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Study on Potential of Fenugreek And/or Soybean in Replacing Commercial Feed Additive Lysine in Layers Ration

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Abstract: Commercial lysine production for animal feed is becoming a major global industry. However, it is not produced in Ethiopia and thus imported. High cost and shorter shelf life, due to long time elapsed between production and importation, make lysine and methionine supplementation a bottle neck for commercial poultry producers in Ethiopia. In searching a solution for this problem, fenugreek and soybean were tested as an alternative to commercial feed additive lysine. Six different formulations of poultry ration (with and without commercial feed additive lysine) were tested on 30 Bovans Brown commercial layers in University of Gondar laboratory animals farm from January to March 2013. The hens were arranged in completely randomized designed with six treatment and five replications. After acclimatization period of two weeks, egg production and feed consumption were recorded for consecutive 12 weeks. Body weight were recorded at the binging and end of the research. Finally, the data were analyzed using JMP (10.0.2) software. The research have found that 8.5 -18 % Fenugreek inclusion in a layers ration reduced feed consumption and egg production, however egg weight and body weight change remained unaffected**.** Replacing one unit of fenugreek with similar unit of commercial feed additive lysine resulted no significant ($P>0.05$) change in egg production. To the contrary, replacing one unit of soybean with similar unit of commercial feed additive lysine significantly ($P<001$) reduced egg production. In this study, the highest egg production was observed in rations with high soybean and no commercial feed additive lysine. Thus, it is concluded that, in areas where commercial feed additive lysine is lacking, soybean can be used as an alternative.

Key words: Lysine replacer · Fenugreek · Soybean

INTRODUCTION

Feed comprise 67.4% of total egg production cost [1]. Thus profitability of the farm largely depend on the efficient use of feed resources. In confined animal husbandry practice, since there is no way of compensating the nutrient deficiency in the ration, all nutrients should be supplied through feeds. High level of animal performance can only be achieved if important nutrients are made available in the correct combination and sufficient quantity.

One of the essential amino acids that mono-gastric animals need to be supplied with is lysine. Lysine is the second limiting amino acid for poultry. Production of L-Lysine by fermentation was started in Japan during the 1960s. Lysine is industrially produced by microbial fermentation, from a base mainly of sugar. Lysine production for animal feed is a major global industry, reaching 600,000 tons in 2000 [2]. One of lysine benefits is helping the proper absorption of calcium from the gastro intestinal tract and conserving its use so it can improves egg production. Lysine is one of the primary components of proteins. Therefore, it is critical for proper body growth particularly in young animals.

Industrial Lysine is not produced in Ethiopia but is imported. Though the amount required in feed is low, high cost of lysine and shorter shelf life, due to longer time elapsed between production and importation, supplementation of lysine is becoming a bottleneck for feed processors and commercial poultry farmers in Ethiopia. In searching a solution for this problem, fenugreek and soybean were selected to be tested as an alternative because of their availability and high lysine content.

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Fenugreek (*Trigonella foenum-graecum,* Family Fabaceae*)* is an herbaceous plant from the family of the leguminous. Even from the ancient times the seeds and leaves of fenugreek were used largely to prepare medicinal extracts and powders [3]. It widely grown in Ethiopia as spices. At the present production scale, fenugreek ranks 6th among the highland pulses [4]. Fenugreek is one of high lysine containing seeds. A raw seed contains 5.86 % lysine [5].

Soybean (US) or soya bean (UK) (Glycine max) is the richest in protein content of all the common seeds used for animal feed [6]. The nitrogenous constituents of the seed include some inhibitory and toxic factors. The most important of these is the soybean trypsin inhibitor, which blocks the activity of the digestive enzyme trypsin. As trypsin inhibitor is destroyed by heat and as soybeans are normally heated before or during processing, it is of no concern in the oilcake. Whole seeds, however, should thoroughly be heated before feeding to pigs or poultry. Too high or too prolonged heat will destroy essential amino acids. Soybean also contains urease, an enzyme that releases ammonia from urea and therefore cannot be fed together with urea [6].

Soya bean contain 6% lysine and 39.5% crude protein [2]. Soybean breeding and production have been going on in Ethiopia since the 1950's. However, the production has been slow, because of lack of know-how of the local farmers on the utilization aspect of the crop, unavailability of attractive market for the produce and lack of systematic approach in popularizing the crop. In 2010 Ethiopia has produced 158,244.12 quintal soybean [7]. Because of an immense effort being bone on this crop in extension and policy issues, it's production is expected to increase. Therefore, the objective of this research is to test the potential of fenugreek and soybean seeds in replacing commercial feed additive lysine in layers ration.

