Alinteri J. of Agr. Sci. (2019) 34(1): 84-87
e-ISSN: 2587-2249
info@alinteridergisi.com

http://dergipark.gov.tr/alinterizbd
http://www.alinteridergisi.com/
DOI: 10.28955/alinterizbd.578536

Alinteri Journal of Agriculture Sciences

RESEARCH ARTICLE

The Effect of Rosehip Seed Supplementation into Laying Hens Diets on Performance, Egg Quality Traits, Yolk Lipid Profile and Serum Parameters

Hatice Kaya, Adem Kaya, Nurinisa Esenbuğa*, Muhlis Macit

Atatürk University, Faculty of Agriculture, Erzurum/Turkey

ARTICLE INFO

Article History:

Received: 01.02.2019
Accepted: 21.05.2019
Available Online: 10.06.2019

Keywords:

Laying Hen
Roseship Seed
Performance
Egg Quality
Serum Parameters

ABSTRACT

This study was carried out to determine the effect of dietary rosehip seed (RS) supplementation into layer diets at different levels on performance, egg quality traits and some serum parameters. A total of 72 Lohmann layers, 46 weeks old, were divided into three treatment groups. The control group was fed with commercial layer diet (K), and the other two groups were fed with basal diet + 10% ground rosehip seeds (K1) and basal diet + 15% ground rosehip seeds (K2) for 12 weeks. The water and feed were provided as ad-libitum during the trial. The rosehip seed supplementation level at 15% into layer diets increased the feed consumption and egg yield ($p<0.05$), and decreased the damaged egg ratio. Though some egg quality traits such as the yolk colour, shell thickness and shell weight increased ($p<0.05$) in eggs from K2 group, there were no significant differences ($p> 0.05$) among the groups in respect to other egg quality traits such as shape index, shell strength, albumen and yolk indexes and Haugh unit values. Total cholesterol, cholesterol esters, free fatty acids and triglyceride contents in the egg yolks from treatment groups were not affected by dietary treatments ($p> 0.05$). Serum parameters such as albumin, total cholesterol, VLDL, triglyceride and ALT values increased ($p <0.05$) with the RS supplementation at level of 15% into layer diet. Results showed that rosehip seed supplementation into layer diets may be beneficial to improve egg quality traits especially such as shell thickness and to decrease damaged egg ratio. But further investigations are needed to clarify the use of rosehip seed in layer diets and its effects on performance, egg quality and serum parameters.

Please cite this paper as follows:

Kaya, H., Kaya, A., Esenbuğa, N. and Macit, M. (2019). The Effect of Rosehip Seed Supplementation into Laying Hens Diets on Performance, Egg Quality Traits, Yolk Lipid Profile and Serum Parameters. *Alinteri Journal of Agriculture Sciences*, *34*(1): 84-87. doi: 10.28955/alinterizbd.578536

Introduction

The poultry sector plays an important role in Turkey. However, inadequate of animal feed resources in both quantitatively and qualitatively is most often the limiting factor of the development of livestock production in Turkey (Celebi et al., 2013). In this context, feed producers and scientist have researched to alternative feed materials. Many agricultural and agro-industrial products have the potential as animal feeds (Garipoglu, 2004). Rosehip seed (RS) is one of this fruit wastes. RS is as a waste after processing into products such as fruit juice, jam, marmalade and tea. It has been reported that the remaining seeds are rich in energy and do not cause metabolic disease by grains-based feds (Nichita et al., 1981; Macit et al., 2002).

RS represents approximately 20% to 44% of R. canina fruit and has 93.48% dry matter, 8.72% crude protein, 6.0% digestible protein, 7.97% crude fat, 1.87% crude ash, 31.56-44.05% crude fiber, 30.87% nitrogen free extract, 64.44% acid detergent fiber, 64.78% neutral detergent fiber, and 1800 kcal. ME/kg ground R. canina seed (Nichita et al., 1981; Macit et al., 2002). In another study on the content of mineral substances (Kadakal and Nergiz, 1999), it was found that RS has an average of 4181.2 mg / kg potassium, 2724 mg / kg calcium, 1045.2 mg / kg magnesium, 46 mg / kg iron, 39.8 mg / kg sodium, 29.6 mg / kg of nickel, 9.8 mg / kg of zinc, 4.9 mg / kg of copper, 0.1 mg / kg of cadmium, 55.08% linoleic acid, 20% arachidic acid and 19.31% oleic acid. In addition, it has been stated that

* Corresponding author
E-mail address: esenbuga@atauni.edu.tr

RS reduce serum cholesterol and triglyceride value in animal experiments (Kadakal and Nas, 2018). Andersson et al., (2012) reported that the total plasma cholesterol and the LDL-cholesterol levels were reduced by 4.9% and 6%, respectively.

