Inducing salt tolerance of some selected wheat varieties

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Pot experiments were conducted under the green house conditions to study the response of two cultivars of wheat (Triticum aestivum cv. i.e Sakha 93 and Seds -1) to chicken manure as a soil treatment and amino acids as a foliar spray treatments on grain weight as well as the straw weight and yield components of macro nutrients (N, P, K, Ca, Mg and Na) and micro nutrients (Fe, Mn, and Zn) under irrigation with water ofdifferent salinities.Amino acids spray treatments included: non spraying (T1), Arginine (T2), Proline 'Pr' (T3) and Proline +Glutarnic acid (Pr+G1) (T4), Humic acid 'HA' Humic acid + Arginine 11A+Ar' (T6) and Humic acid + Proline + Glutamic`11A+Pr+G1' T7 [7 treatments].Different levels of irrigation water salinity were also assessed. There were 3 different levels of salinity by diluting sea water with tap water. There was a ratio of 1:5 (8.29 dSm') and a ratio of 1:3 (11.02 dSm-I) beside tap water itself (.59 dSm1) .Soil was taken from the 0-30 surface layer from El Nubaria Research Station. It was air dried, gently crushed and sieved through a 2 mm screen and packed in plastic bags at a rate of 2Kg / bag, the soil bags were placed in PVC pots.The design of the experiment was a randomized complete block, factorial. Factors of the experiment are 4 as follows:1- Manuring: non- manured `Mo'and chicken manured Mil 2 treatments].Summary and Conclusion -209-2-Two cultivars of wheat (Triticum aestivum cv. Sakha 93 and Seds -1)3-Salinity of irrigation water: water of dSm-1: 0.59 (W1) ; 8.29 (W2) ; and 11.02 (W3) [3 treatments .4-Foliar spray with amino and humic acid:seven treatments as mentioned before.Treatments were done in 3 replicates,Soil fertilization: fertilizers were added to soil and mixed thoroughly as follows:Amonium nitrate (33.5%N) as a N source at the rate of 75 mg N/kg, super phosphate 6.8% P at the rate of 40 mg P/kg and the potassium sulphate (40% K) at the rate of 25 mg K /kg, respectively.Grains of wheat were soaked in a mixture of tap and saline water (8.29 dsm-I) for 24 hours, then were planted 10 grains per pot and irrigated with the tap water when needed up to 10 days (seedling emergence). The seedlings were then thinned into 5 per pot followed by application of the water treatments.One experiment was done with spraying at 15 days after sowing; another was done with spraying at 21 days after sowing .After 150 days the plants were harvested, washed, dried at 70°C and the dry matter and grain yields were recorded. Plant samples were taken ground, wet digested and N, P, K, Ca, Mg, Na and micro nutrients (Fe, Mn and Zn).The obtained results can be summarized as the following:Summary and Conclusion -210-Yield and Yield Components:Grains and straw yields:Applied chicken manure to soil significantly increased grain and straw yields under all levels of salinity.Grain and straw yields decreased significantly with increasing salinity. The reduction in wheat grain was greater than in straw yield. Grain and straw yields increased significantly in response to sprayed humic and amino acids .The increasing percentage of straw yield sprayed at 15days after sowing (DAS) was 29.48, 36.17, 35.24, 43.23, 33.52, and 57.39% while it was 15.93, 20.34, 41.41, 50.85, 31.91 and 40.52 % at 21 DAS due to foliar application with Arg, Pr, Pr+glu, H.A, H+Arg andHA+Pr+Glu, respectively.(HA+Pr+Glu) treatment was the most effective treatment in increasing straw yields with a mean value of 2.53 (g/pot) at 15 DAS while HA treatment was the most effective treatment at 21 DAS giving a mean value of 2.42 g/pot as compared with all theother treatments.Spraying wheat at 15 DAS gave greater dry weight of wheat straw as compared with the same treatments sprayed at 21DAS.Increases in grain yield sprayed at 15 DAS were 5.12, 9.76, 14.85, 8.92, 2.15 and 12.72 % DAS while it was 4.00, 9.10, 5.15, 5.96, 13.16 and 10.71 at 21 DAS

