Minufiya J. Agric. Res. Vol.36 No. 1: 159 - 176 (2011) "http://www.mujar.net"

USE OF COTTON GIN TRASH FOR IMPROVING PROPERTIES AND PRODUCTIVITY OF SANDY SOILS

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(Received: Nov. 23, 2010)

ABSTRACT: ***Field experiment was conducted at a sandy soil in El-Kantra East, North Sinai, to investigate the effect of adding cotton gin trash (at rates of 0, 10, 20 40, 60 and 80 tan/fed) in combination with two tillage depths (0-10 and 0-20 cm) on some properties of sandy soils and yield of corn grain. The obtained data revealed that the values of soil EC, bulk density, penetration resistance, and hydraulic conductivity were decreased with increasing the application rates of cotton gin trash, while, organic carbon content and maximum water holding capacity were increased. The obtained data showed also that corn grain yield was increased with increasing cotton gin trash rates up to 80 t fed^{-1} under different tillage treatments. The average yields were 1516.66, 2207.89, 2753.56, 3273.89, 3537.44, and 4411.78 kg fed^{-1} in the case of adding 0, 20 and 40 ton/fed. of cotton gin trash, respectively. While, they reached 2648.22 and 3252.18 kg fed^{-1} in the case of the two tillage depths (10 and 20 cm) under the different of treatments cotton gin trash, respectively. So, we can said that cotton gin trash can considered effective in improving soil properties and productivity.***

Key Words: ***cotton gin trash, sand soil, corn, tillage depth, North Sinai***

INTRODUCTION

Corn (Zea mays L.) is an important crop and one of two sources for cereal flour used in Egypt for making bread. The average area of corn in 1999 was 1.886 million feddan which produced 7.976 million tons (CAMS, 2010). This indicates that annual production per unit area is not enough for effort consumption. Therefore, investigators gave many to increase corn production with different ways. It is known that both fertilizers levels (N, P, and K) and tillage systems exert paramount effect on the growth and yield of corn plants.

Cotton gin waste is a term used to describe the by-products of the cotton ginning process and includes leaves, stems, hulls, and some lint (Jackson *et.al.,* 2005). Current practices of disposal of cotton gin waste include broadcast spreading the raw waste over farmland, use as a livestock feed, or disposal at a landfill. These disposal and utilization methods are very limited and costly to the cotton gins.

Typical cotton gin by-products consist mainly of fruit and vegetative parts of the cotton plant which were collected during harvest and removed by the

cotton cleaning during processing at the gin. CGT (Cotton Gin Trash) is comprised of stems, leaves, bracts, hulls, some cotton fiber, weed seeds, and soil particles that are removed from the lint during the ginning process (Thomasson and Willcutt 1996; and Buser 2001). The fleshy cotton burrs, also the component of CGT are important because they are the primary repository of nutrients in the cotton plant. Cotton burrs contain a significant amount of Nitrogen (N), Phosphorus (P), and Potassium (K), as well as numerous micronutrients (Hills *et al.,* 1981). Cotton burrs have a carbon nitrogen (C:N) ratio of 22:1, eliminating the nitrogen tie-up that occurs when wood or wood based products are composted. This C:N ratio allows CGT to be composted and then utilized as an amendment or growing media without causing severe nitrogen depletion to plants (Thomasson 1990).

Thomasson, *et. al.,* (1996) considered that shown the cotton gin compost is generally beneficial to growth and yield of various plants when used in place, or as an amendment to exist growing substrates. Incorporating cotton gin compost to soil as an amendment has been shown to add nutrients to and increase the WHC of certain soils (Mayfield, 1991). Cotton gin compost also has a high CEC, high porosity, and it contains organic nitrogen that is preserved during the composting process being slowly released to the environment after maturity (Papafotiou *et al.,* 2001).

The use of organic amendments has been associated with desirable soil properties including higher available water holding capacity and CEC and lower bulk density (Doran, 1995 and Drinkwater *et al.,* 1995). Benefits of compost amendments to soil also include pH stabilization and faster water infiltration rate due to enhanced soil aggregation (Stamatiadis *et al.,* 1999). Soil chemical characteristics are affected by soil amendments and production system. For example, at the Rodale Institute, long-term legume-based and organic production systems have resulted in an increase in soil organic matter and reduced nitrate runoff (Drinkwater *et al.,* 1998). Soils in organic production systems lost less nitrogen into nearby water systems than did conventional production systems (Liebhardt *et al.,* 1989). The amount of soil nitrogen in fields under conventional production systems has been negatively correlated with soil microbial components, whereas soil nitrogen in fields under organic production was positively correlated with soil microbial components (Gunapala and Scow, 1998).

Cotton gin trash is an organic waste product readily available in Arkansas. Composted gin trash can increase the water- and nutrient-holding (CEC = 200 meq/100 gm) properties of media and has a pH of 5.5 to 6.0. High soluble salts can be a concern, but this can be reduced quickly through leaching with water. Several studies have shown reduction of plant growth when the media contains > 50% gin trash (Robbins and Evans, 2010).

