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for managing natural resources and a better life for all”

Does lettuce and pak choi benefit of intercropping with the halophyte glasswort?

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Abstract

Salt accumulation in the soil is increasing by approximately 10 % annually e.g. due to high surface evaporation, weathering of native rocks, and poor agricultural practices. High salinity imposes osmotic stress and ion toxicity which negatively affects the nutritional quality and has a negative impact on the economic value. This research aimed to study if the quality of salt-sensitive lettuce (*Lactuca sativa*) and pak choi (*Brassica rapa* sp. *chinensis*) could be improved through intercropping with salt-tolerant glasswort (*Salicornia europaea*) in saline conditions. The experiment was conducted for 5 weeks in a greenhouse under three treatment conditions: Control (freshwater), 50 mM NaCl, and 100 mM NaCl. The design consisted of 9 individual plants in monoculture and a combination of 3 lettuce, 3 pak choi, and 3 glasswort plants in an intercropping system. Plants were analysed for ions and selected bioactive compounds using ion chromatography and HPLC-DAD, respectively. Results were compared using two-way ANOVA ($p \leq 0.05$). Plants' survival rates showed beneficial intercropping effects only for lettuce at 50 mM salt treatment; so pak choi and 100 mM salt treatment were not considered for further analysis. The β -carotene content in lettuce grown in intercropping at 50 mM salt treatment (5.41 ± 0.58 mg/100 g dw) was significantly higher compared to the lettuce grown in monoculture at 50 mM salt treatment (2.05 ± 0.26 mg/100 g dw). Similarly, lutein content in lettuce at 50 mM (6.19 ± 0.89 mg/100 g dw) was significantly higher than its monoculture counterpart (1.49 ± 0.27 mg/100 g dw). Both chlorophyll a and b content at 50 mM salt treatment were found to be significantly higher in lettuce grown in intercropping (166.70 ± 10.01 mg/100 g dw and 45.45 ± 3.11 mg/100 g dw) than its monoculture counterpart (58.87 ± 4.43 mg/100 g dw and 13.27 ± 1.25 mg/100 g dw). In contrast, chloride concentration in intercropping lettuce at 50 mM (107.18 ± 1.94 mg g⁻¹ dw) was significantly lower than its monoculture counterpart (117.80 ± 3.76 mg g⁻¹ dw). These findings suggest that lettuce benefits from growing in an intercropping system with glasswort (up to 50 mM salinity) and could contribute to developing cultivation strategies for saline soils, promoting sustainable resource management and food security.

Keywords: Lettuce, pigments, polyculture, salicornia, saline agriculture