Little or no published information is available on the quality of feed provided by Rosehip fruit or on how it could be evaluated as feed ingredient in poultry diets.

This study was carried out to determine the effect of dietary rosehip seed supplementation into layer diets at different levels on layer performance, egg quality traits, egg yolk lipid profiles and some blood parameters in layers.

Materials and Methods

A total of 72 Lohmann layers, 46 weeks old, were divided into three treatment groups, and placed to six cages for each treatment (four birds per cage). The laying hens were reared in poultry houses of Food and Livestock Application and Research Center of Ataturk University. The control group was fed with commercial layer diet (K), and the other two groups were fed with basal diet + 10% ground rosehip seeds (K1) and basal diet + 15% ground rosehip seeds (K2). The water and feed were provided as ad-libitum during the trial. After one week of the adaptation period, the chickens were weighed and randomly divided into three groups, and experiment lasted for twelve weeks.

Formulation and chemical composition of diets on dry matter basis are shown in Table 1. The RS was obtained from a fruit juice plant in Gumushane. The experimental diets were formulated to meet the NRC nutrient requirements of layers (NRC, 1994). ME (kcal /kg DM) was calculated using following formula given by Görgülü (2014).

$$ME = 3212 - 6.66CP\% + 37.34\ EE\% - 14{,}43\ CA\% - 34.60\ CF\% \quad (1)$$

Table 1. Chemical composition of commercial layer diet and RS

			Chemical composition (%)	
			Commercial layer diet	Rosehip seed
Soybean meal	18.13	Dry matter	89.47	93.4
Maize	52.81	Crude protein	16.50	8.7
Barley	6.00	Ether extract	4.88	8.00
Full fat soy	1.65	Crude fiber	4.49	44.1
Sunflower meal	7.50	Ash	11.70	1.9
Ground corn	2.04	ME (kcal kh^{-1})	2720	1899*
Soya oil	1.60			
Ground limestone	6.82			
Salt	0.30			
DCP 18	2.65			
D-L Methionine 99	0.15			
L-Lysine	0.10			
Vitamin Premix[1]	0.25			

[1]Premixes were formulated to meet recommended levels for minerals and vitamins (NRC, 1994)
*Calculated by Görgülü (2014)

Egg production and feed consumption were measured daily, egg weight was measured biweekly and body weight was measured monthly. 12 eggs was randomly collected from each group at the beginning, midst and end of the experimental period to assess egg quality parameters (Kaya and Macit, 2012). Egg quality parameters were shape index, shell strenght, shell thickness, shell weight, yolk color, yolk index, albumen index and Haugh units . At the end of the experiment, 6 animals from each group were selected and blood samples were taken from the wing vena using heparinized tubes and centrifuged at 3000 x g for 5 minutes. Plasma lipid profile, some mineral and enzyme contents were determined by using commercial kits (DDS Spectrophotometric Kits, Istanbul Turkey) in the Mindray Perfect Plus 400 brand autoanalyzer in the Faculty of Medicine, Department of Biochemistry. In order to determine the lipid profile of egg yolk, a total of 18 eggs taken from each sub group at the end of the experiment were immediately broken and egg whites and yolk were separated. Egg yolks were placed in pre-weighed 50 ml capillary fragments. To determine the egg yolk cholesteryl ester (CE), triglyceride (TG), free fat acid (FFA), cholesterol (COL), phosphotidylserine (PS) and phosphotidylcholine (PC) of egg samples the HPTLC methods were used (Hara and Radin, 1978; Macala et al., 1983).

The data were analyzed using general linear model procedure of SPSS 20.0 (2011) program. Significant differences among means were tested using Duncan's Multiple Range Test (Duncan, 1955).

Results and Discussion

The results of the performance parameters are given in Table 2. It was found that there were significant differences among the groups in terms of performance parameters such as feed consumption, egg production, cracked egg yield and egg weight. Egg production and feed consumption values were increased ($p < 0.01$) and cracked egg yield was decreased (p

<0.05) in the group fed with diet including 15% ground rosehip seed (K2). Eggs from K1 were heavier than eggs from K and K2 (p <0.01). There is a negative correlation between energy content and consumption of diet (Ozkan and Acikgoz, 2007). Due to the high fiber and low energy content of the RS, the chickens in the K1 and K2 groups consumed more feed to meet their nutritional needs, especially their energy needs. Some researchers reported that feed consumption increased in broiler groups fed with the addition of rosehip seed (Nichita et al., 1981). Vlaicu et al., (2017) reported that the diets including high cellulose content because of rosehip powder negatively affected the feed consumption of the layers.

