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Research Article

CHEMISTRY

Effect of some organic materials and polymeric granstar on chemical properties of two types of soil and wheat yield in Nile Delta

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polymeric granstar, herbicides, calcareous soil's

ABSTRACT

The low organic matter content of the cultivated soils in Egypt with weed infestations led to a decrease in crop productivity, so this study aimed to study the effect of the different types of organic amendments and polymeric granstar as polymeric herbicides on clay and calcareous soil's properties, wheat productivity, and nutrient content. The result indicated that the addition of PC significantly affected chemical properties, grain yield (15.9 and 16.4%), straw yield (8 and 11.7%), total nutrient uptake by wheat plant in an average value of two seasons in clay and calcareous soil, respectively. In addition, data showed that, with the treatments of granstar and polymeric herbicides, the rate of increase in the soil content of available micronutrients varied widely from nutrient to another of two soils in two seasons. Also, the results indicated that unweeded plots caused a decrement in grain yield by 3.77 and 7.87% in clay soil and by 4.47 and 4% in calcareous soil for in 1st and 2nd, respectively.

Introduction

Egypt's wheat productivity increased to 8.9 million tons in 2020/2021, due to an increase in cultivated area. While the deficiency between productivity and utilization is estimated to be 42.79% (**USDA, 2020**). So, as to must be supported farmers to increase wheat cultivate areas. The organic matter content of the cultivated soils in Egypt is usually less than 2% is a result of transformation being high in the subtropics (**Abd El-Aziz, 2013**) and intensive cultivation practices (**Batlle-Bayer *et al*. 2010**). It has been shown that the amendment of the soil with organic matter leads to increase sustainability in agricultural production because it possesses many desirable properties such as cation exchange capacity, enhanced nutrient uptake, and chemical and biological characteristics of the soil (**Khalifa *et al*., 2022**). Using organic materials as a soil amendment has received good solicitude which is viewed as serving as a means to ameliorate the soil characteristic, which in turn promotes the crop production suitability and rescue of the environment **(Mulugeta *et al*., 2020).** Compost is often made of rice straw with animal manure and it's considered a common organic fertilizer that riches organic matter and nutrients. It could help to improve the soil's physical structure and biological activity. In addition, it supports soil productivity by providing nutrients in the soil, water holding capacity, and increasing aeration for plant growth and sustainable agriculture (**Omar *et al*., 2020**; **Aiad *et al*., 2021; El-Sharkawy *et al*., 2022)**. Another source of the organic amendment is municipal solid waste (MSW), which is an important to improve the biochemical properties of soil. MSW recycling mitigates the environmental load and could be effective in using nutrient resources and improving soil health, thus enhancing its productivity **(Dai *et al*., 2019; Gravuer *et al*., 2019; Zhu *et al*., 2021)**. Applying municipal compost through soil increases N, P, K, Fe, Cu, and Zn uptake by the wheat plants five years after the application (**Mouhoun-Chouaki *et al*., 2019; Domínguez *et al*., 2019; Alireza Mojave *et al*., 2020**). Also, poultry manure (PC) is an extraordinary source of organic fertilizer, which provided a high percentage of important nutrients to plants as compared to other organic sources, which increased pH, OM, total N, and available P, K, Ca, and Mg (**Nwite *et al*., 2018; Aruna Olasekan Adekiya *et al*., 2020; Le Van Dang *et al*., 2021; Yingxing Zhao *et al*., 2021**).

Weed infestations lead to substantial losses in crop production and quality (**Bastiaans *et al*., 2008**). Chemical-dependent weed control has led to the evolution of herbicide-resistant weeds and pollution of arable land and water systems, posing a great threat to food security and environmental safety (**Zhang *et al*., 2021**). Successful applications of functionalized polymers in a wide variety of chemical, biological and technological areas have recently received great interest. In the last few years, there has been a growing interest in the chemical combination of Agrochemicals with functioned polymers for achieving controlled release systems **(Soliman *et al*., 2015; El-Kholy *et al*., 2019)** reported that tribenuron-methyl herbicide (granstar) was effective at controlling weeds in wheat fields and increased wheat growth and yield.

