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Burrowing and transformation activity of earthworms in lab studies

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Drilosphere and hydraulic conductivity

Evaluation of Hounsfield Units from scanned soil columns by means of X-ray computed tomography allowed for assessing the bulk density distribution of the drilosphere (burrow wall) of earthworms (SCHRADER et al. 2007). In a silt loam soil with a bulk density of 1.4 Mg m^{-3}, *L. terrestris* enhanced the density in the inner part of the drilosphere for 11 %, which concentrically decreased over a distance of ca. 2 cm to the initial density of the bulk soil. The density distribution in the drilosphere controls hydraulic conductivity in soil which was shown by conducting mini-disc-infiltrometry (PÉRÈS et al. 2006). *L. terrestris* and *N. giardi* increased and *A. caliginosa* decreased the hydraulic conductivity compared to a control.

Transformation impact on crop residues

Feeding experiments with *A. caliginosa* and *L. terrestris* on transgenic maize residues (leaves and roots) showed an enhanced decline of immunoreactive Cry1Ab proteins through earthworm turnover activity (SCHRADER et al. 2008).
A health risk in reduced tillage systems combined with mulching of crop residues may be caused by pathogenic fungi like *Fusarium* species which produce mycotoxins like deoxynivalenol (DON). *L. terrestris* takes part in the efficient degradation of *Fusarium* and DON content (OLDENBURG et al. 2008; SCHRADER et al. 2009).

Outcome and conclusions

- The soil structural compaction of the drilosphere due to earthworm burrowing ranges in the scale of [cm].
- The transport of infiltrating water along earthworm burrows is under species specific control.
- The decline of the protein Cry1Ab in transgenic maize residues is enhanced due to earthworm activity; traces of Cry1Ab may be immobilized in casts.
- Soil health risks through *Fusarium* plant pathogens and the mycotoxin DON are reduced through earthworm activity.

Literature

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