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Effect of Salicylic, Humic and Fulvic Acids Application on The Growth, Productivity and Elements Contents of Two Wheat Varieties Grown Under Salt Stress

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ABSTRACT

A field experiment was carried out at the farm of El-Nubaria Agricultural Research Station, Behaira Governorate, Agric. Res. Center, and Ministry of Agriculture and land Reclamation, Egypt. During 2016/2017 and 2017/2018 winter seasons to evaluate the effect of salicylic, humic and fulvic acids application on growth, productivity and mineral contents of two wheat (*Triticum aestivum* L.) varieties grown under salt-affected soil conditions in the Nubaria region. The experimental design was split plot with three replicates. Main treatments were two different wheat cultivars (Sids 12 and Sakha 94) while sub-main plot was control, Potassium fulvate as foliar application (1 kg fed^{-1}), Salicylic acid as foliar application (1.600 kg fed^{-1}), Potassium humate as foliar application (1 kg fed^{-1}), Potassium fulvate (1 kg fed^{-1}) + Salicylic acid (1.600 kg fed^{-1}) + Potassium humate (1 kg fed^{-1}) as foliar application, Potassium fulvate as soil application (2 kg fed^{-1}), Salicylic acid as soil application (3.200 kg fed^{-1}), Potassium humate as soil application (2 kg fed^{-1}) and Potassium fulvate (2 kg fed^{-1}) + salicylic acid (3.200 kg fed^{-1}) + Potassium humate (2 kg fed^{-1}) as soil application. The obtained results showed that Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the best means of all Studied traits; namely, plant height, grains weight, weight 1000 grains, grain yield, macronutrients in straw**,** secondary elements in straw**,** micronutrients in straw, elements in grains, protein in grains, micronutrients in grains, element in soil, Nutrient Use Efficiency and Agronomic Efficiency compared with the control and with foliar application of organic acid under salinity stress. In addition, results showed that Sids 12 was the best and more tolerant in the most studies traits under salinity stress compared with Sakha 94 cultivar.

Keywords: Salicylic acid, Potassium humate, Potassium fulvate, Wheat and Salinity

INTRODUCTION

Soil salinity is a global problem that negatively affects 20 % of irrigated land and reduces crop yields (Qadir *et al*., 2014). Soil salinity is a threat that affects agricultural soils and turns these soils into low yielding soils and interferes with the normal growth of crops (Suhaib *et al*., 2018). Salt stress is the most serious factor affecting crop development and production in arid regions, and about 23% of the world's cultivated soil is saline (Jouyban, 2012). Salinity is an environmental stress that negatively affects plant growth and metabolism (Munns, 2005).

Wheat (*Triticum aestivum* L.) is considered one of the most important cereal crops in the world and in Egypt. The quantity demanded of it is greater than that produced locally. The total area planted with wheat in Egypt was about 1.425 million hectares and the total production exceeded 9.279 million tons with an average of 6.511 tons $hectare^{-1}$ (FAO, 2016). Moreover, wheat grains contain protein (6-21 %), fats (1.5-2.0%), cellulose (2.0-2.5%), minerals (1.8%) and vitamins (Malav *et al*., 2017).

Biostimulants are loosely defined as organic materials that are applied to improve nutrient absorption, stimulate growth, and enhance stress tolerance or crop quality (Van Oosten *et al*., 2017). Fulvic acid is a bio-product of humic acid. Humic acid is extracted from any material that contains well decomposed organic matter soil, coal and composts. Humic substances are decomposed by live microbes. Fulvic acid is low molecular weight and highly bioactive. It has the necessity and ability to easily bind minerals and elements in its molecular structure causing them to dissolve and a plant growth regulator that can dissolve in acids, alkalis and water. Humic is easy to be absorbed by plants with high chemical and biological activity (Justi *et al*., 2019). Liquid FA increases nutrient availability and influences on chemical, biological, and physical properties of Aridisol soils (Sootahar *et al*., 2020). In addition, Fulvic acid is an organic fertilizer, a non-toxic mineral chelating additive and a water binder that increases its uptake through the leaves and stimulates the plant. It attracts water molecules, keeps the soil moist and helps in the movement of nutrients to the roots of the plant (Malan, 2015). Fulvic acid has the characteristics of increasing fertilizer using, improving soil properties, promoting crop growth and improving drought resistance, which is wildly used in wheat (De Pascale *et al*., 2017). Fulvic acid had a higher oxygen content and lower molecular weight of a few hundred daltons and can pass through micro-pores of biological or synthetic membrane systems while humic cannot (Bulgari *et al*., 2015). Fulvic have greater overall acidity, number of carboxyl groups, higher absorption and

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cation exchange capacities than humic acid, and may play a role as natural chelators in the mobilization and transport of micronutrients of (Bocanegra *et al.*, 2006).

Humic acid is a biostimulant that is derived from leonardite shale and among the most concentrated organic materials available. Elemental analysis of humic acid has shown it to consist largely of C (50 %), O (40 %), H (5%), N (3%), P and S both less than (1%). It increases the absorption of nutrients, drought tolerance drought, seed germination, increases microbial activity in the soil and makes it an excellent root stimulator. It helps to aerate the soil from the inside. It also helps to lower the soil's pH relatively and drives high levels of salts out of the root zone, all of which will help promote better plant health and growth (Vrain, 2004). Also, Jindo *et al.* (2020) show that humic substances originally applied from waste as a biostimulant for plant growth is a beneficial and environmentally friendly approach, and fits with the concept of a circular economy that focuses on switching to a new resource. The anatomical and biochemical changes of the plant in the root system by humus are the main factors responsible for increasing nutrient availability through chelation, another contribution of humic substances to plant growth. Tahir *et al.* (2011) noted that humic acid is a fairly stable product of decomposing organic matter that subsequently accumulates in ecosystems, and promotes plant growth by extracting unavailable nutrients and reducing pH. Humic substances comprise about 60% of the organic compounds in the soil; these compounds are an essential component of the agro-ecosystem and are responsible for many chemical and complex reactions in the soil (Gerke, 2018). In the presence of carboxyl and phenol groups, these organic complexes affect the properties of the soil and the physiological properties of plants (Malan, 2015). Also, Nossier *et al.* (2017) revealed that the use of humic acid in saline soils led to an increase in the plants' resistance to salinity conditions. Potassium humate is an effective fertilizer that positively affects the growth, yield and chemical components of wheat plants (Kandil *et al*., 2016).

Salicylic acid is a plant phenolic compound, now consider a hormone-like endogenous regulator, and there is significant interest in elucidating its role in defense mechanisms againt biotic and abiotic stressors. (Erdal *et al*., 2011). Foliar application of wheat cultivars containing salicylic acid stimulates the growth of wheat plants by enhancing the biosynthesis of wheat growth photo pigments. (Mohammadi *et al*., 2013). In addition, Yavas and Unay (2016) noted that SA could be used to improve wheat growth under stress. SA has protective effects on plants against salinity (Azooz *et al*. 2011). EL-Nasharty *et al.* (2019) shown that salicylic acid reduced the effects of salinity stress induced damage in both wheat cultivars, especially the two more salt sensitive cultivars, by increasing growth and protecting the protein from breakdown by free radicals. In general, it can be suggested that foliar application of salicylic acid is an effective strategy to improve wheat yield under salinity stress especially for salinity sensitive cultivars. The objective of this study was to investigation the effect of salicylic, humic and fulvic acids application on the growth, productivity and elements contents of two wheat varieties grown under salt stress in calcareous soil conditions.

MATERIALS AND METHODS

Field experiment was carried out at the research farm of El-Nubaria Agricultural Research Station, Behaira Governorate, Agric. Res. Center, Ministry of Agriculture and land Reclamation, Egypt. During 2016/2017 and 2017/2018 winter growing seasons to evaluate the effect of salicylic, humic and fulvic acids application on the growth, productivity and mineral contents of wheat (*Triticum aestivum* L.) varieties grown under calcareous salt affected soil conditions in the Nubaria region. The geographical situation features of the farm is 30º 90´ N, 29° 96´ E, with altitude of 25 m above sea level. The soil samples (0-30cm) were collected and analyzed according to the methods described by Page *et al.* (1982) and FAO (1970) for soil physical and chemical properties (Table 1). Total nitrogen in soil was determined according to the method the digest was distilled by micro-kjeldahl described by Bremner and Mulvaney (1982). The amount of available phosphorus in soil was determined by the method outlined by Olsen *et al*. (1954) and the concentration of P was measured colorimetrically using ascorbic (Olsen and Watanabe, 1965). The concentration of K and Na were measured by flame photometer (Black, 1965). The amounts of available Fe, Zn, Mn and Cu were determined by extracting the soil with DTPA solution according to Lindsay and Norverll (1978).

Table 1. The main physical and chemical analysis of the experimental soil for the two experimental seasons.

Particle size distribution			Soil texture	pH	EC dS/m	O.M %	CaCO3 %	Available nutrients (mg/kg)							
Sand %	Silt %	Clay%						N	P	K	Na	Fe	Zn	Mn	Cu
50	20	30	Sandy clay loam	8.0	10.87	0.8	31.2	40	4	200	360	5	2.8	2.9	1.8

Experimental layout:

The experimental design was split plot with three replicates. The total numbers of experimental plots were 54 plots (plot area was 10.5 m^2). Main plots treatments were two wheat cultivars Sids 12 and Sakha 94 while sub-main plots were as follows:

1- Control
2- Potassium fulvate (K.F) as foliar application (1 kg fed^{-1})
3- Salicylic acid (S.A) as foliar application (1.600 kg fed^{-1})
4- Potassium humate (K.H) as foliar application (1 kg fed^{-1})
5- Potassium fulvate (K.F) 1 kg fed^{-1}+ Salicylic acid (S.A) 1.600 kg fed^{-1}+Potassium humate (K.H) 1 kg fed^{-1}as foliar application
6- Potassium fulvate (K.F) as soil application (2 kg fed^{-1})
7- Salicylic acid (S.A) as soil application (3.200 kg fed^{-1})
8- Potassium humate (K.H) as soil application (2 kg fed^{-1})
9- Potassium fulvate (K.H) 2 kg fed^{-1}+ Salicylic acid (S.A) 3.200 kg fed^{-1}+Potassium humate (K.H) 2 kg fed^{-1}as soil application

All of soil applications were mixed with 20 kg from the same soil then sprayed on the plot. These organic materials were added twice during the season. The sources of organic materials were as follows: (i) potassium fulvate (Vulvo max contains 60 % fulvic acid and 10 % K_2O),(ii) potassium humate (Vesko plus – K contains 60 % humic acid, 7 % K_2O, 2 % Fe-EDTA and 1.5 % Mn-EDTA) and (iii) salicylic acid (Sword contains 25 % salicylic acid, 0.01 % L- ascorbic acid, 0.01 % vit. B Riboflavine (complex), 0.01 % vit. C, 0.5 % Zn, 0.5 % Mg, 25 % K_2O, 38.98 % adjuvants and carrier materials and 10 % S).

