



Journal homepage: <https://animalscience.com.ua/en>

Animal Science and Food Technology, 15(1), 105-120

Received 23.10.2023 Revised 24.01.2024 Accepted 28.02.2024

UDC: 636.59.086/.087:598.261.7:637.4.05

DOI: 10.31548/animal.1.2024.105

Effect of feeding *Artemisia capillaris* on egg production and egg quality in quail

Mykhailo Sychov*

Doctor of Agricultural Sciences, Professor
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0002-6319-9876>

Dmytro Umanets

PhD in Agricultural Sciences, Associate Professor
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0002-1973-1132>

Ivan Balanchuk

PhD in Agricultural Sciences, Associate Professor
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0002-7576-6508>

Ruslana Umanets

PhD in Agricultural Sciences, Associate Professor
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0003-1483-2775>

Igor Ilchuk

PhD in Agricultural Sciences, Associate Professor
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0003-0961-6613>

Tetiana Holubieva

PhD in Agricultural Sciences, Associate Professor
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
<https://orcid.org/0000-0002-2467-5972>

Suggested Citation:

Sychov, M., Umanets, D., Balanchuk, I., Umanets, R., Ilchuk, I., & Holubieva, T. (2024). Effect of feeding *Artemisia capillaris* on egg production and egg quality in quail. *Animal Science and Food Technology*, 15(1), 105-120. doi: 10.31548/animal.1.2024.105.

*Corresponding author



Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (<https://creativecommons.org/licenses/by/4.0/>)

Abstract. The use of safe, natural feed additives in animal feeding is becoming increasingly important to provide animals with biologically active substances, reduce the risk of chemicals being transferred to the end consumer through products, their accumulation, and increase productivity. The purpose of the study was to determine the effect of *Artemisia capillaris* on egg productivity of quail hens. To conduct the experiment, 4 groups were established – a control group and three experimental groups, 72 animals (♀60+♂12) in each. The experiment, which lasted 210 days, involved feeding poultry with complete balanced feeds that had the same chemical composition and differed only in the content of the test additive, which was introduced into the feeds of poultry of experimental groups 2,3, and 4 in the amount of 0.5%, 1.0%, and 1.5% by weight of the feed, respectively. The introduction of dry wormwood powder in mixed feed of quail hens in the amount of 0.5-1.5% has a positive effect on such indicators of egg productivity as the gross yield of eggs, which increased in the experimental groups by 2.6-5.6%, the egg weight increased by 5.6-12.9%, while feed costs decreased by 2.8%. According to the qualitative indicators of eggs, there was an increase in the absolute weight of yolk by 3.0-8.3%, albumen by 2.6-6.5%, shell by 0.6-1.2%, and a decrease in the egg index by 0.9-4.1%. Feeding *A. Capillaris* to poultry leads to an increase in the content of palmitic, stearic, oleic, linolenic, eicosanoic, and arachidonic fatty acids in egg yolk by 0.01-6.07%. The optimal level of *A. Capillaris* in the diet was determined to be 1.0% of the total weight of the feed; this amount had a positive effect on the above indicators, increasing them, which can be used in the industrial technology of quail eggs production, and in organic production

Keywords: wormwood; quail hens; safety; egg weight; fatty acids; feed conversion

Introduction

Due to the ever-increasing requirements for the quality of livestock products, researchers focus their efforts on the search, study, and implementation of safe, biologically active feed additives that improve the use of feed nutrients by activating enzyme systems, reducing stress in animals, improving metabolic processes, improving immunity and productivity, while not being toxic to the body and not accumulating in tissues, organs, or livestock products.

Consumption of foods with chemical residues can cause allergic reactions, alter the gut microbiota, and most importantly, promote the spread of drug-resistant microorganisms in the population, which ultimately leads to therapeutic failures (Dos Santos *et al.*, 2020). According to Z.P. Liu *et al.* (2023), one of the ways to solve this problem was the use of medicinal plants that have been known since ancient times, becoming increasingly popular today, in particular, due to the decline in the effectiveness of

synthetic substances and public concern about the side effects and drug interactions of synthetic drugs.

The livestock industry is facing an increase in public demand for organic products, as a result, producers are forced to meet these needs, while maintaining high standards of food safety and quality. That is why more and more research is aimed at investigating the effects of natural feed additives on the animal body, such as probiotics, organic acids, and phyto-genic additives. The use of phyto-genic feed additives in animal nutrition is gaining increasing interest, especially for use in the pig and poultry industries, as evidenced by a significant increase in scientific research on these issues since 2000 (Abdelli *et al.*, 2021).

Phyto-genic feed additives are products of plant origin (herbs, seeds, fruits, and other parts of plants) that are used in the development of diets for animals in order to improve

their productivity (El-Sabroun *et al.*, 2023). These feed additives contain various bioactive components such as polyphenols, alkaloids, flavonoids, and have antimicrobial, antioxidant, growth-stimulating and immunoregulatory effects (Alagawany *et al.*, 2021). However, as noted by L. Zhang *et al.* (2022) and J. Chen *et al.* (2022), the effects of phytobiotics on the animal body are not limited to the listed properties, they also have a positive effect on digestion, increasing the secretion of enzymes and the absorption of nutrients. In addition, phytobiotics are natural flavourings that stimulate feed intake and improve the body's performance.

In the context of growing demand for phyto-genic feed additives in animal husbandry and limited available resources, the search for new feed additives of plant origin is becoming very important. One of the typical representatives of phyto-genic feed additives is wormwood (*Artemisia*), belonging to the Asteraceae family (*Compositae*) or asters (*Asteraceae*). Plants of this species can be found in the natural flora of many countries, such as China, Argentina, France, Bulgaria, Hungary, Romania, Spain, Italy, and the United States. This herbaceous plant is well known in traditional medicine since ancient times, where it is used in the treatment of diseases of the digestive, respiratory, and reproductive systems. Native North Americans used crushed leaves of *A. absinthium*, *A. biennis*, *A. frigida* and *A. ludoviciana* for the treatment of ulcers and wounds (Miao *et al.*, 2022). The most famous are such types of wormwood as: *Artemisia Cina*, *Artemisia Annu*, *Artemisia Absinthium*, *Artemisia Abrucanum*, *Artemisia Vulgaris*, *Artemisia Capillaris*; all these types contain aromatic oils, which include a biologically active compound – artemisinin. According to G. Batiha *et al.* (2020), artemisinin in combination with other synthetic drugs has proven to be the most effective treatment for a number of diseases of parasitic aetiology, both in humans and in poultry farming. To date, it has been proven that the synergy between plant components and synthetic substances not only

contributes to a better therapeutic effect, but even enhances the mutual influence, which is conditioned by biologically active substances contained in plants. It is proved that in comparison with pure artemisinin, the leaves of *Artemisia* can release 40 times more artemisinin into the body's bloodstream.

