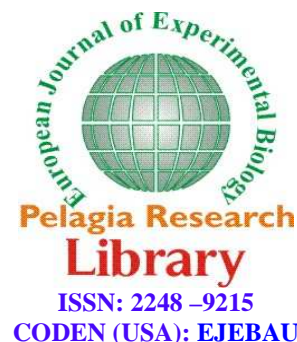




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Hematological Effects of Cadmium in Hybrid *Isa brown*

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ABSTRACT

The aim of this work was to determine the effect of the moderated levels of cadmium, for a 19 days period, on the haematological indicators, in birds for eggs of hybrid *Isa Brown*. Birds are divided in four groups. One group was used as control and three groups were treated with different doses of cadmium sulphate (2 mg Cd/kg, 4 mg Cd/kg and 6 mg Cd/kg). The amount of cadmium salts was given to birds with drinkable water. At the end of the experiment, blood is taken in all 4 groups. The blood was taken in the crucibles with heparin in amount 100 UI heparin for each ml blood taken. In blood we have analysed: RBC, HGB, HCT, MCV, MCH, MCHC, RDW, PLT, MPV, PCT and PDW. Statistical elaboration of haematological parameters was done with ANOVA method by determining the average of each indicator; SD, SEM and tD. Probability is determined by a tabular method. From the results we can conclude that haematological indicators generally have differences ascertained statistically between the control and experimental groups and within experimental groups during the use of cadmium, whereas the level of PDW does not present differences statistically ascertained.

Key Words: Cadmium, haematological parameters, *Isa brown* birds.

INTRODUCTION

Cadmium as mercury is non-essential ion for the poultry [1]. The influence of the cadmium on the haematological parameters was observed on the level of haemoglobin, erythrocytes and hematocrit whereas MCH and MCHC suffer moderated increase. In the experiments conducted in the broilers, it was concluded that the cadmium ions bring anaemia, when the experiment lasts for 42 days with the dose 60 mg/kg food [2, 3, 4]. Exposure to cadmium for 91 days leads to decrease for 40% of the activity of ALA-de-hydro-genesis and it is decreased only by 20% PBG-daesaminasys [5]. In the experiments conducted with the dose 75 mg for a 4 and 6 weeks period, noticed that in the extension of the experiment for 4 weeks it was observed the increase of haematological parameters while after six weeks of experiment it was observed the decrease of these indicators [6].

The aim of this work was to determine the effect of moderated levels of cadmium, for a 19 days period, on the haematological indicators, in birds for eggs of hybrid *Isa Brown*.

MATERIALS AND METHODS

Organization experimental farms:

In this research we have investigated the birds of the hybrid *Isa Brown*. In the experiment are placed birds of 4 weeks age of the *Isa Brown* hybrid. Birds were placed in the cages and in each cage we placed two birds. Birds were treated for a 30 days period without using different supplements of cadmium salts. The experiment was conducted in the village Konjuh, municipality of Lipan in Kosovo, with the following coordinates: sea high-level 568 m. LAT/LON N 42° 32.4370. E 0. 210 08, 335'. Coordinates were measured with GPS.

In the experimental period were created 4 groups with an equal number of birds. In each group are placed 6 birds. First group was treated as a control group while three other groups were experimental groups. Three groups were treated with different doses of cadmium sulphate (group 2, 3 and 4), according to the Table 1.

Tabela 1. Organize groups in experimental farm.

1. Groups	Controlle
2. Groups	Treated with 2 ppm Cd/kg
3. Groups	Treated with 4 ppm Cd/kg
4. Groups	Treated with 6 ppm Cd/kg

The amount of cadmium salts was given to birds with drinkable water. To birds, both during the preparatory period and experimental period, was used same portion of food.

Food that is used during the experiment:

The food portion during the experimental period was composed of a mixture of cereals, food of animal origin, products of oil industry, flour industry sub-products, dried plant products, minerals and vitamins, as presented in the Table 2.

Table 2. The composition of food portion used in all groups of birds.

	%		%
Corn	61.5	Wheat chime	9
Soya oilcake	12.0	Sunflower oilcake	3
Fish flour	5	Animal fat	1
Jodge flour	4	Beer yeast	1
Bones flour	1	Bi-calcium phosphate	1
Sodium chloride	0.25	Premix	1

Taking of food by birds was *ad libidum*. At the end of the experiment was measured the quantity of the food remained un-eaten. The daily level of nutrition was determined by the difference between food given for consumption during the entire experimental period and the food remained at the conclusion of the experiment. Giving of water was done each day, by checking the quantity remained in the pot. The experiment continued for 19 days.

