ISSN NO: 2770-0003
Date of Publication: 10-04-2023

# Biochemical aspects of the use of algae Eyxhorniya on the growth and productivity of rabbits to the negative effects of adding of heavy metal salts at different doses

**Z.T.Rajamuradov,**
**M.A.Bakhrillaeva,**
**D.I.Namazova,**
**N.Z.Rajamurodova.**
Samarkand State University named after Sh. Rashidov

**Annotation:** In this article, in a brief review of the literature, the data obtained on the evaluation of the effectiveness of the use of the Eyxhorniya algae supplement ispresented together with information about cases of stunted growth and reduced productivity, which is used as additional nutrients to bring the amount of protein substances lacking in the animal ration to the norm and to remove consumed heavy metals from the body as a result of the negative effects of heavy metal salts in different doses on the organism of agricultural-animals. According to the obtained data, decrement such as the growth and development of the experimental rabbits slowed down, productivity decreased, along with the amount of form elements in the blood and the amount of total protein in the blood serum and its fractions decreased from the normal level due to the negative effect of traditional farm ration, various amounts of cadmium and lead acetate added to it on the metabolic processes in the rabbits' body.

At the same time, the data obtained showed that the moderated metabolic processes in the body of rabbits of group 5 fed with the ration made of Eyxorniya were moderated and concluded accordingly.

**Key words**: salts of heavy metals, cadmium acetate, lead acetate, high Eyxhornia algae, digestibility, productivity, biochemical indicators.

**Introduction**. In modern animal husbandry, the problem of meeting the demand of their organs for nitrogenous substances in the feeding of high-productivity animals remains one of the priority directions.

For this reason, the materials of the experimental studies conducted to solve this problem have been collected and they were obtained under different conditions in different animals. There is information devoted to the study of the effects on all systems of the body and their physiological states as a result of nitrogenous compounds, such as metabolic processes [11.,12].

It is known that the addition of nitrogen-fixing additives in the nutritional ration is one of the factors of practical importance because if the needs of the animal organism are met due to protein supplements, all metabolic processes in their organism will be moderated, the growth and development of animals will be accelerated, the productivity and quality of products will increase, the level of profitability of the farm will be improved, their resistance to various diseases will be strengthened and their role in the production process in the farm would be strengthened.

The blood and other fluids flowing in the animal's body not only describe the animal's physiological condition but also indicate the state of adaptation to the nutritional and climatic factors of the external environment.

Observing the change in various indicators of the blood, in turn, evaluates the composition of the diet consumed in the habitat or conditions that are new to them and adaptation to the effects of the maintenance procedure [1].

Vitamins of group B, plant and animal proteins contained in the food included in the feeding ration, are involved in a number of processes, such as the control of metabolism, which are very important in the growth and development of animals, including rabbits, contraction of muscles, and reactions that increase the activity of the body's protective systems [2]. Research conducted on the effects of introducing targeted atoms of amino acids into the blood of animals revealed that blood plasma proteins are renewed very rapidly compared to those in other tissues. The half-life of albumins is approximately 10 days, while that of

ISSN NO: 2770-0003
Date of Publication: 10-04-2023

globulins is 2 weeks. In addition, the exchange rate of plasma proteins has a positive effect on the amount of proteins entering the body with food [3,4,5].

The concentration of hemoglobin in the blood, the amount of form elements and total protein and protein fractions are affected by the age, sex, live weight, breed, conditions of care and feeding, season of the year and the physiological state of animals.

**The purpose.** The main objective of the study was to evaluate the effects of feeding heavy metal salts at different doses and adding them to the feeding ration separately and combined and the natural addition of Eyxorniya algae to the ration with added salts

**The objectives of the study were to study** the effect of adding Eyxorniya algae as an experimental supplement of heavy metal salts on changes in the amount of erythrocytes and leukocytes in the blood of rabbits, the concentration of haemoglobin, the amount of total protein and its protein fractions in the blood serum, and the productivity of rabbits in the experimental and control groups.

**Research object and methods used**. The experimental part of the experiment was carried out under the conditions of the "Tarnov Sabzavotlari" farm company in the Akdarya district of the Samarkand region, while laboratory analytical work was carried out in the vivarium of the Faculty of Biology of Samarkand State University with the help of modern equipment. Experimental rabbits of the same age, sex, and breed (Hikol-France breed) are analogue rabbits by their live weight, and they were fed from 45 days to 90 days of age. Balance experiments were repeated twice (60th and 90th days). Five of them (1 control and 4 experimental groups) were formed in each of the groups under investigation, and their results were compared. Experimental animals were formed from analogue rabbits, which differed in the composition of the ration, but the uniformity of the nutritional value of the ration was ensured.

