

GROWTH AND DEVELOPMENT OF BROILER CHICKENS UNDER THE USE OF THE ADSORBENTS "PRIMIX-ALFASORB" AND THE PROBIOTICS "PRIMIX-BIONORM-K" IN MIXED FODDERS

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Abstract

The research undertaken in order to determine the optimal dose and efficacy of the use of additives "Primix-Alfasorb" and "Primix-Bionorm-K", was conducted on broiler chickens of the meat hybrid COBB-500, in the laboratory of the Department of General Animal Husbandry of the State Agrarian University of Moldova, in the period from 11.18.2011 to 30.12.2011. To conduct the experiment on the basis of analogies, five groups of clinically healthy one day-old chickens of the Cobb 500 hybrid, 21 head each, were formed. The first group served as the control group, and received the basic diet; in the fodder for the second and the third groups, the experimental ones, the enterosorbent "Primix-Alfasorb" was added – 0.2 and 0.4 kg/t respectively; in the fodder for the fourth group the probiotic preparation "Primix-Bionorm-K" in quantities of 0.2 kg/t was added, and the fifth group received both probiotic and the adsorbent in quantities of 0.2 kg/t. In the trial the average live weight of the broiler chickens, which received the supplement "Primix-Alfasorb" in quantities of 0.2 and 0.4 kg per 1 t in EG₁ and EG₂, amounted to 1995.62 g and 2060.10 g respectively, with an average daily gain of 46.37 and 47.89 g, which was higher than in the control group by 2.20 and 5.55%. The supplementation of the fodder for the broiler chickens with the additive "Primix-Bionorm-K" at the level of 0.2 kg/t, increased the live weight of the broiler chickens in the EG₃ by 10.40% ($P \leq 0.01$), the average daily gain by 10.62%, while the cost of the fodder per 1 kg of gain decreased by 7.94% compared with the control group. When both "Primix-Alfasorb" and "Primix-Bionorm-K" were added, the broiler chickens' live weight in the EG₄ in the scientific and economic trial, was of 1967.95 g, which was higher than the same index in the control group by 0.70 %. It was determined, that the optimal rate of enterosorbent "Primix-Alfasorb" input in the diets for broiler chickens was of 0.2 kg/t, and of the "Primix-Bionorm-K" of 0.2 kg/t.

Key words: broiler chicken, productivity, probiotic, adsorbent, fodder additives

INTRODUCTION

In the present conditions of the industrial poultry breeding, the veterinary load on the body of poultry significantly increases under the development of intensive production technologies. Due to the fact, that international organizations prohibit the use of antibiotics in animal husbandry, there emerges the necessity of studying and use of analogues, which do not produce harmful effects on animals and humans.

Nowadays, of all the fodder additives, probiotics are the most important. They are biological preparations, consisting of living organisms or their products of fermentation, with antagonistic activity against pathogenic and unwanted microflora in the animals' intestines [4].

The mechanism of their action is based on the species specificity of bacteria and their composition. There are probiotics composed of one type of bacteria (monoprotiotics), or associations of several strains - "associate probiotics," or "simbiotics", which derives from the word symbiosis, representing either a liquid suspension or dry powder.

It is known that the use of microbial drugs in animal husbandry improves fodder efficiency, accelerates the growth of animals, their productivity, and reduces production costs and the number of cases of illness and death [10, 11, 14, 15, 7, 8, 16].

Currently, probiotic preparations may replace antibiotics in mixed foddors for young poultry, in order to improve digestion, to speed up the adaptation of animals to diets, to increase the

efficiency of fodder use and productivity of animals, and to prevent and treat gastrointestinal diseases.

The new probiotic fodder additive "Primix-Bionorm-K" was produced by Ltd "Ariadne" (Ukraine) on the basis of freeze-dried cells, specially selected for resistance to antibiotics, with a pronounced antagonism to pathogenic microflora - 14 strains of lacto- and bifidobacteria with an activity of 1×10^6 CFU/g contains a prebiotic - fructooligosaccharides, B vitamins, pectin and natural acidifier. The drug has no analogue, as the microorganisms which compound it are protected from the effects of gastric juice and bile acids.

