MOBIL AND TOTAL FORMS OF SOME TRANSITIONAL METAL CATIONS IN FOOD CHAIN OF BLACK CURRANTS CULTIVATION AND PROCESSING

Sbanca Mirela, Jianu Călin, Alexa Ersilia, Rivi□ Adrian, Jianu Ionel

Banat's University of Agricultural Science Romania, Calea Aradului no.119, Timisoara, 300645, email: mirela_sbanca@yahoo.com

ABSTRACT

Romania has large natural possibilities through Western Plain, diligence and skill of residents in cultivation and processing of specific and quality horticultural products. In the world there are few areas where the climate, soil and diversity of spontaneous and cultivated flora can provide quality natural food products, with high nutritional value.

The experimental results obtained for the heavy metal concentrations in the black currants cultivated on soils close to the C.E.T. Timişoara ash storage reveal higher concentrations for these elements. Higher concentrations for the toxic heavy metals (Cd, Pb) and for the potential toxic heavy metals (Zn, Cu) were identified in some vegetables, especially for leaf vegetables and for the root vegetables. Although some heavy metals were identified in higher concentrations, close to the toxic limits or higher, the mean values for these concentrations in the vegetables were in the range of normal limits. This fact demonstrate that the pollution of this areal is incipient and forward cannot be affirm that the heavy metal pollution process is evident, but this phenomenon could be amplified in the case of a prolonged anthropic impact, and without the specific agro-pedo-ameliorative measures.

The classification of the non-polluted and polluted regions is achieved by multivariate analysis (PCA-principal component analysis) of the data using especially the Fe, Mn, Zn, and Cu concentration values for the first and second principal components, and Zn and Fe concentration values for the third principal component.

INTRODUCTION

Through the hilly and plain areas of the Cara□-Severin and Timi□ counties (part of the historical Banat), Western Romania is known as an area with fruit-growing tradition. Thus, fruit and vegetables production in 2000, was 5.70% and 6.33% of country's total production.

Under the conditions of transition to a market economy and accession to the European Union, agriculture could be considered a strategic priority and the horticultural sector should be entrusted with an important competitive role in its development on modern bases. In response to these requirements and to become competitive in the European Community, Romania needs to increase and diversify quality horticulture production to at least 12-15 million tons annually.

The main purpose of the research work is to determine the concentration levels of some chemical elements (Fe, Cu, Zn, Cd, Pb), defined as "heavy metals", in black currants (*Ribes nigrum*) grown in hilly and plains areas of Banat, in order to determine contamination / pollution with heavy metals and identification of potential sources of pollution with such metals.

To achieve the intended purpose, the following steps were taken:

➢ knowledge of specific climatic condition for the researched area;
➢ determination of the main soil physico-chemical parameters and soil characterization;
➢ determination of heavy metals (total and mobile forms) content in soil from the investigated area;
➢ characterization of ash from the CET – Timișoara (Utvin); determination of heavy metals content;
➢ determination of pH and heavy metal content in surface waters from the investigated area;
➢ determination of heavy metals content in black currant shrub from the investigated area.

MATERIALS AND METHODS

Materials
1. Black currant fruits (*Ribes nigrum*) from 2010's fruit harvest in Utvin area (Timiș county), in the vicinity of CET Timișoara
2. All reagents (selective list) were analytical grade (Sigma Aldrich) and specific for atomic absorption spectral analysis.

Methods
Following analytical sequence was taken:
➢ pre-concentration of heavy metals acid extracts, when the concentration was below the analytical detection limit;
➢ comparison of experimental results obtained with the same analytical method in different laboratories or with different methods in order to establish their accuracy;
➢ tabular and graphic presentation of experimental results and their interpretation, comparatively, for the analyzed products;
➢ comparison of experimental results obtained in the investigated areas and with those from the literature.
➢ multivariate analysis (PCA - principal component analysis) to experimental data.

RESULTS AND DISCUSSION

The climatic parameter values from the Utvin areal are in the normal range and don't have a significative influence on the accumulation of the heavy metals in soil and plants. According to the aeolian characteristics, the higher frequency is observed for the case of wind from the North and North-East direction, but also for those from the South-West direction. Due to the fact that the ash storage is placed in the East of the Utvin village, the wind can transport dry ash and pollute the agricultural soil from this area.

The chemical analysis of the ash reveals a low alkaline medium and a higher content of humus, nitrogen, phosphorus, and potassium. A higher content of heavy metals - total forms was determined in the ash samples, comparatively with the normal values for the agricultural soils, but the level of the heavy metals in soil is not limitative for the plant culture. The highest values, close to the alert thresholds, were determined for the lead, nickel, and cobalt. The alkaline ash reaction maintains these metals in forms which are inaccessible for the plants. However, an excess of heavy metals in the agricultural soils could be appear by aeolian activity, which have a negative impact on the soil and plant quality.

Utvin areal soils have a supplementary anthropic charge with heavy metals, especially for Cd, Pb, Co, Cu, and Zn. The soil physico-chemical parameters maintain these metals in forms

which are inaccessible to the plants. As a result, this soil is still non-debased by the anthropic impact of the ash from storage placed to the East side of the cultivated field.

The experimental results obtained for the heavy metal concentrations in the blackberries cultivated on soils close to the C.E.T. Timişoara ash storage reveal higher concentrations for these elements. Higher concentrations for the toxic heavy metals (Cd, Pb) and for the potential toxic heavy metals (Zn, Cu) were identified in some vegetables, especially for leaf vegetables and for the root vegetables. Although some heavy metals were identified in higher concentrations, close to the toxic limits or higher, the mean values for these concentrations in the vegetables were in the range of normal limits. This fact demonstrate that the pollution of this areal is incipient and forward cannot be affirm that the heavy metal pollution process is evident, but this phenomenon could be amplified in the case of a prolonged anthropic impact, and without the specific agro-pedo-ameliorative measures.

The classification of the non-polluted and polluted regions is achieved by multivariate analysis (PCA-principal component analysis) of the data using especially the Fe, Mn, Zn, and Cu concentration values for the first and second principal components, and Zn and Fe concentration values for the third principal component.

CONCLUSION

Can be appreciate the importance of knowledge and research extension on heavy metal (total and mobile forms) circuit (geobiochemical cycle) on black currants quality (*Ribes nigrum*), as nutrients.

LIST OF REFERENCES

[1] Mirela Sbanca, Teză de doctorat, (în finalizare 2011), Peptide antibacteriene. Izolare, purificare, caracterizare.

[2] Daniel A. Vallero, Environmental contaminants: assessment and control, 2004, Ed. Elsevier Academic Press, ISBN 0-12-710057-1, United State of America.

[3] Daniel A. Vallero, J. Jeffrey Peirce, Engineering the risks of hazardous wastes, 2003, Ed. Butterworth-Heinemann, ISBN 0-7506-7742-2, United State of America.

[4] Yolanda Picó, Food contaminants and residue analysis, 2008, Ed Wilson&Wilsons, ISBN 978-0-444-53019-6, Hungary.

[5] S.N.Mahindru, Food Contaminants - Origin, Propagation & Analysis, 2009, Ed. A.P.H. Publishing Corporation, ISBN 81-7648-525-X, New Delhi.

[6] Darsa Purnama Siantar, Mary W Trucksess, Peter M Scott, Food contaminants: mycotoxins and food allergens, 2008, Ed. American Chemical Society, ISBN: 9780841269545, USA.