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ABSTRACT

Accumulation Of Heavy Metals In The Body Of Honey Bees

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Massive death of bee colonies (collapse) requires a close study of its causes. Scientists make various proposals, some of them are quite logical, but have no direct justification. In many publications, pollution of environment by heavy metals is considered as the cause of bee colonies death, since urban areas are subjected to increased techno genic pollution. Vehicles are the cause of environment pollution. Exploitation of vehicles results in intensive ejection of heavy metals into the environment released with exhaust gases and while cars are exposed to the road surface. The combustion of leaded fuel is accompanied by the release of lead (1 liter of gasoline contains up to 0.5 g of tetraethyl lead). While combustion of lubricating oils cadmium is released. A large amount of this element is formed as a result of abrasion of tires on asphaltic concrete. Lead and cadmium, which are highly toxic, accumulate in soil and vegetation and spread along trophic chains, pose a threat to bees' life. The influence of a busy highway on the body pollution of honey bees has been studied in this article. In bees, the least amount of studied pollutants has been accumulated in the head sections, the largest in rectum (hind gut). A relatively large amount of lead Pb and cadmium Cd found in the body of honey bees has been accumulated in the territory with a distance of 0.5 - 1 km from the highway.

KEYWORDS

honey bee, rectum, honey goiter, midgut, lead Pb and cadmium Cd, heavy metals, pollutants, highway.

INTRODUCTION

Environmental protection is an urgent task of now days, therefore, many researchers are interested in the possibility of using bees to study the state of the environment and its impact on bee families.

Honey, wax, propolis and other beekeeping products are produced by honey bees in different period of their life. All of them are biologically active substances. This most valuable gift of nature is used not only in folk medicine, but also as a high-calorie balanced diet. Therefore, the requirements for environmental cleanliness of bee products should be high.

Toxic substances enter into beekeeping products - honey, wax, pollen, propolisthrough plants from air, water and soil contaminated by industrial and transport discharges, or as a result of the use of various chemicals in agriculture. That's why there is a need for organizing quality control of beekeeping products and prohibiting the maintenance of bees in large cities and subsidiary farms located near chemical enterprises and large plants [2].

In 1975 at the International Congress of Beekeepers in Grenoble, it was noted that environmental poisoning by industrial emissions, chemical and radioactive substances leads to massive bee death, reduced honey collection and contamination of beekeeping products. According to O.F. Grobov (1989) there were numerous evidences of bees death in industrial areas that used coal with a high content of arsenic, and in bee-gardens located near aluminum, phosphate, glass and brick plants. A large death of bees has been observed in apiaries located near electrified railways and highways.

Arsenic turned out to be the cause of the massive death of honey bees in Yugoslavia, since the apiary was near the industrial complex. Arsenic was in free and bound form [4].

In the south of Poland, in the area of the zinc melting plant, researches of the Beekeeping Institute had observed three apiaries, per five families in each. Based on the observations, it was concluded that environmental pollution by lead, zinc, cadmium is unfavorable for bees. An increase in the proportion of heavy metal in comparison with their content in flowering plants has been found in the dead bees as follows: lead more than 5-7 times, zinc - 3.5 times, cadmium - 3.5 times. At the same time, these elements have been found to be less in honey in comparison with their content in flowering plants, namely: lead less than 100 times, zinc 5 times, and cadmium 10 times [3]. Studies have shown that honey collected 79 km from the city contains 32 times less mechanical impurities than honey produced in the city. It has been established that an excess of lead, copper, cadmium and other micromacro elements adversely affects the growth, development, viability of bee colonies to infectious and invasive diseases and their productivity [1].

Thus, environmental pollution with industrial emissions, chemical and radioactive substances leads to massive death of bees, reduction of honey collection and pollution of bee products. The content of heavy metals in honey is unstable, which makes it possible to use honey in monitoring to identify environmentally clean and disadvantaged **MATERIALS AND METHODS**

The object of this work was to study the accumulation of lead Pb and cadmium Cd in the body of bees. The study was performed on the feed site of bees, mainly exposed to pollution by vehicles. At a distance of about 0.5 km from the hives, there was a highway, the load of which in the spring-summer period was from 280 to 400 hundred cars per hour. The main melliferous plants have been presented by following vegetation: garden trees apple tree (Malus), pear (Pyrus), sweet cherry (Cerasusavium), apricot (Armeniaca vulgaris), quince (Cydonia) and plum (Prúnus), herbaceous goldenrod giant (Solidago field cod (Cirsiumarvense), arvensis), buttercup (Anemone ranunculoides), plantain (Plantágo), melilot (Melilótus officinális), sunflower (Helianthus), alfalfa (Medicago), clover (Trifolium), common bruise (Échiumvulgáre). The distance from the hives to the most remote of these plants did not exceed 1.5 km, which allowed the bees to consume nectar and pollen from them and to areas while placing apiaries [5].

prepare honey and bee bread from spring to autumn.

Samples of honey bees have been taken from 30 families, totally from 220 individuals, they have been fixed with boiling water and then stored in 70% alcohol, bee morbidity has been prepared in such way. The distance between apiaries has been compared in 0.5 - 1 km and 1.3 - 1.5 km. The content of lead Pb and cadmium Cd in the bodies of honey bees has been determined by the usage of atomic adsorption analyzer QUANT - Z. ETA - GOST 30692 - 2000.

RESULTS

The investigations have been carried out in Kibray district of Tashkent region of the Republic of Uzbekistan, in the apiary of the "Kodirkhuza ota" farm, half of the hive of the farm has been located in a distance of 0.5-1 km and the second half in a distance from

1.3- 1.5 km from the highway. The results of the study are presented in the table:

N⁰	Object	Pb	Cd
Distance from the highway 0,5 – 1 km			
1	Head	1,02±0,16	0,12±0,013
2	Chest	1,26±0,19	0,20±0,015
3	Abdomen	1,95±0,20	0,40±0,052
4	Honey goiter	0,84±0,54	0,37±0,198
5	Rectum (hindgut)	1,99±0,20	0,62±0,049
Distance from the highway 1,3 – 1,5 km			
6	Head	1,00±0,66	0,08±0,035
7	Chest	0,10±0,02	0,05±0,010
8	Abdomen	1,45±0,14	0,17±0,020
9	Honey goiter	0,47±0,05	0,28±0,100
10	Rectum (hindgut)	1,20±0,08	0,50±0,021

The content of lead Pb and cadmium Cd in the body of honey bees, mg / kg

As it is seen from the table when bees consume contaminated carbohydrate and protein feed, pollutants are irregularly distributed in the body of individuals. The smallest accumulation of lead Pb in the middle intestine and honey goiter of honey bees, the largest in rectum, abdomen and chest of honey bees, the least accumulation of cadmium Cd are distinguished in the head, the largest in the abdomen, honey goiter and gut of honey bees. While processing nectar into honey, the body of working individuals, and especially the abdomen, rectum (there is the highest concentration of lead Pb and cadmium Cd content) is contaminated. The abdomen and rectum contains an energy resource - fat with the amount of which the lifespan of bees correlates. Keeping of honey bees in techno genic contaminated areas, for example, near busy highways, leads to a relatively high accumulation of lead Pb and cadmium Cd in their bodies, reaching 1-2 and 0.1-0.4 mg/kg, accordingly.

CONCLUSION

Because of the fact that accumulations of lead Pb and cadmium Cd near busy highways is high, it is advisably not to place honey bees families in areas subjected to intensive techno genic pollution. In such areas, pollution adversely affects the physiological state of honey bees. The quality of beekeeping products decreases in techno genic-polluted zones.

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