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The Influence of the BioR Remedy Administration on the Prooxidant (oxidant) – Antioxidant System Parameters in Broilers

Vasile MACARI[1], Victor PUTIN[1], Valentin GUDUMAC[2],Valeriu RUDIC[3], Ana MACARI[1], Natalia PAVLICENCO[1]

[1]State University Agrarian of Moldova
[2]Institute of Microbiology and Biotechnologies of Moldova Academy of Sciences
[3]State University of Medicine and Pharmacy „Nicolae Testimitanu"
Str. Mircelti 44, MD- 2049, Chisinau, Republic of Moldova
Email: v. macari@uasm.md

Abstract. The purpose of the research was the complex study of the BioR remedy effects investigation on broilers health and productivity. The tested BioR remedy produced in the Republic of Moldova is obtained through modern technologies from Spirulina platensis. The study was made in production conditions and involved 5 lots of broilers (1 control lot and 4 experimental lots), 30 broilers each. The remedy was administrated twice: on the 9th and on the 21st day of life in different doses to each lot while the broilers from the control lot were injected saline. The main purpose of our research was to highlight the effects of this drug on the prooxidant (oxidant) – antioxidant system markers and in order to evaluate them were studied the values of some bioproductive indices. The study results revealed that the BioR remedy tested on broilers is well tolerated, reduces the intensity of the oxidant stress which shows in the increase of the malon – dialdehide (MDA) level in serum and in the intensification of the antioxidant system and of other biochemical indices that in general are reflected by higher values of the bioproductivity in the lots treated with BioR.

Key words: BioR remedy, Spirulina platensis, broilers, malon-dialdehide (MDA), superoxide-dismutase (SOD), productivity index.

INTRODUCTION

It is well known that in most of the countries including the Republic of Moldova aviculture is the most stable, dynamic and multilateral agro-industrial branch (3, 12, 18, 20). It is obvious that broiler is the practical achievement of nutrition and genetics it being materialized due to the technological and scientific progress from the last decades (4,19,26).

After the ban of antibiotics as growth stimulators in the EU, broiler breeding became a complex and often a hard activity (23). Thus taking all of this in consideration more often the problem of elaborating, testing and using natural, ecologically pure animal growth stimulators harmless both for animals and humans is put into discussion. In the Republic of Moldova of great interest is the BioR remedy obtained from Spirulina platensis that was studied thoroughly on pigs and laboratory animals (8, 13, 16). Taking in consideration these facts we considered appropriate to study the effects of this remedy on some indices of the oxidative stress (OS) and on the antioxidant status in broilers bred in field conditions.

Nowadays in aviculture are proposed and used remedies that increase the bioproductive indices, the nonspecific resistance of the bird organism among which are

probiotics, prebiotics, immunomodulators, enzymes and other bioactive substances. At the same time the studies regarding the determination of the different bioactive substances categories influence on the OS and on the antioxidant status indices in birds are limited. Therefore it is important to study the influence of the BioR remedy on the (prooxidant) oxidant – antioxidant system on birds which actually was the main purpose of this study.

MATERIALS AND METHODS

The study involved 5 lots of 30 nine-day broilers each lot, in the conditions of Avicola Shaver poultry farm located in Bucovat, Republic of Moldova. The principle of organization and realization of this study with the utilization of the BioR remedy is shown in Table 1.

Tab. 1.

Diagram of injection of the BioR remedy to broilers

Broiler lots	Nr.of broilers	Way of adminis-tration	Injection schedule	Dose, ml	
				1 time	2 times
Control	30	i/mus	Two times on the 9th and on the21st day of life	0,4 ml 0,9% sol. NaCl	0,6 ml 0,9% sol. NaCl
Experimental 1	30	i/mus		0,3	0,4
Experimental 2	30	i/mus		0,4	0,6
Experimental 3	30	i/mus		0,5	0,8
Experimental 4	30	i/mus		0,6	1,0

The national product we tested is obtained through biotechnological means from the alga Spirulina platensis (15). This medical drug contains a complex of biologically active substances such as carbohydrates, phycobiliproteins (Phycocyanin C), oligopeptides, amino acids, especially immunoactive amino acids, trace elements, etc.

Veterinary assistance, breeding, food and water nourishment of broilers from all the lots were the same according to the national technology.The broilers subjected to the study during the investigations were permanently examined and for the elucidation of the bioproductive indices were weighed at a period of 7 – 10 days. For the laboratory examination (hematological, biochemical) blood was collected from 5 broilers, on the 9th day of life, before injecting BioR, and on the 41st day of life before slaughter, from 5 broilers from each lot.