This study aimed to study the effect of the different types of organic amendments and polymeric granstar as polymeric herbicides on clay and calcareous soil's properties, wheat productivity, and nutrient content.

Experimental

In a split plot design, with three replicates, a lysimeter experiments were carried out on wheat (*Triticum aestivum L.*, cv. Misr 2) during 2 seasons (2018/2019 and 2019/2020) at the Sakha Agricultural Research Station, Kafr El-Sheikh Governorate, Egypt, located at 31° 5' 37.68" N and 30°56' 55.90" E with an elevation 6 m above mean sea level. The soil texture in these experiments was a clay and calcareous soil **(Table 1)**. Lysimeter (2 m^2) was divided into 2 groups (clay and calcareous soil); each group includes 24 lysimeters. Organic amendments were assigned as main plots: CK: as a control; RSC: applying rice straw compost (5 ton fed^{-1}); HHC: applying house holding waste compost (10 ton fed^{-1}) and PM: applying poultry manure (5 ton fed^{-1}), whereas the subplots were subjected to the two types of herbicides (CK: without using herbicide and GS: granstar or PGS: polymeric granstar). Some chemical properties of organic amendments shown in **Table (2)**.

Organic amendments, as well as P, were given during seedbed preparation. Wheat grains were sown in first season on November 18th, 2018 and harvested on May, 5th, 2019 after full maturity. While in the second season, wheat grains were sown on November 6th, 2019 and harvested in April, 21st, 2020. All recommended cultural practices were followed according to the recommendations of the Egyptian Ministry of Agriculture. Granstar herbicide was sprayed at 20 days after sowing in the first season and polymeric granstar in second season.

Table (1): Some chemical and physical properties of the experimental soils before planting

Properties	Clay	Calcareous	Properties	Clay	Calcareous
Soil pH **	8.5	8.6	Particle size distribution (%)		
EC dS m^{-1} 25 C^{o} *	8.3	3.2	Sand	17.6	67.4
Soluble ions mmol L^{-1}*			Silt	29.7	18.4
Ca^{2+}	16.2	5.3	Clay	52.6	14.2
Mg^{2+}	15.6	4.5	Texture grade	Clay	Sandy loam
Na^{+}	51.1	22.3	Organic matter (g kg^{-1})	1.1	0.62
K^{+}	0.3	0.13	$CaCO_3$ (g kg^{-1})	15	306.2
HCO_3^{-}	4.5	10	Bulk density (Mg m^{-3})	1.4	1.4
Cl^{-}	40.8	12.5			
SO_4^{2-}	37.9	9.6			
Exchangeable sodium percent (ESP)	14.9	11.9	Available micro-elements (mg kg^{-1})		
Available macro- elements (mg kg^{-1})			Fe	28.2	2.8
N	23.8	20.9	Zn	21.6	3.1
P	9.8	7.2	Mn	8.3	1.1
K	401.4	229.3	Cu	2.1	0.7

***: measured in soil paste extract **: measured at 1:2.5 (soil: water suspension)**

Table (2): Some chemical properties of the household waste, compost and poultry composts

Characteristics	House holds waste	rice straw	Poultry manure
EC dS/m/ 25 C^{0} *	2.2	4.6	3.5
pH **	7.8	7.9	7.4
Organic matter %	1.9	16.6	31.8
Total carbon %	14.2	9.5	18.2
Total N %	1.9	1.3	2.6
C/N ratio	7.3	7.1	6.8
P %	0.9	0.5	1
K %	0.5	0.7	0.4
Fe	42.8	82.6	40.4
Zn	28.7	25.4	20.3
Mn	32.3	40.2	35.5
Cd	0.46	1.01	0.4
Pb	1.8	2.7	2.3

