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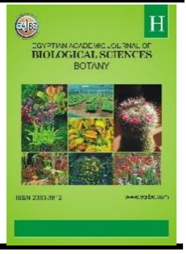

Performance of Barley Under Organic Manure, Salinity Remediator and Selenium as Mitigators To Soil Salinity

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ABSTRACT

The present study was carried out at Exerimpental Farm of Faculty of Agriculture (Saba Basha), Abess Region, Alexandria, Egypt during the two seasons of 2018/2019 and 2019/2020 to alleviate the effect of salinity on barley (*Hordeum vulgare* L. cv. Giza 123) by using organic manure, salinity remediator and selenium. This experiment was conducted in split- split plot system in three replications during the two seasons. The main plots were organic manure (Without application (control), 12 and 24 m^3/ha), the subplot was an application of salinity remediator (control, Agrosol Tonic at the rate of 12 L/ha with the first irrigation, Agrosol Tonic at the rate of 12 L/ha with the second irrigation) and foliar application of selenium (Se) rates (spray water, 5 ppm and 10 ppm) was distributed in a sub-subplot in both seasons. The obtained results showed that increasing organic manure from 0 to 24 m^3 recorded the highest mean values of yield, yield components and protein (%) in grain, increasing application of Agro-Sol Tonic with 2nd irrigation increased yield, yield components and protein (%) in grain and increasing selenium (Se) concentration up to 10 ppm increased these characters of barley. Concerning the first-order interaction, the highest mean values of these traits achieved by “24 m^3 /ha from sheep manure + Agro Sol Tonic application with the 2nd irrigation”; “24 m^3 /ha from sheep manure + 10 ppm selenium concentration”; “Agro Sol Tonic application with the 2nd irrigation + 10 ppm selenium concentration”, while the lowest ones recorded with the control treatments (untreated) in the two seasons. Respecting to the second interaction order, the highest mean values of these traits achieved by 24 m^3 /ha from sheep manure + Agro Sol Tonic application with the 2nd irrigation + 10 ppm selenium concentration under salinity condition, while the lowest ones recorded with the control treatments (untreated) under study conditions at Abess, Alexandria Governorate, Egypt.

INTRODUCTION

Barley (*Hordeum vulgare* L.) is considered one of the most important cereal crops in Egypt. Since early history, it occupied a very important position in the Egyptian cropping

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system for its moderate salt tolerance, and capability for growing in a wide range of environmental stresses including arid, poor, or saline soils (Abd El-Hady, 2007). The area devoted to barley in the world about 47.9 million hectares (ha) with an average yield of about 2.9 t/ha but in Egypt is about 30470 ha with an average yield of about 3.3 t/ha. But in Libya the area for barley reached 136247 ha with an average of about 0.5 t/ha (FAO, 2019).

Organic manures also, catalyzing mitigate the adverse effect of alkalinity which develops due to the use of high RSC irrigation water, by means of increasing aeration, permeability and infiltration rate of soil (Abbas and Fadul, 2013). Application of farmyard manure (FYM) for increasing productivity of crops. FYM has rich in nutrients and can supply all major essential macronutrients for plant development as well as micronutrients. A small portion of its nitrogen is readily available for plant uptake and a large portion is released during and after decomposition (Mwahija, 2015). FYM Application significantly increased the organic matter content in the soil. The organic matter serves as a reservoir of nutrients and water in the soil, helps to reduce compaction and surface crusting, and increases water infiltration into the soil (Schmidt *et al*., 2011). Also, FYM can increase the availability of nutrients for plant uptake, it improves soil physical properties such as structure and water holding capacity and creates a suitable environment for the activity of soil microorganisms (Mwahija, 2015). Jagwe *et al.* (2020) revealed that the application of organic manure increased growth, yield and its component. They indicated that applying organic materials prior to their use as crop fertilizers mends their quality in terms of the macronutrients (N, P, and K). In addition, organic amendments can perform as well as inorganic fertilizers when the essential crop nutrients (N, P, and K) are used at the same rate. For this study, maize yield was significantly increased with the application of fertilizer with no significant differences among the fertilizer treatments.