Wheat cultivars (Sids 12 and Sakha 94) were obtained from El- Nubaria Research Station, Field Crops Institute Crops Institute, Agricultural Research Station, Giza, Egypt. The grains were sown at 15th November at the rate of 60 kg fed^{-1}. N fertilizer as ammonium sluphate (20.5% N) was added at 480 kg fed^{-1}, P fertilizer as superphosphate (15.5% P_2O_5) added at 150 kg fed^{-1} and K fertilizer as potassium sluphate (48% K_2O) added at a rate of 50 kg fed^{-1}. These additions and all other cultivation practices (i.e., fertilizers, irrigation, weeds and diseases control, etc.) were added according to the recommendation of Ministry of Agriculture and Land Reclamation, Egypt for wheat crop. Soil samples were collected after irrigation at different locations farm the experimental site in a randomized way to determined soil salinity (Table 2). Irrigation 1 was at 20th December, irrigation 2 at 20th January, irrigation 3 at 15th February and irrigation 4 at 20th march, respectively.

Table 2. Mean values of soil E.C after irrigation at the different locations for the two experimental seasons.

location	Irrigation1	Irrigation 2	Irrigation 3	Irrigation 4
1	10.22	9.37	8.15	7.5
2	10.32	9.0	8.04	7.29
3	10.87	9.74	8.01	7.8
4	10.65	9.95	8.5	7.96
5	10.1	9.96	8.13	7.47
6	10.32	9.82	8.1	7.7
Mean E.C (dS/m)	10.58	9.64	8.15	7.62

Measurements and Analysis:

Yield components

Parameters for yield components were plant height (cm), weight 1000 grains (gm) and grains yield was estimated as the weight of grains for each m^2 and converted to grains yield ton/fed.

Elements in straw and grain: The harvest plant samples (straw and grains) were also taken for determination of nutrients by Estefan *et al.* (2013). Nitrogen (%) was estimated by using Micro-Kjeldhl, then the protein (%) was also calculated using factor 6.25. Phosphorus was determined colormetricly, potassium, sodium and calcium were measured by Flame Photometer. The contents of iron, zinc, manganese, copper and magnesium were measured by Perkin Elmer Atomic Absorption Spectrophotometer.

Elements in soil: Soil samples (0-30 cm) were collected after plant harvest for chemical analysis. Total nitrogen in soil was determined by digesting 1.0 g soil in 5 ml. of concentrated H_2SO_4 and 1.1g of digestion mixture (100g K_2SO_4, 10g $CuSO_4$. $5H_2O$ and 1.0 g selenium). The digest was distilled by micro-kjeldahl apparatus using 20 ml. NaOH (40%) to release $NH^{+4}$and 10 ml. of 20 % boric acid containing a mixture of bromocresol green-methyl red indicator to receive the distilled ammonia. The collected NH^{+4} was titrated against standard H_2SO_4 (0.011 N). The amount of available phosphorus in soil was extracted by 0.5 N $NaHCO_3$ pH 8.5 and the amount of available K was extracted with neutral normal NH4-Acetate solution.

Nutrient Use Efficiency Indices: They were calculated for treatments according to Craswell and Godwin (1984) and Roozbeh *et al.* (2011). Use efficiency (UE) also expressed as apparent recovery (AR) as well as agronomic efficiency (AE) for applied N, P and K were according to Eq (1):

$$\text{Nutrient Use Efficiency (UE/AR)} = \frac{(Pn_f - Pn_0)}{\text{Fertilizer rate (N or K kg fed}-1)} \times 100 \quad (1)$$

Where: **P_n = seed nitrogen (N, g kg^{-1}) and potassium (K, g kg^{-1}) P_{nf} = seed nutrient in fertilized plots f = fertilized plots by Potassium fulvate (K.F), Potassium humate (K.H), or Salicylic acid (S.A) P_{n0} = seed nutrient in nonfertilized plots {0 = non-fertilized plots (control treatments)}**

$$\text{Agronomic Efficiency (AE)} = \frac{Y_f - Y_0}{\text{Fertilizer rate (N or K ,kg fed}-1)} \quad (2)$$

Where: **Y = seed yield (kg fed^{-1})**

Statistical analysis: Statistically analysis was performed to compare the means of two season's data by using the least significant difference (L.S.D) (Snedecor and Cochran, 1990).

RESULTS AND DISCUSSION

Yield Components

1. Plant height:

Table 3 shows significant differences between the two wheat varieties for plant height .The highest variety was Sids12, where it recorded 90.7 cm. On the other hand, Sakha 94 was the shortest under control and it recorded 85.9cm. Table 3 indicated also a significant increase in plant height with application of organic materials compared to the control under salinity. The largest increases in plant height was found with K.F+S.A+K.H soil treatment where it recorded 95.8 cm. Table 3 shows significant effects of the interaction between different treatment of organic materials and varieties for plant height. The interaction between Sids 12 and Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of plant height where it recorded 96.7cm. This increase is due to the acids that have the ability to increase the length of the plant. The obtained results are in accordance with the findings results of Al-Haidary and Al-Zubaidy (2020) who indicated that fulvic spray at a rate of 6 mg L^{-1} was significantly superior and had the highest rate of plant height (80.89 cm). Tahir *et al.* (2011) showed that the largest increases in plant height was found with HA (60 mg kg^{-1} soil). Babar Iqbal *et al.* (2016) revealed that humic acid at the rate of 15 kg ha^{-1} and nitrogen at the rate of 150 kg ha^{-1} produced maximum plant height (109 cm). Shafi *et al.* (2020) noted that mamimum plant height (89 cm) was observed where 90 kg P_2O_5 ha^{-1} with 5 kg HA ha^{-1} were applied. Erdal *et al.* (2011) found that SA application increases the tolerance of wheat seedlings to salt stress which may be related to increased antioxidant enzyme activity. Suhaib *et al.* (2018) found that a significant improvement in shoot length was observed with the application of salicylic acid. Yadav *et al.* (2020) found that application of SA significantly enhanced plant height. Maqbool *et al.* (2015) reported that drought stress reduced wheat plant height. Mohamed *et al*. (2019) noted that salicylic acid significantly affected plant height more than boron and recorded the highest result (97.23 cm). There is a positive effect of SA on plant height (Kareem *et al.,* 2017).

2.Grains weight:

Table 3 showed non-significant differences between the different two wheat cultivars (Sids 12 and Sakha 94) for grains. There is an increase in grains weight was associated with applied stress reducers compared to the control under salinity. The highest mean of grains weight was due to K.F+S.A+K.H soil treatment (625.0 gm). A significant interaction of organic materials treatments for grains weight was revealed (Table 3). Grains weight variable was recorded for the studied organic materials treatments at Sids 12 and Sakha 94. The interaction between Sids 12 and K.F+S.A+K.H soil treatment was the highest for grains weight (666.7 gm). This increase due to organic acids has the ability to increase the grains weight of the plant. The obtained results agree with the finding by Mohamed *et al.* (2019) who reveal that foliar application with either salicylic acid or low level of boron had significant effect on grain yield per m^2 in comparison with the control. Salicylic acid had significant positive effects on grain dry weight compared to the control (Rihan *et al.,* 2017).

3.Weight 1000 grain:

Table 3 showed non-significant differences between the two wheat cultivars (Sids 12 and Sakha 94) for weight of 1000 grain all over organic materials treatments. Table 3 indicates a significant increase in weight of 1000 grain with application organic materials compared to the control under salinity. The largest increases in weight of 1000 grain was due to K.F+S.A+K.H soil treatment (80.83gm). Table 3 showed significant effects of the interaction between different treatment of organic materials and varieties for weight of 1000 grain. Results showed that soil application interaction Potassium fulvate + Salicylic acid + Potassium humate was significantly superior and produced the highest means of weight of 1000 grain (85.0 gm).

These results agree with those found by Al- Haidary and Al-Zubaidy (2020) who indicated that spraying of fulvic at 6 mg l^{-1} was significantly superior and had the highest means of weight 1000 grain (33.60 g). Babar Iqbal *et al.* (2016) revealed that humic acid at the rate of 15 kg ha^{-1} that and nitrogen at the rate of 150 kg ha^{-1} produced maximum weight of 1000 grain (46.3 g). Shafi *et al.* (2020) found that application of HA produced heavier grains of 42.61g which were statistically higher than the grains weight of the plots which receive no HA. Wali *et al*. (2015) reported that interaction between Gemmiza-11 and 75% NPK+1 kg humic acid produced the highest values of 100 grain (5.73 g). It can be concluded that humic acid can replace 25% of mineral fertilizers and produce insignificant increase in grain yield of wheat under calcareous soil conditions. Abd El-Kader (2016) stated that the spraying of organic acid at concentration 4 ml L^{-1} significantly increase of 1000 grain weight compared with control.

