

Effect of feeding probiotic and vitamin U on poultry egg production

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Abstract

The aim of the research was to find out the effect of the addition of Cellobacterin-T and vitamin U in the formulation of compound feed for laying hens on their egg productivity. The objects of research were laying hens of the cross «KOB-500». The duration of this experiment was 10 months. It was found that a more favorable effect on the indicators of egg productivity in the experimental poultry was exerted by joint additions to the mixed feed of the enzyme probiotic and vitamin U. Taking this into account, the layers of the 3 experimental group versus the analogs in the control group had higher egg production values per average layer, the egg-laying rate, the weight of one egg, the yield of egg mass with a decrease in the consumption of compound feed for the production of 10 pieces. eggs. With the combined introduction of an enzymatic probiotic and vitamin U into the compound feed formulation, an improvement in the biochemical composition of the laid eggs was noted in the 3rd experimental group of layers. In them, relative to the control analogs, this superiority was manifested in an increase in the egg yolk of the dry matter concentration, protein; in egg white – the concentration of dry matter and the actual protein. The layers of the 3 experimental group versus the analogs in the control group had higher indices of the shape index by 1,67%, the number of incubated eggs – by 26.40 pcs., fertilized eggs – by 2562 pcs. and hatched chickens – by 25.1 heads.

Key words: chickens; enzymes; vitamin U; egg productivity; physicochemical properties; incubation qualities of eggs

Introduction

Egg production serves as an important indicator of the influence of feeding factors on the productive characteristics of a bird, its physiological state and the functional activity of the reproductive organs. The intensity of laying hens' egg production is due to the time period required for egg formation in the ovaries of female poultry. The longer the period of time it takes for the hen to form an egg, the lower the number of eggs will be laid in that particular period. This process is significantly influenced by the nutritional value of the parent flock, including the rational use of biologically active drugs in the diet of laying hens (Kokaeva et al., 2008; Temiraev et al., 2012; Tedtova et al., 2017; Baeva et al., 2008).

To improve metabolism and optimize the conversion of nutrients into egg products when organizing full-fledged feeding for parental flocks of poultry, feed additives from biologically active compounds have been effectively used in recent decades. New generation drugs have appeared, which in their composition have a combination of the properties of two biologically active additives. For example, there are preparations that rationally combine multi-enzyme complexes and probiotics, including living representatives of beneficial microorganisms. Due to the complementary action, these components of the enzyme probiotics enrich the composition of the beneficial microflora of the gastrointestinal tract (GIT), increasing the egg productivity of layers. The specified list of enzymatic probiotics includes the drug Cellobacterin-T, which has unique nutritional properties and synergistic action with other biologically active additives (BAA) (Temiraev et al., 2015; Tsalieva et al., 2017; Temiraev et al., 2017; Yuldashbaev et al., 2020; Stolbovskaya et al., 2013).

It is effective to combine vitamin U (S-methylmethionine) with enzyme preparations in poultry diets. It is necessary for the bird's body to prevent peptic ulcer disease in various parts of the gastrointestinal tract. Vitamin U contributes to the restoration of gastric acidity and the healing of the mucous surface of the glandular stomach. In addition, this drug is able to neutralize various toxic substances in the body. With this in mind, vitamin U is used as a powerful antihistamine (Temiraev et al., 2012; Baeva et al., 2009; Temiraev et al., 2017; Kokaeva et al., 2017; Tedtova et al., 2020; Temiraev et al., 2009).

Taking into account the above, the aim of the research was to find out the effect of the addition of Cellobacterin-T and vitamin U in the formulation of compound feed for laying hens on their egg productivity.