due to foliar application with Arg, Pr, Pr+glu, H.A, H+Arg and HA+Pr+Glu,respectively.Summary and Conclusion -211-Pr+Glu treatment was the most effective treatment for increasing grain yield at 15DAS giving a mean value of 2.62 (g/pot) while HA+Arg treatment was the most effective treatment among all the other treatments giving a mean value of 2.58 g/pot at 21 DAS.Spraying at 15 DAS surpassed significantly wheat grains as compared with the same treatments sprayed at 21 DAS. Nutrient uptake:In all cases application of chicken manure significantly increased Nutrient uptake of (N, P, K, Ca, Mg, Fe, Mn, Zn) except Na uptake. 1.Nitrogen uptakeNitrogen uptake decrease significantly with increasing salinity. On the other hand, N uptake in grain and straw increased significantly in response to spray humic and amino acids .The increasing percentage of N uptake in straw sprayed at 15 DAS was13.09, 17.91, 18.96, 24.93, 18.73 and 23.82 % while it was 7.23, 7.56, 13.44, 18.95, 11.79 and 19.88 % at 21 DAS for (Arg),(Pr), (Pr+glu), (H.A),(H+Arg) and (HA+Pr + Glu) respectively.Spraying plants with humic and amino acids at the period of 15 days was superior to spraying at 21 DAS for increasing N uptake.Increases in N uptake in grain wheat were 32.04, 29.14, 23.22, 18.28 , 25.67 and 22.84 % at 15 DAS while it was15.25, 10.75, 8.01, 15.98, 17.17 and 25.11 % at 21 DAS for Arg, Pr, Pr+glu, H.A, H+Arg and HA+Pr+Glu, respectively. SprayingSummary and Conclusion -212-wheat at 15 days after sowing. surpassed in N up take in wheat grains as compared with the same treatments sprayed at 21 daysof sowing.2. Phosphorous uptakePhosphorous uptake decrease significantly with increasing salinity. There was a significant negative relationship between salinity and phosphorous uptake in grain and straw of wheat. On the other hand, P uptake in grain and straw increased significantly in response to spray humic and amino acids .The increasing percentage of P uptake in straw wheat sprayed at 15 DAS was 14.03, 16.23, 13.19, 18.93, 22.97 and 24.16 % while it was13.71, 16.05, 16.7, 23.88, 18.05, and 30.16 % at 21 DAS for Arg, Pro, P+G, H.A, H+Arg and HA+Pr+Glu, respectively. The highest values of P uptake at 21 DAS were obtained The highest values of P uptake were obtained in response to HA+Pr+Glu and HA, at 15 and 21 DAS spraying treatments, respectively.In general, spraying treatments at 15 DAS is equal to those at 21 DAS on P uptake of wheat straw.The increment percentage of P uptake in wheat grains was 24.59, 23.64, 34.08, 23.37, 30.59 and 27.24 % at 15 DAS while it was 22.68, 36.17, 24.51, 30.26, 32.67 and 30.07 % at 21 DAS for Arg, Pro, P+G, H.A, H+Arg and HA+Pr+Glu,respectively.The highest values of P uptake were obtained in response to Pr and HA+Arg, respectively at 21 DAS, while it was obtained in response to Pr and HA+Arg at 15 DAS.Summary and Conclusion -213-3.Potassium uptakePotassium uptake decrease significantly with increasing salinity. On the other hand, K uptake in grain and straw increased significantly in response to spray humic and amino acids .The increasing percentage of K uptake in wheat straw sprayed at 15 DAS was 31.31, 28.84, 29.51, 37.31, 28.74 and 11.09 % while it was 26.4, 29.79, 29.00, 37.00, 29.53 and 27.10% at 21 DAS for Arg, Pr, Pr+glu, H.A,H+Arg and HA+Pr+Glu, respectively.Spraying treatments at 21 DAS is better than those at 15 DAS on K uptake of wheat straw.The increment percentage of K uptake in wheat grains sprayed at 15 DAS was 29.48, 32.77, 24.66, 27.77, 28.99 and 20.11 at 15 DAS while it was 26.78, 15.74, 26.57, 20.98, 19.24 and 27.95 % AT 21 DAS for Arg, Pr, Pr+glu, H.A,H+Arg and HA+Pr+Glu, respectively.Spraying treatments at 15 DAS is better than those at 21 DAS on K uptake of wheat grains. 