Kafkas Univ Vet Fak Derg
15 (6): 971-974, 2009

SHORT COMMUNICATION

Using of Poppy Seed Meal and Yeast Culture *(Saccharomyces cerevisiae)* as an Alternative Protein Source for Layer Hens

Seher KÜÇÜKERSAN * Derya YEŞİLBAĞ ** Kemal KÜÇÜKERSAN *

* Ankara Üniversitesi Veteriner Fakültesi Hayvan Besleme ve Beslenme Hastalıkları Anabilim Dalı, Ankara - TÜRKİYE
** Uludağ Üniversitesi Veteriner Fakültesi Hayvan Besleme ve Beslenme Hastalıkları Anabilim Dalı, Bursa - TÜRKİYE

Makale Kodu (Article Code): 2009/082-A

Summary

This study was carried out to determine the effects of diets containing different amounts of poppy seed meal (PSM) and yeast culture *(S. cerevisiae)* on performance and egg quality parameters of laying hens. A total of 160 laying hens, 40 weeks old, were divided into four groups of 40 hens each, which were in turn subdivided into four subgroups of 10 hens' experimental replicates. The animals in experimental groups were fed with diets containing 7.5% PSM plus 0.1% yeast culture (Group I), 15% PSM plus 0.1% yeast culture (Group II), and only 0.1% yeast culture (Group III), respectively. The poppy seed meal addition up to 7.5 and 15% increased feed consumption values significantly (P<0.01). Egg production and feed efficiency values were not significantly affected (P>0.05). The highest mean egg weight value was defined in the Group II. In addition eggshell thickness values were significantly lower in the control group than in experimental groups. PSM and yeast culture together can be efficiently used in laying hen diets as a protein source.

Keywords: *Poppy seed meal, Yeast culture, Saccharomyces cerevisiae, Performance, Laying hens*

Haşhaş Tohumu Küspesi ve Maya'nın *(Saccharomyces cerevisiae)* Alternatif Protein Kaynağı Olarak Yumurtacı Tavuk Rasyonlarında Kullanımı

Özet

Bu araştırmada değişik düzeylerde haşhaş tohumu küspesi ve maya kültürü *(S. cerevisiae)* içeren rasyonların yumurtacı tavuklarda performans ve yumurta kalite parametreleri üzerine olan etkilerinin belirlenmesi amaçlanmıştır. Araştırmada 40 haftalık yaşta toplam 160 yumurtacı tavuk her biri 40 hayvandan oluşan 4 gruba bölündü, gruplarda herbiri 10 hayvandan oluşan 4 alt gruba ayrıldı. Deneme gruplarına sırasıyla %7.5 HTK ve %0.1 maya kültürü (Grup I); %15 HTK ve %0.1 maya kültürü (Grup II); ve sadece %0.1 maya kültürü (Grup III) ilave edildi. Araştırma sonunda rasyonlara %7.5 ve %15 düzeyinde haşhaş tohumu küspesi ilavesi yem tüketimi değerini önemli düzeyde artırmıştır (P<0,01). Yumurta verimi ve yemden yararlanma değerlerinde ise kontrol ve deneme grupları arasında önemli bir farklılık oluşturmamıştır (P>0.05). En yüksek yumurta ağırlığı değeri Grup II'de saptanmıştır. Yumurta kabuk kalınlığı kontrol grubunda diğer deneme gruplarıyla kıyaslandığında önemli (P<0.05) düzeyde düşük olarak ölçülmüştür. Sonuç olarak haşhaş tohumu küspesi ve maya kültürünün yumurta tavuğu rasyonlarında protein kaynağı olarak birlikte kullanılabileceği değerlendirilmiştir.

Anahtar sözcükler: *Haşhaş tohumu küspesi, Maya kültürü, Saccharomyces cerevisiae, Performans, Yumurtacı tavuk*

INTRODUCTION

A need arise for new and cheaper proteins as protein sources for animal diets are very expensive worldwide. Poppy seed meal is a high-level protein source produced in many region of the world. Poppy seed production is performed approximately in fifteen provinces in Turkey. Poppy seed meal containing about 30-36% crude protein and 1-15% crude oil is a good and cheap alternative for common protein sources for farm animals [1]. Additively yeast culture containing mannan-oligosaccharides might be potential alternatives for antibiotic growth promoters (AGP). Yeast culture is a dried fermented product containing small amounts of live yeast cells *(Saccharomyces cerevisiae)* and metabolic by-products produced by this yeast during fermentation [2]. Yeast cultures have biologically valuable proteins combined with high potency vitamin B-complex, important trace minerals (P, Mg, Zn, Cr, Se, Fe etc.) and protein. Lysine deficiency resulted from cereals sources have been completed by addition of *S. cerevisiae* cultures into the diets [3].

