

# Application of feed additives derived from fermented spring wheat straw in broiler poultry farming

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**Abstract.** Studied the growth and safety of broiler chickens after replacing 10% of the grain in the feed mixture with feed additives, which are prepared from cellulose-containing raw materials by enzymatic hydrolysis (spring soft wheat straw). It was experimentally established that feeding with feed additives had a positive effect on the safety of broiler chickens; there was no negative effect on the growth rates of chickens.

## 1 Introduction

The traditional technology for the production of mixed feed for poultry allows us to obtain 60-80% of the grain components of the ration [4, 6]. At the same time, grain reserves in the world are decreasing, demand for grain is increasing, its consumption is growing, and the continuing increase in grain production does not allow satisfying all needs for them. In the Russian Federation, there is a constant accumulation of huge reserves of practically unused agricultural waste (waste from grain processing enterprises, livestock complexes), which can acquire useful fodder properties 1.5-3.0 times higher than grain components after appropriate processing [5, 7, 8].

Enrichment of cellulose-containing raw materials with microbial protein is more ecological, allows us to avoid the problems of environmental pollution that may arise during the technological processing of grain, and will also directly contribute to an increase in the volume of the raw material base for the production and use of feed additives [1, 9, 10].

The purpose of our research was to clarify the effectiveness of introducing additives prepared from cellulose-containing raw materials into compound feed for poultry by enzymatic hydrolysis (spring soft wheat straw).

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## 2 Material and methods

As a material for our research, we used additives that were prepared from cellulose-containing raw materials using enzymatic hydrolysis of spring soft wheat straw in the laboratory of the Oryol Regional Center for Agricultural Biotechnology Collective Use Center of the Oryol State Agrarian University. In the process of preparing the supplements, the mushrooms *Trichoderma harzianum*, *Fusarium oxysporum*, as well as the preparation Baikal EM-1 were used. [2, 3].

To achieve this goal, we have formed four groups of broiler chickens of the “Competitor-2” cross. In all groups of birds that took part in the experiment, 30 heads were selected. The main elements of the broiler keeping technology were similar both in the control and in all experimental groups of poultry used in the experiment. The ration of broilers from the control group contained only the components of the main compound feed used at the enterprise.

The composition of feed mixtures for broiler chickens of the first experimental group, the second experimental group and the third experimental group was corrected by us according to the following scheme (Table 1):

**Table 1.** Feeding scheme for experimental groups

Bird groups	Feed composition	
	Up to 14 days of age	After 14 days of age
Control	Main compound feed	Main compound feed
1 experienced	Main compound feed	Replacement of 10% of wheat with feed additive KD.1 (wheat straw + Baikal EM-1)
2 experienced	Main compound feed	Replacing 10% of wheat with feed additive K.D.2 wheat straw + <i>Trichoderma harzianum</i>
3 experienced	Main compound feed	Replacing 10% of wheat with feed additive K.D.3 wheat straw + <i>Fusarium oxysporum</i>

In experienced broilers, we studied the growth rate and monitored the safety of the poultry. At the age of 1 day and at slaughter, at the age of 42 days, we carried out a control weighing of broiler chickens.

## 3 Results and discussion

As a result of adjusting the diet by adding 10% of the feed additives we received instead of wheat, we noted high safety rates of broiler chickens, and also did not observe a negative impact on the growth rates of chickens in the experimental groups (Table 2, Figure 1, 2).

At the beginning of rearing, the live weight of one broiler head had a range of 41.0 g - 41.3 g. At the final stage of the experiment at 42 days of age, the live weight of birds of all experimental groups did not differ significantly.

At the final stage of our research, the highest live weight (2031.4 g) was recorded in broilers of the third experimental group, the diet of which was adjusted by adding wheat straw treated with *Fusarium oxysporum* mushrooms.

