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Effect of Pressmud, as an Organic Fertilizer, on Some Soil Properties, Growth of Tomato Plant and Infestation of *Tuta absluta* Under Saline Irrigation Water

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ABSTRACT

A filed experiment was carried out to study the effect of addition pressmud (PM) as organic wastesunder saline irrigation water on some soilproperties, *Tuta Absuluta* Damage and plant growth. PM was applied at rates of 0, 5 and 10 ton/fed. The soil was cultivated with tomato (Genotype: Alissa) under salinity irrigation whichapplied having 0, 25 and 50 mM NaCl.Untreated soil was used as a control (CTRL). At the end of the experiment, soil samples and plants were taken from each treatment. The results showed that the application of PM significantly decreased the soil bulk density, soil pH, while, under saline irrigation water increased them compared with PM. On the other hand, PM increased each of ECe, cations such as Ca^{+2} + Mg^{+2}, Na^{+} and K^{+} while these parameters were increased with increasing salinity levels compared with CTRL. In addition, data showed also that the parametersplant growth were significantly positively affected by the application of PM addition rates compared with control or salinity stress. Na^{+} was accumulated into plant tissues with increasing level NaCl. The Ca^{2+}+ Mg^{2+} and K^{+} contents reduced under saline irrigation water compared as control or PM addition rates. On the other hand, plants growing under 10 ton/fed of PM and freshwater had lower number of miners/leaf and infested fruits/plant compared with plants growing under 5 ton/fed of PM or control treatment. High level of salinity had a good effect on *T. absluta* damage than control treatment. These results support the hypothesis that plants growing under a good level of organic fertilizer and salt-stress are better defended against*T. absluta*.

Keywords: salinity, amendments, growth, soil properties, tomato leafminer

INTRODUCTION

Tomato is one of the most economically important vegetable crops in the world, including Egypt (Radwan and Taha 2012). However, industrial byproducts in agriculture become use to improved the productivity of agricultural land and save the environment from its degradation through their disposal in the nearby vicinity of the industries (Pagaria and Totawat 2011). In Egypt, these waste residues present a problem for disposal; therefore, it was through useful to use residues as an organic source and play a role in decreasing the pollution effect of excessive mineral fertilizer in soil (Arafat *et al*. 1997 and Yassen *et al*. 2002). One of these important organic wastes is Pressmud (a byproduct of sugar cane industry containing oxides of Si, Ca, P, Mg and K) (Partha and Sivasubramanian 2006). It is a good source of organic soil fertilizers, low cost, effects on soil texture, structure, organic matter contents, water holding capacity, aeration of soil, capable of supplying sufficient amount of plant nutrients to soil and enhances microbial activities (Qadir *et al*.. 2006; Rangaraj *et al*.2007; Jamil *et al*.2008; Muhammad and Khattak 2009; Ghulam *et al*.2010). On the other hand, the organic fertilization can affect the susceptibility of plants to insect pests through the change of plant tissue nutrient levels. The ability of resistant crops to insect pests and diseases linked to the basic characteristics of soil such as; physical, chemical and biological. The morphological responses of plant to fertilization are clear direction, such as changes in growth rates, acceleration of maturity, size of plant and thickness and hardness of Epicuticle layer (Bernays and Chapman 1994; Awmack and Leather 2002).

Recently, the tomato leaf miner, *Tuta absoluta* Meyrick, (Lepidoptera: Gelechiidae) became one of the major pest that attacks commercial tomato in Egypt (Temerak, 2011). However, soil fertility management practices affected C and N dynamics and, as a consequence, also affected pathogen-host relationships and plant-herbivores interactions through community level mechanisms. The N and K affect the vegetative and reproductive characteristics of plants (Malavolta *et al*.1989; Marschner, 1995). The nitrogen enhances the synthesis of proteins and nucleic acids, and promotes vegetative growth, bud formation and flowering fruit (Marschner, 1995). The potassium is related to protein synthesis (RNA translator) and carbohydrates, promotes the storage of sugars and starch, and stimulates vegetative growth of the plant, the better use of water and resistance to pests and diseases (Malavolta *et al*. 1989; Marschner, 1995).Leite, (1999 and 2003) found that the increase of N and K^{+} levels in tomato leaves raise the favorability attack by *T. absoluta* larval. But also he found that greater egg was laid by *T. absoluta* female under low level of fertilization.

Normally, in Egypt, tomato plants are irrigation with water from the River Nile. But due to decreasing of freshwater resources, salty water has become a potential sources for suitable the irrigation of some crops. The effect of high salinity levels affecting plant growth, yield, dry weights of leaves, stems, tillers, fertile tillers and roots (Allakhverdiev *et al*.2000; Chartzoulakis and Klapaki 2000; Parida and Das 2005). Salinity stressed plants have demonstrated to be more susceptible to herbivore attacks and feeding (Schoenweiss, 1975; Heil, 1999), but it could be also conceivable that any dramatic increase sodium concentrations in the host plant could therefore make it more difficult for insect herbivores to get an optimal balance of mineral elements (Clancy and king 1993; Martel, 1995; Mittal *et al*.2012). Salinity is a widespread problem in crop cultivation, therefore aimed of this study to evaluate the direct effect of soil organic fertilization (pressmud) on soil properties and quality of tomato and indirect effects on *T. Absoluta* damage under fresh or saline irrigation water.