In response to biotic stress, plants have gradually evolved a complete set of stress able to control ion homeostasis to adapt to salinity stress (Zhu, 2003), whereas osmoprotectants secreted by plant cells protect them against osmotic stress (Zhu, 2002; Sairam and Tyagi, 2004). Plants can adjust osmotic stress by accumulating high concentrations of compatible solutes in the cytoplasm (Wu *et al*., 2013). The application of exogenous compatible solutes has been recommended as an alternative approach to increase crop productivity under saline conditions (Chen and Murata, 2002). Yield components and growth parameters also show differential responses to salinity stress (Taghipour and Salehi 2008). The increase of sodium chloride concentration resulted in the decrease in the number of tillers, length of the spike, number of spikelets/spikes, biomass/plant and grain yield/plant as reported by Ahmad *et al.* (2003) and Kandil *et al*. (2013).

The application of selenium (Se) to plants improves the production and quality of edible plant products, by increasing the antioxidant activity of plants, as shown in tea leaves (Xu et al., 2003) and rice (Xu and Hu, 2004). In wheat plants, nutrient uptake, under salt stress, was better when using selenium by soaking or soaking with a foliar application, but in root, the results were different depending on the concerned nutrient (Nossier *et al*., 2011). This effect of Se could be attributed to its ability to decrease oxygen radicals produced in the presence of salinity stress by increasing the antioxidant enzyme activities that reduce the level of accumulation of reactive oxygen species (ROS) (El-Shalakany *et al*., 2010). Soaked wheat grains in different concentrations of mixtures of selenium and humic acid led to increases in the percentage of germination as well as length both shoot and root along with their dry matter contents, were also favored total soluble sugars. Using mixtures of selenium and humic acid in saline soil led to increased resistance of plants to salinity conditions, therefore decreasing the content of proline compared to control, in case of wheat grains, the treatments also improved the proportion of protein and selenium compared to the control.

Nossier et *al.* (2017). Selenium (Se) is considered to be an essential trace element for humans, animals, and some species of microorganisms. Low concentrations of Se play an important role in antioxidative reactions and hormone balance in plant cells such as enhancing the activity of glutathione peroxidase (GPX) (Filek *et al.*, 2008; Cartes et *al.*, 2010). Some researchers reveal plants supplemented with Se have shown enhanced resistance to certain abiotic stresses including salinity (Djanaguiraman *et al*., 2010). For occurrence, Hawrylak-Nowak (2009) reported that a low level of exogenous Se commonly stimulates growth and photosynthetic pigment accumulation in NaCl-treated cucumber seedlings.

The main objective of this study was to study the role of organic manure, salinity remediator and selenium and their interactions for alleviating the effect of salinity on barley under the study conditions.

MATERIALS AND METHODS

The present study was carried out at Exerimpental Farm of Faculty of Agriculture (Saba Basha), Abess Region, Alexandria, Egypt, during the two seasons of 2018/2019 and 2019/2020 to study the role of organic manure, salinity remediator and selenium and their interactions for alleviating the effect of salinity on the yield of barley (*Hordeum vulgare* L. cv. Giza 123).

The preceding crop was maize in the two seasons. The physical and chemical properties of experimental soil are presented in Table (1) which according to the method described by Page *et al.* (1982).

This experiment was conducted in split- split plot system in three replications during the two seasons. The main plots were organic manure (Without application (control), 12 and 24 m^3/ha), the subplot was an application of salinity remediator (control, Agrosol Tonic at the rate of 12 L/ha with the first irrigation, Agro sol Tonic at the rate of 12 L/ha with the second irrigation) and foliar application of sodium selenite rates (spray water, 5 ppm and 10 ppm) was distributed in a sub-sub plot in both seasons.

Compound of Agrosol Tonic contains 15.0 % carboxylic acid, 10.0 % calcium, amino acids, 2.0% biosac and 5.0 % Seaweeds Extarct,

Organic manure structure was shown in Table (2) which according to the method described by Page *et al.* (1982).

Barley grains at the rate of 120 kg/ha were sown in 15^{th} and 20^{th} November in 2018/2019 and 2019/2020 seasons, respectively. The area of the sub-plot was 10.50 m^2 (3.50 m long and 3.00 m width).

Phosphorus fertilizer was added at a rate of 60 kg P_2O_5/ha in the form of calcium superphosphate applied with soil preparation. Mineral nitrogen fertilizer at 168 kg N/ha was in the form of urea (46 % N) applied at two doses the first dose was 112 kg N/ha applied with soil preparation, while the second dose was 56 kg N/ha applied with the first irrigation and K fertilizer was added at a rate of 60 kg K_2O/ha in form potassium sulphate applied soil preparation and all the other cultural practices were followed as Ministry of Agriculture and Land Reclamation recommendations.

