Improving phytoremediation process by using *Picea abies* and *Aesculus hippocastanum* residues

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**INTRODUCTION**

Phenolics could be properly use in food industry, health protecting, plants growth and development, bioremediation. Besides being radical scavengers, flavonoids, for example are able to function as chelators for metals, depending on the molecular structure. The valorization of waste industrial products, based on complex processing of biomass, represent an important challenge for sustainable development and environmentally friendly processes. There are huge amounts of spruce bark and chestnuts shell residues which are readily available at low prices and can be used as a raw material for the production of high-value bioactive substances.

The aim of this study was to evaluate the influence of aqueous polyphenolic extracts on maize plant growth and development in cadmium stress conditions.

**RESULTS AND DISCUSSIONS**

HPLC analysis provide that the main identified compounds of chestnuts shell (CS) polyphenolic extracts were catechine, syringic and ferulic acids while for spruce bark (SB) aqueous extracts the identified compounds were catechine, gallic and vanillic acid (Fig. 1, 2).

Bioaccumulation capacity of *Z. mays* to concentrate, transport and storage cadmium ions into different parts of the plant was considerably improved (220-685% comparing with the values registered for 25mg/L Cd (II) contamination level) when the growth medium was supplemented with polyphenolic extracts (Fig. 3).

![HPLC analysis of chestnuts shell extracts](image1)

![HPLC analysis of spruce bark extracts](image2)

**CONCLUSIONS**

 ✓ The relation established between polyphenolic compounds and heavy metal tolerance/bioaccumulation investigated in the case of *Zea mays* could be correlated with the possibilities of using polyphenols as heavy metal biosolubilizer.

 ✓ *P. abies* bark and *A. hippocastanum* chestnuts shell represent an important raw material which could be properly used in phytoextraction process through the supplementation of contaminated medium with polyphenolic aqueous extracts.

 ✓ Cadmium tolerance into maize plant was generally improved in the presence of *P. abies* and *A. hippocastanum* polyphenolic extracts (Fig.4).

The presence of natural bioactive compounds in a Cd (II) contaminated environment stimulates (5 - 125% comparing with control) maize plant growth and development depending on extracts concentrations (Fig. 5, 6). The stimulatory effects on plantlet elongation increase with decreasing CS extracts concentrations and with increasing SB extract concentrations.