Table 2: Least squares means for performance parameters of laying hens

Trait	FC (g/day)	EP (%)	CEY (%)	EW (g)	FCR (kg feed/kg egg)
K	95.03^{b}	72.49^{b}	4.41^{b}	65.89^{b}	2.21
K1	111.29^{a}	79.87^{b}	4.34^{b}	68.38^{a}	2.09
K2	118.51^{a}	89.29^{a}	1.39^{a}	64.85^{b}	2.08
SEM	2.84	3.35	1.98	0.76	0.20
P	**	**	*	**	ns

$^{a, b:}$ Means in rows with different superscripts are significantly different *(P<0.05), **(P<0.01), ns: non significant, FC: Feed consumption, EP: Egg production, CEY: Cracked egg yield, EW: Egg weight, FCR: Feed conversion ratio

Table 3: The effect of RS on egg quality traits of laying hens

Trait	Shape index (%)	Shape strength (kg/cm^2)	Shell thickness (mm×10^{-2})	Shell weight (g)	Yolk color	Yolk index (%)	Albumen index (%)	Haugh unit
K	73.59	0.569	0.338^{b}	7.03^{b}	7.19^{b}	38.84	7.54	78.03
K1	74.61	0.521	0.338^{b}	7.39^{b}	7.58^{b}	39.10	8.11	80.78
K2	76.01	0.800	0.375^{a}	7.98^{a}	8.20^{a}	38.84	7.22	77.26
SEM	0.84	0.089	0.036	0.22	0.18	0.83	0.57	2.64
P	ns	ns	*	**	**	ns	ns	ns

$^{a, b:}$ Means in rows with different superscripts are significantly different *(P<0.05), **(P<0.01), ns: non significant

It was determined that there were no significant differences among the groups in terms of shape index, shell strength, yolk index, white index and Haugh unit. The birds in K2 group produced better eggs in terms of shell thickness, shell weight and yolk color significantly than the control group. Calcium is an important macro mineral for egg shell formation of laying hens. The improvement in external quality parameters such as cracked egg yield, shell thickness and shell weight obtained from the birds in the K2 group may be due to the fact that the RS is rich in Ca (2724 mg / kg) (Kadakal and Nergiz, 1999). On the other hand, it has been reported that the RS is rich in carotenoids (Gao et al., 2000). The increase in egg yolk color with the addition of 15% RS may be due to the carotenoid content of RS.

Table 4: The effect of Rose canina seed on egg yolk lipid profiles of laying hens

Trait	CE	TG	FFA	COL	PS	PC
K	4.86	56.25	0.389	20.43	0.278^{b}	6.44
K1	4.87	56.04	0.420	20.65	0.503^{a}	6.77
K2	5.94	56.03	0.303	21.24	0.468^{a}	5.95
SEM	0.47	1.21	0.646	0.36	0.062	0.367
P	ns	ns	ns	ns	*	ns

$^{a, b:}$ Means in rows with different superscripts are significantly different *(P<0.05), **(P<0.01), ns: non significant, CE, cholesteryl ester; TG, Triglyceride; FFA, Free fat acid; COL, cholesterol; PS, Phosphatidylserine; PC, Phosphatidylcholine

Table 5: The effect of RCS on serum parameters of laying hens

Blood Parameters	K	K10	K15	SE	P
Uric acit (µmol/L)	4.65	3.66	3.65	0.52	ns
Total protein (g/L)	3.36	4.07	4.29	0.47	ns
Albumin (g/L)	1.02^{b}	1.39^{ab}	1.71^{a}	0.16	*
Globulin (g/L)	2.33	2.69	2.58	0.33	ns
ALT (U/L)	7.5^{b}	8.5^{b}	30.0^{a}	6.15	*
Triglycerides (mg/L)	699.5^{b}	1146.3^{ab}	1644.8^{a}	365.6	*
Cholesterol (mmol/L)	86.08^{b}	137.5^{ab}	164.5^{a}	20.69	*
HDL (g/L)	18.25	25.5	28.0	4.41	ns
VLDL (g/L)	139.92^{b}	229.33^{ab}	329.00^{a}	74.7	*
LDL (g/L)	64.25	55.50	61.00	11.72	ns
Ca	12.11^{b}	19.08^{a}	19.83^{a}	2.21	*

$^{a, b:}$ Means in rows with different superscripts are significantly different *(P<0.05), **(P<0.01), ns: non significant

The yolk lipid profile of the eggs collected at the end of the experiment are given in Table 4. There were no differences among the groups. It has been determined that the addition of RS to the laying hens' diets increased egg yolk phosphatidyl serine content.

There was no significant difference ($p > 0.05$) in uric acid, total protein, globulin, HDL, LDL, but albumin, ALT, cholesterol, triglyceride, VLDL and Ca were increased by addition of RS 15% (Table 5). In the study carried on broiler, it was found that the serum urea, creatinine, uric acid, triglyceride, total protein, glucose, K and Cl were not affected by the addition of rosehip, but cholesterol level decreased because of high cellulose content and flavonoids (Tekeli, 2014). In the different study, it has been reported that phenolic compounds such as flavonoids, anthocyanidins and anthocyanins reduced endogenous cholesterol absorption and synthesis (Nurulhuda et al., 2012). It is also emphasized that the RS may have hypocholesterolemic activity because it is rich in phenolic compounds.