At harvest time, plant height (cm), number of spikes/m^2, number of grains/spikes, number of spikelets/spikes, 1000- grain weight (g) grain yield (t/ha), straw yield (t/ha), biological yield (t/ha), harvest index (%), and grain protein content (%) of barley (*Hordeum vulgare* L.) were recorded in both seasons**.**

Protein percentage was determined by estimating the total nitrogen in the grains and multiplied by 5.75 to obtain the percentage according to the method described by AOAC (1995).

All collected data were subjected to analysis of variance according to Gomez and Gomez (1984). All statistical analysis was performed using analysis of variance technique by means of CoStat (2005) computer software package.

Table 1. Physical and chemical properties of experimental soil in both seasons.

Soil properties	Season	
	2018/2019	2019/2020
A) Mechanical analysis:		
Clay %	40.00	38.00
Silt %	29.00	31.00
Sand %	31.00	31.00
Soil texture	Clay loam soil	
B) Chemical properties		
pH (1 : 1)	8.00	8.10
Ec (dS/m)	4.00	4.05
1) Soluble cations (1:2) (cmol/kg soil)		
K^+	1.53	1.54
Ca^{++}	9.30	9.10
Mg^{++}	10.30	12.00
Na^+	11.50	10.60
2) Soluble anions (1 : 2) (cmol/kg soil)		
$CO_3^{--} + HCO_3^-$	2.80	2.70
Cl^-	16.40	17.00
SO_4^{--}	11.60	11.50
Calcium carbonate (%)	5.50	6.10
Total nitrogen %	1.10	0.92
Available phosphate (mg/kg)	3.10	3.20
Organic matter (%)	1.52	1.61

From the soil properties in Table (1), soil classified as soil affected by salinity.

Table 2. Composition of Sheep organic manure (OM) as a farmyard manure (FYM).

Properties	FYM
Moisture (%)	20.00
Organic matter (%)	33.30
Total N (%)	1.90
Total P (%)	1.01
Total K (%)	1.99
p^H	6.70
EC	1.40
Fe (ppm)	17.90
Zn (ppm)	19.00
Mn (ppm)	19.00
Cu (ppm)	12.50
C/N ratio	17.5

RESULTS

The results in Tables (3 and 4) showed the effect of organic manure, Agro Sol Tonic, selenium rates and their interaction on plant height, number of spikes/m^2, number of spikletes/spike, number of grains/spikes, 1000- grain weight, grain yield, straw yield, biological yield, harvest index (HI%) and grain protein content (%) of barley (*Hordeum vulgare* L. cv. Giza 123) during 2018/2019 and 2019/2020 seasons.

The obtained results in Tables (3 and 4) showed that application of organic manure (sheep manure) significantly affected plant height, number of spikes/m^2, number of spikletes/spike, number of grains/spike, 1000- grain weight, grain yield, straw yield, biological yield, harvest index (HI%) and grain protein content (%) of barley, whereas increasing organic manure from 0 to 10 m^3 recorded the highest mean values of these traits, while the control treatment (untreated= 0 organic manure) gave the lowest ones in both seasons. The increase of these characters may be due to the role of organic manure for the physiological and productivity of barley. These findings are in the same line with those obtained by Rudrappa *et al.* (2006), Schmidt *et al*. (2011); Gomaa *et al*. (2015); Gomaa *et al*. (2020); Kandil *et al.* (2020) they reported that organic manure had a vital role for improving soil properties, increasing essential macronutrients, increasing micronutrients availability, and increasing crop yield.

