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Influence of environmental pollutants of Azerbaijan on venom of *Apis mellifere* L. Caucasica

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Abstract
Experimental studies have revealed the effect of heavy metals on the waste products of the honeybee *Apis mellifere* Linnaeus Caucasian. The concentration of metal ions was investigated by X-ray fluorescence spectrometry using X Omega Roentgen fluorescent spectrometer. In the polluted zones (Sumgait) fluctuation of maintenances of heavy metals in structure of venom, pollen and propolis for Fe, Mn, Cu, Pb, Cd, Zn, Ni, Cr, Co has been: 1.17, 5.5, 0.29, <0.001, <0.001, 5.7, <0.01, 0.01<0.001 (propolis), 0.57, 0.19, 0.16,<0.001, <0.001, 2.7, <0.01, 0.05, <0.001 (pollen) and 2.5, 3.6, 0.31, <0.001, <0.001, 6.8, <0.02, 0.03, <0.02, and In the ecology clean areas of the Pirkuli has been 0.73, 1.14, 5.1, 0.23, <0.001, <0.001, 4.7, <0.01, 0.01, <0.001 (propolis), 0.51, 0.17, 0.14,<0.001, <0.001, 2.2, <0.01, 0.03, <0.001 (pollen) and 2.2, 0.29, <0.001, <0.001, 5.8, <0.01,0.02, <0.01(venom) mg/kg, accordingly.

Keywords: Environment, heavy metals, venom, honeybee, *Apis mellifera* Linnaeus Caucasica

1. Introduction

Environmental contamination by heavy metals continues to be one of the causes of environmental degradation of the natural ecosystems. Currently, drugs of natural origin, which include honeybee products have attracted increasing attention of scientists.

All progressive pollution of biosphere of Azerbaijan by man caused emissions of the industrial enterprises, leads to catastrophic worsening of an ecological situation in the nature, imbalance of natural processes, destruction of the ecosystems leading to considerable saturation by toxic elements, including heavy metals. The problem of pollution of biosphere of Apsheron of Azerbaijan by toxic, heavy metals like Pb, Hg, As, Cd, Ni, Cu, Va, Zn, Co, Mo, Sr and other metals, has arisen by technogen emissions of the industrial enterprises in an atmosphere. They are the most dangerous toxic elements for fauna and animals by entering in the basic biological circulation of substances. Due to the intensive study of the venom of bees worldwide, the study of metabolic products of the honeybee (*Apis mellifera* L. Caucasica widely ubiquitous in Azerbaijan) is in considerable interest. Honeybees (*Apis mellifera* L. Caucasica) are one of the most important insects in ecosystems. Bees are not only pollinators they are also healers, manufacturers of environmentally friendly medicinal products such as honey, royal jelly, pollen, propolis and wax. Bee venom – is the active ingredient with a wide range of pharmacological effects. Apitoxin is a product of the secretory activity of the glands of the working honey bee. The quantity and quality of it depends on the age of the bees, forage quality and season. Bee venom contains trace elements phosphorus, copper, calcium, magnesium and other elements. Bee venom is composed of 18 amino acids. Enzyme action of bee venom is 30 times more potent than the snake. Its activity maintains for 7-8 years. No visible effect withstands freezing and heating to 110-115 °C. Bee venom is resistant to the effects of acids and alkalis. Lead peptide in bee venom melittin is composed of 26 amino acids (50-55% dry matter venom) [1, 2, 3, 4]. The work of Palma, M. S.; Brochetto-Braga, MR, (1993) shows the data of biochemical variability poisons from various races Bee Apis mellifera. The comparison of molecular exclusion cromatography profiles of venoms from sting apparatuses of *Apis mellifera* ligustica, *Apis mellifera* and Africanized honey-bees in Sephadex G-100 revealed both qualitative and quantitative differences. The venoms from *Apis mellifera* ligustica and *Apis mellifera* presented, respectively, three and two peaks characteristic of each sub-species, while Africanized honey-bee was characterized by the absence of eight peaks common to the former. The polypeptides with M sub(r) in the range from 100,000 to 7500 Da

Correspond respectively to 62.0%, 66.6% and 68.7% of total proteins from the venon of *Apis mellifera* ligustica, *Apis mellifera* adansonii and Africanized honey-bees, while the peptidic fraction with M sub(r) range from 4100 to 2000 Da corresponds to 11.4%, 32.4% and 10.2% of venom protein, respectively [5].