Table 3. Effect organic materials on yield components of wheat under salinity (combined analysis of two seasons)

Treatments		Plant height	Grains weight	Weight 1000	Grains yield
Varieties	Organic materials	(cm)	gm/ m^2	grain (gm)	ton fed^{-1}
Sids12	Control	83.3^{cd}	373.3^{d}	56.67^{fg}	1.57^{d}
	K.F foliar	86.7^{bcd}	460.0^{bcd}	63.33^{def}	1.93^{bcd}
	S.A foliar	88.3^{abcd}	420.0^{d}	60.0^{ef}	1.76^{d}
	K.H foliar	91.7^{abc}	500.0^{bcd}	66.67^{cdef}	2.10^{bcd}
	K.F+S.A+K.H foliar	95.0^{ab}	566.7^{abc}	70.0^{bcde}	2.38^{abc}
	K.F soil	88.3^{abcd}	493.3^{bcd}	73.33^{abcd}	2.07^{bcd}
	S.A soil	91.7^{abc}	486.7^{bcd}	70.0^{bcde}	2.04^{bcd}
	K.H soil	95.0^{ab}	513.3^{bcd}	80.0^{ab}	2.16^{bcd}
	K.F+S.A+K.H soil	96.7^{a}	666.7^{a}	85.0^{a}	2.80^{a}
Sakha 94	Control	73.3^{e}	373.3^{d}	46.67^{g}	1.57^{d}
	K.F foliar	80.0^{de}	513.3^{bcd}	58.33^{efg}	2.16^{bcd}
	S.A foliar	86.7^{bcd}	453.3^{bcd}	56.67^{fg}	1.90^{bcd}
	K.H foliar	86.7^{bcd}	500.0^{bcd}	66.67^{cdef}	2.10^{bcd}
	K.F+S.A+K.H foliar	91.7^{abc}	513.3^{bcd}	68.33^{bcdef}	2.16^{bcd}
	K.F soil	85.0^{cd}	466.7^{bcd}	66.67^{cdef}	1.96^{bcd}
	S.A soil	85.0^{cd}	426.7^{cd}	65.0^{cdef}	1.79^{cd}
	K.H soil	90.0^{abc}	506.7^{bcd}	70.0^{bcde}	2.13^{bcd}
	K.F+S.A+K.H soil	95.0^{ab}	583.3^{ab}	76.67^{abc}	2.45^{ab}
Means values of (varieties)	Sids12	90.7A	497.8A	69.44A	2.09A
	Sakha 94	85.9B	481.9A	63.89A	2.02A
Means values of (organic acid)	Control	78.3D	373.3D	51.67E	1.57D
	K.F foliar	83.3CD	486.7BC	60.83CD	2.04BC
	S.A foliar	87.5BC	436.7CD	58.33DE	1.83CD
	K.H foliar	89.2ABC	500.0BC	66.67BCD	2.10BC
	K.F+S.A+K.H foliar	93.3AB	540.0AB	69.17BC	2.27AB
	K.F soil	86.7BC	480.0BC	70.0B	2.02BC
	S.A soil	88.3BC	456.7BCD	67.50BC	1.92BCD
	K.H soil	92.5AB	510.0BC	75.0AB	2.14BC
	K.F+S.A+K.H soil	95.8A	625.0A	80.83A	2.63A
LSD 0.05 (var.)		3.815	55.203	5.710	0.232
LSD 0.05 (acid)		6.676	95.149	8.492	0.3996
LSD-Interaction (var. x acid)		9.084	144.5	11.817	0.607

Potassium fulvate (K.F), Salicylic acid (S.A) and Potassium humate (K.H)

4.Grains yield:

Table 3 showed nonsignificant differences between the different two wheat cultivars (Sids 12 and Sakha 94) for yield ton fed^{-1}. It indicate a significant increase in grains yield ton fed^{-1} with applied organic materials compared with the control treatment under salinity over both varieties. Potassium fulvate + Salicylic acid + Potassium humate as soil application resulted the highest values of yield (2.63 ton fed^{-1}) and increased yield compared with the control treatment over both varieties. Table 3 showed significant effects of the interaction between different treatment of organic materials and varieties for yield ton fed^{-1}. The interaction between Sids 12 and potassium fulvate + Salicylic acid + Potassium humate as soil application produced the highest values of grains yield (2.80 tons fed^{-1}.). Humic substances create vegetation cover in saline and poor soils and thus increase plant productivity. These findings agree with those reported by Abd EL-Kader (2016) who found that application of organic acid to the soil increased the yield by 2.56% and 10.21% in the first and second season, respectively. Fulvic improved wheat yield under stress conditions. The spraying of fulvic at 6 mg l^{-1} was significantly superior and had the highest means of seeds yield 4.162 ton ha^{-1} (Al- Haidary and Al-Zubaidy, 2020). In addition, foliar spraying with mixture of humic and amino acids resulted the highest values of yield attributes and increased grain compared with the control treatment over both seasons (Kandil *et al.*, 2016). Potassium humate significantly increased grains yield. Totally, yield of wheat increased from 2.5 to 3.6 t ha^{-1} by use of applied humic fertilizer (Shahryari and Mollasadeghi, 2011). Brunetti (2007) found that 2% humic acid increased the grain yield of the wheat by 26%. Shafi *et al.* (2020) found that humic acid also showed significant results with grain yield of 2540 kg ha^{-1} over no HA application with grain yid of 2338 kg ha^{-1}. Wali *et al*. (2015) reported that the interaction between Misr-1 and the combination of 75% NPK and 1kg humic acid produced the highest values grain yield (2.96 tons fed^{-1}). Yadav *et al*. (2020) found that the reduction in grains yield under 8 and 12 dSm^{-1} was 7.68 and 32.93% in wheat, respectively compared to 2 dS m $^{-1}$ and SA significantly enhanced grains yield. Akher *et al*. (2018) noted that the minimum grains yield were found 1.14 t ha^{-1}, 1.07 tha^{-1} and 0.26 t ha^{-1} at 3-4 dSm^{-1}, 7-8 dSm^{-1} and 11-12 dSm^{-1}NaCl, respectively. These yields were increased with SA (0.4 mmol) from 1.14 to 1.32 t ha^{-1} ,1.07 to 1.14 t ha^{-1} and 0.26 to 0.31 t ha^{-1} at 3-4 dSm^{-1},7-8 dSm^{-1} and 11-12 dSm^{-1} NaCl, respectively, and therefore, salicylic acid can alleviate the detrimental impacts of salinity and increase the grains yield of wheat. Ibrahim *et al.* (2014) reveal that exogenous application of 50 and 100 ppm SA resulted in significant increase in grains yield. EL-Nasharty *et al.* (2019) noted that foliar application of salicylic acid increased grains yield of studied wheat cultivars. Abdallah *et al*. (2020) revealed that salicylic acid improved the yield parameters of wheat under saline soil. High level of salicylic acid with cultivars proved to be the most effective.

Macronutrients in straw

1. Nitrogen:

Table 4 cleared significant differences between the two wheat varieties for nitrogen percentage content in straw. The highest nitrogen percentage for Sids12 was (2.71%). On the other hand, the lowest was due to Sakha 94 (0.80%). Table 4 indicated also a significant increase in nitrogen percentage in straw with application of organic materials compared with the control treatment under salinity for the two wheat. Potassium fulvate + Salicylic acid + Potassium humate as soil application resulted the highest values of nitrogen percentage in straw (2.85%). Table 4 showed significant effects of the interaction between different treatment of organic materials and varieties for nitrogen percentage in straw. The interaction between Sids 12 and Potassium fulvate+ Salicylic acid+ Potassium humate as soil application produced the highest values nitrogen percentage in straw (4.60%). Thus, mixing between organic acids increases the total nitrogen in the soil. The obtained results are in line with the finding of Karim and Khursheed (2011) who found that wheat plant with salicylic acid led to significant increase in nitrogen content (27.40%) of leaves comparing with untreated plants. Organic material may indirectly influence N supply to plants through promoting growth and activity of N mineralizing in soils (Tahir *et al.*, 2011). Humic acid at 0.2% was found much more effective on increasing nitrogen uptake at high lime conditions (Katkat *et al.*, 2009).

2.Phosphorus:

Table 4 showed non-significant differences between two wheat cultivars (Sids 12 and Sakha 94) for phosphorus percentage in straw with all organic materials treatments. There was a significant increase in phosphorus percentage in straw with applied organic materials compared with the control treatment under salinity for the two wheat varieties. Potassium fulvate + salicylic acid + Potassium humate as soil application resulted the highest values of phosphorus percentage in straw (0.133%). Table 4, further, shows significant effects of the interaction between different treatment of organic materials and varieties for phosphorus percentage in straw. The interaction between Sids 12 and Potassium fulvate + Salicylic acid + Potassium humate as soil application produced the highest values phosphorus percentage in straw (0.139%). Organic acids increases C.E.C. Hence, an increase in the availability of phosphorous. These results are in agreements with those of Abd EL-Kader (2016) who showed that P content (kg fed^{-1}) in straw was significantly increased with the different methods application of organic acids in both seasons. HA increases the nutrient uptake and accumulation. Organic material may indirectly influence P supply to plants through promoting growth and P solubilizing in soils (Tahir *et al.*, 2011). Shafi *et al.* (2020) showed that plant P concentration and its uptake were also significantly improved by the addition of HA with alone Superphosphate compared to sole Single Superphosphate application. It was evident that P efficiency could be increased with HA addition and it has the potential to improve crop yield and plants P uptake in calcareous soils. Karim and Khursheed (2011) found that wheat with salicylic acid led to significant increase in phosphorus content (14.91%) of leaves comparing with untreated plants.

