The Influence of Ecological Factors on Benign Predators (Coccinellidae) of Azerbaijan Fauna

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Abstract: The data on revealing of degree of influence of industrial pollutants and anthropogenous factors on number and distribution of Coccinellidaes in Azerbaijan is presented in article. The concentration of heavy metals in bugs Thea 22-punctata, Propylaea guaturdecimpunctata has been defined by XRF spectrometer. Concentration of heavy metals are Fe (530.67, 303.21), Mn (65.03, 33.15), Cu (66.59, 27.80), Pb (42.24), Cd (10.74, 2.64), Zn (120.17, 110.63), Ni (22.91), mg / kg accordingly. Natural radioactive elements in investigated samples 4 isotopes Ra\textsubscript{226}, Cs\textsubscript{137}, U\textsubscript{235}, U\textsubscript{238}, and Th\textsubscript{232} and K\textsubscript{40} have been revealed by "Canberra" gamma spectrometer with the plenary Ge-detector. Considerable activity of isotope U\textsubscript{238} in investigated samples has been defined, activity was (122.2-203.0) mBk/g, and activity of other isotopes was insignificant. The most sensitive kinds of useful bugs to environmental contaminations which can be used as bioindicators for studying of a condition of the given biocenosis have been established.

Key-Words: influence, Coccinellidae, Azerbaijan, fauna, atom-absorbing spectrometry, heavy metals, radioactive elements

1 Introduction

Pollution of biosphere, including ground, vegetation and water resources, by anthropogenic emissions of the industrial enterprises: oil refining, oil-extracting, metallurgical, chemical, power branches of Azerbaijan promotes saturation by their toxic substances. Прогрессирующее загрязнение окружающей среды этими продуктами ведет в свою очередь к постепенному обеднению фауны и флоры данных областей Азербайджана. Progressing environmental contamination by these products conducts in turn to gradual pauperization of fauna and flora of the given areas of Azerbaijan. Progressive pollution of environment by anthropogenic emissions of industrial enterprises: leads to a gradual impoverishment of fauna and flora of Azerbaijan

Coccinellidae - family of beetle have more than 5000 species, of which 93 species live in Azerbaijan. Ladybugs have been successfully used in biological control, occupying a variety of habitats.-bunun ruscası yoxdu tercumede

Azerbaijan differs by the big variety of natural landscapes and as consequenceby rich fauna. Woods cover 22 % of the area of Caucasus.

Natural process of evolution of wood ecosystems can conflict to practice of economic activities of the person interested in preservation of given woods. In this case there is a necessity for a complex of the forest shelter actions directed on increase of stability of biogeocenoses and decrease of number of insects-wreckers.

Studying of population structures of kind, an estimation of its stability in connection with influence of a complex biotic and abiotic factors and in the conditions of influence growing anthropogenic press, is one of the important problems both for theoretical researches, and for the decision of practical problems of preservation of a biological variety of Coccinellidae, investigating ladybirds as bioindicators of a state of environment. The urgency of researches is defined by importance of the theoretical and practical importance of Coccinellidae. These problems still are not perfect and insufficiently studied and demand deeper theoretical and practical researches.

The amount and even the kinds of pests living on the plants change as a result of different influences, including abiotic and biotic factors of environment. The lack of accordance in the spreading of pests
requires careful and continuous observation on them. Their kind structure, density, dynamics of development, coincidence with them, the size of field which they damage, the influence of heavy metals and radiation are noted on the basis of these observations. Then the ideas about struggle against them are said. It must be noted that not only chemical struggle which influences the health of alives, but also biological struggle are used and among predators and parasite of pests the effective kinds which regulates their number and thus decrease the damage considerably must be discovered and collected. More than 40 predator kinds are known and most of them can remain in some limit of the development of predators. Semi-carranldlylar, trips, some kinds of gnayzhnololar and etc. are examples of these kinds.

In general, stable environmental condition is created in gardens as usual. This environmental condition forms the permanent structure of fauna of бүүмайәләр phytophages. During the whole year the amounts of these kinds varies on seasons. These change is connected to the adoption of their phenology to the nutrition of different bodies of fruit trees. [4,5].

Preying capability is higher in some kinds - 3 kinds (Coccinella septempunctata, Adalia bipunctata, Stethorus punctillum) [6,7] of Coccinellidae which have 98 kinds in Caucasus, 92 kinds in Azerbaijan in insect and larva period. They are very active [8,9].