The intensity of the lipid peroxidant oxidation (LPO) was evaluated by determining the malon – dialdehide (MDA) and the prooxidant activity (21) while the antioxidant system protection state was appreciated corresponding to the total antioxidant activity (TAA) and to the activity of the superoxide-dismutase (SOD) and catalase (21).

The statistical evaluation of the biochemical indices was realized with the help of the t-Student parameter with a deviation lower than 0,05 ($p< 0,05$).

RESULTS AND DISCUSSIONS

The scientific researches which involved broilers in the conditions of avicola poultry farm located in Bucovat, Republic of Moldova during a period of over 30 days highlighted the

fact that there were no indizerable reactions at the place of administration or adverse reactions of the whole body.

It is important to mention that during the experiment on broilers from all the lots of the study, the broilers from the experimental lots treated with the BioR remedy were less stressed and more calm all of this being confirmed by the birds` observation behavior, including less scratches and also being more calm than the birds from the control lot untreated with BioR. At the same time it was established that the broilers from the experimental lots had glossier feathers indicating a better state of health, at the same time chins and combs were practically identical in all the lots from the experiment during the whole study. The results of the BioR remedy influence evaluation of lipid peroxidation indices and of the antioxidant system at the administration of the drug to broilers are shown in Table 2.

Tab. 2.

The influence of the BioR remedy on the lipid peroxidation indices and on the antioxidant system in blood serum at its administration to broilers

Animal lots (n=5)	MDA, mkmol/l	SOD, u/c	Catalase, mmol/s.l.	The prooxidant activity, mkmol/l	TAA, u/c
At the beginning of the study	28,52± 1,46	1469,96± 138,30	28,35± 5,25	2,59± 0,42	38,56± 4,95
Control	25,08± 0,34	974,76± 51,94*	24,20± 2,87	1,05± 0,12*	28,57± 0,76
Experimental 1	14,72± 2,72*	1104,76± 82,78	24,69± 5,32	1,49± 0,22	27,63± 3,44
Experimental 2	12,84± 1,91*	1119,40± 54,12	18,50± 1,52	1,62± 0,47	22,06± 3,15
Experimental 3	22,16± 2,52	1010,80± 91,77	24,78± 3,12	1,69± 0,37	21,10± 1,75*
Experimental 4	17,36± 2,45*	1252,40± 81,08	23,90± 4,54	1,16± 0,14*	19,76± 1,94*

Note: *p< 0,05 as compared to the control. MDA – malon – dialdehide; SOD – superoxide – dismutase; TAA – total antioxidant activiy

Data shown in table 2 reveal that the basal level of MDA in blood serum in 9 –day broilers, before the administration of the BioR remedy, has a average value of 28,52 ± 1,46 mkmol/l, parameter that is maintaining at a high level and on the 41st day before slaughter, at the same time there is a decrease of the MDA value by 12,1% in the control lot as compared to the value registered at the beginning of the study.

During the investigations at the end of the study was observed a tendency of decrease of the studied parameter in all the experimental lots. Thus the remedy contributed to the lipid peroxidation decrease it being confirmed by lower MDA values, in blood serum in the broilers from the experimental lots, by 11,6% - 48,8% as compared to the reference lot, being registered in the experimental lots 1, 2 and 3significant statistical differences ($p<0,05$). Similar modifications of the lipid peroxidation indices were obtained and in case of SEL – PLEX product testing on broilers (2), in case of the ”Helavit” and ”Amilidan” remedies on dogs and horses (25).

The BioR remedy positive effect on the level of the MDA in blood, parameter which reflects first of all the lipid peroxidation system (LPO), is extremely important and can be

probably explained and by the fact that the LPO processes take place in all cells but the biggest generators of free radicals are white blood corpuscles, platelets and hepatocytes due to the peculiarities of their cellular metabolism (11).

Therefore the decrease of the MDA parameter in blood in broilers treated with the BioR remedy can probably be explained by the white cells values decrease in blood under the influence of this drug, results published by us previously (24) and by the hepatoprotective effects of this product (7, 9, 10, 16).

SOD - enzyme responsible for the superoxide (O_2) free radicals transformation in hydrogen peroxide and molecular oxygen (5, 11) is the first enzymatic AO which has a huge importance for maintaining an adequate antioxidant system (AOS) status becoming one of the main compounds of the cellular protection status in case of oxidative stress.