Maria Izabel Barnez Pignata, Antonio Carlos Stort, Osmar Malaspina Six variables were studied in the F1 descendants of two types of crosses, i.e., Caucasian queens x Africanized males (cross 1) and Africanized queens x Caucasian males (cross 2). Multidimensional analyses were also performed and the generalized Mahalanobis distances (D2) between the F1 descendants and the parental lines were determined. There was an apparent dominance of Africanized bees in both unidimensional and multidimensional analyses. Correlation analysis showed that bees with longer glossae collected more food (sugar syrup) and flew more slowly from the colony to the food source [6, 7].

Strachecka A. J., Gryzińska M. M., Krauze M. (2010) [8] noted that environmental pollution is of great significance to the protective barrier of the proteinous nature on the body surface of the honey bee. Crucial elements of this barrier are proteases and protease inhibitors (enzymes).

They contribute to the protection of the bee against pathogens. Constant weakening of this barrier can lead to the rapid fall of its immunity, and even death [8].

So systemic insecticides such as those used as seed coatings, which migrate from the roots through the entire plant, all the way to the flowers, can potentially cause toxic chronic exposure to non-target pollinators and bee [9,10].

Currently available global data and knowledge on the decline of pollinators are not sufficiently conclusive to demonstrate that there is a worldwide pollinator and related crop production crisis [11].

Although honey bee hives have globally increased close to 45% during the last 50 years [12], declines have been reported in several locations, largely in Europe and Northern America. This apparent data discrepancy may be due to interpretations of local declines which may be masked by aggregated regional or global data. During the same 50-year period, agricultural production that is 3 independent from animal pollination has doubled, while agricultural production requiring animal pollination has increased four-fold (reaching 6.1% in 2006). This appears to indicate that global agriculture has become increasingly pollinator dependant over the last 50 years. However, human activities and their environmental impacts may be detrimental to some species but beneficial to others, with sometimes subtle and counter-intuitive causal linkages [13, 14].

It should be noted that the information available in the literature on problems on the influence of the degree of contamination of the biosphere by heavy metals to the venom, propolis and pollen of the honeybee is insufficient. Based on the above discussion, the relevance of the investigated problem is apparent.

2. Materials and Methods

Definition of the concentration of ions metals in products livelihoods bees *Apis mellifere* L. Caucasica has been investigated by X-ray fluorescence spectrometry. Content and quantity of heavy metals in the samples of products of vital activity of melliferous bee venom, propolis and pollen tests taken from the investigated regions of the Azerbaijan have been measured by X Omega Roentgen Fluorescence Spectrometer.

3. The purpose of research

The aim of the work is to study the effect of the degree of contamination of the biosphere Azerbaijan by heavy metals on the venom, propolis and pollen of the honeybee *Apis mellifera* L. Caucasica.

4. Results and Discussions

By method the roentgen florescent spectrophotometer on the roentgen florescent spectrophotometer (XRF) – Innov –X firm has been defined in the venom of *Apis mellifera* L. Caucasica the content of heavy metals in venom bee, propolis and pollen on territory the Sumgait polluted areas of Absheron Peninsula of Azerbaijan and on the ecology clean areas of the Pirkuli. In the polluted zones (Sumgait) fluctuation of maintenances of heavy metals in structure of biologically active polymer venom, in pollen and propolis for Fe, Mn, Cu, Pb, Cd, Zn, Ni, Cr, Co has been: 1.17, 5.5, 0.29, <0.001, <0.001, 5.7, <0.01, 0.01,<0.001 (propolis), 0.57, 0.19, 0.16, <0.001, <0.001, 2.7, <0.01, 0.05<0.001(pollen) and 2.5, 3.6, 0.31, <0.001, <0.001, 6.8, <0.02, 0.03, <0.02 (venom), accordingly (fig. 1).