4.Calcuim uptakeIncreasing salinity level without applied chicken manure and foliar application of different amino and humic acids decreased calcium uptake in both grains and straw. Ca uptake were significantly increase as a result of spraying treatments. The increment percentage in Ca uptake of wheat straw in comparison with non- spraying plants was 17.2, 19.13, 25.24, 31.51, 21.85 and 29.75 % at 15 DAS while it was 17.83, 17.61, 26.74, 17.88, 18.04, and 22.85 for Arg, Pro, Pr+Glu, HA, HA+Arg and HA+Pr+Glu respectively. The higher values of CaSummary and Conclusion -214-uptake were obtained in response to HA, and HA+Pr+Glu at 15 DAS while it was obtained in response to (Pr+Glu) and(HA+Pr+Glu), at 21 DAS.In response to spraying date, the data showed that, spraying wheat plants at 15 DAS was more efficient than in inducing more K uptake in wheat straw.Different amino and humic acids caused significant increase in Ca uptake among all the other acids. The mean values of Ca uptake in grains are 7.17, 6.25, 7.19, 6.88, 6.77 and 6.70 corresponding to 36.66, 19.09, 37.08. 31.19, 29.1 and 27.73% at 15 DAS, while The increment % of Ca uptake in grains as compared with non- sprayed plants (5.25 mg/pot) were 34.38, 40.2, 31.00, 44.36, 36.09 and 51.53

% at 21 DAS for Arg, Pro, P+G, H.A, H+Arg and H+P+G, respectively.The highest values of Ca uptake in wheat grains were obtained in response to Pr+Glu, Arg and HA respectively at 15 DAS, while it was obtained in response to Pr+Glu, Arg and HA, respectively at 21 DAS. 5.Magnisium uptakeThere is a significant decrease in Mg uptake in both grains and straw. as a result of raising irrigation salinity. The total uptakes of Mg were significantly increased as a result of spraying humic and amino acids. The increment percentage of Mg uptake as compared tonon sprayed treatment were 22.33, 19.28, 32.63, 29.73, 31.12 and 33.97 % at 15 DAS while it was 21.10, 31.07, 29.62, 25.56, 33.62 and 11.12 % for Arg, Pr, Pr+glu, HA, HA+Arg and HA+Pr+Glu, respectivelySummary and ConclusionConcerning the spraying date, treatment of wheat plants with different humic and amino acids at 15 DAS induced significant increments in Mg uptake in straw compared to the same treatments sprayed at 21 DAS.The increment percentage of Mg uptake in wheat grains sprayed at 15 DAS was 20.01, 21.26, 20.20, 22.39, 22.23 and 28.9 %, while it was19.74, 21.62, 16.17, 18.06, 23.11 and 28.53 % at 21 DAS for Arg, Pr, Pr+glu, HA, H+Arg and HA+Pr+Glu, respectively.Concerning the spraying date, treatment of wheat plants with different humic and amino acids at 15 DAS induced significant increments in Mg uptake in grains compared to the same treatments sprayed at 21 DAS6. Sodium uptakeSalinity level showed a high increase in Na uptake in both grains and straw. The uptake of Na were significantly decrease as a result of spraying treatments. The decrements percentage in comparison with non- spraying plants were 31.42, 38.07, 29.66, 21.37, 35.74 and 40.52 % at 15 DAS while it was 31.38, 25.98, 23.68, 17.96, 20.75 and 13.67 % at 21 DAS for Arg, Pro, P+G, H.A, H+Arg and HA+Pr+Glu respectively.The lowest value of Na uptake in wheat straw were obtained in response to (HA+ Pr+Glu) at 15 DAS while it were obtained in response to (.Arg) at 21 DAS.In response to spraying dates, the results showed that, wheat plants sprayed at 21 DAS with different amino and humic acids induced much higher values of Na uptake over that resulted from the same treatments at 15 DAS.Summary and Conclusion -216-The uptake of Na in grains were significantly decrease as a result of spraying treatments. The decrement % of Na uptake as compared with non- sprayed plants (4.32 mg/pot) were 21.21, 25.28, 20.94, 23.07, 21.75 and 23.56 % at 15 DAS while it was 15.5, 19.21, 20.83, 23.37, 21.06 and 6.71 % at 21 DAS for Arg, Pro, P+G, HA, HA+Arg and HA+Pr+Glu, respectively.The lowest values of Na uptake in grains were obtained in response to (Pr) and (HA+Pr+Glu) at 15 DAS while