Table 4. Effect organic materials on elements in straw of wheat under salinity (combined analysis of two seasons)

Varieties	Organic materials	N	P	K	Ca	Mg	Na
		(%)					
Sids12	Control	0.70^{g}	0.013^{k}	0.325^{h}	0.123^{g}	0.103^{k}	0.50^{a}
	K.F foliar	1.10^{d}	0.078^{h}	0.355^{f}	0.135^{ef}	0.128^{hi}	0.445^{c}
	S.A foliar	0.91^{e}	0.067^{ij}	0.330^{h}	0.133^{f}	0.132^{ghi}	0.475^{b}
	K.H foliar	1.20^{d}	0.083^{gh}	0.355^{f}	0.135^{ef}	0.139^{efgh}	0.46^{bc}
	K.F+S.A+K.H foliar	4.20^{b}	0.117^{c}	0.415^{b}	0.155^{c}	0.173^{b}	0.375^{gh}
	K.F soil	3.90^{c}	0.10^{e}	0.395^{cd}	0.145^{d}	0.159^{c}	0.39^{fg}
	S.A soil	3.90^{c}	0.086^{g}	0.375^{e}	0.155^{c}	0.152^{cde}	0.415^{d}
	K.H soil	3.90^{c}	0.103^{de}	0.405^{bc}	0.155^{c}	0.163^{bc}	0.383^{fg}
	K.F+S.A+K.H soil	4.60^{a}	0.139^{a}	0.465^{a}	0.160^{bc}	0.213^{a}	0.35^{i}
Sakha 94	Control	0.69^{g}	0.065^{j}	0.335^{gh}	0.135^{ef}	0.108^{jk}	0.410^{de}
	K.F foliar	0.70^{g}	0.084^{g}	0.345^{fg}	0.143^{de}	0.120^{ij}	0.395^{ef}
	S.A foliar	0.70^{g}	0.071^{i}	0.345^{fg}	0.145^{d}	0.127^{hi}	0.395^{ef}
	K.H foliar	0.70^{g}	0.085^{g}	0.357^{f}	0.155^{c}	0.134^{gh}	0.385^{fg}
	K.F+S.A+K.H foliar	0.91^{e}	0.107^{d}	0.380^{e}	0.165^{b}	0.151^{cdef}	0.375^{gh}
	K.F soil	0.77^{fg}	0.092^{f}	0.355^{f}	0.155^{c}	0.142^{defg}	0.375^{gh}
	S.A soil	0.77^{fg}	0.087^{fg}	0.345^{fg}	0.145^{d}	0.138^{fgh}	0.375^{gh}
	K.H soil	0.84^{ef}	0.101^{e}	0.378^{e}	0.165^{b}	0.155^{cd}	0.363^{hi}
	K.F+S.A+K.H soil	1.10^{d}	0.128^{b}	0.385^{de}	0.175^{a}	0.161^{bc}	0.355^{i}
Means values of (varieties)	Sids12	2.71A	0.087A	0.380A	0.144B	0.151A	0.421A
	Sakha 94	0.80B	0.091A	0.358B	0.154A	0.137B	0.38B
Means values of (organic acid)	Control	0.70D	0.039G	0.33E	0.13D	0.105F	0.46A
	K.F foliar	0.90BCD	0.081EF	0.35DE	0.14C	0.124E	0.42AB
	S.A foliar	0.81CD	0.069F	0.34DE	0.14C	0.129E	0.44A
	K.H foliar	0.95BCD	0.084DE	0.36CD	0.145BC	0.136DE	0.42AB
	K.F+S.A+K.H foliar	2.56A	0.112B	0.40B	0.16A	0.162B	0.38CD
	K.F soil	2.34ABC	0.096CD	0.38BC	0.15B	0.151BCD	0.38CD
	S.A soil	2.34ABC	0.086DE	0.36CD	0.15B	0.145CD	0.40BC
	K.H soil	2.37AB	0.102BC	0.39B	0.16A	0.16BC	0.37CD
	K.F+S.A+K.H soil	2.85A	0.133A	0.43A	0.17A	0.19A	0.35D
LSD 0.05 (var.)		0.62	0.015	0.018	0.007	0.014	0.021
LSD 0.05 (acid)		1.54	0.012	0.024	0.010	0.016	0.035
LSD-Interaction (var. x acid)		0.13	0.006	0.012	0.009	0.013	0.018

Potassium fulvate (K.F), Salicylic acid (S.A) and Potassium humate (K.H)

3.Potassium:

Table 4 showed significant differences between the two wheat varieties for potassium percentage in straw. The highest variety over organic materials treatments, for potassium percentage, was Sids12, since, it recorded 0.380%. On the other hand, the lowest variety was Sakha 94, since, which recorded 0.358 %. Table 4 indicated a significant increase in potassium percentage in straw with application of organic materials compared with the control treatment under salinity. Potassium fulvate + Salicylic acid + Potassium humate as soil application resulted the highest values of potassium percentage in straw (0.43%). Organic acids act as a natural suspension of mineral ions under alkaline conditions and increase their absorption. Table 4 showed also significant effects of the interaction between different treatment of organic materials and varieties for potassium percentage in straw. The interaction between Sids 12 and Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of potassium percentage in straw where, it recorded 0.465%. Such observation were also recorded by Suhaib *et al*. (2018) who reported that salicylic acid reduced the Na^{+}/K^{+} in the crop plants as compared to saline treatments alone, showing that it subjected the plant to uptake more K^{+} as compared to Na^{+} even under salt stress. Karim and Khursheed (2011) found that wheat plant with salicylic acid led to significant increase in potassium content (23.36%), of leaves comparing with untreated plants.

Secondary elements

1.Calcium:

Table 4 showed significant differences between the two wheat varieties for calcium percentage in straw. The highest variety over organic materials treatments, for calcium percentage, was Sakha 94 (0.154%). The lowest variety was Sids12 which recorded 0.144%. Table 4 indicated a significant increase in calcium percentage in straw with application of organic materials compared with the control treatment under salinity. Potassium fulvate + Salicylic acid + Potassium humate as soil application resulted the highest values of calcium percentage in straw (0.17%). Table 4, further, shows significant effects of the interaction between different treatment of organic materials and varieties for calcium percentage in straw. The interaction between Sakha 94 and Potassium fulvate+ Salicylic acid+ Potassium humate as soil application was significantly superior and had the highest means of calcium percentage in straw where, it recorded 0.175%. Humic acids help calcium to adsorb on clay particles and thus be available to the plant. These observation were previously noticed by Khan *et al.* (2010) showed that foliar application of salicylic acid resulted in increasing Ca^{+2} accumulations which helped in decreasing membrane damages.

2.Magnesium:

Table 4 showed significant differences between the two wheat varieties for magnesium percentage in straw. The highest variety over organic materials treatments, for magnesium percentage, was Sids12 which recorded 0.151%. On the other hand, the lowest variety was Sakha 94 which recorded 0.137%. Table 4 indicated a significant increase in magnesium percentage in straw with applied organic materials compared with the control treatment under salinity over both varieties. Potassium fulvate + Salicylic acid + Potassium humate as soil application resulted the highest values of magnesium percentage in straw (0.19%).

Table 4 showed also significant effects of the interaction between different treatment of organic materials and varieties for magnesium percentage in straw. The interaction between Sids12 and Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of magnesium percentage in straw where, it recorded 0.213%. These findings agree with those reported by Katkat *et al.* (2009) humic acid significantly affected Mg uptake with the highest dry matter accumulation and nutrient uptake obtained at the rate of 1g kg^{-1} of humic acid treatment

3.Sodium:

Table 4 showed significant differences between studied varieties for sodium percentage in straw. The highest variety over organic materials treatments, for sodium percentage, was Sids12, since, it recorded 0.421%. On the other hand, the lowest variety was Sakha 94, which recorded 0.38%. Table 4 indicate a significant decrease in sodium percentage in straw with applied organic acids compared with the control treatment under salinity over both varieties. The control treatment resulted the highest values of sodium percentage in straw (0.46%). Table 4 showed also significant effects of the interaction between different treatment of organic materials and varieties for sodium percentage in straw. The interaction between Sids12 and control treatment was significantly superior and had the highest means of sodium percentage in straw where, it recorded 0.50%. Humic acids improve the ability to retain elements in calcareous soils and its association with sodium helps the plant to tolerate high concentrations of it. The obtained results, in general, are in harmony with Suhaib *et al.* (2018) who found that the salinity treatments significantly increased the Na^+/K^+ ratio in wheat plants. But salicylic acid remarkably reduced the sodium uptake by the plants. EL-Nasharty *et al.* (2019) who indicated that the highest content value of Na and low Na: K ratio in straw was produced by foliar spray of 400 ppm salicylic acid.

Micronutrients in Straw

1.Iron:

Table 5 showed significant differences between the two wheat varieties for iron in straw . The highest variety all over organic materials treatments, for iron, was Sids12, where, it recorded 108.2 mg kg^{-1}. On the other hand, the lowest variety was Sakha 94, where, it recorded 118.6 mg/kg. Table 5 indicate a significant increase in Fe uptake in straw with applied organic materials compared with the control treatment under salinity over both varieties. Potassium fulvate+ salicylic acid+ Potassium humate as soil application resulted the highest values of Fe uptake in straw (268.3 mg kg^{-1}). Table 5 showed also significant effects of the interaction between different treatment of organic materials and varieties for iron in straw. The interaction between Sids12 and Potassium fulvate+ Salicylic acid+ Potassium humate as soil application was significantly superior and had the highest means of Fe uptake in straw where, it recorded 279.0 mg/kg. Organic acids increase the absorption of micronutrients and reduce stress on plants. Similar results were obtained by Katkat *et al.* (2009) who showed that the foliar application of humic acid significantly affected Fe uptake with the highest dry matter accumulation and nutrient uptake obtained at the rate of 1 g kg^{-1} of humic acid treatment.