Studies related to use of poppy seed meal in poultry diets are limited. Previous studies reported that poppy seed meal can be used in 25% in layer hen diets and

İletişim (Correspondence)
☎ +90 312 3170315
✉ Seher.Kucukersan@veterinary.ankara.edu.tr

20% in broiler diets. In another studies [4-6] poppy seed meal was added in quail diets at 5%, 15% and 25% concentrations and determined the effect of poppy seed meal on egg production and feed consumption. It was reported to increase egg production and feed consumption, and to improve feed efficiency, but decreasing efficiency of hatchability and increasing the rate of embryonic death.

The aim of this study was to evaluate the use of poppy seed meal and yeast culture together as a cheaper alternative for soybean meal used as protein source in layer hen diets.

MATERIAL and METHODS

In the present experiment a total of 160 commercial laying hens (hybrid Lohmann LSL), 40 weeks of age were divided into four groups, consisting of 1 control and 3 experimental groups. Each group containing 40 hens divided into four subgroups 10 hens each. The study was carried out in the Experimental Unit of Department of Animal Nutrition and Nutritional Diseases at the Faculty of Veterinary Medicine, Ankara University. The hens were fed with a diet containing 17% crude protein (CP) and 2750 kcal/kg metabolisable energy (ME). In experimental groups was supplemented with 7.5% poppy meal + 0.1% yeast (Group I); 15% poppy meal + 0.1% yeast (Group II) or 0.1% yeast only (Group III). Dry culture of *S.cerevisiae* was used as yeast culture. The experiment was lasted 12 weeks. Experimental design, ingredients and chemical composition of the diets are shown in *Table 1*. The hens were randomly assigned to caging (40x40x46 cm) unit 5 hens each. The animals were fed water and the diets ad libitum throughout the experiment. During the experiment a lighting program of 17 h a day was applied besides day light. The amount of foodstuff nutrients in the experimental diets were determined according to the methods described by A.O.A.C. [7] while the level of metabolisable energy (ME) in the diets were determined according to method described in TSE [8].

Feed consumption and egg weights were measured fortnightly measurements. Egg production was recorded daily at the same time every day. Feed efficiency was calculated as kg of feed intake for kg of egg production. The eggs were collected once a month to determine characteristics of egg quality parameters (yolk index, albumen index, Haugh unit, shell thickness, shell breaking strength). Egg quality parameters were measured 24 h later than egg collection [9-11].

Statistical analyses of data were performed by SPSS 10.0 version for Microsoft Windows. One-way ANOVA [12] was used for the determining differences between groups. When the P-values were significant, Duncan's multiple range test was performed [13]. All data were expressed as means ± standard error.

Table 1. *Ingredients and chemical composition of the diets*
Tablo 1. *Rasyonlarının bileşimi ve kimyasal kompozisyonu*

Ingredient	Control	Group I	Group II	Group III
Corn	46.20	48.60	44.10	46.10
Barley	10.00	12.00	12.00	10.00
Soybean meal	30.00	18.00	15.00	30.00
Poppy seed meal	-	7.50	15.00	-
Yeast	-	0.10	0.10	0.10
Limestone	8.40	8.40	8.40	8.40
DCP	1.50	1.50	1.50	1.50
Vegetable oil	3.00	3.00	3.00	3.00
Vitamin- premix [1]	0.25	0.25	0.25	0.25
Mineral-premix [2]	0.10	0.10	0.10	0.10
DL-Methionine	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30
Chemical analysis, dry matter (DM) basis				
Dry matter, %	93.08	93.35	94.05	93.64
Crude protein, %	17.30	17.30	17.30	17.30
Ash, %	13.55	13.55	13.92	13.79
Calcium, %	3.65	3.65	3.63	3.62
Phosphorus, %	0.66	0.65	0.66	0.66
Metabolizable energy, kcal/kg*	2744	2743	2751	2745

