Original paper

INVESTIGATION OF BLOOD PARAMETERS AND OVARIAN MORPHOLOGY OF LAYING HENS FEEDING *LAVANDULA STOECHAS* ESSENCE

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Abstract

The objective of this study was to evaluate the effects of different levels of *Lavander stoechas* essence on blood parameters and ovarian morphology of laying hens for 8 weeks. This experiment was conducted with 160 Hy-Line (W36) laying hens (30 wks of age) randomly divided into 4 experimental groups, 5 replicates and 8 birds per each (2 cages for each replicate and 4 birds in each cage). Treatments were control (without *Lavander* essence), and levels of 200, 400, and 600 *ppm Lavander* essence. All hens were provided the layer diets (2870 kcal/kg ME and 15.5 % CP) ad- libitum and received 16 h of light/ 8 h of dark. At the end of experiment, 2 birds of each replicate were randomly selected and blood samples were collected by brachial venipuncture. Serum was harvested by centrifugation and frozen for future analysis of plasma lipid. After that birds were killed by cervical dislocation for morphological assessments of ovaries. The weights of the oviduct, ovary, and stroma were recorded. The stroma weight comprised the ovarian tissue remaining after the large yellow follicles (LYF) were counted and removed. The number of small yellow follicles (SYF) and postovulatory follicles (POF) was recorded. Blood triglycerides, glucose and HDL were not affected by the treatments but by adding *Lavender* essence to the diet, cholesterol and LDL concentration decreased significantly in comparison with control diet ($p<0.05$). In addition, the levels of *Lavander* essence had no effect on the relative weight of the ovary, oviduct, stroma and number of SYF and POF. However, the levels of 200 and 400 ppm of *Lavender* caused significant increase of number and weight of LYF. The results showed that the addition of essence of *Lavender* up to 400 ppm increased weight and numbers of LYF.

Key words: *blood parameters, Lavender essence, ovary morphology*

Introduction

In the commercial egg type chicken industry profits depend on the cost and nutritive value of the feed. One of the promoting enhances productive performance of layers are antibiotics. Antibiotics have been used as a growth promoting substance. However, the using of antibiotics as feed additives is risky due to, not only cross-resistance, but also to multiple resistances in pathogens (Bach Knudsen, 2001; Schwarz et al., 2001). Consequently, the animal feed industry is under increasing consumer pressure to reduce the use of antibiotics as a feed additive and to find substitutes for antibiotics in the diet (Hertrampf, 2001; Humphrey et al., 2002). Many scientists have searched for alternatives to antibiotics (Langhout, 2000; Mellor, 2000; Wenk, 2000; Kamel, 2001). Recently, it has

been found that natural additives such as herbs and edible plants have some properties as growth enhancers to replace antibiotics. These additives are given to animals or birds to improve their physiological and productive performance. The antimicrobial effect of the medicinal plants is well documented (Valero and Salmeron, 2003). Lavander stoechas is a flowering plant in the family of *Lamiaceae*. The medicinal parts are the essential oil from the fresh flowers and/or the inflorescence, the flowers collected just before opening and dried, the fresh flowers and the dried flowers. Lavender oil has been reported to contain more than 100 components. The essential oil (1 to 3%) of *Lavandula* is rich in linalool and linalyl acetate. Further aroma components are β-ocimene, cineol, camphor and caryophyllene epoxide. Linalyl acetate is the major compound found in flowers. The plant also contains rosmarinic acid and coumarin. Since no information is available about the administration of *Lavandula* in laying hens diet, this experiment was conducted to investigate the effect of using Lavander stoechas as an additive on productive performance and egg quality of laying hens.

Material and methods

Birds and housing

One hundred and sixty Hy-Line (W36) laying hens (30 wks of age) were individually weighed and randomly housed in cages and allotted for four dietary treatment groups of five replicate and eight birds in each replicate for ten weeks (four birds in each cage and two cages for each replicate). Two weeks were for adaptation and eight weeks for sampling. The birds were maintained under commonly 16 h light:8 h dark cycle throughout the experimental period. Hen house temperature was 17-20°C during the experiment. Feed and water were offered ad-libitum. Treatments were basal diet (Corn-Soybean diet with 2870 kcal/kg ME and 15.5 % CP) and increasing levels of Lavander stoechas essence (200, 400 and 400 ppm) added to basal diet. The experimental diets were in mash form and formulated to meet or exceed NRC (1994) recommendations.

