*Pakistan J. Zool., vol. 51(5), pp 1793-1797, 2019.* **DOI**: http://dx.doi.org/10.17582/journal.pjz/2019.51.5.1793.1797

# Dietary Supplementation of Fenugreek (*Trigonella foenum graecum*) on the Egg Quality Characteristics of Rhode Island Red Spent Layers

**Fazal Wahab[1], Naila Chand[1], Rifat Ullah Khan[1], Nazir Ahmad[1], Urooba Parvez[2], Zia ur Rehman[3] and Shabana Naz[4,*]**

[1]*Faculty of Animal Husbandry and Veterinary Sciences, The University of Agriculture, Peshawar*
[2]*Departmnt of Extension Education and Communication, The University of Agriculture, Peshawar*
[3]*Directorate of Livestock and Dairy Development, Peshawar*
[4]*Department of Zoology, Govt. College University, Faisalabad*

**Article Information**
**Received 10 August 2018**
**Revised 12 November 2018**
**Accepted 27 January 2019**
**Available online 24 June 2019**

**Authors' Contribution**
**FW and NC conducted the study. RUK, NA and UP edited the manuscript. ZR revised the paper. SN submitted the manuscript.**

**Key words**
**Egg production, Egg traits, Fenugeek seed, Rhode Island red spent layer.**

## ABSTRACT

The present research was conducted to investigate the effect of various levels of fenugreek seeds supplementation on feed intake, egg production and egg quality of Rhode Island Red spent layers. A total of 60 spent Rhode Island Red layers were assigned to 4 treatments; FS-0, FS-0.5, FS-0.75, and FS-1 with 3 replicates, each with 5 birds. Birds were kept in cages for 28 days in open sided house. FS-0 was kept as control while treatments FS-0.5, FS-0.75 and FS-1 were provided with fenugreek seed powder in the ration at the rate of 0.5, 0.75 and 1%, respectively. Egg production and feed intake was recorded on daily basis. Egg weight, egg shell weight, egg shell thickness, Haugh unit, albumin height and yolk weight were determined on weekly basis. The results showed that FS supplementation significantly ($P<0.05$) decreased feed intake (g/hen/day) at all recorded stages. Overall higher feed intake was noted for the control treatment while lower feed intake was noticed for treatment FS-1. Significantly higher ($P<0.05$) egg production was recorded for treatment FS-0.5 followed by treatment FS-0.75 while lower egg production was recorded for the control and FS-1 treatments. Egg quality traits including egg shell weight, egg weight, egg shell thickness, Haugh unit, albumin height and yolk weight were not affected by supplementation of fenugreek seeds. It was concluded from the study that supplementation of fenugreek at the rate of 0.5% increased egg production without affecting egg quality traits.

## INTRODUCTION

Egg production and quality depend on nutritional management and health of laying birds (Shahid *et al*., 2015; Raza *et al*., 2016; Chand *et al*., 2018). To enhance the productivity under normal and adverse conditions, different medicinal plants have been used in animals and birds (Khan *et al*., 2012a, b; Alzawqari *et al*., 2016). Medicinal plants are widely used due to easy availability, effective antimicrobial nature, reduced cost, affordability of a common farmer, decreased disease associated risk and better growth and productive performance (Khan *et al*., 2012c, d; Chand *et al*., 2014; Tanweer *et al*., 2014; Alhidary *et al*., 2017). In order to increase the effectiveness of herbal products and herbs are included in the diets of birds and animals instead of antibiotics and chemical products (Abudabos *et al*., 2016; Zia ur Rehman *et al*., 2018). Herbs and their active constituents improve digestion, body metabolism and have bactericidal action (Abudabos *et al*., 2018).

Fenugreek (*Trigonella foenum graecum*) belongs to the family Leguminosea (Alarcon-Aguilara *et al*., 1998). The protein level in fenugreek is 20-30%. It has 5-10% fatty acids, which mostly include palmitic, oleic, linolenic and linoleic acids. Fenugreek has 45-65% total carbohydrates, which represent galactomannan by 15%. Fenugreek is also rich in calcium, manganese, phosphorous, zinc, iron, saponins and flavonoids. Seeds of fenugreek have unique chemical composition; protein (28.4%), crude fiber (9.3%) and crude fat (7.1%) (El Nazar and El Tinay, 2007). Fenugreek also contains iron, para-amino benzoic acid (PABA), phosphates, lecithin, B-complex and choline that aid in disintegration of fatty substances and cholesterol (Dixit *et al*., 2005). Seeds and leaves of fenugreek are

* Corresponding author: drshabananaz@gcuf.edu.pk
0030-9923/2019/0005-1793 $ 9.00/0

used widely for the preparation of powders and extracts for medicinal uses (Basch *et al*., 2003). Seeds of fenugreek at the level of 0.05% have been reported to improve feed conversion in layers (Moustafa, 2006) and increased egg production by 2.23% and reduced feed intake were also reported at the level of 0.5% (Abaza, 2007).

