Jojoba and castor bean residues were placed on the soil surface before sowing, during seed bed preparation in the first season. While, mineral fertilizers were placed as the normal practices in the two seasons.

The addition of seed residues were done before maize sowing in the first season only and the residual effect of these materials was studied on wheat crop in the second one, where the same experimental plots were left without application of any amendments to study the residual effects of applied seed residues in the first season.

Maize grains (Zea mays L., three-way cross-321) were planted in the first season (summer 2007) at the rate of 15 kg/fed. during the first week of June 2007. While wheat grains (Sakha 93 variety) were planted in the second season (winter 2007/2008) at the rate of 60 Kg/fed. during the third week of November 2007. The normal agricultural practices were carried out as usual for each crop according to the recommendations of El-Gemmeiza Research Station.

At harvesting time of each crop, total yield of maize and wheat for each plot was separately harvested, weighed and related to Ton/fed., also 100 corn seed and 1000 wheat seed weight and wheat straw Ton/fed., were determined for each treatment. Ten random plants per plot were sampled at the harvest of each crop to determine the following growth characters.

- Maize growth characters:

1- Plant height, cm
2- Ear length, cm
3- Ear diameter, cm
4- Number of rows per ear.
5- Number of kernels per row
6-Dry matter after 80 days of sowing, g/plant

- Wheat growth characters.

1- Plant height, cm
2- Spike length, cm
3- Dry matter after 90 days of sowing, g/10 plants

Soil samples (0-20 and 20-40cm depths) were collected from each field treatment plot of each season after crop harvesting. The collected soil samples were air-dried, ground and passed through 2 mm sieve and stored for chemical analysis.

Soil pH in soil water suspension (1: 2.5) and soil electrical conductivity (EC, dSm^{-1}) in soil paste extract were measured. Soluble cations and anions

were determined in soil paste extract using the methods described by Page *et al.* (1982).

Sodium Adsorption Ratio (SAR) was calculated as:

$$SAR = \frac{Na \ meq/l}{\sqrt{\frac{Ca + Mg \ meq/l}{2}}}$$

Total soluble salts, % were calculated according to the following equation:

$$T.S.S., \% = \frac{EC \ dSm^{-1} \times 0.064 \times SP}{100}$$

where: SP = Saturation percentage

Organic matter was determined by Walkely and Black method according to Black (1965). Total NPK of the soil were determined according to Hesse (1971). Total nitrogen by macro-Kjeldahel method, total phosphorus by ascorbic acid molybdenum blue method and total potassium by flame photometer method.

The collected data were statistically analyzed according to procedure out lined by Sendecor and Cochran (1981). The mean values were compared at 0.05 level using L.S.D.

Economic evaluation was done to compare between different treatments to state which one is the best. The test was executed according to the price of the yield (1100 LE/Ton maize in the first season and 2500 LE/Ton grain of wheat and 1000 LE/Ton straw of wheat in the second one, as well as the cost of different treatments including the price of the addition treatments and the price of labor they added, which was calculated considering conventional method of estimating both fixed and variable costs.

RESULTS AND DISCUSSION

I- Effect of different treatments on some soil chemical properties

1- Soil reaction (pH)

Data in Tables (2 to 5) show that most of the added treatments lead to a significant decrease in soil reaction (pH) of the two soil depths (0-20 and 20-40cm) at the end of the two growing seasons comparing to the control (untreated soil). The decreases in soil pH values were ranged between 0.39, 3.87% and between 0.38, 4.14% for the two soil depths (0-20 and 20-40cm) in the first season and the decreases were 0.39, 4.15 and between 0.38, 5.30% for the same depths in the second one respectively, under the control (which recorded 7.75, 7.98 and 7.71, 7.92) for the two soil depths in the first and second seasons, respectively. Similar results were obtained by Kongchum (2005) and El-Maddah *et al.* (2007).

Table (2): Effect of different treatments on some soil chemical properties at 0-20cm depth in the first season (summer 2007).

Jojoba ton /fed	Castor bean ton/fed	Mineral fertilizer R.D*	pH	EC, dSm^{-1}	Cations, meq/l				Anions, meq/l				TSS, %	SAR
					Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4		
0	0	Control	7.75	5.46	13.65	14.70	25.87	0.41	0.00	5.88	36.64	12.11	0.26	6.87
		0.5	7.76	5.49	13.70	14.75	25.97	0.41	0.00	5.81	36.61	12.40	0.26	6.88
		1.0	7.76	5.52	13.80	14.80	26.05	0.42	0.00	5.67	36.60	12.80	0.26	6.89
	1	0.0	7.72	5.10	12.80	14.23	23.84	0.36	0.00	5.26	35.79	10.19	0.24	6.49
		0.5	7.71	5.17	13.05	14.26	24.26	0.37	0.00	5.33	36.05	10.57	0.25	6.57
		1.0	7.70	5.31	13.25	14.25	25.01	0.38	0.00	5.47	36.33	11.10	0.26	6.74
	2	0.0	7.69	4.78	11.75	13.15	22.37	0.33	0.00	4.92	32.81	9.87	0.23	6.34
		0.5	7.68	4.87	12.20	13.40	22.92	0.34	0.00	5.07	33.86	9.94	0.24	6.41
		1.0	7.66	4.99	12.40	13.75	23.33	0.35	0.00	5.22	34.51	10.10	0.25	6.45
1	0	0.0	7.66	4.55	10.95	13.10	21.23	0.30	0.00	4.76	31.26	9.56	0.22	6.12
		0.5	7.65	4.63	11.40	12.85	21.64	0.31	0.00	4.81	31.70	9.69	0.23	6.21
		1.0	7.63	4.71	11.60	13.00	22.03	0.32	0.00	4.88	32.36	9.71	0.24	6.28
	1	0.0	7.62	4.28	9.90	12.75	19.71	0.27	0.00	4.64	28.61	9.38	0.22	5.86
		0.5	7.60	4.36	10.33	12.73	20.44	0.28	0.00	4.66	29.70	9.42	0.22	6.02
		1.0	7.59	4.48	10.75	12.75	20.81	0.29	0.00	4.72	30.43	9.46	0.23	6.07
	2	0.0	7.59	4.02	9.15	12.30	18.47	0.24	0.00	4.46	27.20	8.51	0.21	5.64
		0.5	7.58	4.10	9.30	12.45	18.90	0.25	0.00	4.53	27.21	9.16	0.21	5.73
		1.0	7.57	4.19	9.60	12.63	19.31	0.26	0.00	4.56	27.98	9.26	0.22	5.79
2	0	0.0	7.56	3.77	8.45	11.65	17.33	0.21	0.00	4.27	26.53	6.85	0.19	5.47
		0.5	7.55	3.85	8.65	11.85	17.62	0.22	0.00	4.30	26.76	7.28	0.20	5.50
		1.0	7.53	3.93	8.90	12.03	18.04	0.23	0.00	4.42	27.19	7.59	0.21	5.58
	1	0.0	7.53	3.50	7.35	11.55	15.92	0.18	0.00	4.12	26.14	4.75	0.19	5.18
		0.5	7.51	3.59	7.80	11.45	16.35	0.19	0.00	4.13	26.29	5.38	0.20	5.27
		1.0	7.50	3.68	8.25	11.40	16.90	0.20	0.00	4.20	26.49	6.07	0.20	5.39
	2	0.0	7.49	3.25	6.70	11.25	14.44	0.15	0.00	3.85	25.03	3.67	0.18	4.82
		0.5	7.47	3.33	6.95	11.40	14.87	0.16	0.00	3.87	25.46	4.05	0.18	4.91
		1.0	7.45	3.40	7.15	11.40	15.28	0.17	0.00	3.95	25.93	4.13	0.19	5.02
(A) Jojoba ton/fed		0	7.71	5.19	12.96	14.14	24.40	0.38	0.00	5.40	35.47	11.01	0.25	6.63
		1	7.61	4.37	10.33	12.73	20.28	0.28	0.00	4.67	29.61	9.35	0.22	5.97
		2	7.51	3.59	7.80	11.55	16.31	0.19	0.00	4.12	26.20	5.53	0.19	5.24
		F	*	*									*	*
		LSD_{05}	0.04	0.25									0.01	0.21
(B) Castor bean ton/fed		0	7.65	4.66	11.23	13.19	21.75	0.32	0.00	4.98	31.74	9.78	0.23	6.20
		1	7.61	4.39	10.39	12.82	20.36	0.28	0.00	4.72	30.65	8.48	0.22	5.95
		2	7.58	4.10	9.47	12.41	18.88	0.25	0.00	4.49	28.89	7.63	0.21	5.68
		F	*	*									*	*
		LSD_{05}	0.04	0.24									0.01	0.32
(C) Mineral fertilizer		0	7.62	4.30	10.08	12.74	19.91	0.27	0.00	4.68	30.00	8.32	0.21	5.86
		0.5	7.61	4.38	10.38	12.79	20.33	0.28	0.00	4.72	30.41	8.65	0.22	5.94
		1.0	7.60	4.47	10.63	12.89	20.75	0.29	0.00	4.79	30.87	8.91	0.23	6.02
		F	NS	NS									NS	NS
		LSD_{05}												
ABC		F	NS	NS									NS	NS
		LSD_{05}												

* R.D = Recommended dose

Table (3): Effect of different treatments on some soil chemical properties at 20-40cm depth in the first season (summer 2007).