it were obtained in response to (HA), (HA+Arg) and (Pr+Glu) at 21 DAS, respectively.In response to spraying dates, the results showed that, wheat plants sprayed at 21 DAS with different amino and humic acids induced much higher values of Na uptake over that resulted from the same treatments at 15 DAS.7. Iron uptake:Increasing salinity caused a significant decrease in Fe uptake in both grains and straw. The Fe uptake significantly increased as a result of spraying humic and amino acids. The increment percentage of Fe up take in comparison with non spraying treatment were 63.82, 51.85, 62.14, 50.63, 53.33, and 59.25 % at 15 DAS while it was 48.72, 44.41, 46.68, 49.77, 58.2 and 42.95 % at DAS for Arg, Pr, Pr+glu, H.A,H+Arg and HA+Pr+Glu, respectively.Also the results showed that spraying wheat plants with HA+Arg followed by HA were superior to all the other treatment at 21 DAS.Spraying acids at 15 DAS gave higher values over those sprayed at 21 DAS.Summary and Conclusion -217-The increment % of Fe uptake in grains as compared with non sprayed (0.96 mg/pot) treatment were 22.73, 35.80, 36.66, 30.32, 20.20 and 31.72 % at 15 DAS while it was 31.43, 47.48, 45.79, 55.85, 50.00 and 47.81 % at 21 DAS for Arg, Pr, Pr+glu, H.A, H+Arg and HA+Pr+Glu, respectively.8. Manganese uptakeSalt stress caused a significant reduction of Mn uptake in both grains and straw. The different amino and humic acids caused significant difference increases in Mn uptake in straw. Mn uptake significantly increased as a result of spraying treatments. The increment percentage of Mn uptake in wheat straw in comparison with non- sprayed plants were 20.85, 14.26, 31.52, 27.93, 36.33 and 51.05 % at 15 DAS but it was 12.57, 8.69, 36.75, 26.49, 28.74 and 42.68 % at 21 DAS for Arg, Pr, Pr+glu, HA,HA+Arg and HA+Pr+Glu, respectively. The highest values of Mn uptake were obtained in response to HA.+Pr+Glu.The highest values of Mn uptake were obtained in response to HA.+Pr+Glu. at 15 DAS while it was obtained in response to HA.+Pr+Glu and Pr+Glu at 21 DAS, respectively.Spraying wheat at 15 DAS surpassed those of 21 DASvalues.The increment of Mn uptake in grains as compared with non- sprayed plants(.09 mg/pot) were 23.96, 31.1, 31.53, 29.20, 15.56 and 29.47 % at 15 DAS while it was 20.30, 26.65,

19.18, 23.11, 27.01 and 25.68 at 21 DAS for Arg, Pr, Pr+Glu, HA, HA+Arg and HA+Pr+Glu, respectively.The highest values of Mn uptake in grains were obtained in response to Pro=HA+Arg =HA+Pr+Glu at 21 DAS, respectively.Summary and Conclusion -218-Spraying wheat at 15 DAS surpassed the same treatmentssprayed at 21 DAS. 9. Zinc uptake:Zn uptake by wheat straw significantly decreased with increasing salinity in both grains and straw and increased as a result of spraying humic and amino acids. The increment percentage of Zn uptake in wheat straw in comparison with non spraying treatment were 20.88, 22.36, 28.08, 38.47, 27.45 and 51.06 % at 15 DAS and 19.03, 28.87, 32.17, 32.26, 28.08 and 56.12 % for 21 DAS Arg, Pr, Pr+glu, H.A,H+Arg and HA+Pr+Glu, respectively.Spraying at 15 DAS gave more valuesthan 21 DAS.The increment of Zn uptake in grains increased by 14.18, 19.84, 25.17, 18.67,11.74 and 24.90 % at 15 DAS and by 16.42, 23.66, 19.73, 19.84, 27.38 and 26.88 % at 21 DAS for spray with Arg, Pr, Pr+glu, HA,HA+Arg and HA+Pr+Glu,respectively.Concerning the spraying date, treatment of wheat plants with different humic and amino acids at 21 DAS induced significant increments in Zn uptake in grains compared to the same treatments sprayed at 15 DAS.The 15 DAS values were greater than the 21 DAS values.It could conclude, that the addition of chicken manure and humic and amino acids to the saline soil or when use salinity water may elevated the negative effects of salinity. Thus, the plant growth and yield could be increased by the addition of chicken manure and humic and amino acids under the salineconditions.