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RESEARCH ARTICLE

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Economic efficiency of a functional biological product used as a feed additive

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ABSTRACT

Developed an environmentally friendly and cost-effective way to germinate grain for forage purposes. A further technology for the production of a bioproduct based on probiotic strains and seedlings is also proposed as an inexpensive substrate. A cost-effective scheme for the use of a bioproduct in quail rearing is proposed. The research results can be used to increase the productivity, safety of poultry and the level of profitability of obtaining poultry meat.

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bioproduct, grain germination, bio-leaven, quail, live weight, cost price, economic efficiency.

INTRODUCTION

One of the priority areas of the State Program for the Development of Agriculture and Regulation of Agricultural Products, Raw Materials and Food Markets for 2013-2020 is the accelerated development of animal husbandry and poultry farming.

The profitability of the poultry industry can be increased primarily by improving the quality of feed, in particular by reducing the loss of feed nutrients such as vitamins and various sugars. However, it should be taken into account that it is practically impossible to ensure high economic efficiency of obtaining poultry products, to increase the productivity of birds only at the expense of feed, since nutrients are often unbalanced in them, which leads to overconsumption of feed per unit of production, an increase in the cost of poultry products and, ultimately, to reduce the level of profitability of the entire industry [1, 2, 3, 6, 8, 12, 15].

The emergence of biotechnology as a science has led to the emergence of new and improved various feeds and dietary supplements. These products primarily include probiotic preparations, as well as directly probiotics [7, 9, 10, 11].

Thus, one of the main economic problems of the agro-industrial complex and, in particular, feed

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production is the use of cheaper feed means and the improvement of existing substrates while reducing their cost and the creation of new bases for obtaining probiotic products [4, 5, 13, 14].

The purpose and objectives of the study is to study the economic efficiency of biotechnology for the production and use in poultry farming of a bioproduct based on *Lactobacillus acidophilus* and *Saccharomyces cerevisiae* strains, hydroponic green seedlings and various fillers of functional action.

EXPERIMENTAL METHODS

In order to create a bioproduct, research was carried out in several stages.

The first stage of research consisted in the selection of the optimal means of sterilizing seeds. Sterilization was carried out by soaking the seeds for a certain time in the test solutions (ozonized water, anolyte, sodium hypochlorite, hydrogen peroxide), followed by washing with distilled water after the specified time.

The seeds were treated by soaking at a certain concentration for a certain time. In this case, the ratio of the mass of seeds to the solution is 1: 1. The degree of sterilization was determined at the end of the sterilization process.

The second stage consisted in the selection of the amount of substrate and in determining the effect of various types of mineral water on the growth and germination of wheat seeds, as well as on the change in the amount of nutrients.

To analyze the effect of the substrate on seed germination, GOST 12038-84 was used. Agricultural seeds. Germination determination methods.

The experiment used water of the following types: distilled water, Anolyte, catholyte, tap water, mineral water from well № 21-2. Goryachy Klyuch, mineral water from well № 104. Goryachy Klyuch, standard nutrient solution for hydroponic plant cultivation according to Gerick.

At the third stage, the optimal duration of forcing (germination) of seedlings was selected. This indicator was determined on the basis of biochemical analyzes of seedlings.

At the fourth stage, lactic acid microorganisms and yeast were obtained and the optimal media were selected for the joint cultivation of microorganisms in order to obtain the highest cell titer.

To obtain a pure culture of lactic acid microorganisms, a liquid MRS medium was used. For the cultivation of yeast, Sabouraud's medium was used.

The fifth stage consisted in inoculating the sterilized substrate and evaluating its effectiveness in solid-phase fermentation. The following types of substrate were used: native and crimped seedlings; sprout paste.

Quail experience. When conducting the experiment, we were guided by the guidelines for feeding poultry (Sergiev Posad, 2005). Used quail breed Texas white. The effect of a symbiotic biological product on growth, safety, feed costs and economic indicators of quail rearing was evaluated. To conduct the experiment, 4 groups of quails were created, each of them contained 22 heads (Table 1). Economic efficiency was calculated on the basis of the cost of the combined feed used and the consumed feed additive per 1 kg of quail live weight.