Blood samples and hematological analysis:

At the end of the experiment, birds were taken to the autopsy room at the Veterinary Institute in Prishtina, and the blood was taken in the vein of the arm (*v. Brahialis*) with the crucibles with heparin in amount 100 UI for each ml blood taken. In blood we have analysed: RBC (erythrocytes), HGB (haemoglobin), HCT (hematocrit), MCV (mean corpuscular volume), MCH (mean corpuscular hemoglobin), MCHC (mean corpuscular hemoglobin concentration), RDW (red blood cell distribution width), PLT (platelets), MPV (mean platelet volume), PCT (procalcitonin) and PDW (platelet distribution width). Tests are done at the Faculty of Agriculture and Veterinary at University of Prishtina. The determination of these indicators was done with an automatic device for haematological counting, type *ABX MICROS 60* (Manufactured by *HORIBA ABX SAS*).

Statistics:

Statistical elaboration of haematological parameters was done with the method ANOVA by determining the average of each indicator, standard deviation (SD), standard error of the average (SEM) and accuracy of difference through a Student test (tD). Probability was determined by a tabular method.

RESULTS AND DISCUSSION

The data obtained are presented in the tabular manner (table 3), while for evaluation of the effects of CdSO₄ are developed figures 1-4.

Table 3. Average values (M) of the standard error of the average (SEM) of haematological parameters of the control and experimental group with cadmium in *Isa brown*.

	Gr.1 Controll	Gr.2 Exp.	Gr.3 Exp.	Gr.4. Exp.	(tD)					
	1	2	3	4	1:02	1:03	1:04	2:03	2:04	3:04
RBC $\times 10^{12}/L$	2.02±0.09	1.91±0.04	2.02±0.09	2.02±0.09	1.07	1.24	0.21	2.76	1.67	1.21
HGB g/L	8.7±0.31	8.23±0.16	8.7±0.31	8.7±0.31	1.44	0	0.77	1.4	0.49	0.76
MCV fl	136.5±2.42	132.1±1.42	136.5±2.42	136.5±2.42	1.54	4.09**	2.50**	3.71**	1.26	3.1*
MCH pg/L	43.3±0.61	43±0.56	43.3±0.61	43.3±0.61	0.38	4.81**	0.38	4.76**	0.16	1.95
MHCH g/L	31.75±0.28	32.5±0.48	31.75±0.28	31.75±0.28	1.36	0.25	0.19	1.31	1.29	0.37
RDW%	8.81±0.91	7.46±0.21	8.81±0.91	8.81±0.91	1.45	1.82	1.67	1.28	0.72	0.43
HCT %	27.5±0.93	25.3±0.44	27.3±2.58	26.5±2.58	2.13	0.16	0.8	1.76	1.28	0.59
PLT $10^9/L$	25±2.58	81.33±10.3	87.5±7.93	103.6±12.2	5.32**	7.49***	6.29**	0.48	1.4	1.11
MPV μm^3	6.31±0.14	0.43±0.0005	6.31±0.14	6.31±0.14	5.91***	7.6***	5.51***	1.57	0.72	0.23
PCT %	0.1±0.002	6.13±0.13	0.1±0.002	0.1±0.002	5.59**	7.64***	7.62***	0.45	1.55	1.29
PDW%	5.46±0.39	5.3±0.44	5.46±0.39	5.46±0.39	0.57	0.27	0.93	0.49	0.82	1.13

Note: Significance level: $p < 0.05^*$, $p < 0.01^{**}$, $p < 0.001^{***}$

Blood indicators connected with erythrocytes and haemoglobin (MCV, MCH, MHCH, RDW) suffer changes but these changes are not ascertained statistically ($P > 0.05$).

The level of platelets, PCT and MPV increases from the control group to the third group. This increase is ascertained statistically between the control and experimental groups ($P < 0.05$) but these changes are not ascertained statistically between the experimental group ($P > 0.05$). The values of platelets in the control group are within the normal average limits [7].

The level of PDW suffer changes depending from the dose but these changes are not ascertained statistically ($P > 0.05$).

In graphic 1 we show that cadmium ions, in the first experimental group, will decrease the level of erythrocytes in relation with the control group. In the second experimental group it is concluded that the cadmium ions in the concentration of 4 mg Cd/kg can increase the level of erythrocytes. Same legality is observed also in the third experimental group when the concentration of Cd was 6 mg Cd/kg.

In graphic 2 we show that the level of haemoglobin will decrease under the low concentration of cadmium ions (first experimental group). In the second group it is noticed an increase level of haemoglobin when the concentration of cadmium ions was 4 mg Cd/kg. In the third group with a highest level of cadmium ions 6 mg Cd/kg, it is noticed that the level of haemoglobin increases in comparison with the second group whereas under activity of the cadmium ions it is noticed a slight decrease of the haemoglobin level.

