

Bioaccumulation of Pb, Cd and Zn from Polluted Soil in Rapeseed (*Brassica napus* L. var. *oleifera* Metzg)

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Abstract

The study was conducted at three locations in the Savinjska region of Slovenia (Medlog, Škofja vas, Ponikva), where soil is contaminated with heavy metals due to the zinc industry (Cinkarna Celje). In Medlog the soil to a depth of 30 cm contains 0.9 mg kg⁻¹ Cd, 20 mg kg⁻¹ Pb and 82 mg Zn kg⁻¹, in Škofja vas 6.7 mg kg⁻¹ Cd, 215 mg kg⁻¹ Pb and 140 mg kg⁻¹ Zn and in Ponikva 0.5 mg kg⁻¹ Cd, 25 mg kg⁻¹ Pb and 700 mg kg⁻¹ Zn. Concentrations of other heavy metals (Cu, Ni, As, Ba), total N, the amount of plant available phosphorus, K and Mg, S and total organic carbon (TOC) were also determined. pH at the selected sites was between 7.3 and 7.6.

In the beginning of September 2006 two hybrids of *Brassica napus* L. var. *oleifera*, PR 45D01 (a semi-dwarf hybrid with a distinctive reduced crop height and tolerance to different ecological conditions, suitable for biodisel) and PR 46W31 (the first hybrid sort in Slovenia, with a high yield of seeds and oil, a high tolerance to drought and stable in different ecological conditions, suitable for biodisel) from Pioneer Hi-Bred International, Inc., were sown.

After 90 days 10 plants of each hybrid was collected. In root and shoot samples Pb, Zn and Cd were determined by AAS. The contents of C, N and S were determined by IR analysis. Photosynthetic pigments and vitamins C and E in shoots were analysed by HPLC.

The concentration range in shoots for [Cd]_{shoot} was 0.43 - 0.78 mg kg⁻¹, for [Zn]_{shoot} 25.1 - 74.0 mg kg⁻¹ and for [Pb]_{shoot} 0.82 - 2.15 mg kg⁻¹. In roots the range for [Cd]_{root} was 0.46 - 0.86 mg kg⁻¹, for [Zn]_{root} 43.8 - 166.6 mg kg⁻¹ and for [Pb]_{root} 2.56 - 15.41 mg kg⁻¹. The S/R ratio ranged for Cd from 0.633 to 1.2, for Zn from 0.44 to 0.78 and for Pb from 0.44 to 0.7.

Preliminary results showed that using *Brassica napus* L. var. *napus* the concentration of heavy metals in the soil could be reduced, with the simultaneous production of biodisel.

Key words: heavy metals, bioaccumulation, *Brassica napus* L. var. *oleifera*

sa2008_a0106