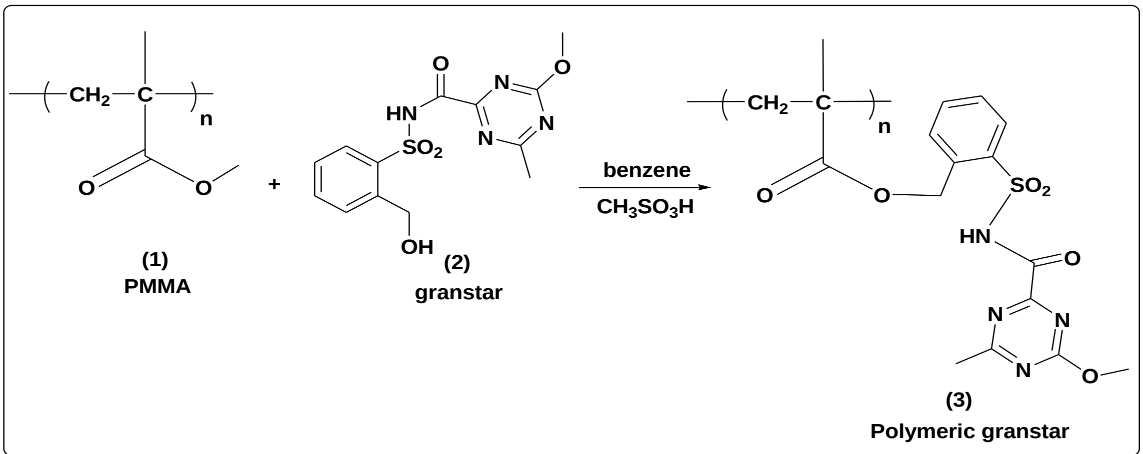
Granstar is a sulfonylurea's herbicide (Dustable powder DP 75% Tribenuron–methyl. Molecular formula: $C_{15}H_{17}N_5O_6S$.

Synthesis of Methylmethacrylate linear polymer (1)

Methylmethacrylate linear polymer was synthesized and characterized as described by **Selim, A *et al.*, 2017**.

Synthesis of Polymeric granstar (3)

In a 100 mL two necks round bottom flask (5 g, 50 mmol) of PMMA was dissolved in 30 ml benzene then (25.37 g, 75 mmol) of granstar was added and 0.5 mL of methane sulphonic acid was added, the reaction mixture was refluxed for 5 hrs using dean stark trap. **(scheme 1)** Then the product was cooled and neutralized by 5% sodium carbonate solution. The polymeric granstar was filtered off and dried. Yield 86%; mp over 300; IR (cm^{-1}), 1715 (C=O), 3412 (NH), 3025 (CH- Ar), 1613-1645 (C=N).



Scheme (1): Synthesis of polymeric granstar

Soil samples representing the surface of 30 cm were collected for analysis according to methods cited by **Page *et al.*, (1982); US, (1954)**.

At harvest grain and straw yields were determined and converted to kg fed^{-1}. Plant samples were digested and analyzed as described by **Kalra, (1998)**.

All measurement data during the two seasons in this study were analyzed according to the methods described by **Snedecor *et al.*, (1980)**. The differences among the means of different treatments were tested using the Least Significant Differences (LSD) at probability 5%. Statistical analysis was done using the CoStat package program, version 6.311 (cohort software, USA).

Results and discussion

Effect on soil properties

The data in Table (3) show that granstar herbicides resulted in a slight improvement in soil chemical properties in the first season compared with polymeric granstar in the second season.