The feed rations of the rabbits in the control and experimental groups were formulated in accordance with the feeding standards, and the mixture of nutrients was granulated so that the nutrients in the feed ration with the added amount of combikorma were consumed and the rabbits' bodies could absorb them at a high level. Cadmium and lead are the most toxic heavy metals for humans and animals. These heavy metal salts are considered the most intensive sources that enter the environment, as well as the trash of metallurgical and chemical enterprises, combustion of solid and liquid fuels, pesticides, and industrial and autoemissions. In recent years, the amount of lead and cadmium use has increased, and therefore, as a result of their addition, the content of soil, water and air is increasing in the level of pollution [6].

Their harmful effects are primarily provided by the following:

- Decrease in enzyme activities;
- Formation of chelates and disorders of metabolism;
- Adaptation of cell membranes to changes in activity and permeability;
- Reduction of competitive activities with chemical elements necessary for the life of the organism [7,8].

In addition, these substances are absorbed very easily, and because they remain in the body for a long time, rapid accumulation in a number of organs and tissues is observed. According to the data, the low concentration of cadmium from heavy metals has a negative effect on metabolic processes in the animal body. Cadmium intoxication causes kidney, bone, and lung damage, and cadmium toxicity affects the liver, lungs, reproductive function, and blood formation in animals. [14.17,18].

It is known that the reaction of the animal body to various toxic substances and their concentrations is different and closely related to the species, age, physiological state, gender and nutrition levels of the animals, as well as various other factors. [16,19]. In this regard, we set out to conduct experiments to study the effects of high concentrations of heavy metal salts (including cadmium and lead acetate) brought into the rabbit's body with food on their separate and joint digestive processes and the possibility of accumulation in some tissues and organs.

To prevent and reduce the negative impact of heavy metal salts on animal organisms and product quality, economically convenient and effective means are being developed and put into production. Recently, the cheapest and most promising benthic and algae are being used to balance the amount of digestible protein in animal feeding rations at the standard level, as they contain 70% protein. In addition,

ISSN NO: 2770-0003
Date of Publication: 10-04-2023

algae (Eyxorniya) are used in cleaning polluted water from salts of various heavy metal salts in running water plants and remove salts from their organism by helping to feed them in animal rations [13].

The effectiveness of these substances is primarily explained by the fact that they are stored in the natural complexes of plants as food raw materials, passed through a biological filter and are not foreign to the animal organism.

Scientific production experiments were carried out on the basis of a drawing covering a single methodological approach. The tests were carried out on French Hikol rabbits with a 45-day live weight of 1,090 g. Based on the principle of pair-analogs, 5 groups of analog rabbits with 5 of each were formed. Group 1 is the control group, and their ration consists of the basic farm ration (TraditionalRation) being used in the farm, and its content of the energy nutrition unit and the level of nutritious substances were balanced according to the standards recommended by the Russian Academy of Agricultural Sciences[2].

The mixture of heavy metal salts and the experimental additives were mixed by hand and then mixed with the main concentrate feed, and then granules were prepared and used to feed the rabbits.

Group II - TR + lead acetate is 5 times more than the dose that can be used for feeding rabbits (25 mg/kg).

Group III – TR + cadmium acetate is 5 times more than the dose that can be used for feeding rabbits (0.97 mg/kg).

Group IV- TR + lead acetate (25 mg/kg live weight) + cadmium acetate (0.97 mg/kg).

Group V - TR + lead acetate (25 mg/kg live weight) + cadmium acetate (0.97 mg/kg) + experimental additive (Eyxorniya).

Eyxorniya algae was added to the composition of the experimental supplement at a level of 3% dry matter at natural moisture and was fed. The amount of leukocytes, erythrocytes and hemoglobin in the blood of rabbits of the control and experimental groups, as well as the amounts of total protein and its fractions in the blood serum, were determined on the last day of the balance experiments.

Blood was taken from the ear vein of rabbits for laboratory analysis. Before starting the blood collection procedure, the blood collection surface was rubbed so that some cells in the blood would stop in one place for a certain period of time [11].