2.Manganese:

Table 5 cleared significant differences between the two wheat varieties for manganese uptake in straw. The highest variety all over organic materials treatments, for manganese uptake, was Sakha 94, where, it recorded 44.78 mg kg^{-1}. On the other hand, the lowest variety was Sids12, where, it recorded 30.28 mg kg^{-1}. Data in Table 5 indicate a significant increase in manganese uptake in straw with applied organic materials compared with the control treatment under salinity over both varieties. Potassium fulvate + Salicylic acid + Potassium humate as soil application resulted the highest values of manganese uptake in straw (49.75 mg/kg). Table 5 showed also significant effects of the interaction between different treatment of organic materials and varieties for manganese uptake in straw. The interaction between Sakha 94 and Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of manganese uptake in straw where, it recorded 55.5 mg kg^{-1}. These results are consistent with those reported by Katkat *et al.* (2009) who showed that the foliar application of humic acid significantly affected Mn uptake with the highest dry matter accumulation and nutrient uptake obtained at the rate of 1g kg^{-1} of humic acid treatment.

3.Zinc:

Table 5 showed significant differences between the two wheat varieties for zinc in straw. The highest variety all over organic materials treatments, for zinc uptake, was Sids12, where, it recorded 62.83 mg kg^{-1}. On the other hand, the lowest variety was Sakha 94, where, it recorded 40.67 mg kg^{-1}. Table 5 indicate a significant increase in Zn uptake in straw with applied organic materials compared with the control treatment under salinity over both varieties. Potassium fulvate + Salicylic acid + Potassium humate as soil application resulted the highest values of Zn uptake in straw (83.5mg kg^{-1}). Table 5, further, shows significant effects of the interaction between different treatment of organic materials and varieties for Zn uptake in straw. The interaction between Sids12 and Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of Zn uptake in straw where, it recorded 116.5 mg kg^{-1}. The results are in agreement with those given by Katkat *et al*. (2009) showed that humic acid applications increase Zn uptake of plants in non- limed pots at 0.1% rate of humic acid.

4.Cupper:

Table 5 showed significant differences between the two wheat varieties for cupper in straw. The highest variety all over organic materials treatments, for cupper uptake, was

Sids12, where, it recorded 62.83 mg kg^{-1}. The lowest variety was Sakha 94, where, it recorded 16.78 mg kg^{-1}.

Table 5 indicated a significant increase in Cu uptake in straw with applied organic materials compared with the control treatment under salinity over both varieties. Potassium fulvate + salicylic acid + Potassium humate as soil application resulted the highest values of Cu uptake in straw (123.8 mg kg^{-1}). Table 5 showed also significant effects of the interaction between different treatment of organic materials and varieties for Cu uptake in straw. The interaction between Sids12 and Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of Cu uptake in straw where, it recorded 213.5 mg kg^{-1}. The same obtained results are in good agreement with those obtained by Katkat *et al*. (2009) who reported that humic acid applications increase Cu uptake of plants in non-limed pots at 0.1% rate of humic acid.

Table 5. Effect organic materials on micronutrients in straw of wheat under salinity(combined analysis of two seasons)

Treatments: Varieties	Organic materials	Fe	Mn	Zn	Cu
		mg kg^{-1}			
Sids12	Control	62.0^{gh}	18.0^{k}	38.5^{ijk}	9.0^{hij}
	K.F foliar	68.5^{fg}	19.5^{jk}	41.0^{hij}	13.0^{ghij}
	S.A foliar	68.5^{fg}	19.5^{jk}	41.5^{hij}	14.5^{fghij}
	K.H foliar	71.0^{fg}	21.0^{j}	44.5^{fgh}	15.5^{fghij}
	K.F+S.A+K.H foliar	155.0^{d}	40.5^{fg}	102.5^{b}	149.5^{b}
	K.F soil	87.5^{ef}	35.0^{i}	55.0^{d}	31.0^{de}
	S.A soil	77.5^{fg}	36.5^{hi}	47.5^{efg}	17.0^{fghi}
	K.H soil	104.5^{e}	38.5^{gh}	78.5^{c}	102.5^{c}
	K.F+S.A+K.H soil	279.0^{a}	44.0^{cd}	116.5^{a}	213.5^{a}
Sakha 94	Control	47.0^{h}	37.0^{hi}	31.5^{l}	4.5^{j}
	K.F foliar	58.5^{gh}	41.5^{ef}	35.5^{kl}	5.5^{ij}
	S.A foliar	69.0^{fg}	40.5^{fg}	35.5^{kl}	6.5^{ij}
	K.H foliar	75.5^{fg}	42.0^{def}	40.5^{hijk}	8.5^{hij}
	K.F+S.A+K.H foliar	220.5^{c}	49.5^{b}	49.5^{ef}	23.0^{defg}
	K.F soil	106.5^{e}	44.5^{c}	38.0^{jk}	23.0^{defg}
	S.A soil	77.5^{fg}	43.5^{cde}	41.5^{hij}	19.5^{efgh}
	K.H soil	155.0^{d}	49.0^{b}	43.5^{ghi}	26.5^{def}
	K.F+S.A+K.H soil	257.5^{b}	55.5^{a}	50.5^{de}	34.0^{d}
Means values of (varieties)	Sids12	108.2A	30.28B	62.83A	62.83A
	Sakha 94	118.6A	44.78A	40.67B	16.78B
Means values of (organic acid)	Control	54.5E	27.5C	35.0D	6.75D
	K.F foliar	63.5E	30.5BC	38.25D	9.25D
	S.A foliar	68.75E	30.0BC	38.5D	10.5D
	K.H foliar	73.25E	31.5BC	42.5CD	12.0D
	K.F+S.A+K.H foliar	187.8B	45.0A	76.0AB	86.25AB
	K.F soil	97.0D	39.75AB	46.5CD	27.0CD
	S.A soil	77.5DE	40.0AB	44.5CD	18.25CD
	K.H soil	129.8C	43.75A	61.0BC	64.5BC
	K.F+S.A+K.H soil	268.3A	49.75A	83.5A	123.8A
LSD 0.05 (var.)		38.765	4.48	11.217	28.264
LSD 0.05 (acid)		23.298	10.033	20.255	50.032
LSD-Interaction (var. x acid)		21.466	2.234	5.405	12.085

Potassium fulvate (K.F), Salicylic acid (S.A) and Potassium humate (K.H)

Elements and Protein Contents in Grains

1.Nitrogen:

Table 6 showed significant differences between the two wheat varieties for nitrogen percentage in grains. The highest variety due to all organic materials treatments, for nitrogen percentage in grains, was that of Sids12, since, it recorded 2.93%. While, the lowest was Sakha 94, which recorded 2.23 %. Table 6 indicated a significant increase in nitrogen percentage in grains with application of organic acid compared with the control treatment under salinity over both varieties. K.F+ S.A+ K.H as soil application resulted the highest values of nitrogen percentage in grains (3.28%). Table 6 showed also significant effects of the interaction between different treatment of organic acid and varieties for nitrogen percentage in grains. The interaction between Sakha 94 and K.F+ S.A+ K.H as soil application was significantly superior and had the highest means of nitrogen percentage in grains where, it recorded 3.28%. The same obtained results are in good agreement with those obtained by Abd EL-Rahman and Eskarous (2014) who showed that humic acid increased the nitrogen uptake by plants as compared with that fertilized by urea only. Abdallah *et al*. (2020) noted that salicylic at 25 and 50 mg 1^{-1} induced significant increases N contents compared to control.

2.Potassium:

Table 6 showed significant differences between the two wheat varieties for potassium percentage in grains. The highest variety all over organic materials treatments, for potassium percentage in grains, was Sids12, where, it recorded 1.49 %. While, the lowest variety was Sakha 94, where, it recorded 0.50 %. potassium percentage in grains was not significantly affected by organic materials treatments over both varieties. Table 6, further, shows significant effects of the interaction between different treatment of organic materials and varieties for potassium percentage in grains. The interaction between Sids12 and potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of potassium percentage in grains where, it recorded 2.20 %. Our results are in accordance with the findings of EL-Nasharty *et al.* (2019) who noted that foliar application of salicylic acid increased potassium content and decreased Na: K ratio in grains.

3.Calcium:

Table 6, shows significant differences between studied varieties for calcium percentage in grains. The highest variety all over organic materials treatments, for calcium percentage in grains, was Sids12, where, it recorded 1.25 %. On the other hand, the lowest variety was Sakha 94, where, it recorded 0.13%. calcium percentage in grains was not significantly affected by organic materials treatments over both varieties. Table 6, further, shows significant effects of the interaction between different treatment of organic materials and varieties for calcium percentage in grains. The interaction between Sids12 and K.F+ S.A+ K.H as soil application was significantly superior and had the highest means of calcium percentage in grains where, it recorded 2.150 %. This is due to the fact that humic substances chelate calcium and prevent phosphates from reacting leading to the formation of calcium phosphate. These findings are agree with those found by EL-Nasharty *et al.* (2019) who found that Ca content in grain was the highest in Sakha 93 cultivar as tolerant genotype. Abdallah *et al.* (2020) noted that salicylic acid at 25and 50 mg/1 induced significant increases Ca compared to control. Dincsoy and Seonmez (2019) reported that calcium content reflected significant effect on $p<.01$ level.

4.Magnesium:

Table 6, shows non-significant differences between two studied different wheat cultivars Sids 12 and Sakha 94 for magnesium percentage in grains all over organic materials treatments**.** Table 6 indicate a significant increase in magnesium percentage in grains with applied organic materials compared with the control treatment under salinity over both varieties. K.F+ S.A+ K.H as soil application resulted the highest values of magnesium percentage in grains (0.42%). Table 6, further, shows significant effects of the interaction between different treatment of organic materials and varieties for magnesium percentage in grains. The interaction between Sids12 and K.F+ S.A+ K.H as soil application was significantly superior and had the highest means of magnesium percentage in grains where, it recorded 0.595%. The current results agree with the finding Dincsoy and Seonmez (2019) who showed that extractable Mg content increased with increasing humic acid applications. Humic acid application with the addition of potassium fertilizers resulted in an increase in only magnesium content.

