

RADIATION EFFECT ONTO BIODIVERSITY OF SPIDERS

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Abstract:- The radionuclides and heavy metals in spiders have been determined at “Canberra” Gamma Spectrometer and X Omega Roentgen Fluorescence Spectrometer . Radionuclides and heavy metals have been determined in four background species of spiders. Natural radioactive elements were revealed in the investigated samples.

Key-Words:- spider, radionuclides, radiation, biodiversity, spectrometer

1 Introduction

All progressing pollution of biosphere, as well as soil, plants and water resources by antropogenic emissions of industrial enterprises assists in their saturation by toxic substances, heavy metals and radionuclides [1-3]. Progressing environmental contamination by these products results in its turn to gradual pauperization of fauna and flora of the given areas of Azerbaijan.

Spiders (Araneae) are one of the considerably diverse groups of living organisms in fauna of the Republic. Spiders are ubiquitous populating too diversified biotopes, characterized by the extremely different natural conditions. They play an important role in environmental chain, being the main group of wild arthropodas in most biocoenoses. Therefore, it's not surprised that recently an increased interest has being observed to the study of spiders as indicators of environmental conditions. These problems have not been solved yet and require deep theoretical and practical analysis and remain urgent as before.

2. Problem Formulation

Spiders have been collected in polluted areas, their identification and sampling of soil, water and plants has been conducted.. The degree of radionuclides' impact on the number and distribution of spiders and their venom in the observed zones of Azerbaijan has been revealed and preliminarily predicted.

The materials have been collected on Boyukdash, Kichikdash and their surrounding areas. Sixty soil samples and sixty plant samples including mainly wormwood (*Artemisia fragrans*) and glasswort (*Salsola nodulosa*) have been taken.

The number of the collected spiders equals to – 292 which has been determined later at an electronic identifier Spinnen Mitteleuropas. During the determination process the following species of spiders have been revealed: *Agalenatea redii*, *Araniella cucurbitina*, *Gibbaranea bituberculata*, *Gibbaranea gibosa*, *Hypsosinga albovittata*, *Mangora acalypha*, *Neoscona adianta*, *Dysdera azerbaijdzhanica*, *Drassodes*, *Drassylus crimaensis*, *Haplodrassus dalmatensis*, *Nomisia aussereri*, *Alopecosa cursor*, *Aelurillus muganicus* , *Pellenes geniculatus*, *Kochiura aulica* , *Enoplagnatha*

gemina, *Simitidion simile*, *Steatoda paykuliana*, *Steatoda triangulosa*, *Ozyptilla tricoloripes*, *Thomisus onustus*, *Xysticus loefleri* относящиеся к семействам Araneidae, Dysderidae, Filistatidae, Gnaphosidae, Lycosidae, Salticidae, Theridiidae, Thomisidae.

3. Problem Solution

The radionuclides and heavy metals in spiders have been determined at “Canberra” Gamma Spectrometer and X Omega Roentgen Fluorescence Spectrometer. Radionuclides and heavy metals have been determined in four background species of spiders. Two species (*Xysticus loefleri* and *Steatoda paykuliana*) populate in soil and two species (*Kochiura aulica* and *Hypsosinga albobittata*) populate in plants (Table 1).

Natural radioactive elements were revealed in the investigated samples. These radionuclides are - Ra²²⁶ and Ra²²⁸ isotopes (together with decay products), included in the set of natural radioactive elements U²³⁸ and Th²³² and K⁴⁰ natural radioactive isotopes not included in the set. The specific activity of Ra²²⁶ radionuclide is calculated by 352 KeV gamma lines of Pb²¹⁴ isotope, which is its decay product after keeping the sample in hermetic conditions for 18 days. Ra²²⁶ radionuclide has 186 KeV gamma lines. Because of the presence of U²³⁵ radionuclide in environmental objects and the coincidence of 185.7 KeV gamma lines of this isotope with 186 KeV gamma lines of Ra²²⁶ radionuclide (or formation of a spectral disturbance), we don't determine Ra²²⁶ radionuclide by the gamma line using a direct method. We mainly determine the specific activity of Ra²²⁸ radionuclide by 338.4 KeV, 911 KeV and 968.9 KeV gamma lines of Ac²²⁸ isotope, being its decay product. K⁴⁰ isotope was determined by 1461 KeV photopeaks.

Table 1 The activity and concentration of radionuclides in spider sample

Radionuclide	Measuring unit	Spider 2	Spider 1
Th-232	<i>mBk/g</i>	MDA=0,25	MDA=0,34
Ra-226	<i>mBk/g</i>	7,0 ± 1,0	9,3 ± 1,5
Ra-228	<i>mBk/g</i>	3,50 ± 0,19	1,5 ± 0,1
U-235	<i>mBk/g</i>	0,035 ± 0,006	MDA=0,15
U-238	<i>mBk/g</i>	0,75 ± 0,13	MDA=3,20
K-40	<i>mBk/g</i>	75,7 ± 6,6	89,5 ± 8,7
Cs-137	<i>mBk/g</i>	8,7 ± 1,1	11,5 ± 1,7
Th-232	mkq/kg	MDQ=61,8	MDQ=84,1
Ra-226	pq/kg	191 ± 27	254 ± 41
Ra-228	fq/kg	3,47 ± 1,88	14,9 ± 9,9
U-235	nq/kg	438 ± 75	MDQ=1880
U-238	mkq/kg	60,7 ± 10,5	MDQ=259
K-40	mkq/kg	292 ± 26	346 ± 34
Cs-137	pq/kg	2,71 ± 0,34	3.59±0.53

The goal of the study – is to reveal the impact of heavy metals on biodiversity of spiders. The content of heavy metals in the spiders, soil and plant samples taken in Gobustan have been measured by X Omega Roentgen Fluorescence Spectrometer (Table 2).

Metal, mq/kq	S	Cl	K	Ca	Ti	Mn	Fe	Cu	Zn	As	Rb	Sr	Zr	Mo
Sample name														
Plant			1513	10235	911	1833	110414		57		60	4477	415	
Soil	257	382	1716	22716	2236	15504	1660260			739				
Spider 1					472		784	267	783			603	539	610
Spider 2	490	898	5566	3301		1406	6210	1709	3917		170	1711	1221	1079
Spider 3	83	263	1646	1206		284	4050	204	1546		194	792	1282	1475

Table 2 The content of heavy metals and their concentration in spider, soil and plant samples

4. Conclusion

The main difference between the measurements of spider and lichen is that lead concentration in spiders reflects atmosphere pollution not more than two years before the collection and in lichen four and more years before. In most cases it's easier to collect lichens, but it's impossible to differ separate species in them and all scales of ages are mixed. For Araneus measurements can be conducted on separate species independent on the sizes, which facilitates the collection of sufficient quantity of materials and allows comparing lead content in various scales of ages.

By this way in different biotopes of pollution levels in the territory of Azerbaijan spiders have been collected in order to determine their species diversity and magnitude of population. Soil and plant samples have been simultaneously taken in the same biotopes. These samples have been analyzed under laboratory conditions on the content of toxic substances, such as heavy metals and radionuclides. The concentration of these toxic pollutants in spiders and their venom has been specified in different biotopes. In consequence of the conducted studies afterconcentration of heavy metals and radionuclides has been determined in spiders, plants, soil and spider venom.

References

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