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EFFECT OF DIFFERENT UREA FORMS APPLICATION AND LAND LEVELLING TREATMENTS ON SALINE SOIL PROPERTIES AND RICE PRODUCTIVITY

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ABSTRACT: Afield experiments were performed during 2020 and 2021rice grown seasons. The site of experiment was located at the northern part of delta, at Ehamoul district, Kafr Eshiekh province under salt affected soil irrigated by saline drainage water. The goal of study is addressing the impact of varying land levelling treatment wet levelling (L1), traditional levelling (L2) and lazer levelling in the terms of lazar levelling (L3) and different urea treatments urea, (N1) sulphur coated urea (N2) and urea+ rice compost straw (N3) on soil salinity, soil physical properties, rice growth, rice yield attributes rice grain yield, water productivity and NPK% in rice grain. The main findings were displayed as following. The apply various land levelling significantly varied in their influence in all studied parameters related to soil and plant. Lazar levelling at dead level (L3) develop the best results since it significantly, reduced salinity level, ESP with improving soil physical properties, especially aggregation concept which reflection higher rice growth, yield attributes and yield as well as water productivity and NPK% in rice grain. Various urea form application markedly different in its impact on studied soil and plant parameter during current trail in both seasons. The urea plus rice compost straw was the best urea form improving soil quality and fertility which giving the higher values of studied growth parameters, yield attribute, and rice grain yield as well as NPK% in rice grain. The urea along with rice compost straw treatment significantly improved aggregation characteristic in both seasons but they did not have significant effect on the rest of characteristics in both seasons. The interaction showed insignificant effect with same trait. It could be concluded that lazar levelling with urea plus rice straw compost is recommended under salt affect soil to ensure high rice grain yield.

Keywords: **land levelling; urea application; slow-release nitrogen fertilizer; organic fertilization; rice productivity**

INTRODUCTION

Soil salinity and sodicity considered two major concerns in irrigated agricultural, particularly in arid and semiarid regions due to water scarcity and climate change. Worldwide, the area of salt-affected soil is about 935 Mha (Rengasamy, 2006), and about 560 Mha of the total salt affected soil is categorized as saline-sodic soils. These salt-affected soils need effective, low-cost, and environmentally acceptable management (Khaled et al., 2014 and Zayed et al. 2017). In Egypt, about 33.0% of total land is categorized as saline-sodic soils Zayed et al. (2018). Saline-sodic soils have poor aeration and hydraulic conductivity (HC) due to dispersion, translocation and deposition of clay platelets in the conducting pores (Lid et al. 2018). Saline-sodic soils have an adverse effect on the growth and yield of crops due to the low fertility (Jat et al. 2009 and Zayed et al.

2018) and sea water intrusion in response to sea level rise as well as a biotic stress.

Saline-sodic soil amelioration with physical amendments such as ploughing, and sub soiling is considered a valuable technology and low costly. However, integration between land levelling types and proposed mineral, organic and mineral with organic fertilization on saline sodic soils in arid environments has less attention.

Tillage process is fundamental practices that can influence soil fertility, crop production, and consequently the sustainability of cropping systems (Mai et al., 2017and EL Baroudy et al., 2014). It can increase soil mulching ability, infiltration rate and leaching different salts from the soil surface to deeper layers. Thus, tillage process can be considered a great practice in reclamation of saline-sodic soils. On the other hand, reduced tillage is one of the most applicable management practices for gaining the mutual advantages in terms of carbon sequestration, erosion control and lessening the input of energy (Safi and Zaki, 2018). However, reduced tillage was not studied well before in combination with soil amendments, particularly in salt affected soils.

Nevertheless, sustaining crop yields is considered a challenge, when adopting reduced tillage in many traditional cereals-based cropping systems (Shi et al., 2019). In addition, land levelling types cannot result in the target goal of high crop production and soil quality without apposite agronomic practices and mineral, organic and mineral with organic fertilization, particularly in salt affected soils. Zayed et al. (2013 and 2017) slated that applying urea combined rice compost straw significantly improved soil prosperities, fertility, yield component and grain yield of rice under salt stress. They also reported that applying surfure exerted apparent improvement of soil properties' soil fertility yield and yield component of rice under saline conditions. Therefore, the current study aimed to assign the impact of different land levelling treatments along with urea application and rice compost straw on soil properties and rice productivity.

