

BOOK OF ABSTRACTS

3rd International Conference on Plant Biology (22nd SPSS Meeting)



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Institute for Biological Research "Siniša Stanković", University of Belgrade

Faculty of Biology, University of Belgrade

**3rd International Conference
on Plant Biology
(22nd SPPS Meeting)**



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Nepetalactone-rich essential oil mitigates BASTA-induced ammonium toxicity in *Arabidopsis thaliana* L. by maintaining glutamine synthetase activity

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Phosphinothricin, active ingredient of the commercial herbicide BASTA, acts as an inhibitor of glutamine synthetase (GS), a key enzyme in ammonium assimilation, which leads to the elevation of ammonium levels in plants and further to various physiological alternations, ammonium toxicity and lethality. *Nepeta rtanjensis* Diklić & Milojević essential oil (*NrEO*), rich in iridoid monoterpenoids nepetalactones, has been previously highlighted as a potential bioherbicide inducing oxidative stress in model plants. Interestingly, simultaneous foliar application of *NrEO* and BASTA, two agents showing differential mode of herbicidal action, suspends BASTA-induced toxicity in *Arabidopsis thaliana* plants by maintaining sub-toxic and/or sub-lethal ammonium concentration in tissues. *NrEO* effectively reduces BASTA efficacy, and the degree of antagonism between these agents escalates at increasing BASTA and *NrEO* levels. Regulation of GS activity, as influenced by BASTA, *NrEO*, and their joint action, partially occurs at transcriptional, posttranscriptional, and/or posttranslational levels, and is organ-specific. Furthermore, BASTA and *NrEO* interaction mitigates the effects of these agents, applied independently, on chlorophyll, soluble sugars and organic acids metabolism. Results suggest the existence of complex regulatory mechanisms determining antagonistic BASTA and *NrEO* interaction, and highlight the possible applications of the BASTA/*NrEO* mixture in agricultural practice. Furthermore, the possibility of using *NrEO* as a bioherbicide in BASTA-treated crop fields to mitigate the effect of BASTA residues in contaminated soils, is suggested here as an environment-friendly approach for weed control.

Keywords: BASTA, phosphinothricin, nepetalactone, antagonism, glutamine synthetase, ammonium toxicity

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