When fodders and other agricultural products were analyzed, a high pollution of microscopic fungi (80-100%) was identified; in the majority of cases (40-60%) they were toxigenic [5].

Studies show, that animal husbandry supports serious economic losses, because of the reduced productivity and the reproduction of farm animals, arising from mycotoxicosis [2].

Nowadays, more than three hundred mycotoxins are known, and most of them have toxic effects on animals and poultry. Because of their accumulation, mycotoxins gradually destroy the animals and poultry's immune system. This effect is specific to almost all mycotoxins, but its detection is practically impossible without the use of special methods.

Due to the fact, that it is practically impossible to completely prevent the contamination of fodders with microscopic fungi and mycotoxins, a promising way of the improvement of the usefulness of animal fodders is the addition of drugs with adsorbent action to the fodders [13].

Adsorbents are among the drugs that contaminate the mycotoxins and eliminate their waste products, preventing their deleterious effects on the body. Chelators a new generation of drugs for the prevention and treatment of mikotoksycosis, with sorption and detoxifying properties, are based on the principle of complete binding and removal of mycotoxin by the instrumentality of complex components that have different mechanisms of action, and are directed against different groups of toxins.

The enterosorbent "Primix-Alfasorb" has sorption properties, it is a fodder additive

(manufactured at the Ltd "Ariadne", Ukraine) which contains cellulose, hemicelluloses, lignin and pectin, and has a high activity. It is a complex of activated biopolymers, which has been deeply processed and activated.

Since lignin is a natural polymer having an irregular structure, being covalently bound to cellulose and hemicellulose, it forms the cell walls of plants. The greatest amount of lignin is found in the stems of grasses and grain surface membranes, especially buckwheat [3].

Probiotics "Monosporin" and "Batsell" are also used to reduce the harmful effects of mycotoxins, to prevent and treat infectious diseases in poultry, as well as to improve the nutritional value of fodders [17].

According to [9], the addition of probiotic Subtilis MK to the mixed fodder increased the safekeeping of chicken stock by 7.6% and the live weight by 1%.

At the same time, in the literature there are practically no data on the use of drugs of sorption nature in combination with probiotic complexes, in order to improve the implementation of the biological resources of broiler chickens. Such a complex application would contribute to the reduction of the acid-binding ability of fodders, to their disposal of mycotoxins, to the improvement of gastrointestinal microflora, and, consequently, to the reduction of the toxicological load on the body, improving safekeeping, poultry productivity, as well as the quality and ecological purity of the production.

MATERIAL AND METHOD

The scientific research into the determination of the optimal dose and efficacy of the use of additives "Primix-Alfasorb" and "Primix-Bionorm-K" were conducted using broiler chickens of the meat cross COBB-500 in the laboratory of the department of General Animal Husbandry of the Agrarian State University of Moldova, in the period from 18.11.2011 to 30.12.2011. For the trial on the basis of analogues (by the method of [1]) five groups of one day-old chickens, twenty-one head each, were formed (Table 1).

Table 1. Scheme of the trial on broiler chickens

Group	Number of heads	Feeding properties
CG	21	Main mixed fodder (MF)
EG ₁	21	MF + 0.2 kg/t Primix-Alfasorb
EG ₂	21	MF + 0.4 kg/t Primix-Alfasorb
EG ₃	21	MF + 0.2 kg/t Primix-Bionorm-K
EG ₄	21	MF + 0.2 kg/t Primix-Bionorm-K + 0.2 kg/t Primix-Alfasorb

The chickens in the control group received the basic diet; the broilers in the experimental groups received the probiotic or enterosorbent in addition to the basis diet. The feeding was carried out using complete and balanced mixed fodders, in accordance with the accepted feeding standards [6].

