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Effects of Fat Type on Performance, Some Egg Charecteristics and Egg Yolk Cholesterols of Laying Hens

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Abstract: The objective of this experiment was to determine the effect of fat type on hen performance, cholesterol level and some egg charecteristics. A total number of 75 Lohman white layers, with 36 week old weeks of age at the beginning of the experiment, was distributed in a completely randomized experimental desing into five treatments, with three replicates of 5 hens each. Fat type had no significant ($p>0.05$) effect on Final Body Weight (FBW), Feed Intake (FI) and Feed Conversion Ratio (FCR) of laying hens. The FBW of laying hens at the end of experiment ranged from 1586.67±21.53-1623.33±27.21 g. The FI and FCR of laying hens ranged from 124.48±0.29-126.66±0.11 and 2.14±0.02-2.28±0.04, respectively. The fat type also had no significant ($p>0.05$) effect on the external egg charecteristics. The egg weigth and shell weight ranged from 60.07-63.55 and 7.62-7.96 g, respectively. The egg shape index ranged from 74.00-75.00%. The fat type had significant ($p<0.001$) effect on the cholesterol level of egg of laying hens. The egg yolk cholesterol level and egg yolk fat content ranged from 211.89-248 mg and 32.87-36.02 g, respectively. Egg yolk cholesterol level and fat content of laying hen fed diet V was significantly ($p<0.001$) higher than those of laying hen fed other diets. It is likely to manipulate the chlosterol level of egg without changing external and internal egg quality charecteristics.

Key words: Laying hen, egg yolk cholesterol, soybean oil, sheep tail fat, internal egg characteristics, external egg characteristics

INTRODUCTION

Estabilishment of physiological role of cholesterol esters in the genesis of atherosclerosis has led to great interest in the cholesterol distrubution among different foods and factors affecting the cholesterol level (Zhang *et al*., 1999). Egg contains approximately 220 mg of cholesterol (Simopoulos, 2000). It was suggested that the chlolesterol level of egg may be effected by several factors such as the age of the hen, genotype, rearing system and diet and may be slowered by enviromental and nutritional manipulations (Hargis, 1988; Basmacioglu and Ergul, 2005). The objective of this experiment was to determine the effect of fat type on hen performance, cholesterol level and some egg charecters.

MATERIALS AND METHODS

A total number of 75 Lohman white layers, with 36 week old weeks of age at the beginning of the experiment, was distributed in a completely randomized experimental desing into five treatments, with three replicates of 5 hens each. Birds recived water and experimental diets (Table 1) ad libitum during the experimental period. The two eggs from each replicate were collected at 3, 5 and 7 week for analysis.

Table 1: Ingredients and chemical composition of experimental diets (as fed basis)

	Diets				
Ingredients (%)	I	II	III	IV	V
Maize	49.250	42.000	33.200	46.300	34.700
Wheat	16.000	8.000	5.000	5.400	7.000
Barley	0.000	6.000	8.000	5.300	8.100
Soybean meal	24.200	24.000	23.540	24.600	24.100
Wheat bran	0.000	6.650	14.000	5.000	9.800
Soyabean oil	0.000	3.000	6.000	0.000	0.000
Sheep tail fat	0.000	0.000	0.000	3.000	6.000
DCP	2.000	1.700	1.500	1.850	1.640
Ground limestone	8.000	8.10	8.200	8.000	8.100
Sodium chloride	0.250	0.250	0.250	0.250	0.250
DL-Methionine	0.050	0.050	0.060	0.050	0.060
Vitamin + Mineral premix*	0.250	0.250	0.250	0.250	0.250
Total, Kg	100.000	100.000	100.000	100.000	100.000
Composition					
Dry matter	89.040	89.420	90.110	90.000	89.130
Crude protein	17.030	17.020	17.000	17.010	17.010
ME	11.321	11.324	11.326	11.325	11.329
Crude fiber	2.970	3.240	3.750	3.300	3.480
Total calcium	3.520	3.500	3.500	3.500	3.490
Total phosphorus	0.710	0.690	0.700	0.700	0.700
Methionine	0.330	0.320	0.320	0.320	0.320
Lysine	0.850	0.850	0.850	0.860	0.860