Concerning the effect of AgroSol Toinc to alleviate the soil salinity effect, the results in Tables (3 and 4) showed that increasing application of Agro-Sol Toinc with 2nd irrigation increased plant height, number of spikes/m^2, number of spikletes/spike, number of grains/spike, 1000- grain weight, grain yield, straw yield, biological yield, harvest index (HI%) and grain protein content (%) followed the application of Agro-Sol Toinc with 2nd irrigation as compared with the control treatment which gave the lowest ones in both seasons. These results cleared by Watanabe *et al*. (2006) who reported that 100 mg/L of the keto-amino acid, 5-aminolevulinic acid (ALA) enhanced the growth and photosynthesis of grapevines, Also, they indicated that application of the ALA at low concentrations increased the growth over the control on kidney bean, barley, potato and garlic plants. They assumed that the higher production was related to photosynthetic rate increases and CO_2 fixation and reduced release of CO_2 in darkness. Also, Zhang *et al*. (2006) indicated that ALA improved salt tolerance in rice and potato. This compound, therefore, appears to play as a hormone-like plant growth regulator, which is effective at relatively low concentrations (10–100 mg/L). Moreover, Xu *et al.*, 2010 found that the application of ALA increased the growth of kudzu plant through increasing photosynthetic rate and stomatal conductivity.

Results in Tables (3 and 4) showed that increasing selenium (Se) concentration up to 10 ppm increased plant height, number of spikes/m^2, number of spikletes/spike, number of grains/spikes, 1000- grain weight, grain yield, straw yield, biological yield, harvest index (HI%) and grain protein content (%) as compared with the control treatment which gave the lowest ones in both seasons. These results are in harmony with those indicated by Xu *et al*. (2003); Xu and Hu, (2004), Nossier *et al*. (2011); El-Shalakany *et al*. (2010); Nossier *et al*. (2017) they reported that selenium could be increased growth and yield of crops under salinity conditions.

Also, data in Tables (3 and 4) showed the significant interaction effect in both seasons on plant height, number of spikes/m^2, number of spikletes/spike, number of grains/spikes, and 1000- grain weight (not presented data) and grain yield, straw yield, biological yield, harvest index (HI%) and grain protein content (%) as shown in Table (5)

Table 3. Plant height, number of spikes/m^2, number of spikletes/spike, number of grains/spikes, 1000- grain weight of barley (*Hordeum vulgare* L. cv. Giza 123) as affected by organic manure, Agro Sol, selenium rates and their interaction in both seasons.

Treatment	Plant height		Number of spikes/m^2		Number of spikletes/spike		Number of grains/spike		1000- grain weight	
	Seasons									
	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020
A- Organic manure (Sheep manure) m^3/ha										
0	75.42	82.99	260.56	286.62	41.98	46.18	31.76	34.93	31.99	35.19
12	79.80	87.78	285.07	313.63	48.31	53.15	34.79	38.27	37.08	40.79
24	89.85	98.87	311.48	342.63	52.66	57.93	40.84	44.93	41.83	46.01
LSD at 0.05 (A)	2.28	2.45	1.35	1.48	3.04	3.34	2.80	3.07	0.37	0.41
B- Agro Sol Tonic application (12 L/ha)										
Untreated	77.15	84.86	259.24	285.17	44.12	48.53	31.29	34.43	34.23	37.65
With the 1st irrigation	80.73	88.80	284.07	312.48	47.63	52.39	36.04	39.65	36.86	40.55
With the 2nd irrigation	87.20	95.97	313.80	345.18	51.21	56.34	40.05	44.06	39.80	43.78
LSD at 0.05 (B)	1.21	1.32	3.62	3.99	0.36	0.39	1.85	2.03	0.42	0.46
C- Selenium concentration (Se ppm)										
Spray water (control)	73.27	80.60	256.18	281.80	42.73	47.00	32.25	35.47	34.78	38.26
5	81.39	89.55	284.65	313.11	47.48	52.23	35.81	39.39	36.96	40.66
10	90.42	99.49	316.28	347.91	52.75	58.03	39.33	43.27	39.16	43.07
LSD at 0.05 (C)	0.23	0.21	0.19	0.21	0.07	0.07	0.68	0.74	0.17	0.19
Interaction										
A x B	*	*	*	*	*	*	*	*	*	*
A x C	*	*	*	*	*	*	*	*	*	*
B x C	*	*	*	*	*	*	*	*	*	*
A x B x C	*	*	*	*	*	*	*	*	*	*

*: significant difference at 0.05 level of probability.

Table 4. Grain yield, straw yield, biological yield, harvest index (HI) and grain protein content of barley (*Hordeum vulgare* L. cv. Giza 123) as affected by organic manure, Agro Sol, selenium rates and their interaction in both seasons.