Lui, *et.al.,* (2007) found that the soils amended with cotton gin trash had higher soil water content, lower bulk density, higher humic matter content, higher porosity and higher levels of mineralizable N, than soils with other fertility amendments.

Tejada and Gonzalez (2007) found that the application of cotton gin crushed compost improved the soil's physical (structural stability, bulk density), chemical (exchangeable sodium percentage, ESP), and biological properties (microbial biomass, soil respiration, and enzymatic activities) and the wheat yield parameters; however, the application of sewage sludge adversely affected the soil biological properties and reduced the wheat yield, probably because the high amounts of heavy metals. .Also, Tejada (2010) found that all organic waste materials (vermicomposts, vegetal origin and cotton gin compost) had a positive effect on the soil biological properties, plant nutrition and crop yield parameters.

Moreover, Ghosh, *et.al.,* (2010) found that the organic amendments (cotton gin trash and cattle manure) improved the physical properties of sodic Vertisols by decreasing clay dispersion, cotton gin trash produced the largest decreased (29%) in the dispersion index over the control. Available nutrients (N,P, and K) were also increased significantly at higher sodicity levels by using organic amendments.

Bulluck and Ristaino (2002) and Bulluck, *et.al.* (2002) found that the soil plots receiving cotton gin trash or rye-vetch had significantly higher level of potassium than soil in plots amended with synthetic fertilizers or swine manure. Also, they found that the soil plots receiving cotton gin trash , rye-vetch or swine manure retained a greater percentage of water content. Soil bulk densities were highest in plots amended with synthetic fertilizers and lowest in plot amended with cotton gin trash.

Under Egyptian conditions, Wanas and Omran (2006) showed that cotton and banana composts significantly improved sandy soil hydro-physical characteristics and recommended their use as amendments in sandy soils.

In Egypt, totaled distributor of cotton was1.513 million BC.M (Metric quintal of cotton hair) from the first season until the end of February 2010 compared to 365 thousand BC.M in the previous season, with an increase of 182.3% (CAMS 2010). Moreover, the amount of cotton that has been Haljha was 1.207 million BC.M during the period from December 2009 to February 2010 .

Disposal of organic wastes such as cotton gin trash, has become a serious problem facing all communities, in Egypt. The main objective of this study is to quantify the effects of cotton gin trash with two tillage depths on some physical properties of sandy soils and evaluate their effect on corn grain yield.

MATERIALS AND METHODS

This study was conducted in the sandy soil at El-Kantra East, North Sinai. The soil of the experimental site is sandy in texture, highly noncalcareous (1.7% CaCO3), non-saline (EC of 3.37 dS/m), pH (7.79) and having 0.32% organic carbon, available soil P is 2.5 ppm, total N is 0.1%, Fe, Zn and Mn are 3.9, 1.15 and 1.98 ppm, respectively.

Some chemical properties of the cotton gin trash are summarized in Table (1). Cotton gin trash was obtained from Zagazig town, EL-Sharkeya governorate, Egypt.

Table (1): Some chemical properties of the used cotton gin trash amendment.

Component and characteristics	Unit	Value
Ash	%	7.15
Bulk density	g/cm^3	0.56
Organic Carbon	%	53.0
Total Nitrogen	%	1.65
Total Phosphorus	%	0.89
Total Potassium	%	1.82
Total Iron	ppm	450
Total Manganese	ppm	82
Total Zinc	ppm	170
Total Copper	ppm	59
Hemi cellulose	%	17.25
Lignins	%	15.50
pH (1:5)		7.10
EC (dS/m)		1.50

The experiment was carried out in a split plots design. Each block (2 by 20 m) was split for two tillage depth 0-10 and 0-20 cm (the main plots). The sub-main plots received cotton gin trash with six application rates (0, 10, 20, 40, 60 and 80 t/fed.). The cotton gin trash incorporated with surface soil layers (0-10 and 0-20 cm with chisel tillage). So, the field experiment comprised of 5 application rates of cotton gin trash and two depths of tillage with 3 replicates.

Corn hybrid "*Zea Maze 321*" was sown during the first week in May. Seeding rate was 20 kg seed fed^{-1}.

All plots were fertilized as commonly practiced. Superphosphate (15.5% P_2O_5) was added at the rate of 300 kg/fed., it banded adjacent to seed hills at sowing, and potassium sulphate was applied after thinning at the rate of 48 kg K_2O/fed.. Nitrogen fertilizer was applied as ammonium nitrate (33.5%N) at the rate of 300 kg/fed. in a three equal does, at sowing, at thinning, and at two weeks after thinning. Cultivation practices were followed as recommended by the Ministry of Agricultural and Land Reclamation.

Also, all plots were received 20 L/fed. effective microorganisms (EM). EM was applied weekly as 1L fed^{-1} EM with 1.6L fed^{-1} of molasses mixed into 17.4L of water. It was fermented for 7 days and applied with irrigation water (for twenty weeks).

Corn was harvested in late September. Whole plants were taken at harvest from each plot to determine grain yield.

