CONTRIBUTIONS TO DETERMINATION THE AFFINITY FOR HEAVY METALS ACCUMULATION OF SOME ORGANS AT *HELIANTHUS ANNUUS L.*

Gabriela BUSUIOC[1], **Ivona DAVID**[1], **Clara STIRBU**[1], **Nicoleta ILIESCU**[1], **Valentina MOCANU**[1]

[1] VALAHIA University from Târgovişte
e-mail: g1busuioc@yahoo.com

This work is about the affinity for heavy metals accumulation of some organs at sunflower. The field chosen for our study is faraway against any pollution industrial source. Also it were prelevated soil samples from roots zone under each plant harvested, and was made the pH analyse. The results emphasized in soil and inside plants organs the following heavy metals: silicium, strontium, zincum, copper, titanium, iron and manganese. In the roots of plants were stored higher concentrations of silicium, zincum, titanium, iron and manganese then those registered in the soil content. In the lowest content was zincum (0,113%) and the highest one was titanium (0,656%). In leaf was accumulated manganese in 0,653% concentration, higher then soil content of 0,001%. Zincum was accumulated in leaf stalk in higher concentration then the soil one (0,055% respectively 0,046%).

***Key words**: accumulation, heavy metals, Helianthus anuus*

Different speciality studies show that *Helianthus anuus* plants are hyperaccumulators for heavy metals, that's why in American States were developing researches in the view to used them in environmental biotechnologies, in phytoremediation technologies respectively [1,3]. It is one researches world trend to decontaminate polluted soil and waters with plants [4,5,6].

Our work is in according with this researches direction, its aim being to determinate the affinity for heavy metals accumulation of some organs at sunflower. The plants analysed were harvested at their maturity phenological phase from one field somewhere in the south-eastern of Romania, no matter, by randomization method, from four place of the cropculture: east, west, south and north. The field chosen for our study is faraway against any pollution industrial source.

MATERIAL AND METHOD

Biological samples consisted in fresh plants harvested at phenological phase of maturity. It were made analyses on roots, leaf, and flowers. In the same time were prelevated substrate samples under each plant. It were determinated heavy metals as

iron, manganese, chromium, copper, lead, zincum, cobalt and nickel. Also was determinated the pH of substrate.

Biological samples and their substrate samples have been weighed and then dried at 60^0C some hours. After drying the samples were weighed again and grinded until to fine powder. The samples prepared in this way were analysed by EDXRF (fluorescence –spectrometer) method 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 5.9KeV. For the evaluation of EDXRF results was used a certified reference sample NIST SRM 1571-Orchard leaves [2]. The sensitivity of method is 1ppm. The results were exprimated in percents (%). Every result represent the average of values obtained on some different samples, prelevated from some sunflower plants.

It was calculated the level of accumulation for heavy metals by mathematics equation:

Elva-X software was used to interpret the EDXRF spectra (1, 9). The accuracy and precision of results were evaluated by measuring a certified reference sample (NIST SRM 1571-Orchard biological samples).

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

Were: *Lc%*=level of metal concentration; *Cm* =metal concentration in mushroom; *Cs* = metal content in substrate.

RESULTS AND DISCUSSIONS

The analyses put in evidence much more elements then they are presented in this work. But on were chosen to be presented the most significant of them as quantities.

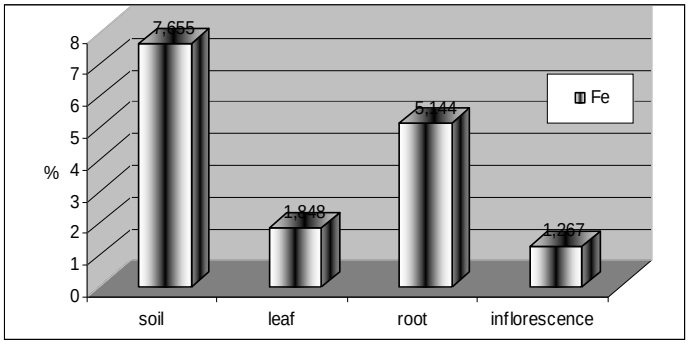

Figure 1 **Iron concentration in *Helianthus annuus* organs**

Inspite of important content in iron of soil, in *Helianthus anuus* organs were stored lower quantities (*fig. 1*). The maximum was registered in roots as significant comparatively to that of soil. The lowest concentration were find in leaf and inflorescence, minimum being obtained in the last one.

