

Bioconcentration and translocation of heavy metals from landfill leachate by selected plants

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INTRODUCTION & AIM

It is reported in the literature that the most common pollutants in landfill leachate, apart from ammonium nitrogen, chlorides and sulfates, include heavy metals. Municipal waste landfills are considered a potential source of heavy metal contamination of groundwater, soil and plants. In high concentrations, they may pose a threat to human health and cause toxic effects in plants.

- The aim of the research was to verify the content of heavy metals in leachate from operated municipal waste landfills on the example of a Central European country.

METHOD

- The range of research of the raw and post-treatment by *Phragmites australis* included: **iron, manganese, nickel, zinc, cadmium, copper, lead and chromium.**
 - The content of the heavy metals in the plant material was determined after wet digestion in a mixture of concentrated perchloric acid, sulphuric acid and nitric acid (4:1:10 ratio). All analyses were performed in three repetitions. The control samples (plants placed in tap water) were subjected to the same procedure.
 - Landfill leachate from two operated landfills was added to the containers (with *P. australis* seedlings) in increasing concentrations:
 - from 0% (tap water), through: **6.25%, 12.5%, 25% and 50% up to 100%.**
- Exposure to leachate lasted another **14 days**. Each variant was performed in 3 repetitions.



Phragmites australis

RESULTS & DISCUSSION

- The content of heavy metals (Cu, Ni, Pb, Cr and Cd) was low in all cases, i.e. <0.06 mg/g.
- A higher metal content was found in the roots than in the shoots, but these differences were insignificant.
- Research carried out on *P. australis* showed that underground organs have a greater ability to accumulate heavy metals compared to shoots, which may be due to, for example, a defense mechanism.

Tab. Bioconcentration factor (BCF) for *Phragmites australis*

Element	Roots	Shoots
Iron	0.00	0.00
Manganese	0.00	0.00
Copper	0.00	0.09
Zinc	0.00	0.00
Chromium	0.00	0.00
Cadmium	0.00	0.00
Nickel	0.00	0.00
Lead	0.00	0.00

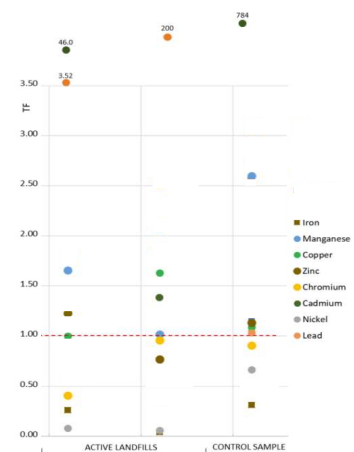


Fig. Translocation factor (TF) of pollutants of *Phragmites australis*

CONCLUSION

- The concentrations of heavy metals in *P. australis* (Cu, Ni, Pb, Cr and Cd) were low in all analyzed cases.
- In most cases, higher metal content was recorded in the roots than in the shoots.
- P. australis* was not effective in translocating Fe, Cr and Ni. The largest translocation from roots to shoots was recorded for Cd.
- P. australis* does not show the characteristics of a good hyperaccumulator of pollutants contained in leachate.

FUTURE WORK / REFERENCES

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- Wdowczyk, A., Szymańska-Pulikowska, A., 2023. Effect of substrates on the potential of *Phragmites australis* to accumulate and translocate selected contaminants from landfill leachate. Water Resour. Ind. 29. <https://doi.org/10.1016/j.wri.2023.100203>