Undisturbed soil sample from each plot was taken from 0-10 and 0-20 cm depths to determine some soil properties.

Bulk density (BD) was determined using to the core methods as described by Blake (1986).

For the measurement of penetration resistance (CI), a standard cone penetrometer was used. CI measurements were repeated six times in each plot from locations baside BD measurements (ASAE, 1993).

Saturated hydraulic conductivity (K_{sat}) for the undisturbed soil samples was determined according to Klute (1986).

Maximum water holding capacity was determined according to the technique described by Stolte *et.al.* (1992).

The water extract components were determined in the soil paste extract, and the following determinations were carried out by using the standard methods of analysis according to Jackson (1973). The total soluble salts were determined conductimetrically. Soil reaction (pH) was determined in the soil paste, according to Richards (1954). Organic matter was determined following by the modified Walkley and Black method, Jackson (1973).

RESULTS AND DISCUSSION

The cotton gin trash used in this study possessed chemical properties (Table 1). Original cotton gin trash had a neutral reaction. Concerning the effect of cotton gin trash applied on soil pH, the obtained pH values slight decrease from 7.79 to 7.69. Fig. 1 shows that the application of cotton gin trash at the five rates (10, 20, 40, 60 and 80 t/fed.) decreases the pH values than the treatment without cotton gin trash (rate 0). That decrease of soil pH in the treated soil may be explained by the production of organic acids, CO_2 and hydrogen ions (H^+). These realties are in agreement with those obtained by Bulluck *et.al.* (2002).

On the other hand no significant differences in the value of pH are detected due to the effect of tillage depths (Fig. 1).

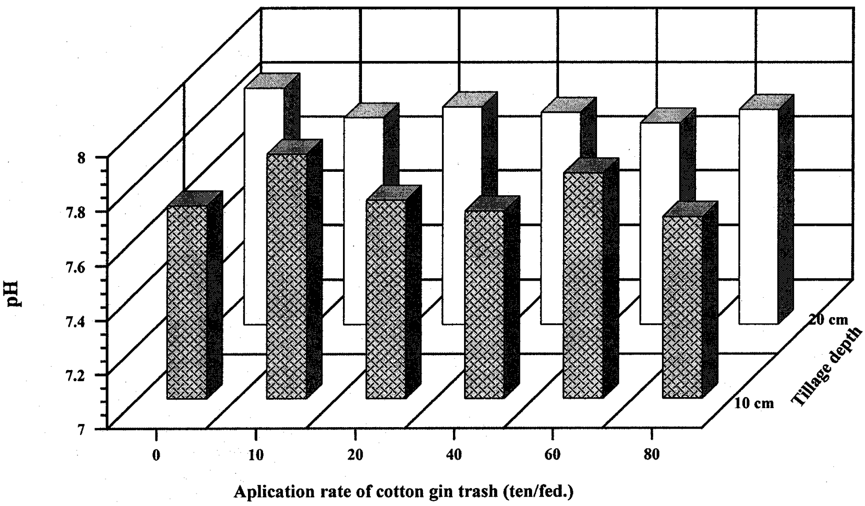

Fig (1): Effect of cotton gin trash and tillage depth treatments on soil pH.

Cotton gin trash rates and tillage depths effect on electrical conductivity of the saturation extract (EC_e) of the soil is shown in Table (2) and Fig. (2). Values of EC_e range from 2.06 to 3.37 dS/m. The EC_e of soil is affected by both cotton gin trash rates and tillage depth.

Soil electrical conductivity of the saturated extract (EC_e) is decreased from 3.32 dS/m to 2.14 dS/m with application of cotton gin trash (Table 2 and Fig. 2). As the rate of cotton gin trash increases the EC_e of the soil decrease being, on the average, of 18.14, 38.91, 43.72, 48.21, and 55.14% in the five treatments, respectively, lower than that of control treatment. Similar results were obtained by Tejada *et.al.* (2006).

The tillage depth main effects on EC_e were not significant in EC_e of soil (Table, 2). EC_e was relatively high in the 10 cm tillage depth than in 20 cm tillage depth.

Table (2) and Fig. (3) represents the response of organic carbon (O.C) of soil to applied cotton gin trash. Table (2) and Fig. (3) shows that the soil O.C% gradually increases as the cotton gin trash rate increases. The increase in O.C% reached 183, 375, 508, 708, and 1158% on the average due to the increase in cotton gin trash rate from 0 to 10, 20, 40, 60 and 80 t/fed., respectively. These results are in agreement with those obtained by Bulluck *et.al.* (2002) , Tejada and Gonzalez (2007) and Tejada (2010).

A survey of these data (Table 2) shows that the two tillage depths was significant by affect the value of O.C% in soil.

Table (2): Effect of cotton gin trash and tillage depth treatments on soil electrical conductivity (EC_e) and O.C%.

