



Effects of trehalose on the antioxidant system of radish seedlings under salt stress



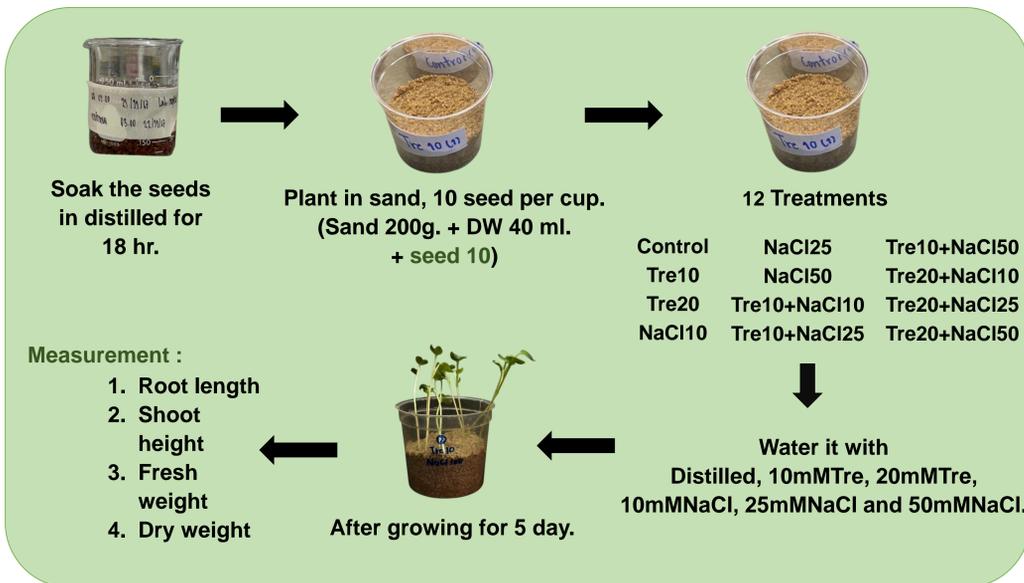
Krittima Thumlungka and Sitthisak Intarasit Department of Biology, Faculty of Science, Chiang Mai University

Abstract

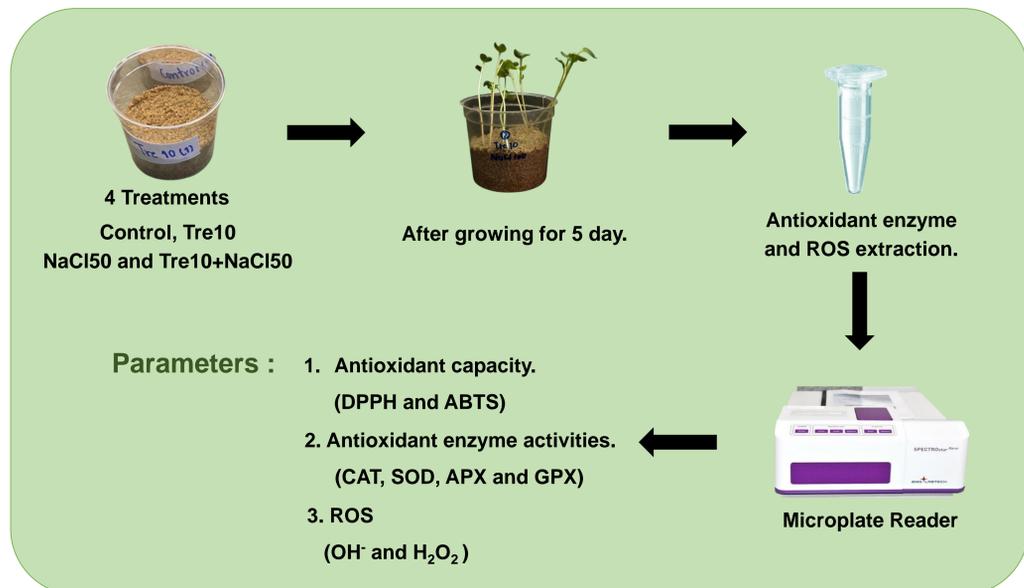
This study examined the effects of trehalose (Tre) and sodium chloride (NaCl) on radish (*Raphanus sativus* Linn.) sprouts. The results showed that 10 mM Tre combined with 50 mM NaCl optimized growth, as indicated by stem and leaf length. Additionally, Tre and NaCl treatments enhanced antioxidant enzyme activity (superoxide dismutase, catalase, glutathione peroxidase, and ascorbate peroxidase), increased total antioxidant capacity (ABTS and DPPH assays), and reduced free radical levels (hydrogen peroxide and hydroxyl radicals) compared to the control. These findings suggest that Tre and NaCl improve radish sprout growth while enhancing antioxidant defense mechanisms.

