colloquium-journal

ISSN 2520-6990

Międzynarodowe czasopismo naukowe

Historical sciences
Agricultural sciences

№12(99) 2021
Część 2

colloquium-journal

ISSN 2520-6990

ISSN 2520-2480

Colloquium-journal №12 (99), 2021

Część 2

(Warszawa, Polska)

«Colloquium-journal»
Wydawca «Interdruk» Poland, Warszawa
Annopol 4, 03-236
E-mail: info@colloquium-journal.org
http://www.colloquium-journal.org/

CONTENTS

HISTORICAL SCIENCES

AGRICULTURAL SCIENCES

78. Yhurber J.A. Inhibitory effect of gibberellins on nodulation in dwarf beans, Phaseolus vulgaris. Nature. 1958. Vol. 181. P. 1082-1083.

79. Yowling W.A., Buirchell B.J., Tarta M.E. Lupin. Lupinus L., Promoting the conservation and use of underutilized and neglected crops 23. Institute of Plant lyenetis and crop Plant Research, yatersleben. International Plant lyenetic Resources Institute. Rome, 1998. P. 112-114.

80. Zhao, H., Cao, H., Ming-Zhen, P., Sun, Y., & Liu, T. (2017). The role of plant growth regulators in a plant aphid parasitoid tritrophic system. Journal of Plant Growth Regulation, 36(4), 868-876.

81. O.A. Shevchuk,.O. Tkachuk, V.G. Kuryata,O.O. Khodanitska, S.V. Polyvanyi. 2019. Features of leaf photosynthetic apparatus of sugar beet under retardants treatment. Ukrainian Journal of Ecology. 2019. 9 (1). P. 115-120.

82. O.O. Khodanitska, V. G. Kuryata, O.A. Shevchuk, O.O. Tkachuk, I.V. Poprotska. 2019. Effect of treptolem on morphogenesis and productivity of lin seed plants. Ukrainian Journal of Ecology. 9 (2). 9-126.

UDC: 636.087.7:636.59

Poberezhets J.N.,
Candidate of Agricultural sciences, Associate Professor
Lotka H.I.
Candidate of Agricultural sciences, Associate Professor
Vinnytsia National Agrarian University 3, Soniachna str., Vinnytsia, 21008, Ukraine
DOI: 10.24412/2520-6990-2021-1299-30-34

PRODUCTIVITY OF LAYING HENS FED BY FEED ADDITIVES

Abstract.

The aim of the experiment was to research the effect of the enzyme additive AlfaGal on egg-laying ability and egg quality of laying hens. It was found that the average daily, absolute and relative gains increased by 9.9% (P≤0.05), 10%, respectively, and 3.2% for poultry fed by the feed additive than control counterparts.

The AlfaGal enzyme additive application for laying hens feeding increases the gross collection of eggs by 6.2% (P≤0.05) compared with control counterparts.

The enzyme additives application in the experimental poultry feeding reduces feed costs by 10 eggs by 5.5% compared to the control.

Using an enzyme additive for laying hens feeding increases the weight of the egg by 7.6% (P≤0.05).

Egg white weight increases by 5.4% (P≤0.05) in the second experimental group under the action of AlfaGal.

Keywords: laying hens, enzyme preparation, feed, eggs.

INTRODUCTION

Today, it is common practice to use enzymes to increase the nutritional value of the diet and the nutrient composition variability of such feed components as phytase, enzymes [4, 7, 10].

There are many manufacturers and suppliers of feed enzymes on the market today, so the feeding specialist has a huge range to choose from. However, there is a significant problem in finding effective drugs [1, 3, 6].

Enzymes have a different mechanism of action on the body of animals than hormones and biostimulants. They are not accumulated in the animal body and livestock products as a part of the final products. Animals and poultry produce their own enzymes in the digestive tract they are the hydrolysis of feed nutrients. Adult animals can digest up to 60-70% of feed nutrients, although the digestive glands produce sufficient amounts of pepsin, trypsin, amylase, lipase and other digestive enzymes. It is known that young animals are born with an underdeveloped digestive enzyme system [2, 12].

Poultry is one of the important and promising branches of animal husbandry, it has low labor and feed costs receiving a significant amount of valuable dietary foods for humans. Providing the population in food and industry in raw materials can be achieved due to the proportional development of agricultural industries, including poultry.To increase the efficiency of feed use is one of the important tasks facing poultry farming [6, 11].

Therefore, the aim of the experiment was to research the effect of the AlfaGal enzyme additive on the laying ability and eggs quality of laying hens. Feed additive is aimed for use in feeding farm animals and poultry.