Tillage depth (cm)	Application rate of cotton gin trash (tan/fed.)						*Mean*
	0		20	40	60	80	
	EC dS/m						
10	3.37	*2.58*	2.43	2.35	2.29	2.22	*2.58*
20	3.27	*2.49*	2.36	2.28	2.20	2.06	*2.49*
Mean	3.32		2.39	2.31	2.24	2.14	
LSD of Cotton Gin	0.219						
LSD of Tillage	0.126						
LSD of Interaction	0.309						
	O.C%						
10	0.140	*0.854*	0.634	0.917	1.324	1.760	*0.854*
20	0.116	*0.516*	0.517	0.567	0.705	0.849	*0.516*
Mean	0.128		0.575	0.742	1.014	1.304	
LSD of Cotton Gin	0.206						
LSD of Tillage	0.199						
LSD of Interaction	0.292						

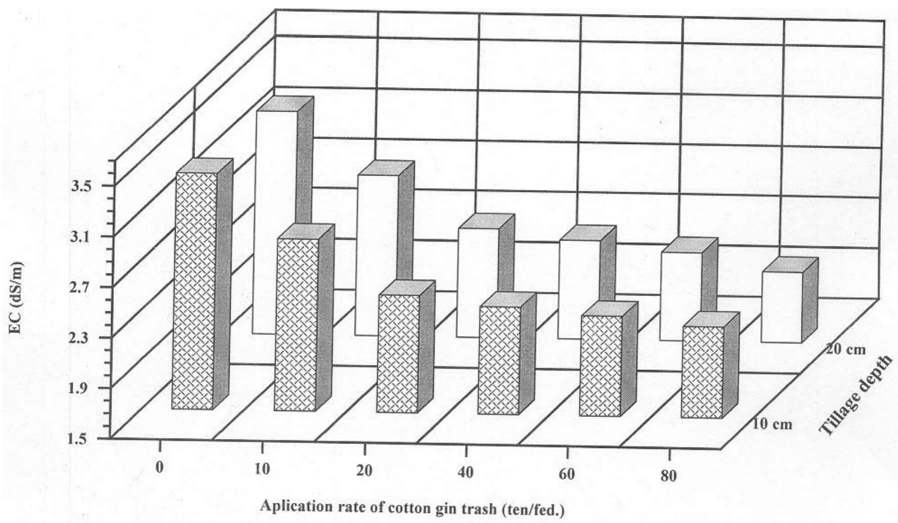

Fig (2): Effect of cotton gin trash and tillage depth treatments on soil electrical conductivity (EC_e).

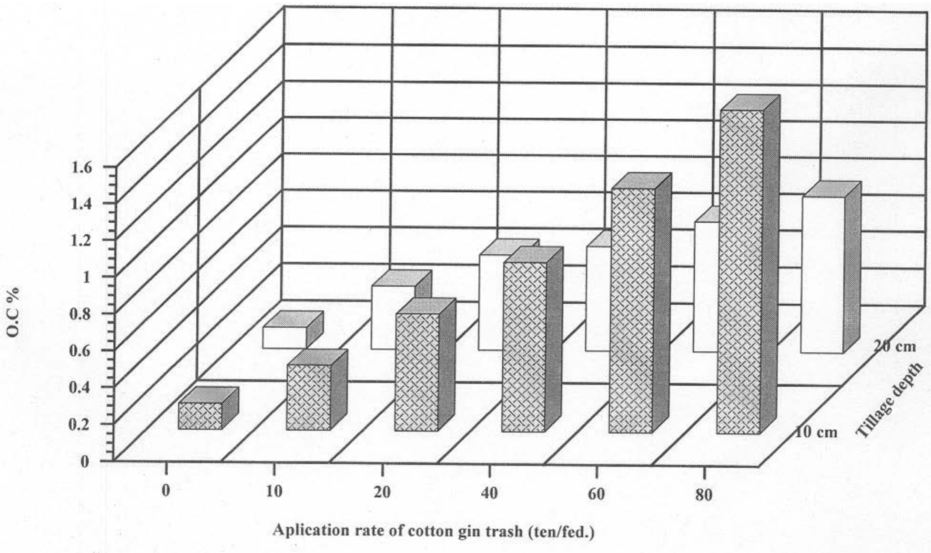

Fig (3): Effect of both cotton gin trash and tillage depths on soil OC%

Soil Physical Properties:
Bulk Density:

Results show that soil bulk density values in the treatments of cotton gin trash are lower than the control treatment and the differences are statistically significant (Table 3 and Fig. 4). This could be attributed to the effect of low bulk density of applied cotton gin trash.

Moreover, data show that the mean bulk densities are decreased with increasing application rates of cotton gin trash. The relative reductions in soil bulk density reach 12.23, 23.80, 27.86, 30.00, and 32.20% as an average base due to the increase in cotton gin trash from 10, 20, 40, 60, and 80 t/fed, respectively,. This finding clearly shows the adverse effect of increasing application rates of cotton gin trash on soil bulk density. These realties are in agreement with those obtained by Bulluck and Ristaino (2002) and Bulluck *et.al.* (2002).

One the other hand, the two tillage depths had significant effect on soil bulk density (Table 3).

