

Heavy metal content in blood and feathering of white fronted goose (*Anser albifrons*), shot in Moscow region

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Because of increasing environmental pollution by heavy metals, researches of influence of this factor on animals are of current interest. One of the most dangerous toxicants are lead and cadmium. Wide use of lead in industry provides increasing of its invading in environment. Subsequent upon augmentation of truck haulage lead pollution of urban landscapes and areas near highways increased.

Substantial contribution to pollution of game animals' habitat makes lead shot. With the use of lead shot probability of hunting area pollution increases. During one year in European countries about 20,000 tones of lead shot were shot (Kuznetcov, 1998). Related with this accumulation of lead in soil is in direct dependence with intensity of hunting (Pain, 1992). There is information that the most visited by hunters areas can accumulate during a year up to 10 kg of lead per hectare, that means 5-11 lead shots per m² (Lebedeva, Sorokina, 2004). In wetlands more shot accumulates in littoral area (Kiriakulov, 2007).

On of the tasks of this research was study of heavy metal pollution in one of the most popular Russian hunting object - white fronted goose (*Anser albifrons*). It nests mainly in arctic tundras and flies for wintering to the south up to India, Mexico, China, Japan and so on. Earlier we have discovered that in blood of some geese shot in the period of their flight over Moscow region there was high concentration of cadmium. This explains the importance of further research.

Data for study and methods

The study was made on birds shot during the period of flight to their nesting area in Moscow region in years 2006-2007. For heavy metal analysis blood or main oar feathers were used. Level of concentration of heavy metals was counted in Analytic laboratory of ecological monitoring in the department of Ecology and game management of Russian Agricultural Open University (department chairman and chief of the laboratory – professor E. K. Eskov). The laboratory was accredited in 20.12.2006 be Federal Agency of technical regulation and metrology (accreditation certificate # 00351).

Analyses were made according to the method of atomic absorption spectrometry, based on the phenomenon of absorption of resonance emission of free atoms of an element. For this spectrometer QUANT-Z. ETA was used. In analyzer of this type transformation of the sample in condition of atomic vapour is conducted in graphite tubicolous electrothermic furnace, warmed up to the temperature of atomization of analyzed element. In the furnace with the help of micropipette a sample of analyzed substance is injected. The value weight concentration of the element in a sample is calculated by calibration curve correspondence, created after measurement of several calibration points with error not more than 8%. Work with the spectrometr, processing of the results, display and storage of data is produced by personal computer with software QUANT ZEEMAN 1.6.

Atomic absorption definition of mercury in solutions was made with the help of mercury-hydride generator MHG-106, which is linked with the spectrometer. Mercury that contains in a sample first chemically restores to metallic condition, and then in a stream of argon according to the method of “cold vapour” transfers to an internal surface of graphite furnace of atomizer of spectrometer. As a reductant tin chloride is used. For absorption of mercury the

internal surface of the graphite furnace of atomizer of the spectrometer is covered beforehand with a layer of fine dispersion palladium.

Results of the research and discussions

In comparison with background level blood of geese differed greatly with high content of dangerous pollutants. Lead concentration in blood was about 5 times higher than background level, cadmium concentration – 30 times higher. Concentration of microelement (without Zn) also was much higher (table 1)

Table 1

Concentration of heavy metals in shot white fronted geese

Elements	Blood	Feathering	maximum permissible concentration in foods (Sanitary and Food norms 2.3.2.1078-01)
	M ± m lim	M ± m lim	
Mercury microgram/liter	2.5 ± 0.13 0.9-4.6	0,47±0,08 0,03-1,12	30
Lead milligram/liter	1.01 ± 0.038 0.11-6.90	0,24±0,06 0,01-0,48	0.50
Cadmium microgram/liter	14.1±1.67 1.1-41	11,2±2,9 0,01-23,33	50
Zn milligram/liter	4.49±0.873 0.7-5.3	45,4±1,8 11,5-139,6	
Se microgram/liter	1.94±0,37 0,3-2,6	930±26,7 545-1721	

The most individual differences of pollution by heavy metals are in concentration of cadmium. Its maximal concentration was in the most of white fronted geese was 27 times more than minimal concentration. Comparing with ground level concentration of this element was from 2 to 82 times higher. But in blood of one of geese concentration of cadmium was about 16 thousand times higher. In its blood concentration of lead was also the highest – 34 times more than ground level. It was a female that weighted 2145 grams. Other geese weighted from 1840 to 2380 grams. That's why the high concentration of cadmium and lead can't be explained by the weight of the bird. Such correlation was discovered by N.V. Lebedeva and T.V.Sorokina (2004) in waterfowl and semi-aquatic birds of Azov sea basin.

In feathering cadmium and lead concentration had maximum of variability. For example, maximal concentration of cadmium was about 50 times higher than minimal concentration, of lead – more then 2000 times (see table 1).

Comparing with the limits of maximum permissible concentration in Russia the shot geese are not suitable for nutrition because of lead concentration. Some birds had concentration of lead more than 10 times more than this limits. In some birds concentration of cadmium was about maximum allowed level. In feathering there was a high concentration of Se (see table 1).

As the result, geese that fly to nesting areas are highly polluted by heavy metals. The most dangerous for birds and for hunters are concentration of lead and cadmium. Received data shows the importance of the research of heavy metal pollution of geese. At least monitoring of birds must be hold during their flight to nesting area and their flight back. Some information can be collected without shooting, but only by collecting feathers.

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