For the chickens in the control and experimental groups the same conditions of keeping were created, in accordance with zootechnical requirements.

Throughout the entire trial the poultry were weighed individually every week. A daily record of the consumed fodder was made.

The obtained data were statistically processed [12].

RESULTS AND DISCUSSIONS

During the trial on the determination of the effectiveness of the influence of the adsorbent "Primix-Alfasorb" and probiotic "Primix-Bionorm-K" on the productive quality of broilers, and the identification of the optimal dose of supplementation, the fodders recommended for Cobb-500 cross were used, depending on the age of chickens, and that were balanced in all nutrients (Table 2).

Table 2. Nutritional value of the mixed fodders

Indices	Starter	Growth	Finisher
Fattening period in days	0 - 10	11 - 22	23 - 42
Energy, Kcal/kg	2988	3083	3176
Crude protein, %	21.00	19.00	18.00
Lysine, %	1.20	1.10	1.05
Digestible lysine, %	1.08	0.99	0.95
Methionin, %	0.46	0.44	0.43
Digestible methionin, %	0.41	0.40	0.39
Methionine + cystine, %	0.89	0.84	0.82
Methionine + digestible cystine, %	0.80	0.75	0.74
Tryptofan, %	0.20	0.19	0.19
Treonin, %	0.79	0.74	0.72
Arginin, %	1.26	1.17	1.13
Calcium, %	1.00	0.96	0.90
Digestible phosphorus, %	0.50	0.48	0.45
Sodium, %	0.20	0.17	0.16
Chlorine, %	0.20	0.20	0.20
Linoleic acid, %	1.25	1.25	1.00

According to the results of weekly control weighing, it was found out that the used drugs had an effect on the productive qualities of the broiler chickens.

The indices of the dynamics of live weight showed a positive effect of the adsorbent "Primix-Alfasorb" and the probiotic preparation "Primix-Bionorm-K" on the growth of broiler chickens (Table 3, fig. 1).



Photo 1. Keeping of broiler chickens in the trial



Photo 2. Individual weighing

Table 3. Dynamics of the live weight of broiler chickens in the scientific and economic trial

Groups	The live weight of broiler chickens, g						
	at the beginning of the trial	7 days	14 days	21 days	28 days	35 days	at the end of the trial
CG	48.62±0.800	111.29 ± 3.993	304.95 ± 12.369	612.38 ± 16.487	1055.95 ± 25.639	1434.00 ± 31.410	1954.24 ± 46.842
EG ₁	48.05±0.927	121.52 ± 3.907	317.71 ± 17.047	641.38 ± 24.824	1051.57 ± 35.982	1448.62 ± 46.712	1995.62 ± 57.034
EG ₂	48.81±0.764	131.24 ± 3.632	331.24 ± 12.525	637.43 ± 19.536	1024.05 ± 35.701	1503.91 ± 47.739	2060.10 ± 60.210
EG ₃	49.48±1.018	130.33 ± 3.704	326.57 ± 10.695	647.38 ± 12.382	1123.05 ± 20.713	1582.62 ± 34.565	2157.52 ± 34.263
EG ₄	48.76±0.532	115.95 ± 2.662	298.24 ± 9.486	587.71 ± 13.532	998.52 ± 19.760	1460.67 ± 30.779	1967.95 ± 33.686