5.Sodium:

Table 6, shows significant differences between studied varieties for sodium percentage in grains. The highest variety all over organic materials treatments, for sodium percentage, was Sids12, where, it recorded 2.06 %. On the other hand, the lowest variety was Sakha 94, where, it recorded 1.36 %. Table 6 indicate a significant decrease in sodium percentage in grains with applied organic materials compared with the control treatment under salinity over both varieties. Salicylic acid, when combined with salt, turns into sodium salicylate salts. Salicylic acid is the sodium salt of salicylic acid. It has a high solubility in water. Humic acids improve the holding capacity of elements in calcareous soils. And through its association with sodium, it helps the plant to withstand high concentrations of it.The control treatment resulted the highest values of sodium percentage in grains (2.28%). Table 6, further, shows significant effects of the interaction between different treatment of organic materials and varieties for sodium percentage in grains. The interaction between Sids12 and control treatment was significantly superior and had the highest means of sodium percentage in grains where, it recorded 2.817%. Humates buffer plants from excess sodium and reducing drought stress.

These results go in line with Yadav *et al.* (2020) who found that the Na:K ratio was significantly increased by each progressive increase in salinity level and the was obtained under 12 dSm^{-1}. There was significant reduction in Na:K ratio by SA as compared to control. SA use in both crops improved sodium concentration. EL-Nasharty *et al.* (2019) indicated that salicylic acid showed significant effects on Na and Na:K in grains of the two studied wheat cultivars, and therefoe, foliar application of salicylic acid increased potassium content and decreased Na: K ratio in grains. Abdallah *et al*. (2020) noted that salicylic acid at 25 and 50 mg/l induced significant decreased in Na contents in Sakha 94 as compared to control.

6.Protein:

Table 6, shows significant differences between studied varieties for protein percentage in grains. The highest variety all over organic materials treatments, for protein percentage in grains, was Sids12, where, it recorded 16.86%. On the other hand, the lowest variety was Sakha 94, where, it recorded 12.83%. Table 6 indicate a significant increase in protein percentage in grains with applied organic materials compared with the control treatment under salinity over both varieties. Potassium fulvate + Salicylic acid + Potassium humate as soil application resulted the highest values of protein percentage in grain (18.83 %).

Table 6, further, shows significant effects of the interaction between different treatment of organic materials and varieties for protein percentage in grains. The interaction between Sakha 94 and Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of protein percentage in grains where, it recorded 18.88%. These results are in agreement with those given by Abd EL-Kader (2016) who showed that protein was significantly increased with organic acids in both seasons. The maximum mean values of protein was 409.1 kg fed-1. Ali *et al*. (2014) found that increasing rate of humic acid increase the percentage of protein. The highest mean values of protein was associated with plants which received higher level of humic acid (14.40 $l\ ha^{-1}$.) with compost. Kandil *et al*. (2016) noted that mixture of humic and amino acids resulted the highest values of protein compared with the control. Wali *et al*. (2015) reported that the interaction between Misr-1 and the combination of 75% NPK and 1 kg humic acid produced the highest of protein 9.8%.

Table 6. Effect organic materials on elements and protein contents in grains of wheat under salinity (combined analysis of two seasons)

Treatments: Varieties	Organic materials	N	K	Ca	Mg	Na	Protein
		(%)					
Sids12	Control	2.50^{c}	0.460^{de}	0.120^{f}	0.153^{f}	2.817^{a}	14.37^{c}
	K.F foliar	2.80^{b}	0.485^{de}	0.130^{f}	0.174^{def}	2.350^{bc}	16.10^{b}
	S.A foliar	2.80^{b}	0.475^{de}	0.125^{f}	0.165^{ef}	2.425^{b}	16.10^{b}
	K.H foliar	2.80^{b}	1.950^{c}	1.650^{d}	0.175^{def}	2.350^{bc}	16.10^{b}
	K.F+S.A+K.H foliar	2.90^{b}	1.950^{c}	1.900^{b}	0.215^{bc}	1.30^{ghi}	16.68^{b}
	K.F soil	3.20^{a}	1.900^{c}	1.750^{c}	0.195^{cde}	2.250^{c}	18.40^{a}
	S.A soil	2.90^{b}	1.950^{c}	1.550^{e}	0.195^{cde}	2.250^{c}	16.68^{b}
	K.H soil	3.22^{a}	2.050^{b}	1.900^{b}	0.205^{bcd}	1.550^{e}	18.50^{a}
	K.F+S.A+K.H soil	3.27^{a}	2.200^{a}	2.150^{a}	0.595^{a}	1.225^{ijk}	18.78^{a}
Sakha94	Control	1.75^{e}	0.440^{e}	0.125^{f}	0.155^{f}	1.735^{d}	10.06^{e}
	K.F foliar	2.10^{d}	0.485^{de}	0.130^{f}	0.175^{def}	1.450^{ef}	12.08^{d}
	S.A foliar	1.75^{e}	0.480^{de}	0.130^{f}	0.175^{def}	1.450^{ef}	10.06^{e}
	K.H foliar	2.10^{d}	0.495^{de}	0.130^{f}	0.185^{cdef}	1.400^{fg}	12.08^{d}
	K.F+S.A+K.H foliar	2.50^{c}	0.510^{d}	0.135^{f}	0.215^{bc}	1.150^{jk}	14.38^{c}
	K.F soil	2.20^{d}	0.500^{de}	0.135^{f}	0.215^{bc}	1.310^{ghi}	12.65^{d}
	S.A soil	2.20^{d}	0.510^{d}	0.135^{f}	0.185^{cdef}	1.350^{fgh}	12.65^{d}
	K.H soil	2.20^{d}	0.515^{d}	0.135^{f}	0.215^{bc}	1.250^{hij}	12.65^{d}
	K.F+S.A+K.H soil	3.28^{a}	0.520^{d}	0.140^{f}	0.237^{b}	1.125^{k}	18.88^{a}
Means values of (varieties)	Sids12	2.93A	1.49A	1.25A	0.23A	2.06A	16.86A
	Sakha 94	2.23B	0.50B	0.13B	0.20A	1.36B	12.83B
Means values of (organic acid)	Control	2.13C	0.45A	0.12A	0.15B	2.28A	12.22C
	K.F foliar	2.45BC	0.49A	0.13A	0.17B	1.90AB	14.09BC
	S.A foliar	2.28BC	0.48A	0.13A	0.17B	1.94A	13.08BC
	K.H foliar	2.45BC	1.22A	0.89A	0.18B	1.88AB	14.09BC
	K.F+S.A+K.H foliar	2.70B	1.23A	1.02A	0.22B	1.23C	15.53B
	K.F soil	2.70B	1.20A	0.94A	0.21B	1.78AB	15.53B
	S.A soil	2.55BC	1.23A	0.84A	0.19B	1.80AB	14.66BC
	K.H soil	2.71B	1.28A	1.02A	0.21B	1.40BC	15.57B
	K.F+S.A+K.H soil	3.28A	1.36A	1.15A	0.42A	1.18C	18.83A
LSD 0.05 (var.)		0.207	0.286	0.321	0.053	0.220	1.193
LSD 0.05 (acid)		0.518	0.778	0.881	0.080	0.509	2.98
LSD-Interaction (var. x acid)		0.268	0.061	0.068	0.039	0.103	1.543

Potassium fulvate (K.F), Salicylic acid (S.A) and Potassium humate (K.H)

Micronutrients in Grains

1.Iron:

Table 7 showd significant differences between the two wheat varieties for iron in grains. The highest variety all over organic materials treatments, for iron, was due to Sakha 94 where, it recorded 38.22 mg kg^{-1}. While, the lowest variety was due to Sids12 where, it recorded 31.11 mg kg^{-1}. Results in Table 7 indicate a significant increase in Fe content in grains with applied organic materials compared with the control treatment under salinity over both varieties. Soil application by Potassium fulvate + Salicylic acid + Potassium humate resulted the highest values of Fe content in grains (55.75 mg kg^{-1}). Table 7 showed also significant effects of the interaction between different treatment of organic materials and varieties for iron in grains. The interaction between Sakha 94 and Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of Fe content in grains where, it recorded 63.50 mg kg^{-1}. These results go in line with Dincsoy and Seonmez (2019) who showed that iron content reflected significant effect on p<.01 level with humic acid applications.

2.Manganese:

Table 7 showed significant differences between the two wheat varieties for manganese content in grains. The highest variety all over organic materials treatments, for manganese content, was Sids12, where, recorded 50.94 mg kg^{-1}. Also, the lowest variety was, Sakha 94 where, it recorded 44.89 mg kg^{-1}. Results in Table 7 indicate a significant increase in manganese content in grains with applied organic materials compared with the control treatment under salinity over both varieties. Potassium fulvate + Salicylic acid + Potassium humate as soil application resulted the highest values of manganese content in grains (66.0 mg kg^{-1}). Table 7, further, shows significant effects of the interaction between different treatment of organic materials and varieties for manganese content in grains. The interaction between Sids12 and Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of manganese content in grains where, it recorded 70.0 mg kg^{-1}.

3.Zinc:

Table7, shows non-significant differences between two studied different wheat cultivars Sids 12 and Sakha 94 for Zn content in grains in grains all over organic materials treatments**.** Data indicated that a significant increase in Zn content in grains with applied organic materials compared with the control treatment under salinity over both varieties. Potassium fulvate+ Salicylic acid + Potassium humate as soil application resulted the highest values of Zn content in grains (27.50 mg kg^{-1}). Table 7, further, shows significant effects of the interaction between different treatment of organic materials and varieties for Zn content in grains. The interaction between Sakha 94 and Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of Zn content in grains where, it recorded 29.50 mg kg^{-1}. Similar results were obtained by Babar Iqbal *et al.* (2016) revealed that humic acid is known to be among the most bio-chemically active materials found in soil. It increases root vitality, improved nutrient, increase fertilizer retention and improve yield. Dincsoy and Seonmez (2019) indicated that humic acid applications caused an increase in zinc content in grain, thus due to that organic acids help in avaiablitiy elements for soil . zinic content reflected significant effect on p<.01 level.

