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# **Phytochemical Resilience and Bioactivity of Broccoli in Response to Temperature Stress: Susceptible vs. Resistant Markers**

**I. Šola<sup>1</sup>, D. Gmižić<sup>1</sup>**

<sup>1</sup>*Department of Biology, Faculty of Science, University of Zagreb, 10000 Zagreb, Croatia*

*E-mail: [ivana.sola@biol.pmf.unizg.hr](mailto:ivana.sola@biol.pmf.unizg.hr)*

## **Abstract**

Among the most evident factors of climate change are variations in temperature, which can have a major impact on the physiological and biochemical processes in plants. Plants may adjust their metabolism to such an extent that it has a significant impact on their nutritional potential and the biological activity of their extracts. In scope of this work, we aimed to determine the level of susceptibility/resistance of broccoli (*Brassica oleracea* L. convar. *botrytis* (L.) Alef. var. *cymosa* Duch.) phytochemical parameters and its extracts' bioactivity in response to low (LT) and high (HT) growing temperatures and single out sensitive ones as potential markers of LT/HT stress. The results revealed that two of the most significant changes were under LT: soluble sugars increased by 137%, whereas total anthocyanins decreased by 81%. The third most significant change was under the HT - an IAA increase by 78%. Based on the collected data, we concluded that both HT and LT significantly changed the broccoli microgreens at the level of the parameters analyzed, by 82% and 81%, respectively. Among the altered parameters, HT increased 44% of them, while LT increased 55%. The parameters that were significantly changed by HT, but not LT, were the total proanthocyanidins, kaempferol, sinapic acid, the hormone IAA, and the antioxidant capacity measured by the ABTS method. On the other hand, the parameters significantly affected by LT, but not HT, were the total proteins and tannins, the antioxidant capacity measured by the DPPH and FRAP methods, and the potential to inhibit the enzyme lipase. We assumed that, among these parameters responsive to one but not to the other temperature stress type, we could search for the mediators that are crucial for plants' adjustment to HT/LT stress.

**Keywords:** climate change; ferulic acid; glucosinolates; kaempferol; phytochemicals; polyphenolics; quercetin; sinapic acid; sugars

**Recent Publications:**

Šola, Ivana; Poljuha, Danijela; Pavičić, Ivana; Jurinjak Tušek, Ana; Šamec, Dunja. Climate Change and Plant Foods: The Influence of Environmental Stressors on Plant Metabolites and Future Food Sources. *Foods*, 14 (2025), 3; 416-416. doi: 10.3390/foods14030416

Šola, Ivana; Gmižić, Daria; Miškec, Karlo; Ludwig-Müller, Jutta. Impact of Water Stress on Metabolic Intermediates and Regulators in Broccoli Sprouts, and Cellular Defense Potential of Their Extracts, *International Journal of Molecular Sciences*, 26 (2025), 2; 632-657. doi: 10.3390/ijms26020632

Šola, Ivana; Vujčić Bok, Valerija; Popović, Maja; Gagić, Sanja. Phytochemical Composition and Functional Properties of Brassicaceae Microgreens: Impact of *In Vitro* Digestion. *International Journal of Molecular Science*, 25 (2024), 0; 10.3390/ijms25210000, 24. doi: 10.3390/ijms25210000

**Biography (150 words limit)**

Dr. Ivana Šola, Assoc. Prof. works in Laboratory for Phytochemistry at the Department of Biology, Faculty of Science, University of Zagreb. Her main scientific interest is plant specialized metabolism plasticity under different environmental conditions. So far, she has led, or was a collaborator, on more than 10 international and national projects. She is a coauthor of 44 scientific papers, 1 manual, and participated in more than 80 international congresses. She teaches Fundamentals of Phytochemistry, Plant Anatomy, Plant Bioactive Substances, Plants in Phytotherapy, Molecular Biology of Plants, and leads the Laboratory Professional Practice.

**Presenting Author Details and Photo**

Full Name: Ivana Šola

Email ID: [ivana.sola@biol.pmf.unizg.hr](mailto:ivana.sola@biol.pmf.unizg.hr)

Phone No: +385 915438578

LinkedIn: <https://www.linkedin.com/in/ivana-sola-51869932/>

Twitter: -

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