

The Effects of Microbial Polysaccharides on the Copper Accumulation in *Daphnia magna*

B. Lončarević^{1*}, M. Lješević¹, Marijana Marković¹, Gordana Gojgić-Cvijović¹, Ivan Anđelković², Vladimir Bešković³

¹University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Njegoševa 12, 11000, Belgrade,

²School of Agriculture, Food and Wine, University of Adelaide, Urrbrae SA, 5064, Australia,

³University of Belgrade, Faculty of Chemistry, Studentski Trg 12-16, Belgrade, 11000, Serbia.

Introduction

Copper is one of the leading metal pollutants in the water, which can cause adverse effects when present in high concentrations. The *Daphnia magna* is a model organism usually used for the determination of ecotoxicological effects of various compounds since it is highly sensitive to toxic compounds [1].

The aim of this work was to investigate the potential application of microbial extracellular polysaccharides (EPS), levan and pullulan, as agents for reducing the copper toxicity to *D. magna*. The protective effects of EPS were estimated based on the accumulation of copper in the *D. magna* cells.

Material and Methods

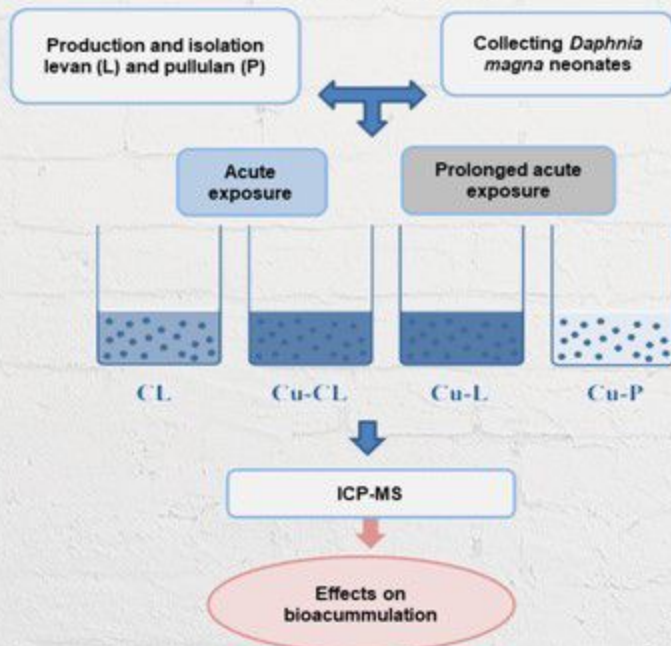


Figure 1. Schematic view of the experimental setup.

Results and Discussion

The results showed that animals exposed to Cu (II) only, accumulated Cu (II) in a greater amount after the prolonged test compared to the acute one, despite the lower concentration. The treatment with EPS during the acute test increased the copper accumulation for both EPS concentrations tested, whereas during the prolonged exposure test, the Cu (II) accumulation was inhibited.

Table 1. Concentrations of Cu²⁺ (µg Cu/g wt wt with standard deviation-SD) obtained by ICP-MS

	2 days, 10 µg/L Cu ²⁺ , 50 mg/L EPS		2 days, 50 µg/L Cu ²⁺ , 100 mg/L EPS		5 days, 10 µg/L Cu ²⁺ , 50 mg/L polysaccharide	
	Concentration (µg Cu/g wt wt)	SD	Concentration (µg Cu/g wt wt)	SD	Concentration (µg Cu/g wt wt)	SD
CL	1.70	0.03	3.56	0.07	1.11	0.00
Cu-CL	4.24	0.03	5.93	0.02	52.03	0.14
Cu-L	22.86	0.33	21.83	0.31	4.57	0.05
Cu-P	19.20	0.20	26.19	0.30	3.35	0.02

Conclusion

Considering that protective effects of levan and pullulan were observed only with lower copper concentrations and 5 days of exposure, additional experiments are necessary to determine the mechanism of EPS action in order to confirm their possible use as protective agents.

Acknowledgments: This work was partially supported by Ministry of Education, Science and Technological Development of Republic of Serbia (Grants No: 451-03-9/2021-14/200168 and 451-03-9/2021-14/200026)