MATERIALS AND METHODS

1- Experimental design

Field experiment was carried out in an experiment farm of Faculty of Agriculture, in EL-Kwamel city- new reclamation area, at Sohag University, during two seasons (2014/2015). Tomato plants (Genotype: Alissa) sow in open field conditions. The experiment was designed in a complete randomized block design (RCB), with three replicates for each concentration were used.

2- Soil sampling and analysis

Surface Soil samples (0-30 cm) were collected before sowing plants. They were air dried, crushed to pass through a 2-mm sieve and determined for their physico-chemical soil properties. Soil sample was used for particle size distribution analysis by pipette methods (Richards, 1954). Bulk density was determined by the core method according to the methodology described by (Blake and Hartge 1986). The soil pH was measured in 1:1 soil: water suspension using pH meter (Orion model 410A) (Jackson, 1973). Total soluble salts were determined by measuring the electrical conductivity of the soil past extract (ECe) using electrical conductivity meter (Orion model 150) (Jackson, 1973). Calcium carbonate content was determined volumetrically using the calibrated collin's Calcimeter method (Jackson, 1973). Soluble cations and anions were measured in the saturated soil paste extracted according to Jackson (1973). Organic matter (OM) content was determined by a modified Walkely-Blake method as described by Jackson, (1967). Some physical and chemical characteristics of the studied soil are showed in Table 1.

3- Treatments amendments

To study the effectiveness of saline water irrigation with different addition rates of pressmud (PM) as organic fertilizer, PM addition rates were thoroughly mixed with 0-30 cm of the surface soil layer before planting. PM was applied at application rates of 0, 5, 10 ton/fed. The chemical characteristics of the pressmud were presentedin Table 2. Saline water irrigation was used in the study at three levels (0, 25 and 50 mM NaCl). The experimental design included: (T1): control soil (CTRL). (T2) PM 5 ton/fed. (T3) PM 10 ton/fed. (T4). PM 5 ton/fed + 25 mM NaCl. (T5) PM 5 ton/fed + 50 mM NaCl. (T6) PM 10 ton/fed + 25 mM NaCl. (T7) PM 10 ton/fed + 50 mM NaCl.

4- Tomato leafmines infestation

Samples of 20 plants randomly selected from each replicate to examine in the field. The experiment was evaluated weekly for leaves and during the fruiting stage for fruits. The parameters evaluated were: Number of mines/leaf, number of holes/fruit and number of infested fruits/plant.

5- Plant and soil treatment analysis

The data was recorded for each treatment and each replicate to measure the following traits of the growth plant: (1) plant height (cm) (2) number of branches (3) root length (cm) and (4) fresh and dry weight of roots and shoots. After harvest, plant materials were oven dried at 70 °C and weighted to determine the biomass production. Plant samples were wet digested in 5 mL 14M HNO_3, 2 mL H_2O_2 and 1 mL distilled water at 180°C in PFA (perfluoroalkoxy copolymer resin) tubes under microwaves (MarXpress, CEM). Mineral composition in the plant digests (Ca, Mg, Na and K) determine by Flame photometer (Page *et al*.1982). At the end of experiments, the soil samples were taken from all treatments to measure some soil properties.

6- Statistical analysis

The multiple-treatment experiments on tomato statistically evaluated by an analysis of variance (Two-way ANOVA) and followed by Duncan's Multiple Range Test. Significance level will set to 0.05 (Gomez and Gomez 1984).

Table 1: Physico-chemical characteristics of the soil before planting

Soil parameters	Unit	Value
Sand	%	82.5
Silt	%	8.5
Clay	%	9.0
Bulk density (BD)	g/cm^3	1.52
pH	-	8.12
ECe	dS/m	1.1
$CaCO_3$	%	2.44
Ca	Meq/l	6.98
Mg	Meq/l	3.06
Na	Meq/l	2.22
K	Meq/l	1.17
HCO_3	Meq/l	5.4
Cl	Meq/l	3.46
SO_4	Meq/l	1.66
OM	%	0.47

Table 2: Chemical characteristics of pressmud (PM)

Analysis	Unit	PM
pH	-	7.3
EC	dS/m	4.14
Total N	%	1.1
Total P	%	0.9
Total K	%	0.4
Ca	%	1.7
Mg	%	0.6
OM	%	6.54
Fe	ppm	5368
Zn	ppm	107
Cu	ppm	55
Mn	ppm	236

RESULTS AND DISCUSSION

1-Soil physico-chemical characteristics

Data revealed that the application of different levels of pressmud and saline irrigation water positively affectthe physico-chemical characteristics of the soil (Table 3). The increase levels of pressmud and water salinity decreased the bulk density compared with initial bulk density (1.52 g/cm^3). It was noticed that the highest bulk density value (1.5 g/cm^3) was recorded in T1 (CTRL) and the lowestvalue (1.37 g/cm^3) was observed in T 3 which received the higherlevel of PM. These results are also in accordance with the finding of researchers who reported a decreased in soil bulk density with the addition of pressmud that improves the root development, soil aeration and water retention (Jamil *et al*. 2008; Sarawar *et al*.2010; Khan, 2011; Ghulam *et al*.2012).On the other hand, the addition of PM under all salinity increased the bulk density compared with the addition of PM alone. Thisis may be due the increase of sodium ion in the soil extractas a result of irrigationwith highly saline irrigation water (Mohamed *et al*.2007). Regarding to soil pH,it was noticed that the soil pH value reduced from 8.03 to 7.84 with the addition of PM. The lowest value of soil pH was recorded in T7 and the highest value was recorded

in T1 (CTRL). This could be due to the effect of organic acids produced during the process of decomposition of organic amendments (Antil and Mandeep 2007; Jamil *et al*.2008; Ghulam *et al*.2010; Sarawar *et al*.2010; Khan, 2011; Prapagar *et al*.2012; Negim, 2016). In addition, the decreases in soil pH with the application of saline irrigation water is due to displacement of protons by Na of saline irrigation water (Ghallab and Usman 2007; Hamam and Negim 2014).