The basic background kinds among useful kinds of bugs it is necessary to note ladybirds which can be applied as environment bioindicators. However the given problem remains insufficiently studied. Therefore in the given work results on revealing of influence of industrial pollutants on a biodiversity of ladybirds are presented.

Research objective - revealing of degree of influence industrial pollutants and anthropogenic factors on number and distribution of Coccinellidae in Azerbaijan, revealing of the most sensitive kinds of bugs to environmental contaminations which can be used as bioindicators for studying of a condition of the given biocenose.

2 Materials and methods
Generally accepted methods - entomological and arachnological methods have been used during observation and experiments. The food connections of Coccinellidae have been observed by eye. The main purpose of the research was studying of kind composition of phitophage ticks coincided on the trees, bushes and plants and their entomophages – Coccinellidae and bioecological properties of some kinds, dynamics of predator Coccinellidae, the influence of them in activity of ticks. As we noted, the direction of our work consists of 2 parts: field work and laboratory work.

Field work has been carried out for collecting materials for studying of fauna of ladybirds in different biotops, especially in agriculture plants, in the places such as gardens, meadows, orchards, forests and etc. in Gandja-Gazakh region during academic mission. The collecting of entomological materials from plants has carried out by entomological grid and from trees by shaking method. In early spring (April-May) appearance of ladybirds on plants, nutrition, oviposit, the development of larvas, their behavior was noted accurately by observation 3 times in a day. Furthermore, the ecological factors: temperature, humidity, wind, radiation and etc. have been taken into account. The seasonal dynamics of infection of ladybirds, also phitophag ticks have been studied during nature observation. For finding out some biological properties of Coccinellidae, besides the field work, the laboratory works have been carried out.

Definition of heavy metals in an organism of Coccinellidae has been spent by method atom-absorbing spectrometry on AAC-300, Perkin Elmer. Definition of heavy metals in samples of bugs has been spent after combustion at direct influence on ashes with a solution of trichloroacetic acid. Definition of the maintenance of heavy metals in samples of bugs has been spent after sedimentation of fibers trichloroacetic acid.

Concentration of radionuclide in samples has been determined on scale-spectrometer "Canberra" with the plenary Ge-detector. The part of samples has been subjected to the analysis on the maintenance of radionuclids on installation Canberra.

3 The results of research
One family, 19 species and 35 effective kinds which hace a great role in the decrease of numbers of predators have been studied in a research. 8 kinds of them are new to Azerbaijan, 10 kinds to Gandja-Kazakh zone.

While studying Coccinellidae, one of the interested issues was definition of possibility of utilization these bugs as natural enemy against phytophages. During research of mode of life and spreading of ladybirds, the ecological properties of foods which ticks- the food of ladybirds eat must be studied for being possible of studying of...
year, seasonable day rhythm of movement of reason of bugs migration.

Thus, the most active period of ladybirds which we observed in the zone is from third ten-days of May to third ten-days of June. As a result of warming up of air and reduction of moisture, most of bugs pass into summer silent. In the following months the most active mode of life continues until 2nd part of September and the middle of October. Their activity becomes weaker from November and they go to their winter shelters. One activity period of them is higher than two.

The first fertility finishes in this period and density of some kinds are high. In this case, we have observed the migration of them on wild plants very clearly.

We have conducted visual observation in different hours of day of expedition for following their day activity and we came to a conclusion that the reason of richness of ladybirds are connected to diversity of vegetation. Different kinds of pests which are the food of Coccinellidae, especially plant eating ticks enrich the biocenose.

There biocenose remains stable (in comparison to external fields), temperature increases, moisture establishes the suitable microenvironment for pests. As the vegetative bodies of plants are fragile, the nutrition of ticks becomes easier. Accompanying them, pests migrate there.

The purpose of the work - to study the effect of contaminants (radionuclides and heavy metals) on the recovery of the ecosystem of the Gandja-Kazakh zone of Azerbaijan with the elucidation of the fauna of harmful and useful arthropods, and some pests that live on fruit crops and in forests.

Determination of heavy metals in the body of Coccinellidae was conducted by atom-absorption spectrometry on AAS-300, Perkin Elmer

At dry ashing spiders have been exposed to temperature processing at $500^\circ$ within 24 hours, and then the dry rest has been dissolved in nitric acid and contents have been lead up in a measured flask to volume by of 25 ml deionisative water. Data by definition of concentration of heavy metals in an organism of ladybirds is presented in table 1.