METHODS AND MATERIALS

The experiment was carried out using the method of analogue groups, it allows to determine the effect of the researched drug. Forming the groups, we took into account the live weight of animals, age, sex, breed, productivity, etc. [5].

The equalization period of the experiment lasted for 10 days, and the main period of the experiment lasted for 180 days. The poultry was kept in one tier group cages in compliance with zoohygienic requirements [5].

The control group consumed the basic diet (BD), i.e., complete feed. Experimental group was additionally fed by AlfaGal (0.1 kg per ton of feed).

Table 1

Feeding patterns

Group	Period duration, days		Number, heads	Feeding characteristics
	equalization	main		
I - control	10	60	20	BD (complete feed)
II - experimental	10	60	20	BD + **AlfaGal (**0.1 per 1 ton of feed).

The egg productivity of laying hens was assessed by daily counting the eggs number. Such indicators as gross egg collection, egg-laying on the initial and middle laying hens, egg-laying intensity, number of egg mass, weight, shape, size and chemical composition of eggs, egg mass yield were determined [8].

The digital material was processed biometrically [9] using a PC. The values of the Student-Fisher probability criterion were used at three probability levels, i.e., * P <0.05; ** P <0.01; *** P <0.001.

Complete feed was used for poultry feeding, it provided them with nutrients according to detailed feeding standards and feed zootechnical analysis. The applied compound feed is shown in Table 2.

The air temperature is an important factor influencing the poultry food consumption, its health and productivity. The room temperature is about 18ºC at a humidity of 60-70%.

Laying hens were kept in one tier group cages. Optimal microclimate conditions were observed during the research. Temperature regime, relative humidity, air exchange and light regimes were controlled.

Table 2

PC compound feed 4-4 for laying hens with a live weight of 1,100 – 1,500 g, age 18 to 22 weeks

Ingredient	Quantity, g	Exchange energy, g	Crude protein, g	Crude fat, g	Crude fiber, g
Yellow corn	41.1	577.04	4.11	1.68	0.90
Wheat	20	243.80	2.30	0.22	0.70
Sunflower meal	10	111.90	4.20	0.35	1.50
Wheat bran	10	76.70	1.58	0.42	0.91
Fishmeal	5	52.35	2.97	0.09	-
Fodder yeast	3	35.43	1.35	0.04	0.26
Clover meal	3	21.00	0.48	0.09	0.74
Shell	6.8	-	-	-	-
Bone meal	0.4	-	-	-	-
Table salt	0.3	-	-	-	-
Fodder fat	0.4	14.60	-	0.4	-
Total	100	1131.82	16.99	2.93	5.01
Norm	100	1131.00	17.00	2.93	5.50
Difference (± norm)	0	+0.82	-0.01	0	-0.49

RESULTS AND DISCUSSIONS

The live weight and safety of livestock were determined to characterize the effect of the AlfaGal enzyme supplement on the growth intensity (Table 3).

It was found that at the end of the experiment the poultry of the second experimental group increases the live weight by 6.0% relative to control.

The survival of the second experimental group laying hens is higher by 2.0% compared to control counterparts.

Table 3

Live weight and safety of laying hens

Indicator		I – control group	II – experimental group
Live weight, g	at the beginning of experiment	1,195 ± 25.48	1,200 ± 22,14
	at the end of experiment	1,810 ± 38.40	1,920 ± 32,56
Livestock safety, %		98	100

The effect of enzyme additives on poultry live weight was researched (Table 4).

Table 4

Live weight gain

Gain	I - control	II - дexperimental
Absolute, g	655 ± 18.25	720 ± 15.38*
Average daily, g	10.9 ± 7.52	12.0 ± 5.64
Relative, %	43.0 ± 14.65	46.2 ± 12.82

It was found that the average daily, absolute and relative growth of poultry increased for poultry consumed feed additive by 9.9% (P≤0.05), 10% and 3.2%, respectively than control counterparts.

Dominant cross chickens begin to lay very at 4-5 months and give a big egg. Their egg production is 310 eggs. Their weight is 65-70 g, they can be up to 118 g. As a rule, these eggs are two-yolk and are not suitable for incubation. The appearance of Czech chickens is diverse, depending on the parental lines.

The level of egg productivity is determined by the number and quality of laid eggs over a period of time (Table 5).

The use of the AlfaGal enzyme additive for laying hens feeding increases the gross egg collection by 6.2% (P≤0.05) compared with control counterparts.