MATERIALS AND METHODS

Experimental Site: The experiment was conducted between January to March 2013 in Ethiopia at University of Gondar animals farm, 12°36' N and 37°28' E, [8], 2133 meter above sea level. The annual rainfall of the area is 1000 to 1500 mm. The rainy season is from June to end of September. The average annual temperature is 25 to 35°C [9].

External Animals, Design and Treatments: Two hundred Bovans Brown Commercial layer pullets at the age of 12 weeks of age were purchased from private commercial farm and maintained on deep litter house fed with grower ration until the age of 18 weeks. Then 30 pullets having uniform size and weight were selected and randomly placed in individual cage. Treatment rations (Table 1) were randomly allotted to individual hens with six treatment and five replication in completely randomized design.

Table 1: Composition of expermental diets

	Parts in treatment ration %						
Ingredients	T1	T2	T3	T4	T5	T6	T7
White maize (%)	51	51	51	51	51	51	50
wheat (%)	8	8	8	8	8	8	17
Soya bean %	18.00	9.00	0.00	17.00	8.50	0.00	18.10
Fenugreek	0.00	9.00	18.00	0.00	8.50	17.00	0.00
Noug (Niger seed) cake (%)	15.00	15.00	15.00	15.00	15.00	15.00	0.00
Methionine %	0.16	0.16	0.16	0.16	0.16	0.16	0.00
Lysine (%)				1.00	1.00	1.00	0.00
Lime stone (%)	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Meat and bone meal							7.00
Layer premix %	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Salt (%)	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Total weight (as feed) in kg	100.06	100.06	100.06	100.06	100.06	100.06	100.00
Me (Kcal/kg)	2811.00	2861.00	2918.00	2785.00	2832.00	2879.00	2902.00
CP (%)	16.00	15.00	14.00	17.00	16.00	15.00	15.15
Lysine (%)	0.73	0.66	0.60	1.68	1.62	1.56	0.88
Methionine (%)	0.40	0.38	0.36	0.39	0.38	0.36	0.31
CF%	8.36	8.25	8.14	8.28	8.18	8.00	1.51
Calcium (g/kg)	34.00	32.00	30.00	34.00	32.00	30.00	35.00
Total phosphorus (g/kg)	5.00	4.00	4.00	5.00	4.00	4.00	15.00

Table 2: Performance of Bovans Brown Commercial layers on varying level of soyabean and fenugreek with and without sinthetic lysine

	Results							
Parameter	T1	T2	T3	T4	T5	T6	T7	P value
Final body weight (kg)	1.77[a]	1.68[a]	1.73[a]	1.78[a]	1.83[a]	1.88[a]	1.78[a]	>0.16
Initial body weight (kg)	1.73[a]	1.67[a]	1.72[a]	1.79[a]	1.71[a]	1.66[a]	1.71[a]	> 0.75
Body weight change(kg)	0.04[a]	0.01[a]	0.01[a]	-0.01[a]	0.12[a]	0.22[a]	0.01[a]	>0.32
Egg production %	74.53[a]	35.79b[c]	19.47[c]	50.53[b]	50.53[b]	31.58[bc]	79.65[a]	<0.001
Number of egg /hen	67[a]	32[bc]	18[c]	46[b]	45[b]	28b[c]	72[a]	<0.001
Egg weight (g)	55.53[a]	56.54[a]	54.33[a]	57.17[a]	54.45[a]	55.86[a]	55.53[a]	>0.70
Feed intake per hen								
Daily (g)	111.00[a]	100.41[c]	81.20[e]	110.82[a]	104.21[b]	93.20[d]	110.58[a]	<0.001
Total (kg)	9.99[a]	9.04[c]	7.31[e]	9..97[a]	9.38[b]	8.39[d]	9.95[a]	<0.05
ME and CP intake								
ME(Kcal/hen/day)	312.03[a]	266.66[d]	236.94[e]	294.96[b]	284.35[c]	319.04[a]	320.90[a]	<0.001
CP(gram/hen/day)	17.76[a]	13.98[d]	11.37[e]	18.01[a]	16.06[c]	16.62[b]	16.75[b]	<0.001
Feed cost								
For kg of treatment feed (Birr)*	7.35	7.85	9.51	9.99	8.35	9.03	7.91	
Per hen /90 days	73.43[d]	70.94[d]	89.19[a]	83.8[b]	61.02[e]	90.06[a]	78.72[c]	< 001
Value egg (Birr) at rate of 2.5birr/egg	167.50[a]	80.00[bc]	42.50[c]	112.00[b]	112.50[b]	70.00[bc]	177.50[a]	< 001
Gross profit(lose)	94.07[ab]	9.06[cd]	- 46.69[e]	28.70[c]	51.48b[c]	-20.06d[e]	98.78[a]	< 001

* birr is Ethiopian currency; One birr is equal to 0.05 US dollar.