The results of ECe revealed that there was an increased values in all treatments compared with CTRL. The highestvalue was observedin the treatment received the maximum application rate of both PM andwater salinity T7 (2.13 dS/m) and the lowest value of ECe was observed in T1 (1.22 dS/m). Similar results have been reported in previous works done(Antil and Mandeep 2007;Jamil *et al*.2008; Ghulam *et al*. 2010; Khan, 2011) who reported that the application of organic manures (FYM, Poultry manure and pressmud) increased the electrical conductivity (ECe) of the soil. Values of ECe for irrigated soil increased with increasing salinity water (Choudhary *et al*.2004; Ragab *et al*.2008; Hamam and Negim 2014). Mohamed *et al*.(2007) reported that the application of soil organic amendments under salinity water increased (ECe) in the surface soils.

Soil cations content were also affected by various treatments. There was an increase in Ca^{+2} + Mg^{+2}, Na^{+} and K^{+} content of the soil with increasing levels of pressmud application rates or under salinity water compared with CTRL. Na^{+} and Ca^{+2} + Mg^{+2} concentrations increased with application of pressmud in soil (Jamil *et al*.2008; Ghulam *et al*.2010; Sarawar *et al*. 2010). In our study, the maximum value of Ca^{+2} + Mg^{+2} was recorded in the soil with receiving the highest levels of pressmud.The application of organic amendments could be raising the amount of Ca^{+2} and Mg^{+2} in soil solution due to the formulating of organic acids and the action of dissolved CO_2 on native $CaCO_3$ of the soil (Ahmed *et al*.1988: Wong *et al*.. 2009). Regarding to sodium concentration there was an increase of Na^{+} with increasing rates of pressmud and the most increased was recorded with the application of PM under salinity water. Soluble sodium content in all treatments increased by increasing NaCl levels (Ghallab and Usman 2007; Hamam and Negim 2014). K contents affected also increased in all treatments compared with CTRL. The increased of soluble K^{+} with addition of PM may be due to the applied chemical composition of organic amendments (Ahmed *et al*.1988; Jamil *et al*. 2008; Mohamed and Khattak 2011). Several studies indicated that the distribution and concentration of most cations were increased with increasing saline irrigation water (Ghallab and Usman 2007; Ragab *et al*.2008; Hamam and Negim 2014).

Table 3: Effect of pressmud and salinity levels on some soil properties after the harvest of tomato plants

Treatments	PM (ton/fed)	Salinity (mM NaCl)	BD (g/cm^3)	pH	ECe (dS/m)	Soluble cations (meq/l) Ca^{+2}+Mg^{+2}	Na^{+}	K^{+}
T1 (CTRL.)	0	0	1.50^{a}	8.03^{a}	1.22^{a}	10.5^{e}	1.7^{g}	0.11^{a}
T2	5	0	1.39^{c}	7.96^{b}	1.76^{g}	16.4^{b}	2.15^{f}	0.17^{g}
T3	10	0	1.37^{c}	7.95^{b}	1.85^{e}	17.1^{a}	3.19^{e}	0.22^{e}
T4	5	25	1.44^{b}	7.88^{c}	1.88^{d}	14.6^{c}	3.34^{d}	0.24^{d}
T5	5	50	1.49^{a}	7.87^{c}	1.93^{c}	13.5^{d}	4.81^{c}	0.27^{c}
T6	10	25	1.42^{b}	7.86^{c}	1.97^{b}	15.4^{b}	5.18^{b}	0.29^{b}
T7	10	50	1.47^{ab}	7.84^{c}	2.13^{a}	14.3^{c}	6.85^{a}	0.31^{a}
F-Value			34.54	10.14	2098.26	127.31	2407.72	179.97
P			<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

Means followed by the same letter per column do not differ by the F test (P = 0.05).

2-Plant analysis

Tomato growth

The tabulated (Table 4) showed that the growth parameters viz., plant height (cm), number of branches, root length (cm), fresh and dry roots and shoots (g) were positive significantly affected by the application of pressmud addition rates compared with control or under used pressmud with saline irrigation water. The maximum plant height (69.67cm) was observedin the highest applicationof pressmud (T3) and the T7 treatment recordedthe lowestvalue of plant height (55.67cm). These results are in line with the work carried out by (Nehraand Hooda 2002; Naik and Rao 2004; Ghulam *et al*.2012; Ibrahim and Fadni 2013; Kavatagi and Lakshman 2014), who reported an increased plant height in some crop due to addition of pressmud and other organic fertilizer. Kahlaoui *et al*.(2011) reported that tomato growth reduce under saline irrigation water.