*Vitamin premix (per 2.5 kg): 12000000 IU Vitamin A, 2400000 IU Vitamin D_3, 30000 mg Vitamin E, 2500 mg Vitamin K_3, 3 000 mg Vitamin B_1, 7000 mg Vitamin B_2, 40 000 mg Niacin, 8000 mg calcium-D-pantothenate, 4000 mg Vitamin B_6, 15 mg Vitamin B_{12}, 1000 mg folic acid, 45 mg D-biotin, 1500 mg canthaxantin, 500 mg Apocarotenoic asit ester, 125,000 mg colin chloride, 50,000 mg Vitamin C, 80,000 mg manganez, 80,000 mg Iron 60,000mg Zinc, 8000 mg Cupper, 200 mg cobalt, 500 mg Iod, 150 mg selenium ve 10000 mg antioxidant

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The performance characteristics of laying hens (feed intake, feed conversion ratio and egg yield), egg internal qualities (egg yolk weight, albumen index, egg yolk index, haugh unite, roche color value), eggs external quality (egg weigth, shell weigth, shell strength, eggshell thicknes and egg shape) were determined. Cholesterol level of egg yolk was calculated by the method of Boehringer Mannheim GmbH Biochemica.

Statistical analysis: One-way Analysis of Variance (ANOVA) was carried out to compare performance characteristics, egg internal qualities, eggs external qualities and cholesterol level of egg using General Linear Model of Statistica for Windows. Significance between individual means was identified using the Duncan multiple range test. Mean differences were considered significant at $p<0.05$.

RESULTS AND DISCUSSION

The effect of fat type on hen performance of laying hens is given in Table 2. As can be shown from Table 2 fat type had no significant ($p>0.05$) effect on the In W, FBW, FI and FCR of laying hens. The FBW of laying hens at the end of experiment ranged from 1586.67±21.53-1623.33±27.21 g. The FI and FCR of laying hens ranged from 124.48±0.29-126.66±0.11 and 2.14±0.02-2.28±0.04, respectively. The FI and FCR obtained in the current study were comparable with thoso obtained by Lee *et al.* (2001) who found that FI and FCR 110.62-112.56 g and 2.33-2.38, respectively. The egg yield (%) obtained in the current experiment was considerable higher than that obtained by Lee *et al.* (2001) who found that 0.766-0.797.

The effect of fat type on external egg charecteristics of laying hens are given in Table 3. The fat type had no significant ($p>0.05$) effect on the external egg charecteristics. The egg weigth and shell weight ranged from 60.07-63.55 and 7.62-7.96 g, respectively. The egg shape index ranged from 74.00-75.00%. The egg weight obtained in the current experiment was comparable with Lee *et al.* (2001) who found that egg weight ranged from 61.10-61.90 g. The shell weight and shell thickness obtained in the current experiment was comparable with finding of Wang and Pan (2003) who found that s shell weight and shell thickness were 5.77-5.96 g and 0.433-0.441 mm, respectively.

The effect of fat type on internal egg charecteristics of laying hens is given in Table 4. The fat type had no effect on the internal egg charecteristics. The egg yolk weigth ranged from 15.86-16.28 g. The albumen and eg yolk index ranged from 8.71-9.26 and 44.65-44.99%, respectively. Haugh unite and roche color value ranged from 80.72-84.29 and 8.46-9.96, respectively. The Haugh unite obtained in the current experiment was comparable with Lee *et al.* (2001) who found that haugh unite ranged from 70.64-72.52.

Table 2: The effect of fat type on hen performance of laying hens

	Diets				
Parameters	I	II	III	IV	V
In W	1472.00±17.76	1478.67±25.63	1432.00±19.30	1469.33±22.50	1453.33±19.49
FBW	1586.67±21.53	1623.33±27.21	1594.00±25.26	1616.00±22.06	1606.67±26.86
FI	124.48±0.29	126.66±0.11	126.01±0.79	126.58±0.35	125.00±0.68
FCR	2.14±0.02	2.14±0.06	2.20±0.00	2.20±0.05	2.28±0.04
Egg yield (%)	0.94±0.01	0.94±0.01	0.95±0.01	0.94±0.01	0.92±0.01

[abc]Row means with common superscript do not differ ($p>0.05$), In W: Initial Weigth (g) FBW: Final Body Weight (g), FI: Feed Intake (g/bird/day), FCR: Feed Conversion Ratio (g feed/egg weigth)

Table 3: The effect of fat type on external egg charecteristics of laying hens (n = 3)

