## Abstract

Plants, as a rich source of secondary metabolites with diverse biological activities, are of significant interest to industry. To reconcile the growing demands of the market with limited plant resources, it is necessary to develop sustainable methods for stimulating the production of desired secondary metabolites. One promising approach involves the use of exogenous metabolic modulators, including chemical elicitors, that activate plant defense mechanisms. In this study, the effects of chitosan lactate (ChL; 150 mg/L), sodium selenite (Se; 10 mg/L), and salicylic acid (SA; 100 mg/L), as well as their mixture (ChL+Se+SA in a 1:1:1 ratio), were evaluated in terms of their influence on the accumulation of secondary metabolites in controlled pot cultivation of three medicinal plant species (*Melissa officinalis*, Hypericum perforatum, and Chelidonium majus). The impact of the applied substances on basic physiological parameters and selected oxidative stress indicators was also assessed. The results demonstrated that the application of individual elicitor solutions effectively modulated the biosynthesis of bioactive compounds depending on their metabolic class, significantly increasing the levels of polyphenolic compounds (phenolic acids, flavonoids) and certain isoquinoline alkaloids. The observed changes in secondary metabolite accumulation in M. officinalis and H. perforatum were associated with alterations in the oxidative status of the plants, including increased accumulation of H<sub>2</sub>O<sub>2</sub> and O<sub>2</sub><sup>-,</sup>, elevated membrane lipid peroxidation, free proline concentration, and enhanced activity of antioxidant enzymes. Moreover, elicitor treatments enhanced the antioxidant activity of extracts from the investigated medicinal plants. Effective induction of secondary metabolite accumulation did not affect plant biomass and did not induce visible symptoms of phytotoxicity, although in some cases a reduction in physiological parameters related to photosynthesis was observed (chlorophyll a fluorescence, content of photosynthetic pigments). The obtained results provide new insights into the influence of chemically diverse elicitors on the accumulation of specialized metabolites and the physiological condition of medicinal plants. Furthermore, they suggest that elicitation may serve as an effective strategy in controlled potted production of high-quality plant raw materials enriched in health-promoting secondary metabolites with a broad spectrum of biological activity.

Keywords: secondary metabolites, medicinal plants, chitosan, selenium, salicylic acid