

INFLUENCE OF LOW TEMPERATURE ON THE ANTIOXIDANT ACTIVITY OF NETTLE

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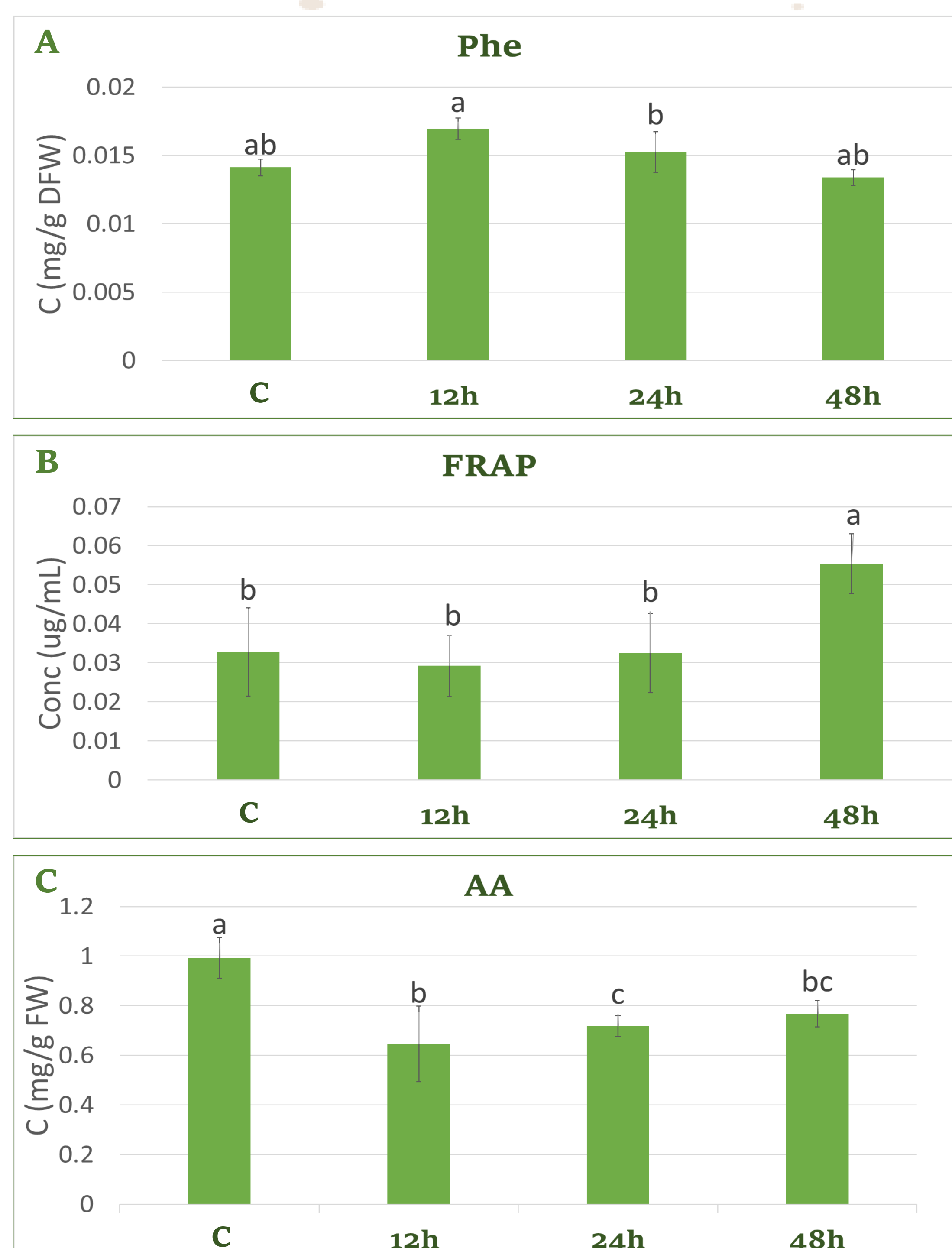
INTRODUCTION

Nettle (*Urtica dioica* L.) is a traditional medicinal plant in Croatia. It is considered as an important source of natural antioxidants that have a positive effect on the human body because it helps fight various diseases and slows down aging¹. Nettle grows in different habitats and easily adapts to changes in environmental conditions. However, prolonged exposure to a certain environmental factor, such as low temperature, can negatively affect the growth and development of plants causing increased formation of reactive oxygen species and the occurrence of oxidative stress. In such conditions, plants activate a highly effective antioxidant system². The aim of this research was to determine the influence of low temperature on nettle's antioxidant activity.

MATERIALS AND METHODS

The nettles were grown under controlled conditions (temperature 22±1°C, photoperiod 16h/8h, light intensity ~ 100 $\mu\text{mol m}^{-2}\text{s}^{-1}$). When they reached adult stage, they were exposed to low temperature (10°C) for various time periods: 12h, 24h and 48h. Untreated plants were considered as a control group. In order to describe the antioxidant activity the content of total soluble polyphenols (Phe)³, the iron reduction antioxidant capacity (FRAP)⁴, and the content of ascorbic acid (AA)⁵ were determined.

RESULTS



The graphs show the mean values and standard deviations of total soluble polyphenol content (Phe, A), total antioxidant activity (FRAP, B) and content of ascorbic acid (AA, C) of nettle plants exposed to 12h, 24h and 48h to low temperature (10°C). Results marked with different letters indicate a statistically significant difference according to the ANOVA, LSD, $p < 0.05$.

CONCLUSION

While exposure of nettle to low temperature does not show a significant change in the level of total soluble polyphenols (Phe) compared to the control, it shows difference between treatments, with the highest Phe content was observed after 12h of exposure to low temperature. The level of antioxidant activity (measured by using the FRAP method) in treated plants differs depending on the time spent in stressful conditions with the highest increase observed after 48h after exposure. However, a significant decrease of the ascorbic acid (AA) content was observed in the nettles immediately after they were exposed to low temperature.

The obtained results, therefore, indicate that even shorter exposure of common nettle to low temperature causes a decrease in secondary metabolites, while the exposure for a longer periods would cause an increase in their antioxidant activity.

¹ Bhusal K.K., Magar S.K., Thapa R., Lamsal A., Bhandari S., Maharjan R., Shrestha S., Shrestha J. (2022) Nutritional and pharmacological importance of stinging nettle (*Urtica dioica* L.): A review. *Heliyon* 8(6):e09717.; ² Mittler R. (2002) Oxidative stress, antioxidants and stress tolerance. *Trends in Plant Science*, 7:405-410.; ³ Singleton, V. and Rossi, J. (1965) Colorimetry of Total Phenolic Compounds with Phosphomolybdic-Phosphotungstic Acid Reagents. *American Journal of Enology and Viticulture*, 16, 144-158.; ⁴ Xiao F., Xu T., Lu B., Liu R. (2020) Guidelines for antioxidant assays for food components. *Food Frontiers* 1(1):60-69.; ⁵ Benderitter M., Maupoil V., Vergely C., Dalloz F., Briot F., Rochette L. (1998) Studies by Electron Paramagnetic Resonance of the Importance of Iron in the Hydroxyl Scavenging Properties of Ascorbic Acid in Plasma: Effects of Iron Chelators. *Fundamental & Clinical Pharmacology* (12): 510-516.