Numerous studies of the effectiveness of extracts have been described in the literature *Artemisia* and its essential oils, their antibacterial, antifungal and antiparasitic effects on the bird's body (Batiha *et al.*, 2020). The presence of bitterness in *Artemisia* stimulates the secretion of salivary glands and digestive organs, which improves digestion and further absorption of feed nutrients (Zhang *et al.*, 2022). Wormwood also contains antioxidant compounds such as vitamin E and other phenolic compounds that have a positive effect on product quality (Chen *et al.*, 2022). The hepatoprotective effect of *Artemisia absinthium* and *Artemisia vulgaris* on the body has also been proven, and the product has been found to be non-toxic and can be safely used in animal feeding (Hrytsyk *et al.*, 2019). There is limited information on the use of *Artemisia capillaris* in quail feeding. Considering the above, the purpose of the scientific and economic experiment was to investigate the effect of feeding wormwood powder (*A. capillaris*) on egg productivity and quality of quail eggs.

Materials and Methods

The study was conducted in the laboratory of the Department of Animal Nutrition and Feed Technology of the National University of Life and Environmental Sciences of Ukraine. For this purpose, 288 birds of 42 day-old Japanese quails were selected, from which 1 control and 3 experimental groups were established on the principle of analogues, 72 birds (♀60+♂12) in each (Table 1). When forming groups, the following factors were considered: live weight, age, and sex of the bird. The experiment lasted 210 days and was divided into 7 sub-periods of 30 days each for ease of recording.

Table 1. Scheme of the scientific and economic experiment

Group	Number of birds, units	Content of wormwood powder (<i>Artemisia capillaris</i>) in mixed feed, %
Control 1	72 (♀60 + ♂12)	0
Experimental: 2	72 (♀60 + ♂12)	0.5
3	72 (♀60 + ♂12)	1.0
4	72 (♀60 + ♂12)	1.5

Source: developed by the authors

During the study period, the experimental quail population was kept in a six-tiered battery cage of 18 animals (15 females and 3 males), the area per quail was 133 cm², feeding front – 2 cm and watering front – 1 cm. In the room, the microclimate indicators corresponded to the established standards. Quail hens of all experimental groups were fed complete mixed feeds developed in accordance with the established standards, considering the age of the bird. Feeding standards for quail hens were developed by the Research Institute

of Poultry Farming of the Ukrainian Academy of Agrarian Sciences (Ryabokon *et al.*, 2005) and other Ukrainian researchers (Ibatullin *et al.*, 2022). Mixed feed for all groups was manufactured from the same ingredients. However, due to the introduction of 0.5-1.5% of wormwood powder to obtain mixed feed of the same nutritional value in the control and experimental groups, the proportions of individual ingredients were changed using mathematical methods for optimising mixed feed formulations (Table 2).

Table 2. Composition of complete mixed feed for quail hens, % by weight

Ingredient	Group			
	1	2	3	4
	Content, %			
Soy cake	30.5	30.6	30.8	31.0
Corn	54.5	53.9	53.3	52.6
Fish flour	5.9	5.9	5.9	5.9
Premix KN 2.5%	2.5	2.5	2.5	2.5
Sunflower oil	0.6	0.6	0.6	0.6
Limestone flour	6.0	6.0	5.9	5.9
Wormwood powder	0	0.5	1.0	1.5

Source: developed by the authors

The chemical composition of the mixed feed used for feeding poultry was identical and differed only in the content of wormwood powder (Table 3). The addition of dry wormwood powder (*Artemisia capillaris*) to mixed feed was performed by weight dosing and multi-stage mixing according to the experimental scheme (Table 1). The birds were fed twice a day – in the morning and in the evening. Throughout the experiment, accurate records were kept of the feed consumed and the residues that remained

uneaten. In terms of chemical composition, all diets for poultry in all groups were identical and differed only in the content of wormwood (Table 3). Introduction of wormwood (*A. capillaris*) to the feed was carried out by weight dosing and multi-stage mixing, according to the experimental scheme (Table 1). Ready-made feed was distributed twice a day (morning and evening). Throughout the experiment, accurate records were kept of the feed consumed and the residues that remained uneaten.

Table 3. Energy and nutrient content in 1 kg of mixed feed for quail hens

Indicator	Content	Indicator	Content
Metabolic energy, kcal	2,850.0	Tryptophan, g	2.4
Crude fat, g	50.0	Arginine, g	12.2
Raw fibre, g	34.0	Calcium, g	28.0
Crude protein, g	210.0	Total phosphorus, g	8.0
Linoleic acid, g	21.7	Available phosphorus, g	5.2
Methionine, g	5.0	Sodium, g	1.8
Methionine+cystine, g	7.4	Vitamin A, MU	15,000
Lysine, g	10.9	Vitamin E, mg	20.0
Threonine, g	7.8	Vitamin D ₃ , MU	3,000

Source: developed by the authors

During the experiment, the safety of live-stock was monitored. Feed consumption was recorded: daily, weekly, and for the entire period of the experiment. Feed costs per 10 eggs and 1 kg of egg weight were calculated weekly and for the entire period of the experiment. The conditions of feeding, watering, housing, care, and disease prevention in the animals in the experiment were in accordance with European legislation on animal welfare and comfort (Council Directive 1999/74/EC; Council Directive 1998/58/EU; Council Directive 2010/63/EU).

Based on the daily accounting of egg production, the egg productivity of quails for the initial and average laying hens, and the intensity of egg production were calculated monthly and for the entire period of the experiment. The eggs were weighed on a Radwag PS 600.R2 scale with an accuracy of ± 0.01 g, in the last five days of each sub-period of the experiment. At the end of each month of the experiment, eggs were randomly selected to assess their quality by morphological indicators.