Table 5

Productivity of laying hens

Growth	I – control group	II – experimental group
Gross collection of eggs, pieces	1,120 ± 22.10	1,190 ± 18.42*
Laying for the experiment period, pieces	58.9 ± 8.32	59.5 ± 14.25
Incubation intensity, %	98.2± 17.14	99.1± 22.08

Laying is an indicator characterizing poultry ability to lay eggs and is equal to the number of eggs laid during the reporting period. It was found that additional consumption of AlfaGal compound feed enzyme increases egg production by 1.0% and egg intensity by 0.9% compared to the control group.

Feed costs were also determined for 10 eggs (Fig. 1).

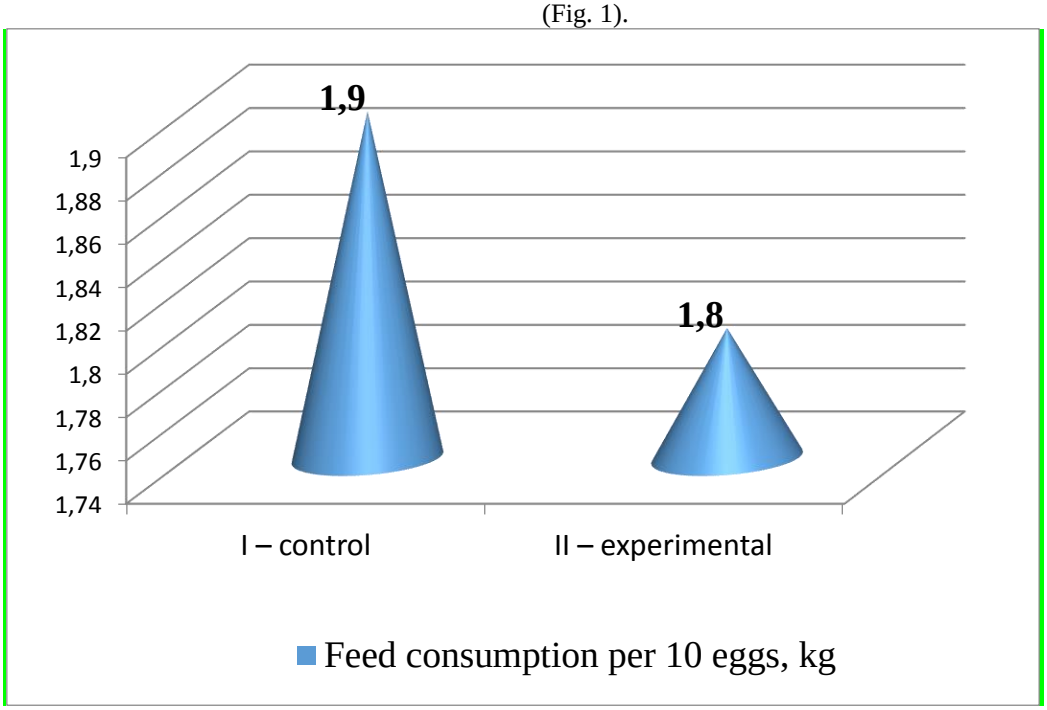

Fig. 1 Feed consumption, kg

The enzyme additives application for experimental poultry feeding reduced feed costs by 10 eggs by 5.5% compared to the control.

Egg quality is related to a number of factors, i.e., genetic, feed, age, poultry housing conditions, equipment quality, poultry production technologies, and so on.

The weight of eggs and its components were also studied (Table 6).

Table 6

Weight and morphological composition of the egg, M ± n, n = 10

Indicator	Group	
	I - control	II - experimental
Egg weight, g	65.0 ± 1.52	70.0 ± 1.28*
Egg white weight, g	38.4 ± 0.68	40.5 ± 0.54*
Yolk weight, g	19.0 ± 0.46	21.5 ± 0.35**
Shell weight, g	7.6 ± 0.22	8.0 ± 0.27

Using an enzyme additive for laying hens feeding increases the weight of the egg by 7.6% (P≤0.05).

The egg white weight increases by 5.4% (P≤0.05) under the action of AlfaGal in the second experimental group.

The yolk is the most nutritionally important part of the egg. It contains lots of nutrients. It has a spherical shape, it is yellow or orange, it is located in the center of the egg (freshly laid) and surrounded by a delicate elastic film.

Thus, the yolk weight increased by 13.1% (P≤0.01) in the experimental group of poultry fed by feed additive.