Data collected

At the end of the experiment, two birds of each replicate were selected and 10-mL blood sample was collected by brachial venipuncture. Serum was separated by centrifugation at 3000 g for 10 min, and stored at -20ºC until the time of analysis. Serum samples were analysed for glucose (glucoseoxidase method; Trinder, 1969), triglycerides (glycerol-3-phosphate-oxidase paraamino-phenazone GPO-PAP colourimetric enzymatic method; Trinder, 1969), total cholesterol (cholesterol-oxidase para-aminophenazone (CHOD-PAP) colouri-metric enzymatic method; Roeschlau et al., 1974), high-density lipoprotein (HDL), and low-density lipoprotein (LDL) (Zlatkis et al., 1953). At the end of the experiment, two birds from each replicate were killed by cervical dislocation and body weight was recorded. Then the birds were dissected, and weights of the oviduct, ovary, and stroma (ovarian tissue remaining after the LYF were counted and removed) were recorded. The LYF were counted, sorted by size (> 10 mm diameter) and individually weighted. The number of small yellow follicles (SYF) (5 to 10 mm diameter), large white follicles (LWF) (< 5 mm diameter) and postovulatory follicles (POF) on the stroma were recorded (Renema et al., 1999).

All the results were statistically analyzed by General Linear Models (GLM), one way analysis of variance, using SAS software (SAS Institute, 1999). Differences among the means were separated using Duncan's multiple range test (Duncan, 1955).

Results and discussion

Table 1. *Effects of treatments on blood parameters of laying hens*

Level of essence (ppm)	Glucose, mg/dL	Cholesterol, mg/dL	Triglycerides, mg/dL	LDL,[2] mg/dL	HDL,[1] mg/dL
0	193.38	146.0[a]	201.80	62.25[a]	45.4
200	191.23	90.6[b]	195.20	45.00[b]	46.8
400	194.54	130.2[ab]	189.00	51.50[b]	45.2
600	204.30	106.2[ab]	158.25	51.20[b]	43.6
SEM	3.32	7.18	9.90	1.50	0.88

[a,b] Column means with different superscripts differ significantly (P < 0.05); [1]High-density lipoprotein; [2]Low-density lipoprotein

As shown in Table 1, serum parameters such as glucose, triglycerides and HDL were not affected by the treatments (P>0.05). However, it was noted that the triglyceride values of the control group were numerically higher than those of the other treatments. Layers fed diets supplemented with *Lavandula* essence significantly (P<0.05) decreased total plasma cholesterol and LDL compared with those fed control diet (Table 1). Our results are in agreement with that reported by Abdalla et al. (2011) that showed that the addition of mixture of medicinal plants to layer diets decreased significantly total cholesterol compared to control group. El-Husseiny et al. (2002) also noticed that addition of fenugreek to broiler diet decreased significantly total cholesterol compared to control group. Moreover, El-Kaiaty et al. (2002) found that a fenugreek seeds extract containing steroid saponins induced hypocholesterolaemia. Such reduction is often related to the mode of action of fenugreek in bird metabolism, which includes competition with cholesterol at binding sites or interfere with the cholesterol biosynthesis in the liver. Hypocholesterolaemic effects of fenugreek are owing to increased conversion of hepatic cholesterol to bile salts due to the loss in the feces of complexes of these substances with fenugreek fiber and saponins.

Table 2. *Effects of treatments on reproductive morphometrics of laying hens*

Parameters	Level of essence (ppm)				
	0	200	400	600	SEM
Oviduct weight (g)	4.90	4.04	3.87	3.87	0.13
Ovary weight (g)	3.72	3.44	3.21	2.77	0.13
Stroma weight (g)	8.07	6.99	7.93	7.55	0.25
Number of SYF[1]	17.8	14.4	17.6	16.0	0.81
Number of LYF[2]	5.2[ab]	5.8[a]	5.7[a]	5.0[b]	0.1
Number of LWF[3]	38.6	41.8	36.6	42.2	2.15
Number of POF[4]	3.4	3.8	3.6	3.7	0.12
Total LYF weight (g)	39.38[ab]	46.08[a]	44.51[a]	32.85[b]	1.14

[a,b] Row means with different superscripts differ significantly (P < 0.05); [1]Small yellow follicle (5 to 10 mm diameter); [2]Large yellow follicle (>10 mm diameter); [3] Large white follicle (<5 mm diameter); [4]Postovulatory follicle.

Oviduct, ovary and stroma weights were not significantly affected by the treatments (P>0.05) (Table 2). However, the number of LYF and total LYF weight were significantly

affected by the treatments ($P<0.05$). There was an increase in the number of LYF and total LYF weight at levels of 200 and 400 *ppm* essence compared to the control and 600 *ppm*.

We found no study that shows the effect of *Lavandula* essence on reproductive morphometrics of laying hens in literature to compare our result. But Khazaei et al. (2011) reported significant increase in a total number of follicles by using *Foeniculum vulgare* compared to the control in female mice.

Conclusion

Lavandula essence supplementation in laying hen diets shows a significant positive effect on lipid parameters. Moreover, *Lavandula* essence supplementation in diet increased number of LYF and total LYF weight. The present study has elucidated the fact that *Lavandula* essence has a folliculogenesis effect in laying hens. But further studies are suggested for understanding the exact mechanism(s) underlying these actions and probable changes in hormonal levels.

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