The egg shape index was defined as the ratio of the horizontal egg diameter to the vertical one (expressed in %), and the egg diameter was measured using a caliper. Shell thickness was measured with a micrometer in the following areas: in the equatorial part, blunt end, and tip with an accuracy of 0.01 mm, the relative weight of albumen, yolk, and shell was expressed as a

percentage of egg weight. The ratio of albumen weight to yolk weight was also calculated.

The chemical composition of the feed was determined by generally accepted methods:

- crude protein – according to the Kjeldahl method;
- raw fat – according to the S.V. Rushkovsky method;
- raw fibre – according to the Henneberg and Stoman method;
- amino acid content – using an automatic TTT 339 analyser with LG ANB cationite with SO₃ active groups
- mineral element content – using spectral analysis on an “ElvaX” X-ray fluorescence spectrometer.

• in egg yolks, the content of fatty acids was determined by lipid extraction using the Folch method (Folch *et al.*, 1957), followed by their hydrolysis to fatty acids and methylation of the latter. Fatty acid methyl esters were separated by gas chromatography on a Trace GC Ultra gas chromatograph (USA) with a flame ionisation detector. Identification of fatty acid methyl esters was performed by comparing the retention time of test samples with the retention time of a mixture of standard fatty acid methyl esters (FAME) Mix C14-C22 (Supelco).

Biometric processing of the data obtained in this study was performed using MS Excel 2016 using the built-in statistical functions. In

the process of processing experimental data, the following were calculated: M (arithmetic mean) and $\pm m$ (its error), P (significance level). The following symbols were used in the tables to indicate the significance level of the probability criterion (P): * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$ compared to control group 1.

Results and Discussion

According to the results obtained, it was found that different levels of *A. capillaris* in the diet of quails affected their egg productivity (Table 4). Thus, the gross egg harvest for 7 months

of the experiment on average for groups ranged from 8,563 to 9,038 eggs. The experimental groups outperformed the control group – by 2.6% (group 2), by 5.5% (group 3), and by 3.0% (group 4). Thus, an increase in the content of wormwood powder in the diet had a positive effect on productivity, and the gross egg yield was highest when 1.0% of the supplement was introduced into the diet. An increase in the amount of supplements in the diet of quails of group 4 to 1.5% resulted in a slight decrease in productivity compared to group 3, but was higher than in the control.

Table 4. Indicators of egg productivity of quails for 7 months of experiment

Indicators	Group			
	1	2	3	4
Gross egg collection, units:				
– for the entire experiment	8,563	8,785	9,038	8,823
– for a 30-day period	1,223.3 \pm 16.16	1,255.0 \pm 20.21	1,291.1 \pm 25.49*	1,260.4 \pm 20.84
Egg production for the initial quail hen, units:				
– total	142.7	146.4	150.6	147.1
– for a 30-day period	20.4 \pm 0.27	20.9 \pm 0.34	21.5 \pm 0.42*	21.0 \pm 0.35
Egg production per average quail hen, units:				
– total	164.9	167.7	171.0	168.9
– for a 30-day period	23.6 \pm 0.84	24.0 \pm 0.86	24.4 \pm 0.91	24.1 \pm 0.85
Egg production rate, %	78.5 \pm 2.81	79.9 \pm 2.88	81.4 \pm 3.04	80.4 \pm 2.83
Egg weight, g	11.06 \pm 0.080	11.39 \pm 0.119*	11.81 \pm 0.189**	11.80 \pm 0.162
Amount of egg mass, g				
– total	94,702.3	100,006.3	106,870.6	104,191.1
– for a 30-day period	13,528.9 \pm 168.80	14,286.6 \pm 216.36*	15,241.1 \pm 322.94**	14,884.4 \pm 213.71

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ compared to group 1

Source: developed by the authors

The gross egg harvest indicator averaged over the 30-day experiment period also shows the probability of changes obtained. Thus, the experimental groups outperformed the control by 2.6-5.5%. However, the highest rate was in poultry of experimental group 3, which outperformed the control by 5.5% ($p < 0.05$). Egg production for the initial quail for the entire period of the experiment was the highest in poultry of experimental group 3 – by 8 eggs, groups 2 and 4 also outperformed the control, but less

significantly – by 4 eggs in group 2 and by 4 – in group 4. This indicator, calculated for a 30-day experiment period, shows that an increase in wormwood powder in mixed feed to 1.0% leads to an increase in egg production by 5.5% ($p < 0.05$). Groups 2 and 4 also outperformed the control by 2.5 and 2.9%, respectively, but they lagged behind the indicator of group 3.

Egg production on an average quail is an indicator of egg productivity of poultry, considering its integrity. The data obtained indicate

that egg production per average quail increased in proportion to the increase in the content of wormwood powder in feed. However, this indicator was highest in poultry of experimental group 3. They outperformed the control by 6 eggs, or 3.7%. Quails of groups 2 and 4 outperformed the control group less significantly – by 3 and 4 eggs, respectively, or by 1.7 and 2.4%. This figure calculated over a 30-day period shows that this advantage was statistically unlikely in all study groups. Poultry of experimental group 3 outperformed the control by 3.4%. Egg production for the average quail was higher than the control in quails of groups 2 and 4, respectively, by 1.7 and 2.1%.

According to the degree of productivity of quails that consumed mixed feed with the addition of wormwood powder, an excess of 1.4–2.9% over the control group was found. In the group 3, this indicator was the highest among all groups. The effect of introducing wormwood powder into mixed feed also affected the weight of eggs, where an increase in this indicator was observed with an increase in the content of the drug in the feed. For example, quails that consumed mixed feed with 0.5% of wormwood powder showed a higher egg weight of 0.33 g or 3.0% compared to the control group ($p < 0.05$). An increase in the drug content to 1.0% led to a further increase in egg weight in group 3 by 0.75 g or 6.8% ($p < 0.01$).

Although an increase in the content of the drug in mixed feed to 1.5% led to a slight decrease in egg weight compared to group 3, and the advantage over the control was 0.74 g or 6.7%.