1 *Rovimix 123-T; each 2.5 kg Rovimix 123-t contained: Vitamin A 12.000.000 IU, Vitamin D_3 2.000.000 IU, Vitamin E 35.000 IU, Vitamin K_3 5.000 mg, Vitamin B_1 3.000 mg, Vitamin B_2 6.000 mg, Vitamin B_6 5.000 mg, Vitamin B_{12} 15 mg, Niacin 20.000 mg, Folic acid 750 mg, D-biotin 45 mg, choline chloride 125.000 mg and Vit C 50.000 mg, calcium D- pantothenate 6.000 mg*

2 *Remineral S; each kg Remineral S contained: Mn 80.000 mg, Fe 60.000 mg, Zn 60.000 mg, Cu 5.000 mg, Co 200 mg, I 1.000 mg, Se 150 mg and Ca 446.925 mg*

******* *This value was found to with calculation, TSE, 1991*

RESULTS

Chemical compositions of poppy seed meal and yeast culture used in this study are shown in *Table 2*. Feed consumption, egg production, feed efficiency and egg weight values are given in *Table 3*. Egg quality parameters detected in this experiment are shown in *Table 4*. In this study feed consumption, egg weight and egg shell thickness which is one of egg quality parameters showed significant differences between control and experimental groups. The highest feed consumption value was determined by poppy seed meal supplementation (Group I and Group II) and these differences were statistically significant ($P<0.01$). Similarly egg weight was changed significantly ($P<0.05$) from the statistical point of view and the highest egg weight value was measured in Group II. The highest egg shell thickness value was determined in yeast culture supplemented group (Group III). But feed efficiency, egg production and other egg

Table 2. *Chemical composition of the poppy seed meal and yeast culture (%)*
Tablo 2. *Haşhaş küspesi ve maya kültürünün kimyasal kompozisyonu (%)*

Object	Dry matter	Ether extract	Crude protein	Crude fibre	Ash	Nitrogen free Extract	ME* (kcal/kg)
Poppy Seed Meal	89.75	12.80	33.50	***8.72***	11.30	23.43	2950
Yeast culture	93.00	1.10	44.50	***2.75***	3.50	41.15	1990

* *This value was found to with calculation, TSE, 1991*

Table 3. *The effect of different levels of poppy seed meal and yeast culture to the diets on performance*
Tablo 3. *Rasyonlardaki farklı düzeylerde haşhaş küspesi ve maya kültürünün performans üzerine etkileri*

Parameters	Control ($\bar{x}\pm S\bar{x}$)		Experimental Groups						P
			Group I ($\bar{x}\pm S\bar{x}$)		Group II ($\bar{x}\pm S\bar{x}$)		Group III ($\bar{x}\pm S\bar{x}$)		
Feed consumption, g/day	114.95	2.84 ^{b}	122.88	0.59 ^{a}	126.43	2.22 ^{a}	115.69	1.28 ^{b}	**
Feed efficiency, kg feed/kg egg	1.95	0.003	2.00	0.001	2.09	0.005	2.00	0.009	-
Egg production, %	89.25	1.27	90.98	1.20	89.85	2.47	86.91	2.02	-
Egg weight, g	65.55	0.34 ^{b}	66.18	0.39 ^{ab}	67.07	0.41 ^{a}	66.53	0.43 ^{ab}	*

a-b *The mean values within the same row with varying superscripts have significant difference* ****:*** *P< 0.05* *****:*** *P< 0.01* ***-:*** *not significant*

Table 4. *The effect of different levels of poppy seed meal and yeast culture to the diets on egg quality parameters*
Tablo 4. *Rasyonlardaki farklı düzeylerde haşhaş küspesi ve maya kültürünün yumurta kalite parametreleri üzerine etkileri*

Parameters	Control ($\bar{x}\pm S\bar{x}$)		Experimental Groups						P
			Group I ($\bar{x}\pm S\bar{x}$)		Group II ($\bar{x}\pm S\bar{x}$)		Group III ($\bar{x}\pm S\bar{x}$)		
Egg yolk index	40.49	0.42	40.70	0.25	40.69	0.28	39.59	0.50	-
Egg albumen index	5.59	0.20	5.47	0.14	5.17	0.008	5.24	0.19	-
Haugh unit	82.94	1.28	81.17	1.54	80.32	0.79	78.78	1.33	-
Eggshell thickness (µm)	384	3.60 ^{b}	391	5.80 ^{ab}	394	5.60 ^{ab}	404	3.40 ^{a}	*
Eggshell breaking strength (kg/cm^2)	3.07	0.20	3.00	0.13	3.13	0.17	2.83	0.10	-

a-b *The mean values within the same row with varying superscripts have significant difference* ****:*** *P< 0.05* ***-:*** *not significant* ***n:*** *12*

quality parameters except for egg shell thickness did not affected by supplementation of poppy seed meal and yeast culture into laying hen diets.