Material and methods

The research and production experiment was carried out in the conditions of the poultry farm of OOO Iraf-Agro, North Ossetia-Alania (Longitude: 44° 40'04 " East, Latitude: 43° 02'12 "North. Altitude: 671 m). The objects of research were laying hens of the cross "KOB-500". The duration of this experiment was 10 months. At the same time, 4 groups of laying hens, 90 heads in each, were formed from replacement young animals aged 22-23 weeks, according to the principle of analogous groups, which were fed with complete feed according to the «Recommendations for feeding poultry» (2003), in accordance with the scheme presented in table 1.

The company "BIOTROF" (Russia) produces the drug Cellobacterin-T, which is a complex of cellulolytic bacteria and combines the functions of two feed additives - a feed enzyme and a probiotic. The drug allows you to increase the digestibility of cereals, sunflower meal and bran, optimizes the gastrointestinal microflora by suppressing opportunistic and stimulating the growth of beneficial microorganisms, and significantly reduces the cost of medicines (including antibiotics). It contains a live culture of *Bacillus subtilis* bacteria and filler (sunflower meal or wheat bran).

During the experiment, poultry egg production was recorded by daily collection of laid eggs in the morning and evening. Changes in the weight of eggs were monitored by weighing 30 eggs from each group of hens. The study involved the physico-biochemical characteristics of the laid eggs with the establishment of the level of dry matter, protein and fat in them. The incubation properties were studied by carrying out three sets of 100 eggs from chickens of each group with a preliminary ovoscopy.

In the compound feed (Table 2) of repair young stocks according to the PK-6 recipe. Cellobacterin-T and vitamin U were introduced into the composition of dry full-feed compound feeds of the experimental bird in a three-stage way using standard dispensers, due to which they were more evenly mixed with other ingredients.

The obtained research data were subjected to mathematical processing with the calculation of the Student's criterion.

Table 1. Scheme of scientific and economic experience

Group	Birds, heads	Features of birds feeding in the compared groups
Control	90	Basic ration (BR) - standard compound feed
I	90	BR + Cellobacterin-T preparation at the rate of 1 kg / ton of feed
II	90	BR + preparation of vitamin U at the rate of 150 g / t feed.
III	90	BR + Cellobacterin-T preparation at the rate of 1 kg / t feed + vitamin U preparation at the rate of 150 g / t feed

Table 2 - The Composition and nutritional value of full feed poultry

Indicators	Repair young	Laying hens
	Age, weeks	Age, weeks
	1-23	23-52
Composition, %:	-	-
Corn	31.5	28.7
Barley	25.7	25.0
Soybean meal	20.0	18.3
Dry corn gluten	4.2	3.9
Hydrolysis yeast	4.5	4.3
Fish flour	5.3	4.4
Herbal flour	4.1	5.1
Feather flour	2.5	2.0
Chalk feed	1.0	6.8
Common salt	0.4	0.5
Premix P - I - I - 89	1.0	1.0
100 g of feed contained:		
exchange energy, MJ	1.093	1.115
crude protein, g	15.29	14.12
crude fat, g	2.58	2.88
crude fiber, g	5.07	4.46
calcium, g	1.15	2.70
phosphorus, g	0.75	0.76
sodium, g	0.24	0.30
lysine, g	0.65	0.75
methionine + cystine, g	0.47	0.45
linoleic acid, g	1.14	1.23
aflatoxin B1, mg / kg	0.24	0.24
For 1 t of feed is added:		
lysine, r	680	430
methionine r	440	310

Results and discussion

In the course of the experiment, we studied the effect of the used feed preparations on the indicators of egg productivity (per average laying hen) and payment for feed with products in the experimental bird (Table 3).

It was found that a more favorable effect on the indicators of egg productivity in the experimental poultry was exerted by joint additions to the mixed feed of the enzyme probiotic and vitamin U. Taking this into account, the layers of the 3 experimental group versus the analogs in the control group had higher egg production values per average layer by 23.7 pcs. or by 11.3% ($P>0.95$), the egg-laying rate (for 10 months of the experiment) – by 7.87%, the weight of one egg – by 1.46 g or 2.42% ($P>0.95$), the yield of egg mass – by 1.77 kg or by 13.96% with a decrease in the consumption of compound feed for the production of 10 pieces. eggs – by 10.14%.