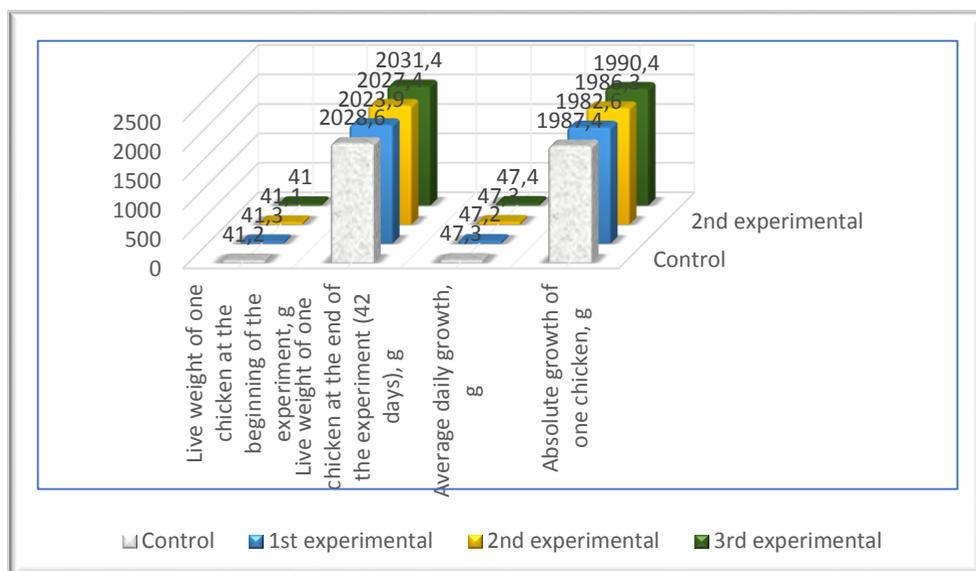
This indicator had lower values in birds of the control, first experimental and second experimental groups. In broiler chickens of the control group, it was lower by 1.97%, in the

first experimental group by 1.38%, and in the second experimental group by 3.7%. However, we did not record significant differences in this indicator.

Over the entire growing period, the average daily gain was 47.2 g in the first experimental group, 47.4 g in the third experimental group, 47.3 g in the first experimental and control groups.

**Table 2.** Indicators of growth intensity and preservation of broiler chickens.

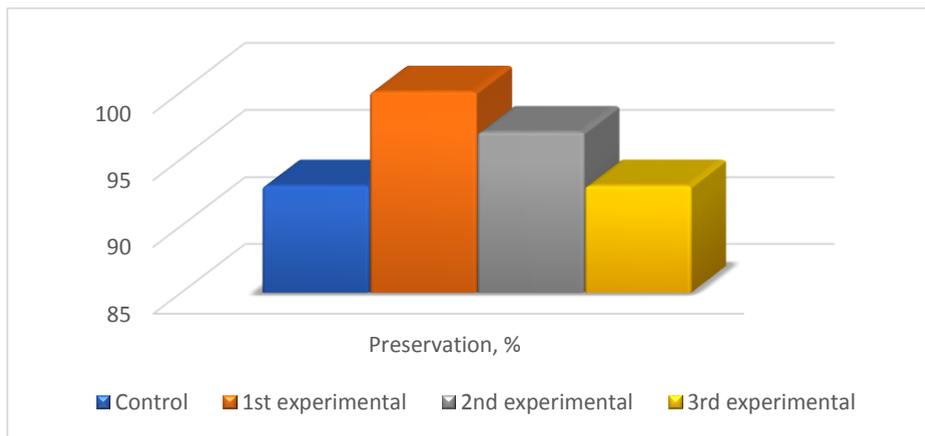
Indicators	Groups			
	Control (compound feed)	1st experimental (compound feed + FA1)	2nd experimental (compound feed + FA2)	3rd experimental (compound feed + FA3)
Number of chickens at the beginning of the experiment	30	30	30	30
Number of heads at the end of the experiment	28	29	30	28
Live weight of one chicken at the beginning of the experiment, g	41.2±0.09	41.1±0.10	41.3±0.08	41.0±0.11
Live weight of one chicken at the end of the experiment (42 days), g	2028.6±8.40	2027.4±7.20	2023.9±11.34	2031.4±7.90
Absolute growth of one chicken, g	1987.4±8.65	1986.3±7.11	1982.6±9.74	1990.4±7.87
Average daily growth, g	47.3±0.19	47.3±0.16	47.2±0.18	47.4±0.15
Preservation, %	93	97	100	93



**Fig. 1.** Indicators of the growth rate of broiler chickens.

As a result of our adjustment of the diet of 14 day old chickens - broilers by replacing the grain component of the compound feed with the biologically active additives we

received, a high safety of the poultry population was recorded. Replacement of the grain component of the compound feed with a biologically active additive KD.1 (wheat straw + Baikal EM-1) in the first experimental group made it possible to obtain 100% safety of broiler chickens.