On the other hand, poultry manure (PC) caused a marked decrease in the same properties. The lowest decrease values for soil chemical properties were by treatments not receiving any treatment. No significantly affected the values of soil chemical properties by the combined effects, but it showed an enhancement in the values of soil nutrients Cu and K in the first and second seasons, respectively. As shown in Table (4), granstar and polymeric granstar had a different effect on soil properties. Poultry manure (PC) application has a significant effect on soil properties in comparison to other organic amendments and control. Insignificantly effect on the values of soil chemical properties by the combined between herbicides and organic amendments, only in increasing the values of Fe in the second seasons.

Table (3): Effect of soil amendments and herbicides on clay soil chemical properties

Property	Ec (ds m^{-1})	ESP %	O.M %	N (ppm)	P (ppm)	K (ppm)	Fe (ppm)	Mn (ppm)	Zn (ppm)	Cu (ppm)
Season	**1st season**									
Herbicides										
CK	8.2	14.5	1.5	31.6	11.5	441.3	40.7	30.1	14.3	5.5
GS	8.1	14.5	1.6	32.2	13.3	450.3	45.4	33.8	17.2	6.3
F-test	**	ns	*	**	*	ns	*	*	*	*
Organic amendments										
CK	8.2	14.7	1	24.2	10.3	410.6	30.7	24.8	9.7	2.8
RSC	8	14.7	1.6	33.2	12.3	437	44	30.6	13.4	5.8
HHC	8.1	14.4	1.3	34.3	12.9	452.6	47.8	33.9	17	7.1
PC	8	14.1	2.1	35.8	14	482.8	49.5	38.3	22.9	7.7
F-test	**	ns	**	**	**	**	**	**	**	**
Interaction										
CK * GS	8.2	14.6	1	24.5	11.2	416.3	32.7	26.6	11.2	3.1
RSC * GS	8	14.9	1.6	33.4	12.8	439.6	47.3	33	14.4	6.1
HHC * GS	8.1	14.3	1.3	34.5	14	453.6	50.1	35.5	18.8	7.4
PC* GS	7.9	14	2.1	36.1	15.2	491.3	51.4	40.1	24.5	8.5
F-test	ns	ns	ns	ns	ns	ns	ns	ns	ns	*
Season	**2nd season**									
Herbicides										
CK	7.8	13.6	1.5	31.5	11.4	400.2	43.7	35.1	15.1	6.7
PGS	7.7	13.8	1.6	32.4	12.2	449.1	46.1	39	19.7	7.1
F-test	**	ns	ns	ns	ns	*	ns	ns	*	ns
Organic amendments										
CK	8.1	14.5	1	21.9	10.1	323.6	28.8	20.7	8.5	2.4
RSC	7.6	13.7	1.7	34.1	12.4	456.5	49.9	37.7	15.8	8.4
HHC	7.7	13.6	1.4	33.4	11.4	430.8	48.8	36.6	18.9	7.7
PC	7.5	12.8	2.2	38.4	13.4	487.5	52.1	53.1	26.2	9.1
F-test	**	**	**	**	**	**	**	**	**	**
Interaction										
CK * PGS	8.1	14.4	1.1	22.3	10.3	402.3	31.1	23	10.4	2.4
RSC * PGS	7.5	14	1.7	34.4	12.7	460	50.5	39.6	16.9	8.4
HHC * PGS	7.7	13.7	1.4	33.9	12.1	443.3	49.9	38.2	21.9	8.1
PC* PGS	7.4	12.9	2.2	38.8	13.7	490.6	52.8	55.3	29.4	9.5
F-test	ns	ns	ns	ns	ns	**	ns	ns	ns	ns

*CK: as a control; RSC: applying rice straw compost (5 ton fed^{-1}); HHC: applying house holding waste compost (10 ton fed^{-1}), PM: applying poultry manure (5 ton fed^{-1}), GS: granstar and PGS: polymeric granstar. *: refers to significant, and **: refers to highly significant differences between them ($p < 0.05$).

Data presented in Tables (3 and 4) revealed that the addition of PC significantly affected chemical properties in clay and calcareous soil.

