The using of natural fullerenes (shungites) in feeding of poultry of meat and eggs production

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Introduction

The new form of carbon existence - fullerenes, which was artificially synthesised in 1985, was found out subsequently in a rare natural material of black colour with the local name shungite. The unique large deposit of shungites is located at Onego Lake, on the northern coast of The Republic of Karelia (bordering on Finland) in an area of 22 thousand hectares. Its stocks are estimated approximately in 1 billion tons (Y.K.Kalinin, 2002). The mineral contains 30% of fulleren-like carbon, which has high activity in oxidative - reductive processes, and absorptive and catalytic properties.

Due to this shungites have begun to apply in many branches of an industry, the construction, agriculture, ecology and medicine (A.E. Bolgov et all., 2002).

Objectives

In submitted work we investigated possibilities and efficient uses of the natural Karelian shungites in poultry feeding for meat and eggs production.

Methods

The experiment was carried out during 3 months on the hens of Hysex Brown cross from 134 days age. The hens were contained in three-storey poultry cages, four to a cage. They were fed twice daily, and water was supplied by circulatory water distributor.

The groups were formed by a principle of analogues (table 1): according to origin, age, live weight, productivity and common development. The difference in average parameters of live weight was no more than 3 %. The egg's collection and feed distribution were made by hand during the experiment. Productivity was tested daily. The quality test of eggs was done every 2 days per one ten-day period. The control of live weight was made before the beginning and after ending of experiment.

Parameters of control

1. Recipes of the concentrated feeds and mixed feed for the control and experimental groups
2. Edibility of a feed in control days (2 days in ten-day period)
3. Control of presence and remains of shungites and dolomite (not less 1 time in one ten-day period)
4. The egg productivity of the hens, health of hens and removal of defective hens - daily
5. The egg productivity on phases of egg laying and at the end of the experiment
6. The eggs quality: weight, thickness of eggs shell. Number of defective eggs (checked and cracked)
7. Quality and action of drinking water after filtration through a shungite

Table 1

Scheme of experiments

Group	Hens number	Peculiarities of feeding
Control	20	High-grade concentrated feed (HCF) without inclusion of shungite
1st experimental	20	99% HCF + 1% shungite flour
2nd experimental	20	99% HCF + 1% shungite crumb (the size up to 1-2 mm)
3rd experimental	20	99% HCF + 1% shungite crumb (the size up to 3-4 mm)
4th experimental	20	99% HCF + 1% dolomite
5th experimental	20	99% HCF + 0,5% shungite + 0,5% dolomite

Total amount of poultry in experiment is 4120 heads

Results

It was established, that the additive of shungite and dolomite in a ration increased eggs laying of hens in Hysex Brown cross on 3-29 % (table 2). The hens, which received shungite and dolomite, had egg weight on the average 50,3-51,6 g, in control group - 48,8 g. (table 3).

Table 2

Productivity of the laying hens of Hysex Brown cross during experiment (duration of feeding by complete norm of the additive is 80 days)

Group	Average hens number	Eggs, on the average for one hen	
		number	% to control group
Control	19,18	53,7	100
1st experimental	19,18	60,19	112,1
2nd experimental	19,18	67,78	126,2
3rd experimental	20	54,33	101,2
4th experimental	19,18	65,74	122,4
5th experimental	19,18	65,53	122,03