Table (3): Effect of cotton gin trash and tillage depth treatments on soil bulk density and maximum water holding capacity

Tillage depth (cm)	Application rate of cotton gin trash (tan/fed.)						*Mean*
	0	10	20	40	60	80	
	Bulk density g/cm^3						
10	1.60	1.45	1.30	1.26	1.24	1.22	*1.34*
20	1.52	1.34	1.23	1.18	1.16	1.14	*1.26*
Mean	*1.56*	*1.39*	*1.26*	*1.22*	*1.20*	*1.18*	
LSD of Cotton Gin	0.040						
LSD of Tillage	0.023						
LSD of Interaction	0.057						
	Maximum Water Holding Capacity (%)						
10	21.37	25.12	29.05	34.95	38.90	42.16	*31.92*
20	20.37	21.99	27.73	32.29	37.30	42.71	*30.39*
Mean	*20.87*	*23.55*	*28.39*	*33.62*	*38.10*	*42.43*	
LSD of Cotton Gin	2.223						
LSD of Tillage	1.680						
LSD of Interaction	3.144						

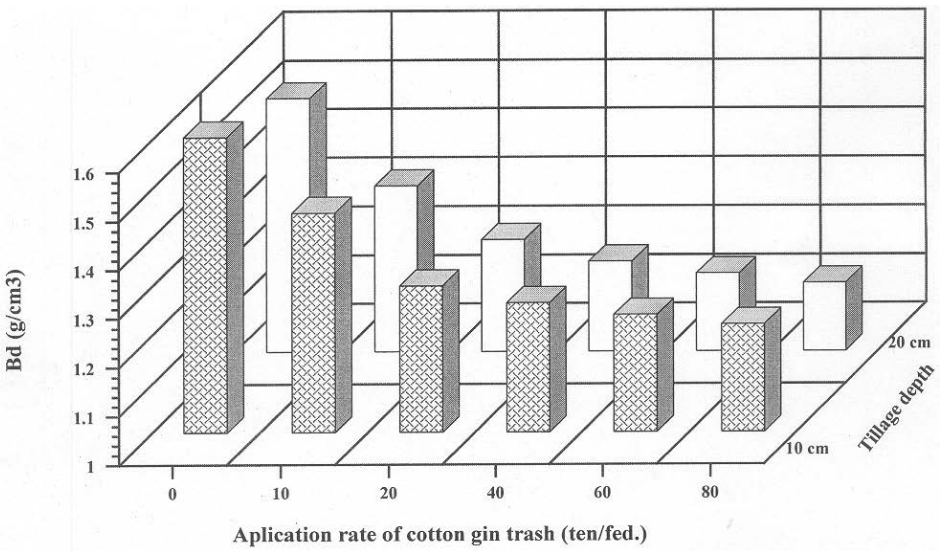

Fig (4): Effect of both cotton gin trash and tillage depths on soil bulk density

Penetration Resistance:

The soil penetration resistance is a good indicator for the soil physical properties, the decrease in penetration resistance allows the plant roots for easy penetration in the soil. As shown in Fig. (5), a decrease in soil penetration resistance is accompanied by an increase in both the rates of applied cotton gin trash and tillage depth.

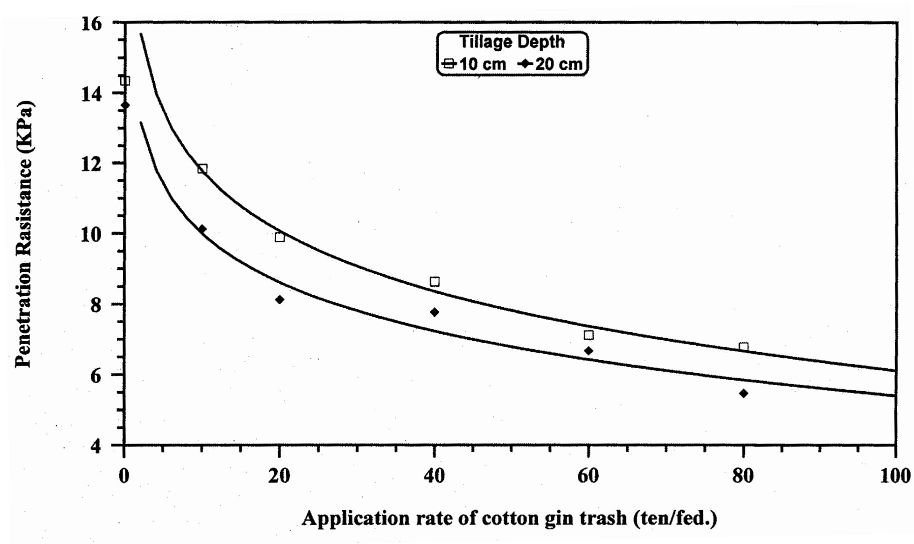

Fig (5): Effect of both cotton gin trash and tillage depths on soil penetration resistance

Maximum Water Holding Capacity (MWHC):

Incorporating of cotton gin trash with surface soil could enhance soil physical properties. Data in Table (3) and Fig. (6) illustrate that the effects of cotton gin trash rates on maximum water holding capacity are significant as they increase with increasing cotton gin trash rates. Moreover, a significant difference is detected between the maximum water holding capacities under the five rates of cotton gin trash additions. The relative increases in the maximum water holding capacity reach 12.84, 36.03, 61.09, 82.55, and 103.30% for cotton gin trash rates of 10, 20, 40, 60, and 80 t/fed., respectively.