MATERIALS AND METHODS

Two field experiment was carried out during 2020 and 2021 seasons at Elhamol district –Kafr El shiekh province -Egypt to addressed the effects of land levelling treatments i.e. wet levelling (Talweet) (L1), traditional land levelling (L2) and dead level (with lazar levelling (L3) and urea application method (i.e. urea (N1), urea slow-release nitrogen fertilizer (N2) and urea with compost (N3)) on soil physical and chemical properties, growth and yield of performance of Sakha 108 rice cultivars. The Representative soil samples were taken at the depths of 0 - 15- 30 -45cm from the soil surface before sowing. Samples were air - dried then ground to pass through a 2 mm sieve and well mixed. Results of some physical and chemical analysis of the soil in both seasons are shown in Table 1. The soil is clayey in texture; the average value of texture was shown in Table 1. The procedure of soil analysis followed the methods of Jakson (1967).

The experiment was conducted in a split plot design with three replications. land levelling systems were placed in main plots, while urea application method were placed in sub-plots. The area of each land levelling treatment was 240 m^2. Land levelling treatments were applied before first and second growing seasons.

The experimental site was prepared and levelled as it describe in the treatments of levelling. The seeds of rice cultivar Sakha 179 were sown at the rate of 142.8 kg ha^{-1} on May, 17th 2020 and on May, 15th 2021.

Table 1: Initial soil chemical and physical analyses of the experimental site before sowing shown as average of both seasons

Soil depth (cm)	PH	ECe (dS m^{-1})	SAR	ESP	Available (mg kg^{-1})			
					N	P	K	
0-15	8.28	4.58	12.21	14.34	29.4	9.3	332	
15-30	8.22	5.97	13.50	15.72	31.5	9.6	325	
30-45	8.24	6.74	14.52	16.78	26.7	9.2	319	
Soil depth (cm)	SOM (%)	CEC (Cmol kg^{-1})	FC (%)	PWP (%)	AI	MWD (mm)	IR ($cmhr^{-1}$)	
0-15	1.84	38.2	41.18	22.25	0.086	0.172	0.58	
15-30	0.98	31.3	40.12	21.65	0.057	0.114		
30-45	0.56	29.5	38.21	20.26	0.050	0.099		
Soil depth (cm)	Soluble cations (Cmol L^{-1})				Soluble anions (Cmol L^{-1})			
	Na^+	K^+	Ca^{2+}	Mg^{2+}	CO_3^{2-}	HCO_3^-	Cl^-	SO_4^{2-}
0-15	32.98	0.41	9.10	5.50	0.0	7.78	23.08	17.12
15-30	41.79	0.60	11.99	7.16	0.0	9.10	29.25	23.19
30-45	47.52	0.67	12.78	8.63	0.0	9.15	33.26	27.19
Soil depth (cm)	Sand	Silt	Clay	Texture class	SBD (Mg m^{-3})		TP	
0-15	19.67	24.55	55.78	Clay	1.26		52.45	
15-30	17.68	26.09	56.23	Clay	1.33		49.81	
30-45	18.88	25.63	55.49	Clay	1.39		47.55	

ECe: electrical conductivity (salinity); ESP: exchangeable sodium percentage; SOM: soil organic matter; FC: field capacity; PWP: permanent wilting point; SBD: soil bulk density; AI: soil aggregation index; MWD: mean weight diameter of soil particles; IR: Infiltration rate; CEC: Cation exchange capacity