Table (4): Effect of soil amendments and herbicides on calcareous soil chemical properties

Property	Ec (ds m^{-1})	ESP %	O.M %	N (ppm)	P (ppm)	K (ppm)	Fe (ppm)	Mn (ppm)	Zn (ppm)	Cu (ppm)
Season	**1st season**									
Herbicides										
CK	2.81	11.68	0.78	27.36	8.85	265.33	4.58	4.99	2.27	0.92
GS	2.75	11.54	0.81	28.27	11.70	293.50	4.71	5.58	2.53	1.00
F-test	ns	ns	ns	*	**	*	*	ns	ns	ns
Organic amendments										
CK	3.00	12.04	0.57	21.72	7.50	225.00	3.52	3.54	1.88	0.78
RSC	2.72	11.50	0.83	29.79	11.00	299.00	7.14	5.47	2.58	1.09
HHC	2.78	11.62	0.76	28.45	10.40	253.00	3.80	4.60	2.32	0.83
PC	2.61	11.28	1.01	31.30	12.20	340.67	4.12	7.53	2.82	1.15
F-test	**	**	**	**	**	**	**	**	*	*
Interaction										
CK * GS	2.99	12.03	0.57	22.20	9.00	231.67	3.71	3.65	2.17	0.78
RSC * GS	2.68	11.40	0.83	29.97	12.20	316.67	7.10	5.80	2.54	1.17
HHC * GS	2.74	11.53	0.79	29.12	12.00	261.00	3.83	5.01	2.45	0.88
PC* GS	2.59	11.21	1.03	31.79	13.60	364.67	4.19	7.87	2.98	1.18
F-test	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Season	2nd season									
Herbicides										
CK	2.52	10.67	0.68	27.24	7.95	230.67	4.32	3.23	1.73	0.71
PGS	2.45	10.68	0.72	28.04	10.40	279.58	5.92	4.61	2.30	0.80
F-test	*	ns	ns	ns	**	*	ns	ns	*	*
Organic amendments										
CK	2.83	11.53	0.55	19.81	6.55	200.33	2.87	2.68	1.86	0.58
RSC	2.43	10.45	0.72	29.00	9.25	233.67	4.65	2.92	1.99	0.79
HHC	2.55	10.83	0.69	28.70	9.85	273.33	5.76	3.84	1.68	0.76
PC	2.13	9.88	0.85	33.06	11.05	313.17	7.21	6.23	2.53	0.89
F-test	**	**	**	**	*	**	**	**	**	**
Interaction										
CK * PGS	2.80	11.48	0.56	19.84	8.00	217.00	3.33	3.52	2.26	0.63
RSC * PGS	2.39	10.56	0.73	29.48	10.60	257.00	6.10	3.91	2.28	0.89
HHC * PGS	2.51	10.78	0.71	29.36	10.80	300.00	6.64	4.80	1.88	0.79
PC* PGS	2.10	9.91	0.87	33.49	12.20	344.33	7.62	6.20	2.78	0.89
F-test	ns	ns	ns	ns	ns	ns	**	ns	ns	ns

*CK: as a control; RSC: applying rice straw compost (5 ton fed^{-1}); HHC: applying house holding waste compost (10 ton fed^{-1}), PM: applying poultry manure (5 ton fed^{-1}), GS: granstar and PGS: polymeric granstar. *: refers to significant, and **: refers to highly significant differences between them ($p < 0.05$).

This may be due to the high organic matter content of poultry manure than other treatments that enhanced the soil structure and held nutrient capacity. Similar results were obtained by **Makhlof *et al.*, 2019** revealed that compost and chicken manure in wheat's soil at harvesting stage increased available N, also with addition of chicken manure; the results indicated increased available P with application rate for the soil. Also, **Aruna *et al.*, 2020** showed that application of PM increased soil pH, OM, N, P, K, Ca and Mg significantly compared to the control. **Kobierski1 *et al.*, 2017** found that application PC resulted in a significant increase in the content of Cu, Mn , Zn and Fe.