Jojoba ton /fed	Castor bean ton/fed	Mineral fertilizer R.D*	pH	EC. dSm^{-1}	Cations, meq/l				Anions, meq/l				TSS. %	SAR
					Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4		
0	0	Control	7.98	5.91	14.10	15.30	29.35	0.38	0.00	6.47	37.58	15.09	0.27	7.65
		0.5	7.99	5.95	14.15	15.35	29.44	0.39	0.00	6.40	37.44	15.50	0.28	7.67
		1.0	7.99	5.99	14.25	15.45	29.53	0.39	0.00	6.37	36.84	16.41	0.28	7.66
	1	0.0	7.95	5.46	13.30	14.73	26.23	0.33	0.00	6.20	35.43	12.97	0.26	7.01
		0.5	7.94	5.55	13.45	14.93	27.00	0.34	0.00	6.27	35.76	13.69	0.26	7.17
		1.0	7.93	5.64	13.70	15.05	27.40	0.35	0.00	6.29	36.10	14.11	0.27	7.23
	2	0.0	7.92	5.17	12.80	14.55	24.11	0.30	0.00	6.09	34.06	11.61	0.25	6.52
		0.5	7.91	5.26	12.95	14.60	24.92	0.31	0.00	6.13	34.65	12.01	0.25	6.72
		1.0	7.90	5.36	13.10	14.67	25.72	0.32	0.00	6.16	34.96	12.69	0.26	6.90
1	0	0.0	7.89	4.88	12.45	14.30	21.84	0.27	0.00	5.91	32.39	10.56	0.23	5.97
		0.5	7.88	4.97	12.55	14.40	22.68	0.28	0.00	5.95	33.08	10.89	0.24	6.18
		1.0	7.86	5.06	12.70	14.45	23.33	0.29	0.00	6.06	33.54	11.18	0.25	6.33
	1	0.0	7.85	4.59	12.18	13.98	19.71	0.24	0.00	5.82	30.29	9.99	0.22	5.45
		0.5	7.84	4.69	12.28	14.03	20.49	0.25	0.00	5.83	31.13	10.08	0.23	5.65
		1.0	7.82	4.78	12.35	14.10	21.20	0.26	0.00	5.89	31.55	10.47	0.24	5.83
	2	0.0	7.81	4.31	11.90	13.87	17.16	0.21	0.00	5.59	28.53	9.04	0.21	4.78
		0.5	7.80	4.40	11.98	13.90	18.03	0.22	0.00	5.70	29.03	9.40	0.22	5.01
		1.0	7.79	4.50	12.05	13.93	18.88	0.23	0.00	5.74	29.70	9.65	0.23	5.24
2	0	0.0	7.78	4.03	11.60	13.76	14.81	0.18	0.00	5.44	26.90	8.01	0.19	4.16
		0.5	7.76	4.12	11.70	13.81	15.66	0.19	0.00	5.48	27.39	8.49	0.21	4.39
		1.0	7.75	4.22	11.80	13.83	16.57	0.20	0.00	5.55	27.94	8.91	0.21	4.63
	1	0.0	7.73	3.75	11.00	13.25	13.01	0.14	0.00	5.17	25.26	6.96	0.18	3.74
		0.5	7.72	3.84	11.15	13.30	13.74	0.16	0.00	5.19	26.16	7.00	0.20	3.93
		1.0	7.70	3.93	11.25	13.40	14.29	0.17	0.00	5.34	26.19	7.59	0.20	4.07
	2	0.0	7.69	3.47	10.65	12.80	11.18	0.11	0.00	4.99	24.78	4.98	0.18	3.26
		0.5	7.67	3.56	10.80	13.05	11.61	0.12	0.00	5.00	24.71	5.87	0.18	3.36
		1.0	7.65	3.66	10.90	13.20	12.46	0.13	0.00	5.13	24.82	6.75	0.19	3.59
(A) Jojoba ton/fed		0	7.95	5.59	13.53	14.96	27.08	0.35	0.00	6.26	35.87	13.79	0.26	7.17
		1	7.84	4.69	12.27	14.11	20.37	0.25	0.00	5.83	31.02	10.14	0.23	5.60
		2	7.72	3.84	11.21	13.38	13.70	0.16	0.00	5.25	26.02	7.17	0.19	3.90
		F	*	*									*	*
		LSD_{05}	0.10	0.27									0.01	0.53
(B) Castor bean ton/fed		0	7.88	5.01	12.81	14.52	22.58	0.29	0.00	5.96	32.56	11.67	0.24	6.07
		1	7.83	4.69	12.29	14.08	20.34	0.25	0.00	5.78	30.87	10.32	0.23	5.56
		2	7.79	4.41	11.90	13.84	18.23	0.22	0.00	5.61	29.47	9.11	0.22	5.04
		F		*									*	*
		LSD_{05}	0.04	0.25									0.01	0.31
(D) Mineral fertilizer		0	7.84	4.62	12.22	14.06	19.71	0.24	0.00	5.74	30.58	9.91	0.22	5.39
		0.5	7.83	4.70	12.33	14.15	20.40	0.25	0.00	5.77	31.04	10.33	0.23	5.56
		1.0	7.82	4.79	12.46	14.23	21.04	0.26	0.00	5.84	31.29	10.86	0.24	5.72
		F	NS	NS									NS	NS
		LSD_{05}												
ABC		F	NS	NS									NS	NS
		LSD_{05}												

* R.D = Recommended dose

Table (4): Effect of different treatments on some soil chemical properties at 0-20cm depth in the second season (winter 2007/2008).

Jojoba ton /fed	Castor bean ton/fed	Mineral fertilizer R D*	pH	EC, dSm^{-1}	Cations, meq/l				Anions, meq/l				TSS, %	SAR
					Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4		
0	0	Control	7.71	5.10	12.90	13.60	24.13	0.33	0.00	5.82	34.14	11.00	0.25	6.63
		0.5	7.72	5.18	12.95	13.65	24.62	0.34	0.00	5.76	33.73	12.07	0.25	6.75
		1.0	7.72	5.25	13.08	13.68	25.31	0.34	0.00	5.55	33.23	13.63	0.26	6.92
	1	0.0	7.68	4.66	12.37	13.44	20.54	0.30	0.00	5.14	31.76	9.75	0.23	5.72
		0.5	7.67	4.74	12.45	13.46	21.22	0.31	0.00	5.21	32.26	9.96	0.24	5.89
		1.0	7.66	4.83	12.55	13.50	21.97	0.31	0.00	5.35	32.86	10.11	0.24	6.09
	2	0.0	7.65	4.39	12.18	13.23	18.19	0.28	0.00	4.80	29.94	9.14	0.22	5.10
		0.5	7.64	4.48	12.20	13.35	19.10	0.29	0.00	4.95	30.49	9.50	0.23	5.34
		1.0	7.63	4.57	12.25	13.40	19.90	0.30	0.00	5.10	31.21	9.53	0.24	5.56
1	0	0.0	7.63	4.14	11.90	13.05	16.18	0.27	0.00	4.72	28.14	8.55	0.21	4.58
		0.5	7.62	4.21	12.00	13.10	16.81	0.27	0.00	4.74	28.70	8.74	0.22	4.75
		1.0	7.60	4.30	12.10	13.15	17.68	0.28	0.00	4.76	29.49	8.96	0.23	4.98
	1	0.0	7.59	3.85	11.55	12.75	14.06	0.26	0.00	4.53	25.79	8.30	0.20	4.03
		0.5	7.58	3.96	11.75	12.80	14.79	0.26	0.00	4.54	26.65	8.41	0.21	4.22
		1.0	7.56	4.03	11.80	13.00	15.16	0.26	0.00	4.60	27.12	8.50	0.22	4.30
	2	0.0	7.55	3.59	10.65	12.30	12.82	0.23	0.00	4.34	23.65	8.01	0.19	3.78
		0.5	7.54	3.69	10.80	12.45	13.24	0.24	0.00	4.41	24.14	8.19	0.20	3.88
		1.0	7.52	3.77	11.35	12.38	13.66	0.25	0.00	4.44	24.95	8.24	0.21	3.97
2	0	0.0	7.51	3.32	9.95	11.65	11.24	0.21	0.00	4.15	21.15	7.75	0.17	3.42
		0.5	7.50	3.41	10.15	11.85	11.97	0.21	0.00	4.19	22.14	7.86	0.18	3.61
		1.0	7.49	3.51	10.40	12.03	12.39	0.22	0.00	4.30	22.81	7.92	0.19	3.70
	1	0.0	7.48	3.05	9.35	11.05	9.83	0.17	0.00	4.12	19.14	7.15	0.17	3.08
		0.5	7.45	3.15	9.50	11.25	10.70	0.18	0.00	4.13	19.91	7.59	0.18	3.32
		1.0	7.44	3.25	9.85	11.45	10.95	0.19	0.00	4.08	20.74	7.62	0.18	3.35
	2	0.0	7.43	2.78	8.80	10.65	8.18	0.14	0.00	3.73	18.15	5.89	0.16	2.62
		0.5	7.41	2.89	8.95	10.65	9.21	0.15	0.00	3.75	18.71	6.50	0.16	2.94
		1.0	7.39	2.96	9.15	10.65	9.63	0.16	0.00	3.83	18.88	6.89	0.17	3.06
(A) Jojoba ton/fed		0	7.68	4.80	12.55	13.48	21.66	0.31	0.00	5.30	32.18	10.52	0.24	6.00
		1	7.58	3.95	11.54	12.78	14.93	0.26	0.00	4.56	26.51	8.44	0.21	4.28
		2	7.46	3.15	9.57	11.25	10.46	0.18	0.00	4.03	20.18	7.24	0.17	3.23
		F	*	*									*	*
		LSD_{05}	0.05	0.26									0.01	0.44
(B) Castor bean ton/fed		0	7.61	4.27	11.71	12.86	17.81	0.27	0.00	4.89	28.17	9.61	0.22	5.04
		1	7.57	3.95	11.24	12.52	15.47	0.25	0.00	4.63	26.25	8.60	0.21	4.45
		2	7.53	3.68	10.70	12.12	13.77	0.23	0.00	4.37	24.46	7.99	0.20	4.03
		F	*	*									*	*
		LSD_{05}	0.04	0.21									0.01	0.23
(E) Mineral fertilizer		0	7.58	3.88	11.07	12.41	15.02	0.24	0.00	4.59	25.76	8.39	0.20	4.33
		0.5	7.57	3.97	11.19	12.51	15.74	0.25	0.00	4.63	26.30	8.76	0.21	4.52
		1.0	7.56	4.05	11.39	12.58	16.29	0.26	0.00	4.67	26.81	9.04	0.22	4.66
		F	NS	NS									NS	NS
		LSD_{05}												
ABC		F	NS	NS									NS	NS
		LSD_{05}												

* R.D = Recommended dose

Table (5): Effect of different treatments on some soil chemical properties at 20-40cm depth in the second season (winter 2007/2008).