The obtained blood samples were immediately brought to the physiology laboratory of the faculty and analysed on the ECL 760 Filly automated Hemostasis analyser. Mathematical processing of the data obtained from the analyser was carried out using Statistica 8.

**Discussion and results**: No differences were observed between the compared groups in terms of their live weight. At the end of the experiment, there were reliable differences in live weight and average daily growth of the control and experimental groups (Table 1).

According to the data presented in Table 1, the daily growth of the rabbits of experimental groups II and III, which consumed only lead and cadmium acetate separately in addition to the farm ration, and experimental group IV, which consumed both salts of heavy metals together, was lower compared to the control group and correspondingly showed that low weight will have up to 7.4, 11.9 and 19.2%. The change in the live weight of the rabbits of experimental group V, fed acetate salts of both heavy metals with Eyxorniya algae arbitrarily, was not significantly different from the control group, and the difference between them was only 1.2% of the control group.

The average growth of one rabbit during 45 days of experiments was 1,710±1,03 kg in the control group, and in experimental groups II, III and IV, it was 1,583±0,8, 1,507±1,13 and 1,381±1,02 kg, respectively.

ISSN NO: 2770-0003
Date of Publication: 10-04-2023

Table 1
Growth during the experimental period of rabbits fed rations containing various doses of heavy metal salts

| Groups | Live weight and growth, kg | | | Daily growth obtained during the experiment, g |
|---|---|---|---|---|
| | At the beginning of the experiment | At the end of the experiment | During the experiment | |
| I-Traditional farm ration (TR) | 1,090±0,1 | 2,800±0,1 | 1.710±1,03 | 38,0±6,09 |
| II-TR+lead acetate (25 mg/kg) | 1,090±0,1 | 2,6730±0,9 | 1.583±0,8* | 35.2±6,13 |
| III-TR+ cadmium acetate (0.97 mg/kg) | 1,091±0,1 | 2,598±1,2* | 1.507±1,13* | 33.5±7.67 |
| IV-TR+cadmium+lead (0.97 mg/kg) + (25 mg/kg). | 1,090±0,08 | 2,471±1,04 | 1.381±1,02* | 30.7±7,69** |
| V-AR-cadmium+lead acetates (0.97 mg/kg) + (25 mg/kg) + experimental additive (Eyxorniya algae) | 1,091±0,13 | 2.837±0,82 | 1.746±0,73* | 38.8±5,25** |

Note * - R ≥ 0.95, ** - R ≥ 0.99

The lowest rate among the groups compared here was observed in rabbits of group IV and averaged 30.7 g per day. This was found to be 19.2% less than in the control group. The observed differences in the overall growth during the above experiment show that the daily growth indicators were different in the cross section of the groups.

We believe that the addition of Eyxorniya algae in feeding as an experimental supplement to rabbits against the background of poisoning with salts of cadmium and lead metals reduced the negative effects of the studied toxins and activated the growth process. Therefore, the total and daily growth of rabbits in the fifth group may be higher compared to the control group and other experimental groups.

The data obtained in Table 2 show the negative effects of high doses of heavy metal salts such as cadmium and lead on the hematological parameters of the blood in rabbits.

Table 2
Biochemical indicators of the blood of experimental rabbits

| Indicators | The norm in blood | Groups | | | | |
|---|---|---|---|---|---|---|
| | | I | II | III | IV | V |
| Hemoglobin, g/l | 96-160 | 112±1,67 | 92,3±1,59 | 95,3±1,71 | 89,5±1,05 | 104,3±1,37 |
| Erythrocytes, $10^{12}$/l | 5,36-7,5 | 5,7±0,35 | 4,6±0,11 | 4,7±1,17 | 4,4±0,9 | 5,3±0,33 |
| Leukocytes $10^{9}$/l | 7,5-10 | 8,1±0,32 | 6,8±0,19 | 7,2±0,28 | 6,6±0,22 | 7,6±0,3 |
| Total protein, g/l | 76-80 г/л | 78,6±1,02 | 71,8±1,17 | 60,6±1,03 | 65,8±1,17 | 78,8±1,3 |
| Albumins,% | 58,3 | 58,8± 0,62 | 51.2±1,02 | 48,0±0,71 | 44,9±1,04 | 54,7±1,24 |
| Globulins,%, | 41,7 | 42,0±0,58 | 33,1±0,37 | 34,6±0,63 | 33,3±0,81 | 38,7±0,58 |
| α-globulins, % | 12,8 | 12,4±0,26 | 9,3±0,13 | 8.3±0,31 | 7,4±0,42 | 13,1±0,37 |
| β-globulins,% | 14,7 | 14,8±0,42 | 9,3±0,27 | 9,6±0,34 | 8,4±0,24 | 10,2±0,7 |
| γ-globulins,% | 14,2 | 14,2±0,37 | 14,5±0,2 | 16,7±0,43 | 17,5±0,56 | 15.4±0,45 |

