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Effect of sulfur fertilization on yield and selenium uptake by the above-ground parts of maize

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Statement of the Problem: Selenium belongs to the group of elements necessary for the proper functioning of humans and animals. In order to ensure an adequate supply of this element, it is needed to increase the level of consumption of this element along with plant products. The addition of selenium through plants may be largely dependent on sulfur content in soil. Similar geochemical properties may trigger the reaction of ionic antagonism / synergy between these two elements and it may be dependent on the Se:S ratio in soil. The aim of the experiment was to determine the effect of sulfur on maize yield, selenium content and the Se uptake by two maize varieties (Lober and Bielik). Methodology: Maize was grown in pot as a part of greenhouse experiment and selenium was applied into the soil before sowing at dose of 0.100 mgSe·kg-1 of soil, in form of Na2SeO4. The sulfur was added in doses: 0-control; 0.03; 0.06; 0.09; 0.12 g·kg-1 of soil introduced as Na2SO4. Plants were harvested in the phase BBCH 70.

Findings: The study has shown a significant reduction in the yield of plants with the increasing dose of sulfur in the soil. The application of sulfur caused an increase in the selenium content in above-ground parts of maize. The highest selenium concentration (Lober: 469 µg·kg-1; Bielik: 534 µg·kg-1) contained maize cultivated on soil where the ratio between S: Se was at the level of 350: 1 (at dose 0.09 gS·kg-1). However, under the influence of the highest dose of sulfur (0.12 gS·kg-1 at ratio S: Se 376:1) the antagonism between S and Se occurred, because it caused the reduction of selenium accumulation by above-ground parts of maize. Conclusion & Significance: Simultaneously fertilizing with sulfur and selenium may change the Se uptake by the above-ground parts of maize.

Recent Publications

1. Golob A., Gad D., Stibilj V., Djiki M., Gavri T., Kreft I., Germ M. (2016) Sulphur interferes with selenium accumulation in Tartary buckwheat plants.Plant Physiology and Biochemistry 108:32-36.
2. Cheng B., Lian H., Liu Y., Yu X., Sun Y., Sun X., Shi Q., Liu S. (2016) Effects of selenium and sulfur on antioxidants and physiological parameters of garlic plants during senescence. Journal of Integrative Agriculture, 15(3): 566–572.
3. Liu X.c, Yang Y., Deng X., Li M., Zhang W., Zhao Z. (2017) Effects of sulfur and sulfate on selenium uptake and quality of seeds in rapeseed (Brassica napus L.) treated with selenite and selenate Environmental and Experimental Botany 135: 13–20.
4. Boldrin P., de Figueiredo M., Yang Y., Luo H., Giri S., Hart J., Faquin V., Guilherme L., Thannhauser T., Li L. (2016) Selenium promotes sulfur accumulation and plant growth in wheat (Triticum aestivum) Physiologia Plantarum 158: 80–91.
5. González-Morales S., Pérez-Labrada F., García-Enciso E., Leija- Martínez P., Medrano-Macías J., Dávila-Rangel I. ,Juárez-Maldonado A., Rivas-Martínez E. Benavides-Mendoza A. (2017) Selenium and Sulfur to Produce Allium Functional Crops Molecules, 22, 558.

Biography

Aldona Płaczek is a research worker in the field of agronomy. The scope of her research for years is related to the fertilization of plants with selenium, its impact on the yield, as well as on the content and uptake of macro and microelements by various plant species. She is the author of 10 publications on fertilization with this element. The content of Se in Polish soils is considered low in terms of animal and human nutrition; hence she involved in research on the development of methods for introducing this element to the soil-plant-animal-human food chain. The PhD thesis entitled "The effect of selenium fertilization on the content of this element in aboveground parts of maize" has been awarded a national supervisory grant.

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