

## LEVEL ASSESSMENT OF LEAD IN MIXED FEEDS FOR BROILERS CHICKEN AND THEIR EXPOSURE TO TOXIC RISK

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### Abstract

*Lead is a heavy metal, especially dangerous, which can affect animal health. The goal of the researches was to identify and evaluate the lead residues in mixed feeds for broiler chickens and their exposure to toxic risk. Thirty samples of mixed feeds (starter, grower, finisher), were harvested and investigated in 2006 and 2007 years. Lead concentration was assessed using atomic absorption spectrophotometry method in flame. The results (expressed in mg/kg at 12% moisture) showed that all analyzed samples contained lead residues in detectable amounts, with average values ranging between 0,43 and 1,47 mg/kg. Based on estimated intake of lead from mixed feeds for broiler chickens was calculated the risk exposure of consumers. The data obtained showed that mixed feeds are adequate and doesn't endanger the safety of production and animal health.*

**Key words:** lead, mixed feeds, toxic risk

### INTRODUCTION

Keeping the environment at a low level of pollution is a basic requirement to produce food in conditions of maximum security [6].

Ubiquity of toxic substances (mycotoxins, heavy metals, pesticides) in the environment is the result of environmental contamination by using inappropriate agricultural practices.

Animal exposure to toxic substances is high, so their management and control in the food chain is essential. Control of hazardous environmental contaminants that can cause residues in livestock products is quite difficult and requires time and special attention [2,7].

Lead is a non-essential trace element and animal health can be adversely affected (oncology actions, causing liver, skin and lung cancer and change hematological parameters) when the contaminant concentration in feed and water is high [1, 3, 9].

The purpose of this study was to assess the level of lead in mixed feeds for broiler chickens and their exposure to toxic risk.

### MATERIAL AND METHODS

Thirty mixed feeds samples (starter, grower, finisher) were taken in 2006 and 2007 from a unit in Iasi profiled on broiler chickens breed. The sampling of mixed feeds was conducted in compliance with the rules in the legal standards and legislation in our country (STAS 9597/1-74, SR EN ISO 6497/2005, ISO 6498/2001) and to be representative for the identification and evaluation of lead content.

The method used to determine lead concentration in samples was spectrophotometric atomic absorption (AAS) in flame using GBC-Avanta device. Processing of mixed feeds was made by dry mineralization-burn at 500 °C; calcinated ash was washed with HCl solution and brought to an optimal dilution for the spectrophotometric analysis. Lead calibration curve (absorbance/concentration) was done in 5 points (0,5; 1; 2,5; 5; 7,5 ppm).

Prepared samples were read from the device at 217 nm wave-length.

The quantitative values are expressed as ppm in feed samples by reference to a 12% moisture content.

The results were used to estimate the contribution of lead in the required quantity of mixed feeds provided in used scheme in the production and to assess the toxic risk exposure to consumers. Statistical processing of results was made using ANOVA method.

## RESULTS AND DISCUSSION

The statistical analysis results for determination and assess lead concentration from mixed feed samples for broiler chickens, are presented in Table 1.

Table 1 Average concentration of lead in mixed feeds for broiler chickens, mg/kg at 12% moisture, 2006-2007 years

Mixed feed	No. sample	2006		2007	
		$\bar{X} \pm s_{\bar{X}}$	V%	$\bar{X} \pm s_{\bar{X}}$	V%
Starter	5	1,11±0,03	6,52	0,92±0,01	1,72
Grower	5	1,08±0,03	5,24	0,70±0,01	1,75
Finisher	5	1,47±0,02	2,79	0,43±0,01	3,68
Average	15	1,22±0,03	-	0,68±0,01	-

In 2007 compared to 2006, the average lead concentrations in the analyzed samples was decreased in all three mixed feeds: starter with 17,12%, grower with 35,19% and finisher with 70,45%

The average level of lead recorded in 2007 decreased with 44,26% compared 2006.

Samples of mixed feeds for broiler chicken (starter, grower, finisher) had a lead content below the maximum recommended limit (MRL) of 5 mg/kg under the current legislation [10]; the highest average of lead concentration was recorded in 2006 year at mixed feed - finisher of 1,47±0.02 mg/kg; this value is 3,40 times lower than the maximum permissible limit.

Analysis and risk assessment of Pb residues accumulation determined from samples shown that mixed feeds are proper and do not endanger the safety of animal production and health. Data from tests performed on samples were used to estimate the contribution of lead in the required quantity of mixed feeds provided in scheme used in the unit production [8].

The quantity of mixed feeds provided by the scheme and used also in calculating the contribution of lead is for the first period of 11 days – starting from 249 g/head, for a second period of 14 days – growing the amount is provided of 1218 g/head and the third period of 17 days – finishing a quantity of 2608 g/head, so that the entire cycle of

production is 42 days and total consumption of all three mixed feeds is 4075 g/head to reach an average weight body of 2150 g.

To calculate the lead intake it has been taken into account the humidity of mixed feeds for consumption. In 2006, for the entire production, the quantity was of 4,176 kg mixed feed with 88% DM and of 4,135 kg mixed feed with 88% DM in 2007.

Evaluation of average lead intake by mixed feed for each period and for the entire cycle production of 42 days is shown in Table 2. From the presented data, is observed that the highest average intake of Pb was recorded of 3,93 mg/head/period in finishing period of the 2006.

Average intake of lead with mixed feeds in 42 days, by broiler chickens, in 2006, was of 5,56 mg/head/period and of 2,24 mg/head/period in 2007, a decrease of 2,5 times.

The level of exposure to toxic risk of broiler chickens was calculated by dividing the lead quantity ingested with mixed feed with average mass body of 2150 g. The limits found were: minimum of 0,11 mg/kg b.w. in 2007 year at the first period-starting and maximum in 2006 of 1,83 mg/kg b.w., at the third period-finishing; during the entire cycle production of 42 days, the level of toxic risk exposure was of 2,58 mg/kg b.w. in 2006 and of 1,04 mg/kg b.w. in 2007.

Table 2 Average intake of lead in mixed feeds for broiler chicken

Year	Pb, mg/head/period			
	Mixed feed			
	Starting (1-11 days)	Growing (12-25 days)	Finishing (26-42 days)	TOTAL (1-42 days)
2006	0,28	1,35	3,93	5,56
2007	0,23	0,87	1,14	2,24

Various studies have shown that chickens tolerate lead concentrations up to 500 mg/kg, without affecting the rate of weight gain when in the diet the level of calcium increases; other experimental studies have shown that a small concentrations of lead acetate, by 250-400 ppm, can determined adverse effects, on the performance of broiler chickens [4, 5, 9]. By comparing data obtained with those found in scientific literature, the mixed feeds analyzed samples can be considered sure and not endanger the safety of animal production and the health of consumers.

## CONCLUSIONS

The presence of lead in all analyzed mixed feed samples is an indicator of pollution level of areas from where raw materials samples were harvested.

High toxicity of lead justify to continue monitoring of this pollutant in raw materials and in mixed feeds in order to obtain results that can be used as support for some recommendations and measures to protect animal health and production.

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