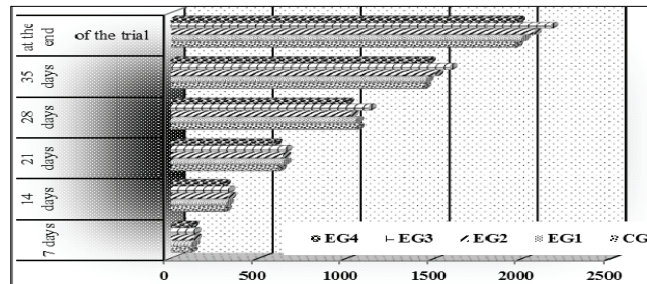


Fig.1. The live weight of broiler chickens by periods of growth

When the investigational adsorbent was added to the mixed fodder for the chickens in the experimental groups (EG₁ and EG₂), an increase in the live weight of chickens was observed, in comparison with the control group, respectively by 41.38 and 105.86 g. The highest rate of growth was in the poultry in the experimental group EG₂, whose mixed fodder was supplemented with the adsorbent "Primix-Alfasorb" at the level of 0.4 kg/t. The chickens in this group surpassed the chickens in the control group concerning the increase of live weight by 5.42%. The chickens in the group EG₃, which received the probiotic "Primix

Bionorm-K" at the level of 0.2 kg/t surpassed their analogues in the control group concerning the average daily gain on the 7, 14, 21, 28, 35 and 42-th day, respectively by 19.98, 1.33, 4.35, 7.24, 21.56 and 10.51%, and at the end of the growth period the indices on live weight in this group were higher compared with the control group by 10.4%. When the preparations of probiotic and adsorbent were used together (EG₄), no significant changes in the dynamics of live weight of chickens in the trial were observed, and the daily gain of broilers on the 14, 21 and 28-th days was lower in comparison with the analogues in other experimental

groups, as well as in comparison with the control group, and the differences were, respectively, by 5.88, 5.84, and 7.39% (Table 4,

fig. 2). During the whole trial, the daily gain of chickens in this group was slightly higher compared with the control group (0.71%).

Table 4. The dynamics of the absolute and average daily weight gain chickens - broilers in the trial

Groups Data	The average live weight gain						the whole for the experience	
	25.11.2011	02.12.2011	09.12.2011	16.12.2011	23.12.2011	30.12.2011	absolute	average daily live weight gain
	average daily live weight gain							
CG	9.571	27.667	43.918	63.367	54.007	74.320	1905.619	45.372
EG ₁	11.204	28.027	46.238	58.599	56.721	78.143	1947.571	46.371
EG ₂	11.306	28.571	43.741	55.231	68.551	79.456	2011.286	47.888
EG ₃	11.483	28.034	45.830	67.952	65.653	82.129	2108.048	50.192
EG ₄	10.082	26.041	41.354	58.687	66.020	72.469	1919.190	45.695

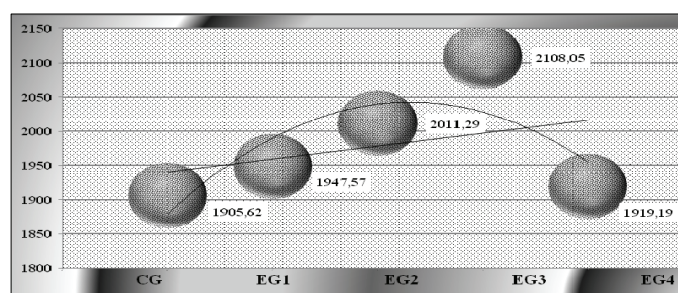


Fig.2. The dynamics of the absolute weight gain per one chicken during the trial, g

The supplementation of the mixed fodder for broiler chickens with the drugs "Primix-Alfasorb" and "Primix-Bionorm-K" within 42 days, contributed to the decrease of their fodder consumption (Table 5, fig. 3), at the same time

the fodder consumption per 1 kg of live weight gain of the experimental chickens was lower, because they used the foddors more effectively in comparison with the control group (Table 6).