The amount of egg mass obtained from experimental quails is the most objective indicator of their productivity. This figure was the highest in experimental group 3 – 106.871 kg. They outperformed the control by 12,168 kg, or 12.8%. Quails in groups 2 and 4 outperformed the control group by 5.3 and 9.5 kg or 5.6 and 10.0%, respectively. This indicator calculated for the 30-day period of the experiment showed the advantage of quails of experimental group 3 over the control by 12.8% ($p < 0.01$). Poultry of experimental group 2 also significantly exceeded the control – by 5.6% ($p < 0.05$). The advantage of quails of experimental group 4 was no less substantial, but not statistically significant, they exceeded the control by 10.0%.

Analysis of the morphological composition of experimental quail eggs is shown in Table 5. The absolute weight of egg yolk significantly increased in all experimental groups. Thus, quails of experimental groups 2, 3, and 4 outperformed the control, respectively, by 4.8% ($p < 0.05$); 10.2% ($p < 0.001$), and 9.9% ($p < 0.001$). The weight of egg albumen in experimental group 3 increased most significantly – this correlates with the highest egg weight in poultry of this group.

Table 5. Morphological composition of experimental quail eggs

Group	Absolute weight, g			Shell thickness, mm	Form index, %
	Yolk	Albumen	Shell		
1	3.32±0.030	6.12±0.016	1.62±0.032	26.3±0.06	80.9±0.20
2	3.48±0.046*	6.28±0.050*	1.63±0.027	26.4±0.15	80.0±0.08*
3	3.66±0.058***	6.51±0.111*	1.64±0.033	26.0±0.16	75.9±0.09***
4	3.65±0.069***	6.52±0.113*	1.64±0.030	26.0±0.06***	76.1±0.18***

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ compared to group 1

Source: developed by the authors

The absolute weight of egg albumen also increased, but less significantly. It was highest among quails of experimental group 4. They outperformed the control by 6.5% ($p < 0.05$).

The absolute weight of egg albumen in experimental group 2 was also 2.6% higher than the control ($p < 0.05$). This indicator in experimental group 3 was higher than the control – by 6.4%

($p < 0.05$). The absolute weight of eggshells was inversely proportional to their total. This indicator was lowest in quails of the control group, by 0.6% compared to group 2 and by 1.2% compared to groups 3 and 4. Eggshell thickness was lower in quails of experimental groups 3 and 4 – by 1.1% ($p < 0.001$). This indicator in experimental group 2 was higher than the control by 0.4%. Usually, the shape index increases with increasing egg weight and increasing their transverse diameter (rounding), but in this case, the opposite phenomenon of decreasing egg shape index can be observed. Thus, in quails of experimental groups, it decreased by 0.9-5.0% ($p < 0.001$).

The fatty acid content of quail egg yolk is shown in Table 6. In terms of palmitic acid content, poultry of experimental groups 3 and 4 were 1.51-1.59% superior ($p < 0.05$) to the control group. In the yolks of poultry of experimental

group 3, the content of stearic acid was higher ($p < 0.05$) by 0.35%. As for the content of oleic acid, poultry of experimental groups 2, 3, and 4 were 3.38-6.07% superior ($p < 0.05$) to analogues of the control group. According to the content of linoleic acid in the yolks of poultry of experimental group 4, the control group prevailed by 0.48% ($p < 0.05$). In the yolks of poultry of experimental groups 3 and 4, the content of linolenic acid was higher by 0.06-0.08% ($p < 0.05$). In terms of eicosanoic acid content, poultry of experimental groups 3 and 4 were 0.01-0.02% superior ($p < 0.05$) to the control group. Regarding the content of arachidonic acid in egg yolks, group 3 poultry was 0.24% ($p < 0.05$) and group 4 poultry was 0.50% ($p < 0.01$) higher than the control analogues. There was no statistically significant difference in the content of other fatty acids.

Table 6. Fatty acid content in quail egg yolk, %

Acid	Group			
	1	2	3	4
Myristic (C _{14:0})	0.38±0.009	0.38±0.008	0.38±0.008	0.37±0.007
Myristoleic (C _{14:1})	0.04±0.012	0.05±0.013	0.05±0.010	0.06±0.011
Pentadecylic (C _{15:0})	0.10±0.013	0.10±0.012	0.09±0.013	0.09±0.011
Palmitic (C _{16:0})	20.64±0.533	20.71±0.475	22.15±0.528*	22.23±0.478*
Palmitoleic (C _{16:1})	3.26±0.095	3.31±0.089	3.46±0.086	3.42±0.088
Heptadecanoic (C _{17:0})	0.15±0.025	0.18±0.033	0.20±0.033	0.12±0.025
Stearic (C _{18:0})	9.88±0.124	9.84±0.183	10.23±0.116*	9.67±0.205
Oleic (C _{18:1})	43.54±1.110	46.92±1.122*	47.12±1.177*	49.61±1.012*
Linoleic (C _{18:2})	11.92±0.253	11.56±0.235	11.66±0.213	12.40±0.350*
Linolenic (C _{18:3})	0.46±0.012	0.48±0.010	0.52±0.019*	0.54±0.015*
Eicosanoic (C _{20:0})	0.03±0.001	0.03±0.002	0.04±0.003*	0.05±0.003*
Icosanoic (C _{20:2})	0.02±0.007	0.02±0.006	0.02±0.008	0.02±0.006
Arachidonic (C _{20:4})	2.11±0.054	2.20±0.041	2.35±0.051*	2.61±0.046**
Docosapentaenoic (C _{22:5})	0.15±0.008	0.16±0.009	0.14±0.012	0.15±0.010
Docosahexaenoic (C _{22:6})	1.21±0.574	1.26±0.445	1.24±0.754	1.28±0.647

Notes: * $p < 0.05$; ** $p < 0.01$ compared to group 1

Source: developed by the authors

Relative weight indicators of egg components are shown in Table 7. The relative weight of egg yolk in quails from experimental groups increased by 0.6-1.0% ($p < 0.01$). The relative

weight of albumen practically did not change and was slightly lower in quails of the experimental groups by 0.4-0.6% compared to the control.

