ajava

Asian Journal of Animal and Veterinary Advances

Academic Journals Inc.

www.academicjournals.com

Asian Journal of Animal and Veterinary Advances 4 (6): 337-341, 2009
ISSN 1683-9919

The Effects of Replacing Soybean Meal with Different Levels of Rapeseed Meal on Egg Quality Characteristics of Commercial Laying Hens

[1]S.R. Riyazi, [1]Y. Ebrahimnezhad, [1]K. Nazeradl, [1]N. Maheri-Sis,
[1]R. Salamatdust and [2]T. Vahdatpour
[1]Department of Animal Science, Islamic Azad University,
Shabestar Branch, Shabestar, Iran
[2]Young Researchers Club, Islamic Azad University,
Shabestar Branch, Shabestar, Iran

Abstract: One hundred and forty four of Hy-line (W-36) laying hens from the age of 44 to 56 weeks were used to evaluate the effects of replacing different levels of rapeseed meal with soybean meal on egg quality characteristics of commercial laying hens. The rapeseed meal was replaced with soybean meal at the levels of 0 (control), 5, 10 and 15% for 12 weeks. Hens were distributed in multi-observational completely randomized block design with 4 treatments, three replicates and 12 hens in each replicate. The parameters used to assess were haugh unit, shell thickness, shell weight, shell strength and yolk index. Results showed that addition of 10% rapeseed meal in diets increased ($p<0.05$) eggshell weight. With increasing of rapeseed meal level in diets, yolk index had showed decline ($p<0.05$). No specific trend was observed on the effect of rapeseed meal on haugh unit, shell thickness and shell strength, however these parameters were higher in groups that fed 10% rapeseed meal. We did not observe any health problems of the hens during the experiment.

Key words: Rapeseed meal, laying hens, egg qnality

INTRODUCTION

Rapeseed meal is a commouly used and economically effective feed ingredient in commercial layer diets. The crude protein content is range from 41 to 44% and considered to have a good amino acid profile when compared to other plant source (Newkirk *et al*., 1997). The use of rapeseed meal in poultry feeding is limited by presence of certain anti nutritional substances importantly glucosinolate, sinapine, tannins, erucic acid and phytates (Thanaseelaan *et al*., 2007). Glucosinolates and their hydrolytic products are commonly referred to as goitrogens (Kermanshahi and Abbasi Pour, 2006). Sinapine is a methylated substance that is converted into trimethylamine. Some brown egg birds do not have the ability to convert the trimethylamine to trimethylamine oxide, so it builds up in the blood and accumulates in egg, causing them to have fishy taste (Leeson and Summers, 1991). Kaminska (2003) reported that only 3.4% of Hy-line laying hens produced eggs with a fishy odour when they fed rapessed meal. Tannins are phenolic compounds that bind with various compounds, as the tannin content increased in rapeseed meal the digestibility of the protein and energy decreased in poultry (Bell, 1984). The presence of phytate in rapeseed meal causes phosphorus, calcium, protein and other nutrient deficiency syndromes in poultry (Sasyte *et al*., 2006). Lichovnikova *et al*. (2000) used extruded rapeseed in diets of laying hens and reported that the proportion of rapeseed did not affect the eggshell strength, eggshell thickness and haugh unit. Kaminska (2003) used two form of rapeseed meal (regular and fractionated) and reported no effect on laying rate parameters of egg and eggshell quality. Najib and Al-Khateeb (2004) evaluated canola seeds at inclusion rates of 0, 5, 10, 20 and 30%

Corresponding Author: Seyyed Reza Riyazi, Department of Animal Science, Islamic Azad University, Shabestar Branch, Shabestar, Iran Tel: 00989144106535

in layer diets and observed high percentage of canola seeds cause significant improve in specific gravity, haugh unit and yolk index of the eggs. Summers *et al*. (1988) reported that egg size was reduced in laying hens fed 10% canola meal. They suggested that reduced feed intake or more specifically, reduced energy intake, may account for smaller egg size. Casartelli *et al*. (2007) suggested that canola meal can be included in laying hens diets until 8% without decrease performance and eggshell quality. Shen *et al*. (1993) showed that if the seeds were finely ground or steam pelleted, good results with up to 20% whole canola seed could be expected. The goal of this research is to investigate the effect of replacing soybean meal with rapeseed meal as a protein source on egg quality of laying hens and also determine the proper level of rapeseed meal in ration and try to decrease total cost of diets.