	Diets				
Parameters	I	II	III	IV	V
Egg weight (g)	60.07±0.76	63.55±1.17	60.07±0.85	60.76±0.40	60.67±0.95
Shell weight (g)	7.88±0.12	7.96±0.06	7.62±0.16	7.75±0.20	7.81±0.09
Shell thickness (mm)	0.35±0.02	0.35±0.08	0.36±0.03	0.35±0.06	0.36±0.01
Shell strength (kg/cm^2)	2.33±0.20	2.62±0.12	2.47±0.12	2.62±0.14	2.67±0.14
Egg shape index (%)	74.00±0.00	74.00±0.00	75.00±0.01	75.00±0.00	74.00±0.00

Table 4: The effect of fat type on internal egg charecteristics of laying hens (n = 3)

	Diets				
Parameters	I	II	III	IV	V
Egg yolk weight (g)	15.86±0.18	16.22±0.26	15.99±0.23	16.28±0.12	16.20±0.12
Albumen index (%)	9.00±0.11	8.85±0.07	8.71±0.16	9.15±0.20	9.26±0.24
Egg yolk index (%)	44.65±0.25	45.47±0.25	44.99±0.27	45.29±0.21	45.35±0.28
Haugh unite	80.72±3.52	83.40±0.52	82.59±0.91	84.29±0.64	84.28±0.79
Roche color value	8.46±0.12	9.25±0.17	9.42±0.18	9.63±0.17	9.96±0.23

Table 5: The effect of fat type on cholesterol level of egg of laying hens (n = 3)

	Diets				
Parameters	I	II	III	IV	V
Egg yolk cholesterol level (mg egg^{-1})	211.89±06.26^{b}	211.91±04.94^{b}	209.66±03.96^{b}	223.32±05.91^{b}	248.22±00.60^{a}
Egg yolk fat content (%)	32.87±0.63^{d}	34.16±1.15^{c}	35.63±1.01^{ab}	35.54±0.95^{b}	36.02±1.03^{a}

The effect of fat type on cholesterol level of egg of laying hens is given in Table 5. The fat type had significant ($p<0.001$) effect on the cholesterol level of egg of laying hens. Egg yolk cholesterol level and fat content of laying hen fed diet V was significantly ($p<0.001$) higher than those of laying hen fed other diets. The egg yolk cholesterol level 211.89-248 mg. This result is comprable with findings of Basmacioglu and Ergul (2005) who found that the cholesterol level of eggs ranged from 191.2-203.2 mg, changing with genotype and rearing system.

CONCLUSION

Although, fat type had no significant effect on the external and internal egg quality charecteristics fat type had a significant effect on the egg yolk chlosterol level. As conclusion it is likely to manipulate the chlosterol level of egg without changing external and internal egg quality charecteristics.

REFERENCES

Basmacioglu, H. and M. Ergul, 2005. Resarch on the factors affecting cholesterol content and some other charecteristics of eggs in laying hens. Turk. J. Vet. Anim. Sci., 29: 157-164. http://journals.tubitak.gov.tr/veterinary/issues/vet-05-29-1/vet-29-1-26-0307-7.pdf.

Hargis, S.P., 1988. Modifiying egg yolk cholesterol in the domestic fowl: A review. World Poult. Sci., 44: 17-29. DOI: 10.1079/WPS19880002.

Lee, B.D., D.J. Kim and S.J. Lee, 2001. Nutritive and economic values of high oil corn in layer diet. Poult. Sci., 80 (11): 1527-1534. http://ps.fass.org/cgi/reprint/80/11/1527.

Simopoulos, A.P., 2000. Human requirement for N-3 polyunsaturated fatty acids. Poult. Sci., 79: 961-970. http://ps.fass.org/cgi/reprint/79/7/961.pdf.

Wang, J.J. and T.M. Pan, 2003. Effect of red mold rice supllements on serum and egg yolk cholesterol levels of laying hens. J. Agric. Food. Chem., 51: 4824-4829. http://ntur.lib.ntu.edu.tw/bitstream/246246/162667/1/12.pdf.

Zhang, R.Z., L. Long, S.T. Liu, R.M. Chen and P.F. Rao, 1999. An improved method of cholesterol determination in egg yolk by HPLC. J. Food Chem., 23: 351-361. http://www3.interscience.wiley.com/cgi-bin/fulltext/119071514/PDFSTART.