Treatments	Grain yield (t/ha)		Straw yield (t/ha)		Biological yield (t/ha)		Harvest index (HI)		Grain protein (%)	
	Seasons									
	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020
A- Organic manure (Sheep manure) m^3/ha										
0	3.01	3.51	4.38	4.92	7.39	8.43	40.73	41.64	8.71	9.59
12	3.58	4.14	5.36	5.85	8.94	9.99	40.04	41.44	9.17	10.08
24	4.53	5.18	6.16	6.80	10.69	11.98	42.38	43.24	9.67	10.63
LSD at 0.05 (A)	0.12	0.14	0.26	0.36	0.14	0.23	1.20	1.00	0.07	0.08
B- Agro Sol Tonic application (12 L/ha)										
Untreated	3.08	3.58	4.87	5.30	7.95	8.88	38.74	40.32	8.51	9.36
With the 1st irrigation	3.74	4.32	5.25	5.89	8.99	10.21	41.60	42.31	9.17	10.09
With the 2nd irrigation	4.30	4.93	5.77	6.38	10.07	11.31	42.70	43.59	9.87	10.85
LSD at 0.05 (B)	0.07	0.08	0.11	0.20	0.11	0.19	0.54	0.82	0.05	0.05
C- Selenium concentration (Se ppm)										
Spray water	3.13	3.65	4.65	5.19	7.78	8.84	40.23	41.29	8.43	9.27
5	3.71	4.29	5.31	5.85	9.02	10.14	41.13	42.31	9.16	10.08
10	4.27	4.90	5.94	6.54	10.21	11.44	41.82	42.83	9.96	10.96
LSD at 0.05 (C)	0.01	0.02	0.05	0.13	0.05	0.14	0.21	0.44	0.01	0.01
Interaction										
A x B	*	*	*	*	*	*	*	*	*	*
A x C	*	*	*	*	*	*	*	*	*	*
B x C	*	*	*	*	*	*	*	*	*	*
A x B x C	*	*	*	*	*	*	*	*	*	*

* : significant difference at 0.05 level of probability.

The results in Table (5) showed that the first order of interaction effect between 'organic manure x AgroSol', 'organic manure x selenium' and 'AgroSol x selenium' significantly affected grain yield, straw yield, biological yield, harvest index (HI) and grain protein content of barley in both seasons 2018/2019 and 2019/2020, where the highest mean values of these traits achieved by "24 m^3 /ha from sheep manure + Agro Sol Tonic application with the 2nd irrigation"; "24 m^3 /ha from sheep manure + 10 ppm selenium concentration"; "Agro Sol Tonic application with the 2nd irrigation + 10 ppm selenium concentration", while the lowest ones recorded with the control treatments (untreated) in both seasons**.**

Table 5. Interactions effect between 'organic manure x AgroSol', 'organic manure x selenium' and 'AgroSol x selenium' of grain yield, straw yield, biological yield, harvest index (HI) and grain protein content of barley (*Hordeum vulgare* L. cv. Giza 123) in both seasons.