Table 7. Relative weight of egg components

Group	Relative weight, %			Yolk to albumen (weight ratio)
	Yolk	Albumen	Shell	
1 (n=20)	30.1±0.10	55.4±0.27	14.6±0.19	0.55±0.005
2 (n=20)	30.7±0.13*	54.9±0.20	14.4±0.08	0.57±0.006**
3 (n=20)	31.1±0.24**	54.9±0.31	14.0±0.15*	0.58±0.010*
4 (n=20)	31.1±0.28**	55.00±0.40	13.9±0.13**	0.57±0.011*

Notes: *p<0.05; **p<0.01; ***p<0.001 compared to group 1

Source: developed by the authors

The relative weight of the shell decreased in the experimental groups. This indicator was lowest in poultry of experimental group 4. Compared to the control, it was lower by 0.7% (p<0.01). In addition, the difference in this indicator was significant in experimental group 3 – 0.6% (p<0.05) below the control. In experimental group 2, the relative weight of eggshells was slightly and not significantly lower than the control group – by 0.2%. The ratio of yolk and albumen weight increased in quails of the experimental groups. It was higher than the control by 0.2-0.3% (p<0.01),

which correlates with absolute yolk and albumen weight values. Thus, according to the complex of indicators of egg productivity and egg quality, there is positive effect of introducing dry wormwood powder into the mixed feed of quail hens in the amount of 0.5-1.5%. However, these indicators were highest for the introduction of 1.0% of wormwood. Feed consumption per unit of production is the most important indicator that determines production efficiency (Table 8), especially in poultry farming, where feed costs can reach 90% of the production cost.

Table 8. Feed consumption per 10 eggs, kg

Month of experiment	Group			
	1	2	3	4
1	0.43	0.42	0.42	0.42
2	0.39	0.38	0.37	0.37
3	0.35	0.34	0.33	0.34
4	0.33	0.32	0.31	0.33
5	0.33	0.33	0.32	0.32
6	0.34	0.33	0.32	0.33
7	0.35	0.35	0.35	0.34
Average	0.36±0.014	0.35±0.014	0.35±0.014	0.35±0.014

Source: developed by the authors

Feed consumption decreased in quails of experimental groups along with an increase in the content of dry wormwood powder to 1.5%. Thus, during the 1st month of the experiment, this indicator in quails of experimental groups decreased by 2.3% in relation to the control. In the 2nd month of the experiment, feed consumption in quails of experimental group

2 decreased by 2.6%, and in poultry of experimental groups 3 and 4 – by 5.1%. In the following months, a similar trend continued – a decrease in feed consumption in the groups of poultry that consumed the drug under study. In the 3rd month of the experiment, the lowest feed consumption was in poultry of experimental group 3. This figure was 5.7% lower than the

control. In poultry of experimental groups 2 and 4, this indicator decreased by 2.9%.

At the 4th month of research, the indicative feed consumption per 10 eggs in quails of experimental group 3 was again the lowest – 0.31 kg. This figure was 6.1% lower than the control. In quails of experimental group 2, feed consumption was 3.0% lower. In poultry of experimental group 4, this indicator was at the control level. At the 5th month of research, the feed consumption rate decreased in poultry of experimental groups 3 and 4 – by 3.0%. Within 6 months, feed costs decreased in quails of all experimental groups, but they were the lowest in poultry of experimental group 3 – 5.9% less than the control. In poultry of groups 2 and 4, this indicator was 2.9% lower than the control. At the 7th month of research, feed consumption in quails of experimental groups 2 and 3 was at the control level and amounted to 0.35 kg/10 eggs. However, in quails of experimental group 4, this indicator was lower than the control by 2.9%. Analysis of the average feed costs for 10 eggs during the entire experiment shows that this indicator was equally lower in quails in all experimental groups, compared to the control group, by 2.9%.

The results of the conducted studies proved the positive effect of feeding quail hens with different contents of *Artemisia capillaris* on the indicators of their egg production, morphological composition of eggs, the content of fatty acids in the yolk, and feed consumption per unit of production. According to the conducted experiments, the poultry of the experimental groups in terms of egg productivity exceeded the control group by 2.6-5.5%, while the highest indicator was in the poultry of experimental group 3, which was fed 1.0% of wormwood grass powder. Recently, phytochemical substances, which are biologically active compounds, are increasingly attracting interest as feed additives, in particular in poultry farming, due to their ability to increase the efficiency of feed use by increasing the production of digestive secretions and improving the absorption of

nutrients, while reducing the pathogenic load in the intestines and reducing the load on the immune status of animals (Adbelli *et al.*, 2021). The literature contains data on the use of herbs and other components from wormwood (*Artemisia*) as phytochemical feed products in poultry feeding. The results obtained are consistent with the data of P. Remberg *et al.* (2004), according to which the use of oil from *Artemisia Herba* improved the productive qualities of chicken hens by increasing the secretory activity of the gastrointestinal tract. Similar data on increasing egg productivity of chickens, by almost 5.0%, was obtained when 2.0-3.0% of *Artemisia argyi* were included in their diet (Chen *et al.*, 2022; Zhou *et al.*, 2023). In addition, M.A. Al-Nuri (2012) also reported a positive effect of adding 0.25-0.50% of *Artemisia* powder on the productivity of broiler chickens.

Feeding quail with *Artemisia capillaris* led to an increase in the absolute mass of the shell. With an increase in the amount of wormwood in the diet, the shell weight increased in poultry of the experimental groups by 0.62-1.23% compared to the control, while quails of group 2 showed an increase in the shell thickness by 0.1 mm. This is consistent with the results of P. Baghban-Kanani *et al.* (2019) who report that feeding laying hens 5.0-7.5% of *Artemisia annua* increased the thickness of the shell and reduced the cholesterol content in the egg yolk. In addition, according to G. Cherian *et al.* (2013), E.A. Brisibe *et al.* (2009) *Artemisia annua* leaves have high concentrations of Ca, Mg, P, and S, which have a positive effect on the development of eggshells.