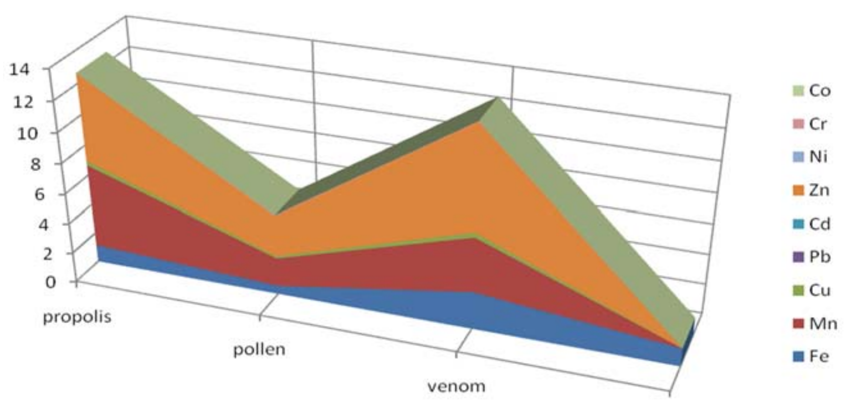

Fig 1: The content of elements and their concentration in products of vital activity of melliferous bee *Apis mellifera* L. Caucasica on territory the Sumgait, mg/kg

In the environmentally clean areas of the Pirkuli, the fluctuation of maintenances of heavy metals in structure of biologically active polymer is for Fe, Mn, Cu, Pb, Cd, Zn, Ni, Cr, Co has been 1.14, 5.1, 0.23, <0.001, <0.001, 4.7, <0.01, 0.01<0.001 (propolis), 0.51, 0.17, 0.14,<0.001, <0.001, 2.2, <0.01, 0.03, <0.001 (pollen) and 2.2, 3.4, 0.29, <0.001, <0.001, 5.8, <0.02, 0.02, <0.01 (venom), accordingly (fig.2).

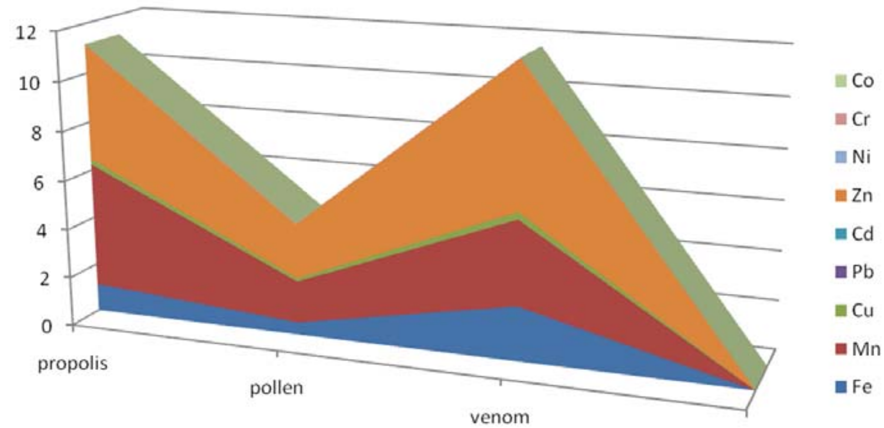

Fig 2: The content of elements and their concentration in products of vital activity of melliferous bee Apis mellifera Caucasica on territory the Pirkuli, mg/kg

Experimentally it is established that, in venom of bees, propolis and pollen collected from apiaries Sumgait content of Fe, Mn, Cu, Zn, Cr is above than in the venom of bee apiaries with a cleaner area Pirkuli. The content of metal ions in bee venom, pollen and propolis was in the ranges within, for samples from Sumgait: Fe, (0.57-2.5 mg/kg), Mn (0.19-5.5 mg/kg), Cu (0.16-0.31 mg/kg), Zn (2.7-6.8 mg/kg), Cr (0.01-6.8 mg/kg), and from Pirkuli: Fe (0.51-2.2 mg/kg), Mn (0.17-5.1 mg/kg), Cu (0.14-0.29 mg/kg), Zn (2.2-5.8 mg/kg), Cr (0.01-0.03 mg/kg), respectively.

Thus significant changes in the chemical composition of the samples of the poison, propolis and pollen honey bees collected from apiaries located in different degree of contamination of the territory of Azerbaijan has been revealed. These changes are reflected in the change of pharmacological and biochemical indicators of metabolic products of honeybees. These biochemical changes were in direct proportion to the degree of contamination of the environment finding apiary bees. It should be noted that, in turn, the degree of areas contamination by heavy metals entail changes the pharmacological and toxicological properties of a biologically active biopolymer apitoxins, pollen and propolis.

As a result of the research works degree of influence of ecological factors, heavy metals on qualitative and quantitative structure of biologically active products of synthesis of bees has been revealed. Influence of ecological pollutant on biochemical characteristics of products of vital activity of bees that is in turn reflected their pharmacological properties is presumably revealed.