A survey of these data (Table 3) shows that the difference in MWHC between two the tillage depths is not significant.

In this respect, Bulluck and Ristaino (2002), and Jackson *et.al.* (2005) found that the cotton gin compost increased water holding capacity of certain soils.

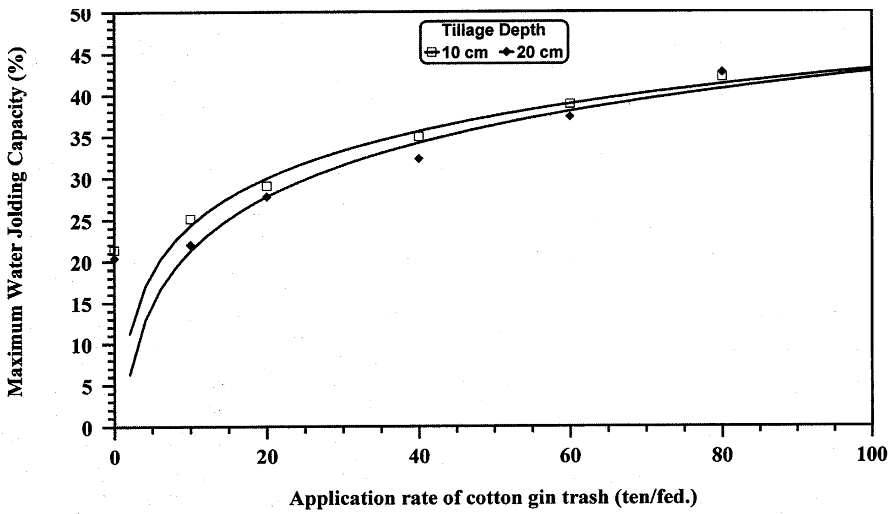

Fig (6): Effect of both cotton gin trash and tillage depths on soil maximum water holding capacity

Hydraulic Conductivity:

Concerning the effect of cotton gin trash on soil hydraulic conductivity, data presented in Table (4) and Fig. (7) show a decrease in the soil hydraulic conductivity with the increase of amendments application rates. The relative decreases in the soil hydraulic conductivity reach 9.74, 20.97, 29.09, 35.60, and 50.92% in the cotton gin trash treatment of 10, 20, 40, 60, and 80 t/fed., respectively. These realties are in agreement with those obtained by Wanas and Omran (2006) who clearly showed the effect of cotton compost applications on decreasing hydraulic conductivity on sandy soil.

The tillage depths are significant by affect soil hydraulic conductivity (Table, 4 and Fig. 7). Hydraulic conductivity is relatively high in the 10 cm tillage depth than in the 20 cm tillage depth.

Table (4): Effect of cotton gin trash and tillage depth treatments on soil hydraulic conductivity

Tillage depth (cm)	Application rate of cotton gin trash (tan/fed.)						*Mean*
	0		20	40	60	80	
	HK (cm/sec)						
10	24.93	22.20	20.40	19.05	18.32	16.3	*20.20*
20	22.38	20.9	18.71	17.60	16.56	15.04	*18.53*
Mean	*23.65*	*21.55*	*19.55*	*18.32*	*17.44*	*15.67*	
LSD of Cotton Gin	2.267						
LSD of Tillage	0.925						
LSD of Interaction	1.603						

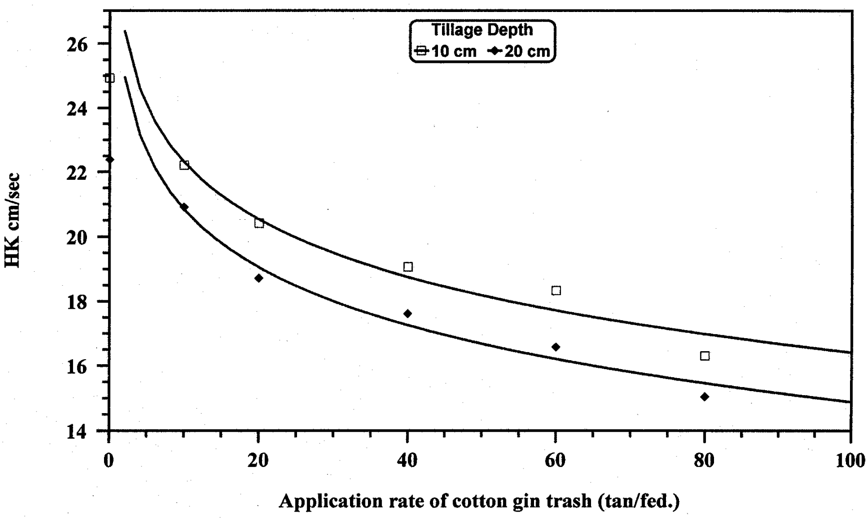

Fig (7): Effect of both cotton gin trash and tillage depths on soil hydraulic conductivity

Corn grain yield :

Data in Table (5) and Fig. (8) represent the response of corn grain yield to the application of cotton gin trash and tillage depths.

