

# Utjecaj kalcizacije i gnojidbe fosforom na koncentraciju Zn i Cd u listu i zrnu soje

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## Sažetak

Cilj je ovog rada utvrditi utjecaj kalcizacije i mineralne gnojidbe fosforom na ukupni (ekstrahiran zlatotopkom) i raspoloživi (ekstrahiran s EDTA) Zn i Cd u tlu, te koncentracije Zn i Cd u listu i zrnu soje.

Poljski pokusi postavljeni su 2003. godine na dva različita tipa tla, distričnom luvisolu i karbonatnom regosolu. Kalcizacija distričnog luvisola provedena je u tri razine: bez kalcizacije, 10, te 20 t ha<sup>-1</sup> karbokalka. Mineralna gnojidba provedena je svake godine u tri razine: bez gnojidbe, standardna (140-200:150:300) i dvostruka gnojidba fosforom (140-200:300:300) za usjeve u plodored: kupus, kukuruz, pšenica, te soja koja je uzgajana 2006. godine, tj. u četvrtoj vegetaciji nakon kalcizacije. Ukupno je analizirano 72 uzorka tla, 36 prije provođenja kalcizacije (proljeće 2003.) i 36 prije gnojidbe za soju (2005.). ICP-OES-om je nakon mikrovalne digestije utvrđena koncentracija Zn i Cd u 108 uzoraka soje prikupljenih tijekom vegetacije (list) i u žetvi (stabljika i zrno).

Koncentracije ukupnog Zn i Cd veće su u karbonatnom regosolu nego u luvisolu, a raspoloživog Cd i Zn veće su u kiselijem tlu. Analizom tla nije utvrđen značajan utjecaj kalcizacije i gnojidbe na koncentracije ukupnih Zn i Cd, a jedino je utvrđeno značajno povećanje Cd ekstrahiranog s EDTA kao posljedica provedene gnojidbe.

Akumulacija Zn najveća je u listu i zrnu, dok je akumulacija Cd najveća u stabljici soje. Odnos Zn/Cd u listu i zrnu soje je 283 i 287, a u stabljici samo 34. Kalcizacija je rezultirala smanjenjem koncentracije Zn i Cd u listu i zrnu soje. Mineralna gnojidba vrlo je malo smanjila koncentraciju Zn u listu (5%) i zrnu (3%) soje. Nasuprot tome, povećanje gnojidbe tripleksom rezultiralo je povećanjem koncentracije Cd u listu (43%) i zrnu (58%) soje. Kisela i nedovoljno kalcizirana tripleksom gnojena tla rezultirala su koncentracijom Cd iznad dozvoljena 2 mg Cd kg<sup>-1</sup> zrna soje. Najznačajniji utjecaj kalcizacija je imala na smanjenje koncentracije Cd u zrnu soje za 49 %, tj. ispod dozvoljenog praga.

Ključne riječi: soja, kalcizacija, trostruki superfosfat, Zn, Cd

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# Liming and phosphorus fertilization impact on Zn and Cd concentration in soybean leaf and grain

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## Abstract

The aim of this paper was to determine liming and phosphorus fertilization impact on total (extracted by aqua regia) and plant available (extracted by EDTA) soil Zn and Cd, and on Zn and Cd concentration in soybean leaves and grain.

The field trials started in 2003 on two soil types, dystric luvisol and calcareous regosol. Liming of dystric luvisol was conducted in three levels: control without liming, 10 t ha<sup>-1</sup> of carbocalk, and 20 t ha<sup>-1</sup>. Mineral fertilization was conducted in every season in three levels: control without fertilization, standard (140-200:150:300) and phosphorus doubled (140-200:300:300) fertilization for crops in rotation: cabbage, corn, wheat, and soybean grown in 2006, i.e. in fourth season after liming. The 72 soil samples were analysed, 36 before liming (spring 2003) and 36 before fertilization for soybean (autumn 2005). The 108 soybean samples were collected during vegetation (leaves) and in harvest (stems and grains), digested by microwave and Zn and Cd concentration measured by ICP-OES.

The total soil Zn and Cd concentrations were higher in regosol than in luvisol, but available Zn and Cd concentrations were higher in more acid soil. Soil analyses didn't show significant impact of liming or fertilization on total Zn and Cd concentrations, but only significant increasing of Cd extracted by EDTA as a result of fertilization.

The Zn concentration was highest in leaf and grain, and Cd concentration in stems. Zn/Cd ratio in leaves and grains was 283 and 287, and in stems only 34. Liming resulted in decreasing of Zn and Cd concentrations in leaves and grains. Mineral fertilization slightly decreased Zn concentration in leaves (5%) and grains (3%). The fertilization with triple phosphate has opposite effect on Cd concentration, resulting in increasing in leaves (43%) and grains (58%) of soybean. Acid and insufficiently limed soils fertilized by triple phosphate resulted in Cd concentration in soybean grain over allowed 2 mg Cd kg<sup>-1</sup>. The most significant impact of liming was reducing Cd concentration in soybean grain for 49%, i.e. below threshold.

Key words: soybean, liming, triple phosphate, Zn, Cd

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