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EFFECTS OF PHYTOGENIC ADDITIVE ON PRODUCTION AND QUALITY OF TABLE EGGS IN EARLY STAGE OF LAYING CYCLE

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Abstract: The aim of this paper is to present results achieved by adding dietary phytogenic additive (Biomin® P.E.P. 125 poultry) on production and quality of table eggs in the early stages of laying period in commercial Hy Line Brown hens. The experiment was conducted from 16 to 28 weeks of hens age. During the experimental period the following parameters were determined every week : egg production, percentage of second grade eggs and egg weight. The examination of egg quality was conducted at 21, 24, 26 and 28 weeks of hens age. Based on the obtained results we can conclude that the addition of dietary phytogenic additive induced an increase in egg production and egg weight and reduced the percentage of second grade eggs. Significant effects of phytogenic additive on some egg quality parameters were not established.

Key words: phytogenics, laying hens, performance, egg quality

Introduction

Intensive egg production, after a complete ban or restricted use of antibiotic growth promotors *(Castanon, 2007)*, imposes a comprehensive researches about their replacement with additives that on acceptable way increase production performance, maintain animal health and not create harmful residues in food. One of the possible alternatives are phytogenic additives, which are specially prepared parts of plants or their extracts containing active ingredients *(Lee et al., 2004, Windisch et al., 2009)*. Most research is focused on the evaluation of the effects of aromatic herbs and spices added in feed or water, because they contain a large number of substances with antimicrobial, antiviral and antioxidant activities *(Bölükbaşi and Erhan, 2007, Bölükbaşi et al., 2009)*. Digestive stimulation by phytogenic additives is achieved through stimulation of saliva secretion, liver

function, pancreas and intestine enzymes activities *(Platel and Srinivasan, 2004)*, intestine function and morphohistology *(Incharoen and Yamauchi, 2009, Perić et al., 2010)* and metabolism *(Zhou et al., 2009, Chowdhury et al., 2002)*.

The aim of this study was to investigate the effects of a commercial dietary phytogenic additive in laying hens nutrition on production parameters and table eggs quality.

Materials and Methods

The study was conducted in the experimental farm "Pustara", at Faculty of Agriculture in Novi Sad. A total of 360 commercial Hy Line Brown hens divided in two equal groups were used in this experiment. Each group consisted of six repetitions. One repetition consisted of 6 cages with 5 hens in standard tree-floor batteries, making a total of 30 hens.

Table 1. Composition and nutrient content of laying hens diet

Components, %	Pre-lay feed	Layer feed
Corn	57.32	44.46
Wheat middlings	6.00	7.00
Oil	/	2.00
Full fat soya (extruded)	6.51	15.63
Soyameal (44% CP)	11.64	9.54
Sunflower meal (33% CP)	9.5	9.00
Limestone	6.26	3.25
Ca particles	/	6.13
MCP	1.91	1.40
Salt	0.25	0.28
Sodium bicarbonate	0.15	0.10
L-lizin	0.07	0.05
DL Methionine	0.09	0.16
Premix	1.00	1.00
Nutrient content, calculated		
Crude protein (%)	16.5	18.00
ME MJ/kg	11.52	11.8
Lysine (%)	0.82	0.93
Methionine (%)	0.41	0.46
Calcium (%)	2.75	4.00
Available P (%)	0.40	0.44

Hens from both groups consumed a standard diet for pre-lay period (16-18 weeks of hens age) and a diet for laying period. Composition and nutritive value of diets are shown in Table 1. A phytogenic additive based on oregano, citrus and anise essential oils (Biomin® P.E.P. 125 poultry, Biomin GmbH, Herzogenburg,

Austria) was added to the feed for hens in the experimental group in the dosage of 0,125 kg/T of feed. Hens in the control group consumed feed without the additive. The experiment lasted from 16 to 28 weeks of hens age.

Egg production, percentage of second grade eggs and egg weight were determined every week. The egg quality was evaluated at 21, 24, 26 and 28 weeks of age. The following egg quality parameters were determined: egg weight, shell cleaness, shell weight, shell thickness, shell breaking force, albumen height and yolk colour. Shell cleaness was assessed by points on a scale from 1 (very dirty) to 5 (completely clean). Shell breaking force was determined by the instrument Egg Force Reader (Orka Food Technology Ltd, Israel). Yolk colour was determined using the Roche fan. Albumen height was measured with a tripod micrometer. On the basis of data on egg weigth (M) and albumen height (H), Haugh units were calculated according to formula $HJ=100\log(H+7.57-1.7M^{0.37})$. Albumen height in measurements for 26 week was not determined, due to technical reasons, and this parameter and Haugh units are not shown.

Statistical analysis was performed using GLM MANOVA and LSD *post hoc* test, with statistical software Statistica 8 *(StatSoft, 2009)*.

Results and Discussion

Table 2 presents the results of egg production in the period from 19 to 28 weeks of hens age.