5. Conclusions

Concentration of ions metals in the samples of products of vital activity of melliferous bee taken from the investigated regions of the Azerbaijan has been measured by X Omega Roentgen Fluorescence Spectrometer.

The fluctuations in the chemical composition of the venom, propolis and pollen honey bees collected from apiaries within Azerbaijan with varying degrees of pollution has been revealed. It is experimentally established that the fluctuation of maintenances of heavy metals in structure of biologically active polymer venom, pollen and propolis for Fe, Mn, Cu, Pb, Cd, Zn, Ni, Cr, has been: 1.17, 5.5, 0.29, <0.001, <0.001, 5.7, <0.01, 0.01 <0.001 (propolis), 0.57, 0.19, 0.16, <0.001, <0.001, 2.7, <0.01, 0.05 <0.001 (pollen) and 2.5, 3.6, 0.31, <0.001, <0.001, 6.8, <0.02, 0.03, <0.02 mg / kg, in the polluted zones (Sumgait) accordingly.

In the ecological clean areas of the Pirkuli it has been 1.14, 5.1, 0.23, <0.001, <0.001, 4.7, <0.01, 0.01<0.001 (propolis), 0.51, 0.17,5. 0.14, <0.001, <0.001, 2.2, <0.01, 0.03, <0.001 (pollen) and 2.2, 0.29, <0.001, <0.001, 5.8, <0.02, 0.02, <0.01(venom) mg/kg, accordingly.

6. References

1. Topchiyeva Sh A, Mehrabova MA, Abiyev HA. Investigation of electrophisical parameters of snake venom. The International conference on structural analysis of advanced materials. 2009; 1:57-58.
2. Krylov VN. Bee venom - what is it. Beekeeping. 1993; (2):36-39.
3. Krylov V, Oshevensky L, Kurnikov G, Klemenova I. Cream based on wax with propolis and poyal jelly in the treatment of dermatological diseases. Apimondia'99. Congress Vancouver, Canada. Proceedings. 1999; 36:249.
4. Topchiyeva Sh A, Mammadova FZ, Yusifov RY. Influence of environmental factors (heavy metals) on the chemical composition of the venom of the honeybee Apis Mellifera K. NASA Proceedings of the Institute of Zoology. 2011; (29):469-473.
5. Palma MS, Brochetto-Braga MR. Biochemical variability between venoms from different honey-bee Apis mellifera races. Comparative Biochemistry and Physiology C Comparative Pharmacology and Toxicology. 1993; (2):423-427.
6. Cosenza GW, Batista JS. Morfometria da Apis mellifera adansonii (abelha africanizada), da Apis mellifera caucasica (abelha caucasiana) e suas híbridas. Cienc. Cult. 1974; (26):864-866.
7. Barnez Pignata MI, Stort AC, Malaspina O. Study of the length of the mouthparts of Africanized, Caucasian and Africanized/Caucasian honey bee crosses, and relationships between glossa size and food gathering behavior. Genetics and. Molecular Biologiya, On-line version ISSN 1678-4685, 1998, (21).
8. Strachecka AJ, Gryzińska MM, Krauze M. Influence of Environmental Pollution on the Protective Proteolytic Barrier of the Honey Bee Apis mellifera mellifera, Polish J of Environ. Stud. 2010; 19(4):855-859.
9. Colin ME, Bonmatin JM. Quantitative analysis of the foraging activity of honey bees: relevance to the sub-lethal effects induced by systemic insecticides, Arch. Environm. Contam. Toxicol. 2004; (47):387-395.
10. Bonmatin JM, Marchand PA. Quantification of imidacloprid uptake in maize crops. Journal of

agricultural and food chemistry. 2005; 53(13):5336-5341.
11. Ghazoul J, Buzziness as usual. Questioning the global pollination crisis. TRENDS in Ecology and Evolution. 2005; 20:7.
12. Aizen MA. The Global Stock of Domesticated Honey Bees Is Growing Slower Than Agricultural Demand for Pollination, Current Biology. 2009; (6):1-4.
13. Thomas CD, Jones TM. Partial recovery of a skipper butterfly (Hesperia comma) from population refuges: lessons for conservation in a fragmented landscape. Journal of Animal Ecology. 1993; (62):472-481.
14. Benedek P. Structure and density of lucerne pollinating wild bee populations as affected by changing agriculture, Acta Horticulturae, 1996, 353-357.