Feeding quail hens with different amounts of *Artemisia capillaris* affected the fatty acid content of egg yolk. The introduction of wormwood powder into the feed of quail hens led to an increase in the content of palmitic acid by 1.51-1.59%, stearic acid by 0.35%, oleic acid by 3.38-6.07%, linoleic acid by 0.48%, linolenic acid by 0.06-0.08%, eicosanoic acid by 0.01-0.02% and arachidonic acid by 0.24-0.50% compared to

the control a group. This is consistent with the findings of J. Chen *et al.* (2022), where is the introduction of 2.0% of *Artemisia argyi* in the diet of chicken hens caused a significant increase in the content of heptadecanic acid (C_{17:0}), eicosadienoic acid (C_{20:2}), docosahexaenoic acid (C_{22:6}), linolenic acid (C_{18:3}), linoleic acid (C_{18:2}) in the yolk, and when the level of *Artemisia argyi* increases up to 3%, the content of these acids no longer increased, but rather decreased. The obtained indicators are consistent with the findings of I.S. Carvalho *et al.* (2011), who examined the content of fatty acids in 13 species of *Artemisia*, in particular, *Artemisia capillaris*, and it was found that it contains palmitic (C_{16:0}), oleic (C_{18:1}), linoleic (C_{18:2}), and linolenic (C_{18:3}) fatty acids and traces of palmitoleic (C_{16:1}), stearic (C_{18:0}) and eicosanoic (C_{20:0}) fatty acids. As a result, an increase in the intake of these fatty acids in the body of quails with mixed feeds contributes to their direct transition to production, and to the egg yolk in particular. According to the data obtained by A. Saleh *et al.* (2021), the inclusion of paprika in the diet alone or in combination with carmoisin increased ($p < 0.05$) the content of linolenic and oleic fatty acids in the egg yolk of laying hens.

Feeding mixed feed with different levels of *Artemisia capillaris* to quail hens resulted in a reduction in feed consumption per 10 eggs during the entire experiment period. In general, for the entire period of the experiment, which lasted 210 days, the lowest feed consumption per 10 eggs was in quails that consumed mixed feed from 1.0% of *Artemisia capillaris*. Feed costs in this group were 2.9% lower than in the control analogues. Similar data was obtained on laying hens by N.H. Mansoub (2011) when feeding them *Artemisia annua*, explaining this fact by its antibacterial and antifungal action, which as a result leads to a decrease in the number of pathogenic microbes in the digestive system, an increase in immunity and productivity of chickens. Reducing feed consumption per unit of production depends on the type of phytobiotics

that are included in the poultry diet. Thus, in experiments on laying hens by N. Puvača *et al.* (2020), when introducing essential oil of *M. Alternifolia* into diets, there was a decrease in the feed conversion rate by 2.4-3.2%, while M. Bozkurt *et al.* (2014) did not notice differences in feed intake when feeding laying hens herbs thyme, oregano, rosemary, and turmeric. The same data was obtained S.R. Chowdhury *et al.* (2002) when feeding different doses of garlic. Moreover, the positive effect on productivity is conditioned by the chemical composition and nutritional value of wormwood, so in particular, the leaves of *Artemisia anna* contains more than 4,271 kcal/kg of gross energy, 27.0% crude protein, and >50% essential fatty acids.

Thus, the use of phytobiotics as feed agents depends on the type and form of the additive, and therefore, the study of the impact on the productive qualities of a certain group or species of animals is relevant, in particular today, when the requirements for the quality of final products have significantly increased. The data obtained as a result of the experiment proved a positive impact of *Artemisia capillaris* on egg productivity of quail hens, while improving the quantitative and qualitative indicators of products, and a decrease in feed conversion rates was proved.

Conclusions

The study found that the introduction of *Artemisia capillaris* dry powder into the composition of mixed feed of quail hens in the amount of 0.5-1.5% has a positive effect on their egg productivity, egg quality, and feed consumption per unit of production. It was revealed that the optimal level of wormwood powder in quail feed is 1.0%, although the results obtained for the introduction of 0.5 and 1.5% of the additive to complete poultry feed also had a positive effect on productivity and exceeded the indicators of the control group. When 1% of *Artemisia capillaris* was introduced into the quail diet, an increase in gross egg production was observed –

by 5.5% ($p < 0.05$), egg production per average and initial quail – by 5.5 and 3.7% ($p < 0.05$), egg production rate – by 2.9%, egg weight – by 6.8% ($p < 0.01$), and egg weight for the 30-day period of the experiment – by 12.8% ($p < 0.01$). Feed costs per 10 eggs at this level of wormwood in the feed are reduced by 2.9%. These facts on increasing productivity and reducing feed costs per unit of production are obtained due to the presence of biologically active substances in wormwood, which contribute to the release of digestive enzymes, activate digestion, and increase the digestibility of nutrients. There was also an increase in the relative weight of yolk by 3.3% ($p < 0.01$) in poultry that received 1.0% of *A. capillaris*, which increased its weight relative to albumen by 5.5% ($p < 0.01$). The presence of fatty acids in the composition of the supplement under study directly proportional to the increase in their content in egg yolks, where

an increase in the content of palmitic, stearic, oleic, linolenic, eicosanoic, and arachidonic fatty acids in egg yolk was noted by 0.01-6.07%. Therefore, given the positive effect of *Artemisia capillaris* powder on egg production and product quality of quails, it is advisable to conduct further research on the effect of wormwood on productivity and product quality in other species of animals and poultry.

Acknowledgements

The results are part of the research on the scientific topic: “Scientific substantiation of the parameters of the use of phytobiotics and their analogues in the feeding of farm animals” – state registration No. 0119U100826, which was funded by the state budget of Ukraine.

Conflict of Interest

None.