Keeping in view the potential advantages of using seeds of Fenugreek in poultry sector, the effect of Fenugreek seeds on egg production and egg quality in layers need to be explored. Therefore, the present study was planned to elucidate the effects of different dietary supplementations of Fenugreek seeds on egg quality and production performance of Rhode Island Red spent layers.

## MATERIALS AND METHODS

*Experimental animals, design and management*

In the study, a total of 60 Rhode Island Red (RIR) spent layers were selected and distributed randomly among 4 treatments, each with 15 birds and 3 replicates. The treatments were denoted with FS-0, FS-0.5, FS-75 and FS-1 and are represented with 4 levels as 0, 0.50, 0.75 and 1%, respectively. A 16 h day light was given to the birds throughout experimental period. The birds were kept in cages, in open sided house under similar environmental conditions and fed with basal diet. Birds were offered water *ad libitum*. The study was continued for four weeks including first week for adaptation period.

*Feed intake and egg production*

On daily basis feed intake was recorded by subtracting refused feed from feed offered. On daily basis eggs were collected from each replicate and daily egg production was calculated to work out total egg production.

*Egg quality traits*

Five eggs from each replicate (15 eggs from each treatment group) were collected randomly at the end of each week to measure the following egg quality traits. For egg weight, eggs were weighed on electric balance. With the help of standard screw gauge, shell thickness was measured after removing shell membrane. Shell thickness was measured at 3 different locations on the same egg. Yolk was weighed on electrical balance by pouring it in Petri dish. With the help of Spherometer, albumin height was calculated. After removing the egg contents, the inside of the shell was dried with the help of tissue paper and then shell was weighed on electrical balance. To measure Haugh unit, egg sample was broken in petri dish and Haugh unit was measured by using the following formula of Silversides *et al*. (1993).

$$HU=100 \times \log (h+7.57 - 1.7w^{0.37})$$

Where, h is albumin height (cm) and w is weight of egg (g).

*Statistical analysis*

The statistical analysis was performed in SAS 9.2 (SAS Institute, 2009) using a completely randomized design and least significant difference (LSD) was used for statistical difference among various experimental treatments. Data were analyzed by one-way ANOVA. Duncan multiple range tests were used to compare means. Significance was declared at $P < 0.05$.

## RESULTS AND DISCUSSION

Feed intake data of spent layers supplemented with various levels of fenugreek seeds is presented in Table I. There was significantly decreasing effect of various levels of fenugreek seeds on feed intake of experimental birds. Feed intake during 1st week was significantly higher for the control treatment followed by FS-0.5 and FS-0.75 while lowest feed intake was noted for treatment FS-1. The same trend was observed during 2nd, 3rd, and 4th week.

Decreased feed intake with treatment in the present study might be due to the reason that seeds of Fenugreek have antinutritional factor (Hooda and Jood, 2002). Our findings are in line with the results of Awadein *et al*. (2010) who mentioned that average intake of feed of Manadrah hen fed diet containing 0.5% fenugreek seeds was significantly lower than the control. Abaza (2007) also

**Table I.- Effect of dietary supplementation of fenugreek seed on feed intake (g/hen/day) of spent layers.**

| Week | Mean feed intake | | | | |
|---|---|---|---|---|---|
| | FS-0% | FS-0.5% | FS-0.75% | FS-1% | P- value |
| 1 | 105.06±0.28 [a] | 103.79±0.07 [b] | 103.57±0.06 [b] | 101.59±0.28 [c] | 0.0000 |
| 2 | 105.17±0.30 [a] | 103.61±0.18 [b] | 102.98±0.13 [b] | 101.81±0.37 [c] | 0.0001 |
| 3 | 105.18±0.13 [a] | 103.81±0.11 [b] | 102.85±0.24 [c] | 101.93±0.16 [d] | 0.0000 |
| 4 | 105.22±0.09 [a] | 104.49±0.20 [a] | 103.70±0.03 [b] | 102.39±0.42 [c] | 0.0002 |
| Mean | 105.16±0.20 | 103.93± 0.14 | 103.275±0.12 | 101.93±0.31 | |

[a,b,c,d], values in each column followed by different superscripts are significantly different at 0.05. FS-0, FS-0.50, FS-0.75 and FS-1 represent 0, 0.50, 0.75 and 1.0 % of FS/kg feed, respectively. FS, Fenugreek seed.