Jojoba ton fed	Castor bean ton/fed	Mineral fertilizer R D*	pH	EC. dSm	Cations, meq/l				Anions, meq/l				TSS. %	SAR
					Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4		
		Control	7.92	5.55	13.60	14.30	27.17	0.31	0.00	6.44	36.33	12.61	0.26	7.28
	0	0.5	7.93	5.62	13.65	14.35	27.75	0.32	0.00	6.37	35.94	13.75	0.27	7.42
		1.0	7.93	5.69	13.75	14.45	28 13	0.32	0.00	6.36	35.34	14.96	0.28	7.49
		0.0	7.89	5.08	12.95	14.08	23.62	0.27	0.00	6.17	33.18	11.57	0.24	6.43
0	1	0 5	7.87	5.18	13.10	14.13	24.43	0.28	0.00	6.24	34.01	11.68	0.25	6.62
		1 0	7.85	5.27	13.20	14.20	25.10	0.28	0.00	6.27	34.60	11.91	0.26	6.78
		0.0	7.84	4 78	12.50	13.85	21.06	0.26	0.00	6.07	30.44	11.17	0.23	5.80
	2	0.5	7.82	4.87	12.65	13.90	21.88	0.26	0.00	6.10	31.28	11.32	0.24	6.01
		1.0	7.80	4.98	12.80	13.97	22.68	0.27	0.00	6.14	32.21	11.36	0.25	6.20
		0.0	7.79	4.48	11.95	13.80	18.79	0.24	0.00	5.89	28.01	10.88	0.22	5.24
	0	0.5	7.77	4.59	12.05	13.90	19.64	0.25	0.00	5.93	28.95	10.96	0.23	5.45
		1.0	7.75	4.68	12.30	13 80	20.29	0.25	0.00	6.03	29.54	11.07	0.24	5.62
		0.0	7.74	4.18	11.58	13.68	16.23	0.22	0.00	5.79	25.41	10.50	0.21	4.57
1	1	0.5	7.72	4.28	11.73	13 73	17.01	0.23	0.00	5.81	26.25	10.63	0.22	4.77
		1.0	7 70	4.37	11.85	13.75	17.72	0.23	0.00	5.84	27.05	10.66	0.23	4.95
		0.0	7.69	3.88	11.20	13.57	13.69	0.20	0.00	5.55	23.15	9.96	0.20	3.89
	2	0.5	7.67	3.98	11.30	13.58	14.55	0.20	0.00	5.67	23.78	10.18	0.21	4.13
		1.0	7.66	4.10	11.45	13 63	15.62	0.21	0.00	5 70	24.95	10.25	0.22	4.41
		0.0	7.65	3.59	10.90	13.41	11.33	0.19	0.00	5.41	22.03	8.39	0.18	3.25
	0	0.5	7.63	3.69	11.00	13.45	12.18	0.19	0.00	5.44	22.89	8.49	0.19	3.48
		1.0	7.61	3.79	11 10	13.53	13.00	0.20	0.00	5.53	22.44	9.86	0.20	3.71
		0.0	7 60	3.30	10.50	13.25	9.09	0.17	0.00	5.13	21.01	6.97	0.18	2.64
2	1	0.5	7.58	3.39	10.65	13.35	9.83	0.18	0.00	5.17	21.79	7.04	0.18	2.84
		1.0	7.56	3.49	10.75	13.40	10.55	0.18	0.00	5.30	22.49	7.10	0.19	3.04
		0.0	7.54	3.02	10.15	13.10	6.83	0.15	0.00	4.94	18.90	6.39	0.16	2.00
	2	0.5	7.52	3.12	10.30	13.15	7.48	0.16	0.00	4.95	19.59	6.55	0.17	2.18
		1.0	7.50	3.20	10.40	13.20	8.11	0 16	0.00	5.09	20.07	6.71	0.18	2.36
		0	7.87	5.22	13.13	14.14	24.65	0.29	0.00	6 24	33.70	12.26	0.25	6.67
(A)		1	7 72	4 28	11 71	13 71	17 06	0 23	0 00	5 80	26 34	10.56	0.22	4.78
Jojoba ton/fed		2	7.58	3.40	10.64	13.32	9.82	0.18	0.00	5.22	21.24	7.49	0.18	2.83
		F	*	*									*	*
		LSD_{05}	0.05	0.28									0.01	0.63
		0	7.78	4.63	12.26	13.89	19.81	0.25	0 00	5.93	29.05	11.22	0.23	5.44
(B)		1	7.72	4.28	11.81	13.73	17.07	0.23	0.00	5.75	27.31	9.77	0.22	4.74
Castor bean ton/fed		2	7.67	3.99	11.42	13.55	14.65	0.21	0.00	5.58	24.93	9.32	0.21	4.11
		F	*	*									*	*
		LSD_{05}	0.06	0.23									0 01	0.27
		0	7.74	4.21	11 70	13.67	16.42	0.22	0.00	5.71	26.49	9.82	0.21	4.57
(F)		0.5	7.72	4.30	11.83	13.73	17.19	0.23	0.00	5.74	27.16	10.07	0.22	4.77
Mineral fertilizer		1.0	7.71	4.40	11.96	13.77	17.91	0.23	0.00	5.81	27.63	10.43	0.23	4.95
		F	NS	NS									NS	NS
		LSD_{05}												
ABC		F	NS	NS									NS	NS
		LSD_{05}												

* R D = Recommended dose

Concerning the effect of jojoba and/or castor bean seed residues on soil reaction, it is clear from Tables (2 to 5) that increasing their rate additions the soil pH significantly decrease, where the 2 ton/fed of jojoba or / and castor bean residues decreased it more than the other rates (1.0 and 0.0 ton/fed). Where the recorded pH values were ranged between 7.71, 7.51 and between 7.95, 7.72 for jojoba and between 7.65, 7.58 and 7.88, 7.79 for castor bean in the two soil depths in the first season. While the values were ranged between 7.68, 7.46 and between 7.87, 7.58 for jojoba and between 7.61, 7.53 and 7.78, 7.67 for castor bean in the same depths for the second season. This may be due to the produced organic acids by decomposition of organic substances in the soil. These results are in agreement with those of El-Maddah *et al.* (2007) and El-Sodany *et al.* (2007).

On the other hand, it is obvious that mineral fertilizers also affected soil pH where all rates of the recommended dose were insignificantly decreased soil pH compared with the control. The mean values were ranged from 7.62 to 7.60 and 7.84 to 7.82, respectively for the two soil layers (0-20 and 20-40cm) in the first season. While in the second one the mean values were ranged from 7.58 to 7.56 and 7.74 to 7.71, respectively for the same soil depths. These results are in line with El-Maddah (2005).

These results reveal that there is no wide variation between the different treatments on soil pH values because the magnitude of pH change depends on many soil properties, including buffering capacity and length of time after the application of the residues.

2- Soil salinity (EC) and Soluble ions

The different treatments under this study gave different effects on electrical conductivity of soil paste extract (EC, dSm^{-1}), total soluble salts (TSS,%) and sodium adsorption ratio (SAR) of the soil at the end of the two growing seasons. From data in Tables (2 to 5) and Fig (1), it could be concluded that most treatments and both jojoba and / or castor bean residues led to an increase in the leaching of soluble salts and decrease soil salinity (EC) and (SAR) values at the two soil depths (0-20 and 20-40cm) in the two growing seasons compared with the control (untreated soil). Thus, it can be said that these treatments caused a progressive decrease in soil salinity (EC), TSS%, and SAR. These results are agreement with that of El-Maddah *et al.* (2007) and El-Sodany *et al.* (2007).

Concerning the effect of jojoba and / or castor bean seed residues on decreasing EC (dSm^{-1}), TSS% and SAR values, data in Tables (2 to 5) and Fig (1) show that both jojoba and castor bean residues decreased these values in the two soil depths at the end of the two growing seasons, where jojoba residues decrease them with increasing its rate additions from 0.0 to 2.0 ton/fed from 5.19 to 3.59 dSm^{-1}; 0.25 to 0.19 %; 6.63 to 5.24 and from 5.59 to 3.84 dSm^{-1}; 0.26 to 0.19 %; 7.17 to 3.90, respectively in the two soil depths (0-

20 and 20-40cm) for the previous characters at the end of the first season. While, in the second one the decreases were from 4.80 to 3.15 dSm^{-1}; 0.24 to 0.17%; 6.00 to 3.23 and from 5.22 to 3.40 dSm^{-1}; 0.25 to 0.18% and 6.67 to 2.83 respectively for both the same depths and characters.

Castor bean residues take the same trend but with different values where increasing its application rates from 0.0 to 2.0 ton/fed the values were decreased from 4.66 to 4.10 dSm^{-1} ; 0.23 to 0.21%; 6.20 to 5.68 and from 5.01 to 4.41 dSm^{-1}; 0.24 to 0.22%; 6.07 to 5.04, respectively in the first season and were decreased from 4.27 to 3.68 dSm^{-1} ; 0.22 to 0.20%; 5.04 to 4.03 and from 4.63 to 3.99 dSm^{-1}; 0.23 to 0.21%; and 5.44 to 4.11, respectively in the second one for the same depths and characters. These results may be due to the rates of organic residues addition and the rates of its decomposition. These results are in line with those of El-Maddah *et al.* (2007) and El-Sodany *et al.* (2007).

Regarding to the effect of mineral fertilizers on soil salinity (EC), (TSS) and (SAR), data in Tables (2 to 5) and Fig (1) show that all rates of the recommended dose of mineral fertilizers insignificantly decreased the previous characters compared with the control (untreated soil). These decreases were slightly than the decreases caused by jojoba and / or castor bean residues. Also, it can be noticed that the effect of all treatments on reducing (EC), (TSS) and SAR were more pronounced after cultivation wheat plants in the second season (winter 2007/2008) which enhancing the leaching processes.

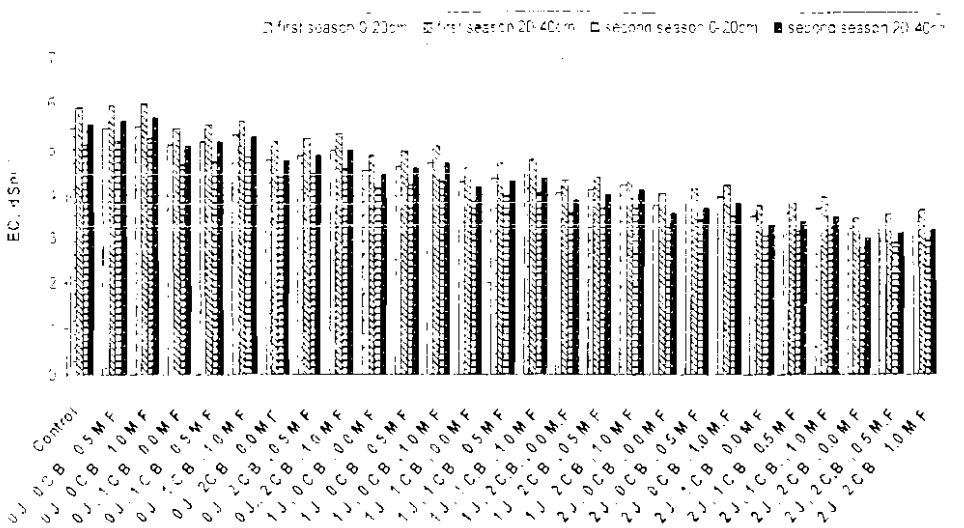

Fig.(1): Effect of different treatments on soil electrical conductivity (EC, dSm^{-1}) in the first and second seasons

Thus, it could be arranged the mean values of EC, TSS and SAR in the following order: the first season > the second one.

The added materials can be also arranged on decreasing EC, TSS and SAR in the following descending order: jojoba seed residues > castor bean seed residues > mineral fertilizer.

Concerning soluble soil cations and anions, the results in Tables (2 to 5) generally indicate that the soluble calcium, magnesium and sodium slightly decreased with increasing all added treatments, also the soluble bicarbonate, chloride and sulphate slightly decreased with increasing all added treatments.

With regard to the combined effect of different treatments on EC, TSS and SAR, it could be observed that all different treatment decreased salt content of soil comparing to the control (untreated soil) at the two depths in the two growing seasons. The best treatment was found to be 2 ton/fed of jojoba seed residues with 2 ton/fed of castor bean seed residues at the recommended dose of mineral fertilizers, since it recorded the lowest values of EC, TSS and SAR which were 3.40 and 3.66 dSm^{-1} , 0.19 and 0.19%, 5.02 and 3.59, respectively for the two soil depths in the first season, and were 2.96 and 3.20 dSm^{-1}, 0.17 and 0.18%, 3.06 and 2.36, respectively at the same depths in the second one.

The previous tables showed that the mean values of all treatments were lower in the upper soil layer than the deeper one due to the turning under of amendments which did not reach to the deeper depth with the same quantities of their arrangement in the upper layer.

Also, the lower mean values of the treated soil with amendments at the end of the second season compared with the first one may be due to the high residual effect of these amendments in the second season. These results are in agreement with that obtained by El-Maddah (2000).

3- Total macronutrients in soil

Tables (6 and 7) and Figs. (2 to 4) indicate that total soil N, P and K values were increased with all treatments especially with the added residues of jojoba and / or castor bean seeds for the two sequence soil depths (0-20 and 20-40cm) at the end of the two growing seasons compared with the control (untreated soil). It is shown that, under all treatments the soil content of total macronutrients followed the order: jojoba seed residues > castor bean seed residues > mineral fertilizers > control. This arrangement could be related to initial status of these elements in soil and the nutrients content of the previous residues of jojoba and / or castor bean seeds.