According to the method used, it was observed that the ration of heavy metal salts in increased doses caused deterioration of the hematological parameters of the blood of experimental rabbits.

ISSN NO: 2770-0003
Date of Publication: 10-04-2023

Therefore, the amount of hemoglobin in the blood of the rabbits in the second, third, fourth and fifth experimental groups was 17.58%, 14.91%, 20.1% and 6.9%, respectively, the amount of erythrocytes was 19.3%, and a 17.54%, 22.8% and 7.1% decrease compared to the control group was observed, while the amount of leukocytes decreased by 16.14%, 12.35%, 18.51% and 6.17%.

Deterioration of hematological indicators of blood indicates a decrease in total protein and albumin content of blood plasma, which may be one of the symptoms of liver injury.

It was clearly observed in the obtained data that the salts of heavy metals added to the ration of rabbits in the doses mentioned above have a negative effect on the biochemical parameters of the blood.

Compared to the blood of rabbits in the control group, total proteins in the blood of rabbits in the second, third, fourth and fifth experimental groups decreased by 10.4%, 12.9%, 16.2% and 6.1%, respectively, and the amount of albumin decreased by 12.9%, 18.3%, 22.2% and 6.9%, respectively. An analogous situation was observed in the fraction of globulins; due to the decrease in the amount of α- and β-globulins, an increase in the amount of the fraction of γ-globulins was observed. In our opinion, we explain that the main reason for the observation of such a situation is excessive consumption of heavy metal salts might belong to the mobilization of the fraction of γ-globulins in the body to prevent injuries and disorders occurring in various organs.

At the same time, it is worth noting that the blood of rabbits in the fourth experimental group, where salts of cadmium and lead were fed together, showed a very rapid decrease in haematological indicators compared to the blood of rabbits in the control group.

Compared to the hematological parameters of the blood of the rabbits of the second, third and fourth experimental groups, the hematological parameters of the blood of the rabbits of the fifth experimental group, which were fed with the experimental supplement with algae (Eyxorniya) mass, were slightly improved, and the amount of albumin was close to the parameters of the rabbits of the control group.

The concentration of calcium and phosphorus macroelements in the blood of rabbits fed with rations containing high doses of cadmium and lead salts was observed as a downwards trend, along with the data by some researchers confirming that the microelement content of the blood serum was also changed.

We acknowledge that in our experiments, the reduction in the living mass of the rabbits in the 2nd, 3rd, and 4th experimental groups was faster than that in the control and experimental groups. The daily growth and development of experimental group V rabbits fed Eyxorniya algae can be similar to or higher than those of control group rabbits, and in our opinion, it ensures the activation of enzymatic processes in the stomach and intestinal system, rapid absorption of nutrients and changes in total proteins and its fractions were also observed in the blood of the rabbits of the 5th experimental group, which naturally consumed whole Eyxorniya algae by the organism. The fact that the amount of blood-forming elements in the blood of other experimental groups was below the standard level indicates that the functional activity of the hemopoietic organs was negatively affected to some extent.

In addition, the blood parameters of the rabbits of the other three experimental groups were reduced compared to those in the blood of the rabbits of experimental group V, which naturally consumed Eyxorniya algae, and the rabbits of control group I, which were fed a conventional farm ration. In our view, heavy metals may have caused a decrease in total protein and its fractions absorbed into the blood due to their negative effect on digestive processes, which in turn led to a decrease in their live mass and productivity.

**Summary**. We have come to the following conclusions from our investigations on the effects of heavy metal salts on the form elements in the blood of rabbits, hemoglobin and total protein in the blood serum and its fractions, as well as preventing other negative effects on the body, studying the effect of Eyxorniya algae. Eyxorniya algae is useful for the body of rabbits, increases the natural resistance of the organism, and directly affects the growth and development of animals by 8%.