Table 4. Effect of pressmud and salinity levels on plant analysis of tomato plant

Treatments	PM (ton/fed)	Salinity (mM NaCl)	Fresh shoot(g)	Dry Shoot(g)	Plant Height(cm)	Number of branches	Root length (cm)	Fresh root (g)	Dry root (g)	Soluble cations (ppm) Ca^{+2}+Mg^{+2}	Na^{+}	K^{+}	K^{+}/Na^{+}
T1 (CTRL)	0	0	152^{bc}	80.67^{b}	60^{bcd}	10^{ab}	16^{a}	32.33^{d}	7^{a}	37.33^{f}	12^{d}	39.33^{g}	3.27^{b}
T2	5	0	194.67^{ab}	85.67^{b}	66.67^{ab}	13^{ab}	20^{a}	42^{a}	8^{a}	54^{b}	10.69^{e}	56^{b}	5.23^{a}
T3	10	0	219.67^{a}	121.67^{a}	69.67^{a}	15^{a}	22.67^{a}	45^{a}	8.5^{a}	56.6^{a}	10.26^{e}	58^{a}	5.65^{a}
T4	5	25	$164b^{c}$	80.33^{b}	62.67^{abcd}	11^{ab}	18^{a}	37^{bc}	7.5^{a}	49.66^{c}	16.46^{c}	49.66^{d}	3.02^{c}
T5	5	50	120.33^{c}	54.33^{d}	54.33^{d}	8^{b}	17^{a}	33^{cd}	6.5^{a}	48^{d}	20.26^{a}	48^{e}	2.36^{d}
T6	10	25	190.33^{ab}	84.33^{b}	65^{abc}	13^{ab}	18^{a}	41^{ab}	8^{a}	54^{b}	18.5^{e}	52.33^{c}	2.82^{d}
T7	10	50	125.33^{c}	64.67^{c}	55.67^{cd}	8^{b}	16^{a}	35^{cd}	6.5^{a}	50.66^{c}	20.43^{a}	45^{f}	2.2^{e}
	F-Value		6.44	123.68	3.65	2.78	1.22	12.24	1.02	123.1	1755.19	203.38	318.46
	P		0.002	<0.0001	0.0214	0.054	0.351	<0.0001	0.452	<0.0001	<0.0001	<0.0001	<0.0001

Means followed by the same letter per column do not differ by the F test (P = 0.05).

Number of branches increased by the addition of PM and decreased in the treatment applied (PM 10 ton/fed and50 mM NaCl) compared with control treatment. The same results arein agreement with that obtained by Ghulam *et al*.2012; Ibrahim and Fadni 2013. Shakila and Anburani (2008) who suggested that applied certain organics and pressmud resulted in improving the growth tomato crops like plant height, number of branches, number of leaves and leaf area. Regarding to the root length, it was maximum in T3 which recorded 22.67 cm followed by T2 which recorded 20 cm. The minimum value 16 cm was recorded in the T1 and T7. Ghulam *et al*.(2012) reported

that the application of pressmud addition rates could be increased the root length of plants in calcareous soil.

Fresh and dry roots and shoots (g) were significantly increased by the application of pressmud addition rates compared with control or under saline irrigation water. The same results were found by (Ghulam *et al*.2012; Ibrahim and Fadni 2013; Kavatagi and Lakshman 2014).

The best treatment for dry weight of roots and shoots was T3 which recorded 8.5 and 121.67g respectively and the lowest value recorded in T7. Under increasing salinity, Debouba *et al*.(2006) found that the addition high salts irrigation water 50 and 100 mM NaCI decreased plant growth activity mainly within shoots tissues.

Cation contents in plants

The results of cations contents in plant were shown in Table 4. Data refer that Na+ was progressively accumulated into plant tissues with increasing level of NaCl. The highest level of Na^+ concentration observed in T7 and the lowest value was found in T3. Under saline irrigation water, Na concentration accumulated in leaves, stems and roots of tomato plants as well as reduce the K^+, Ca^{2+}, Mg^{2+} contents (Kahlaoui *et al*.2011). The contents of Ca^{2+}+Mg^{2+} were increased by addition rates of pressmud but a decreased was observed when the addition of pressmud under saline irrigation water. These results are in agreement with findings recorded by (Al-Karaki, 2000; Maggio *et al*.2004; Kahlaoui *et al*.2011). In addition, Ca^{2+} content decreased under high salinity in leaves and stems tomato (Debouba *et al*.2006). The highest levels of Ca^{2+}+Mg^{2+} content were found in T3 and the lowest concentration was found in control treatment (T1). Organic fertilizers could be supply the soluble Ca^{2+}+Mg^{2+} in soil solution due to formulating of organic acids (Ahmed *et al*.1988; Wong *et al*.2009). Potassium content was increased by addition of pressmud but a slightly decreased was observed when the addition of pressmud under saline irrigation water. The highest levels of K^+ content were found in T3 and the lowest concentration was found in control treatment (T1). Under high salinity, the K^+ contents decrease was highly related to the increase and accumulation of Na^+ contents in plant (Debouba *et al*.2006; Kahlaoui *et al*.2011). This is possibly due to Na^+ block the K^+ specific transporters of root cells (Zhu, 2003; Juan *et al*.2005; Kahlaoui *et al*.2011). K^+ increased in leaves of tomato and decreased in the roots which it can be attributed to: (i) transfer of K^+ from roots to leaves and fruits, (ii) an exchange of K^+ ions with Na^+ ions in root tissues, and (iii) Na^+ could have directly interfered with K^+ uptake (Kahlaoui *et al*.2011). Considering the K^+/Na^+ ratio, the results refer that K^+/Na^+ ratio was increased by addition rates of pressmud and a decreased was observed when the addition of pressmud under saline water irrigation (50 mM NaCl). These results are in agreement with thatfound by (Al-Karaki, 2000; Maggio *et al*.2004; Kahlaoui *et al*.2011). Increasing water deficit reduced the contents of K^+, Ca^{2+} and Mg^{2+} in tomato cultivars, while Na^+ and Na^+/K^+ ratio increased in plant (Kahlaoui *et al*.2011).