Table (6): Effect of different treatments on total macronutrients and C/N ratio in the first season (summer 2007).

Jojoba ton fed	Castor bean ton/fed	Mineral fertilizer R.D*	Total macronutrients, %						OC, %		C/N ratio	
			N		P		K					
			0-20cm	20-40cm	0-20cm	20-40cm	0-20cm	20-40cm	0-20cm	20-40cm	0-20cm	20-40cm
0	0	Control	0.1420	0.1180	0.020	0.019	0.351	0.340	1.490	1.130	10.49	9.58
		0.5	0.1422	0.1182	0.021	0.019	0.358	0.348	1.491	1.132	10.49	9.58
		1.0	0.1423	0.1184	0.021	0.020	0.364	0.356	1.492	1.133	10.48	9.57
	1	0.0	0.1425	0.1189	0.022	0.021	0.369	0.365	1.499	1.141	10.52	9.60
		0.5	0.1427	0.1194	0.023	0.022	0.388	0.374	1.500	1.145	10.51	9.59
		1.0	0.1430	0.1208	0.024	0.022	0.395	0.381	1.502	1.157	10.50	9.58
	2	0.0	0.1432	0.1211	0.024	0.023	0.405	0.391	1.511	1.169	10.55	9.65
		0.5	0.1436	0.1217	0.025	0.023	0.416	0.399	1.514	1.173	10.54	9.64
		1.0	0.1440	0.1224	0.026	0.024	0.425	0.410	1.516	1.179	10.53	9.63
1	0	0.0	0.1442	0.1228	0.027	0.025	0.435	0.419	1.527	1.190	10.59	9.69
		0.5	0.1444	0.1232	0.029	0.026	0.445	0.429	1.528	1.193	10.58	9.68
		1.0	0.1447	0.1237	0.030	0.026	0.454	0.440	1.529	1.196	10.57	9.67
	1	0.0	0.1448	0.1241	0.031	0.028	0.461	0.449	1.537	1.209	10.62	9.74
		0.5	0.1450	0.1247	0.033	0.029	0.472	0.459	1.538	1.213	10.61	9.73
		1.0	0.1452	0.1252	0.034	0.029	0.481	0.468	1.539	1.217	10.60	9.72
	2	0.0	0.1453	0.1255	0.035	0.031	0.490	0.476	1.544	1.229	10.63	9.79
		0.5	0.1455	0.1259	0.036	0.033	0.500	0.485	1.545	1.231	10.62	9.78
		1.0	0.1457	0.1264	0.037	0.034	0.510	0.494	1.546	1.235	10.61	9.77
2	0	0.0	0.1458	0.1267	0.039	0.035	0.519	0.502	1.554	1.244	10.66	9.82
		0.5	0.1460	0.1271	0.040	0.037	0.529	0.514	1.555	1.247	10.65	9.81
		1.0	0.1461	0.1278	0.041	0.037	0.536	0.523	1.555	1.254	10.64	9.81
	1	0.0	0.1463	0.1282	0.043	0.038	0.545	0.534	1.565	1.267	10.70	9.88
		0.5	0.1465	0.1285	0.044	0.039	0.556	0.543	1.566	1.268	10.69	9.87
		1.0	0.1466	0.1287	0.045	0.039	0.566	0.553	1.566	1.269	10.68	9.86
	2	0.0	0.1470	0.1289	0.047	0.041	0.575	0.562	1.580	1.281	10.75	9.94
		0.5	0.1473	0.1291	0.048	0.043	0.585	0.571	1.582	1.282	10.74	9.93
		1.0	0.1475	0.1293	0.049	0.044	0.594	0.580	1.583	1.283	10.73	9.92
(A) Jojoba ton/fed		0	0.1428	0.1199	0.023	0.021	0.386	0.374	1.502	1.151	10.51	9.60
		1	0.1450	0.1246	0.032	0.029	0.472	0.456	1.537	1.213	10.60	9.73
		2	0.1466	0.1283	0.044	0.039	0.556	0.542	1.567	1.266	10.69	9.87
		F	*	*	*	*	*	*	*	*	*	NS
		LSD_{05}	0.0004	0.0031	0.001	0.000	0.001	0.017	0.006	0.031	0.01	
(B) Castor bean ton/fed		0	0.1442	0.1229	0.030	0.027	0.443	0.430	1.525	1.191	10.57	9.69
		1	0.1447	0.1243	0.033	0.030	0.470	0.458	1.535	1.210	10.60	9.73
		2	0.1455	0.1256	0.036	0.033	0.500	0.485	1.547	1.229	10.63	9.78
		F	*	*	*	*	*	*	*	*	*	NS
		LSD_{05}	0.0003	0.0006	0.001	0.001	0.001	0.014	0.004	0.031	0.01	
(G) Mineral fertilizer		0	0.1446	0.1238	0.032	0.029	0.461	0.449	1.534	1.207	10.61	9.74
		0.5	0.1448	0.1242	0.033	0.030	0.472	0.458	1.535	1.209	10.60	9.73
		1.0	0.1450	0.1247	0.034	0.031	0.481	0.467	1.536	1.214	10.59	9.73
		F	*	*	*	*	*	*	NS	NS	*	NS
		LSD_{05}	0.0003	0.0003	0.001	0.001	0.001	0.013			0.01	
ABC		F	NS	NS	NS	NS	*	NS	NS	NS	NS	NS
		LSD_{05}					0.002					

* R.D = Recommended dose

Table (7): Effect of different treatments on total macronutrients and C/N ratio in the second season (winter 2007/2008).

Jojoba ton /fed	Castor bean ton/fed	Mineral fertilizer R.D*	Total macronutrients, %						OC, %		C/N ratio	
			N		P		K					
			0-20cm	20-40cm	0-20cm	20-40cm	0-20cm	20-40cm	0-20cm	20-40cm	0-20cm	20-40cm
0	0	Control	0.1479	0.1220	0.022	0.021	0.364	0.353	1.472	1.116	9.95	9.15
		0.5	0.1481	0.1223	0.023	0.022	0.370	0.360	1.474	1.118	9.95	9.14
		1.0	0.1494	0.1227	0.023	0.022	0.380	0.369	1.485	1.120	9.94	9.13
	1	0.0	0.1495	0.1229	0.024	0.023	0.389	0.378	1.493	1.131	9.99	9.20
		0.5	0.1497	0.1235	0.025	0.024	0.396	0.389	1.494	1.135	9.98	9.19
		1.0	0.1499	0.1240	0.026	0.025	0.405	0.400	1.495	1.137	9.97	9.17
	2	0.0	0.1500	0.1242	0.027	0.026	0.415	0.411	1.507	1.149	10.05	9.25
		0.5	0.1504	0.1245	0.028	0.027	0.427	0.424	1.509	1.150	10.03	9.24
		1.0	0.1507	0.1248	0.029	0.027	0.435	0.435	1.510	1.151	10.02	9.22
1	0	0.0	0.1508	0.1250	0.030	0.028	0.444	0.441	1.520	1.163	10.08	9.30
		0.5	0.1510	0.1255	0.031	0.029	0.456	0.452	1.521	1.165	10.07	9.28
		1.0	0.1513	0.1261	0.032	0.030	0.467	0.461	1.522	1.169	10.06	9.27
	1	0.0	0.1514	0.1265	0.033	0.031	0.479	0.472	1.530	1.183	10.11	9.35
		0.5	0.1517	0.1270	0.034	0.033	0.492	0.483	1.532	1.185	10.10	9.33
		1.0	0.1519	0.1272	0.035	0.033	0.501	0.492	1.533	1.186	10.09	9.32
	2	0.0	0.1520	0.1275	0.036	0.034	0.512	0.501	1.540	1.199	10.13	9.40
		0.5	0.1522	0.1287	0.038	0.035	0.523	0.511	1.541	1.208	10.12	9.39
		1.0	0.1525	0.1293	0.039	0.036	0.531	0.520	1.542	1.212	10.11	9.37
2	0	0.0	0.1526	0.1295	0.040	0.037	0.540	0.530	1.550	1.228	10.16	9.48
		0.5	0.1528	0.1307	0.041	0.039	0.552	0.540	1.551	1.238	10.15	9.47
		1.0	0.1531	0.1312	0.042	0.039	0.561	0.551	1.552	1.240	10.14	9.45
	1	0.0	0.1532	0.1315	0.044	0.040	0.570	0.559	1.559	1.258	10.18	9.57
		0.5	0.1533	0.1320	0.046	0.041	0.582	0.569	1.560	1.261	10.18	9.55
		1.0	0.1535	0.1324	0.046	0.042	0.592	0.579	1.561	1.262	10.17	9.53
	2	0.0	0.1536	0.1325	0.048	0.043	0.601	0.588	1.565	1.273	10.19	9.61
		0.5	0.1537	0.1328	0.049	0.045	0.610	0.597	1.566	1.275	10.19	9.60
		1.0	0.1539	0.1331	0.051	0.046	0.619	0.607	1.567	1.276	10.18	9.59
(A) Jojoba ton/fed		0	0.1495	0.1234	0.025	0.024	0.398	0.391	1.493	1.134	9.99	9.19
		1	0.1516	0.1270	0.034	0.032	0.489	0.481	1.531	1.186	10.10	9.33
		2	0.1533	0.1317	0.045	0.041	0.581	0.569	1.559	1.257	10.17	9.54
		F	*	*	*	*	*	*	*	*	*	NS
		LSD_{05}	0.0024	0.0008	0.001	0.002	0.022	0.008	0.010	0.007	0.02	
(B) Castor bean ton/fed		0	0.1508	0.1261	0.032	0.030	0.459	0.451	1.516	1.173	10.06	9.30
		1	0.1516	0.1274	0.035	0.032	0.490	0.480	1.529	1.193	10.09	9.36
		2	0.1521	0.1286	0.038	0.035	0.519	0.510	1.539	1.210	10.11	9.41
		F	*	*	*	*	*	*	*	*	*	NS
		LSD_{05}	0.0009	0.0003	0.003	0.003	0.020	0.005	0.005	0.006	0.01	
(H) Mineral fertilizer		0	0.1512	0.1268	0.034	0.031	0.479	0.470	1.526	1.189	10.09	9.37
		0.5	0.1514	0.1274	0.035	0.033	0.490	0.481	1.528	1.193	10.09	9.35
		1.0	0.1518	0.1279	0.036	0.033	0.499	0.490	1.530	1.195	10.08	9.34
		F	*	*	*	*	NS	*	NS	NS	*	NS
		LSD_{05}	0.0003	0.0006	0.001	0.001		0.004			0.01	
ABC		F	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
		LSD_{05}										