<table>
<thead>
<tr>
<th></th>
<th>Fe</th>
<th>Mn</th>
<th>Cu</th>
<th>Pb</th>
<th>Cd</th>
<th>Zn</th>
<th>Ni</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thea 22-punctata</td>
<td>30.67</td>
<td>65.0</td>
<td>66.59</td>
<td>42.24</td>
<td>10.74</td>
<td>120.1</td>
<td>22.9</td>
</tr>
<tr>
<td>Propylaea guaturdecimpunctata</td>
<td>303.21</td>
<td>33.1</td>
<td>27.80</td>
<td>2.64</td>
<td>110.6</td>
<td>110.6</td>
<td>1</td>
</tr>
</tbody>
</table>

We have revealed that, depending on the degree of contamination of ground habitat, content of heavy metals in the body of Thea 22-punctata (Linnaeus, 1758), Propylaea guaturdecimpunctata Lin., 1758 species varies and corresponds to: Fe (530.67, 303.21), Mn (65.03, 33.15), Cu (66.59, 27.80), Pb (42.24), Cd (10.74, 2.64), Zn (120.17, 110.63), Ni (22.91), mg / kg.

Table 1. The given maintenances of heavy metals in investigated samples of Coccinellidae, mg/kg (ppm)

![Thea 22-punctata](image1.jpg)

**Fig.1.** Thea 22-punctata

![Propylaea guaturdecimpunctata](image2.jpg)

**Fig.2.** Propylaea guaturdecimpunctata

The spectrum defining activity of radionuclids in investigated samples has been removed on spectrometer Canberra.

Concentration of radionuclide in samples has been determined on scale-spectrometer "Canberra" with the plenary Ge-detector (tabl.2).

So, specific activity of radionuclides Ra-226 and Ra-228 in sample has been determined by HPGe gamma spectrometer by spectroscopic method after preservation it in hermetic conditions 18 days. We have defined isotope K-40 on 1460.8 keV photopeak.
Table 2. Radiating activity of elements in investigated samples (mBk/g)

<table>
<thead>
<tr>
<th>Sample, Element</th>
<th>Thea 22-punctata</th>
<th>Propylaea guaturdecimpunctata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cs-137</td>
<td>MDA=0.315</td>
<td>MDA=0.416</td>
</tr>
<tr>
<td>Ra-226</td>
<td>2.40 +/- 0.85</td>
<td>5.31 +/- 0.89</td>
</tr>
<tr>
<td>Th-232</td>
<td>1.78 +/- 0.09</td>
<td>4.65 +/- 0.25</td>
</tr>
<tr>
<td>K-40</td>
<td>25.8 +/- 1.5</td>
<td>35.7 +/- 4.6</td>
</tr>
<tr>
<td>U 235</td>
<td>6.08</td>
<td>10.1</td>
</tr>
<tr>
<td>U 238</td>
<td>122.2</td>
<td>203.0</td>
</tr>
</tbody>
</table>

Natural radionuclides and heavy metals of low activity in samples of Coccinellidae, soil, plants, and waters, taken with territory in Azerbaijan and their vicinities have been defined. The revealed activity of uranium element in a spectrum of a Coccinellidae is the result of radiation phone which is formed at influence of ionizing radiation on an environment.

4 Results

It is established that concentration of heavy metals in Thea 22-punctata, Propylaea guaturdecimpunctata varies within Fe (530.67, 303.21), Mn (65.03, 33.15), Cu (66.59, 27.80), Pb (42.24), Cd (10.74, 2.64), Zn (120.17, 110.63), Ni (22.91), mg / kg accordingly.

Natural radioactive elements in investigated samples - isotopes Ra226, Cs137, U235, U238 and Th232 and K40 have been revealed. Considerable activity of isotope U238 in investigated samples is defined, activity was (122.2-203.0) mBk/g, and activity of other isotopes was insignificant.

The most sensitive kinds of ladybirds to environmental contaminations have been revealed. The forecast has been given and the kind of Coccinellidae (Thea 22-punctata,) which is more expressed, specific and can be applied as bioindicators at studying and degree revealing of pollutants in investigated biocenoses has been revealed.

References: