RESEARCHES CONCERNING THE BIOCONVERSION FACTOR OF SOME MACROMYCETES FOR BIOMINERALS SPECIES

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Abstract
In the frame of research project IDEI 624/2008 it were determinate the concentrations of biominerals in some macromycetes species harvested from Dambovita forestry ecosystems. This paper is about Pleurotus ostreatus, Coriolus versicolor, Stereum hirsutum, Phellinus tremulae, Pseudotrametes gibbosa and Pholiota destruens very common species in forestry ecosystems from south of Romania. Some of them are edible, some of them are not edible but not poisonous, and only one species contains toxic compounds. Were determinate their content in calcium, potassium, phosphorus and sulphur by EDXRF method with ELVA-X spectrometer with fluorescence.
The accuracy and precision of results were evaluated by measuring a certified reference sample NIST SRM 1571-Orchard biological samples. The sensibility of method is 1ppm. Every result represents the average of minimum 3 and maximum 10 samples and was exprimated in percents.
The bioconversion factor was calculated for each case by mathematics equation. Also it was determinate the pH of macromycetes substrates (soil or bark tree).
So, the value of bioconversion factor was different from one macromycetes species to others and also with the biominerals species evaluated.
The value of bioconversion factor for calcium was minimum 0,16 registered for Pleurotus ostreatus and maximum 1,33 at Pholiota destruens. For potassium accumulation the lowest value of bioconversion factor of 0,22 was calculated for Phellinus tremulae and the highest (9,0) for Coriolus versicolor. Concerning the bioconversion power for phosphorus, maximum level of 5,2 was in Coriolus versicolor and minimum of 0,5 in Pholiota destruens. In case of sulphur bioabsorbtion, bioconversion factor was maximum in Phellinus tremulae (20) and minimum was obtained in Coriolus versicolor (0,2).
Our researches put in evidence the possibility of using one or other of macromycetes species analysed as natural source for obtaining organic biominerals necessary for pharmaceutical or food industry biotechnologies. For example, on can use Coriolus versicolor as natural source for potassium and also as phosphorous source.

Keywords: bioconversion factor, biominerals, macromycetes species

1. INTRODUCTION

It is tasty, healthy, perfect for diets and necessary for a balanced diet. It seems to have been incurred in error: the milk at that time was held in a leather skin and forgotten outside at a warm temperature. It is possible that the name of 'yogurt' arises from 'yogur', a word of Turkish origin. About the yogurt's birth it is not known anything for sure. Yogurt (yogurt) is the product obtained by fermenting milk with a mixed culture of two species of thermophilic lactic acid bacteria: *Streptococcus lactis*, *Streptococcus thermophylus* and *Lactobacillus delbrueckii* subsp. bulgaricus (LD), which must be found in a living state in the final product [1]. Therefore, only the presence of mentioned living bacteria in yogurt gives us clear indications that there was milk coagulation and acidification on biological pathway and not by chemistry. The two types of living bacteria are the one responsible also for the validity of these products. So, as the retention period is smaller, the more we guarantee the use of selected cultures of bacteria to obtain yogurt.

2. MATERIALS AND METHODS

Mushrooms species where identifying using some guides very known in Europe, two of them published after 2000 (5, 8, 17). The samples were weighted and dried at 60°C. After drying operation the samples were weighted again. The elemental content of biological and environmental samples was

determined using Elva-X spectrometer having a X-ray tube with Rh anode.The samples were excited for 300s and the characteristic X-rays were detected by a multichannel spectrometer based on a solid state Si-pin diode X-ray detector with a 140 mm Be window and a energy resolution of 200eV at 5.9 KeV 91,20 (2,19). Elva-X software was used to interpret the EDXRF spectra [1,4,5]. The accuracy and precision of results were evaluated by measuring a certified reference sample (NIST SRM 1571- Orchard biological samples) (16). The results obtained by EDXRF method were exprimated in ppm. Every result represents the average of at least 3 and maximum 6 determinations. The level of accumulation or bioconversion factor for different metals find in fruit body of mushrooms was calculated after the following mathematics equation:

$$L_C\% = \frac{C_m \times 100}{C_s}$$

Were: *Lc%* =level of metal concentration;
Cm =metal concentration in mushroom;
Cs = metal content in substrate.
Bioconversion factor was exprimate in percent.

3. RESULTS AND DISCUSSIONS

Maximum concentration of calcium was determinate in *Phellinus tremulae* of 8,97ppm and minimum (0,1ppm) in *Pleurotus ostreatus* harvested from Mija. Only the concentration of calcium of *Phellinus tremulae* and *Pholiota destruens* (harvested from Mija) was higher than their substrate content (Figure 1).
In figure 2 on can see that potassium content was higher, in important concentration in *Pleurotus ostreatus* (9,92ppm), *Stereum hirsutum* (1,28ppm), *Coriolus versicolor* (4,53ppm), *Pseudotrametes gibbosa* (0,87ppm) and *Pholiota destruens* (8,58ppm) from Vacaresti than that of their substrates (1,93ppm, 0,2ppm, 0,51ppm; 0,22ppm and 6,55 ppm respectively).