* R.D = Recommended dose

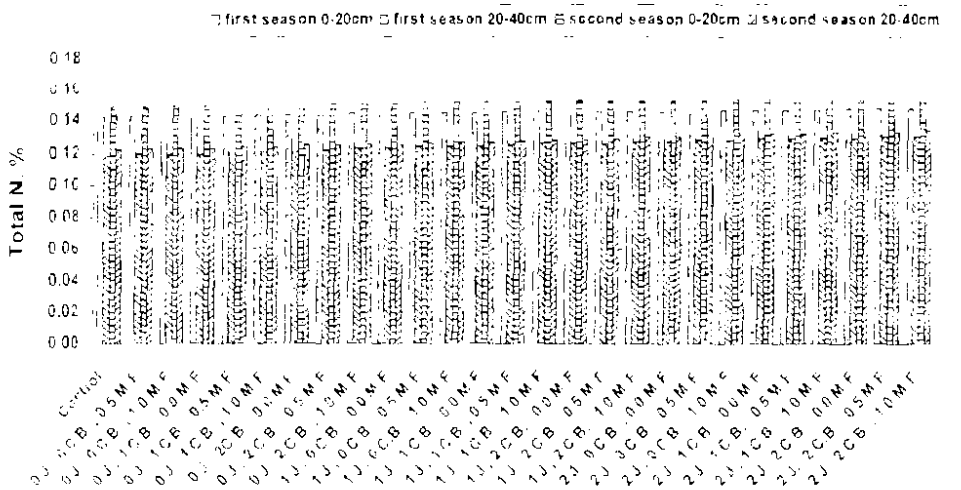

Fig.(2). Effect of different treatments on total N, % in the first and second seasons

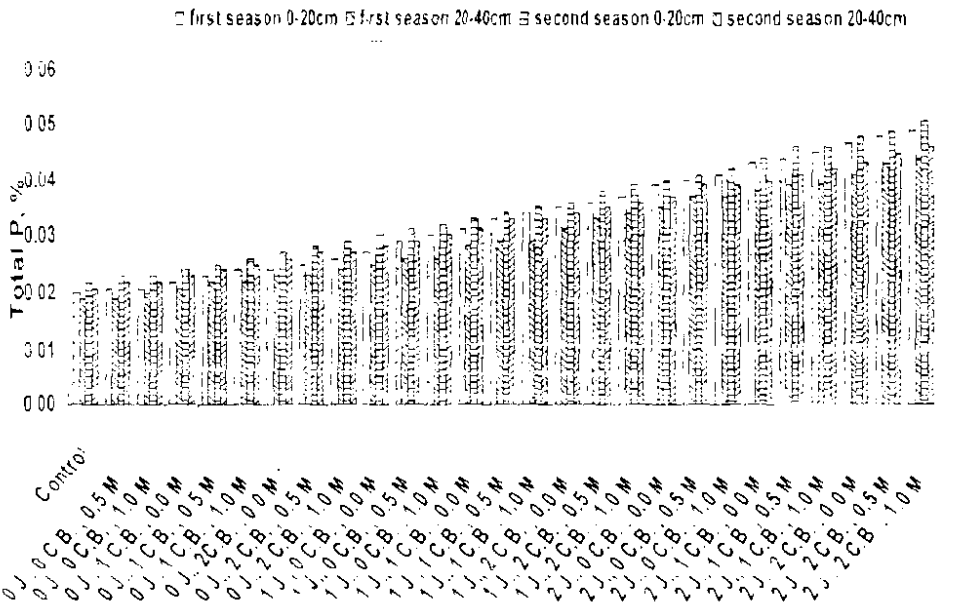

Fig.(3): Effect of different treatments on total P, % in the first and second seasons

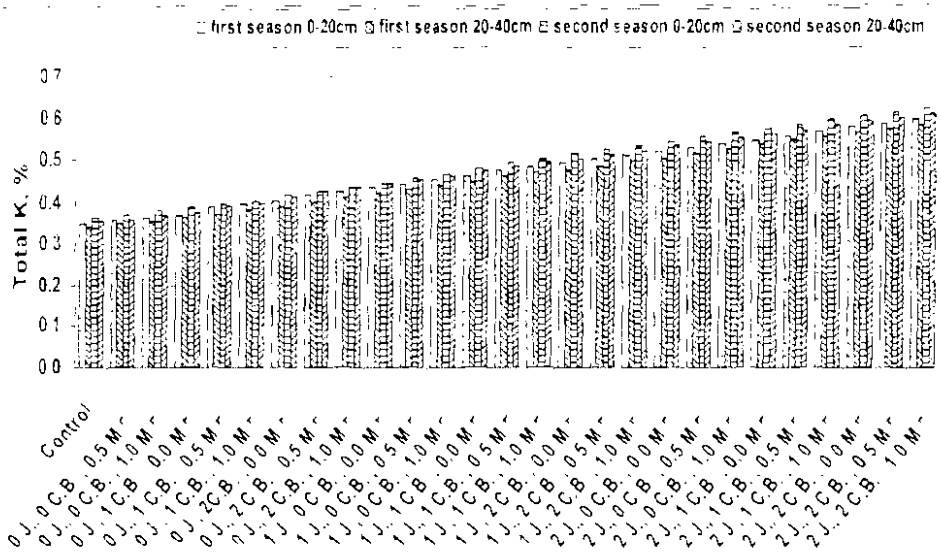

Fig.(4): Effect of different treatments on total K, % in the first and second seasons

Concerning nitrogen concentration of the soil, the results reveal that the increasing of jojoba and / or castor bean seed residues from 0.0 to 2.0 ton/fed led to significantly increases in total N from 0.1428, 0.1199% to 0.1466, 0.1283% and from 0.1442, 0.1239 to 0.1455, 0.1256% for the two soil depths in the first season for jojoba and castor bean seed residues respectively, also from 0.1495, 0.1234 to 0.1533, 0.1317% and from 0.1508, 0.1261 to 0.1521, 0.1286%, respectively for the same depths and treatments in the second one.

Phosphorus and potassium concentrations take the same trend as nitrogen where they significantly increased with increasing jojoba and castor bean seed residues rates. The mean values were increased from 0.023, 0.021% and from 0.386, 0.374% to 0.044, 0.039% and 0.556, 0.542%, respectively for phosphorus and potassium at the two soil depths in the first season for jojoba seed residues, and were increased from 0.030, 0.027% and from 0.443, 0.430% to 0.036, 0.033% and 0.500, 0.485%, respectively for the same parameters as affected by castor bean seed residues addition. While in the second season the mean values were increased from 0.025, 0.024% and from 0.398, 0.391% to 0.045, 0.041% and to 0.581, 0.569%, respectively for the previous parameters as affected by increasing jojoba residues rates from 0.0 to 2.0 ton/fed. Also, the mean values were increased from 0.032, 0.030% and from 0.459, 0.451% to 0.038, 0.035% and to 0.519, 0.510%, respectively for the same parameters as affected by increasing castor bean seed residues rates

from 0.0 to 2.0 ton/fed. These results are confirmed with Saker *et al.*, (1992), El-Maddah *et al.*, (2007) and El-Sodany *et al.*, (2007).

As for mineral fertilizers, data in Tables (6 and 7) show that all rates of the recommended dose of mineral fertilizers significantly increased macronutrients where the mean values were increased from 0.1446, 0.1238% and from 0.032, 0.029% and from 0.461, 0.449% to 0.1450, 0.1247% and to 0.034, 0.031% and to 0.481, 0.467%, respectively for N, P and K at the two depths in the first season, and were from 0.1512, 0.1268% and from 0.034, 0.031% and from 0.479, 0.470% to 0.1518, 0.1279% and to 0.036, 0.033% and to 0.499, 0.490%, respectively for the same N, P and K at the same depths in the second one.

With regard to the combined effects, data show that all different treatments increased total soil NPK compared with the control (untreated soil) at the two depths in the two growing seasons. The best treatment was adding 2 ton/fed of jojoba seed residues with 2 ton/fed of castor bean seed residues at the recommended dose of mineral fertilizers, since it recorded the highest mean values of total NPK which were 0.1475, 0.1293% and 0.049, 0.044% and 0.594, 0.580% respectively for NPK at the two soil depths in the first season, and were 0.1539, 0.1331% and 0.051, 0.046% and 0.619, 0.607%, respectively for the same NPK at the same depths in the second one. While the control recorded the lowest values 0.1420, 0.1180% and 0.020, 0.019% and 0.351, 0.340%, respectively in the first season, and 0.1479, 0.1220% and 0.022, 0.021% and 0.364, 0.353%, respectively for total NPK at the two depths in the second one.

These results suggested that it may practical apply organic residues of jojoba and castor bean seed residues to soils to increase NPK concentrations in the soils and thereby enhance its availability to crops.

4- Organic carbon (O.C) and C/N ratio of the soil.

Data in Tables (6 and 7) show that all applied treatments including all rates of jojoba and castor bean seed residues and all rates of mineral fertilizers led to an increase in O.C % of the two soil depths (0-20 and 20-40 cm) at the end of the two growing seasons compared with the control (untreated soil). The increases were ranged between 0.067, 6.24 % and between 0.177, 13.54%, respectively for the two soil depths in the first season and were ranged between 0.136, 6.45 % and between 0.179, 14.34%, respectively for the same depths in the second one. Similar results were obtained by El-Maddah *et al.*, (2007) and El-Sodany *et al.*, (2007).

With regarded to the effect of jojoba and / or castor bean seed residues as soil amendments, data in Tables (6 and 7) show that both jojoba and castor bean residues significantly increase O.C % in the two soil depths at the end of the two growing seasons, where jojoba residues increase O.C % with increasing its rate from 0.0 to 2.0 ton/fed from1.502 to 1.567 % and from 1.151

to 1.266 %, respectively in the first season. and from 1.493 to 1.559 % and from 1.134 to 1.257 %, respectively in the second one. Castor bean residues take the same trend where the mean values were increased from 1.525 to 1.547 % and from 1.191 to 1.229 %, respectively for the same depths in the first season and from 1.516 to 1.539 % and from 1.173 to 1.210 %, respectively in the second one. Similar results were obtained by Biswas and Khosla (1971) and Kladivok and Nelson (1979), they reported that the addition of organic amendments to soil increase the carbon content of the soil. Also, the decomposition of the added residues will decreased O.C % values and increased total N % values.

Concerning mineral fertilizers. data in Tables (6 and 7) show that the recommended dose rates of mineral fertilizers were insignificantly increased O.C % but the mean values were increased from 1.534, 1.207 % to 1.536, 1.214 %, respectively for the two soil depths in the first season and from 1.526, 1.189 % to 1.530, 1.195%, respectively for the same depths in the second one.

Regarding to the combined effect, it could be noticed that the best treatment was 2 ton/fed of jojoba residues with 2 ton/fed of castor bean residues at the recommended dose of mineral fertilizers since it recorded the highest mean values of O.C % which were 1.583 and 1.283 %. respectively for the two depths in the first season and were 1.567 and 1.276 % for the same depths in the second one. While the control recorded the lowest values 1.490 and 1.130 %, respectively in the first season and were 1.472 and 1.116 %, respectively in the second one. These results are in line with El-Maddah *et al.*, (2007) and El-Sodany *et al.*, (2007).

The soil C/N ratio is considered as a one of the useful characters which can be used as an indicator for improving the properties of the soil, where the application of the used residues to soil increase the carbon content of the soil which decreases bulk density, increases aggregation and hydraulic conductivity (Biswas and Khosla, 1971: El-Maddah, 2000 and El-Maddah and Badr, 2005).

