# EXHAUSTED WASTE OF GRAPE MARC FOR AN EFICIENT Pb(II) BIOSORPTIVE REMOVAL

Gabriela UNGUREANU[1], ORCID ID: 0000-0002-9272-4297
Irina Gabriela CARA[2], ORCID ID: 0000-0002-3614-954X
Antoanela PATRAŞ[1*], ORCID ID: 0000-0002-4054-4884

[1] *"Ion Ionescu de la Brad" Iasi University of Life Sciences, Department of Sciences, Iasi, Romania*
[2] *Research Institute for Agriculture and Environment, "Ion Ionescu de la Brad" University of Life Science, Iasi, Romania*

*Corresponding author: Antoanela Patraş, email antoanelapatras@gmail.com

**Introduction**. The present study investigates the performance of an eco-friendly adsorbent derivate from raw grape marc of Merlot and Sauvignon Blanc (MR and SBR), respectively grape marc exhausted waste of the same grape varieties (ME and SBE) for the adsorptive removal of a highly toxic contaminant, Pb(II).

**Material and methods**. Repeated ultrasound-assisted extractions were applied to the raw grape marc as an efficient method for separating various compounds, resulting a depleted (exhausted) residue (ME and SBE). All tests were performed in batch, for 6 hours contact time (excepting the kinetic studies with a longer contact time), at 140 rpm under orbital rotation, at 23±1°C, in duplicate. All adsorption tests were performed in Erlenmeyer flasks containing 25 mL of lead solution. For all tests a synthetic effluent was used. A stock solution of Pb(II) was prepared by dissolution of $Pb(NO_3)_2$ salt (Merck, analytical grade). Initial metal solutions used in biosorption tests were prepared by dilution of the stock solution. The pH was adjusted to the required values using $HNO_3$ and NaOH aqueous solutions, prepared from $HNO_3$ 65% PA (Chemicals) and NaOH 1N standard solution (Chemicals). After contact, the amount of removed lead was measured by atomic adsorption spectrometry (AAS).

**Results.** Preliminary pH tests were performed and show that pH is an important parameter that has a great influence on Pb removal. Based on the results of screening tests, only exhausted grape marc residue, obtained for both Merlot and Sauvignon Blanc were selected for further experiments. The effect of adsorbent dosage on lead biosorption was analyzed. According with the results found, an optimum adsorbent dosage of 0.50 g/L was selected to be used in further experiments. For the adsorption kinetic studies, metal solutions (25 mL each Erlenmeyer flask) were mixed with the exhausted waste (adsorbent dosage: 0.50 g/L accurately weight) and stirred at 23°C for 8 h, pH 5.5 ± 0.5. Samples were performed at predefined time intervals and lead concentration was analyzed in the liquid phase. For both ME and SBE residues, the pseudo 2nd order model has a better fitting to the experimental points. The isotherms assessments were also performed. These tests give us information about the affinity of adsorbent to the adsorbate and the maximum biosorption capacity. Results were obtained at 23°C, using an adsorbent dosage of 0.5 g/L and varying the initial concentration of lead from 7.5 to 100 mg/L. Expressed as a percentage, the retention capacity of the studied materials is around 95%.

**Conclusions.** The grape marc is an available biomass and can be considered a low-cost sorbent; the types under study present good biosorption ability for lead, which is a positive indicator for its practical use in the remediation of contaminated waters.

***Keywords:*** *agro-food waste, biosorptive removal, grape marc, lead, water decontamination*

**Acknowledgments:** Joint Operational Programme Romania – Republic of Moldova 2014 – 2020, grant 2SOFT/1.2/83, 02.09.2020, project "Intelligent valorisation of agro-food industrial wastes" (INTELWASTES).