References

- [1] Abdelli, N., Solà-Oriol, D., & Pérez, J.F. (2021). Phytogetic feed additives in poultry: Achievements, prospective and challenges. *Animals*, 11(12), article number 3471. [doi: 10.3390/ani11123471](https://doi.org/10.3390/ani11123471).
- [2] Alagawany, M., Elnesr, S.S., Farag, M.R., Abd El-Hack, M.E., Barkat, R.A., Gabr, A.A., Foda, M.A., Noreldin, A.E., Khafaga, A.F., El-Sabrou, K., Elwan, H.A.M., Tiwari, R., Yattoo, M.I., Michalak, I., Di Cerbo, A., & Dhama, K. (2021). Potential role of important nutraceuticals in poultry performance and health – A comprehensive review. *Research in Veterinary Science*, 137, 9-29. [doi: 10.1016/j.rvsc.2021.04.009](https://doi.org/10.1016/j.rvsc.2021.04.009).
- [3] Al-Nouri, M.A. (2012). Effect of adding different concentrations of Nigella sativa and Artemisia Herba powder and their combination in the ration on productive performance of Broiler. *Anbar Journal Veterinary Science*, 5(2), 177-187.
- [4] Baghban-Kanani, P., Hosseintabar-Ghasemabad, B., Azimi-Youvalari, S., Seidavi, A., Ragni, M., Laudadio, V., & Tufarelli, V. (2019). Effects of using artemisia annua leaves, probiotic blend, and organic acids on performance, egg quality, blood biochemistry, and antioxidant status of laying hens. *The Journal of Poultry Science*, 56(2), 120-127. [doi: 10.2141/jpsa.0180050](https://doi.org/10.2141/jpsa.0180050).
- [5] Batiha, G.E.S., Olatunde, A., El-Mleeh, A., Hetta, H.F., Al-Rejaie, S., Alghamdi, S., Zahoor, M., Beshbishy, A.M., Murata, T., Zaragoza-Bastida, A., & Rivero-Perez, N. (2020). Bioactive compounds, pharmacological actions, and pharmacokinetics of wormwood (*Artemisia absinthium*). *Antibiotics*, 9(6), article number 353. [doi: 10.3390/antibiotics9060353](https://doi.org/10.3390/antibiotics9060353).
- [6] Borodina, O., Prokopa, I., & Rykovska, O. (2024). Strengthening the role of local agri-food systems in overcoming the consequences of using food as a weapon in Ukraine. *Ekonomika APK*, 31(1), 19-28. [doi: 10.32317/2221-1055.202401019](https://doi.org/10.32317/2221-1055.202401019).

- [7] Brisibe, E.A., Umoren, U.E., Brisibe, F., Magalhães, P.M., Ferreira, J.F., Luthria, D., Wu, X., & Prior, R.L. (2009). Nutritional characterization and antioxidant capacity of different tissues of *Artemisia annua* L. *Food Chemistry*, 115(4), 1240-1246. doi: [10.1016/j.foodchem.2009.01.033](https://doi.org/10.1016/j.foodchem.2009.01.033).
- [8] Carvalho, I.S., Teixeira, M.C., & Brodelius, M. (2011). Fatty acids profile of selected *Artemisia* spp. plants: Health promotion. *LWT – Food Science and Technology*, 44(1), 293-298. doi: [10.1016/j.lwt.2010.05.033](https://doi.org/10.1016/j.lwt.2010.05.033).
- [9] Chen, J., Chen, F., Peng, S., Ou, Y., He, B., Li, Y., & Lin, Q. (2022). Effects of *Artemisia argyi* powder on egg quality, antioxidant capacity, and intestinal development of roman laying hens. *Frontiers in Physiology*, 13, article number 902568. doi: [10.3389/fphys.2022.902568](https://doi.org/10.3389/fphys.2022.902568).
- [10] Cherian, G., Orr, A., Burke, I.C., & Pan, W. (2013). Feeding *Artemisia annua* alters digesta pH and muscle lipid oxidation products in broiler chickens. *Poultry Science*, 92(4), 1085-1090. doi: [10.3382/ps.2012-02752](https://doi.org/10.3382/ps.2012-02752).
- [11] Chowdhury, S.R., Chowdhury, S.D., & Smith, T.K. (2002). Effects of dietary garlic on cholesterol metabolism in laying hens. *Poultry Science*, 81(12), 1856-1862. doi: [10.1093/ps/81.12.1856](https://doi.org/10.1093/ps/81.12.1856).
- [12] Council Directive 1999/74/EC "On Laying Down Minimum Standards for the Protection of Laying Hens". (1999, July). Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31999L0074>.
- [13] Council Directive 1998/58/EU "On Concerning the Protection of Animals Kept for Farming Purposes". (1998, July). Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31998L0058&from=en>.
- [14] Council Directive 2010/63/EU "On the Protection of Animals used for Scientific Purposes". (2010, September). Retrieved from <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:276:0033:0079:en:PDF>.
- [15] Dos Santos, A.F.A., Da Silva, A.S., Galli, G.M., Paglia, E.B., Dacoreggio, M.V., Kempka, A.P., Souza, C.F., Baldissera, M.D., Da Rosa, G., & Boiago, M.M. (2020). Addition of yellow strawberry guava leaf extract in the diet of laying hens had antimicrobial and antioxidant effect capable of improving egg quality. *Biocatalysis and Agricultural Biotechnology*, 29, article number 101788. doi: [10.1016/j.bcab.2020.101788](https://doi.org/10.1016/j.bcab.2020.101788).
- [16] El-Sabrou, K., Khalifah, A., & Mishra, B. (2023). Application of botanical products as nutraceutical feed additives for improving poultry health and production. *Veterinary World*, 16(2), 369-379. doi: [10.14202/vetworld.2023.369-379](https://doi.org/10.14202/vetworld.2023.369-379).
- [17] Folch, J., Lees, M., & Stanley, G.H.S. (1957). A simple method for the isolation and purification of total lipids from animal tissues. *Journal of Biological Chemistry*, 226(1), 497-504. doi: [10.1016/S0021-9258\(18\)64849-5](https://doi.org/10.1016/S0021-9258(18)64849-5).
- [18] Hrytsyk, R.A., Struk, O.A., & Ivanochko, V.M. (2019). Investigation of the effect of *Artemisia* L. herb extracts on the progress of the toxic tetrachloromethane liver damage. *Medical and Clinical Chemistry*, 4, 147-155. doi: [10.11603/mcch.2410-681X.2019.v.i4.10851](https://doi.org/10.11603/mcch.2410-681X.2019.v.i4.10851).
- [19] Kulyk, A., Fokina-Mezentseva, K., Piankova, O., Sierova, L., & Slokva, M. (2023). Forecasting husbandry development using time series. *Scientific Horizons*, 26(11), 166-174. doi: [10.48077/scihor11.2023.166](https://doi.org/10.48077/scihor11.2023.166)
- [20] Liu, Z.P., Chao, J.R., Xu, P.T., Lv, H.Y., Ding, B.Y., Zhang, Z.F., Li, L.L., & Guo, S.S. (2023). *Lonicera flos* and *Cnicus japonicus* extracts improved egg quality partly by modulating antioxidant status, inflammatory-related cytokines and shell matrix protein expression of oviduct in laying hens. Retrieved from <https://www.sciencedirect.com/science/article/pii/S0032579123000858?via%3Dihub>.