Methods

(1) Investigated the effects of Tre and NaCl alone or their combination on the growth of radish sprouts.



(2) Investigated the effects of Tre, NaCl and Tre combined with NaCl on changes in antioxidant enzyme activity, free radical levels and total antioxidant capacity in radish sprouts.



Grow under light for 18 hr. and darkness for 6 hr. at 25 °C and 85±5% RH.

Discussion

Trehalose plays an important role in protecting proteins and cell membranes, allowing them to withstand stress (Elbein et al., 2003). Additionally, low-intensity stress in plants can stimulate antioxidant activity, enabling plants to tolerate stress caused by reactive oxygen species (ROS) (Castro et al., 2021). This finding aligns with the research of Alhudaibi et al. (2024), who studied the salt stress tolerance of wheat by soaking wheat seeds in trehalose and mannitol solutions. The study found that soaking the wheat seeds in these solutions enhanced salt stress tolerance and promoted antioxidant enzyme activity.

Conclusion

The application of Tre and NaCl salt promoted the growth of radish seedlings, increased the activity of antioxidant enzymes and the overall antioxidant potential, and could reduce the free radical content of radish seedlings.

Introduction & Objectives

Microgreens are plant seedlings that are high in phytochemicals and nutrients. Kaiware (*Raphanus sativus* Linn.) seedlings are popular microgreens in Asia due to their unique flavor and antioxidant properties that can reduce oxidative stress. This study focused on enhancing growth and antioxidant production in Kaiware seedlings with Trehalose (Tre) and NaCl, as Tre can protect against environmental stress damage and stimulate growth, while low levels of NaCl may promote growth. This experiment investigated the effects of Tre, NaCl, and Tre in combination with NaCl on antioxidant enzyme activities and ROS content, which could be used to develop future microgreen cultivation techniques.

Results



Fig.1 The effects of Tre and NaCl alone or their combination on the growth of radish sprouts.