Seeds of rice cultivar were soaked in excess of water for 24 hours then incubated for another 48 hours to enhance germination. Pre transplanting, seeds were handily broadcasting to the nursery. The recommended dose of PK fertilizers was applied. Phosphorus fertilizer (238 kg P_2O_5 ha^{-1}) in the form of calcium super phosphate 15% P_2O_5 was applied during the soil preparation stage. Nitrogen fertilizer at the rate of 165 kg N ha^{-1} in the form of urea 46.0% N was divided into two doses, with the first dose was 2/3 as a basal application in the dry soil then flooded in the same day, while the second dose was 1/3 applied at 30 days after transplanting. However, the total dose of potassium fertilizer (57 kg K_2O ha^{-1}) in the form of potassium sulphate 48% K_2O was added directly before compost were applied at the rate of (7.5 tons/ha^{-1}) as a basal application at three weeks before cultivation and were well turned with soil, all amounts of compost were applied as a basal application and incorporated into the soil surface after well turning with soil and were determined using standard analytical methods according to Ismael et al. (2021) and the results are shown in Table 2. Weeds were chemically controlled using Saturn (50%) at the rate of 4.7 L.ha^{-1}well mixed with enough sand and applied after four days from transplanting into 3 cm water depth. After harvest, representative soil samples from each subplot were taken and transferred to lab to determine the soil physical and chemical properties according to Page et al., (1982) Klute 1986, and Delgado and Gómez 2016.

Plant samples were randomly taken at heading starting and transferred to the lab to study some growth parameters such as i.e., plant height, number of tillers, leaf area index and grain and straw nitrogen and potassium contents and nitrogen uptake estimated according to Yoshida et al. (1976).

Table (2): Some chemical properties of the compost rice in both seasons.

Compost analyses	N%	C%	C:N	P %	K%	Mn (ppm)	Fe (ppm)	Zn (ppm)
Seasons 2020	1.49	32.7	21.89	0.75	1.98	493	525	51
Seasons 2021	1.39	31.8	24.68	0.79	2.00	500	530	52

The crop was harvested at maturity and yield components; number of panicles, yield and its components i.e., panicle length (cm), number of filled grains panicle^{-1}, 1000-grain weight (g) and grain yield t ha^{-1} were recorded. Data obtained from the two seasons were statistically analysed by the following analysis of variance (IRRISTAT) described by Gomez and Gomez, (1984). Differences among treatment means were compared by least significant difference were used at $P \leq 0.05$.

RESULTS AND DISCUSSION

The effect of land levelling and urea application form on some soil properties and rice productivity were showed in Tables (3-9). Regarding Electrical conductivity (ECe), and exchangeable sodium percentage ESP of the studied site through the two growing seasons data in Table 3 clearly showed that the studied treatments land levelling and urea application method significantly affected both of ECe, ESP in both season. Concerning the values of ECe, land levelling and urea application method had positive effected in improving and reducing ECe, where as the values through the two growing seasons can be descended in order L1> L2 > L3. The lowest values were recorded under L3 treatment in the terms of lazar levelling and the values are 4.23 and 3.65 ds m^{-1} in the first and second growing seasons, respectively. Regarding, the values of ECe the values were highly significantly affected by land levelling treatment and the values through the two growing season can be descended in order L1> L2 > L3. The lowest values of ESP were 11.47 and 10.67 in the first and second growing seasons, respectively under lazer levelling or dead level lazer levelling might be improved the soil physical properties as drainage system which improved the leaching soil ability resulted in Nacl removing from soil to drain and decreasing both ECe and PSP of soil. These results are in a great harmony with those reported by Jat a et al. (2009), Temizel et al. (2012) and El Khaled et al (2014).

Concerning the effect of urea application method on ECe, and ESP., the values of ECe and ESP were highly significantly affected by urea application method, the values of both ECe and ESP can be descended in order N1> N2 > N3 treatment. The lowest values of ECe and ESP were 4.4 and 3.87 for ECe in the first and second seasons, respectively under N3 treatment. The lowest values of ESP were 11.69 and 10.94 in the first and second seasons, respectively underN3 treatment. Zayed et al. (2013) found that applying urea plus rice compost straw showed great effect in improving soil physical properties which reduced Na^{+} in soil and increased Ca^{+} of soil practical with reducing ECe and ESP that might explained the current obtained finding These finding are in a great agreement with those obtained by Javaid, et al. (2012), Toshiaki et al. (2012) and Jinhyun (2017).

The interaction effect between land levelling (L) and urea application form (N) on ECe and ESP, the values of the studied two parameters were not significantly affected by the interaction effect between the two studied treatments. Those finding are in a great harmony with these reported by Yasuyuki et al. (2015).

Table 3: Effect of land levelling method and urea application on electrical conductivity (ECe, salinity) and exchangeable sodium percentage (ESP) for the studied site during the two seasons.