The data presented in the graphic 3 proves the dynamic of the haematocrit in the birds taken for study, under the activity of cadmium ions. In the first experimental group we notice the decrease of the level of hematocrit in the group treated with cadmium ions. In the second experimental group we conclude that we have an increase of the hematocrit level during the treatment with cadmium ions [8]. In the third group the level of haematocrit decrease when treated with cadmium ions (graphic 3). Cadmium ions will have an impact in lowering values of hematocrit, mainly by lowering of erythrocytes but nevertheless the level of hematocrit remains within the boundaries of normal values [6]. This is because of the fact that erythrocytes are primary cells that determine the hematocrit level.

Impact of cadmium ions on the level of platelets (graphic 4) is sensitive. Thus, in the first group it is noticed the increase of platelets but that is increase from the activity of cadmium ions. It is almost twice higher. In the second experimental group, the increase of platelets is noticed under the activity of cadmium ions. In the third experimental group we notice the increase of platelets parallel with the increase of the dose of cadmium ions. Increase of platelets simultaneously with the increase of cadmium level is linked with the high capacity of platelets to connect cadmium ions. However, there are data that increase of cadmium ions impacts on the decrease of the level of platelets [9].

Fig. 1: The dynamic of erythrocytes on the groups with cadmium.

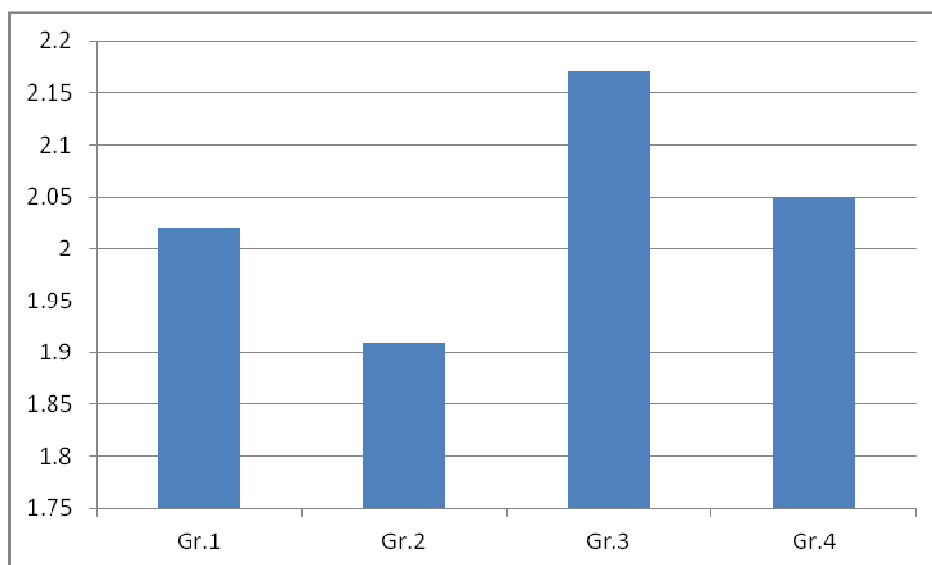


Fig. 2: The dynamic of hemoglobin on the groups with cadmium.

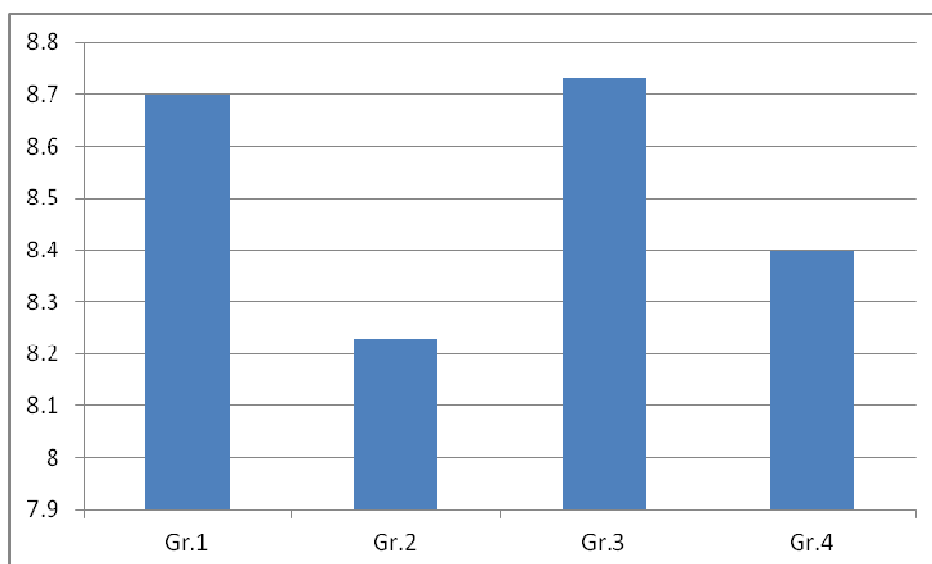


Fig. 3: The dynamic of hematocrit on the groups with cadmium.