In the course of the experiment, the best indicators of egg productivity were provided by joint additions to the mixed feed probiotic bifidumbacterin and a mixture of enzyme preparations celoviridin G20x and protosubtilin GZx in chickens of the 4th experimental group, which outstripped in egg production by 11.7 pieces of eggs ($P<0.05$) and intensity by 3.83% of control analogues (Baeva, et al., 2008; Kokaeva et al., 2017).

The influence of biologically active drugs on the indicators of the chemical composition of chicken eggs during the experiment is presented in table 4.

As can be seen from the data in Table 4, with the combined introduction of an enzymatic probiotic and vitamin U into the compound feed formulation, an improvement in the biochemical composition of the laid eggs was noted in the 3rd experimental group of layers. In them, relative to the control analogs, this superiority was manifested in an increase in the egg yolk of the dry matter concentration by 1.32% ($P>0.95$), protein – by 1.32% ($P>0.95$); in egg white – the concentration of dry matter – by 1.53% ($P>0.95$) and the actual protein – by 1.13% ($P>0.95$). In addition, the shells of eggs from hens of the 3rd experimental group contained more calcium by 0.57% ($P>0.95$) than in the control. This gives them higher indicators of the strength of the eggshell from layers of the 3rd experimental group.

Joint supplements of vitamin C and the probiotic bifidumbacterin contributed to an increase in the content of actual protein in the yolk and white of eggs of hens from the 5th experimental group during all periods of laying, which had the most noticeable advantage over the control group in these parameters at the age of 250 days – by 8.8 and 13.0 %, at the age of 350 – days by 6.3 and 12.9%, and at the age of 450 days – by 8.4 and 17.6% (Temiraev et al., 2012; Stolbovskaya et al., 2013).

A more favorable effect on the nutritional value of the eggs laid by the experimental poultry was exerted by joint additions of the enzyme probiotic and vitamin U to the compound feed. Taking this into account, the yolks of the eggs laid by hens of the 3rd experimental group versus the analogs in the control group were richer in the presence of carotenoids - by 17.90% ($P>0.95$), vitamin A – by 16.99% ($P>0.95$) and vitamin E – by 11.80% ($P>0.95$).

Subsequently, we assessed the effect of the used BAA preparations on the morphological and incubation qualities of the eggs laid by the experimental bird (Table 5).

It was found that a more favorable effect on the morphological and incubation properties of the eggs of the experimental poultry was exerted by joint additives of the enzyme probiotic and vitamin U in the compound feed. Taking this into account, the layers of the 3 experimental group versus the analogs in the control group had higher indices of the shape index by 1.67% ($P>0.95$), the number of incubated eggs - by 26.40 pcs. ($P>0.95$), fertilized eggs - by 25.2 pcs. ($P>0.95$) and hatched chickens - by 25.1 heads ($P>0.95$).

The use of antioxidants in conjunction with a probiotic activated the function of egg formation, which, against the control analogs in layers of the 4th experimental group, was expressed in improving the incubation qualities of eggs by increasing the yield of fertilized eggs by 4.7% and increasing the hatching of chickens from laid eggs by 7.6% (Tedtova et al., 2020; Temiraev et al., 2017).

Conclusion Therefore, in order to increase egg productivity, physicochemical and incubation characteristics of the eggs produced, the diets of laying hens of corn-sorghum-sunflower type should include the enzymatic probiotic Cellobacterin-T at the rate of 1 kg / ton of feed and vitamin U at the rate of 150 g / ton. stern.