DISCUSSION

Supplementation of different levels (7.5% and 15%) of poppy seed meals significantly affected feed consumption (P<0.01). As shown in *Table 3*, the use of poppy seed meal in diets caused an increase in feed consumption (P<0.01). The highest feed consumption occurred by 15% PSM (Group II) supplementation. It is thought to be due to high concentration of calcium (2-3%) in PSM, as laying hens have a specific appetite for calcium [14]. Additionally supplementation of PSM may be increased of diet flavor. Daily feed consumption values obtained in the present study are in agreement with the results of previous studies [6,15]. On the contrary, Yıldız et al.[16] were not found significant effects of PSM on feed consumption. In present work no significant effect on feed consumption was created by use of *S. cerevisiae* culture (0.1%) alone (Group III). Result similar to this finding was also reported [17].

However having some beneficial effects, supplementation of poppy seed meal and yeast culture to the diet did not significantly effect the egg production and feed efficiency (P>0.05). Contrary to that situation, Akıncı and Bayram [6] reported an increase in egg production in quails fed with a diet including 15% and 25% PSM, respectively (P<0.001) and to worse in feed efficiency in broiler chickens fed with in a diet including 5%, 15% and 25% PSM respectively (P<0.001). Besides Bayram et al.[18] reported that the poppy seed meal addition up to 25% was decreased egg production significantly (P<0.01) and the highest feed efficiency was recorded in hens (66 weeks) fed with 25% PSM (P<0.05). At this study supplementation of 0.1% yeast culture did not created important effects on egg production and feed efficiency. This study results are in agreement with the results of Ayanwale et al.[17]. In another study [19] positive effect on egg production and feed efficiency were reported in hens in case of 0.15% and 0.3% yeast culture *(S. cerevisiae)* supplementation to the diets.

The results on egg weight measurements are presented in *Table 3*. Significant differences were observed in mean egg weights among the experimental groups (P<0.05).

The highest egg weight was defined in Group II (15% PSM + 0.1% yeast culture) (67.07 g; P<0.05). Bayram et al.[18] reported a significant (p<0.01) increase in egg weight by addition of 5, 10, 15, 20% and 25% PSM. That is egg weight of the control group were significantly lower (P<0.01) than the other groups. Furthermore Akıncı and Bayram [6] determined egg weight values by addition of 15% PSM that is higher than control group and experimental groups of 5% and 25% PSM addition (P<0.001). Whitehead et al.[20] stated that dietary fatty acid may increase egg weight by stimulating the synthesis of oviductal proteins. The results, observed here may reflect the amino acid or fatty acid content of PSM and soybean meal. Although yeast culture supplementation alone (Group III) caused and slight increase in egg weight, the highest positive effect was recorded in Group II including dietary addition of yeast culture together with 25% PSM (egg weight: 67.07 g). Abou El-Ella et al.[19] reported a proportional increase in egg weight by supplementation of 0.15% and 0.3% yeast culture to diets of laying hens at 28 week old. Contrary to this study, Brake [21] did not define significant effect of yeast culture supplementation on egg weight in broiler breeders'.

The results on egg quality parameters obtained in this study are presented in *Table 4*. At this experiment egg yolk index, egg albumen index, Haugh unit and eggshell breaking strength values were not defined to significantly differ among the groups. However, the use of PSM in diets seemed to cause an increase (P<0.05) in egg shell thickness as eggshell quality parameters. This increase in egg shell thickness may have impact on the increase in egg weight. In a previous study [18] significant (P<0.001) affection of eggshell thickness in aged laying hens by 15-20% PSM supplementation was reported. In this study [20] PSM supplementation reported to lead significant decrease in egg shell thickness. Inconclusive results obtained in different studies may be due to animal materials, animal ages and diets used in the experiments. On the other hand, egg quality parameters have also been reported not to be affected by yeast culture addition to the ration in numerous studies [17,19].

From these results it is concluded that poppy seed meal together with yeast culture *(S. cerevisiae)* has some positive effects on egg weight and eggshell quality parameters (eggshell thickness) in laying hens. In conclusion there were no reverse effects recorded in this study by combined use of poppy seed meal and yeast culture. It is assumed that poppy seed meal together with yeast culture can be used as an alternative protein supplement in laying hen diets.