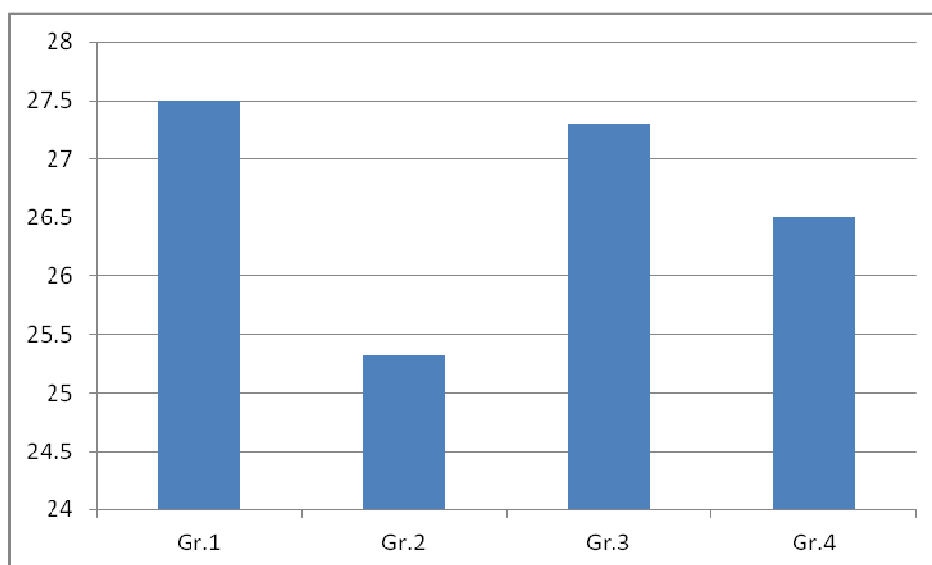
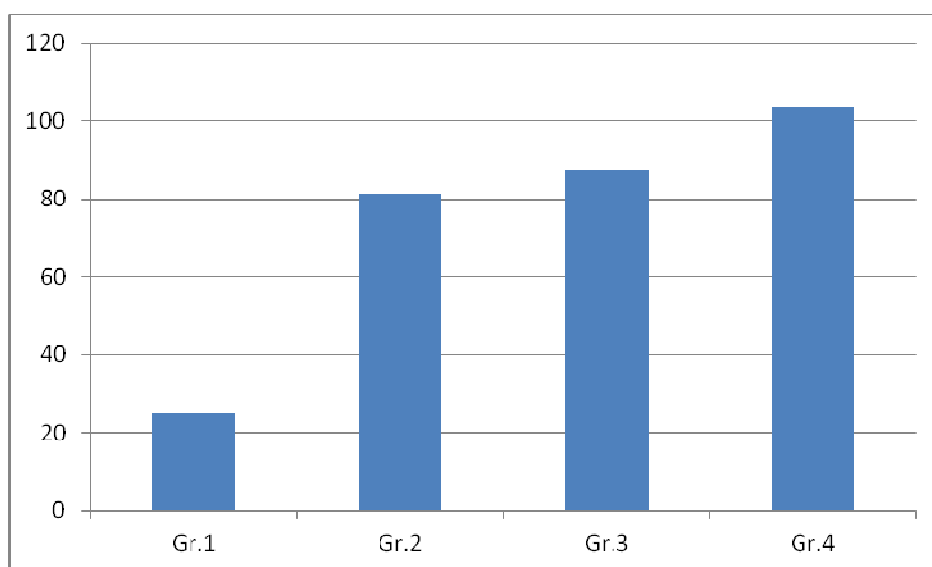


Fig. 4: The dynamic of platelets on the groups with cadmium.



CONCLUSION

Relying on the achieved results through experimental way in birds *Isa brown*, under the effects of cadmium ions on the haematological indicators, we may conclude that cadmium ions have displayed effect on the level of erythrocytes and other haematological parameters linked with erythrocytes and haemoglobin in the blood, but observed effects are not ascertained statistically. Hematocrit level in the bird's blood has oscillations between the control group and experimental groups but differences are not ascertained statistically. Platelets level suffers changes statistically ascertained between the control group and experimental groups and between the second and third group and third and fourth group. This is not ascertained statistically between second and fourth group. Levels of PDW and PCT do not suffer differences statistically ascertained while MPV level suffers differences statistically

ascertained only in comparison between the control group and experimental groups under the activity of cadmium ions.

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