Table 5. Fodder consumption by broiler chickens in the trial, g

Weeks	Groups				
	CG	EG ₁	EG ₂	EG ₃	EG ₄
1	4045	4103	3671	3725	3276
2	10073	9458	9953	10762	8416
3	11850	11099	10304	11138	11299
4	13710	13489	13873	13597	11987
5	17003	17218	18332	18046	17608
6	20480	21737	21446	21316	21605
During the trial, g	77161.000	77104.000	77579.000	78584.000	74191.000
During the trial, %	100.00	99.93	100.54	101.84	96.15
Difference, %	100.00	-0.07	+0.54	+1.84	-3.84

Table 6. Fodder consumption per 1 kg of weight gain of chickens in the trial

Indices	Groups				
	CG	EG ₁	EG ₂	EG ₃	EG ₄
Increase in body weight during the trial, g	1905.62	1947.57	2011.29	2108.05	1919.19
Fodder consumption per 1 kg of weight gain, kg	1.93	1.89	1.84	1.78	1.84
The difference in fodder consumption for weight gain, kg	-	-0.04	-0.09	-0.15	-0.09
Fodder consumption for weight gain, %	100	97.93	95.34	92.23	95.34

The best results on fodder conversion were observed in EG₃, which received Primix-Bionorm-K" at the level of 0.2 kg/t.

Cost-effectiveness of the use of the adsorbent "Primix-Alfasorb" at the level of 0.4 kg/t (EG₂), and the probiotic preparation "Primix-

Bionorm-K" at the level of 0.2 kg/t (EG₃) in the mixed foddors for broiler chickens per group compared with the control group during the

trial was 3.04 and 5.11 dollars respectively (Table 7, fig. 4).

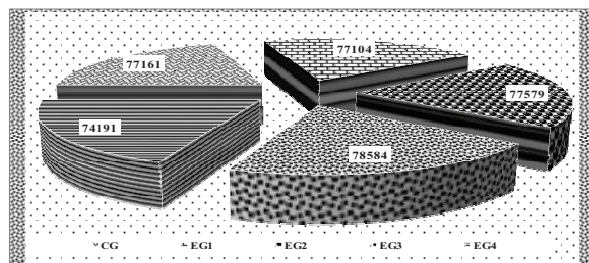


Fig.3. Fodder consumption by broiler chickens by growth periods, g

Table 7. Cost-effectiveness of the use of additives in the mixed foddors for broiler chickens

Indices	Groups				
	CG	EG ₁	EG ₂	EG ₃	EG ₄
Absolute weight gain per one chicken during the trial, g	1905.62	1947.57	2011.29	2108.05	1919.19
Absolute weight gain of the group during the trial, kg	40.02	40.90	42.24	44.27	40.30
Selling price of 1 kg of live weight of broiler chickens, dollars	1.75				
Fodder consumption per group during the entire period, kg	77.16	77.10	77.58	78.58	74.19
The price of 1 kg of fodder (on average), dollars	0.62				
The cost of the mixed fodder consumed in the trial, dollars	47.84	47.80	48.10	48.72	46.00
The quantity of the preparation consumed in the trial, kg	-	0.015	0.031	0.016	0.015/0.015
Price of the preparation used in the trial, dollars	-	18.75		90.00	18.75/90.00
Nominal income per group during the trial, dollars	22.20	23.50	25.24	27.31	22.90
The difference in the conditional income per group compared with the control group during the trial, dollars	-	1.30	3.04	5.11	0.70

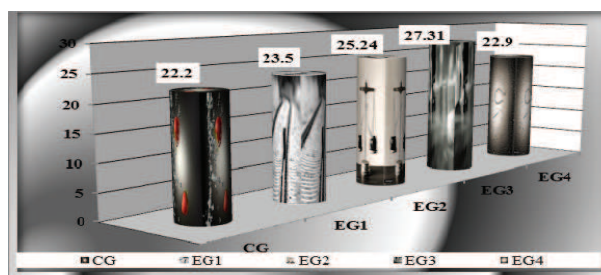


Fig.4. Nominal income per group during the trial, dollars

CONCLUSIONS

- In the scientific and economic trial the average live weight of broiler chickens in EG₁ and EG₂, which received the additive "Primix-Afasorb" in an amount of 0.2 and 0.4 kg per 1t, was respectively of 1995.62 and 2060.10 g, with the average daily gain of 46.37 and 47.89 g, which was higher than in the control group by 2.20 and 5.55%.
- The fodder consumption per 1 kg of live weight gain of broilers in the scientific and

economic trial, when using foddors containing "Primix-Afasorb" in an amount of 0.2 and 0.4 kg/t, was of 1.89 and 1.84 kg vs. 1.93 kg in the control group.