MATERIALS AND METHODS

Experiment was conducted with 144 Hy-line (W-36) commercial laying hens over a 3 months period. This study carried out at Islamic Azad University, Shabestar Branch, Shabestar-Iran in summer 2006. When the experiment starts, layers were on 44 week of age. Experiment was performed in multi-observational completely randomized block design and laying hens distributed randomly to 4 treatments with 3 replication and 12 hens in each replicate.

The 4 experiment diets were: (A) control group, (B) control group+5% rapeseed meal, (C) control group+10% rapeseed meal and (D) control group+15% rapeseed meal as replacements of soybean meal.

The chemical analysis of the rapeseed meal used in this study is presented in Table 1. The composition of the diets was adjusted to the respective requirements of the National Research Council (1994). Water and feed were provided *ad libitum*. The ingredients of diets are showed in Table 2. This experiment was done in six periods, each 15 days sequential period. In order to evaluate the condition of flock, first data collecting supplied in one month before starting the experiment and it was found that there were no differences in performance of treatments before the experiment. In experimental period every 15 day the characteristics of egg shell such as haugh unit, eggshell thickness, eggshell weight, eggshell strength and yolk index were assessed. Haugh unit was calculated using the HU formula (Roberts, 2004) based on the height of albumen determined by micrometer. Eggshell thickness was a mean value of measurements at three locations on the egg (air cell, equator and sharp end) by using eggshell thickness meter (OGAWA SEIKI CO. LTD., 3RD EDN., OSK, 13469). For estimation weight of eggshell, at first, the egg extracted contents then the eggshell dried in fresh air for 48 h and finally weighted. The strength of eggshells was measured manually by a destructive method with an eggshell intensity meter. Eggs were compressed between two parallel plates by a steadily increasing load until the rupture occurred. Yolk index was determined as a ratio of the yolk height to the yolk width.

Because of doing this research within six period of sampling we used, the period effect as an one a factor inside the model when the analysis of data done and because of no significant effects of period, all data of six period pooled together and into the designed model with General Linear Models (GLM) procedure of SAS (1993) software, was employed and significant differences between treatments were separated using Duncan's multiple range test (Duncan, 1955).

Table 1: The chemical composition of rapeseed meal

Composition	Value
ME (kcal kg^{-1})	2000.0
Crude protein (%)	35.0
Ether extract (%)	1.4
Ash (%)	4.7
Dry matter (%)	90.8
Moisture (%)	9.2
Av. phosphorus (%)	0.4
Calcium (%)	0.8

Table 2: The nutritional composition of dietary treatments

	Diets			
Ingredients	A	B	C	D
Corn	45.94	44.49	43.05	41.63
Soybean meal (44%)	21.27	17.39	13.49	9.59
Rapeseed meal (35%)	0.00	5.00	10.00	15.00
Wheat	10.00	10.00	10.00	10.00
Barley	10.00	10.00	10.00	10.00
Soybean oil	1.23	1.61	1.98	2.35
Oyster shell	8.82	8.78	8.75	8.71
Bone meal	1.91	1.84	1.78	1.71
Premix[1]	0.50	0.50	0.50	0.50
DL-Methionine	0.06	0.05	0.04	0.03
L-Lysine	0.00	0.07	0.14	0.21
Salt	0.27	0.27	0.27	0.27
Calculated composition				
ME (kcal kg^{-1})	2700.00	2700.00	2700.00	2700.00
Crude protein (%)	15.55	15.55	15.55	15.55
Linoleic acid (%)	1.99	2.19	2.38	2.58
Calcium (%)	4.00	4.00	4.00	4.00
Av. phosphorus (%)	0.35	0.35	0.35	0.35
Lysine (%)	0.80	0.80	0.80	0.80
Meth+cyst (%)	0.58	0.58	0.58	0.58
Total price (rial)	2176.00	2144.00	2114.00	2083.00

[1]Supplied per kilogram of diet; Vitamin A: 10000 IU, Vitamin D3: 9790 IU, Vitamin E: 121 IU, B12: 20 mg, Riboflavin: 4.4 mg, Calcium pantothenate: 40 mg, Niacin: 22 mg, Choline: 840 mg, Biotin: 30 mg, Thiamin: 4 mg, Zinc sulfate: 60 mg and Manganese oxide: 60 mg. A: Control group, B: Control group+5% rapeseed meal, C: Control group+10% rapeseed meal and D: Control group+15% rapeseed meal

