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Association cultivation of *Ceratonia siliqua* L. and *Spergularia salina J.Presl*: A sustainable strategy for mitigating salt stress in agriculture

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INTRODUCTION & AIM

1,000 million hectares affected by salinity around the world

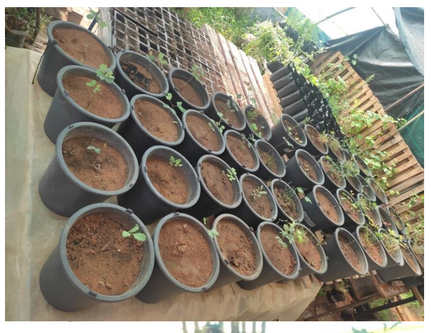
Threat to global food security

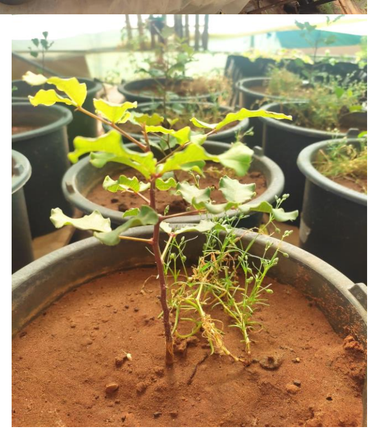
Accentuated by climate change

This study explores the potential of combined cultivation of *Ceratonia siliqua* L. (carob) and *Spergularia salina J.Presl* as a strategy for enhancing growth in a saline environment.

METHOD

- The study was carried out in a greenhouse for two months. Carob plants aged 6 months were subjected to salt stress.
- Four NaCl concentration levels were applied: 0 mM/L (non-saline control), 85 mM/L, 171 mM/L and 257 mM/L.
- *Spergularia salina* was grown with carob at concentrations of 171 mM/L and 257 mM/L.





- Key parameters assessed included soil electrical conductivity, morphological parameters, as well as various physiological and biochemical indicators of stress.

RESULTS & DISCUSSION

Salt stress resulted in a significant increase in soil electrical conductivity (EC) with increasing NaCl concentrations. Morphologically, there was a marked reduction in biomass, above-ground and root length, indicating growth inhibition. Physiologically, relative water content (RWC) and chlorophyll concentrations decreased, reflecting difficulties in maintaining water status and photosynthetic activity. Biochemically, an increased accumulation of proline and soluble sugars was noted, highlighting their role in osmotic adjustment and protection of cell structures under stress conditions.

Combining carob with *Spergularia salina* significantly improved growth and resistance to salt stress. The associated plants showed a higher biomass, a lower reduction in the height of the aerial parts and a better length of the main roots, indicating a beneficial effect on morphological growth. In addition, a decrease in the electrical conductivity (EC) of the soil was observed, suggesting an ionic regulation role by Spergularia salina. Physiologically, the associated plants maintained a higher relative water content (RWC) and a higher chlorophyll content, reflecting increased resilience. Biochemically, the accumulation of proline and soluble sugars was lower, indicating a reduction in the severity of the stress experienced.

CONCLUSION AND FUTURE WORK

The study revealed that saline stress significantly affects the growth and physiology of the carob, but the association with *Spergularia salina* improves its resistance and growth thanks to better ionic regulation and enhanced adaptation mechanisms. This agroecological strategy represents a promising solution for managing saline soils. Prospects: future research could explore this association on a larger scale and its potential with other halophyte species for various agro-environmental contexts.

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