قسم النبات
كلية العلوم
جامعة الفيوم

البحث رقم (١)

Title:	Biochar and Selenium Nanoparticles Induce Water Transporter Genes for Sustaining Carbon Assimilation and Grain Production in Salt-Stressed Wheat
عنوان البحث:	دور الفحم الحيوي وجسيمات السيلينيوم النانوية في تحفيز جينات نقل المياه لتثبيت الكربون وإنتاج الحبوب في القمح المعرض للملوحة
اسم المجلة ومعلومات النشر (السنة، العدد، الصفحات):	Plant and growth regulation **42:1522–1543(2022)** https://doi.org/10.1007/s00344-022-10636-y

English Abstract

Background

In a controlled environment experiment, we studied how physiological changes in leaves during the vegetative phase regulate final grain yield of wheat crops in salt-affected soils. We also hypothesized that amendments such as biochar (SB) and selenium-chitosan nanoparticles (Se-NPs) can protect wheat plants from salt injury.

Results

20-day-old wheat plants were submitted to 4-week salt stress (3000 ppm NaCl). Soybean straw biochar was mixed with soil media at planting and Se-NPs (30 ppm) was sprayed 5 days after the first salt stress treatment. At the end of 4-week Se-NPs treatment, one set of plants was harvested for studying leaf level physiological changes. The salt-stressed plants accumulated significantly high leaf Na+(~ 13-fold increase), which trigged oxidative and osmotic damage. This salt-induced cellular injury was evident from significantly high levels of lipid membrane peroxidation and inhibited photosynthesis. Our study suggested that leaf physiological impairment in wheat plants was translated into poor biomass production and grain yield loss at crop maturity. Compared with control, salt-stressed plants produced 43% lesser biomass during vegetative phase, and 62% lesser grain yield at maturity.

Conclusions

Amendments such as SB and Se-NPs protected the plants from salt-induced cellular injury by restricting Na+ transport toward leaf tissues. Plants treated with NaCl + SB + Se-NPs accumulated 50% less Na+ concentrations in leaves compared with NaCl-treated plants. Our study also suggested that SB and Se-NPs can restore ionic homeostasis and carbon assimilation in salt-stressed wheat by upregulating key transporter genes in leaves.