Treatments		Grain yield (t/ha)		Straw yield (t/ha)		Biological yield (t/ha)		Harvest index (HI %)		Grain protein (%)	
		2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020
Organic manure (A) m^3/ha	Agro Sol (B) ppm	A x B									
0	Untreated	2.77	3.24	3.62	4.06	6.39	7.30	43.35	44.38	8.09	8.89
	With the 1st irrigation	2.97	3.47	4.48	5.09	7.45	8.56	39.87	40.54	8.71	9.58
	With the 2nd irrigation	3.28	3.81	5.04	5.60	8.32	9.41	39.42	40.49	9.35	10.29
12	Untreated	2.87	3.36	5.00	5.29	7.87	8.65	36.47	38.84	8.47	9.31
	With the 1st irrigation	3.56	4.12	5.40	5.98	8.96	10.10	39.73	40.79	9.17	10.08
	With the 2nd irrigation	4.31	4.94	5.69	6.29	10.00	11.23	43.10	43.99	9.87	10.86
24	Untreated	3.59	4.15	5.99	6.54	9.58	10.69	37.47	38.82	8.99	9.89
	With the 1st irrigation	4.69	5.36	5.88	6.59	10.57	11.95	44.37	44.85	9.64	10.60
	With the 2nd irrigation	5.31	6.04	6.60	7.26	11.91	13.30	44.58	45.41	10.38	11.41
LSD at 0.05 (A x B)		0.12	0.13	0.19	0.35	0.19	0.33	0.93	1.44	0.09	0.09
Organic manure (A)	Selenium (C) ppm	A x C									
0	0	2.49	2.94	3.81	4.31	6.30	7.25	39.52	40.55	8.00	8.80
	5	2.99	3.49	4.43	4.91	7.42	8.40	40.30	41.55	8.70	9.57
	10	3.54	4.10	4.90	5.53	8.44	9.63	41.94	42.58	9.45	10.40
12	0	3.02	3.52	4.68	5.05	7.70	8.57	39.22	41.07	8.41	9.25
	5	3.58	4.14	5.42	5.94	9.00	10.08	39.78	41.07	9.14	10.05
	10	4.15	4.76	5.99	6.58	10.14	11.34	40.93	41.98	9.95	10.95
24	0	3.89	4.48	5.47	6.20	9.36	10.68	41.56	41.95	8.87	9.76
	5	4.58	5.23	6.08	6.69	10.66	11.92	42.96	43.88	9.65	10.62
	10	5.12	5.84	6.92	7.51	12.04	13.35	42.52	43.75	10.48	11.53
LSD at 0.05 (A x C)		0.03	0.03	0.09	0.23	0.09	0.23	0.37	0.77	0.02	0.02
Agro Sol (B) ppm	Selenium (C) ppm	B x C									
Untreated	0	2.56	3.01	4.29	4.53	6.85	7.54	37.37	39.92	7.81	8.59
	5	3.09	3.60	4.86	5.29	7.95	8.89	38.87	40.49	8.49	9.34
	10	3.58	4.14	5.48	6.07	9.06	10.21	39.51	40.55	9.24	10.16
With the 1st irrigation	0	3.16	3.67	4.60	5.31	7.76	8.98	40.72	40.87	8.41	9.25
	5	3.74	4.31	5.29	5.84	9.03	10.15	41.42	42.46	9.15	10.07
	10	4.33	4.96	5.88	6.52	10.21	11.48	42.41	43.21	9.95	10.95
With the 2nd irrigation	0	3.68	4.25	5.08	5.71	8.76	9.96	42.01	42.67	9.06	9.96
	5	4.31	4.94	5.79	6.41	10.10	11.35	42.67	4.31	9.85	10.83
	10	6.90	7.60	8.46	9.03	15.36	16.91	44.92	44.94	10.70	11.77
LSD at 0.05 (B x C)		0.03	0.12	0.09	0.23	0.09	0.23	0.37	0.76	0.02	0.02

The results in Table (6) showed that the second-order of an interaction effect between of 'organic manure x AgroSol Tonic x selenium' significantly affected grain yield, straw yield, biological yield, harvest index (HI) and grain protein content of barley in 2018/2019 and 2019/2020 seasons, where the highest mean values of these traits achieved by 24 m^3/ha from sheep manure + Agro Sol Tonic application with the 2nd irrigation + 10 ppm selenium concentration under salinity condition, while the lowest ones recorded with the control treatments (untreated) in both seasons**.**

Table 6. Interaction effect between organic manure, Agrosol Tonic and selenium (Se) of grain yield, straw yield, biological yield, harvest index (HI) and grain protein content of barley (*Hordeum vulgare* L. cv. Giza 123) in both seasons.