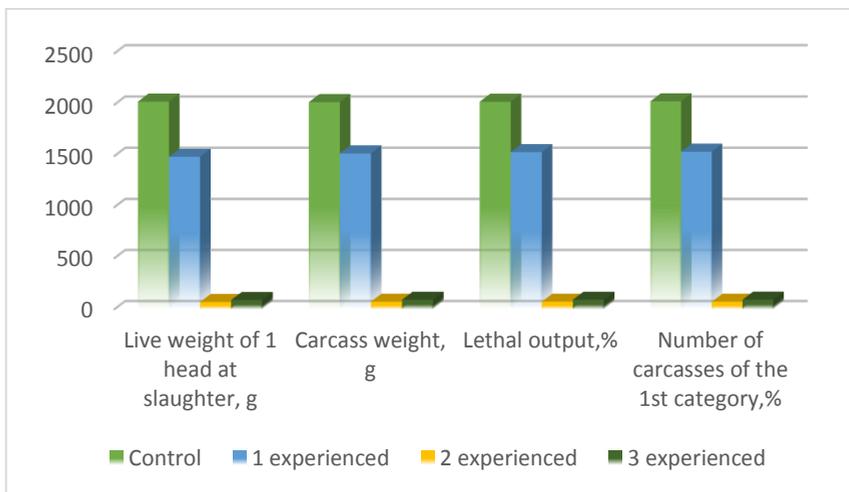


**Fig. 2.** Safety of birds of experimental groups.

When replacing the grain component of the compound feed with a biologically active additive KD.2 (wheat straw + *Trichoderma harzianum*) in the second experimental group, the safety of broiler chickens was 97%, which exceeds this indicator by 4% compared to the control and third experimental groups. In the control and third experimental groups, the safety of poultry was 93%.

The consumption of feed per 1 kg of poultry gain in all experimental groups compared to the control was lower: by 5.8% in the third experimental group, and by 5.3% in the poultry of the first experimental and second experimental groups.

The lethal yield was significantly higher in the second experimental group than in the control group by 3.0%. In the first experimental group, the slaughter yield was also higher than in the control group by 2.3%.



**Fig. 3.** Slaughter qualities of broiler chickens.

When assessing the quality of carcasses, it was found that broilers of the second experimental group had 91.7% carcasses of the 1st category, which is 0.5% and 2.6% more than in the first experimental and control groups.

## 4 Conclusions

1. The introduction of biologically active additives in poultry diets obtained by us by replacing 10% of wheat grain in the feed contributed to an increase of 1% in the growth intensity in broilers of the third experimental group, the diet of which was adjusted by adding wheat straw treated with *Fusarium oxysporum* mushrooms, compared with the control group.

2. Replacing the grain component of the compound feed with a biologically active additive KD.1 (wheat straw + Baikal EM-1) in the first experimental group, made it possible to obtain 100% safety of broiler chickens, which is 3% higher than that of the birds of the second experimental group, the third experimental and control groups by 6%, respectively.

3. Adjustment of the poultry ration for the grain component allowed to reduce feed costs per 1 kg of poultry gain by 5.3 - 5.8%, respectively, in all experimental groups in comparison with the control.

4. Substitution of biologically active additives obtained by us in the feed mixture for broilers of 10% feed wheat allowed us to save 238 g of wheat grain from each head, which, in terms of 1000 head of poultry, will be 238 kg of grain for the growing period (42 days).

5. The introduction of dietary supplements in poultry diets had a positive effect on their slaughter qualities.

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