- In the scientific and economic trial it was established that the optimal input rate of the enterosorbent "Primix-Afasorb" into the diets for broiler chickens was of 0.2 kg per 1 ton of fodder.

- The supplementation of the fodder for broiler chickens with the additives "Primix-Bionorm-K" at the level of 0.2 kg/t increased the live

weight of broiler chickens by 10.40%, the average daily gain by 10.62% ($P \leq 0.01$), while reducing the fodder consumption per one kg of growth by 7.94% compared with the control group.

- When both "Primix-Alfasorb" and "Primix Bionorm-K" were added (in the quantity of, respectively, 0.2 kg per 1 ton), the average live weight of broiler chickens in EG₄ was of 1967.95 g, which was higher than the same index in the control group by 0.70%.

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REFERENCES

- [1] Alexandrov V.A. et. al., 1988. *Guidelines for the conduct of scientific study researches poultry*. - Moscow, 12 p.
- [2] Dorozhkin V., 2007. *Prevention of mycotoxicoses of animals. First Congress of Veterinary Pharmacology Russia*. Voronezh 21-23 June, 699 p.
- [3] Dudkin M.S., 1988. *Dietary fiber*. Kiev: Vintage, 150 p.
- [4] Gerasimenko V. V., 2005. *Morphogenetic effect of the microflora of the gastrointestinal tract on the body of geese*. Bulletin of OSU. Number 2, p. 133-137.
- [5] Ivanov A.B., 2008. *Mycotoxicoses of animals (etiology, diagnosis, treatment, prevention)*. Moscow: Kolos. - 140 p.
- [6] Kalashnikov A.P., 2003. *Norms and animal feeding rations: A Reference Guide*. M.: - 456 p.
- [7] Kvasnikov E. I., Shmilevskaya T. N., Kovalenko N., 1983. *Antagonistic activity of lactic acid bacteria in relation to the causative agent of enteric disease in poultry*. Microbiological magazine. Number 5, p.27-32.
- [8] Kvasnikov E. I., Nesterenko O. A., 1990. *Lactic acid bacteria and methods of their use*. Science Publishing House, Moscow, 389 p.
- [9] Kryukov O., 2006. *Spore-forming probiotic in broilers breeding. Mixed foddrs: production and use*. Number 1, p. 57.
- [10] Nozdrin, G. A. et al., 2005. *The scientific basis of the use of probiotics in poultry breeding*. Novosibirsk. State Agrarian University, 224 p.
- [11] Panin A. N., Malik N. I., 2006. *Probiotics – an integral component of the rational feeding of animals*. Veterinary Medicine. Number 7.
- [12] Plohinsky N.A., 1970. *Biometria*. - Moscow: MGU, 367 p.
- [13] Schrickx J.A., Yuri Lektarau, J. Fink-Gremmels, 2006. *Ochratoxin A secretion by ATP-dependent membrane transporters in Caco-2 cells*. Archives of Toxicology 80: p. 243-249.
- [14] Shevchenko A. I., 2003. *Therapeutic efficacy of the utilization of Vetom 1.1 for broiler of the cross "Smena 2"*. Abstract of thesis. Troitsk, 18 p.
- [15] Shevchenko A. I., 2001. *The effect of Vetom 1.1 on growth and preservation of broiler chickens. Breeding, veterinary medicine, genetics and ecology: Proceedings of the 1st Int. researcher. conference*. Novosibirsk. p. 83.
- [16] Tarakanov B. V., Gerasimenko V., 2007. *Laktomikrotsikol in geese breeding*. Poultry. Number 8. p. 28.
- [17] Trufanov O., 2008. *Probiotics "Monosporin" and "Batsell" in poultry mycotoxicosis*. Poultry. Number 2. p. 24-25.