RESULTS AND DISCUSSION

When evaluating various types of waters when obtaining seedlings of the desired quality, the most stimulating seed germination was mineral water from the well of Goryachiy Klyuch № 104. The length of the roots of seedlings increased by 31,2%, and the length of the shoots - by 29,3% compared to the control. The use of this mineral water also provided a good biochemical composition of the seedlings. The content of vitamin E increased by 4,87%, vitamin B2 - by 7,7%, and carotene by 10,7%. To obtain hydroponic greens, a technology has been developed that includes washing seeds with water, sterilizing seeds with anolyte for 60 minutes, washing seeds twice with water, mixing grain with perlite in an amount of 20 g perlite per 100 g of seeds, soaking seeds in mineral water № 104 for 12 hours, germination for 6 days with double irrigation per day also with mineral water.

As a result of the research, a nutrient glucose-peptone medium was selected for the co-cultivation of *Lactobacillus acidophilus* and *Saccharomyces cerevisiae* strains. The best development of microorganisms was observed on a pasty substrate, with the maximum retention of CFU – *Lactobacillus acidophilus* – $8,2\times10^8$, CFU, *Saccharomyces cerevisiae* – $1,8\times10^7$ CFU. During solid-phase cultivation on seedlings, an even development of the CFU consortium was observed *Lactobacillus acidophilus* – $5,7\times10^6$, *Saccharomyces cerevisiae* – $6,2\times10^6$ CFU.

In the study of the product in various dosages in the experiment on quails, the best result was obtained when it was introduced in a dose of 2% by weight of the compound feed. The introduction of the product at this dose increased the live weight of quails by 8,6%, increased their safety by 5% and reduced the consumption of compound feed by 15,1%.

Calculations of economic efficiency have shown that the use of a biproduct when growing quails can reduce the cost of obtaining 1 kg of live weight gain and increase profits from the sale of quail meat.

The profit in the second group was 10,26% higher compared to the control and amounted to 1669,95

rubles. against 1514,55 rubles. control. In the third group, the best result was shown, the profit was increased to 1823,40 rubles, which is 20,34% more than control. In the fourth group, the profit amounted to 1722,69 rubles, which is 13,74% more than the profit in the control group.

Thus, summing up the experiment, the best economic results were shown in the 3rd experimental group with the addition of a bioproduct in the form of a pasty form in the amount of 2% to the main diet.

CONCLUSION

The use of a bioproduct when growing quails allows to reduce costs and increase profits from the sale of quail meat by 20,34% more than in the control. In the second scientific and economic experiment, when using a pasty bioproduct, the profit increased by 8,42%, when using a dry bioproduct, the profit increased by 10,14%.

Gratitudes

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Table 1: Scheme of scientific and economic experiments

Group	Scheme
1 control	Standard compound feed (SC)
2 experience	SC + bioproduct in the amount of 1% by weight of the compound feed.
3 experience	SC + bioproduct in the amount of 2% by weight of the compound feed.
4 experience	SC + bioproduct in the amount of 3% by weight of the compound feed.

Table 2 shows the composition of feed for quails 1-4 weeks per 1 ton.

Table 2: Composition of compound feed for quails 1-4 weeks with economic calculations and theoretical losses

Composition	Contents in the recipe, %	Price for 1 ton, rub.	Cost, rub.	Quantity, kg	Quantity with losses, kg
Peas + soybeans + rapeseed (extrudate)	35,5	10000,00	3550,00	355,00	358,55
Corn cake	20,0	15000,00	3000,00	200,00	202,00
Corn grain	16,0	5000,00	800,00	160,00	161,60
Sunflower meal	10,0	20000,00	2000,00	100,00	101,00
Soybean extruded	6,0	33000,00	1980,00	60,00	60,60
Sunflower and corn extruded	5,0	12000,00	600,00	50,00	50,50
Fodder yeast	4,0	22000,00	880,00	40,00	40,40
Tricalcium phosphate	2,0	23000,00	460,00	20,00	20,20
Table salt	0,55	7000,00	38,50	5,500	5,55
DL-methionine	0,35	235000,00	822,50	3,500	3,53
Chalk feed	0,3	5000,00	15,00	3,00	3,03
Lysine monochlorohydrate	0,10	155000,00	155,00	1,00	1,01
Premix PK-90-1	0,2	180000,00	360,00	2,00	2,02

Table 3 shows the composition of compound feed for quail 5-6 weeks per 1 ton.