In addition, data showed that, with the treatments of granstar and polymer herbicides, the rate of increase in the soil content of available micronutrients varied widely from nutrient to another of two soils in two season. **Reddy *et al.*, (2003)** reported effects on soil nutrients where the given herbicide treatment significantly increased the available nitrogen levels in the soil. Using herbicide treatment showed little to no considerable impacts on soil chemical characteristics **(Cogill, 2019)**

Effectiveness of Treatments on Wheat Yield and Nutrient uptake by wheat plant

Data in Table 5 indicated that polymer herbicide was more effective than granstar regarding wheat yield and nutrient uptake by the plant in clay soil. But in calcareous soil the application of both herbisides get the similar effect (Table 6). These results indicated that unweeded plots caused a decrement in grain yield by 3.77 and 7.87% in clay soil and by 4.47 and 4% in calcareous soil for in 1st and 2nd, respectively. Straw yield was decreased by 2.93% than using polymer herbicide in 2nd season under clay soil. **Soliman *et al.*, (2011); Ibrahim *et al.*, (2015**), show that in wheat treated with tribenuron-methyl the yield and nutrient uptake were increased than in the control treatment.

Regarding the effect of organic amendments treatments, PC application increased grain yield (15.9 and 16.4%), straw yield (8 and 11.7%), total N uptake (48.4 and 50.2%), total P uptake (69.7 and 79.9%), total K uptake (60.4 and 62.1%), total Fe uptake (73.3 and 77%), total Mn uptake (60.8 and 62.3%), total Zn uptake (43.6 and 90.4%), and total Cu uptake (67.9 and 124.4%), in an average value of two seasons in clay and calcareous soil, respectively. This might be due to the optimum concentrations of nutrients in poultry manure, also the enhancement of both soil properties which reflect on yield and nutrient uptake. **Kobierski1 *et al.*, (2017)** found that application PM resulted in a significant increase in the content of organic carbon, slightly increased the total content of Cu, Mn, Zn, and Fe and, the content of phosphorus and potassium available to plants**. Jamal *et al.*, (2018)** reported the maximum grain yield of wheat with an application of poultry manure.

Table (5): Effect of soil amendments and herbicides on wheat yields and nutrient uptake in clay soil

Property	**G.Y (ton fed^{-1})**	**S.Y (ton fed^{-1})**	**TNU (Kg fed^{-1})**	**TPU (Kg fed^{-1})**	**TKU (Kg fed^{-1})**	**TFeU (Kg fed^{-1})**	**TMnU (Kg fed^{-1})**	**TZnU (Kg fed^{-1})**	**TCuU (Kg fed^{-1})**
Season	1^{st} season								
Herbicides									
CK	3.06	3.96	60.33	25.15	36.04	1.43	0.68	0.30	0.21
GS	3.18	4.01	65.4	28.84	39.67	1.63	0.74	0.32	0.22
F-test	**	ns	*	**	**	**	*	ns	ns
Organic amendments									
CK	2.92	3.80	49.60	19.92	30.74	1.12	0.57	0.26	0.16
RSC	3.23	3.93	64.34	26.46	38.17	1.70	0.71	0.33	0.21
HHC	2.93	4.07	63.31	27.20	36.86	1.34	0.66	0.28	0.22
PC	3.40	4.15	74.22	34.40	45.65	1.97	0.92	0.38	0.27
F-test	**	**	**	**	**	**	**	**	**
Interaction									
CK * GS	3.00	3.78	52.55	21.59	34.11	1.18	0.60	0.28	0.16
RSC * GS	3.27	3.98	67.77	27.99	38.95	1.88	0.74	0.34	0.23
HHC * GS	2.96	4.13	64.92	29.17	38.12	1.39	0.69	0.27	0.22
PC* GS	3.49	4.15	76.37	36.60	47.51	2.08	0.94	0.39	0.29
F-test	ns	ns	ns	ns	*	**	ns	ns	ns
Season	2^{nd} season								
Herbicides									
CK	3.16	4.31	65.41	27.8	42.63	1.58	0.75	0.32	0.24
PGS	3.43	4.44	72.62	32.23	49.47	1.86	0.83	0.35	0.27
F-test	**	**	*	*	**	**	*	*	ns
Organic amendments									
CK	3.07	4.23	54.47	22.13	34.34	1.27	0.63	0.28	0.19
RSC	3.50	4.33	72.89	30.36	45.61	1.95	0.82	0.36	0.26
HHC	3.06	4.45	68.60	30.69	45.05	1.49	0.73	0.30	0.25
PC	3.54	4.51	80.11	36.87	59.19	2.17	1.00	0.40	0.31
F-test	*	ns	**	**	**	**	**	**	**
Interaction									
CK * PGS	3.28	4.35	59.51	24.02	38.13	1.39	0.70	0.31	0.20
RSC * PGS	3.66	4.39	78.33	33.36	49.01	2.19	0.85	0.38	0.28
HHC * PGS	3.12	4.48	70.48	32.59	47.05	1.54	0.76	0.29	0.26
PC* PGS	3.66	4.54	82.16	38.96	63.67	2.31	1.03	0.41	0.33
F-test	**	**	ns	ns	*	**	ns	ns	ns