Table 7. Effect organic materials on micronutrients in grains of wheat under salinity (combined analysis of two seasons)

Treatments		Fe	Mn	Zn
Varieties	Organic materials	mg/kg^{-1}		
Sids12	Control	20.50^{j}	35.0^{j}	14.50^{i}
	K.F foliar	27.0^{ghi}	40.50^{gh}	17.25^{g}
	S.A foliar	25.0^{ghi}	37.0^{ij}	16.50^{gh}
	K.H foliar	28.50^{g}	49.0^{e}	17.33^{g}
	K.F+S.A+K.H foliar	33.50^{ef}	64.0^{b}	24.50^{cd}
	K.F soil	27.0^{ghi}	54.50^{d}	20.50^{e}
	S.A soil	33.50^{ef}	50.50^{e}	21.0^{e}
	K.H soil	37.0^{de}	58.0^{c}	21.50^{e}
	K.F+S.A+K.H soil	48.0^{c}	70.0^{a}	25.50^{c}
Sakha 94	Control	23.50^{ij}	32.0^{k}	15.50^{hi}
	K.F foliar	24.50^{hi}	40.50^{gh}	17.50^{g}
	S.A foliar	27.50^{gh}	39.0^{hi}	16.50^{gh}
	K.H foliar	32.50^{f}	41.50^{fg}	19.0^{f}
	K.F+S.A+K.H foliar	52.0^{b}	53.0^{d}	27.33^{b}
	K.F soil	40.0^{d}	42.50^{fg}	21.50^{e}
	S.A soil	35.0^{ef}	43.50^{f}	21.50^{e}
	K.H soil	45.50^{c}	50.0^{e}	23.67^{d}
	K.F+S.A+K.H soil	63.50^{a}	62.0^{b}	29.50^{a}
Means values of (varieties)	Sids12	31.11B	50.94A	19.84A
	Sakha 94	38.22A	44.89B	21.33A
Means values of (organic acid)	Control	22.0E	33.50F	15.0G
	K.F foliar	25.75DE	40.50DE	17.38EF
	S.A foliar	26.25DE	38.0EF	16.50F
	K.H foliar	30.50CD	45.25CD	18.17E
	K.F+S.A+K.H foliar	42.75B	58.50B	25.92B
	K.F soil	33.50C	48.50C	21.0D
	S.A soil	34.25C	47.0C	21.25CD
	K.H soil	41.25B	54.0B	22.58C
	K.F+S.A+K.H soil	55.75A	66.0A	27.50A
LSD 0.05 (var.)		5.908	5.574	2.290
LSD 0.05 (acid)		6.647	5.019	1.4997
LSD-Interaction (var. x acid)		3.651	2.334	1.356

Potassium fulvate (K.F), Salicylic acid (S.A) and Potassium humate (K.H)

In the end, the results indicate that the increase of micronutrients in the mixed treatment (Potassium fulvate + Salicylic acid + Potassium humate) with soil or foliar application gave the highest values due to the effective role of humic substances that increase the absorption of iron, zinc, manganese and copper ions, which work to chelate them. Also, salicylic acid is a plant hormone involved in seed germination, root growth, and stomata closure, and helps the plant withstand stress.

Macronutrients in Soil

1.Nitrogen:

Table 8 showed non-significant differences between the two wheat cultivars Sids: 12 and Sakha 94 for N in the soil all over organic materials treatments**.** Table 8 indicate a significant increase in N in the soil with applied organic materials compared with the control treatment under salinity over both varieties. Potassium fulvate + Salicylic acid + Potassium humate as soil application resulted the highest values of N in the soil (98.0 mg kg^{-1}). Table 8 showed also significant effects of the interaction between different treatment of organic materials and varieties for N in the soil. The interaction between Sakha 94 and Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of N in the soil where, it recorded 112.0 mg kg^{-1}. These observation were previously noticed by Abd EL-Kader (2016) who found that availability of N in the soil which increased after organic acids application which creates suitable conditions for plant growth and enhanced grain yield and 100 grain weight. The highest mean value of N was 29.30 mg kg^{-1}. The increment of available N in the treatment which resaved organic acid compared to urea may be due to the composition of organic acid and the combination of urea with humic acid which significantly reduced urea hydrolysis (Junejo *et al.*, 2010).

2.Phosphorus:

Table 8, shows significant differences between studied varieties for P in soil. The highest variety all over organic materials treatments, for P in soil, was Sids12, where, it recorded 9.41 mg kg^{-1}. While, the lowest variety was, Sakha 94 where, it recorded 6.78 mg kg^{-1}. Table 8 indicate a significant increase in P in soil with applied organic materials compared with the control treatment under salinity over both varieties. Potassium fulvate + Salicylic acid + Potassium humate as soil application resulted the highest values of P in soil (9.67mg kg^{-1}).

Table 8, further, shows significant effects of the interaction between different treatment of organic materials and varieties for P in soil. The interaction between Sids12 and Potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of P in soil where, it recorded 11.33mg kg^{-1}. The increase in phosphorous available in the treatment that contains organic acids compared to other treatments may be the result of the role of organic acids that help its availability in the soil. The amine group on humic acids can adsorb phosphate anions and improve their availability to plants. These results are agreement with Yang *et al.* (2013) demonstrated that fulvic acid is optimum choice for the improvement of P availability. Tahir *et al.* (2011) reported that humic acid application significantly improved P concentration of the calcareous soil. The highest rate of HA (90 mg kg^{-1} soil) had a negative effect on growth and nutrient uptake of wheat as well as nutrient accumulation in soil, whereas the medium dose of HA (60 mg kg^{-1} soil) was more efficient in promoting wheat growth. Hejazi Mehrizi *et al*. (2015) showed that hunic substances could increase P extractability and availability in soil. Abd EL-Kader (2016) found that availability of P in the soil which increased with organic acids application and enhanced grains yield. The highest mean values of P was10.21mg kg^{-1}. The increment of available P in the treatment which resaved organic acid compared to urea may be due to the composition of organic acid and the combination of urea with humic which significantly reduced urea hydrolysis (Junejo *et al.*, 2010).

Table 8. Effect organic materials on macronutrients in soil (combined analysis of two seasons)

Treatments: Varieties	Organic materials	N	P	K
		mg kg^{-1}		
Sids12	Control	52.0^{ef}	6.42^{l}	251.3^{j}
	K.F foliar	56.0^{def}	8.19^{f}	279.2^{h}
	S.A foliar	56.0^{def}	8.06^{fg}	265.2^{i}
	K.H foliar	59.33^{cdef}	10.97^{b}	279.2^{h}
	K.F+S.A+K.H foliar	60.67^{cde}	11.03^{b}	321.3^{f}
	K.F soil	84.0^{b}	8.50^{e}	307.1^{g}
	S.A soil	56.0^{def}	9.83^{d}	307.1^{g}
	K.H soil	83.83^{b}	10.33^{c}	376.9^{d}
	K.F+S.A+K.H soil	112.0^{a}	11.33^{a}	404.8^{b}
Sakha 94	Control	51.33^{f}	6.50^{kl}	228.7^{k}
	K.F foliar	62.50^{cd}	6.67^{jk}	321.1^{f}
	S.A foliar	56.0^{def}	5.83^{m}	363.0^{e}
	K.H foliar	75.50^{b}	6.67^{jk}	363.0^{e}
	K.F+S.A+K.H foliar	80.50^{b}	7.0^{i}	390.9^{c}
	K.F soil	78.67^{b}	7.67^{h}	361.0^{e}
	S.A soil	65.50^{c}	5.83^{m}	390.9^{c}
	K.H soil	82.0^{b}	6.83^{ij}	404.8^{b}
	K.F+S.A+K.H soil	84.0^{b}	8.0^{g}	460.7^{a}
Means values of (varieties)	Sids12	68.87A	9.41A	310.2B
	Sakha 94	70.67A	6.78B	364.9A
Means values of (organic acid)	Control	51.67E	6.46D	240.0F
	K.F foliar	59.25DE	7.43BCD	300.1E
	S.A foliar	56.0E	6.94CD	314.1DE
	K.H foliar	67.42CD	8.82ABC	321.1CDE
	K.F+S.A+K.H foliar	70.58C	9.01AB	356.1BC
	K.F soil	81.33B	8.08ABCD	334.0CDE
	S.A soil	60.75CDE	7.83ABCD	349.0CD
	K.H soil	82.92B	8.58ABC	390.9B
	K.F+S.A+K.H soil	98.0A	9.67A	432.8A
LSD 0.05 (var.)		9.060	0.685	30.375
LSD 0.05 (acid)		10.167	1.927	41.139
LSD-Interaction (var. x acid)		8.878	0.17	2.664

Potassium fulvate (K.F), Salicylic acid (S.A) and Potassium humate (K.H)

3.Potassium:

Table 8 showed significant differences between studied varieties for potassium in soil. The highest variety all over organic materials treatments, for potassium was Sakha 94 where, it recorded 364.9 mg kg^{-1}. While, the lowest variety was Sids12 where it recorded 310.2 mg kg^{-1}. Table 8 indicate a significant increase in potassium in soil with applied organic materials compared with the control treatment under salinity over both varieties. Potassium fulvate + Salicylic acid + Potassium humate as soil application resulted the highest values of potassium in soil (432.8 mg kg^{-1}). Table 8 showed also significant effects of the interaction between different treatment of organic materials and varieties for potassium in soil. The interaction between Sakha 94 and potassium fulvate + Salicylic acid + Potassium humate as soil application was significantly superior and had the highest means of potassium in soil where, it recorded 460.7 mg kg^{-1}. The increase in potassium available in the treatment that contains organic acids compared to other treatments may be the result of the role of organic acids that help its availability in the soil. This is due to the active role of humic substances that increase the absorption of monovalent ions such as potassium.