3- Leafminer damage

The tomato plant grown in sandy soil fertilized with pressmud and irrigated with freshwater or saline water had lowered damage caused by the leafminer T. absoluta than with the control (Table 5). The amount of leaves and fruit damaged by T. absoluta were differentiated between pressmud and salinity levels. Tomato fertilized with 10 ton/fed of pressmud grown in freshwater in 2014 and 2015 had lower mean number of mines per leaf (1.35 and 1.05, respectively) and infested fruits per plant (3.55 and 3.60, respectively) compared with tomato fertilized with 5 ton/fed of pressmud grown in freshwater. Many researchers have observed that fertility practices that replenish and maintain high soil organic matter makes it resistant or tolerant crops insect infestations, because of resistance and carrying infestation of pests linked to physical, chemical and biological characteristics conferred by organic fertilization of the soil (Altieri and Nicholls 2003; Megali *et al*.2014). As well as, the differences in soil fertility can be mediated the preference of a foliar pest. The buffering of soil processes previously attributed to high soil organic matter and microbial activity may extend to the interactions of plants and aboveground herbivores (Phelan *et al*.1995). In our insect, Altieri and Nicholls (2003) they found that the phase of pupa spends its growth phase in the soil, it is exposed to the risk of developing some pathogens that are frequently their presence in soils which increases the organic matter. The researchers also noted that the soil characterized by a high level of organic matter with low population density of insects, the reason for this may be due to the lower level of nitrogen in organic matter (Letourneau *et al*.1996; Altieri and Nicholls 2003).

Table 5. Mean of mines, hold/fruit and infested fruits/plant caused by *Tuta absoluta* larvae on tomato plant sow in soil treated with pressmud under different levels of salinity

Treatments	PM (ton/fed)	Salinity (mM NaCl)	First Season			Second Season		
			Mains/leaf	Hold/fruit	Infested fruits/plant	Mains/ leaf	Hold/ fruit	Infested fruits/plant
T1 (CTRL.)	0	0	4.00^{a}	1.45^{a}	5.86^{a}	3.98^{a}	1.43^{a}	6.88^{a}
T2	5	0	2.77^{b}	1.26^{a}	5.50^{ab}	3.06^{b}	1.14^{ab}	5.07^{b}
T3	10	0	1.35^{c}	1.05^{a}	3.55^{c}	1.05^{cu}	0.82^{b}	3.60^{c}
T4	5	25	2.05^{bc}	1.44^{a}	4.06^{bc}	2.95^{b}	0.80^{b}	4.16^{bc}
T5	5	50	1.12^{c}	0.88^{a}	3.67^{c}	1.32^{cu}	0.90^{ab}	3.52^{c}
T6	10	25	1.25^{c}	1.15^{a}	3.00^{c}	2.02^{c}	0.90^{ab}	3.61^{c}
T7	10	50	0.9082^{c}	0.79^{a}	2.81^{c}	1.50^{cu}	0.84^{b}	3.06^{c}
F-Value			10.61	1.25	5.00	13.82	1.88	13.37
P			0.0002	0.339	0.006	<.0001	0.156	<.0001

Means followed by the same letter per column do not differ by the F test (P = 0.05).

The highly level of saline water (50 mM of NaCl) with lower level ofpressmud fertilizer (5 ton/fed) had positive effect on the leafminer *T. absoluta* compared with lower level of pressmud without saline water (Table 5). In the both seasons, mine densities and infested fruits per plant were lower on tomato grown in

saline water compared with freshwater (first season: F=0.0002, P=10.61; F=5.00, P=0.006; second season: F=13.82, P=<.0001; F=13.37, P=<.0001). Little information is available about the consequences of salinity on the ecological interactions between host plants and their herbivores. Some researchers investigated that salinity can be as deleterious to leafminer performance (Inbar *et al*. 2001; De Bruyn *et al*.2002). A density of a leafmining insect, Cerodontha iridiphorawas decreasedon herbaceous host plant, Iris hexagona grown under saline conditions (Schile and Mopper 2006).

CONCLUSION

Pressmud is supply the organic matter and micronutrients in the study soil which caused improvement in the physical and chemical soil properties such as bulk density, pH soil, EC soil and soluble cations. On the other hand, plant growth of tomato lick plant height (cm), number of branches, root length (cm), fresh and dry roots and shoots (g) were significantly positively affected by the application of pressmud addition rates compared with control or under saline water irrigation (50 mM NaCl). It could be recommended that pressmud application rates at 10 ton/fed is the most suitable for the sandy soil and plant growth of tomato. Pressmud had a positive effect on decreased of T. absluta damage, as well as, the high level of salinity may have positive effect on *T. absluta* damageunder lower organic fertilizer. Much more research is necessary to understand the biological mechanisms of saline stress with organic fertilizer on the plant, and then develop theory to predict future impacts.