RESULTS AND DISCUSSION

There is no significant difference (p>0.05) in haugh unit between experimental diets, but numerically, addition of 10% rapeseed meal, increase haugh unit (Table 3). Najib and Al-Khateeb (2004) observed significant increase with increasing the proportion of canola seed in diets of layers. Lichovnikova *et al.* (2008) reported that the proportion of rapeseed meal in the diets did not affect the haugh unit, but they suggested addition of iodine had a positive effect on haugh unit. Blair *et al.* (2006) reported any significant effect of the level of rapeseed meal on haugh unit.

No significant difference (p>0.05) in eggshell thickness observed among all experimental and control diets. Comparison between means showed that the diet had 10% rapeseed meal had best value, while the diet had 5% rapeseed meal had the poorest value. The results are in agreement with results of other researchers (Lichovnikova *et al.*, 2000; Blair *et al.*, 2006). Eggshell weight data, showed significant differences (p<0.05) between treatments. Comparison between means showed that, group fed 10% rapeseed meal had the highest eggshell weight, while control group had the lowest eggshell weight. Alkan *et al.* (2008) and Khurshid *et al.* (2003) showed positive correlation between eggshell weight and egg weight. In our pervious study, the group that fed 10% rapeseed meal had significantly higher egg weight than other groups (Riyazi *et al.*, 2008). It seems that higher weight of eggs resulted in the higher weight of eggshells in that group. Lichovnikova *et al.* (2008) reported that feeding of rapeseed meal did not affect the eggshell weight. From the result of Table 3 implied that adding different level of rapeseed meal in diets, had not any significant effect on eggshell strength, but numerically the diet had 10% rapeseed meal gave the best value. Lichovnikova *et al.* (2000) and Kaminska (2003) reported that increasing the level of rapeseed meal had not any effect on eggshell strength. The amount and thickness of the eggshell have been found to be related to eggshell strength (Roberts, 2004). In this study, also the group that fed 10% rapeseed meal, produced eggs with better eggshell thickness and eggshell strength than other groups. The result of this study showed that there was a significant difference in yolk index between dietary treatments. Comparison between means

Table 3: The effect of different levels of rapeseed meal on performance values of laying hens (44-56 weeks) at whole period

	Diets				
Parameters	A	B	C	D	SE[1]
Haugh unit	76.868	77.369	78.596	78.266	5.257
Eggshell thickness (mm)	0.341	0.336	0.342	0.340	0.017
Eggshell weight (g)	5.811^{b}	5.953^{ab}	6.206^{a}	5.819^{b}	0.491
Eggshell strength (kg cm$^{2-1}$)	1.686	1.933	2.042	1.867	0.561
Yolk index	0.437^{a}	0.431^{a}	0.429^{a}	0.413^{b}	0.031

[1]SE: Standards error. Means in rows with no common superscript differ significantly ($p<0.05$). A: Control group, B: Control group+5% rapeseed meal, C: Control group+10% rapeseed meal and D: Control group+15% rapeseed meal as replacements of soybean meal

showed that hens fed 15% rapeseed meal had lowest yolk index than hens fed other dietary treatments and control group. Since, this difference was ouly observed in the group that fed 15% rapeseed meal, probably, decrease in yolk index was due to an increase of anti nutritional factors in that diet. In contrary to this study, Najib and Al-Khateeb (2004) observed a significant increase in yolk index after feeding 20% canola seed in diet.

CONCLUSION

On the basis of present study, we may conclude that addition of 10% rapeseed meal significantly improves eggshell weight and helps to decrease total feed cost without any detrimental effect on egg quality characteristics.

ACKNOWLEDGMENT

The authors express many thanks to Azarbal Poultry Complex for funding. Technical assistance from all staff of Islamic Azad University, Shabestar Branch, Shabestar-Iran is also greatly appreciated.

REFERENCES

Alkan, S., K. Karabag, A. Galic and M.S. Balcioglu, 2008. Predicting yolk height, yolk width, albumen length, eggshell weight, egg shape index, eggshell thickness, egg surface area of japanese quails using various eggs traits as regressors. Int. J. Poult. Sci., 7: 85-88.

