

## COMPARISON BETWEEN ALLELOPATHY AND WATER STRESS IN GERMINATING MUSTARD SEEDS

Oracz K.<sup>1</sup>, Gniazdowska A.<sup>1</sup>, Corbineau F.<sup>2</sup>, Côme D.<sup>2</sup>, Skoczowski A.<sup>3</sup>,  
Janeczko A.<sup>3</sup>, Bogatek R.<sup>1</sup>

<sup>1</sup>*Department of Plant Physiology, Warsaw Agricultural University,  
Nowoursynowska 159, 02-776 Warsaw, Poland.*

<sup>2</sup>*Physiologie Végétale Appliquée, Univ. Pierre et Marie Curie, Tour 53, 4 place Jussieu,  
F- 75252 Paris Cedex 05, France*

*Polish Academy of Sciences, The Franciszek Górski Department of Plant Physiology,  
Niezapominajek 21, 30-239 Kraków, Poland.*

Allelochemicals can exhibit a diverse modes of action on plants. The delay and reduction of seeds germination and/or inhibition of root and shoot growth are the first, visible symptoms of allelopathy stress. The observed disturbances in germination and alterations in seedlings morphology are similar to those caused by water stress. The aim of this study was to compare allelopathy and osmotic stress. It was previously presented that one of the first response to allelopathy stress is induction of oxidative stress and activation of cellular antioxidative system (Bogatek *et al.* 2002, Bais *et al.* 2003). We studied the effect of allelopathy stress provoked by sunflower allelochemicals and water stress induced by PEG on germinability, H<sub>2</sub>O<sub>2</sub> concentration, activities of some enzymes of cellular antioxidant system: glutathione reductase (GR), catalase (CAT), membrane leakage and metabolic heat production in mustard seeds.

Mustard seeds (*Sinapis alba* L.) were germinated in water extract (10%) of sunflower leaves cv. Ogrodowy or in PEG solution (28.5% (w/v)) in 20°C in darkness for 8 days. Osmotic potentials of PEG solution and sunflower extract were the same –1.1 M Pa. Sunflower allelopathics inhibited seed germination in 95%, while water stress in 60%. Reactive oxygen species (H<sub>2</sub>O<sub>2</sub>) concentration in mustard seeds increased 6 times after 8 days of allelopathy stress and only twice under water stress conditions. The CAT activity in osmotic stress increased during two first days of experiment, however it was 4 times lower in comparison to allelopathy stress. The pattern of GR activity detected under both conditions was opposite. Allelopathy stress induced gradual increase of GR activity during experiment, while osmotic stress resulted in highest GR activity detected at the beginning (after 18 hour) and its decrease after 8 days. Allelopathy stress lead to sharp, but transient (1-2 days) increase in metabolic heat production, while in water stressed germinating mustard seeds heat production was similar as compared to the control.

We can conclude that sunflower allelochemicals act on germinating mustard seeds mostly by their toxicity and only partly by their contribution to osmotic potential.

### REFERENCES

- Bais H. P., Vepechedu R., Gilroy S., Callaway R. M., Vivanco J. M. 2003. Allelopathy and exotic plant invasion: from molecules and genes to species interactions. *Science* 301: 1377-1380.
- Bogatek R., Oracz K., Bailly C., Gawrońska H., Côme D., Corbineau F., Gawroński S. W. 2002. Induction of oxidative stress by sunflower allelopathics during germination of mustard (*Sinapis alba* L.) seeds. Abstracts of Third Congress on Allelopathy, Tsukuba, Japan. Fuji Y., Hiradate S., Araya H. (eds.) pp. 158.