Results in Tables (6 and 7) and Fig (5) reveal that the C/N ratio was increased for all treatments especially all rates of jojoba and castor bean seed residues in both surface and subsurface soil layers compared with the control (untreated soil). Generally, O.C % and C/N ratio values were decreased in the second season than the first one, where the decomposition of jojoba and / or castor bean residues in the second season was greater than their decomposition in the first one. Similar results were obtained by Chanyasak and Kubota (1981), they reported that the C/N ratio of sufficiently well composted materials vary widely from 5-20 depending on the type of raw materials. Results shown also that all added rates of jojoba and castor bean seed residues significantly increased C/N ratio in the soil at the surface depth (0 - 20cm) at the end of the two sequence seasons. Jojoba residues

increase C/N ratio with increasing its addition rates from 0.0 to 2.0 ton/fed. from 10.51 to 10.69 and from 9.60 to 9.87, respectively in the first season and from 9.99 to 10.17 and from 9.19 to 9.54, respectively in the second one for the two soil depths. Also, castor bean residues take the same trend where the mean values were increased from 10.57 to 10.63 and from 9.69 to 9.78, respectively for the same depths in the first season and from 10.06 to 10.11 and from 9.30 to 9.41, respectively in the second one. These results may be related to the decomposition rates of these residues and to its initial status of C/N ratio (Table a-b). Also, may be due to the seed residues did not reach to the deeper depth with the same quantities of their arrangement in the upper layer. Also, these results are confirmed with El-Maddah *et al.*, (2007) and El-Sodany *et al.*, (2007).

Concerning mineral fertilizers, it was noticed that increasing its added rates little and insignificantly decreased C/N ratio values especially in subsurface layer (20 – 40cm), where the mean values were decreased from 10.61, 9.74 to 10.59, 9.73 respectively for the two soil depths in the first season and were decreased from 10.09, 9.37 to 10.08, 9.34 respectively for the same depths in the second one. These results reveal that jojoba seed residues was more effective upon C/N ratio increases than the other amendments which took the order: jojoba residues > castor bean residues > mineral fertilizers.

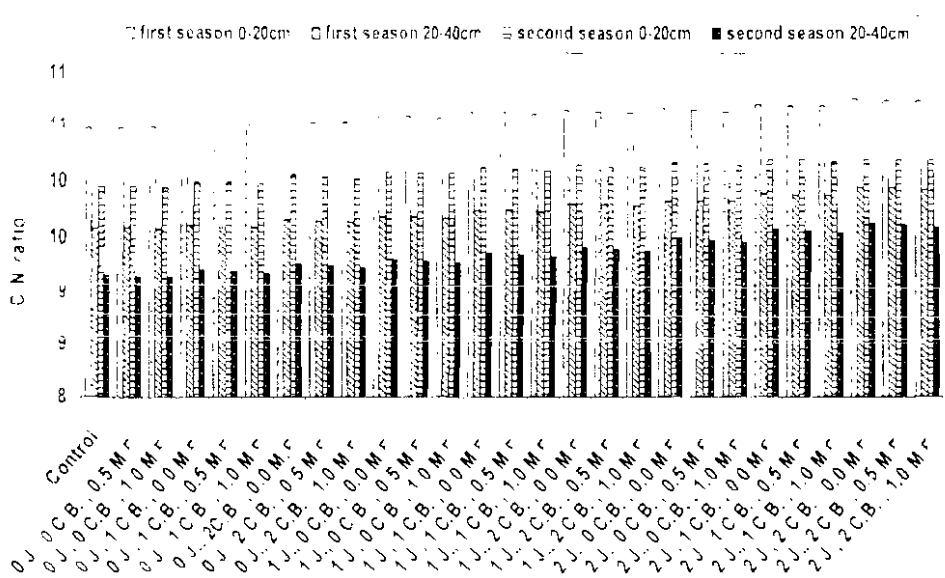

Fig.(5): Effect of different treatments on C/N ratio in the first and second seasons

With regard to the combined effect, it could be noticed that all treatments slightly increased the mean values of C/N ratio compared with the control at the two soil depths in the two growing seasons. These results were explained previously in O.C % and are in line with those of El-Maddah *et al.*, (2007) and El-Sodany *et al.* (2007).

II- Effect of different treatments on yield and yield components.

Most of the recorded characters of maize and wheat plants were significantly affected by the application of jojoba and / or castor bean seed residues and the other treatments. Results in Tables (8 and 9) and Fig. (6) show these effects on yield and yield components of maize and wheat plants, where their response to these treatments were always the same trend, which could be noticed from these tables.

Generally, most of different treatments exhibited significant differences on yield and yield component at the end of the two studied seasons comparing to the control (untreated soil). The increases in maize grains yield ranged between 18.64 and 109.12 %, respectively (Table 8). While, the increases in wheat grains and straw yield were ranged between 18.65 and 124.66 % and between 21.61 and 123.78 %, respectively over the recorded with the control in the second season (Table 10).

Data in Tables (8 and 9) and Fig. (6) reveal that the effect of jojoba and / or castor bean seed residues on yield and yield components are significant and all the studied characters are significantly increased with increasing their rates during the two studied seasons. The mean values of maize grain were ranged from 2.6238 to 3.4486 ton/fed. where the relative increasing grain yield were ranged between 32.02 and 73.52%, respectively over the control in the first season. While the increases in wheat grain and straw yield were ranged between 1.9177 and 2.8400 and between 3.0791 and 4.5949 ton/fed. where the relative increasing grain and straw yield were ranged between 38.51 and 105.13 % and between 39.00 and 107.42 %, respectively over the control in the second one as affected by increasing application rates of jojoba seed residues to 2 ton/fed. Also, the same treatments led to significant increases in plant height, ear length, ear diameter, number of rows per ear, number of kernels per row and 100 seed weight for maize in the first season and in plant height, spike length, harvest index and 1000 seed weight for wheat in the second season. Also, increasing application rates of castor bean seed residues to 2 ton/fed. gave the same trend where the mean values of maize grain were increased from 2.6667 to 3.4052 ton/fed where the relative increasing grain yield were ranged between 34.18 and 71.34 % over the control in the first season. Also, the mean values of wheat grain and straw yield were ranged between 2.0659 and 2.6495 and between 3.3947 and 4.2635 ton/fed. where the relative increasing yield were ranged between 49.22 and 91.37 % and between 53.25 and 92.46 %, respectively in the second season. The other characters take the same trend with jojoba residues as mentioned before.

Table (8): Effect of different treatments on yield and yield components in the first season (summer 2007).

Jojoba ton /fed	Castor bean ton/fed	Mineral fertilizer R D*	Plant height cm	Ear length cm	Ear diameter cm	No of rows per ear	No. of kernels per row	100 seed weight, g	Grain yield ton/fed	R I.G Y	Dry matter g/plant after 80 days
0	0	Control	161.10	13 70	3.90	12 80	40 80	34 90	1 9874	0.00	155.40
		0 5	190.16	16 30	3 93	12.96	41.42	35 17	2.3579	18 64	188 30
		1 0	217 95	18 70	3 96	13.13	41.70	35 62	2.7052	36 12	217.00
	1	0.0	191 18	16.40	3 96	13 06	41.10	35 44	2.3746	19 49	189.00
		0.5	216 77	18.60	4.01	13.23	42.01	35.89	2 7034	36 03	224.70
		1.0	232.28	20 10	4.07	13 43	42.62	36.43	2.9271	47 28	231.70
	2	0 0	192 19	17.30	4 18	13 79	42.35	36 25	2.5047	26.03	226 10
		0.5	222.49	20.10	4 30	14 19	42 96	36.78	2 9354	47.70	251 30
		1 0	229 61	21.50	4.39	14.49	43.29	37.14	3.1185	56.91	252.70
1	0	0.0	172.96	14 10	4.05	13.37	42 78	37.62	2 3427	17 88	197.40
		0.5	205.61	17.30	4.11	13.56	43.39	38.70	2.8093	41.36	240.80
		1.0	231 16	19.50	4.15	13 70	43.84	39.51	2.9848	50 19	247 10
	1	0 0	197.67	16 60	4 22	13.93	44.58	37.98	2 6316	27.38	259.70
		0 5	235.25	22.20	4 52	14 92	47.74	40.68	3.9943	100.98	321 72
		1 0	241 73	22.40	4.58	15 11	48.35	41 22	4 0217	102 36	322 21
	2	0.0	211.45	18.70	4.27	14.09	45.10	38 43	2 7547	38 61	269 50
		0.5	240.27	22.40	4.62	15 25	48.80	41.58	4.0405	103.31	332.50
		1.0	250.63	22.60	4 66	15.38	49.22	41.94	4 1132	106.96	338 10
2	0	0.0	185.35	17 00	4 32	14.26	45 63	39.07	2.7744	39.60	271.86
		0.5	217.74	18.20	4 39	14 49	46.37	39.71	2.9472	48.29	300.15
		1.0	238 71	19.90	4 41	14.55	46.56	40 17	3.0917	55.57	307.74
	1	0.0	215.46	17.50	4.54	14.98	47.94	40.35	2.8634	44 08	310.50
		0.5	239 62	22.30	4 63	15 28	48.90	41.72	4.0817	105 38	324.30
		1 0	246 58	22 50	4 69	15 48	49.54	42.36	4.0995	106.27	336 11
	2	0 0	221.15	19.10	4.59	15.15	48.48	41.54	2.9235	47 10	319.47
		0 5	246.35	22 60	4 77	15 74	50 37	42.92	4 1000	106 30	339.21
		1.0	253 87	22 80	4 83	15.94	51.00	43 65	4 1560	109.12	342 11
(A) Jojoba ton/fed		0	205.97	18 08	4.08	13.45	42.03	35 96	2.6238	32.02	215.13
		1	220 75	19 53	4.35	14 37	45.98	39.74	3.2881	65.45	281.00
		2	229 43	20.21	4 57	15.10	48.31	41.28	3.4486	73 52	316.83
		F	*	*	*	*	*	*	*	*	*
		LSD_{05}	7 63	0 92	0.06	0.05	2 75	2 73	11 3171	1 32	2 90
(B) Castor bean ton/fed		0	202 30	17.19	4 14	13 65	43.01	37.83	2 6667	34 18	236.19
		1	224.06	19.84	4.36	14.38	45.86	39 12	3 2886	65.47	279.99
		2	229.78	20.79	4 51	14.89	46.84	40.03	3.4052	71.34	296.78
		F	*	*	*	*	*	*	*	*	*
		LSD_{05}	4 76	0.01	0.03	0.06	2 16	0 57	13.0662	0 81	5.40
(I) Mineral fertilizer		0	194.28	16.71	4 23	13 94	44.31	37 95	2.5619	28.91	244.33
		0 5	223.81	20 00	4.36	14.40	45.77	39.24	3.3300	67.55	280.33
		1 0	238.06	21 11	4 42	14 58	46.24	39.78	3 4686	74 53	288 31
		F	*	*	*	*	*	*	*	*	*
		LSD_{05}	4.52	0.02	0.03	0.03	1.02	0 63	11.1063	0.55	3.14
ABC		F	NS	*	NS	*	NS	NS	*	*	*
		LSD_{05}		0.05		0 08			33 3190	1.65	9.41

* R D = Recommended dose

Table (9): Effect of different treatments on yield and yield components in the second season (winter 2007/2008).