G.Y: Grain yield (ton fed^{-1}); S.Y: Straw yield (ton fed^{-1}); TNU: Total nitrogen uptake (Kg fed^{-1}); TPU: Total phosphorus uptake (Kg fed^{-1}); TKU: Total potassium uptake (Kg fed^{-1}); TFeU: Total lead uptake (Kg fed^{-1}); TMnU: Total mananez uptake (Kg fed^{-1}); TZnU: Total zinc uptake (Kg fed^{-1}) and TCuU: Total copper uptake (Kg fed^{-1}). *: refers to significant, and **: refers to highly significant differences between them ($p < 0.05$).

Table (6): Effect of soil amendments and herbicides on wheat yields and nutrient uptake in calcareous soil.

Property	G.Y (ton fed^{-1})	S.Y (ton fed^{-1})	TNU (Kg fed^{-1})	TPU (Kg fed^{-1})	TKU (Kg fed^{-1})	TFeU (Kg fed^{-1})	TMnU (Kg fed^{-1})	TZnU (Kg fed^{-1})	TCuU (Kg fed^{-1})
Season	**1st season**								
Herbicides									
CK	2.78	3.26	53.93	19.61	32.48	0.366	0.297	0.036	0.024
GS	2.91	3.31	58.73	22.83	35.89	0.427	0.332	0.04	0.028
F-test	**	ns	*	**	**	**	**	*	*
Organic amendments									
CK	2.62	3.1	43.7	15	27.33	0.315	0.237	0.025	0.015
RSC	2.88	3.37	60.24	22.46	35.57	0.454	0.351	0.042	0.033
HHC	2.86	3.23	56.24	20.34	33.58	0.255	0.298	0.036	0.023
PC	3.02	3.45	65.13	27.08	40.26	0.562	0.372	0.048	0.034
F-test	**	**	**	**	**	**	**	**	**
Interaction									
CK * GS	2.7	3.08	46.45	16.42	30.41	0.330	0.265	0.03	0.017
RSC * GS	2.92	3.43	61.84	24.29	36.81	0.526	0.367	0.043	0.035
HHC * GS	2.91	3.28	59.35	21.68	34.32	0.279	0.313	0.038	0.025
PC* GS	3.11	3.45	67.27	28.94	42.01	0.574	0.382	0.05	0.037
F-test	ns	ns	ns	ns	*	*	ns	**	ns
Season	**2nd season**								
Herbicides									
CK	2.88	3.61	58.83	22.04	38.64	0.414	0.325	0.038	0.028
PGS	3	3.68	62.97	25.05	43.16	0.485	0.366	0.043	0.034
F-test	**	ns	*	ns	**	*	**	**	**
Organic amendments									
CK	2.67	3.4	46.60	16.35	29.55	0.355	0.244	0.027	0.018
RSC	3.01	3.75	65.49	25.70	43.61	0.52	0.39	0.046	0.038
HHC	2.94	3.63	61.01	22.83	38.19	0.299	0.338	0.039	0.028
PC	3.14	3.81	70.50	29.31	52.26	0.623	0.409	0.051	0.04
F-test	**	**	**	**	**	**	**	**	**
Interaction									
CK * PGS	2.79	3.41	49.75	17.36	32.07	0.379	0.294	0.031	0.021
RSC * PGS	3.07	3.78	67.29	27.4	45.59	0.596	0.407	0.047	0.041
HHC * PGS	2.96	3.69	63.81	24.76	39.79	0.326	0.346	0.041	0.03
PC* PGS	3.18	3.84	71.03	30.68	55.2	0.637	0.419	0.053	0.043
F-test	ns	ns	ns	ns	ns	*	**	**	ns