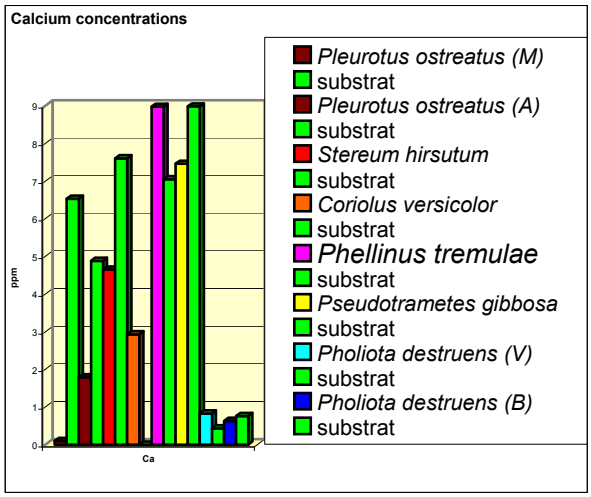

Figure 1. Calcium concentration in macromycetes and their substrate

The concentration of potassium in *Pholiota destruens* harvested from Bilciuresti had a great content in potassium very closely to that of *Pholiota destruens* from Vacaresti (8,49ppm), but in the same measure close to that of its substrate (8,52ppm). *Phellinus tremulae* had the lowest concentration of potassium and sensible lower than that of substrate.

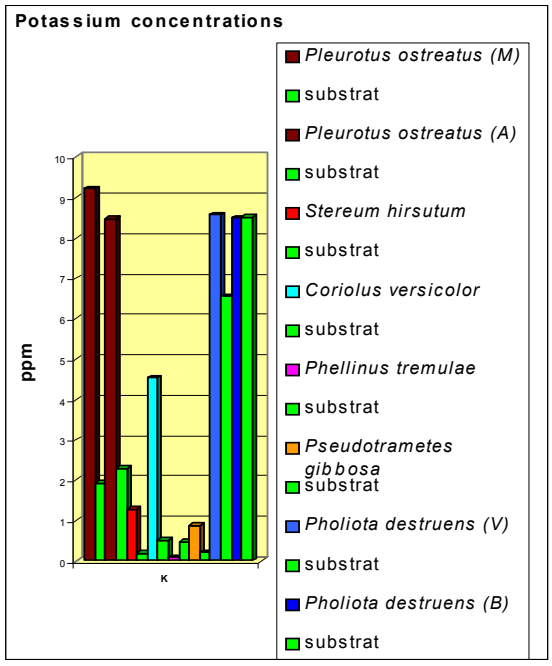

Figure 2. Potassium concentration in macromycetes and their substrates

Phosphorous concentrations were higher in macromycetes in seven cases comparatively to their substrates. By exception was lower in *Pholiota destruens* harvested from Vacaresti (Figure 3). Maximum of content of 0,006ppm was registered in *Coriolus versicolor* .
But the concentrations were lower as values in all cases, between 0,001 in *Pleurotus ostreatus* and 0,006 in *Coriolus versicolor*.
In case of *Phellinus tremulae* and *Pseudotrametes gibbosa* it was registered the same concentrations values as in their substrates.
The species which absorbed much phosphorous quanties than the substrate content were *Pleurotus ostreatus* harvested from Adanca, *Coriolus versicolor* and *Pholiota destruens* harvested from Bilciuresti.

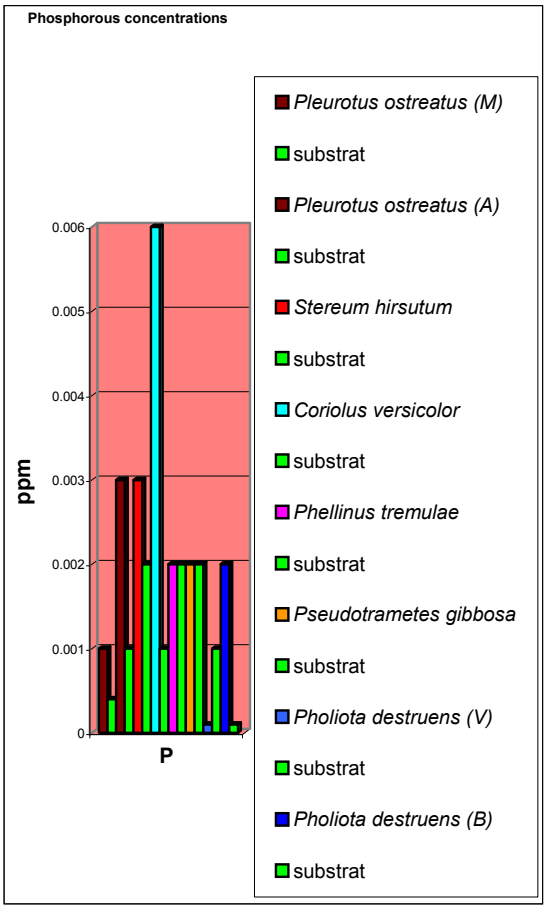

Figure 3. Phosphorous concentration in macromycetes and their substrate

In figure 4 it is presented the content of calcium, potassium and phosphorous in *Pleurotus ostreatus* harvested from 2 forestry ecosystems: Mija and Adanca. In both cases potassium content was higher than that of substrate no matter the place of growing.
Calcium content was very lower than that of substrates. Phosphorous content was in trace in all cases.

