Heavy metals in rape and sunflower

- distribution and binding forms -

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Sunflower and rape are important oil plants which differ in their heavy metal content. For example, the cadmium (0,4 mg/kg dw) and nickel (2 mg/kg dw) content in sunflower seeds exceeds that in rape seeds by nearly one order of magnitude.

This study investigated which mechanisms such as binding forms or immobilization to cellular structures are responsible for these differences.

For this purpose sunflower and rape organs (roots, stems, leaves, seeds) were analysed to determine the distribution of Cd, Cu, Fe, Ni, Zn. In contrast to sunflower plants a **physiological barrier** for cadmium was observed in rape plants. It was localized in the placenta of rape pods.

The proportion of extractable, soluble Cd in sunflower and rape organs is nearly the same. Thus, the influence of water soluble Cd binding forms on the distribution of cadmium in sunflower and rape organs seems to be negligible.

By contrast, less than 10 % of the total nickel were extractable from roots and stems of rape plants. Ni is evidently **immobilized** by non-soluble cell structures (e.g. cell walls) and cannot be transported into the shoots and seeds. In sunflower roots the soluble amount of Ni is about 70 %. Thus, a greater portion of the total Ni could be transported into the shoots and seeds of sunflower than rape plants.

Therefor, besides the “cadmium barrier” in rape pods, another important factor was found, which should be responsible for the differences in the heavy metal content of rape and sunflower seeds.

The molecular weight of metal binding compounds, extracted from sunflower and rape organs by Tris-HCl-buffer, was determined with gel filtration chromatography.

For example, Cd binding compounds (~ 25 kD) from sunflower and rape roots were isolated and investigated by amino acid analysis, fluorescence-HPLC and ESI-MS. It was demonstrated that these compounds were no phytochelatins.