Table 3 – Egg productivity of chickens on average per group per 1 head

Group	Number of eggs per medium hen, pcs.	Egg-laying rate, %	Egg Weight g	Egg mass received		Feed consumption per 10 pcs. eggs, kg
				kg	%	
Control	210.2±1.34	70.10	60.34±0.22	12.68	100.00	2.02
I	224.6±1.45*	74.87	61.56±0.19*	13.83	109.07	1.87
II	225.4±1.33*	75.13	61.62±0.25*	13.89	109.54	1.86
III	233.9±1.29*	77.97	61.80±0.31*	14.45	113.96	1.80

* $P>0.95$

Table 4 – Biochemical composition of chicken eggs on average for the group of layers, %

Index	Group			
	control	1 experienced	2 experienced	3 experienced
Content in the yolk:				
dry matter	51.05±0.20	52.06±0.23*	52.11±0.30*	52.37±0.19*
squirrel	17.46±0.17	18.37±0.14*	18.40±0.09*	18.78±0.10*
fat	32.53±0.14	32.51±0.15	32.60±0.20	32.54±0.13
Carotenoids, µg / g	12.14±0.18	14.00±0.22*	14.07±0.27*	14.32±0.32*
Vitamin A, µg / g	58.26±0.40	65.76±0.45*	65.82±0.48*	68.16±0.41*
Vitamin E, mg / 100 g	18.22±0.13	19.77±0.27*	19.81±0.30*	20.37±0.33*
Protein content:				
dry matter	10.45±0.03	11.52±0.05*	11.60±0.07*	11.98±0.05*
the squirrel itself	8.84±0.05	9.56±0.05*	9.61±0.05*	9.97±0.06*
Inshell content:				
ash	94.08±0.20	95.04±0.10*	95.08±0.20*	95.35±0.15*
calcium	18.37±0.14	19.42±0.08*	19.46±0.11*	19.96±0.16*
phosphorus	0.043±0.001	0.052±0.004	0.053±0.003	0.057±0.005

* $P>0.95$

Table 5 – Morphological and incubation properties of laying hens eggs during the experiment

Index	Group			
	control	I	II	III
Eggs laid, pcs.	210.2±1.34	224.6±1.45*	225.4±1.33*	233.9±1.29*
Weight of 1 egg, g	60.34±0.22	61.56±0.19*	61.62±0.25*	61.80±0.31*
Shape index, %	72.85±0.31	73.96±0.19*	74.05±0.30*	74.52±0.26*
Incubated eggs, pcs.	199.9±0.67	215.7±0.55*	216.5±0.51*	226.3±0.63*
% of hatching eggs	95.11±0.22	96.02±0.17*	96.05±0.23*	96.75±0.29*
Fertilized eggs, pcs.	185.9±0.30	201.0±0.37*	201.8±0.33*	211.1±0.45*
% fertilized	88.44±0.15	89.50±0.32*	89.55±0.22*	90.24±0.30*
Chickens hatched, head.	164.3±0.43	180.7±0.40*	181.4±0.47*	189.4±0.43*
% of pledged	78.18±0.20	80.45±0.23*	80.50±0.28*	80.99±0.30*