As a result, it was determined that the addition of 15% RCS into the laying hen diets improved the egg yield and egg quality traits especially such as shell thickness, yolk color, and decreased cracked egg yield. But further investigations are needed to clarify the use of rosehip seed in layer diets and its effects on performance, egg quality and serum parameters.

References

Andersson, U., Berger, K., Hogberg, A., Landin-Olsson M. and Holm, C., 2012. Effects of rose hip intake on risk markers of type 2 diabetes and cardiovascular disease: a randomized, double-blind, cross-over investigation in obese persons. European Journal of Clinical Nutrition 66: 585-590.

Celebi S., Kaya A., Kaya H., Gul M., 2013. Suyla muamele edilmis fabrika siyah cay atıgının yumurta performans ve kalite kriterleri uzerine etkisi. VII. Ulusal Hayvan Besleme Kongresi, 242-247.

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

Gao, X. Q., Bjork, L., Trajkovski, V., Uggla, M. 2000. Evaluation of antioxidant activities of rosehip ethanol extracts in different test systems. Journal of the Science of Food and Agriculture, 80: 2021-2027.

Garipoglu, A.V., 2004. Lignoselulozik atıkların ruminant beslemede kullanılma imkanlarının artırılmasında fungusların rolü. 4. Ulusal Zootekni Kongresi. 1-3 Eylül, Isparta; 260-266.

Görgülü, M., 2014. Ruminant yemlerin SE, ME, TDN, NEm, NEg, NEl, değerlerinin ham besin maddelerinin hesaplanması. (http://www.muratgorgulu.com.tr/altekran.asp?id=97)

Hara, A. and Radin, N.S., 1978. Lipid extraction of tissues with a low-toxicity solvent. Anal. Biochem., 90: 420-426.

Kadakal C. and Nas S., 2018. Kusburnu deyip gecmeyin. http://www.cine-tarim.com.tr/dergi/arsiv49/arastirma03.htm (28.02.2018).

Kadakal, C. and Nergiz, C., 1999. Kusburnu cekirdeginin mineral madde, yag asidi icerigi ve radyasyon duzeyi. Gıda Bilimi ve Teknolojisi, 4: 59-64.

Kaya, H., Macit, M., 2012. Effect of inclusion of garlic (Allium sativum) powder at different levels and copper into diets of hens on performance, egg quality traits and yolk cholesterol content. International Journal of Poultry Science 11: 114-119.

Macala L. J., Yu R. K., Ando S., 1983. Analysis of brain lipids by high performance thin-layer chromatography and densitometry. J. Lipid Res. 24: 1243- 1250.

Macit M., Demirel M., Bakıcı Y., Erdoğan S., 2002. Kuşburnu cekirdeginin rumende parcalanabilirliginin naylon kese yontemi ile belirlenmesi. Atatürk Univ. Ziraat Fak. Derg. 34: 233-237.

National Research Council (NRC), 1994. Nutrient Requirements of Poultry. 9th Revised ed., National Academy Press, Washington, DC.

Nichita, G., Horea, S., Padeanu, I., Casaleanu, I., Gogoloiu, G., 1981. Eglantine (*Rosa Canina*) seeds for feeding broiler chickens and lambs. Lucrari Stiinfice Institutul Agronomic, Timisoara Zootechnie, 18: 53-59.

Nurulhuda, M.H., Azlan, A., Ismail, A., Amom, Z., Shakirin, F.H., 2012. Cholesterol-lowering and artherosclerosis inhibitory effect of sibu olive in cholesterol fed-rabbit. Asian J.Biochem. 7: 80-89.

Ozkan K. and Acikgoz, Z., 2007. Kanatlı Kumes Hayvanlarının Beslenmesi. Yem ve Su Tuketimi. Hasad Yayıncılık. San Ofset. Istanbul.

SPSS, 2011. SPSS for Windows Release 20.0, SPSS Inc. Chicago.

Tekeli A., 2014. Effect of Rosehip Fruit (Rosa canina l.) supplementation to rations of broilers grown under cold stress conditions on some performance, blood, morphological, carcass and meat quality characteristics. Europ. Poult. Sci., 78. DOI: 10.1399/eps.2014.19

Vlaicu P.A., Dragotoi, D., Panaite, T.D., Untea, A., Saracila, M., Mitoiu, M., 2017. Effect of rosehip addition to Ω3 PUFA-high layer diets on hen performance and egg quality. Proceedings of the 21st European Symposium on Poultry Nutrition.