Data on the shape and size of eggs under the action of enzyme additives is presented in table 7.

Table 7

Shape and size of eggs, M±n, n=10

Indicator	Control group	Experimental group
Small diameter, mm	4.5 ± 0.11	4.7 ± 0.10
Large diameter, mm	5.7 ± 0.22	5.9 ± 0.12
Diameters ratio	1.26 ± 0.04	1.28 ± 0.05
Form index, %	78.9 ± 1.24	79.6 ± 1.25
Air chamber diameter, mm	16.9 ± 0.17	16.8 ± 0.21
Air chamber height, mm	2.4 ± 0.42	2.3 ± 0.54
Egg volume, ml	58.5 ± 3.20	60.8 ± 1.64
Density, g / cm^3	1.11 ± 0.03	1.15 ± 0.05
Shell thickness, mm	0.33 ± 0.005	0.34 ± 0.006

The researched enzyme additive application in the feeding of experimental laying hens has increased both the small and large diameter of the egg by 4.4 % and 3.5 % respectively.

Additional feeding of the AlfaGal enzyme has also increased egg volume by 3.9% and its density by 3.6%. However, no significant difference was found.

The qualitative indicators of eggs were also researched (Table 8).

According to research data, feeding experimental poultry by enzyme feed additives increases the small diameter of the egg white dense layer by 1.0% (P≤0.05) relative to the control indicator.

Table 8

Qualitative indicators of egg white, M±m, n=10

Indicator	Group	
	I - control	2 - experimental
Dense layer of egg white height, cm	0.68 ± 0.04	0.79 ± 0.06
Egg white dense layer small diameter, cm	6.6 ± 0.07	6.8 ± 0.05*
Egg white dense layer large diameter, cm	8.3 ± 0.14	8.7 ± 0.16
Egg white index	0.10 ± 0.02	0.11 ± 0.03
Haugh Unit	81.0 ± 3.14	86.0 ± 2.58

It should be noted that the Haugh Units are by 5 units more in the experimental group than in the control.

The qualitative indicators of egg yolk were also determined (Table 9).

Table 9

Qualitative indicators of egg yolk, M±m, n=10

Indicator	Group	
	I - control	II - experimental
Yolk height, cm	1.3 ± 0.08	1.5 ±0.05*
Yolk small diameter, cm	3.9 ± 0.12	4.2 ±0.08*
Yolk large diameter, cm	4.3 ± 0.07	4.5 ± 0.06*
Yolk index	0.30 ± 0.05	0.33 ± 0.09

The height of the yolk increases by 15.3% (P≤0.05) in the second group than the control value.

It should be noted that the small diameter of the egg yolk increased by 7.6% (P≤0.05) and the large diameter by 4.6% (P≤0.05) in the second experimental poultry group fed by the enzyme feed additive.

The high nutritional value of eggs is due to its rich chemical composition. Eggs contain proteins, fats, carbohydrates, minerals, and vitamins. The egg consists of 70-75% water. Dry matter is 25–30%, including 13-14% of proteins, 11-14% of fats, 1% of carbohydrates and minerals. Waterfowl eggs have a high fat content. The chemicals of a whole egg are unevenly distributed between its structural components.

Dry matter of the yolk is 50-57%, dry matter of the protein 13-14%. The yolk contains the fat, fat-soluble vitamins, and pigments. It also contains a lot of protein and minerals. Egg white contains 86-88% water, and its organic part is mainly protein.

The chemical composition of egg yolk and white were also researched (Table 10).

Table 10

Chemical content of egg yolk of laying hens (in terms of absolutely dry matter), %

Group	Water	Protein	Fat	Ash	Phosphorus
1	4.36	29.18	57.08	3.67	11.75
2	4.12	31.44	54.62	3.68	12.39

The enzyme additives application for laying hens feeding contributes to an increase of protein content by 2.26%, fat by 2.46%, and phosphorus by 0.64% in egg yolk, relative to the control indicator.

The chemical egg white content of laying hen eggs was also investigated (Table 11).

Table 11

Chemical content of egg white of laying hens (in terms of absolutely dry matter), %

Group	Water	Protein	Fat	Ash	Phosphorus
1	6.84	76.88	0.46	9.42	1.75
2	6.75	80.14	0.43	12.25	1.84

The use of AlfaGal as a part of laying hens diet allows to increase the protein content of egg white by 3.26% and phosphorus by 0.09%.