**Table II.- Effect of dietary supplementation of Fenugreek seed on egg production (%) (hen/day) of spent layers.**

| Week | Mean egg production | | | | |
|---|---|---|---|---|---|
| | FS-0% | FS-0.5% | FS-0.75% | FS-1% | P- value |
| 1 | 46.67±0.95 [c] | 56.19±1.91 [a] | 51.43±1.65 [b] | 35.24±0.95 [d] | 0.00 |
| 2 | 49.52±0.95 [c] | 59.04±1.91 [a] | 54.29±1.65 [b] | 38.10±0.95 [d] | 0.001 |
| 3 | 47.62±0.95 [b] | 57.14±3.30 [a] | 53.33±0.95 [ab] | 36.19±0.95 [c] | 0.002 |
| 4 | 50.48±0.95 [c] | 61.91±0.95 [a] | 55.24±0.95 [b] | 40.00±1.65 [d] | 0.003 |
| Mean | 48.58±0.95 | 58.57±2.02 | 53.57±1.30 | 37.38±1.13 | |

[a,b,c,d], values in each column followed by different superscripts are significantly different at 0.05. FS-0, FS-0.50, FS-0.75 and FS-1 represent 0, 0.50, 0.75 and 1.0 % of FS /kg feed. FS, Fenugreek seed.

**Table III.- Effect of dietary supplementation of Fenugreek seed on egg quality of Rhode Island Red spent layers.**

| Egg quality parameter | FS-0% | FS-0.5% | FS-0.75% | FS-1% | P–value |
|---|---|---|---|---|---|
| Egg weight (g) | 46.73±1.29 | 46.48±1.35 | 48.41±0.38 | 48.03±1.11 | 0.45 |
| Shell thickness (mm) | 0.431±0.021 | 0.414±1.89 | 0.432±0.015 | 0.44±0.025 | 0.38 |
| Egg shell weight (g) | 5.13±0.24 | 5.34±0.14 | 5.28±0.08 | 5.27±0.14 | 0.72 |
| Yolk weight (g) | 15.14±0.60 | 15.28±0.42 | 15.51±0.47 | 15.25±0.32 | 0.85 |
| Albumin height (mm) | 6.87±0.24 | 7.5±0.46 | 6.79±0.39 | 6.5±0.31 | 0.12 |
| Haugh unit | 73.31±0.04 | 73.55±0.15 | 73.48±0.09 | 73.25±0.07 | 0.08 |

FS-0, FS-0.50, FS-0.75 and FS-1 represent 0, 0.50, 0.75 and 1.0 % of FS /kg feed. FS, Fenugreek seed.

reported significant decrease in feed intake by supplementation of fenugreek seeds in the ration of layers. In contrast to the present study, Moustafa (2006) reported no significant effect on feed intake by supplementation of fenugreek at the level of 0.5% as compared to the control.

Egg production (%) (hen/day) at different weeks of experiment is given in Table II. Results showed significant ($P<0.05$) effect of various levels of fenugreek seeds on egg production. Significantly increased egg production was observed during 2nd week with treatment FS-0.5, followed by group FS-0.75 and FS-0, while lower egg production was reported with FS-1. An increasing level of FS resulted reduction in egg production. After 2nd week, egg production was significantly decreased (Table II). The high percentage of egg production in group FS-0.5 may be due to phytoestrogen which may have stimulatory effect on egg production (Awadein *et al*., 2010) while lower egg production in high levels of fenugreek supplemented groups may be due to reduced feed intake in these groups (Assefa, 2014).

Our findings are in line with Awadein *et al*. (2010) found significant increase in egg production of layers supplemented with 0.1 and 0.5% fenugreek. Contrary to the results of the present study, Abaza (2007) reported that supplementation of fenugreek seed at the rate of 0.5% has no effect on egg production. Similarly, Safaa (2007) reported that addition of 2% fenugreek has no effect on egg rate.

