THE STUDY OF HEAVY METALS (NI, ZN, CU, PB) IN THE VEGETATIVE ORGANS, HARVEST AND GROWING SOIL OF POTATOES, WHEAT AND WILD BLACKBERRY

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Abstract: *Here was discussed the researches of heavy metals transition to the root, steam and leaf from sprout growing soil of potatoes, wheat and wild blackberry. The growing soil data comparison shows that soils differ with heavy metals content. Heavy metals content differs a little in potato leaf and tube. This gives an opportunity to suggest a new method that is to define heavy metals content in potato tube before harvesting, which will have great organizational and economical importance. According to our study in different organs of potato, wheat and blackberry the quantity of Zn, Cu, Ni, Pb is proportional to their content in soil; Zn. Cu. Ni. Pb contents in vegetative organs of potato, wheat and blackberry and harvest are different; Zn, Cu, Ni, Pb contents in potato tube, wheat grain and blackberry fruit is the least as compared with vegetative organs; The contents of heavy metals in potato tube can be defined by means of new method, before harvesting, by analysis data of green leaf. Growing soils have different contents of heavy metals.*

Keywords: *heavy metals, root, green leaf, potato, sprout, juicy fruit, crop.*

1. Introduction

Biosphere and human population health need protection and conservation. The population health depends on production of ecologically pure products. Ecologically pure product is a priority problem of modern agricultural product evaluation, where is significant not only the production of many and qualified agricultural products and raw materials, but also the ecological evaluation of pollution. The kinds of crop harvest pollution are of different nature from this viewpoint. The wide usage of chemicals lead as agricultural products - fertilizers, herbicides, insecticides, fungicides, different growth stimulators, as well as cultivation of trans-genetic sorts.

The environment safety, improvement of sanitary conditions of anthropogenic factors, ecological wastes treatment and reduction, toxic elements in ecosystems and ecologically pure product receiving is one of the main problems, separate issues of which are solved by many scientists of the world.

The high rate of population growth on the earth, advanced stage of motor transport, power engineering, food, heavy and light industry development essentially increases humane influence on biosphere. There

were used as many raw materials as for the whole human history on the Earth during the last 30 years [1].

The science has not created such ecological terms and methods that would give an opportunity to abolish the emerging negative ecological problems. Indeed, some technological processes are being improved in industry, but ecological damage is irreversible from the ecological viewpoint [1,2].

2. Experimental

Plant pollution is directly connected with water, atmosphere, especially soil pollution.

Water, atmosphere and soil pollution factors are divided into 3 groups:

1. Physical (temperature, noise, electromagnetic field, radioactive materials),
2. Chemical (chloral-organic, aromatic combinations, carbonic acid, heavy metals, radio nucleotides, mineral fertilizers, herbicides, various chemicals),
3. Biological (microbiological, biogenous, gene engineering).

The sources of water, atmosphere and soil pollution are different, where nowadays heavy metals rank high term with their harmfulness [3,6,7,8]. According to the level of harmfulness these metals are divided into 3 groups:

1. As, Cl, Mg, Zn, F, Hg;
2. B, Co, Mo, Cu, Cr;
3. Ba, V, W, Mn.

The main source of heavy metal distribution for agriculture is the soil, the ways of pollution of which are different and we won't touch upon it. But we wish to state by the scientific data of that sphere that they influence on the soil solution reaction, physicochemical properties, mechanical structure, absorption complex, changing soil fertility and crop yield [4,5].

Heavy metals get into the human organism both from crop yield, and wild plants used by people and reflect on their health.

Plant pollution with heavy metals is conditioned by their quantity and dissemination in the growth soil. In this concern the main thing is the initial rock content, airing of which resulted soil was formed. Along with this the main sources of soil pollution with heavy metals is mining, heavy metallurgy, engineering industry, galvanic industry, production of cement, leather, light industry and food production waste and water used for irrigation in agricultural regions. The sources of water pollution are very different. Heavy metals get into plants from soil and into our organism by food chain and infect it, causing various illnesses. Their danger also consists in that influencing on genetic system they cause genetic illnesses, which are inherited to generations. The danger of heavy metals increases. The rates of harmfulness of separate heavy metals are not fully defined by separate metals calculation in plants and especially wild plants.

3. Results and discussion

According to data of definite illnesses monitoring carried out by medical centers and corresponding organizations in Lori region they are more spread in Lori region and heavy metals have their role here. According to international literature data cancer often occurs in developed countries [6,7,8]. If so, Lori region is not the most developed in RA. In the result of anthropogenic pollution in Lori region the presence of color metallurgy is specified (Copper-molybdenum factory of Alaverdi, Ajrum branch and small companies), as well as Teghut. It is possible that there can be other sources of illnesses which are not revealed yet. From this point of view it must be stated that both citizens of Vanadzor and region use wild spicy, food and herbal plants, the number of which is more than twenty. It is not excepted, that part of them can contain more heavy metals which can influence upon our health.

The aim of this paper is to determine heavy metals content in food plants used by people and suggest a method to define HM content before harvesting. The research was carried out in 2009-2011. From cultured plants we took potatoes and wheat, and blackberry bush from wild ones. We followed the principles that both mentioned plants occupy the largest sowing area. Wild blackberry is widely used especially by Lori region population from which preserves and syrups are made and they are very rich of vitamins, sugars and mineral elements.

