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Original Paper

The effect of pumpkin and flaxseed oils on selected parameters of laying hens performance

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The aim of the study was to analyze the dietary effect of pumpkin and flaxseed oils on performance parameters of laying hens. Lohmann Brown Lite hens were randomly divided to three groups. Total 18 hens (6 per group) were monitored. Hens in control group (C) were fed by standard diet. First group (E1) was fed by feed mixture supplemented with pumpkin oil, and second group (E2) with flaxseed oil. Total were gained 244 eggs from C, 277 eggs from E1 and 228 eggs from E2. Average daily production was 4.84 eggs per day in control group, 5.31 eggs in first experimental group and 4.39 eggs in second experimental group. Average weight of eggs was 62.88 g in group with standard feed mixture, 64.62 g in group with pumpkin oil supplementation and 65.28 g in group with flaxseed oil supplementation. After oil supplementation, were significant (P <0.05) differences found in average egg´s weight. Between experimental groups significant difference wasn´t found (P >0.05). In egg´s production was significant (P <0.05) difference only between experimental groups.

Keywords: nutrition, additives, oils, eggs, laying

1. Introduction

Phytogenics are a relatively young class of feed additives and in recent years this feed additives have gained considerable attention in the feed industry. They are a wide variety of herbs, spices and their derived products and are mainly essential oils (Hashemi et al., 2010). Vegetable oils, also called essential or essential oils are aromatic, oily liquids obtained from plant material (flowers, buds, seeds, leaves, twigs, bark, herbs, wood, fruits and roots). It is a complex mixtures of different organic molecules – terpenes, alcohols, esters, aldehydes, ketones and phenols. In animals, in particular, promote the secretion of gastric juices, while operating on gut motility and improve the integrity of the intestinal lining. Some phytogenic extracts stimulate the olfactory receptors and taste buds, resulting in an increase in feed intake, increased production of endogenous enzymes and digestive juices, thereby improving nutrient digestibility of feed (Panda et al., 2009); they can affect reproductive parameters (Mangiagalli et al., 2010). Flax seed contains about 40 % oil, which can be used as part of feed mixture for poultry. Some varieties of flax are rich in linolenic acid, while the other in linoleic acid (Zelenka et al., 2008). In the flaxseed oil is only α-linolenic in bulk, which is a precursor of eicosapentaenoic acid and docosahexaenoic acid (Kralik et al., 2008). Seed contains 8–10 % water, 18–20 % protein, 22 % nitrogen free substances extracted, 9 % fiber and especially drying oils consist of triglycerides of three saturated acids –t palmitic (6.5 %), stearic (2.5 %), oil (22 %) and unsaturated acids – linoleic (15 % or 60 %) and alpha linolenic acid (up to 3 % or 54 %) (Prugar, 2008). Pumpkin seeds contain many valuable functional components and have been traditionally used for herbal, therapeutic as well as clinical applications. Seeds have been used as safe deworming and diuretic agents, and the seed oil as a nerve tonic (Younis et al., 2000). Pumpkin oil has strong antioxidant properties (Stevenson et al., 2007). Pumpkin seeds contain L-tryptophan, omega-6 and -3 fatty acids a very high concentration of vitamin E (Hashemi, 2013). Pumpkin seeds contain zinc and pumpkin peanuts to 54 % oil digestibility coefficient of 98.2 % (Kóňa et al., 2007). The objective of present work was to determine the effect of the two different diets on laying performance.

2. Material and methods

Experiment was realized in cooperation with the Department of Poultry Science and Small Husbandry. At 38 weeks of age, Lohmann Brown Lite hens were housed in three-floor cages (943,2 cm2 per hen), divided into three diets of groups (C-control, E1-pumpkin oil (3 %), E2-flaxseed oil (3 %)). There were housed six hens in one

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Table 1 Nutrient composition of feed mixture

Nutrients	Amount
Crude protein in g kg	min. 160
Crude fiber in g kg	min. 20
Crude fat in g kg	max. 90
Ash in g kg	min. 110
Lysine in g kg	min. 6.5
Methionine in g kg	min. 3.3
Ca in g kg	min. 27
P in g kg	min. 6
Na in g kg	min. 1
Fe in mg kg	75
Cu in mg kg	6
Zn in mg kg	25
Vitamin A in m.j. kg^{-1}	10000
Vitamin D 3 in m.j./kg^{-1}	2200
Phytase	290
Endox in mg kg	115

cage. Feed mixture was composed from wheat, corn, soybean meal, rapeseed meal, sunflower meal, animal fat, soybean oil, calcium carbonate, feed additives, sodium bicarbonate, monocalcium phosphate, sodium chloride and enzyme complex of phytase. The amount of nutrients is shown in Table 1. Laying hens in all groups received feed mixture *ad libitum*. During experiment, the light regime was 16 hours. The experiment lasted 52 days and during the whole period, the eggs were collected for analysis. Following parameters were laying intensity and egg´s weight. Whole egg was measured in grams using an electronic scale.

Differences between groups were analyzed with one-way analysis of variance (ANOVA) by using the statistical programme SPSS 20.0. Results were evaluated using Tukey test.