Treatments			Grain yield (t/ha)		Straw yield (t/ha)		Biological yield (t/ha)		Harvest index (HI %)		Grain protein (%)	
Organic manure m^3/ha (A)	Agro sol Tonic (B)	Se (C) in ppm	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020
0	Untreated	0	2.27	2.70	3.15	3.44	5.42	6.14	41.88	43.97	7.42	8.16
		5	2.75	3.23	3.61	3.97	6.36	7.20	43.24	44.86	8.06	8.87
		10	3.28	3.80	4.10	4.76	7.38	8.56	44.44	44.39	8.77	9.65
	With the 1st irrigation	0	2.46	2.91	3.89	4.53	6.35	7.44	38.74	39.11	8.00	8.80
		5	2.96	3.45	4.55	5.10	7.51	8.55	39.41	40.35	8.69	9.56
		10	3.51	4.06	5.00	5.65	8.51	9.71	41.25	41.81	9.44	10.38
	With the 2nd irrigation	0	2.74	3.21	4.39	4.97	7.13	8.18	38.43	39.24	8.58	9.44
		5	3.25	3.78	5.11	5.67	8.36	9.45	38.88	40.00	9.33	10.27
		10	3.84	4.43	5.61	6.17	9.45	10.60	40.63	41.79	10.15	11.16
12	Untreated	0	2.37	2.81	4.37	4.37	6.74	7.18	35.16	39.14	7.77	8.55
		5	2.86	3.34	5.07	5.41	7.93	8.75	36.07	38.17	8.44	9.28
		10	3.39	3.94	5.57	6.10	8.96	10.04	37.83	39.24	9.19	10.11
	With the 1st irrigation	0	2.99	3.49	4.72	5.29	7.71	8.78	38.78	39.75	8.40	9.23
		5	3.54	4.10	5.48	6.14	9.02	10.24	39.25	40.04	9.15	10.06
		10	4.16	4.78	5.99	6.53	10.15	11.31	40.99	42.26	9.96	10.95
	With the 2nd irrigation	0	3.70	4.27	4.95	5.49	8.65	9.76	42.77	43.75	9.06	9.97
		5	4.34	4.97	5.72	6.26	10.06	11.23	43.14	44.26	9.83	10.82
		10	4.89	5.58	6.39	7.11	11.28	12.69	43.35	43.97	10.71	11.78
24	Untreated	0	3.03	3.53	5.34	5.80	8.37	9.33	36.20	37.83	8.25	9.08
		5	3.66	4.23	5.89	6.49	9.55	10.72	38.32	39.46	8.96	9.85
		10	4.08	4.69	6.75	7.33	10.83	12.02	37.67	39.02	9.75	10.73
	With the 1st irrigation	0	4.03	4.63	5.18	6.13	9.21	10.76	43.76	43.03	8.83	9.72
		5	4.73	5.40	5.84	6.28	10.57	11.68	44.75	46.23	9.63	10.59
		10	5.31	6.05	6.63	7.37	11.94	13.42	44.47	45.08	10.46	11.50
	With the 2nd irrigation	0	4.61	5.27	5.88	6.68	10.49	11.95	43.95	44.10	9.52	10.47
		5	5.34	6.07	6.52	7.29	11.86	13.36	45.03	45.43	10.38	11.41
		10	5.98	6.79	7.39	7.82	13.37	14.61	44.73	46.48	11.23	12.36
LSD at 0.05 (ABC)			0.4	0.21	0.16	0.40	0.15	0.41	0.64	1.32	0.03	0.03

CONCLUSION:

As a result of these two seasons field's study, it was concluded that yield, its components and grain protein (%) of barley increased with planting barley (*Hordeum vulgare* L. cv. Giza 123) under the rate of 24 m^3/ha from sheep manure + Agro Sol Tonic application with the 2nd irrigation + foliar application at the rate of 10 ppm selenium (Se) during two times (45 and 75 days after sowing) under salinity condition at Abess Region, Alexandria Governorate, Egypt and the similar regions.

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ARABIC SUMMARY

أداء الشعير تحت السماد العضوي ومعالج الملوحة والسيلينيوم كمخففات لملوحة التربة

محمود عبد العزيز جمعة[1] ، ابراهيم عباس السيد ابراهيم[1] ، عصام إسماعيل قنديل[1] ، محمد عبد الله امحمد حسين [2]

1- قسم الأنتاج النباتي – كلية الزراعة – سابا باشا – جامعة الأسكندرية
2- قسم الأنتاج النباتي – كلية الزراعة – جامعة سرت – ليبيا
-3

أقيمت تجربتان حقليتان في أبيس – محافظة الأسكندرية – بمزرعة كلية الزراعة سابا باشا – جامعة الأسكندرية خلال موسمي زراعة 2019/2018 و 2020/2019 لدراسة تأثير السماد العضوي (الغنم) واضافة معالج الملوحة والرش الورقي بالسيلينيوم والتداخل بينهما على نمو وانتاجية وجودة محصول الشعير صنف جيزة 123 تحت ظروف الأراضي المتأثرة بالملوحة. ونفذت التجارب في التصميم التجريبي القطع المنشقة مرتين split split plot desing وزعت المعاملات كالتالي :

1. القطع الرئيسية :- السماد العضوي (مخلفات غنم) وهي (مقارنة - 5م^3 – 10 م^3 سماد عضوي للفدان) .
2.القطع الشقية الأولي :- معالج الملوحة (أجرو سول تونيك) وهي (مقارنة – 3 لتر/فدان مع الرية الأولى - 3 لتر/فدان مع الرية الثانية).
3. القطع الشقية الثانية الرش الورقي بالسيلينيوم Sodium selenite (مرتين في عمر 45 ؛75 يوم من الزراعة) وهي (مقارنة - الرش بتركيز 5 جزء في المليون - الرش بتركيز 10 جزء في المليون).