Results on egg quality parameters of spent RIR layers fed with diet supplemented with various levels of Fenugreek seed is presented in Table III. Fenugreek seeds supplementation had no significant effect on egg quality parameters of spent layers. Different treatments showed variable results for different egg quality parameters. Numerically higher level of egg weight was recorded with treatment FS-0.75, followed by treatment FS-1, while lower egg weight was recorded for control and treatment FS-0.5. There was numerically increase in egg shell thickness with FS-1 while it decreased with FS-0.5. Numerically, egg shell weight was higher with treatment FS-0.5, followed by FS-0.75 and FS-1 while lower egg shell weight was recorded with control treatment. Egg yolk weight was not affected by treatments, however numerically higher value of yolk weight was recorded with treatment FS-0.75, while lowest egg yolk weight was recorded with control group. Similarly, supplementation of Fenugreek seed did not present any significant influence on albumin height and Haugh unit. Egg quality parameters were not improved significantly with various levels of fenugreek seeds in the diet of experimental birds. Among different treatments numerically slight differences were observed. Our results are in accordance with Abaza (2007) who found no significant effect on egg quality traits of laying hen supplemented with 0.5% fenugreek. Safaa (2007) observed no significant effect in egg quality by the addition of 2% fenugreek. Awadein *et al*. (2010) reported that supplementation of fenugreek at level of 0.1% and 0.5% in the ration of laying hen had no influence on egg

shell weight, egg weight, but egg shell thickness, yolk weight, and Haught unit were significantly increased.

## CONCLUSION

The results of the present study revealed that fenugreek seeds supplementation at the rate of 0.5% decreased feed intake and improved egg production of spent layers by 10% without affecting egg quality traits.

*Statement of conflict of interest*

The authors declare no conflict of interest.

## REFERENCES


Abaza, I.M., 2007. Effect of using fenugreek, chamomile and radish as feed additives on productive performance and digestibility coefficients of laying layers. *Egypt. Poult. Sci.*, **27**: 199-218.

Abbas, R.J., 2010. Effect of using fenugreek, parsley and sweet basil seeds as feed additives on the performance of broiler chickens. *Int. J. Poult. Sci.*, **9**: 278-282. https://doi.org/10.3923/ijps.2010.278.282

Abudabos, A.M., Alyemni A.H., Dafallah, Y.M. and Khan, R.U., 2016. The effect of phytogenic feed additives to substitute in-feed antibiotics on growth traits and blood biochemical parameters in broiler chicks challenged with *Salmonella typhimurium*. *Environ. Sci. Poll. Res.,* **23**: 24151-24157. https://doi.org/10.1007/s11356-016-7665-2

Abudabos, A.M., Alyemni, A.H., Dafalla, Y.M. and Khan, R.U., 2018. The effect of phytogenics on growth traits, blood biochemical and intestinal histology in broiler chickens exposed to *Clostridium perfringens* challenge. *J. appl. Anim. Res.,* **46**: 691-695. https://doi.org/10.1080/09712119.2017.1383258

Alarcon-Aguilara, F.J., Roman-Ramos, R., Perez-Gutierrez, S., Aguilar-Contreras, A., Contreras-Weber, C.C. and Flores-Saenz, J.L., 1998. Study of the anti-hyperglycemic effect of plants used as antidiabetics. *J. Ethnopharmacol.*, **61**: 101-110. https://doi.org/10.1016/S0378-8741(98)00020-8

Alhidary, I.A., Rehman, Z., Khan, R.U. and Tahir, M., 2017. Anti-aflatoxin activities of milk thistle (*Silybum marianum*) in broiler. *World's Poult. Sci. J.,* **73**: 559-566. https://doi.org/10.1017/S0043933917000514

Alzawqari, M.H., Al-Baddany, A.A., Al-Baadani, H.H., Alhidary, I.A., Khan, R.U., Aqil, G.M. and Abdurab, A., 2016. Effect of feeding dried sweet orange (*Citrus sinensis*) peel and lemon grass (*Cymbopogon citratus*) leaves on growth performance, carcass traits, serum metabolites and antioxidant status in broiler during the finisher phase. *Environ. Sci. Poll. Res.,* **23**: 17077-17082. https://doi.org/10.1007/s11356-016-6879-7

Assefa, G., 2014. Study on potential of fenugreek and/or soybean in replacing commercial feed additive lysine in layers ration. *Eur. J. biol. Sci*., **6**: 110-114.

Awadein, N.B., Eid, Y.Z. and El-Ghany, F.A.A., 2010. Effect of dietary supplementation with phytoestrogens sources before sexual maturity on productive performance of mandarah layers. *Egyp. Poult. Sci.*, **30**: 829-846.

Basch, E., Ulbricht, C., Kuo, G., Szapary, P. and Smith, M., 2003. Therapeutic applications of fenugreek. *Alt. Med. Rev*., **8**: 20-27.

Chand, N., Naz, S., Irfan, M., Khan, R.U. and Zia ur Rehman, 2018. Effect of sea buckthorn (*Hippophae rhamnoides* L.) seed supplementation on egg quality and cholesterol of Rhode Island Red × Fayoumi laying hens. *Korean J. Fd. Sci. Anim. Resour.,* **38**: 468-475.