Soil content in titanium is important one, of 0,641% (*fig. 2*). Only the roots accumulated in plus over the concentration of soil (0,656%). The leaf and inflorescence had very lower concentrations of titanium comparatively to soil content. Also the minimum of titanium content was find in inflorescence (0,075%). Maximum was determinated in roots (0,656%).

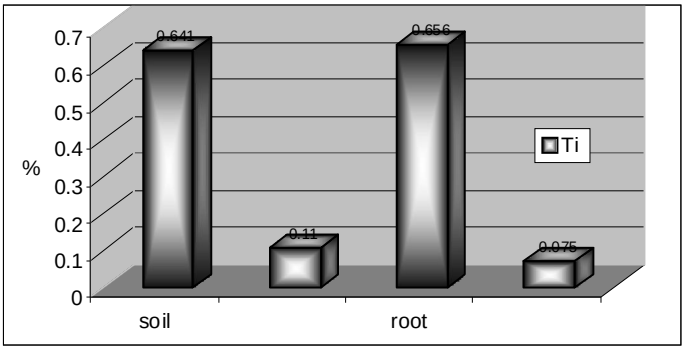

Figure 2 **Titanium concentration in *Helianthus annuus* organs**

Manganese content of soil was very lowest (0,001%), but the leaf accumulated it in very important quantity of 0,653% (*fig. 3*).

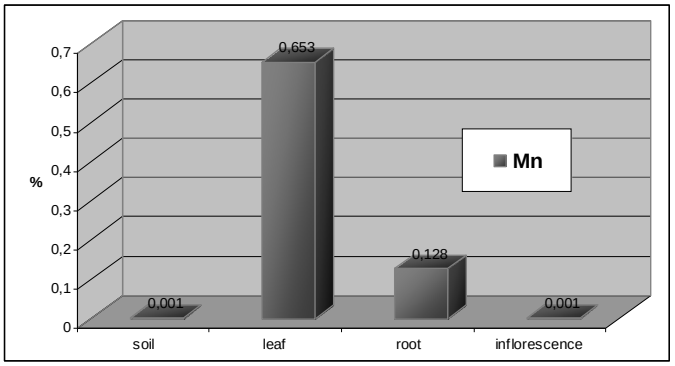

Figure 3 **Manganese concentration in *Helianthus annuus* organs**

A medium concentration, also higher then that in soil was stored in roots (0,122). The inflorescence accumulated this metal species only in according with manganese level of soil.

In case of silicium comparatively to the lowest soil content, the concentration absorbed by roots was a very higher one (*fig. 4*). The quantities of silicium stored in leaf and inflorescence were sensible lower than that of soil, but the same as value in both of them. It seems that the roots can block up silicium inside them and let go only a little part of it to the others organs of plant.

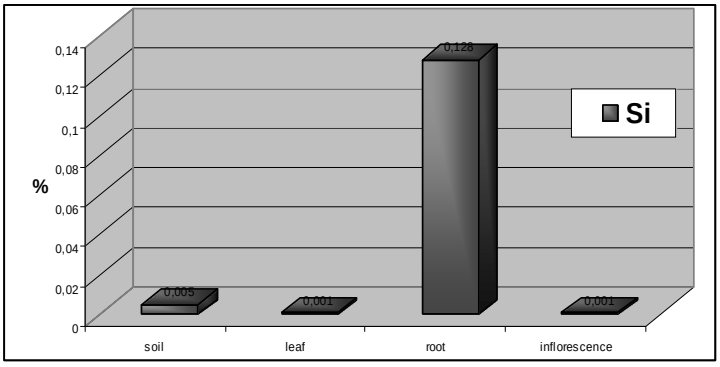

Figure 4 **Silicium concentration in *Helianthus annuus* organs**

The aspect of zincum diagram accumulation is the same with silicium one, being different only as value (*figure 5*). The roots concentrated significant quantities of zincum comparatively with that of soil samples.