Table 2. Production parameters and average egg weight

Parameter	Treatments		Significance
	Control	Phytogenic	
Number of eggs per housed laying hen	48.04	48.15	NS
Number of eggs per average hen	48.58	49.25	NS
Percentage of second grade eggs	4.02[a]	3.34[b]	0.05*
Egg weight (g)	59.32[b]	60.52[a]	0.0001**

[a b] Values within rows with no common superscript are significantly different.
*P<0.05; **P<0.01; NS - not significant

Positive effect of the phytogenic additive on egg production are reflected in increased number of eggs per housed and average hen, however these differences were not statistically significant. Differences in laying percentage in favor of the experimental group were statistically significant (P<0.05) in the period from 22 to 24 weeks of hens age. Analysis of the obtained results clearly showed significantly (P<0.05) lower percentage of second grade eggs in hens fed the phytogenic additive.

Findings of other authors *(Al-Harthi et al., 2009; Zhou et al., 2009; Çabuk et al., 2006)* confirmed increased laying percentage, while researchers such as *Florou-Panera et al. (2006)*, *Chowdhury et al. (2005)* did not find a significant increase when phytogenic feed additives were used.

The average egg weight (Table 3) was significantly higher (P=0,0001)in the experimental group, which is in agreement with findings obtained by *Florou-Panera et al. (2006)*, *Bölükbaşi and Erhan (2007), Bölükbaşi et al. (2009)*. In their studies addition of phytogenic additives had a positive effect on egg weight. The differences in results of added phytogenic additives usually are attributed to the great diversity of applied treatments (plant species, vegetation period, method of preparation and applications) and different experimental conditions *(Perić et al., 2009)*.

Table 3. The parameters of egg quality

Weeks of age	Treatment	Egg weight (g)	Cleanliness	Shell breaking force (kg)	Shell thickness (0.01 mm)	Shell weight (g)	Shell weight (%)	Albumen height (mm)	Yolk colour (Roche)	Haugh unit
21	A	52.67	4.72	3.22	34.21	5.66	10.79[a]	10.68	11.97	103.49
	B	53.64	4.73	3.23	34.09	5.56	10.29[b]	10.59	11.79	102.92
22	A	60.62	4.87	3.15[a]	35.25[a]	6.65	10.98	10.46	12.78	101.02
	B	61.32	4.80	2.80[b]	34.65[b]	6.59	10.75	10.27	12.72	99.81
26	A	63.18	4.85	2.82	33.43	6.45	10.25	-	10.17	-
	B	63.83	4.90	2.82	34.20	6.55	10.27	-	10.52	-
28	A	64.26	4.88	2.74	35.38	6.93[a]	10.81[a]	9.85	11.59	97.18
	B	64.98	4.85	2.83	36.33	7.23[b]	11.15[b]	9.58	11.78	94.94

A - control, B - phytogenic additive

[a b] Values within raws with no common superscript are significantly different (P<0.05)

Significant effects of a phytogenic additive on egg quality parameters were not established (Table 3). There was a certain decrease in shell breaking force and shell thickness of the eggs from the experimental group in week 22, but this effect was not repeated in other measurements. In week 28 , the phytogenic additive showed a positive effect on shell weight, but a significant increase was not found in other measurements, and aforementioned effect cannot be considered as consistent. Other authors came to similar conclusions. Black cumin, according to the results of *Aydin et al. (2008)* improved shell thickness and shell breaking force. According to the results *Botsoglou et al. (2005)*, only the addition of saffron, but not rosemary and oregano, affected intensity of yolk colour, while Haugh units and shell

thickness were not affected by any of the examinated phytogenic additives. However mangrove leaf and spice mixtures increased Haugh units in a study of *Al-Harth et al. (2009)*. Rosemary *(Florou-Panera et al., 2006)*, oregano essential oil *(Florou-Panera et al., 2006)* and thyme *(Bölükbaşi and Erhan, 2007)* did not affect yolk colour and Haugh units.

Conclusion

A phytogenic feed additive based on oregano, citrus and anise aessential oils had a positive impact on production and egg weight. Also, the additive reduced percentage of second grade eggs. Significant effect on the basic parameters of egg quality were not established.

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Efekat fitogenog aditiva na proizvodnju i kvalitet konzumnih jaja u ranoj fazi nosivosti

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Rezime

U poslednjoj deceniji u tehnologiji proizvodnje konzumnih jaja usled pravno regulisanih zabrana i pritiska javnosti, došlo je do značajnih promena. Osim uvođenja novih sistema gajenja, umesto stimulatora na bazi antibiotika sve više se koriste prirodni stimulatori na bazi biljaka, kiselina, enzima i korisnih mikroorganizama. Cilj ovoga rada jeste da prikaže ostvarene rezultate primene fitogenog aditiva (Biomin® PEP 125 poultry) na proizvodnju i parametre kvaliteta konzumnih jaja u ranoj fazi nosivosti. Istraživanje je provedeno u periodu od 16. do 28. nedelje života kokoši provenijencije Hy Line brown. U toku ispitivanog perioda svake nedelje su određivani proizvodnja jaja, udeo jaja druge klase, prosečna masa jajeta. Određivanje osnovnih parametara kvaliteta jaja izvršeno je u 21., 24., 26. i 28. nedelji života nosilja. Na osnovu ostvarenih rezultata može se konstatovati da je dodavanje fitogenog aditiva u hranu uticalo na povećanje nosivosti i mase jaja, te smanjenje udela jaja druge klase. Nije ustanovljen značajan uticaj fitogenog aditiva na kvalitet jaja.

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