Chand, N., Naz, S., Shah, Z., Khan, S., Shah, A.S., and Khan, R.U., 2014. Growth performance and immune status of broilers fed graded levels of *Albizia lebbeck* seeds. *Pakistan J. Zool.*, **46**: 574-577.

Dixit, P., Ghaskadbi, S., Mohan, H. and Devasagayam, T., 2005. Antioxidant properties of germinated fenugreek seeds. *Phytother. Res.*, **19**: 977-983. https://doi.org/10.1002/ptr.1769

El Nasry, N.A. and El-Tinay, A.H., 2007. Functional properties of fenugreek (*Trigonella foenum graecum*) protein concentrate. *Fd. Chem.,* **103**: 582-589.

Hooda, S., and Jood, S., 2002. Effect of soaking and germination on nutrient and antinutrient contents of fenugreek. *J. Fd. Biochem.*, **27**: 165-176. https://doi.org/10.1111/j.1745-4514.2003.tb00274.x

Khan, R.U., Nikosefat, Z., Tufarelli, V., Naz, S., Javdani, M. and Laudadio, V., 2012a. Garlic (*Allium sativa*) supplementation in poultry diet: Effect on production and physiology. *World's Poult. Sci. J.*, **68**: 417-424. https://doi.org/10.1017/S0043933912000530

Khan, R.U., Naz, S., Nikousefat, Z., Tufarelli, V. and Laudadio, V., 2012b. *Thymus vlugaris*: Alternative to antibiotics in poultry feed. *World's Poult. Sci. J.,* **68**: 401-408. https://doi.org/10.1017/S0043933912000517

Khan, R.U., Naz, S., Tufarelli, V. and Laudadio, V., 2012c. Potential applications of ginger (*Zingiber*

*officinale*) in poultry diet. *World's Poult. Sci. J.,* **68**: 245-252. https://doi.org/10.1017/S004393391200030X

Khan, R.U., Naz, S., Javadani, M., Nikousefat, Z., Selvaggi, M., Tufarelli, V. and Laudadio, V., 2012d. The use of turmeric (*Curcuma longa*) in poultry diets. *World's Poult. Sci. J.*, **68**: 97-103. https://doi.org/10.1017/S0043933912000104

Moustafa, K.E.K., 2006. Effect of using commercial and natural growth promoters on the performance of commercial laying layers. *Egypt. Poult. Sci.*, **26**: 941-965.

Raza, T., Chand, N., Khan, R.U., Shahid, M.S. and Abudabos, A.M., 2016. Improving the fatty acid profile in egg yolk through the use of hempseed (*Cannabis sativa*), ginger (*Zingiber officinale*), and turmeric (*Curcuma longa*) in the diet of Hy-Line White Leghorns. *Arch. Anim. Breed.,* **68**: 183-190. https://doi.org/10.5194/aab-59-183-2016

Safaa, H.M., 2007. Effect of dietary garlic or fenugreek on cholesterol metabolism in laying layers. *Egypt. Poult. Sci*., **27**: 1207-1221.

SAS Institute, 2009. *User's guide: Statistics*, Version 9.2. SAS Institute, Inc., Cary, NC, USA.

Shahid, S., Chand, N., Khan, R.U., Suhail, S.M. and Khan, N.A., 2015. Alterations in cholesterol and fatty acids composition in egg yolk of Rhode Island Red x Fyoumi hens fed with hemp seeds (*Cannabis sativa* L.). *J. Chem.,* **2015**: Article ID 362936. https://doi.org/10.1155/2015/362936

Silversides, F.G., Twizeyimana, F. and Villeneuve, P., 1993. Research note: A study relating to the validity of the Haugh unit correction for egg weight in fresh eggs. *Poult Sci.*, **72**: 760-764. https://doi.org/10.3382/ps.0720760

Steel, R.G.D. and Torrie, J.H., 1981. *Principles and procedures of statistics*. McGraw Hill Book Co., New York.

Tanweer, A.J., Chand, N., Saddique, U., Bailey, C.A. and Khan, R.U., 2014. Antiparasitic effect of wild rue (*Peganum harmala* L.) against experimentally induced coccidiosis in broiler chicks. *Parasitol. Res.,* **113**: 2951-2960. https://doi.org/10.1007/s00436-014-3957-y

Zia ur Rehman, Chand, N., Khan, R.U., Naz, S. and Alhidary, I.A., 2018. Serum biochemical profile of two broilers strains supplemented with vitamin E, raw ginger (*Zingiber officinale*) and L-carnitine under high ambient temperatures. *S. Afr. J. Anim. Sci.,* **48**: 935-942.