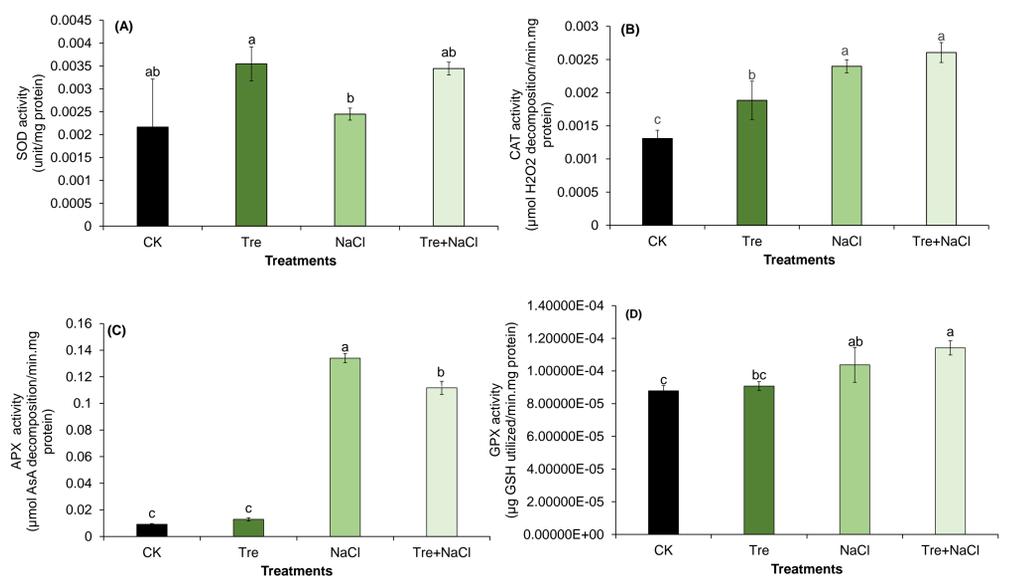


Fig.2 The effects of Tre and NaCl alone or their combination on SOD activity (A), CAT activity (B), APX activity (C) and GPX activity enzymes (D).

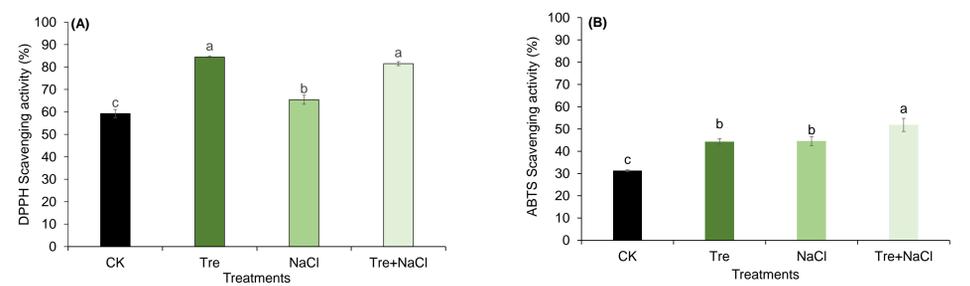


Fig. 3 The effects of Tre and NaCl alone or their combination on DPPH (A) and ABTS (B) scavenging activity of radish sprouts.

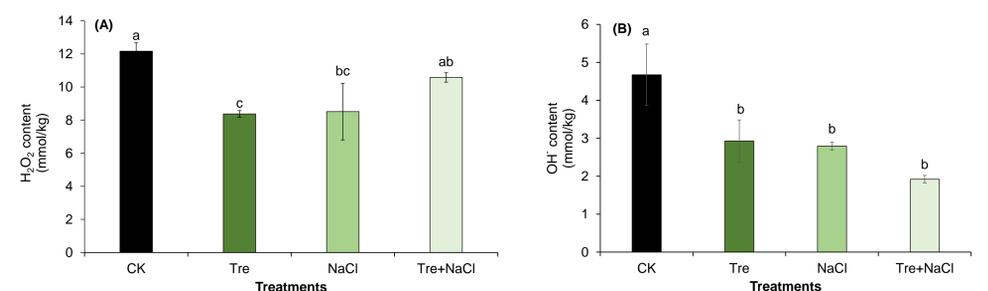


Fig.4 The effects of Tre and NaCl alone or their combination on H₂O₂ (A) and OH⁻ content (B) of radish sprouts.

References

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Castro, B., Citterico, M., Kimura, S., Stevens, D. M., Wrzaczek, M., & Coaker, G. 2021. Stress-induced reactive oxygen species compartmentalization, perception and signalling. *Nature plants* 7 (4): 403-412.

Alhudaibi, A. M., Ibrahim, M. A., Abd-Elaziz, S. M., Farag, H. R., Elsayed, S. M., Ibrahim, H. A., & Srouf, H. A. 2024. Enhancing salt stress tolerance in wheat (*Triticum aestivum*) seedlings: insights from trehalose and mannitol. *BMC Plant Biology* 24 (1): 472.