**References**

1. The effect of probiotics on the blood parameters of rabbits/N.A.Petrova, K.A.Sidorova, K.S.Esenbaeva [and others]// Vestn. Tyumen. RASA. - Tyumen, 2007. - Issue. 1. – P. 162-163.
2. Norms and diets for feeding agricultural animals/A.P.Kalashnikov, V.I.Fisinin, V.V.Shcheglov [and others]. - M., 2003. - 456 p.

ISSN NO: 2770-0003
Date of Publication: 10-04-2023

3. Topuria, G.M. Clinical state of cattle in the zone of ecological trouble/G.M.Topuria, L.Yu.Topuria//Scientific and practical ways to improve environmental sustainability and socioeconomic support of agricultural production. Materials of the international scientific-practical conference dedicated to the year of ecology in Russia. Compiled by N.A.Shcherbakova, A.P.Seliverstov. - 2017. - P. 1443-1446
4. Titova A.V. Protein-amino acid composition of the blood and the productive qualities of rabbits when fed with probiotic preparations. - Kursk, 2010. -143 p.
5. Simonyan G.A., Khisamutdinov F.F. Veterinary hematology. - M.: Kolos, 1995. - 256 p.
6. Dynamics of interferon status in patients with herpetic keratitis in the treatment of a new interferon inducer Aktipol/S.I.Akberova, F.I.Ershov, P.I.Musaev-Galbinur [and others]// Vestn. ophthalmology. - 2001. - No. 1. - P. 33–36.
7. Fedina, R.G. Influence of ecologically unfavorable regions of Novosibirsk on the regulation and interaction of endocrine-metabolic characteristics/R.G.Fedina// Naukaisocium: materials of the Intern. conf. Novosibirsk: ANO DPO "Siberian Institute of Practical Psychology, Pedagogy and Social Work. - 2019. - P. 86-89.
8. Khvastunova, A.N. Parallel study of the morphology and immunophenotype of normal and pathological lymphocytes using a cell biochip: Abstract of the thesis. … cand. biol. sciences: - Moscow: FBUN TTPFF RAN, 2015. - 130 p.
9. Cherniy, V.I. The role and place of albumin in modern infusion-transfusion therapy/V.I.Cherny// Emergency Medicine. - 2017. - No. 1 (80). – pp. 23-31
10. Lyubin N.A., Konova L.B. Guidelines for the determination and derivation of hemograms in animals. – Ulyanovsk, 2005
11. Shaimardanova, A. Sh. Purification of water from iron ions by modified sorption materials based on leaf litter: Abstract of the thesis. Kazan: KNRTU, 2017. - 18 p.
12. Rybyanova Zh. S. Morphobiochemical features of adaptive processes in the body of calves and cows in a natural-technogenic province. Abstract cand. dissertation, Troitsk-2021.p.20.
13. Turdalieva H.S. "Types of bottom and upper water plants in the Angren "water-wastewater" treatment plant and their use in biological treatment of wastewater" Autoref. Samarkand.-2022-p.20
14. BakhrillaevaM., RazamuradovZ.The Negative Effect of Heavy Metal Salts on the Body of Mammal Animals. Open Journal of Animal Sciences, 2022, 12, 704-711
15. Duzgoren-Aydin, N.S., 2007. Sources and characteristics of lead pollution in the urban environment of Guangzhou. Sci. Total Environ., 385:182-195.
16. Bersényi A 1, S Gy Fekete, Z Szöcs, Erzsébet Berta “Effect of ingested heavy metals (Cd, Pb and Hg) on haematology and serum biochemistry in rabbits” Acta Vet Hung 2003;51(3):297-304. doi: 10.1556/AVet.51.2003.3.5.)
17. Kocak, M. and E. Akc, 2006. The effects of chronic cadmium toxicity on the hemostatic system. Pathophy. Haemo.Thromb., 35: 411-416.)
18. Thompson, J. and J.Bannigan, 2008. Cadmium: Toxic effects on the reproductive system and the embryo. Reproductive Toxicology. April 2008, Pages 304-315
19. Z.T.Rajamuradov, M.A.Bakhrillaeva. The Effect of Cadmium Salt on Osmotic Endurance of Erythrocytes in Rabbit Blood. Bulletin of Pure and Applied Sciences Zoology (Animal Science), Vol.41A, July December 2022: P.227-233