*G.Y: Grain yield (ton fed^{-1}); S.Y: Straw yield (ton fed^{-1}); TNU: Total nitrogen uptake (Kg fed^{-1}); TPU: Total phosphorus uptake (Kg fed^{-1}); TKU: Total potassium uptake (Kg fed^{-1}); TFeU: Total lead uptake (Kg fed^{-1}); TMnU: Total mananez uptake (Kg fed^{-1}); TZnU: Total zinc uptake (Kg fed^{-1}) and TCuU: Total copper uptake (Kg fed^{-1}). *: refers to significant, and **: refers to highly significant differences between them ($p < 0.05$).

Concerning the effect of interaction on yield and nutrient uptake, data Table 5 (clay soil) showed that polymer herbicide with organic amendments in grain, straw yield, total K and Fe uptake by wheat plants. While in calcareous soil, the interaction between both herbicides with organic amendments was significant in the total uptake of K, Fe, Mn, and Zn by the wheat plants (Table 6).

Conclusions

According to the findings, applying the poultry manure 5 ton fed^{-1} gave a positive effect in improvement both of the clay and calcareous soil chemical properties, growth, grain straw yield of wheat and uptake of nutrients

were significant increased due to application of poultry manure, polymer herbicide and recorded highest values due to the interaction between application of poultry manure and polymer herbicide under clay and calcareous soils.

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تأثير المواد العضوية المختلفة والبوليمر جرانستار على بعض الخواص الكيميائية لبعض الاراضى في منطقة الدلتا

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يؤدى انخفاض محتوى المادة العضوية في الاراضى المزروعة في مصر بجانب انتشار الحشائش إلى انخفاض إنتاجية المحاصيل ، لذلك هدفت هذه الدراسة إلى دراسة تأثير الأنواع المختلفة من المحسنات العضوية و البوليمر جرانستار كمبيدات أعشاب على خصائص التربة الطينية والجيرية و إنتاجية القمح ومحتوى العناصر. أشارت النتائج إلى أن إضافة روث الدواجن أثرت معنوياً على الخواص الكيميائية بالإضافة إلى ذلك ، أظهرت البيانات أنه مع معاملات جرانستار ومبيدات الأعشاب البوليمرية ، فإن معدل الزيادة في محتوى التربة من العناصر الدقيقة المتاحة يختلف اختلافًا كبيرًا من عنصر إلى آخر و من تربة لأخرى خلال الموسمين. كما أشارت النتائج إلى أن بدون رش المبيد تسبب ذلك في انخفاض محصول الحبوب في كلا من التربة الطينية و الجيرية في الموسم الأول والثاني على التوالي.