3. Results and discussion

Egg´s weight and egg´s production in diets containing pumpkin and flaxseed oil are presented in Table 2. There were significant differences (P <0.05) between control group and both experimental groups in weight of eggs. After oils supplementation was found a tendency (P >0.05) of higher average egg´s weight in E2 group (flaxseed oil supplementation). In egg´s production were found significant (P <0.05) differences only between

Table 2 Effect of oils addition on the weight and egg production

Group	Parameter		Week							
			1st	2nd	3rd	4th	5th	6th	7th	Total
C	weight in g	mean	63.47	62.35	63.74	64.01	62.17	60.71	63.42	62.88[a]
		S.D.	6.33	3.7	3.33	5.02	4.39	4.11	3.71	4.63
		CV in %	9.97	5.93	5.22	7.84	7.06	6.77	5.85	7.36
	production in pcs	mean	5.71	5.57	5.29	5.43	4.43	4.43	3	4.84[a]
		S.D.	0.49	0.53	0.76	0.53	1.51	1.27	1.15	1.28
		CV in %	8.58	9.51	14.37	9.76	34.09	28.67	38.33	26.45
E1	weight in g	mean	65.63	65.22	61.97	62.22	64.95	65.98	66.45	64.62[b]
		S.D.	6.18	4.41	6.92	3.32	4.02	4.37	3.59	5.1
		CV in %	9.42	6.76	11.17	5.34	6.19	6.62	5.40	7.89
	production in pcs	mean	5.57	5.43	5.43	4.86	5	5.43	5.43	5.31[ab]
		S.D.	0.53	0.79	0.79	1.21	0.82	0.53	0.53	0.77
		CV in %	9.52	14.55	14.55	24.9	16.4	9.76	9.76	14.5
E2	weight in g	mean	65.84	65.77	65.41	59.01	64.09	67.27	66.75	65.28[b]
		S.D.	3.27	2.71	4.71	4.75	3.44	3.42	2.18	4.04
		CV in %	4.97	4.12	7.2	8.5	5.36	5.08	3.27	6.19
	production in pcs	mean	5.57	5.14	3.71	3	3.86	4.57	4.86	4.39[ac]
		S.D.	0.53	0.69	1.6	0.58	1.07	0.53	1.07	1.22
		CV in %	9.52	13.42	43.13	19.33	27.72	11.59	22.02	27.79

S.D. – standard deviation, CV – coefficient of variance. Values with different superscripts in a column are significant at the 0.05 level

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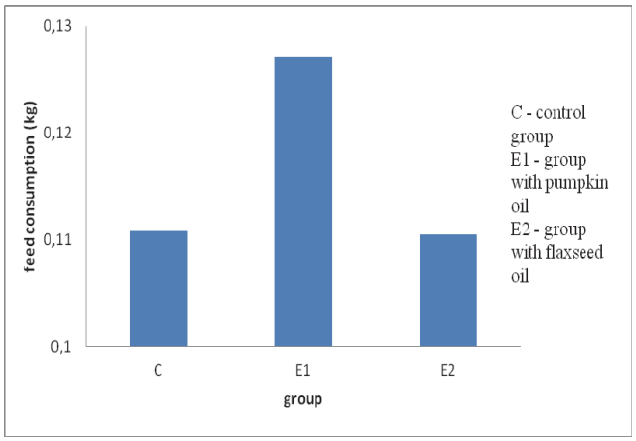

Figure 1 Daily feed consumption per laying hen

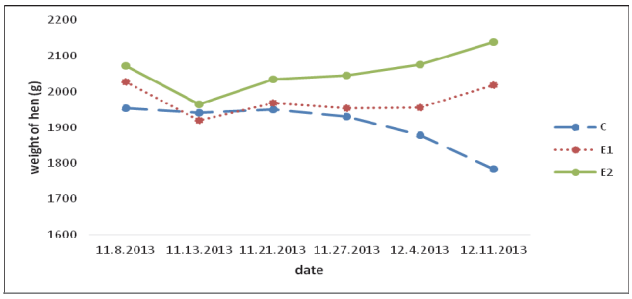

Figure 2 Comparison weight of laying hens

experimental groups. Addition of plant products had positive affect on the production of eggs (Akhtar et al., 2003 Yannakopoulos et al., 2005), egg weight (Aydin et al., 2006), or body weight (Denli et al., 2004). Other authors reported significant difference in performance indicators and quality of eggs between the control group and the groups with the addition of various plant products (Florou-Paneri et al., 2005). Plant products can affect sensory properties of eggs also (Parpinello et al., 2006). Garcia-Rebollar et al. (2008) published a noticeable impact of plant extracts addition on the sensory properties of eggs. Scheideler and Froning (1996) reported decreases in body weight and egg weight in birds fed flaxseed for 8 week. In other experiments Yang et al. (2003), Florou-Paneri (2005) added plant additives into mixture with any impact on rise of egg weight. Jiang et al. (1991) and Caston et al. (1994) reported no effect of flaxseed on egg production. Total feed consumption was 34.58 kg in control group, 39.67 kg in group with pumpkin oil supplementation and 34.47 kg in group with flaxseed oil supplementation. In weight of laying hens wasn't significant changes.

5. Conclusions

Pumpkin and flaxseed oils supplementation in feed mixtures of laying hens have a positive effect on the egg weight. Significantly ($P < 0.05$) higher average egg´s weight during experiment was found after dietary oils supplementation. Tendency ($P > 0.05$) of the highest egg´s weight was found after flaxseed oil supplementation.

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