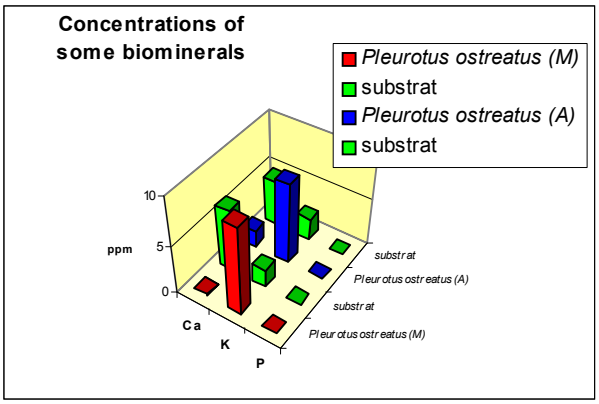

Figure 4. Corelation of biominerals concentrations in *Pleurortus ostreatus* and growing place

In cases of *Pholiota destruens* had calcium, potassium and phosphorous in concentrations very close as values to theirs of substrates (Figure 5). Calcium content of species was between 0,63 and 0,83ppm. Potassium concentrations were important between 8,49-8,58ppm in macromycetes. Phosphorous content was in trace in all cases (0,0001-0,002ppm).

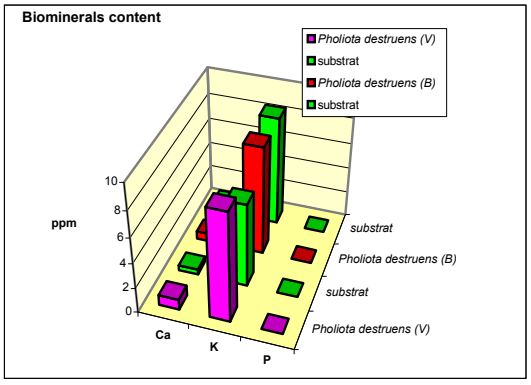

Figure 5. Correlation of biominerals concentrations in *Pholiota destruens* and growing place

In table 1 it are presented the values of bioconversion factor calculated for all studied macromycetes species and for four biominerals analysed. The values of bioconversion factor for calcium were between 0,35 at *Pleurotus ostreatus* and 1,33 in case of *Pholiota destruens*. *Phellinus tremulae* had also a good bioconversion factor (1,27). In case of potassium accumulation bioconversion factor was between 0,22 at *Phellinus tremulae* and 9,00 at *Coriolus versicolor*. The others species had a good values of bioconversion factor over 1. Bioconversion factor values for phosphorous absorption was between 0,5 at *Pholiota destruens* and 5,2 at *Coriolus versicolor*. By exception of *Pholiota destruens* in all the others cases bioconversion factor had a good values, over 1. Concerning values of bioconversion factor for suphurous, it was between 0,2 at *Coriolus versicolor* and 20 at *Phellinus tremulae.* Very high values were obtained in case of *Pleurotus ostreatus* growing at Mija (10), *Stereum hirsutum* (10), *Pseudotrametes gibbosa* (7).

Table 1. Bioconversion level of Ca, K and P

Nr. crt.	Macromycetes species	Bio- conversion level %			
		Ca	K	P	S
1	*Pleurotus ostreatus* (Mija)	0,16	4,8	2,5	**10**
2	*Pleurotus ostreatus* (Adanca)	0,35	3,68	3,1	0,6
3	*Stereum hirsutum*	0,6	6,0	1,5	**10**
4	*Coriolus versicolor*	0,42	**9,0**	**5,2**	0,2
5	*Phellinus tremulae*	1,27	0,22	1	**20**
6	*Pseudotrametes gibbosa*	0,83	4	1	7
7	*Pholiota destruens (Vacaresti)*	**1,33**	1	0,5	-
8	*Pholiota destruens (Bilciuresti)*	0,66	0,77	0,5	-

4. CONCLUSIONS

- *Pleurotus ostreatus* and *Pseudotrametes gibbosa* has a good accumulation for potassium, phosphorous and sulphur.
- *Stereum hirsutum* and *Coriolus versicolor* has a high values of absorbtion for potassium and phosphorous.
- *Phellinus tremulae* accumulated in great concentrations calcium and phosphorous.
- *Pholiota destruens* harvested from Vacaresti has a good accumulation for calcium and potassium.

5. ACKNOWLEDGMENTS

These data are available for food and pharmaceutical biotechnologies.

6. REFERENCES

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