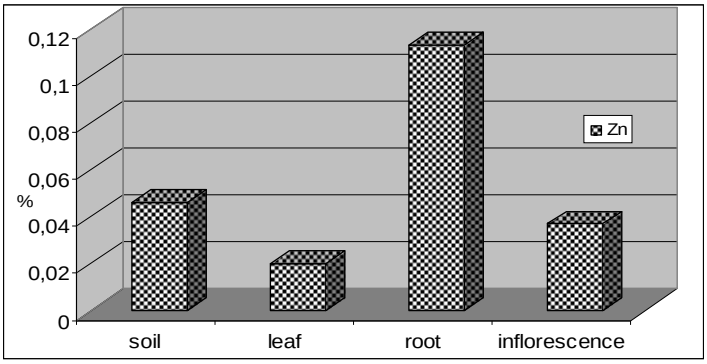

Figure 5 **Zincum concentration in *Helianthus annuus* organs**

Inside leaf and inflorescence zincum was concentrated in lower quantities. But zincum concentration in inflorescence was sensible higher than that accumulated inside leaf. Maximum accumulation was in root and minimum in leaf.

Soil content in strontium was a important one, but its concentrations in sunflower organs was lower than that of soil (*figure.6*). Maximum was stored inside leaf and minimum was determinated inside roots. Medium content between leaf and roots was obtained in inflorescence.

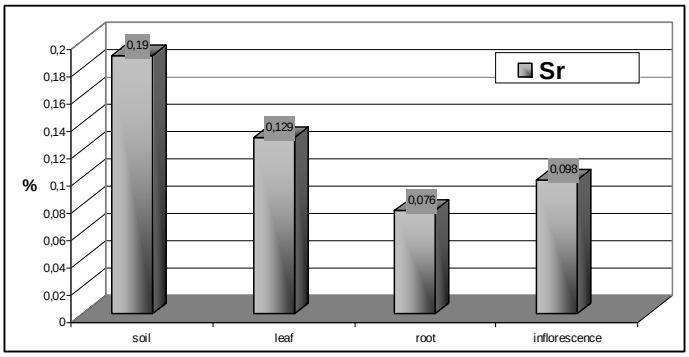

Figure 6 **Strontium concentration in *Helianthus annuus* organs**

In *table 1* it are presented the levels of the main accumulations concerning some heavy metals in different organs of *Helianthus anuus*.

So, on can see that the highest affinity was for manganese at leaf and roots follow by silicium at roots. Also an important storage was registered for zincum and titanium in roots.

Table 1

Accumulation level of heavy metals calculated inside *Helianthus anuus* organs

No crt	Type of sample	Metal concentration (%)						
		Fe	Si	Zn	Cu	Mn	Ti	Sr
1	Soil = 100%	7,655	0,005	0,046	0,061	0,001	0,641	0,190
2	root	67	2 560	245	<100	12 800	102	<100
3	leaf	<100	<100	<100	<100	65 300	<100	68
4	inflorescence	<100	<100	<100	<100	<100	<100	<100

CONCLUSIONS

1. *Helianthuus anuus* roots has a very higher affinity for manganese and silicium.

2. Zincum and titanium were accumulated inside roots in higher concentrations then that of soil.

3. The leaf stored only manganese in highest quantities.

4. The inflorescence does not accumulated any heavy metals, but concerning strontium and zinc the level is a little higher then the storage of the others heavy metals.

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