* $P>0.95$

References

- 1) Baeva, A.A., Stolbovskaya, A.A., Kokaeva, M.G., Dzidzoeva, Z.G., Gusova, Yu.S., Leontiev, O.Yu., Kibizov, G.K. 2008. The use of biologically active additives in feeding broiler chickens. Proceedings of the Kuban State Agrarian University. Krasnodar. 4 (13):179-182.
- 2) Baeva, A.A., Ibragimova, Z.R., Kokaeva, M.G., Abaeva, S.K. 2009. Biological resources for the production of environmentally friendly broiler meat. Collection of scientific papers based on the materials of the international scientific and practical conference "Innovative ways of developing animal husbandry." – Stavropol. Pp 207-208.
- 3) Kokaeva, M.G. 2008. Increasing the nutritional value of broiler meat. Materials of the XII All-Russian Scientific and Practical Conference "Agro-industrial complex and topical problems of the regional economy". - Maykop. pp. 200-201.
- 4) Kokaeva, M.G., Temiraev, R.B., Beslaneev, E.V., Cheresova, S.K., Kubatieva (Gutieva), Z.A. and Kozyrev, S.G. 2017. Influence of antioxidant and adsorbent on the processes of digestive and intermediate metabolism in lacting cows during denitrification. Journal of Pharmaceutical Sciences and Research. 9 (12): 2401-2404.
- 5) Stolbovskaya, A.A., Temiraev, R.B., Baeva, A.A., Vityuk, L.A. 2013. A method for increasing the productivity and consumer qualities of broiler meat while reducing the risk of aflatoxicosis. Vladikavkaz. 184 p.
- 6) Tedtova V.V., Kozhokov M.K., Shugusheva L.H., Kanukova V.N., Baeva A.A., Vityuk L.A. 2017. Preventive and detoxicative action of probiotics on metabolism and consumer quality of broilers meat. Journal of Pharmaceutical Sciences and Research. 9(6): 997-1001.
- 7) Tedtova V.V., Baeva A.A., Churyumova A.A., Bosieva O.I., Tsogoeva F.N. 2020. Method of increasing egg productivity of laying hens by rational use of biologically active preparations in nutrition / In the book: "New materials and promising technologies". The sixth interdisciplinary scientific forum with international participation. Moscow. P. 768-772.
- 8) Temiraev, R., Gappoeva, V., Gagkoeva, N. 2009. Probiotics and enzyme preparations in chicken diets. Poultry farming. 4:20-21.
- 9) Temiraev, R.B., Kokaeva, F.F., Tedtova, V.V., Baeva, A.A., Khadikova, M.A., Abaev, A.V. 2012. A method of increasing the dietary qualities of meat and improving metabolism in broiler chickens in the technogenic zone of the Republic of North Ossetia-Alania . News of the Mountain State Agrarian University. - Vladikavkaz 49(4): 130-133.
- 10) Temiraev, R.B., Kokaeva, F.F., Baeva, A.A., Khadikova, M.A., Abaev, A.V. 2012. A method of increasing the dietary qualities of meat and improving metabolism in broiler chickens in the technogenic zone of the Republic of North Ossetia – Alania. News of the Mountain State Agrarian University. - Vladikavkaz. 49(4): 123-127.
- 11) Temiraev, R.B., Vityuk, L.A., Ktsoeva, I.I., Karsanova, M.D. 2015. Indicators of natural resistance and lipid peroxidation of poultry when using dietary supplements in the diet. Animal husbandry of the South of Russia. - Krasnodar. 3(5): 25-29.
- 12) Temiraev R.B., Kozhokov M.K., Cheresova S.K., Kokaeva F.F., Tletseruk I.R. 2017. Method for diminishing the adverse effect of anthropogenic heavy metal pollution on poultry meat products. Journal of Environmental Management and Tourism. 8. 3 (19): 567-573.
- 13) Temiraev, V.K., Kairov, V.R., Temiraev, R.B., Kubatieva, Z.A. and Gukezhev, V.M. 2017. Method to improve productive performance and digestion exchange of broiler chickens with reduced risk of aflatoxicosis. Ecology, Environment and Conservation. 23 (1) : 554-561.
- 14) Tsalieva, L.V., Temiraev, R.B., Kononenko, S.I., Dzagurov, B.A., Gazzaeva, M.S. and S.A. Grevtsova, S.A. 2017. Ecological and consumer properties of pig meat from different breeds produced in technogenic zone. Journal of Pharmaceutical Sciences and Research. 9 (12): 2397-2400.
- 15) Yuldashbaev Y.A., Temiraev R.B., Tedtova V.V., Temiraev K.B., Osikina R.V., Gazzaeva M.S., Shugusheva L.H., Sattsaeva I.K., Udychak M.M. 2020. Control of physical and chemical qualities of milk and dairy food products obtained in an ecologically unfavorable zone. Journal of Livestock Science 11: 8-13.