Table 3

Egg weight of hens of Hysex Brown cross in an initial cycle of egg laying

Periods of control	Ten day week of control	Control group	Experimental groups					Standard of egg weight for cross
			1st	2nd	3rd	4th	5th	
		X±m	X±m	X±m	X±m	X±m	X±m	
Before inclusion of feed additives	1	41,2±0,38	42,2±0,53	41.5±0,42	41,9±0,39	* 42,8±0,53	41,9±0,41	46
Experimental period	2	48,8±0,37	*** 50,7±0,33	*** 51,6±0,41	* 50,0±0,41	*** 51,0±0,42	** 50,3±0,41	52
	3	51,6±0,46	** 53,6±0,51	* 52,9±0,29	51,3±0,40	** 53,1±0,31	52,4±0,43	53
	4	53,4±1,20	** 56,0±0,50	55,1±0,79	53,9±0,54	55,8±0,75	55.7±0,49	54,8 - 56
	5	56,2±0,54	57,0±0,25	57,4±0,32	56,0±0,27	57,4±0,44	57,2±0,62	56,7 - 58
	6	59,8±0,61	** 63,7±1,10	61,1±0.75	58,9±1,30	62,9±1,79	63,0±1,54	60,4
Final period	7	59,5±1,17	60,4±0,63	59,6±0,78	59,4±0,72	59,9±0,39	60,6±1,06	61

Footnote: * - P≤0,05 ** - P ≤0,01 *** - P ≤ 0,001

The hens receiving the small fraction of the mineral had the greatest egg weight. For an example, during experiment the egg weight of hens, which consumed shungite flour, was increased from 42,2 g up to 63,7 g, in control group - from 41,2 g up to 59,9 g ($P \leq 0,01$ - $P \leq 0,001$).

The using of mineral additives in amount 1 % to weight of a fodder resulted in increase of thickness of eggs shells on 6,7-8,2 % ($P \leq 0,001$) in comparison with control group. In egg shells of the experimental groups the calcium contents was more on 2,35-2,52 %, than in egg shells of control group (table 4).

Table 4

Thickness of egg shells of hens Hysex Brown cross in control and experimental groups

Periods of experiment	Control group	Experimental groups				
		1st	2nd	3rd	4th	5th
		1% shungite flour	1% shungite crumb, size of grist 1-2 mm	1% shungite crumb, size of grist 3-4 mm	1% dolomite, size of grist 2-3 mm	0,5% shungite + 0,5% dolomite, size of grist 1-3 mm
	X ± m	X ± m	X ± m	X ± m	X ± m	X ± m
The preliminary	0,342 ± 0,002	0,341 ± 0,001	0,342 ± 0.002	0,342 ± 0,002	0,345 ± 0,002	0,343 ± 0,001
In 46 days after inclusion shungite and dolomite in a ration	0,342 ± 0,002	*** 0,364 ± 0,002	*** 0,366 ± 0,002	*** 0,341 ± 0,001	*** 0,365 ± 0,001	*** 0,370 ± 0,001
The final period, in 10 days after transfer of poultry on the basic ration	0,327 ± 0,001	*** 0,349 ± 0,001	*** 0,359 ± 0,003	*** 0,351 ± 0,002	** 0,342 ± 0,004	*** 0,355 ± 0,003

Footnote: * - $P \leq 0,05$ ** - $P \leq 0,01$ *** - $P \leq 0,001$

The using of drinking water after filtration through a shungite resulted in increase of eggs weight on 2,4 g ($P<0,01$).

Expenditure of feed for process of eggs development in groups of the hens consuming shungite and dolomite, was lower, than in control group 18,8-22,3 %.

The minimal expenses of feed for a unit of production are registered in group of hens receiving shungite and dolomite crumbs by size 1-2 mm.

The additives of shungites in a ration of broilers in amount 1% and 1,5 % to weight of the basic feeds had positive influence on poultry safety, gain of live weight from 8,8 -9,0 % (1% shungite) up to 5,0-5,3 % (1,5% shungite) and weight before the slaughter from 7,1-7,2 % up to 3,7-4,1 % accordingly. The weight of drawn and half-drawn carcasses of tested broilers were higher on 12,0-13,1%, and the expenses of feeds for 1 kg of gaining weight was lower on 10,8%.

Shungite did not have a negative influence on the physiology of broiler-chickens and hens, but it was the reason for vitamins A and E increasing and common protein in blood (especially gamma globulin), the improving of energy and mineral exchanges.

Conclusions

The additives of Karelian shungite and dolomite in a ration of hens of Hysex Brown cross have caused increase of feeds consumption level, health of poultry, egg quality, payment of feed by production. In meat poultry these additives result in increase of growth intensity, improvement of meat quality and feed economy.