Data show that the application of cotton gin trash at the five rates (10, 20, 40, 60, and 80 t/fed) increases the grain yield of corn under the two tillage depths. The added cotton gin trash increases the production of corn grain comparing with treatment without cotton gin trash (rate 0). Maximum yield is achieved with in the treatment used 80 t/fed cotton gin trash.

Table (5): Corn grain yield (kg/fed.) as affected by the application rates of cotton gin trash and tillage depth

Tillage depth (cm)	Corn grain yield (kg/fed.)						*Mean*
	Application rate of cotton gin trash (tan/fed.)						
	0	10	20	40	60	80	
10	1484.44	2073.56	2568.89	2842.22	3044.44	3875.78	2648.22
20	1548.89	2342.22	2938.24	3705.56	4030.44	4947.78	3252.18
Mean	1516.66	2207.89	2753.56	3273.89	3537.44	4411.78	
LSD of Cotton Gin				131.154			
LSD of Tillage				75.721			
LSD of Interaction				185.489			

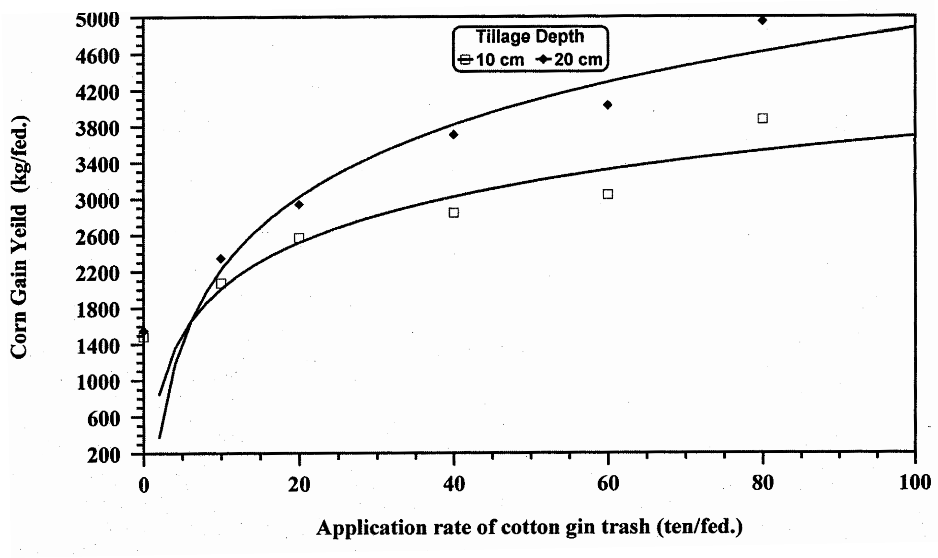

Fig (8): Effect of both cotton gin trash and tillage depths on corn grain yield

Statistical analysis of the data in Table (5) shows that the control treatment (0 cotton gin trash rate) yields grain yield of corn significantly lower than that obtained in the other cotton gin trash treatments. On the other hand, significant differences are detected between the effect of either cotton gin trash rate of 60 and that of 80 t/fed. or between cotton gin trash rate of 10, 20 and 40 t/fed. Applications. High significant different is, however, found between cotton gin trash rates of 10 and that of 80 t/fed..

In this respect, Ghosh *et. al.* (2010), Tejada (2010); Tejada and Gonzalez (2007); and Jackson *et.al.* (2005) who found that the application of cotton gin compost induced significant increase of dry matter yield of wheat, cotton and corn.

Concerning the tillage depths on the grain yield of corn (Table, 5) shows that the grain yield is higher in the treatment of 20 cm tillage depth than that in of 10 cm tillage depth (Fig 8.). Within the two tillage depths, grain yield of corn is continued to increase with increasing cotton gin trash rate up to 80 t/fed.. However, the response to cotton gin trash application is the same for all systems (Fig.8).

Moreover, all cotton gin trash treatments increase grain yield of corn by an average of 45.57, 81.55, 115.86, 133.24, and 190.89% relative to control with the application of cotton gin trash at the rates of 10, 20, 40, 60, and 80

t/fed., respectively. While, an increase in grain yield of corn by an average of 22.80% in the treatment of 20 cm tillage depth.

Statistical analysis shows a significant effect of the interaction between the application rates of cotton gin trash and tillage depth treatment on the yield of corn grain (Table, 5). The relationships between the rates of cotton gin trash and tillage depth are fitted by functions (Fig. 8):

Yield of corn grain = 911.347+60.39 tillage depth (cm)+32.368 cotton gin trash

The correlation obtained for the quadratic relationship between cotton gin trash rate and grain yield is as follows:

corn grain yield = 1685.87 + 46.02 (cotton gin trash)– 0.171 (cotton gin trash)^2 , (equation [1]), R = 0.913,**

indicating that yield increase is attributable to additional cotton gin trash. This indicates that yield increase is attributable to additional amendment additions.