Characters	ECe dS m^{-1}		ESP	
Treatments	2020	2021	2020	2021
land leveling (L)				
L1(Control)	5.54a	5.15a	13.14a	12.68a
L2	4.96 b	4.42 b	12.45 b	11.72b
L3	4.23 c	3.65c	11.47c	10.67c
F test	**	**	**	**
Nitrogen application (N)				
N1 (Control)	5.16a	4.70 a	12.69 a	12.11 a
N2 slow	5.16a	4.66a	12.67a	12.03 a
N3compost	4.4 b	3.87 b	11.69 b	10.94 b
F test	**	**	**	**
Interaction				
L×N	NS	NS	NS	NS

NS = P > 0.05; * = P < 0.05; ** = P < 0.01

Soil bulk density (SBD, mg m^{-3}) and total porosity (%)

Presented data in Table 4 revealed that values of both soil bulk density and total porosity% were clearly affected by land levelling and urea application method in both seasons. For the effect of land levelling, the values of soil bulk density and total porosity% were highly significantly affected by land levelling in the two study season. Effect of land levelling, the values of soil bulk density can be descended in order L1> L2 > L3 in the two seasons. On the other hand, the values of total porosity can be descended in order L3> L2 > L1 in the two seasons. Increasing the values of soil bulk density under L1 in comparison with other land levelling treatments L2 and L3 might be attributed to increasing soil compaction under the conditions of land levelling treatment L1 (padding). This compaction leads to decreasing values of soil porosity. These results are in agreement with these obtained by Liu et al. (2016) and Areas et al. (2017) and Ofori et al. (2017). Concerning, the urea application method on the values of soil bulk density and total porosity, the values of the two studied characters were significantly affected by the method of urea application. The values can be descended in order for the soil bulk density in the two seasons N1> N2 > N3. On the contrary, the values for total porosity can be descended in order N3> N2 > N1 in the two seasons applying urea mixed with rice compost might induced high soil aggregation rate resulted in improving soil properties and soil bulk density. It is mentioning here, The lower value of soil bulk density the improvement of soil drainage will be significant. These results are in the same line with these obtained by Zayed et al. (2013) and Safioz and Zaki (2018).

Mean weight diameter (MWD), aggregation index (AI), structure coefficient (SC) and optimum size of aggregates (OP).

Table 4: Effect of land levelling method urea application on bulk density (SBD) and total porosity and mean weight diameter (MWD), in both seasons.

Characters	SBD (Mg m^{-3})		TP		MWD (mm)	
Treatments	2020	2021	2020	2021	2020	2021
land leveling (L)						
L1(Control)	1.31a	1.30 a	50.48 b	51.11b	0.099 c	0.099 c
L2	1.25 b	1.23 b	52.99 a	53.46 a	0.115 b	0.115 b
L3	1.23 b	1.22 b	53.63 a	54.01 a	0.118 a	0.118 a
F test	**	**	Ns	**	**	**
Nitrogen application (N)						
N1 (Control)	1.27a	1.26 a	51.91 b	52.45b	0.111 a	0.111 a
N2	1.27a	1.26 a	52.03 b	52.41 b	0.111 a	0.111 a
N3	1.24b	1.23b	53.17 a	53.71a	0.111 a	0.111 a
F test	**	**	**	**	**	**
Interaction						
L×N	Ns	Ns	Ns	Ns	Ns	Ns

NS = P > 0.05; * = P < 0.05; ** = P < 0.01

Data in Table 5 indicated to soil of MWD, AI, SC and OP were highly significantly affected by land levelling treatments. The values of abovementioned followed the track of L3> L2 > L1 from the lowest to the highest value it was observed that lazar has a great benefit to improve soil properties by aggregation formation improvement and decreasing soil dispersion. On the contrary, the effect of urea application form which has no significant on SC and OP. It is very interesting to mention that the various tested urea treatments are being effective to improve soil aggregation since applying urea combined with rice compost straw showed the great effect on the concept. The highest improvement obtained regarding aggregate index (AI) was obtained by applying urea along with compost. At the same time, both urea alone and urea slow release treatments were at a par considering the AI in both seasons. It seems that applying compost increase Ca^{+2} ion against Na^{+} which encouraged the aggregation against dispersion induced by sodium under saline soil. There is distinct relation between aggregation and improving black density of soil which reflected on improving drainage system.