Bell, M., 1984. Nutrients and toxicants in rapeseed meal: A review. J. Anim. Sci., 58: 996-1010.

Blair, R., A.R. Robblee, W.A. Dewar, W. Bolton and N.D. Overfield, 2006. Influence of dietary rapeseed meals and selenium on egg production and egg tainting in laying hens. J. Sci. Food Agric., 26: 311-318.

Casartelli, E.M., O.M. Junqueira, R.S. Filardi, A.C. Laurentiz and V. Assuena *et al*., 2007. Canola meal in laying hens diets formulated according to total and digestible amino acid basis. Ciencia Anim. Brasileira, 8: 95-103.

Duncan, D.B., 1955. Multiple range and multiple F-tests. Biometrics, 11: 1-42.

Kaminska, B.Z., 2003. Substitution of soyabean meal with rapeseed meal or its high-protein fraction in the nutrition of hens laying brown-shelled eggs. J. Anim. Feed Sci., 12: 111-119.

Kermanshahi, H. and A.R. Abbasi-Pour, 2006. Replacement value of soybean meal with rapeseed meal supplemented with or without a dietary nsp-dgrading enzyme on performance, carcass traits and thyroid hormones of broiler chickens. Int. J. Poult. Sci., 5: 932-937.

Khurshid, A., M. Farooq, F.R. Durrani, K. Sarbiland and N. Chand, 2003. Predicting egg weight, shell weight, shell thickness and hatching chick weight of Japanese quails using various egg traits as regressors. Int. J. Poult. Sci., 2: 164-167.

Leeson, S. and J.D. Summers, 1991. Commercial Poultry Nutrition. University Books, Guelph, Ontario, Canada, ISBN: 964-91901-4-7.

Lichovnikova, M., D. Klecker and L. Zeman, 2000. The effects of extruded rapeseed feed on laying performance and qnality of eggs. Czech J. Anim. Sci., 45: 199-203.

Lichovnikova, M., L. Zeman and J. Jandasek, 2008. The effect of feeding untreated rapeseed and iodine supplement on egg quality. Czech J. Anim. Sci., 53: 77-82.

Najib, H. and S.A. Al-Khateeb, 2004. The effect of incorporating different levels of locally produced canola seeds (*Brassica napus*, L.) in the diet of laying hen. Int. J. Poult. Sci., 3: 490-496.

National Research Council, 1994. Nutrient Requirements of Poultry. 9th Edn., National Academy Press, Washington, DC. USA., ISBN-10:0-309-04892-3.

Newkirk, R.W., H.L. Classen and R.T. Tyler, 1997. Nutritional evaluation of low glucosinolate mustard meals (*Brassica juncea*) in broiler diets. Poult. Sci., 76: 1272-1277.

Riyazi, S.R., Y. Ebrahim-Nezhad, K. Nazer-Adl, N. Maheri-Sis, T. Vahdatpour and P. Fouladi, 2008. The effects of replacing soybean meal with different levels of rapeseed meal on performance of commercial laying hens. AJAVA., 3: 448-452.

Roberts, J.R., 2004. Factors affecting egg internal and egg shell quality in laying hens. J. Poult. Sci., 41: 161-177.

SAS, Institute, Inc., 1993. SAS User's Guide: Version 6.03. SAS Institute Inc., Cary, North Carolina.

Sasyte, V., A. Raceviciute-Stupeliene, R. Gruzauskas and R. Mosenthin, 2006. Effect of phytase on P and Ca utilization at different age periods of laying hens fed higher amount of rapeseed meal. Biologija, 1: 69-72.

Shen, H.J., D. Summers and S. Leeson, 1993. The influence of steam pelleting and grinding on the nutritive value of canola rapeseed for poultry. Anim. Feed Sci. Technol., 8: 303-311.

Summers, J.D., S. Leeson and D. Spratt, 1988. Canola meal and egg size. Can. J. Anim. Sci., 68: 907-913.

Thanaseelaan, V., K. Viswanathan, D. Chandrasekaran, R. Prabakaran and M. Chellapandian, 2007. Chemical composition, amino acids, minerals and anti nutritional factors of rapeseed meal. J. Vet. Anim. Sci., 3: 101-105.