Selecting these plants we also followed the botanical variety of crop formation, that is – underground potato crop tuber modification to sprout, wheat grain is a single-seed real fruit, and blackberry is multi-seed juicy fruit. The contents of heavy metals in different organs of plants were defined before harvesting. Average samples were taken from 20 plants. During the ripening of potato tops the leaves fall, which were dried in laboratory conditions, as well as other samples.

The content of heavy metals was defined by un-diction cuploidal plasmomass-spectrum ether analysis method. The researches were carried out upon potato «Morphona» and wheat «Bezostaya 1» sorts, and the wild plants of blackberry of Pambak region forest. The samples were taken from our agricultural industrial and experimental sowing area in Darpas.

The cultivation of plants was carried out by the technology approved in the region for the same plants cultivation (land plowing and sowing, plant care and harvesting).

Content of Ni, Zn, Cu, Pb (mg/kg) was studied in all plants.

The study results contents of heavy metals in different organs and growing soil of wheat and potatoes are shown in tables [1,2].

In table 1 is shown heavy metals contents in green leaf, sprout, root, tube and growing soil of potato. It was

revealed that in all cases from heavy metals the contents of Zn is the most, Pb is less, Cu and Ni have average content. It is remarkable, that this regularity is conditioned by growing soil.

Table 1.
Quantitative data of Ni, Zn, Cu, Pb in potato tube and vegetative organs (mg/kg)

N	sample	Heavy metals			
		Ni	Zn	Pb	Cu
1.	Leaf	1.5943	8.7320	1.8435	6.8684
2.	Sprout	3.6053	91.2308	2.2054	19.1473
3.	Root	14.1301	55.5524	3.5985	22.2364
4.	Tube	0.1206	0.33385	0.00915	0.044887
5.	Soil	38.815	72.3573	2.6621	50.3459

In addition. the less contents of heavy metals is in tube. then in leaf. in other organs this regulation is not observed. Those heavy metals which are many in soil proportionally get into potato plant. In table 2 is shown the same data for wheat grain, leaf, sprout root and growing soil.

Table 2.
Quantitative data of Ni. Zn. Cu. Pb in wheat grain. leaf. tube and vegetative organs (mg/kg)

N	sample	Heavy metals			
		Ni	Zn	Pb	Cu
1.	Grain	0.0554	32.1754	0.0005	3.4084
2.	Leaf	6.1682	17.0842	2.2689	4.7428
3.	Sprout	2.5916	15.2739	0.2936	2.6427
4.	root	6.4893	21.4806	1.8036	11.8458
5.	Soil	51.7345	90.2153	13.3052	75.0361

In this case also heavy metals content in different organs of plant is proportional to their content in soil. But heavy metals contents do not differ in quantity. though in grain heavy metals are the less. except Zn and CU. where the difference is insignificant. Heavy metals content in decreasing sequence is as follows: Zn, Cu, Ni, Pb.

In table 3 is shown data for wild blackberry. Content of heavy metals in blackberry is also conditioned by their content in soil and what is important the heavy metals content is less as compared with cultivate plants and their content in decreasing sequence is as follows: Zn, Cu, Ni, Pb. The heavy metals content in case of blackberry of in leaf. sprout. root are less in comparison with crop. It is interesting that Zn. Cu. Ni. Pb are more in leaf. in root and sprouts there is no regulation regarding their quantitative content.

Table 3.
The heavy metals contents in blackberry fruits - leaf. sprout. root and growing soil (mg/kg)

No.	sample	Heavy metals			
		Ni	Zn	Pb	Cu
1.	Berry	2.8728	41.8593	1.6366	19.5595
2.	Leaf	9.6428	66.3545	6.5276	36.3678
3.	Sprout	4.7645	52.2056	1.7386	14.0042
4.	root	2.6425	48.1776	1.7584	53.6446
5.	Soil	30.4895	1111.6418	76.2079	417.4815

Thus, heavy metals Zn. Cu. Ni. Pb migration in various organs of plant and harvest is different and mainly depends on heavy metals quantity in soil and the most important – in potato tube, wheat grain and multi-seed fruit of blackberry these metals are the least.

4. Conclusion

The growing soil data comparison shows that soils differ with heavy metals content.

Heavy metals content differs a little in potato leaf and tube. This possibility gives an opportunity to suggest a new method that is to define heavy metals content in potato tube before harvesting. which will have great organizational and economical importance.

According to our study the following is concluded:

1. In different organs of potato. wheat and blackberry the quantity of Zn, Cu, Ni, Pb is proportional to their content in soil.
2. Zn. Cu. Ni. Pb contents in vegetative organs of potato. wheat and blackberry and harvest are different.
3. Zn. Cu. Ni. Pb contents in potato tube. wheat grain and blackberry fruit is the least as compared with vegetative organs.
4. The contents of heavy metals in potato tube can be defined by means of new method. before harvesting. by analysis data of green leaf.
5. Growing soils have different contents of heavy metals.

5. References

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