These results are in the same line with these obtained by Metwally et al. (2018).

Also, data in the same Table showed that the interaction effect between land levelling method and urea application method has no significant effect on AI, SC and OP in both seasons.

Growth characters

Data in Table 6 showed that the values of the studied growth character were generally significantly affected by land levelling treatments. Land levelling and nitrogen application exerted significant effect on rice growth, yield and yield attributed in both seasons. Generally, the values of the studied growth character can be descended in order of L3> L2 > L1 in the two seasons. Lazar levelling in the term of lazar level significantly recorded the highest values of number of tillers, leaf area index and dry matter in both season while wet levelling recorded the minimum values of them. Improving soil quality and fertility by lazar levelling

ensure proper rice growth. lazar level might be also improved the soil leaching factor which contributed in reducing salinity level and ESP of soil resulted in improving rice growth and enhancing. Regarding the effect of urea application method, the values of the studied yield components were highly significantly affected by urea application method in the two seasons. Data in Table 6&7 indicated that urea plus compost application produced the maximum of rice growth and yield attributes. Applying urea along with compost showed apparent effective role in improving rice growth, rice silently tolerance and yield attributes comparing to urea lone and control.

Table 5: Effect of land levelling method urea application on aggregation index (AI), structure coefficient and optimum size of aggregates (2- 0.5 mm) (OP) for the studied site through the two seasons

Characters	A I		SC		O P%	
Treatments	2020	2021	2020	2020	2021	S2
land leveling (L)						
L1(Control)	0.049b	0.055c	0.749c	0.925 a	15.75 b	19.61 c
L2	0.058 a	0.066b	0.789 b	0.902a	20.89a	24.35 a
L3	0.059 a	0.067 a	0.791 a	0.92 a	20.81 a	24.19b
F test	**	**	**	Ns	**	**
Nitrogen application (N)						
N1 (Control)	0.055 b	0.061 b	0.776 a	0.916 a	19.15a	22.72 a
N2	0.055 b	0.062 b	0.776 a	0.916 a	19.15a	22.72 a
N3	0.058 a	0.066 a	0.776 a	0.916 a	19.15a	22.72 a
F test	**	**	NS	NS	NS	NS
Interaction						
L×N	Ns	NS	NS	NS	NS	NS

NS = P > 0.05; * = P < 0.05; ** = P < 0.01

Table 6: Effect of land levelling method and urea application on growth character of rice crop during the two seasons

Characters	Number of tillers		Leaf area index		Dry matter	
Treatments	2020	2021	2020	2021	2020	2021
land leveling (L)						
L1(Control)	18.82 c	19.82 c	4.15 c	5.15 c	31.51 c	32.51 c
L2	21.42 b	22.42b	5.53 b	6.53b	34.65b	35.55 b
L3	24.58 a	25.58a	6.20 a	7.20 a	36.70a	37.70 a
F test	**	**	**	**	**	**
Nitrogen application (N)						
N1 (Control)	22.86 a	23.86a	5.73 a	6.73 a	36.06 a	37.06 a
N2	21.52b	22.52 b	5.33 b	6.33 b	34.25 b	35.25 b
N3	20.44 c	21.44 c	4.83 c	5.83 c	32.55 c	33.55 c
F test	**	**	**	**	**	**
Interaction						
L×N	Ns	Ns	Ns	NS	NS	NS

NS = P > 0.05; * = P < 0.05; ** = P < 0.01

Table 7: Effect of land levelling method and urea application on yield components of rice crop during the two seasons.