- [21] Mansoub, N.H. (2011). [Evaluation of herbal plant on different parameters of laying hens](#). *Annals of Biological Research*, 2(5), 510-515.
- [22] Miao, Y., Luo, D., Zhao, T., Du, H., Liu, Z., Xu, Z., Guo, L., Chen, C., Peng, S., Li, J. X., Ma, L., Ning, G., Liu, D., & Huang, L. (2022). Genome sequencing reveals chromosome fusion and extensive expansion of genes related to secondary metabolism in *Artemisia argyi*. *Plant Biotechnology Journal*, 20(10), 1902-1915. doi: [10.1111/pbi.13870](#).
- [23] Puvača, N., Lika, E., Cocoli, S., Shtylla Kika, T., Bursić, V., Vuković, G., Tomaš Simin, M., Petrović, A., & Cara, M. (2020). Use of tea tree essential oil (*melaleuca alternifolia*) in laying hen's nutrition on performance and egg fatty acid profile as a promising sustainable organic agricultural tool. *Sustainability*, 12(8), article number 3420. doi: [10.3390/su12083420](#).
- [24] Remberg, P., Bjork, L., Hedner, T., & Sterner, O. (2004). Characteristics, clinical effect profile and tolerability of a nasal spray preparation of *Artemisia abrotanum* L. for allergic rhinitis. *Phytomedicine*, 11(1), 36-42. doi: [10.1078/0944-7113-00350](#).
- [25] Ryabokon, Y., Bratyshko, N., Horobets, A., & Prytulenko, O. (2005). *Recommendations for rationing of poultry feeding*. Kharkiv: Berky.
- [26] Shahini, E., Korzhenivska, N., Haibura, Yu., Niskhodovska, O., & Balla, I. (2023). Ukrainian agricultural production profitability issues. *Scientific Horizons*, 26(5), 123-136. doi: [10.48077/scihor5.2023.123](#).
- [27] Zhang, L., Xing, Y., Shi, L., Guo, S., Jin, X., Xu, Y., Yan, S., & Shi, B. (2022). The effects of dietary supplementation of *Artemisia argyi* polysaccharide on immune and antioxidative functions in broilers. *Journal of Applied Animal Research*, 50(1), 587-597. doi: [10.1080/09712119.2022.2119982](#).
- [28] Zhou, M., Zheng, L., Geng, T., Wang, Y., Peng, M., Hu, F., Zhao, J., & Wang, X. (2023). Effect of fermented *Artemisia argyi* on egg quality, nutrition, and flavor by gut bacterial mediation. *Animals*, 13(23), article number 3678. doi: [10.3390/ani13233678](#).

Вплив згодовування *Artemisia capillaris* на яєчну продуктивність та якість яєць перепелів

Михайло Юрійович Сичов

Доктор сільськогосподарських наук, професор
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
<https://orcid.org/0000-0002-6319-9876>

Дмитро Петрович Уманець

Кандидат сільськогосподарських наук, доцент
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
<https://orcid.org/0000-0002-1973-1132>

Іван Миколайович Баланчук

Кандидат сільськогосподарських наук, доцент
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
<https://orcid.org/0000-0002-7576-6508>

Руслана Миколаївна Уманець

Кандидат сільськогосподарських наук, доцент
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
<https://orcid.org/0000-0003-1483-2775>

Ігор Іванович Ільчук

Кандидат сільськогосподарських наук, доцент
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
<https://orcid.org/0000-0003-0961-6613>

Тетяна Анатоліївна Голубєва

Кандидат сільськогосподарських наук, доцент
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
<https://orcid.org/0000-0002-2467-5972>

Анотація. Все частіше постає питання використання в годівлі тварин безпечних, натуральних кормових добавок з метою забезпечення тварин біологічно-активними речовинами, зменшенням ризиків передачі хімічних речовин до кінцевого споживача через продукцію, їх накопиченням, а також для підвищення рівня продуктивності. Метою дослідження було визначення впливу *Artemisia capillaris* на яєчну продуктивність перепілок-несучок. Для проведення дослідів за принципом аналогів було сформовано 4 групи – контрольну та три дослідні, по 72 голови (♀60 + ♂12) у кожній. Впродовж дослідів, який тривав 210 діб, птицю годували повнораціонними збалансованими комбікормами, які мали однаковий хімічний склад і різнилися лише за вмістом досліджуваної добавки, яку вводили в комбікорми птиці 2-ї, 3-ї та 4-ї дослідних груп в кількості відповідно 0,5 %, 1,0 та 1,5 % від маси комбікорму. Введення сухого порошку полину у комбікорми перепілок-несучок в

кількості 0,5-1,5 % позитивно впливає на такі показники яєчної продуктивності як валовий збір яєць, який зростав в дослідних групах на 2,6-5,6 %, кількість яєчної маси збільшувалася на 5,6-12,9 %, при цьому витрати кормів зменшилися на 2,8 %. За якісними показниками яєць відмічали зростання абсолютної маси жовтка на 3,0-8,3 %, білка на 2,6-6,5 %, шкаралупи на 0,6-1,2 %, а також зменшення індексу яйця на 0,9-4,1 %. Згодовування птиці *A. Capillaris* призводить до підвищення вмісту пальмітинової, стеаринової, олеїнової, ліноленої, ейкозаної та арахідонової жирних кислот у яєчному жовтку на 0,01-6,07 %. Оптимальним рівнем введення *A. Capillaris* в раціон було визначено 1,0 % від загальної маси комбікорму, дана кількість позитивно впливала на вищеперераховані показники збільшуючи їх, що може бути використано за промислової технології виробництва яєць перепілок-несучок, а також при органічному виробництві продукції

Ключові слова: полин; перепілки-несучки; збереженість; маса яйця; жирні кислоти; конверсія корму