ولخصت أهم النتائج فيما يلي:

- أثرت معاملات السماد العضوي (سماد الغنم) تأثيراً معنوياً على الصفات المدروسة مثل ارتفاع النبات وعدد السنابل في المتر المربع وعد السنيبلات للسنبلة وعدد الحبوب للسنبلة ووزن 1000 حبة ومحصول الحبوب ومحصول القش والمحصول البيولوجي ونسبة البروتين في الحبوب حيث وجد أن معدل 10 م^3 من سماد الغنم حقق أعلى القيم لهذه الصفات في حين أن عدم إضافة السماد العضوي (الكنترول) أعطت أقل القيم للصفات المدروسة خلال موسمي الزراعة.
- أثرت معاملات إضافة معالج الملوحة (أجرو سول تونيك) معنوياً في الصفات المدروسة مثل ارتفاع النبات وعدد السنابل في المتر المربع وعد السنيبلات للسنبلة وعدد الحبوب للسنبلة ووزن 1000 حبة ومحصول الحبوب ومحصول القش والمحصول البيولوجي ونسبة البروتين في الحبوب حيث حقق معدل إضافة 3 لتر من معالج الملوحة مع مياه الري وفي الرية الثانية أعلى قيم لها متبوعاً بالإضافة مع الرية الثانية في حين ان عدم الاضافة (الكنترول) اعطى أقل القيم خلال موسمي الدراسة.
- أثرت معاملات الرش الورقي بالسيلينيوم تأثيراً معنوياً على ارتفاع النبات وعدد السنابل في المتر المربع وعد السنيبلات للسنبلة وعدد الحبوب للسنبلة ووزن 1000 حبة ومحصول الحبوب ومحصول القش والمحصول البيولوجي ونسبة البروتين في الحبوب حيث وجد أن معدل 10 جزء في المليون من السيلينيوم حقق أعلى القيم لهذه الصفات في حين أن عدم الرش بالماء (الكنترول) أعطت أقل القيم للصفات المدروسة خلال موسمي الزراعة.
- كان التداخل بين (معدلات السماد العضوي ومعالج الملوحة) في جميع الصفات المدروسة حيث حقق (معدل 10 م^3 من سماد الغنم + إضافة 3 لتر من معالج الملوحة مع مياه الري وفي الري الثانية) و (10 م^3 من سماد الغنم + معدل 10 جزء في المليون من السيلينيوم) و(إضافة 3 لتر من معالج الملوحة مع مياه الري وفي الريه الثانية + معدل 10 جزء في المليون من السيلينيوم) وأيضاً (إضافة معدل 10 م^3 من سماد الغنم + إضافة 3 لتر من معالج الملوحة مع مياه الري في الريه الثانية + معدل 10 جزء في المليون من السيلينيوم) حققت هذا التوليفة أعلى قيم للمحصول ومكوناته ومحتوى الحبوب من البروتين مقارنة بمعاملات الكنترول في موسمي الدراسة.

التوصية: تحت ظروف الدراسة بمنطقة ابيس – محافظة الأسكندرية في جمهورية مصر العربية ومن النتائج المتحصل عليها وجد أن زراعة الشعير (صنف جيزة 123) مع إضافة معدل 10 م^3 من سماد الغنم أثناء تجهيز الأرض + إضافة 3 لتر من معالج الملوحة مع مياه الري وفي الرية الثانية + الرش الورقي بمعدل 10 جزء في المليون من السيلينيوم مرتين بعد 45 و 75 من الزراعة) هذه التوليفة حققت أعلى قيم للمحصول ومكوناته ومحتوى الحبوب من البروتين تحت ظروف ملوحة التربة في منطقة أبيس – محافظة الأسكندرية والمناطق المماثلة.