Characters	Number of panicles		Pan length		pan1weg		1000g1	
Treatments	2020	2021	2020	2021	2020	2021	2020	2021
land leveling (L)								
L1(Control)	19.43b	20.43b	19.32 b	20.33b	2.94c	3.94c	24.45b	25.45b
L2	21.09b	22.09b	19.03b	20.04b	3.25b	4.25b	25.25 a	26.25 a
L3	23.73a	24.73a	20.25a	21.25a	3.59a	4.59a	25.29 a	26.30 a
Ftest	**	**	**	**	**	**	**	**
Nitrogen fertilizer application (N)								
N1 (Control)	23.43a	24.44a	20.21a	21.21a	3.62a	4.62a	25.61 a	26.61 a
N2	21.24b	22.24b	19.54b	20.54b	3.25b	4.25b	24.92 b	25.92 b
N3	19.58c	20.58c	18.86c	19.86c	2.91c	3.91c	24.46 c	25.46 c
F test	**	**	**	**	**	**	**	**
L×N	NS	NS	NS	NS	NS	NS	NS	NS

NS = P > 0.05; * = P < 0.05; ** = P < 0.01.,

The benefit role of mistune of urea plus compost might be owing to its role in saliently mitigation raised rice salinity adaption rising soil fertility capacity and improving soil physical and chemical properties (soil quality reflection rice growth and yield attributes). These results are in agreement with these reported by Zayed et al., (2013).

Regarding, the interaction effect between land levelling and urea application method has no significant effect on the studied growth character and yield attributes in both seasons.

Grain and straw yields.

Presented data in Table 8 indicated that, rice yield were significantly affected by the land levelling except productivity of irrigation water which showed no significant effect in both seasons of study.

Generally, grain and straw yields were went to the following order L3> L2 > L2 in the two seasons, productivity of irrigation water, showed insignificant response to levelling treatments, the lazar levelling treatment continued to produce the highest values of yields that is due to improving rice growth and yield attributes. On the other side, the wet levelling gave the minimum mean of rice yields in both seasons. These results are in conformity with these obtained by Gewaily et al. (2019) and Jin et al. (2018) and Zayed et al. (2013).

Regarding, the effect of urea application, significant effects were noted by urea application on grain and straw yield as well as water productivity. The results recorded the order of urea plus compost> urea slow release > only urea in the two seasons. As it was detected, urea plus compost showed beneficial effect and ability to improve soil fertility and quality reflect on improving rice growth under salinity. Urea plus compost exerted the best yield components which reflected on high grain and straw yields. These results are in the same line with these obtained by Chen et al. (2019).

Table 8: Effect of land levelling and method of urea application on grain, straw yield (t/ha) and field water use efficiency during the two seasons.

Characters	Gran yield t ha^{-1}		Straw yield t ha^{-1}		WP kg gain m^3 water	
Treatments	2020	2021	2020	2021	2020	2021
land levelling (L)						
L1(Control)	8.05 b	9.06 b	9.03 b	10.03 b	0.89 a	0.901 a
L2	8.81 a	9.81 a	9.84 a	10.84 a	0.897 a	0.908 a
L3	9.21 a	10.21 a	10.28 a	11.29 a	0.897 a	0.904 a
Nitrogen fertilizer application (N)						
N1 (Control)	9.40 a	10.40 a	10.54 a	11.54 a	0.891 b	0.9 b
N2	8.64 b	9.64 b	9.64 b	10.64 b	0.897 a	0.907 a
N3	8.03 c	9.03 c	8.97 c	9.97 c	0.896 ab	0.907 a
F test	**	**	**	**	**	**
Interaction						
L×N	NS	NS	NS	NS	NS	NS

NS = P > 0.05; * = P < 0.05; ** = P < 0.01

Also, urea application method showed clear effect on productivity of irrigation water witch indicated significant effect the two seasons. Generally, the interaction between land levelling and urea application methods showed no significant effect on the abovementioned studied parameters in the two seasons. These results are in the same line with these given by Anas. et al. (2019).

Presented data in Table 9 showed that, the values of the N%, P% and K% were generally significantly affected by the method of land levelling. Where, the highest values were recorded under lazar land levelling treatment in the two seasons for the abovementioned studied parameters. These results are in some harmony with these reported by Anas et al. (2021).

Regarding the effect of urea application method on the abovementioned studied parameters, the mean of N,P and K% of grain were highly significantly affected by urea application method. The highest values of NPK% of rice grain were recorded under urea plus compost while the lowest one were recorded under control treatment. Generally, The values of N%, P% and K% can be descended in order N3> N2 > N1 in the two growing seasons. Those results are in the same line with these reported by Ofori et al. (2019).