REFERENCES

Ahmed, M..; B.H.Niazi and G.R. Sandhu (1988). Effectiveness of gypsum, HCl and organic matter for the improvement of saline sodic soils. Pak. J. Agric. Res. 9: 373-378.

Al-Karaki, G.N. (2000). Growth and mineral acquisition by mycorrhizal tomato grown under salt stress, Mycorrhiza. 11: 43-47.

Allakhverdiev, S.I..; A.SakamotoY.Nishiyama and N. Murata (2000). Inactivation of photosystems I and II in response to osmotic stress in Synechococcus: contribution of water channels. Plant Physiol. 122:1201-1208.

Altieri, M.A..; and C.I. Nicholls (2003). Soil fertility management and insect pests: harmonizing. Soil and Tillage Research. 72: 203-211.

Antil, R.S.; and S.Mandeep (2007). Effect of organic manures and fertilizers on organic matter and nutrients status of the soil. Archives of Agronomy and Soil Science. 53(5): 519-528.

Arafat, S.M.;H..El- Aila and A. Algli(1997). Utilization of sugar cane filter mud to minimize nitrogen fertilizers for sorghum growth. J. Agric. Sci. Mansoura Univ. 22(4):1267-1276.

Awmack, C. S.; and S.R. Leather (2002). Host plant quality and fecundity in herbivorous insects. Annu. Rev. Entomol. 47: 817-44.

Bernays, E.A.; and R.F. Chapman (1994). Host-plant selection by phytophagous insects. Chapman & Hall, Inc., USA. pp.97.

Blake, G.R.;and K.H. Hartge (1986). Bulk density. In A. Klute (ed.) Methods of soil analysis. Part 1. 2nd ed. Agron. Monogr. 9. ASA and SSSA, Madison, WI: 363-375.

Chartzoulakis, K.; and G. Klapaki (2000). Response of two greenhouse pepper hybrids to NaCl salinity during different growth stages. Sci Hort. 86: 247-260.

Choudhary, O.P.; Josan, A.S. Bajwa M.S. and L. Kapur (2004). Effect of sustained sodic and saline-sodic irrigation and application of gypsum and farmyard manure on yield and quality of sugarcane under semi-arid conditions. Field Crops Res. 87: 103-116.

Clancy, K.M.; and R.M. King (1993). Defining the western spruce budworm's nutritional niche response surface analysis. Ecology. 74:442-454.

De Bruyn, L.;J. Scheirs and R.Verhagen (2002). Nutrient stress, host plant quality and herbivore performance of a leaf-mining fl y on grass. Oecologia. 130: 594 - 599.

Debouba, M.; H.Gouiaand M.Ghorbel (2006). NaCI effects growth, ions and water status of Tomato (Lycopersicon esculentum) seedlings. Acta Bot. Gallica. 153 (3): 297-307.

Ghallab, A..; and R.A Adel (2007) Usman, Effect of sodium chloride-induced salinity on phyto-availability and speciation of Cd in soil solution, Water Air Soil Pollut, Springer science. 185: 43-51.

Ghulam, S.; M..KhanK. Usman and K.Shakeebullah (2012). Effect of different rates of pressmud on plant growth and yield of lentil in calcareous soil. Sarhad. J. Agric. 28(2):249-252.

Ghulam, S.; M..KhanK. Usman and H. Rehman (2010). Impact of press mud as organic amendment on physico-chemical characteristics of calcareous soil. Sarhad. J. Agri. 26(4):565-570.

Gomez, K.A.;and A.A. Gomez (1984). Statistical procedures for agricultural research (2ed.). John wiley and sons, NewYork,; pp. 680.

Hamam, K.A.;and O. Negim (2014). Evaluation of wheat genotypes and some soil properties under saline water irrigation. Annals of Agricultural Sciences. 59 (2):165-176.

Heil, M. (1999). Systemic acquired resistance - available information and open ecological questions. Journal of Ecology. 87:341-346.

Ibrahim, K.M.;and O.S. Fadni (2013). Effect of Organic Fertilizers Application on Growth, Yield and Quality of Tomatoes in North Kordofan (sandy soil) western Sudan. Greener Journal of Agricultural Sciences. 3 (4): 299-304.

Inbar, M.; H .Doostdar and R.T. Mayer (2001). Suitability of stressed and vigorous plants to various insect herbivores . Oikos. 94: 228 - 235.

Jackson, M.L. (1967). Soil Chemical Analysis. Prentice-Hall Inc., Englewood Cliffs, New Jersey, USA, pp. 225.

Jackson, M.L. (1973). Soil Chemical Analysis. Prentice-Hall Inc., USA.

Jamil, M.; M. Qasim and M.Sharif Zia (2008). Utilization of pressmud as organic amendment to improve physico-chemical charcteristics of calcareous soil under two legume crops. Chem. J. Soc. Pak. 30:577-583.

