

Influence of sulphur fertilization on the selenium content in soil and blue lupin grain on the background of selected oxidoreductases

Oddziaływanie nawożenia siarką na zawartość selenu w glebie i ziarnie łubinu wąskolistnego na tle aktywności wybranych oksydoreduktaz

**Katarzyna Borowska¹, Bożena Barczak², Wojciech Kozera²,
Joanna Lemanowicz¹**

*¹Department of Soil Science and Soil Protection and Biochemistry, ²Department of Agricultural Chemistry, University of Technology and Sciences, Bydgoszcz, Poland
e-mail: kborowska@utp.edu.pl*

The selenium is an essential trace element for correct functioning of human and animal organisms, on account of its presence in selenoproteins, which are involved in a non-oxidizable defence of the organisms, protecting the cell from the negative influence of oxidising agents among others of reactive oxygens species (ROS). For these reason, there are aspiring for raising the content of this element in the soils, crops of plants and in final links of the food chain, that is at people and animals.

The content of selenium available to plants depends mainly on the type of the soil, however the peculiar addition of fertilizers can in some cases considerably influence on taking the selenium by plants. Such an influence can be a result of interaction, both in the soil as well as in plants, between the selenium and ions delivered in fertilizers. Microbiological activity of micro-organisms and the activity of enzymes secreted by them, are mediating in oxidoreductive processes occurring in the soil, next to the solubility and in consequence the mobility and bioavailability of the selenium in the soil – plant system.

The aim of the present research was to determine the impact of sulphur fertilizers on the selenium status in soil and its accumulation by blue lupin grain on the background of chosen oxidoreductases activity. Plant and soil samples were collected in 2004 from the strict field experiment conducted at the area of Research Station in Wierzchucinek, belonging to Faculty of Agriculture and Biotechnology UTA in Bydgoszcz. The experiment was set up with split-plot, on Haplic Luvisol of low richness in sulphate sulphur(VI). The field experiment covered the following factors: sulphur application method (the first order factor: foliar and pre-sowing into soil), form of sulphur (the second order factor: elementary sulphur in a form of Siarkol Extra 80 WP and ionic sulphur in a form of sodium sulphate(VI)), doses of sulphur (the third order factor, in kg S-ha⁻¹: 0, 20, 40 (20+20), 60 (20+20+20)).

Total selenium content in soil and blue lupin seeds was determined using the fluorometric method of Watkinson with 2,3-diaminonaphtalene as a complexing reagent. Catalase activity was assayed by the method of Johnson and Temple, and dehydrogenases activity by the method of Thalmann.

Total selenium content in the control soil, without sulphur addition, was on average 0.288 mg·kg⁻¹. After application of sulphur in both forms (ionic and elementar) the significant decrease of selenium content about 60% was assayed. Sulphur fertilization into soil in ionoc form significantly decreased the selenium content in blue lupin seeds, especially after application of sulphur in the doses of 20 and 40 kg S·ha⁻¹. The opposite tendency was observed when the fertilization with elementar sulphur was applied. The analysis of correlation of the obtained results showed the significant dependence between total Se content in soil and dehydrogenases activity. It demonstrates that in experimental conditions DHA activity was the better indicator of selenium changes in soil than catalase activity.