Jojoba ton/fed.	Castor bean ton/fed.	Mineral fertilizer R.D*	Plant height, cm	Spike length, cm	Biological yield Ton/fed.	Grain yield Ton/fed.	Straw yield Ton/fed.	* R.I.Y. % Grain	* R.I.Y. % Straw	Harvest index %	Dry matter, g/10 plants after 90 days	1000 Seed weight, g
0	0	Control	95.27	8.57	3.5997	1.3845	2.2152	0.00	0.00	38.46	13.78	39.10
		0.5	95.92	8.70	4.3367	1.6427	2.6940	18.65	21.61	37.88	15.10	39.74
		1.0	96.29	8.81	5.0396	1.9383	3.1013	40.00	40.00	38.46	15.87	40.82
	1	0.0	95.72	8.75	4.4426	1.7153	2.7273	23.89	23.12	38.61	14.62	39.78
		0.5	96.63	8.85	5.1638	1.9476	3.2162	40.67	45.19	37.72	16.00	40.95
		1.0	97.21	9.25	5.3867	2.0705	3.3162	49.55	49.70	38.44	17.03	41.88
	2	0.0	96.45	8.88	5.2264	1.9948	3.2316	44.08	45.88	38.17	16.21	40.99
		0.5	97.46	9.47	5.7911	2.1936	3.5975	58.44	62.40	37.88	17.36	41.97
		1.0	98.37	9.98	5.9846	2.3716	3.6130	71.30	63.10	39.63	18.19	42.36
1	0	0.0	96.12	8.65	4.5601	1.7405	2.8196	25.71	27.28	38.17	15.35	40.25
		0.5	97.68	9.11	5.5342	2.0963	3.4379	51.41	55.20	37.88	16.58	41.39
		1.0	98.37	9.52	5.6633	2.1359	3.5274	54.27	59.24	37.71	17.55	41.85
	1	0.0	97.94	9.76	5.9933	2.2875	3.7058	65.22	67.29	38.17	16.58	41.42
		0.5	98.85	10.73	7.3878	2.7916	4.5962	101.63	107.48	37.79	18.86	43.87
		1.0	99.16	10.81	7.4138	2.8110	4.6028	103.03	107.78	37.92	19.57	43.92
	2	0.0	98.94	9.92	6.1616	2.3164	3.8452	67.31	73.58	37.59	17.71	42.73
		0.5	99.47	10.82	7.6491	2.8974	4.7517	109.27	114.50	37.88	19.35	43.91
		1.0	100.35	10.87	7.7554	2.9207	4.8347	110.96	118.25	37.66	20.83	44.15
2	0	0.0	98.15	9.65	6.3737	2.4327	3.9410	75.71	77.91	38.17	17.08	41.78
		0.5	99.87	10.21	6.9490	2.5945	4.3545	87.40	96.57	37.34	18.77	42.41
		1.0	100.52	10.51	7.0892	2.6278	4.4614	89.80	101.40	37.07	19.45	42.25
	1	0.0	98.90	9.95	7.3208	2.8125	4.5083	103.14	103.52	38.42	18.36	42.37
		0.5	101.17	10.86	7.6382	2.9187	4.7195	110.81	113.05	38.21	19.81	43.95
		1.0	101.79	10.97	7.8942	3.0227	4.8715	118.32	119.91	38.29	21.14	44.17
	2	0.0	101.58	10.12	7.6353	2.9982	4.6371	116.55	109.33	39.27	19.89	43.97
		0.5	101.97	10.99	7.9459	3.0427	4.9032	119.77	121.34	38.29	22.14	44.29
		1.0	102.13	11.17	8.0676	3.1104	4.9572	124.66	123.78	38.55	23.24	44.75
(A) Injha ton/fed		0	96.61	9.03	4.9968	1.9177	3.0791	38.51	39.00	38.36	16.02	40.84
		1	98.54	10.02	6.4576	2.4441	4.0135	76.54	81.18	37.86	18.04	42.61
		2	100.68	10.49	7.4349	2.8400	4.5949	105.13	107.42	38.18	19.99	43.33
		F	*	*	*	*	*	*	*	*	*	*
		LSD	1.39	0.05	0.0012	0.0004	0.0012	0.07	0.13	0.02	2.51	1.83
(B) Castor bean ton/fed		0	97.58	9.30	5.4606	2.0659	3.3947	49.22	53.25	37.90	16.61	41.07
		1	98.62	9.99	6.5157	2.4864	4.0293	79.59	81.89	38.17	18.00	42.48
		2	99.64	10.25	6.9130	2.6495	4.2635	91.37	92.46	38.32	19.44	43.24
		F	*	*	*	*	*	*	*	*	*	*
		LSD_{05}	0.79	0.02	0.0018	0.0003	0.0006	0.02	0.03	0.01	0.91	0.88
(J) Mineral fertilizer		0	97.67	9.36	5.7015	2.1869	3.5146	57.96	58.66	38.34	16.62	41.38
		0.5	98.80	9.97	6.4884	2.4583	4.0301	77.56	81.93	37.87	18.22	42.50
		1.0	99.35	10.21	6.6994	2.5565	4.1428	84.65	87.02	38.19	19.21	42.91
		F	*	*	*	*	*	*	*	*	*	*
		LSD_{05}	0.70	0.04	0.0006	0.0003	0.0006	0.02	0.03	0.01	0.71	0.74
ABC		F	NS	*	*	*	*	*	*	*	NS	NS
		LSD_{05}		0.11	0.0017	0.0009	0.0017	0.06	0.08	0.02		

* R.D = Recommended dose

Table (10): Input production items and output of the experiments through the two growing seasons under study (summer season 2007 and winter season 2007/2008).

Items	Treatment	Unit	Unit price (LE.)
Inputs			
Jojoba seed residues	0, 1, 2 ton/fed	Ton	600.00
Castor bean seed residues	0, 1, 2 ton/fed	Ton	500.00
Mineral fertilizers			
Nitrogen fertilizer	0, 0.5, 1 of recommended dose	Kg N	2.10
Phosphorus fertilizer	0, 0.5, 1 of recommended dose	Kg P2O5	4.54
Potassium fertilizer	0, 0.5, 1 of recommended dose	Kg K2O	4.17
Seeds of maize	15 Kg/fed	Kg	7.50
Seeds of wheat	60 Kg/fed	Kg	3.00
land preparation		per fed.	200.00
Labor		per fed.	500.00
Pesticides		per fed.	450.00
* Other costs		per fed.	150.00
Outputs			
Maize grain		Ton	1100.00
Wheat grain		Ton	2500.00
Wheat straw		Ton	1000.00

* Depreciation rate of pumping machine, transportation of seeds, fertilizer...etc.

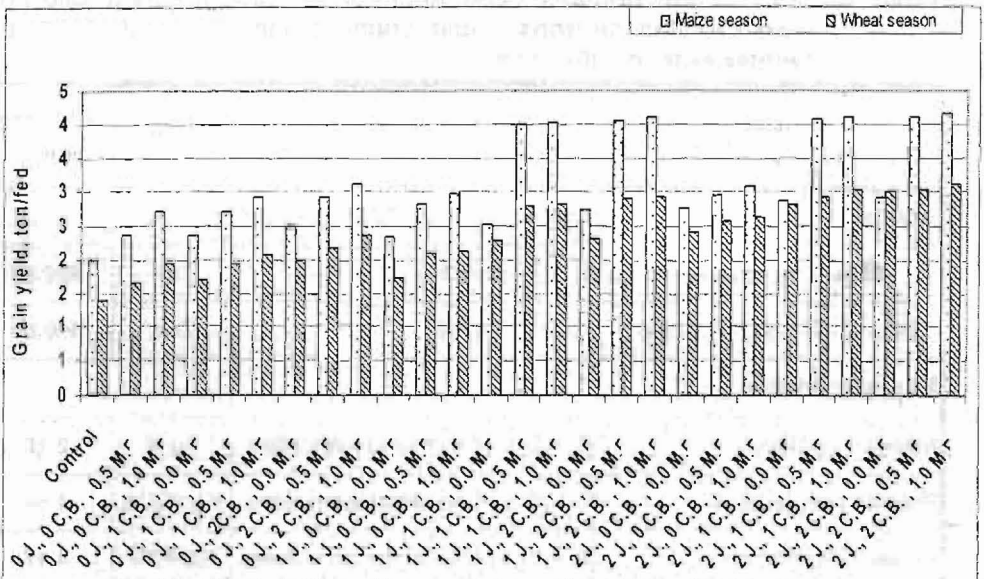

Fig.(6): Effect of different treatments on grain yield (ton/fed.) in the first and second seasons

These results may be due to increases in plant height, spike length, ear diameter and ear length (Tables 9 and 10) which may be caused by the ability of organic materials of jojoba and castor bean in making soil nutrients more available through its decomposition by soil micro organisms. Similar results were obtained by Sakr *et al.* (1992), El-Fayoumy *et al.*, (2000), El-Maddah (2005), El-Maddah *et al.*, (2007) and El-Sodany *et al.*, (2007).

Concerning mineral fertilizers, it can be seen that by increasing its application rates the yield and yield components were increased in the two growing seasons. The increases in maize grains reached to 74.53 % in the first season and the increases in wheat grain and straw yield reached to 84.65 and 87.02 %, respectively in the second one. The other yield characters take the same trend.

Regarding the combined effect, it can be noticed that the best treatment was the addition of 2 ton/fed. from both jojoba and castor bean seed residues at the recommended dose of mineral fertilizers since it gave the highest mean values of yield and yield components during the two growing seasons as shown in Tables (8 and 9).

As for the effect of these treatments on dry matter of maize and wheat plants in both first and second seasons, results generally show a positive effect due to all tested treatments. The mean values in Tables (8 and 9) reveal that dry matter of maize and wheat plants responded positively to application

rates of both jojoba and castor bean seed residues besides mineral fertilizers. The highest values were achieved by 2 ton/fed of jojoba with 2 ton/fed of castor bean at the recommended dose of mineral fertilizers where the values were 342.11 g/plant of maize after 80 days in the first season and 23.24 g/10 plants of wheat in the second one. These differences could be attributed to the increases in plant height and straw yield. Also, these increases in dry matter of plants may be due to the role of these amendments (jojoba and castor bean residues) in improving some nutrients for plants through its decomposition by soil microorganisms. These results are in line with El-Maddah *et al.* (2007) and El-Sodany *et al.* (2007).

Thus the present study could confirm that adding both jojoba and castor bean seed residues as soil amendments combination with half of the recommended dose of mineral fertilizers is an important practice for improving soil physical, hydrophysical and chemical properties of the soil, moreover enhanced the nutrient status of soil and accordingly increasing crop production comparable to untreated soil (control).

III- Economical analysis.

Data presented in Tables (10 and 11) and Fig. (7) show the total inputs costs, outputs, net income and the investment ratio for the tested treatments besides the control. The obtained results indicate that the highest net income value (11569.45 LE/fed.) was incorporated with the mixing of 1.0 ton/fed of jojoba seed residues with 1.0 ton/fed of castor bean seed residues and 0.5 of the recommended dose of mineral fertilizers. While, the control (without any additions) gave always the lowest value (4970.09 LE/fed.).

From the data, it could be seen that although addition of 2 ton/fed of jojoba mixed with 2 ton/fed of castor bean seed residues at the recommended dose of mineral fertilizers treatment gave the highest yield than the other treatments but the net income was not the best one, this is due to its high inputs because its high rates of both jojoba and castor bean seed residues which reflect on their high prices and costs.

On the other hand, most of the investment ratio values were incorporated with the highest net income besides the lowest inputs which were resulted from mixing the different rates of these amendments (jojoba and castor bean seed residues) with half of the recommended dose of mineral fertilizers.