Generally, the interaction between land levelling method and urea application method has insignificant effect on the studied parameters in the terms of NPK% in rice grains in the two seasons. These results are in a great agreement with these given by Hasan, (2013).

Table 9: Effect of land levelling and method of urea application on nitrogen%, phosphorus % and potassium% of rice grain in the two seasons.

Characters	N %		P%		K%	
Treatments	2020	2021	2020	2021	2020	2021
land leveling (L)						
L1(Control)	1.37 b	1.39 ab	0.35 b	0.35 b	0.27 a	0.25 a
L2	1.38 a	1.38 b	0.36 a	0.35 b	0.27 b	0.25 a
L3	1.38 a	1.40 a	0.36 a	0.36 a	0.27 b	0.25 a
F test	**	**	**	**	**	**
Nitrogen fertilizer application (N)						
N1 (Control)	1.36 c	1.37 c	0.35 c	0.34 b	0.26 c	0.25 c
N2	1.38 b	1.40 b	0.36 a	0.36 a	0.27 b	0.25 b
N3	1.39 a	1.41 a	0.35 b	0.36 a	0.27 a	0.26 a
F test	**	**	**	**	**	**
Interaction						
L×N	NS	NS	NS	NS	NS	NS

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تأثير معاملات اضافة اشكال مختلفة من اليوريا و التسوية المختلفة علي صفات التربة الملحية و انتاجية الارز

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الملخص العربى

أجريت تجربة حقلية خلال موسمي زراعة الارز2020و 2021. في منطقة شمال الدلتا بالحامول بمحافظة كفر الشيخ تحت ظروف الارض المتأثرة بالملوحة والمروية بمياه الصرف المالحة. وكان الهدف من الدراسة هو دراسة تأثير معاملات التسوية المختلفة للأرض حيث كانت المعاملات هي التسوية الرطبة (L1) ، والتسوية التقليدية (L2) والتسوية الميتة (بالليزر) (L3) ومعاملات اليوريا المختلفة وهي (N1) اليوريا ،(N2) اليوريا المغلفة بالكبريت (N3) و اليوريا + كمبوست قش الأرز على ملوحة التربة ، والخصائص الفيزيائية للتربة ، ونمو الأرز ، ومحصول الأرز ومكوناته، وإنتاجية المياه ، والنسبة المئوية لNPK في حبوب الأرز. تم عرض النتائج الرئيسية على النحو التالي. اختلفت تطبيقات تسوية الأراضي المختلفة معنوياً في تأثيرها في جميع العوامل المدروسة المتعلقة بتسوية التربة والنبات التسوية بالليزر. كانت أفضل النتائج لأنه بشكل ملحوظ ، انخفاض مستوى الملوحة ، ونسبة الصوديوم المتبادل مع تحسين الخصائص الفيزيائية للتربة ، وخاصة مفهوم التجميع الذي يعكس نمو أعلى للأرز ، وخصائص المحصول والمحصول بالإضافة إلى إنتاجية المياه و NPK ٪ من حبوب الأرز المختلفة تطبيق أشكال اليوريا بشكل ملحوظ في تأثيره على التربة المدروسة ومعايير النبات خلال المسار الحالي في كلا الموسمين. كان معامل اليوريا مع الكمبوست أفضل أشكال اليوريا حيث عملت علي تحسين جودة التربة وخصوبتها مع إعطاء القيم الأعلى لصفات النمو المدروسة، مكونات المحصول صفة المحصول، وإنتاجية حبوب الأرز وكذلك NPK٪ من حبوب الأرز. اظهرت معاملة اليوريا مع الكمبوست تحسين معنوي و ملحوظ لصفة مجمعات حبيبات التربة بينما لم يكن لها التأثير المعنوي ذاته على بقية الصفات ذات الصلة في كلا الموسمين. أظهر التفاعل تأثيراً معنوياً مع نفس الصفة. يمكن الاستنتاج أن التسوية بالليزر مع اليوريا بالإضافة إلى سماد كمبوست قش الأرز موصى به تحت ظروف الاجهاد الملحي تربة ومياه يؤثر على التربة لضمان ارتفاع محصول حبوب الأرز.

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