A highly significant correlation coefficients are found between the yield of corn grain and either organic carbon (r = 0.56**), penetration resistance (r = -0.92**), hydraulic conductivity (r = -0.60**), maximum water holding capacity (r = 0.85**), bulk density (r = -0.88**), or electrical conductivity of soil extract (EC_e) (r = -0.85**).

Also, the multiple regression relating the grain yield of wheat to some soil physical properties and amending rates yields the following equation:

Grain yield = 7059.63 – 3232.72 Bulk density + 43.83 Penetration resistance – 1.825 Hydraulic conductivity – 30.92 Maximum water holding capacity – 612.99 O.C – 106.55 EC + 39.39 Amendment rate

The multiple correlation is highly significant (r = 0.977**) which means that 95.56% of the variations in yield of corn grain could be attributed to the variations in soil bulk density, penetration resistance, hydraulic conductivity, maximum water holding capacity, organic carbon, electrical conductivity of soil extract (EC_e). and amending rate.

Differential's method of regression (equation [1]) was used to find the predicted values of critical rate of amendment, as critical level represents the rate where further change in the yield results in a reduction in the yield.

In this respect, the differential regression (equation [1]) is as follows:

dy/dx = 46.02 – 0.342 cotton gin trash

The value of critical level reaches 134.56 t/fed. cotton gin trash, means, increasing of this rate of addition the yield will decline. Moreover, by observation of this data set, it can be said corn grain yield increases up to

4779.63 kg/fed. in cotton gin trash treatments and then decreases with further increase in amendment rates.

Agronomic efficiency index (EA):

Agronomic efficiency index (EA) of the both food waste and poultry manure was calculated from the seed yield from regression relationship:

$$EA = (GY_{Fx} - GY_{F0})/FX$$

Where *GY* is the dry matter yield production and *F* is the dose of food waste and poultry manure distributed at dose 0 (control) and doses *x*. Agronomic efficiency index of the food waste and poultry manure, i.e. the corn grain yield per unit of cotton gain trash distributed, shows marked differences in relation to both the five rates of cotton gin trash doses (Table, 6). The value of agronomic efficiency index decreases with increasing cotton gin trash at the five amendments rates. While, The value of agronomic efficiency index increases with increasing tillage depth treatments at the five amendments rates

Table (6): Agronomic efficiency index for yield of corn grain as affected by added cotton gin trash and tillage depth .

Tillage Depth (cm)	Agronomic efficiency index					Mean
	Rate of cotton gin trash (tan/fed.)					
	10	20	40	60	80	
10	58.91	54.22	33.94	26.00	29.89	*40.59*
20	79.33	69.46	53.91	41.35	42.48	*57.30*
Mean	*69.12*	*61.84*	*43.92*	*33.67*	*36.18*	

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استخدام مخلفات حلج القطن لتحسين خواص التربة الرملية وإنتاجيتها

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الملخص العربي

في تجربة حقلية تم دراسة تأثير إضافة مخلفات حلج القطن بمعدلات صفر ١٠، ٢٠، ، ٤٠ ،٦٠، ٨٠ طن /فدان و الحرث على عمقين (١٠ ، ٢٠ سم) على بعض خواص الأرض و إنتاجية محصول الذرة في الأرض الرملية بمنطقة القنطرة شرق – شمال سيناء.

أظهرت النتائج أنه بزيادة معدلات إضافة مخلفات حلج القطن مع الحرث على عمقين انخفضت قيم كل من ملوحة التربة و الكثافة الظاهرية و مقاومة التربة للاختراق و التوصيل الهيدروليكي للتربة بينما زاد محتوى التربة من الكربون العضوي و السعة المائية العظمى للتربة

ووجد أنه بزيادة معدل إضافة مخلفات حلج القطن مع الحرث على عمقين زاد محصول الذرة. وكان أعلي محصول عند معدل إضافة ٨٠ طن للفدان بالمقارنة بالمعاملة بدون إضافة. وكان متوسطات قيم محصول الذرة هي ١٥١٦.٦٦ ، ٢٢٠٧.٨٩ ، ٢٧٥٣.٥٦ ، ٣٢٧٣.٨٩ ، ٣٥٣٧.٤٤ ، ٤٤١١.٧٨ كجم/الفدان عند إضافة مخلفات حلج القطن بمعدلات صفر ،١٠ ، ٢٠، ٤٠ ،٦٠، ٨٠ طن /فدان على الترتيب بينما كان متوسط قيم محصول الذرة ٢٦٤٨.٢٢ و ٣٢٥٢.١٨ كجم/الفدان عند استخدام الحرث على عمقين ١٠ و ٢٠ سم على الترتيب.

وبناء على ذلك فانه من الممكن استخدام مخلفات حلج القطن كمصدر للمواد المحسنة لخواص التربة و إنتاجيتها.