Table (11): Input production items and output of the experiments through the two growing seasons under study (summer season 2007 and winter season 2007/2008).

Jojoba ton /fed	Castor bean ton/fed	Mineral fertilizer R.D*	Inputs (LE/fed)	Total yield Ton/fed.			Total yield price, LE/fed			Outputs (LE/fed)	Net income LE/fed	Investment ratio
				Maize grain	Wheat grain	Wheat straw	Maize grain	Wheat grain	Wheat straw			
0	0	Control	2892.50	1.9874	1.3845	2.2152	2186.14	3461.25	2215.20	7862.59	4970.09	2.72
		0.5	3299.48	2.3679	1.6427	2.6940	2593.69	4106.75	2694.00	9394.44	6094.96	2.85
		1.0	3706.46	2.7052	1.9383	3.1013	2975.72	4845.75	3101.30	10922.77	7216.31	2.95
	1	0.0	3392.50	2.3748	1.7153	2.7273	2612.28	4288.25	2727.30	9627.83	6235.33	2.84
		0.5	3799.48	2.7034	1.9476	3.2162	2973.74	4869.00	3216.20	11058.94	7259.46	2.91
		1.0	4206.46	2.9271	2.0705	3.3162	3219.81	5176.25	3316.20	11712.26	7505.80	2.78
	2	0.0	3892.50	2.5047	1.9948	3.2316	2755.17	4987.00	3231.60	10973.77	7081.27	2.82
		0.5	4299.48	2.9354	2.1936	3.5975	3228.94	5484.00	3597.50	12310.44	8010.96	2.86
		1.0	4706.46	3.1185	2.3716	3.6130	3430.35	5929.00	3613.00	12972.35	8265.89	2.76
1	0	0.0	3492.50	2.3427	1.7405	2.8196	2576.97	4351.25	2819.60	9747.82	6255.32	2.79
		0.5	3899.48	2.8093	2.0963	3.4379	3090.23	5240.75	3437.90	11768.88	7869.40	3.02
		1.0	4306.46	2.9848	2.1359	3.5274	3283.28	5339.75	3527.40	12150.43	7843.97	2.82
	1	0.0	3992.50	2.5316	2.2875	3.7058	2784.76	5718.75	3705.80	12209.31	8216.81	3.06
		0.5	4399.48	3.9943	2.7916	4.5962	4393.73	6979.00	4596.20	15968.93	11569.45	3.63
		1.0	4806.46	4.0217	2.8110	4.6028	4423.87	7027.50	4602.80	16054.17	11247.71	3.34
	2	0.0	4492.50	2.7547	2.3164	3.8452	3030.17	5791.00	3845.20	12666.37	8173.87	2.82
		0.5	4899.48	4.0405	2.8974	4.7517	4444.55	7243.50	4751.70	16439.75	11540.27	3.36
		1.0	5306.46	4.1132	2.9207	4.8347	4524.52	7301.75	4834.70	16660.97	11354.51	3.14
2	0	0.0	4092.50	2.7744	2.4327	3.9410	3051.84	6081.75	3941.00	13074.59	8982.09	3.19
		0.5	4499.48	2.9472	2.5945	4.3545	3241.92	6486.25	4354.50	14082.67	9583.19	3.13
		1.0	4906.46	3.0917	2.6278	4.4614	3400.87	6569.50	4461.40	14431.77	9525.31	2.94
	1	0.0	4592.50	2.8634	2.8125	4.5083	3149.74	7031.25	4508.30	14689.29	10096.79	3.20
		0.5	4999.48	4.0817	2.9187	4.7195	4489.87	7295.75	4719.50	16506.12	11506.64	3.30
		1.0	5406.46	4.0995	3.0227	4.8715	4509.45	7558.75	4871.50	16937.70	11531.24	3.13
	2	0.0	5092.50	2.9235	2.9982	4.6371	3215.85	7495.50	4637.10	15348.45	10255.95	3.01
		0.5	5499.48	4.1000	3.0427	4.9032	4510.00	7606.75	4903.20	17019.95	11520.47	3.09
		1.0	5906.46	4.1560	3.1104	4.9572	4571.60	7776.00	4957.20	17304.80	11398.34	2.93

* R.D = Recommended dose

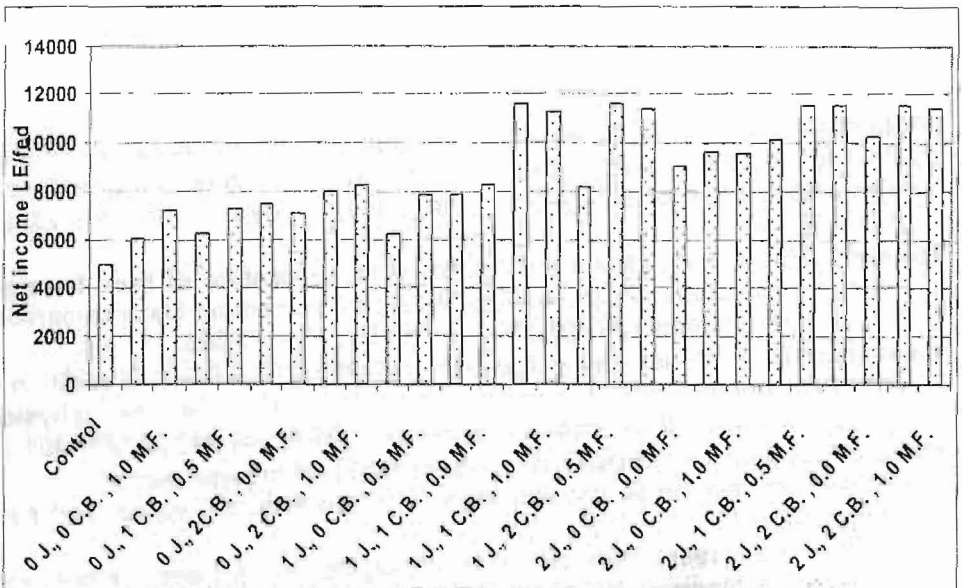

Fig. (7): The net income (LE/fed) due to different treatments through the two growing seasons under study.

The results in Table (11) and Fig. (7) indicate that the net income values of jojoba seed residues treatments generally were higher than those of the other treatments. Thus, the added treatments can be arranged according to their high net income as follows : jojoba > castor bean > mineral fertilizers. Also, it can be noticed that the net income values were increased by increasing single addition rates of jojoba or castor bean seed residues and mostly with increasing mineral fertilizers. Also, mixing jojoba and castor bean with or without mineral fertilizers gave the same trend. These results are in agreement with those obtained by El-Maddah and Badr (2005), El-Sodany *et al.* (2007) and El-Maddah *et al.* (2007).

From the aforementioned results, it can be observed that its better economy to use these amendments (jojoba and castor bean seed residues) in the presence of mineral fertilizers to get a markedly higher net income.

Finally, it can be concluded that under silty clay loam soil conditions, the addition of jojoba and castor bean seed residues with mineral fertilizers markedly improved soil chemical properties such as a decrease in soil pH, soil salinity (EC), SAR and increased the leaching of soluble salts. As well those organic residues caused a substantial increase in soil macronutrients which reflect on increasing the yield and its components incorporated with high net income and investment ratio, besides substitute a part of chemical

fertilizers with organic residues to minimize the pollution caused from the intensive use of it.

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تأثير مخلفات البذور الزيتيه للجوجوبا والخروع كمحسنات للتربه على بعض الخواص الكيماويه للاراضى وإنتاجيتها.

منصور الدسوقى السوداني ، الحسينى ابراهيم المداح ، خطاب عبد الباقي خطاب

معهد بحوث الاراضى والمياه والبيئة – مركز البحوث الزراعية – الجيزة – مصر

الملخص العربى

أجريت تجربتان حقليتان خلال موسمين متعاقبين، الموسم الصيفى ٢٠٠٧ والموسم الشتوى ٢٠٠٧/٢٠٠٨ علي ارض طمييه طينيه سلتيه فى محطة البحوث الزراعيه بالجميزه ، محافظة الغربيه لتقييم تأثير اضافة مخلفات بذورالجوجوبا والخروع على تحسين بعض الخواص الكيماويه للتربه ، وكمية العناصر الكبرى بها واثر ذلك على انتاجية الارض ، ودراسة الاثر المتبقي لهذه الاضافات علي نفس الخصائص السابقه ، بالاضافه الى اجراء الدراسه الاقتصاديه بهدف تحديد افضل معامله لتحقيق اعلى صافي دخل مزرعى ، وكان معدل اضافة مخلفات الجوجوبا والخروع صفر ، ١ ، ٢ طن / فدان لكل منهما وقد تم اضافتها قبل زراعة الذره فى الموسم الاول فقط ، بينما تم اضافة الاسمدة المعدنية بمعدلات صفر ، ونصف وجرعة التسميد الموصي بها حسب كل محصول ، وكان تصميم التجربه قطع منشقة مرتين فى قطاعات كاملة العشوائيه في ثلاث مكررات ، ويمكن تلخيص النتائج المتحصل عليها كالتالي :

١-أدت اضافة مخلفات بذور الجوجوبا والخروع الي انخفاض بسيط في رقم حموضة التربه ، وأدت جميع المعاملات الي زيادة غسيل الاملاح الذائبه وانخفاض قيم ملوحه التربه ونسبه الصديوم المدمص ما عدا زيادة معدلات التسميد المعدني.

٢- أدت جميع المخلفات الى تحسن واضح فى نسبة العناصر الكبري بالتربه.

٣- زيادة النسبه المئويه للكربون العضوى ونسبة ك : ن فى الطبقه السطحيه وتحت السطحيه للتربه كنتيجه لاضافة مخلفات الجوجوبا والخروع.

٤- حدثت زيادة ملحوظه فى المحصول ومكوناته استجابه للمخلفات المضافه ، وتراوحت نسبه الزياده في محصول الذره من ١٧.٨٨ الي ١٠٩.١٢ % مقارنة بالكنترول (الارض الغير

معاملة) ووصل اعلي محصول في حبوب الذرة الي ٤.١٥٦٠ طن / فدان فى الموسم الاول بينما تراوحت الزياده في محصول الحبوب والقش للقمح بين ١٨.٦٥ . ١٢٤.٦٦ % وبين ٢١.٦١ . ١٢٣.٧٨ % لكل من الحبوب والقش علي التوالى حيث وصل اعلي محصول للحبوب والقش الى ٣.١١٠٤ . ٤.٩٥٧٢ طن / فدان علي التوالي .

٥- يشير التحليل الاقتصادى الي ان اضافة ١ طن / فدان من مخلفات الجوجوبا مع ١ طن / فدان من مخلفات الخروع مع نصف جرعة التسميد الموصي بها سجلت اكبر عائد اقتصادى بالمقارنه بالمعاملات الاخرى حيث سجلت ١١٥٦٩.٤٥ جنيها للفدان .

٦- مما سبق يتبين انه من المفيد إستخدام هذه المعاملات (مخلفات بذور الجوجوبا والخروع) للحصول على تحسن واضح في الخصائص الكيماويه للارض والعناصر بها والتي تنعكس علي زيادة المحصول وتحقيق اعلى صافى دخل مزرعي بالاضافه الي احلال جزء من الاسمده المعدنيه بالمخلفات العضويه لتقليل التلوث الناتج عن الاستخدام المكثف لها .