Data Collection and Analytical Procedures: After acclimatization period of two weeks, feed intake (as a difference of offer and left over), egg production and body weight change (as a difference of initial and final weight) were recorded for 12 weeks. Intake and egg production were recorded daily. The data were analyzed using JMP (10.0.2) software.

RESULT AND DISCUSION

Feed Intake: In this research, no differences were observed in feed consumption in the rations which had no fenugreek. Feed consumption recorded in those formulations which were devoid of fenugreek was 111gm/head/day, which is similar to that of reported for the breed (110gm) by NRC [10] and CPI [11]. In treatment ration (T) the addition of 8.5(T5) to 18% (T3) fenugreek in layer ration significantly (P<0.01) reduced intake to 104.21 and 81.20 gram/head/day, respectively (Table 2). This finding is in line with that reported by Abaza *et al.* [11], that addition of 5% fenugreek to layers ration had reduced intake. The present observation is also in congruent with the result obtained by Hassan [13] who reported that 2% fenugreek seed reduced feed consumption. Feed consumption reduction as result of adding ungerminated fenugreek may be due to the presence of anti- nutritional factors (phytic acid and polyphenols) [5].

Egg Production: Inclusion of ungerminated fenugreek more than 8.5% in layers ration significantly (P<001) reduced egg production. Highest reduction had been recorded where ungerminated fenugreek comprised 18% of the total ration. No significant differences were observed in egg production among treatment rations that containing 8.5 to 17% fenugreek. These finding is in agreement with those reported by Criste *et al*. [14] who found that the higher level of dietary fenugreek decreased laying intensity. Hassan [13] also found that addition of fenugreek seed to White Bovans Pullet's diets reduced egg number and egg rate. The reason for low productivity may be due to reduced feed intake. Madian [15] also reported that 0.5%

Fenugreek Seed in Fayoumi diet increased egg number, egg mass and egg rate as compared to 1 and 1.5% Fenugreek Seeds.

Egg Weight: In this research addition of ungerminated fenugreek did not show significant difference (P>0.05) on body and egg weight. The present observation is in congruent with the result obtained by Abdouli *et al*. [16] who reported that adding 2-6% fenugreek seed in layer ration had no significant (P>0.05) difference in their egg weight.

Potential of Fenugreek in Replacing Commercial Feed Additive Lysine: In present study, replacing 1unit of fenugreek with similar unit of commercial feed additive lysine in layers ration resulted no significant (P>0.05) change in egg production (T3 and T6). In addition to this, in a rations which had equal proportion (9% soybean and 9% fenugreek) (T2), replacing 0.5% soybean and 0.5% fenugreek

with one percent commercial feed additive lysine (T5) had no significant (P>0.05) difference in egg production.

Potential of Soybean in Replacing Commercial Feed Additive Lysine: Replacing one unit soybean with similar unit commercial feed additive lysine (see T4 and T1) in layer's ration resulted significant (P<0.01) reduction in egg production. This was due to the consequential reduction of energy content of the ration in T4 and reduced energy intake of hens fed on T4. The observed reduction of egg production as a result of low energy content of a feeds and low energy intake is in line with that reported by Li *et al* [17] and Bonilla *et al.* [18]. Costa *et al.* [19] also reported that egg production increased significantly with increasing levels of metabolizable energy. Similarly Valkonen *et al*. [120] had reported that hens that received the low-energy diet produced fewer eggs per day (P < 0.05) than the birds fed the high-energy diet. Faria & Silva [21] also observed that when energy intake is deficient, egg production compromised. In present study, the highest egg production was observed in rations with high soybean content and no commercial feed additive lysine (T1 and T7).

CONCLUSION

From the above findings, it is concluded that ungerminated fenugreek seed inclusion in layers ration to the level ranging from 8.5 to 18% reduce feed consumption and egg production and thus can't be used as an alternative for commercial feed additive lysine. However, if layers rations are well formulated using more than 18% soybean or equivalent high protein and lysine containing ingredients, the use of commercial feed additive lysine is not require. Thus in areas where commercial feed additive lysine is lacking or too expensive, soybean or other high protein and lysine containing feed ingredients can be used as an alternative.

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