These findings agree with those reported by Abd EL-Kader (2016) who found that availability of K in the soil which increased after organic acids application and enhanced grain yield. The highest mean value of K was 335 mg kg-1. The increment of available K in the treatment which resaved organic acid compared to urea may be due to the composition of organic acid and the combination of urea with humic acid which significantly reduced urea hydrolysis (Junejo *et al.*, 2010). Tahir *et al.* (2011) showed that humic acid application significantly improved K concentration of the non-calcareous soil. The medium dose of HA (60 mg kg^{-1} soil) was more efficient in promoting wheat growth.. Ali and Mindari (2016) Humic acid can balance the soil cation so that the soil pH reached 7-8, through a chelate of Fe, Ca or exchanged with NH4, Na and K. The results showed that the application of 100-200 ml HA/0.12 m^2 gave optimum yield in improving the physical-chemical characteristics of the soil embankment. Humic acid application to soils boost up biological processes in soil and hold the nutrients in easily exchangeable form to minimize their leaching from soil profile with peculating water (Brady and Weil, 2008).

Nutrient Use Efficiency (NUE)

Fig (1A) showed that Nutrient Use Efficiency for organic acids in nitrogen and potassium in grains of Sids 12 was increased. Potassium fulvate + Salicylic acid + Potassium humate as soil application had the highest means of NUE, where, it recorded 7.82% and 87 % in nitrogen and potassium, respectively. Fig (1B) showed that Nutrient Use Efficiency in nitrogen and potassium in grains of Sakha 94 was increased with organic acids. Potassium fulvate + Salicylic acid + Potassium humate as soil application had the highest means of NUE, where, it recorded 15.54% and 4 % in nitrogen and potassium, respectively. Soil application of humic improves nutrient uptake and plant development. These observation were previously noticed by Abd EL-Kader (2016) who noted that NUE was significantly increased with organic acids in both seasons. The maximum mean values of NUE was 41.85 %.

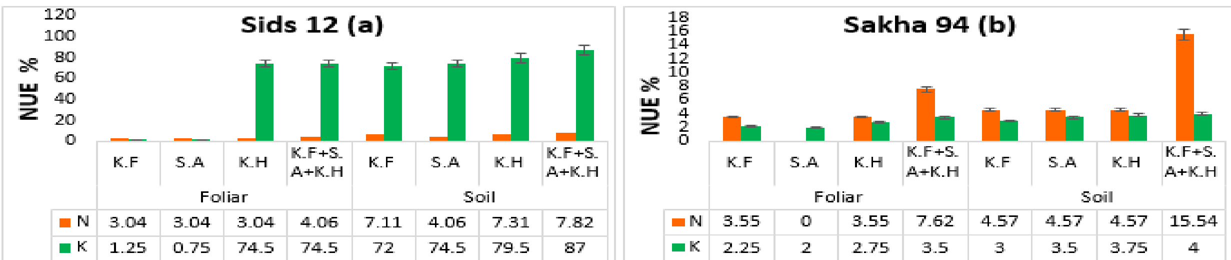

Fig .1. Nutrient Use Efficiency for organic acids of nitrogen and potassium in grains of Sids 12 and Sakha 94 wheat varieties

Error bars refer to the LSD $_{5\ \%}$ values of the statistical analysis of data

Agronomic Efficiency (AE)

Fig (2A) showed that Agronomic efficiency for organic acids in NPK in grain of Sids 12 was increased. Potassium fulvate+ Salicylic acid+ Potassium humate as soil application had the highest means of AE, where, it recorded 12.5%, 116.5%, and 61.5 % in N, P, and K, respectively. Fig (2B) showed that Agronomic efficiency in NPK in grain of Sakha 94 was increased with organic acids. Potassium fulvate+ Salicylic acid+ Potassium humate as soil treatment had the highest means of AE, where, it recorded 8.94%, 83.33%, and 44 % in N, P, and K, respectively. Humates improved fertilizer efficiency with each of phosphorous, followed by potassium, followed by nitrogen, respectively.

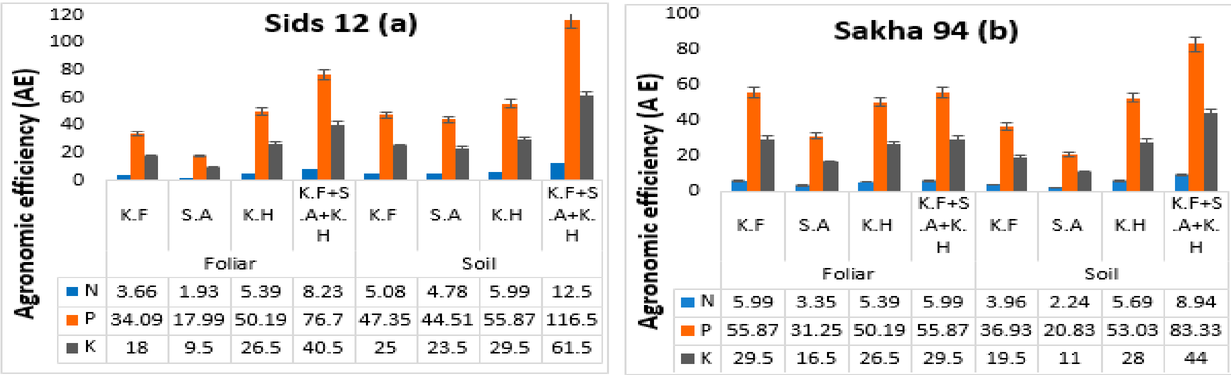

Fig .2. Agronomic efficiency for organic acids of N, P and K in grains of Sids 12 and Sakha 94 varieties
Error bars refer to the LSD $_{5\%}$ values of the statistical analysis of data

CONCLUSION

The obtained results showed that Potassium fulvate+ Salicylic acid+ Potassium humate as soil application was significantly superior and had the best means of all Studied traits; plant height, grains weight, weight1000 grains, grains yield, macronutrients in straw, secondary elements in straw, micronutrients in straw, elements in grains, protein in grains, micronutrients in grains, element in soil, Nutrient Use Efficiency and Agronomic Efficiency compared with the control and with foliar application of organic acid under salinity stress. In addition, these results showed that Sids 12 was the best and more tolerant in the most studies traits under salinity stress compared with Sakha 94 cultivar. Soil application of humic improves nutrient uptake and plant development while foliar application increases stress resistance. The results indicate organic acid fertilizers are considered environmentally friendly fertilizers and do not leave any harmful effects on the environment. Organic acids significantly reduce salinity in the soil. Humic acids increase the ability of the soil to retain water, which leads to savings in irrigation water and resistance to drought. Humic substances increase the conversion of nutrients (N, P, K , Ca, Mg Fe, Zn, Mn, and Cu into forms available to plants. Humic fertilizers are known for their effectiveness because of their effective effect on the physical, chemical and biological properties of soil. Also, salicylic acid is a plant hormone involved in seed germination, root growth and stomata closure, and helps the plant resist salt stress. In the end, the organic materials significantly improve the specifications of the crops in terms of the components of the crop and the productivity of the plant.

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Conflict Of Interest

The author declared that present study was performed in absence of any conflict of interest.

Author's Contribution

All authors significantly contributed in all parts and aspects of paper.

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تأثير إضافة أحماض الساليسيليك والهيوميك والفولفيك على النمو والإنتاجية ومحتويات العناصر لصنفين من القمح النامى تحت الاجهاد الملحى

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أجريت هذه الدراسة فى المزرعة البحثية لمحطة البحوث الزراعية بالنوبارية – محافظة البحيرة – جمهورية مصر العربية فى موسمى الزراعة الشتويين 2016/ 2017 و 2017/ 2018 وكان الهدف من الدراسة هو تقييم تأثير الاضافة من أحماض الساليسيلك والهيومك والفولفيك على النمو والإنتاجية والمحتوى المعدني لصنفين من القمح (Triticum aestivum L.) النامى تحت ظروف التربة المتأثرة بالملوحة في منطقة النوبارية. تم تنفيذ التجربة فى قطع منشقه لتصميم قطاعات كاملة العشوائية مع استخدام ثلاث مكررات حيث تم وضع الأصناف في القطع الرئيسية (صنفين من القمح Sids 12 و Sakha 94) بينما وضعت المعاملات المختلفة للأحماض العضوية في القطع المنشقة وكانت كالتالي :1- المعاملة الكنترول 2- االرش الورقي بفولفات البوتاسيوم (1كجم/فدان) 3- الرش الورقي بحامض الساليسيلك (1.600 كجم/فدان) 4- الرش الورقي بهيومات البوتاسيوم (1كجم/فدان) 5- الرش الورقي لخليط كل من فولفات البوتاسيوم (1 كجم/فدان) وحامض الساليسيلك (1.600 كجم/فدان) وهيومات البوتاسيوم (1كجم/فدان) 6- الاضافة الأرضية بفولفات البوتاسيوم (2كجم/فدان) 7- الاضافة الأرضية بحامض الساليسيلك (3.200 كجم/فدان) 8- الاضافة الأرضية بهيومات البوتاسيوم (2كجم/فدان) 9- الاضافة الأرضية لخليط كل من فولفات البوتاسيوم (2كجم/فدان) وحامض السالسيلك (3.200 كجم/فدان) وهيومات البوتاسيوم (2كجم/فدان). تشير النتائج الي أن المعاملة المختلطه من كل من فولفات البوتاسيوم وهيومات البوتاسيوم وحامض الساليسيلك بالاضافة الأرضية كانت أفضل المعاملات مقارنة بالكنترول و وكذلك أفضل من تطبيق المعاملات بالرش الورقي تحت تأثير الملوحة حيث أعطت أفضل المتوسطات في كل الصفات المدروسة وهي صفة طول النبات و وزن الحبوب و وزن 1000 حبة و المحصول من الحبوب و العناصر الكبري والثانوية والصغري في القش و الحبوب والبروتين فى الحبوب و Nutrient Use Efficiency و Agronomic Efficiency أيضا أظهرت النتائج أن الصنف سدس 12 كان أكثر تحملا للاجهاد الملحي عن الصنف سخا 94.