REFERENCES

1. Kutlu HR: Yemler Bilgisi ve Yem Teknolojisi. Çukurova Üniv Ziraat Fak Yayınları. Adana, 2002.

2. Stone CW: Yeast products in the feed industry. A Practical Guide for Feed Professionals. http://www.diamondv.com/products/yc.html. *Accessed:* 15.10. 2004.

3. Bradley GL, Savage TF: Effect of pre-incubation egg storage time and genotype on hatchability of eggs from turkey breeder hens fed a diet containing a yeast culture. *Poult Sci,* 72 (Suppl. 1): 44, 1993.

4. Bayram I, Akıncı Z: The effect of poppy seed meal added to quail ratios on performance. *Ankara Univ Vet Fak Derg,* 45, 35-39, 1998.

5. Bayram I, Akıncı Z: The effect of the ratios containing different amounts of poppy seed meal on egg production and some blood metabolits in laying quails. *Yüzüncü Yıl Univ Vet Fak Derg,* 10, 44-49, 1999.

6. Akıncı Z, Bayram I: Effects of poppy seed meal on egg production and hatching results in quail *(Coturnix coturnix japonica). Res Vet Sci,* 75, 141-147, 2003.

7. AOAC: Official Methods of Analysis of the Association of Official Analytical Chemists. 14th ed. Inc Arlington, Virginia, 1984.

8. TSE: Hayvan yemleri-metabolik (çevrilebilir) enerji tayini (kimyasal metod). TSE No: 9610. Türk Standartları Enstitüsü, Ankara, 1991.

9. Rauch W: Die elastiche Verformung von Hühnereiern als MaBstab für die Beurteilung der Schalenstabilitat. *Arch Geflugelk,* 29, 467-477, 1965.

10. Wells RG: A study of the hen's egg. **In,** Carter C (Ed): British Egg Marketing Board Symposium. pp. 207-249, Edinburgh, 1968.

11. Card LE, Nesheim MC: Poultry Production.11th ed. Lea and Febiger, Phidelphia, 1972.

12. Snedecor GW, Cochron WG: Statistical Methods. 7th ed. The Iowa State University Press, Ames, Iowa, USA, 1980.

13. Duncan DB: Multiple Range and Multiple F-tests. *Biometrics*, 11, 1-42, 1995.

14. Mongin P, Sauver B: The specific calcium appetite of the domestic fowl. **In,** Forbes JM, 1995, Voluntary Food Intake and Diet Selection in Farm Animals. pp 318-319. Biddles Ltd., Guilfort, 1979.

15. Bayram I, Akıncı Z, Midilli M, Karadaş E, Köken T: Investigation of the effects of poppy seed meal on growth and some blood parameters and also the pathological effects on the tissues in the broiler. *II. National Animal Nutrition Congress,* 18-20 September, Konya-Türkiye, 2003.

16. Yıldız AÖ, Olgun, O, Cufadar Y, Parlat SS: Alternatif protein kaynagı olarak soya küspesi yerine kullanilan haşhaş (*Papaver somniferum* L.) tohumu küspesinin Japon bıldırcınlarında performans ve karkas özelliklerine etkisi. *Hayvancılık Araşt Derg,* 14 (1-2): 73-77, 2004.

17. Ayanwale BA, Kpe M, Ayanwale VA: The effect of supplementing *Saccharomyces cerevisiae* in the diets on egg laying and egg quality characteristics of pullets. *Int J Poult Sci,* 5 (8): 759-763, 2006.

18. Bayram I, Akıncı Z, Şehu, A: The effects of poppy seed meal in the laying hens ration on egg production and some blood parameters. *III. National Animal Nutrition Congress.* 7-10 September, Adana - Türkiye, 2005.

19. Abou El-Ella MAA, Attıae MY, El-Nagmy KY, Radwan MAH: The productive performance of layers fed diets supplemented with some commercial feed additives. *Egypt J Anim Prod,* 33 (5): 423-431, 1996.

20. Whitehead CC, Bowman AS, Griffin HD: Regulation of plasma oestrogen by dietary fats in the laying hen. *Brit Poult Sci,* 34, 999-1010, 1993.

21. Brake J: Lack of effect of alive yeast culture on broiler breeder and progeny performance. *Poult Sci,* 70, 1037-1039, 1991.