Juan, M.; M.Rosa M.R. Rivero L. Romero and J.M. Ruiz (2005). Evaluation of some nutritional and biochemical indicators in selecting salt-resistant tomato cultivars. Environ. Exp. Bot. 54:193-201.

Kahlaoui, B.; M. Hachicha S. Rejeb M.N. Rejeb B. Hanchi and E. Misle (2011). Effects of saline water on tomato under subsurface drip irrigation: nutritional and foliar aspects. J. Soil Sci. Plant Nutr. 11 (1): 69-86.

Kavatagi, P. K.; and H.C. Lakshman (2014). Effect of Arbuscular Mycorrhizal Fungi, Pressmud and Growth Regulator on Solanum Lycopersicum L.Int. J. Pure Appl. Sci. Technol. 21(2):11-16.

Khan, M. J. (2011). Impact of selected doses of organic wastes on physio-chemical characteristics of the soil and yield of wheat. 2nd International Conference on Engineering and Applications. 17:271-275.

Leite, G.L.D.; M.Picanco J.C. Zanuncio G.N. Jham and M.F. Moura (1999). Efecto de los niveles de fertilizacion en la intensidad de ataque de Tuta absoluta en Lycopersicon hirsutum y L. esculentum. Manejo Integrado de Plagas. 53: 72-76.

Leite, G.L.D.; C.A.Costa C.I.M.Almeida and M.Picanço (2003). Efeito da adubação sobre a incidência de traça-do-tomateiro e alternaria em plantas de tomate. Horticultura Brasileira, Brasília. 21: 448-451.

Letourneau, D.K.; L.E.Drinkwater and C.Shennon (1996). Effects of soil management on crop nitrogen and insect damage in organic versus conventional tomato fields. Agric. Ecosyst. Environ. 57: 174-187.

Maggio, A.;S. De Pascale G. Angelino C.Ruggiero and G. Barbieri (2004). Physiological response of tomato to saline irrigation in longterm salinized soils. Eur. J. Agronom. 21:149-159.

Malavolta, E.; G.C.Vitti and S. De Oliveira (1989). Avaliação do estado nutricional das Plantas: Princípios e aplicações. Piracicaba: Associação Brasileira para Pesquisa da Potassa edo Fosfato. pp.201.

Marschner, H. (1995). Mineral nutrition of higher plants. San Diego: Academic Press. pp. 889.

Martel, J. (1995). Seasonal variations in roadside conditions and the performance of a gall-forming insect and its food plant. Environmental Pollution. 88:155-160.

Megali, L.; G. Glauser and S. Rasmann (2014). Fertilization with beneficial micro-organisms decreases tomato defenses against insect pests. Agronomy for Sustainable Development. 34: 649-656.

Mittal, S.;N. Kumari and V. Sharma (2012). Differential response of salt stress on Brassica juncea: photosynthetic performance, pigment, proline, D1 and antioxidant enzymes. Plant Physiology and Biochemistry. 54:17-26.

Mohamed, A.I.;O.M.Ali and M.A. Matloub (2007). Effect of soil amendments on some physical and chemical properties of some soils of Egypt under saline irrigation water.African Crop Science. 8: 1571-1578.

Muhammad, D.; and R.A. Khattak (2011) Wheat yield and chemical composition as influenced by integrated use of gypsum, pressmud and FYM in saline-sodic soil. Journal of the Chemical Society of Pakistan.33(1): 82-89.

Muhammad, D.;and R.A. Khattak (2009). Growth and nutrients concentrations of maize in pressmud treated saline sodic soil. J. Soil and environ. 28:145-155.

Naik, S.K.; and V.S. Rao (2004). Effect of pyrite in combination with organic manures (FYM and Pressmud) on growth and yield of sunflower (Helianthus annuus L.) genotypes grown in Alfisols and Vertisols. J. Interacademicia. 8(3):383-387.

Negim, O. (2016). Effect of addition pressmud and gypsum by product to reclamation of highly calcareous saline sodic soil. Journal of Environment. 1(4): 76-84.

Nehra, A.S.;and I.S. Hooda (2002). Influence of integrated use of organic manures and inorganic fertilizers on lentil and mung bean yields and soil properties. J. Res. Crops. 3(1): 11-16.

Pagaria, P.;and K.L. Totawat (2011). Reclamation of calcareous sodic soil of southwestern rajasthan using industrial waste. Adv. J. Develops. Res. 2: 167-170.

Page, A.L.; R.H. Millerand D.R. Keeney (1982). Methods of soil analysis, Part 2. Chemical and microbiological properties. American Society of Agronomy, Inc., Publisher, Madison, Wisconsin. USA, pp. 2-13.

Parida, A.K.; and A.B. Das (2005). Salt tolerance and salinity effects on plants: A review. Ecotoxicology and Environmental Safety. 60: 324-349.

Partha, N.;and V. Sivasubramanian (2006). Recovery of chemicals from pressmud-A sugar industry waste. Indian Chem. Eng. Sec. 48: 160-163.

Phelan, P.L.; J.F. Mason and B.R. Stinner (1995). Soil fertility management and host preference by European corn borer, Ostrinia nubilalis, on Zea mays: a comparison of organic and conventional chemical farming. Agric. Ecosyst. Environ. 56: 1-8.

Prapagar, K.; S.P. Indraratne and P. Premanandharajah (2012). Effect of Soil Amendments on Reclamation of Saline-Sodic Soil. Tropical Agric. Res. 23:168-176.