Thus the results shown in table 2 represent the fact that at the beginning of the study the SOD activity in blood serum is high with a average value of 1469,96 ± 138,30 u/c a phenomenon that can probably be explained by the physiological – metabolic processes from the young poultry body as the consequence of the yolk sac reabsorption. The researches proved that with age the SOD activity in blood in the broilers from all the lots shows a slight tendency of decrease more evident in the control lot by 33,7% as compared to its value at the beginning of the study ($p<0,05$).

At the end of the study the SOD activity increases in blood serum, in all the experimental lots treated with BioR, by 3,7 – 28,5% as compared to the control lot but without obvious statistical differences. Taking in consideration these results the SOD activity can be explained by the presence in the biomass of spirulina of such bioactive substances as phycobiliproteins (Phycocyanin), carotenoids (B-carotene), Vitamin E, unsaturated fatty acids (linolenic **γ**- acid, arachidonic and others), enzymes – superoxide-dismutase, catalase and others (6, 14).

Regarding catalase – enzyme which decomposes H_2O_2 into O_2 and H_2O taking in consideration the results shown in table 2 it did not have significant modifications. Still the activity of this enzyme with age manifests a slight tendency of decrease in all the lots from the experiment.

Another integral parameter which reflects the oxidative stress evolution is the prooxidant activity, values shown in table 2. From the analysis of the data shown in this table it is obvious that the highest value was at 9- day broilers. With age the prooxidant activity in blood serum decreases in all the lots, this decrease being more obvious in the control lot ($p<0,05$). Analyzing the prooxidant activity evolution on the experimental lots there are differences less or more obvious in all the lots. In general there was a decrease of the studied parameter at the end of the study , on the 41st day of life of broilers, by 10,5 – 60,9% as compared to the referance lot also being signelized and a significant statistical difference ($p<0,05$) in the experimental lot 4 (the biggest dose) as compared to the control lot. Also we should mention the fact that in the broilers treated by two inoculation of the BioR remedy with the highest doses (the experimental lot 4), the prooxidant activity was the lowest one. This result is going to be taken in consideration at the optimal dose selection.

The most conclusive AOS barometer, in parallel with other studied parameters of our research is the total antioxidant activity (TAA), its values being represented in table 2. The TAA study on blood serum revealed the fact that its level is the highest at the beginning of the study, parameter that decreases with age in broilers from all the lots, being signelized also obvious statistical differences in the experimental lots 3 and 4 as compared to the values registered at the beginning of the study ($p<0,05$).

Moreover analyzing the TAA level in blood serum at the end of the study we can establish a decrease of this parameter in all broilers treated with BioR by 3,3 – 30,8% as compared to the control lot, being signelized also obvious statistica differences in the experimental lots 3 and 4 as compared to the control lot ($p<0,05$). Thus the TAA level modifications depend on the BioR administraed dose to broilers, higher doses leading to a statistical conclusive decrease of the TAA level. On the other hand the TAA decrease under the influence of the BioR remedy correlates with the lipid peroxidation decrease indices – MDA and with the prooxidant activity. Thus the BioR remedy administration ensures the maintenance of a balance between the antioxidant system and free radicals with prooxidant character this leading to the development of a better natural resistance. This fact is confirmed by us during the study of some biochemical, hematological indices of the broilers treated with the BioR product (17, 24).

Another argument in favour of the good and favourable action of the BioR product on broilers are the results of this product influence on their productive performances. So if the daily average gain in weight during the whole broilers breeding period was 52,15g in the control lot, values that correspond to the standard and technological demands (19, 22), then in the experimental lots treated with BioR this zootechnical parameter was by 4,5 – 15,0 % higher as compared to the reference lot.

Thus we can mention the fact that the BioR remedy use on broilers two times in succesion leads to the improvement of the LPO – AOS indices this reflecting on the intensity of the growth and development of young poultry, reflected in better bioproductive indices.

CONCLUSIONS

- The BioR remedy obtained through modern technologies from Spirulina platensis, tested in poultry farm conditions for approximately 30 days, is well tolerated by young poultry without local or general adverse reactions.
- At the 9-day broilers the parameters of the LPO-AOS system were the highest and the BioR remedy administrated two times in succesion reduced the oxidative stress intensity pointed out by the more obvious decrease of the malon - dialdehide level in serum and by the intensity of the antioxidant system activity.
- The BioR remedy administrated to broilers besides the improvement of the functional state of the LPO – AOS system and of other parameters contributed to a better growth and development of the broilers involved in the study.
- The BioR administration ensures the maintenance of a balance between the antioxidant system and free radicals with prooxidant character that form physiologically, nonspecific or with acceleration in case of the oxidative stress. The maintenance of this balance between the FR prooxidant activity and the level of antioxidants is essential and characterizes the resistance capacity of the organism.

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