Partial purification of natural coagulants from bean seeds by ion-exchange chromatography

V. Vasić, D. Kukić, J. Prodanović, M. Šćiban

University of Novi Sad, Faculty of Technology Novi Sad, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia

1. Introduction – Coagulation and flocculation are commonly used steps in the water and wastewater treatment. They are usually conducted by adding chemicals such as salts of aluminium and iron and synthetic polyelectrolytes. Since application of these chemicals has harmful influence on human health and the nature, the intensive investigations of natural coagulants have been conducted in the last years in order to replace chemical coagulants in water and wastewater treatment [1,2]. The aim of this study is to separate and purify proteins from common been seeds and evaluate their coagulation activity.

2. Experimental – In this work natural coagulant was extracted from ground common bean seeds with 0.5 mol/L NaCl. After that proteins were precipitated from extract by $(NH_4)_2SO_4$. The excess of salt was removed by dialyses. Further purification was done by anion-exchange resin Abrelite IRA 958 in batch process. The proteins were eluted from resin with NaCl solutions of increasing concentrations (0.5; 1; 1.5 and 2 mol/L). Obtained eluates were used in the coagulation test (jar test) for examination of their coagulation activity as well as optimum dose of coagulant. Coagulation activity was examined in model water obtained by adding kaolin in tap water.

3. Results and Discussion – Based on the obtained results it was found that the amount of proteins in eluates decreases with increasing concentration of NaCl solution. Also, different fractions of eluated proteins showed different coagulation activities as a function of coagulant dose. Although it contained significantly smaller amount of proteins compared to other eluates, protein fraction eluated with 2 mol/L NaCl had the highest coagulation activity. The highest coagulation activity of 53.34% was achieved at dose of 1 mL/L.

4. Conclusions – Been extract is a mixture of various substances. Proteins contained in that extract showed different coagulation activity. Crude been extract is of organic nature and it can increase organic load of treated water, so it requires purification in order to remove compounds that do not posses coagulation activity and increase organic matter content.

5. References

[1] M.G.Antov, M.B.Šciban, N.J.Petrovic, *Bioresource Technol.* **101**(7), (2010) p. 2167–2172.
[2] D.V.Kukic, M.B.Šciban, A.N.Tepic, J.M.Prodanovic, APTEFF, **42**, (2011) p. 71-79.

Acknowledgement:

This research was supported by the grant number APV 142-451-2515/2017-01 from Provincial Secretariat for Higher Education and Scientific Research
The financial support from Provincial Secretariat for Higher Education and Scientific Research, for participation on conference, is also greatly acknowledged.