Conclusions:

1. It was found that the average daily, absolute and relative gains increased by 9.9% (P≤0.05), 10%, respectively, and 3.2% for poultry fed by the feed additive than control counterparts.
2. The enzyme additives application in the experimental poultry feeding reduces feed costs by 10 eggs by 5.5% compared to the control.
3. Additional use of the enzyme additive for the laying hens feeding increases egg weight by 7.6% (P≤0.05) and egg white weight by 5.4% (P≤0.05) than control.
4. Yolk weight increased by 13.1% (P≤0.01), small diameter of the dense layer of egg white by 1.0% (P≤0.05) and yolk height by 15.3% (P≤0.05) in the second experimental group of poultry.
5. The enzyme application for second group poultry feeding increases the small diameter of the egg yolk by 7.6% (P≤0.05) and the large diameter by 4.6% (P≤0.05) against control.
6. The enzyme application for second group poultry feeding increases egg yolk protein content by 2.26%, fat by 2.46%, and phosphorus by 0.64%, relative to the control indicator.
7. The AlfaGal enzyme application in the diet of laying hens increases the protein content of egg white by 3.26% and phosphorus by 0.09%.

References

1. Chudak R.A., Poberezhets Y.M., Vozniuk O.I., Dobronetska V.O. 2019. Echinacea pallida extract effect on quils meat quality. Ukrainian journal of ecology. Vol 9, No 2. C. 151-155. https://www.ujecology.com/articles/echinacea-pallida-extract-effect-on-quils-meat-quality.pdf
2. Chudak, R.A., Poberezhets, Yu.M., Vozniuk, O.I. 2018. Rist i rozvytok broileriv za uvedennia fermentnoho preparatu [Growth and development of broilers with the introduction of the enzyme preparation]. Agricultural science and food technology. VNAU. Vol. 1 (100). Pp. 21 – 27. (in Ukrainian).
3. Dunkley C. 2008. The Use of Probiotics and Prebiotics in Poultry Feeds. Feed and Nutrition. May. P. 25 – 28.
4. Ibatullin I. I., Omelian A. M., Sychov M. Yu. 2017. Impact of different levels of arginine on zootechnical indices and slaughter characteristics of young quails. Ukrainian journal of ecology. No. 7 (1). P. 37-45. doi.org/10.15421/20174
5. Ibatullin I. I., Zhukorskyi O. M., Bashchenko. I., et.al. 2017. Methodology and organization of scientific research in animal husbandry. Kyiv: Ahrar. Nauka. 327 p. (in Ukrainian).
6. Ibatullin, I.I., Ilchuk, I.I., Kryvenok, M.Ya. 2017. Peretravnist pozhyvnykh rechovyn ta balans azotu v kurei batkivskoho stada miasnoho napriamu produktyvnosti za riznykh rivniv lizynu u kombikormi [Digestibility of nutrients and nitrogen balance in chicken breeder meat direction of productivity at different levels of lysine in the fodder]. Scientific Messenger LNUVMBT named after S.Z. Gzhytskyj, vol. 19, no 74. Pp. 7-11(in Ukrainian).
7. Park J. H., Kim I. H. 2014. Supplemental effect of probiotic Bacillus subtilis B2A on productivity, organ weight, intestinal Salmonella microflora, and breast meat quality of growing broiler chicks. Poult Sci, 93(8), 2054–2059.
8. Pigarev, N. V., Bondarev, E. I., Raetskiy, A. V. 1981. Praktikum po ptitsevodstvu: uchebnoe posobie dlya stud. s.-h. vuzov po spets. Zootehniya [Practicum on poultry farming: a textbook for students of agricultural universities in the specialty Zootechnics]. M.: Kolos, 192 p. (in Russian).
9. Plohinskiy N. A. 1969. Guide for biometrics for livestock breeders. M.: Kolos. 256 p. (in Russian).
10. Poberezhets, Yu.M. 2019. Produktyvnist kurok-nesuchok za vykorystannia probiotyka [Productivity of laying hens using probiotics]. International scientific periodical. Balti State University "Alecu Russo". Moldova. Pp. 54-59. DOI: 10.30888/2663-5720.2019-02-01 (in Ukrainian).
11. Podolian Yu. M. 2016. Influence of probiotic on productivity of broiler chickens. Biological journal of the Melitopol State Pedagogical University named after Bogdan Khmelnytsky. 6 (3). P. 141-148. DOI: http://dx.doi.org/10.15421/201680. (in Ukrainian).
12. Shtainer T., Nikol R., Zasiekin M. 2010. Stimulate the growth of birds naturally. Our Poultry Farming. March. P. 30 – 31.