Qadir, M.; A.D. Noble S.Schubert R.J. Thomas and A. Arslan (2006). Salinity induced land degradation and its sustainable management: problems and prospects. Land degradation and Development 17: 661-676.

Radwan, M. M.;and H.S. Taha (2012). Toxic and biochemical effects of different insecticides on the tomato leafminer, Tuta absoluta (Meyrick) (Lepidoptera: Gelechiidae). Egypt. Acad. J. Biolog. Sci. 4 (1): 1-10.

Ragab, A.A.M.; F.A. Hellal and M. Abd El-Hady (2008). Water salinity impacts on some soil properties and nutrients uptake by wheat plants in sandy and calcareous soil. Australian Journal of Basic and Applied Sciences, 2(2): 225-233.

Rangaraj, T.; E. Somasundaram M.M. Amanullah V. Thirumurgan S.Ramesh and S.Ravi (2007). Effect of Agro-industrial wastes on soil properties and yield of irrigated finger millet (Eleusine coracana L. Gaertn) in coastal soil. Res. J. Agric. Biol. Sci. 3: 153-156.

Richards, L.A. (1954). Diagnosis and Improvement of Saline and Alkali soil. United States Department of Agriculture, Handbook 60, pp. 160.

Sarwar, M.A.; M. Ibrahim M. Tahir K. Ahmad Z.I. Khan and E.E. Valeem (2010). Appraisal of press mud and inorganic fertilizers on soil properties, yield and sugarcane quality. Pak. J. Bot. 42(2):1361-1367.

Schile, L.;and Mopper S. (2006). The deleterious effects of salinity stress on leafminers and their freshwater host. Ecological Entomology. 31:345-351.

Schoenweiss, D.F. (1975). Predisposition, stress and plant diseases. Annual Review of Plant Pathology. 13:193-211.

Shakila, A.;and A. Anburani (2008). Effect of certain organics and pressmud on growth and yield characters of tomato. J. Asian Horti. 3(2): 273-276.

Temerak, S. A. (2011). The status of Tuta absoluta in Egypt. EPPO/IOBC/FAO/NEPPO Joint International Symposium on management of Tuta absoluta (tomato borer, Lepidoptera: Gelechiidae) in collaboration with the IRAC and IBMA Agadir, Morocco.

Wong, V.N.L.;R.C. Dalal and R.S.B. Greene (2009). Carbon dynamics of sodic and saline soils following gypsum and organic material additions: A laboratory incubation. Appl. Soil Ecol. 41:29-40.

Yassen, A.A.; S.M. Arafat and S.M. Zaghloul (2002). Maximizing use of vinasse and filter mud as by-products of sugar can on wheat production. J. of Agric. Sci. Mansoura Univ. 27(11):7865-7873.

Zhu, J.K. (2003). Regulation of ion homeostasis under salt stress. Current Opinion of Plant Biology. 441-445.

تاثير اضافة طينة المرشحات كسماد عضوى على بعض خواص التربة ، صفات النمو لنبات الطماطم والاصابة بحشرة التوتا ابسلوتا تحت ظروف الرى بمياه مالحة

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أجريت تجربة حقلية لدراسة تأثير إضافة طينة المرشحات كسماد عضوى تحت ظروف مياه الري المالحة على بعض خواص التربة،وصفات النمو لنبات الطماطم والاصابة بحشرة التوتا ابسلوتا خلال موسمى ٢٠١٤/٢٠١٥. تم اضافة طينة المرشحات بمستويات ٠ و ٥ و ١٠ طن / فدان. استخدم مياه رى مالحة بمستويات ٠ و ٢٥ و ٥٠ مليمول كلوريد الصوديوم. وتم فحص الاوراق والثمار أسبوعياً وحتى نهاية جمع المحصول لتقدير نسبة الاصابة بحشرة التوتا أبسلوتا. في نهاية التجربة، تم أخذ عينات التربة والنباتات من كل معاملة. أظهرت النتائج أن معاملات طينة المرشحات خفضت بشكل ملحوظ الكثافة الظاهرية للتربة، حموضة التربة، مقارنة باستخدام طينة المرشحات مع مياه الري المالحة. من ناحية أخرى،أوضحت النتائج ان استخدام طينة المرشحات والماء المالح ادت الى زيادة محتوى التربة من الكاتيونات الذائبة مثل الكالسيوم والمغنسيوم والصوديوم والبوتاسيوم مقارنة بالكنترول. كان استخدام طينة المرشحات له تاثير ايجابى على نمو النباتات مقارنة باستخدام طينة المرشحات مع مياه الري المالحة. زاد تراكم الصوديوم في الأنسجة النباتية مع زيادة مستوى كلوريد الصوديوم وانخفضت قيم الكالسيوم والمغنسيوم والبوتاسيوم مقارنة باستخدام طينة المرشحات. من ناحية اخرى كان أقل عدد من أوراق وثمار الطماطم المصابة بحشرة التوتا أبسلوتا عند اضافة طينة المرشحات بمعدل ١٠ طن / فدان مقارنة بمعدل أضافة ٥ طن/ فدان والكنترول. وكان للمستويات العالية من الملوحة تأثير واضح على خفض نسبة الاصابة بحشرة التوتا ابسلوتا مقارنة بالكنترول.