Table 3: Composition of compound feed for quail 5-6 weeks with economic calculations and theoretical losses

Composition	Contents in the recipe, %	Price for 1 ton, rub.	Cost, rub.	Quantity, kg	Quantity with losses, kg
Corn grain	24,0	10000,00	2400,00	240,00	242,40
Wheat grain	15,0	10000,00	1500,00	150,00	151,50
Peas grain	15,0	12000,00	1800,00	150,00	151,50
Sunflower flour	14,3	20000,00	2860,00	143,00	144,43
Winter rape	10,0	10000,00	1000,00	100,00	101,00
Soybean extruded	10,0	33000,00	3300,00	100,00	101,00
Meat and bone meal	4,00	21000,00	840,00	40,00	40,40
Fodder yeast	4,00	22000,00	880,00	40,00	40,40
Tricalcium phosphate	1,5	23000,00	345,00	15,00	15,15
Chalk feed	0,8	5000,00	40,00	8,00	8,08
Table salt	0,50	7000,00	35,00	5,00	5,05
Lysine monochlorohydrate	0,40	155000,00	620,00	4,00	4,04
DL-methionine	0,30	235000,00	705,00	3,00	3,03
Premix-90-1	0,2	180000,00	360,00	2,00	2,02

Table 4 shows the composition of compound feed for quails 7 weeks old and older per 1 ton.

Table 4: Composition of compound feed for quails from 7 weeks and older with economic calculations and theoretical losses

Composition	Contents in the recipe, %	Price for 1 ton, rub.	Cost, rub.	Quantity, kg	Quantity with losses, kg
Corn grain	25,0	10 000,00	2 500,00	250,00	252,50
Sunflower and peas extruded	20,0	14 000,00	2 800,00	200,00	202,00
Wheat	19,2	10 000,00	1 920,00	192,00	193,92
Soybean extruded	10,0	29 000,00	2 900,00	100,00	101,00
Sunflower meal	10,0	21 000,00	2 100,00	100,00	101,00
Shell flour	8,0	3 000,00	240,00	80,00	80,80
Fodder yeast	5,00	21 000,00	1 050,00	50,00	50,50
Tricalcium phosphate	2,0	24 000,00	480,00	20,00	20,20
Table salt	0,30	7 000,00	21,00	3,00	3,03
DL- methionine	0,20	235 000,00	470,00	2,00	2,02
Lysine monochlorohydrate	0,10	155 000,00	155,00	1,00	1,01
Premix PK-90-1	0,2	75 000,00	150,00	2,00	2,02

Table 5 shows the cost indicators of the combined feed used per 1 ton, rubles.

Table 5: Cost indicators of compound feed per 1 ton, rubles.

Index	Price		
	1-4 weeks	5-6 weeks	7 weeks and older
Raw material cost	14661,00	16685,00	14786,00
Production losses	146,61	166,85	147,86
Production costs	800,00	800,00	800
The cost of the container	240,00	240,00	240,00
Cost price	15607,61	17891,85	15973,86
Depreciation costs	3121,52	3578,37	3194,77
Price without VAT	18729,00	21470,00	19168,63
VAT 10 %	1872,90	2147,02	1916,86
Selling price	20919,00	23617,00	21085,5

Table 6 shows the cost indicators of a bioproduct in pasty and dry form per 1 ton, rubles.

Table 6: Cost indicators of bioproduct per 1 ton, rubles.

Index	Price	
	Paste	Powder
Raw material cost	8543,0	8543,0
Production losses	98,5	98,5
Production costs	800,0	1200
The cost of the container	340,0	240
Cost price	9781,5	10081,5
Depreciation costs	1956,3	2016,3
Price without VAT	11737,3	12097,8
VAT 10 %	1173,7	1209,78
Selling price	12917,0	13307,58

Table 7 shows the economic efficiency of using a pasty form bioproduct during the growing period.

Table 7: Economic efficiency of the use of bioproduct

Indicators	Groups			
	1	2	3	4
Cost of 1 kg. feed, rub.	20,90	20,90	20,90	20,90
Cost of 1 kg. additives, rub.	–	12,90	12,90	12,90
Consumption of compound feed for the growing period, kg	25,5	26,3	24,8	24,6
Total cost of consumed feed, rub.	532,95	549,67	518,32	514,14
The cost of the consumed supplement, total, rub.	–	3,39	6,78	10,17
Cost of consumed feed and additives for growth, rub.	532,95	553,06	525,10	524,31
Quail live weight gain, total, kg	5,85	6,30	6,71	6,42
Selling price of 1 kg of quail meat, rubles	350,00	350,00	350,00	350,00
Proceeds from the sale of meat, rubles	2047,50	2205,00	2348,50	2247,00
Profit from the sale of meat, rub.	1514,55	1669,94	1823,40	1722,69
% to control	100,00	110,26	120,34	113,74