Khulna University Studies 4(1): 649-654

EFFECT OF VEGETABLE PROTEIN ON THE PRODUCTION PERFORMANCE OF LAYING DUCKS

M. S. Islam*[a], K. Sarkar[b], G. M. R. Islam [a], A. K. M. Sadiqul Islam [a], S. Afroz[a] and D. Karim[a],

[a] *Agrotechnology Discipline, Khulna University, Khulna-9208, Bangladesh*

[b] *Govt. Regional Duck Breeding Farm, DLS, Daulatpur, Khulna, Bangladesh.*

KUS-02/12-040702

Manuscript received: July 04, 2002; Accepted: January 05, 2003

Abstract: A feeding trail was conducted for a period of 90 days to evaluate the effect of vegetable protein (soybean meal) diets on 200 days old 744 Jinding breed egg type ducks of which 654 was female and 90 was male. Each group of dietary treatment had three replications with 124 ducks of which 109 were layer. Experimental diets were isoenergic and isonitrogenous. The level of energy and protein were 2880 Kcal/kg ME and 18% CP respectively. Basal diet contains 3% level of animal protein concentrate (PRO-PAK) and treatment diet contained solely vegetable protein. Soybean meal was used as a source of vegetable protein along with synthetic amino acids L-Lysine and DL-Methionine. Ducks were reared on floor and were offered 160 g of feed per day in the form of wet mash. There were no significant differences ($P>0.05$) of egg production, fertility, hatchability, egg weight, body weight gain, feed efficiency and mortality ($P>0.01$) of the birds used in the trail.

Key words: Soybean meal, Animal Protein, , Egg type ducks, Performance.

Introduction

Among the poultry farm enterprises, duck production plays an important role in rural economy of Bangladesh. Ducks raising is considered to be one of the traditional enterprise and technologically lags behind to any other poultry farm enterprises. Feed cost accounts for 75-80% of the total costs involved in the enterprise, because duck needs 40% more feed than chicken (Farrel, *et al.,* 1995). To make duck production as a profitable enterprise by reducing both cost of feed and mortality, attempt has been made to replace costly fishmeal with cheaper vegetable protein source especially soybean meal in particular (Hanh, *et al.,* 1994). soybean meal is considered to be an important ingredient in poultry diets since it provides high amount of quality protein with a cheaper price (Oloum, *et al.,* 1981, Inam-uh-Hag, *et al.,* 1986). Duck nutritionists in many countries of the world conducted experiments with soybean meal to achieve improved production performance and profitability in poultry industry (Martin, 2000). Feeding trails with vegetable protein ingredient especially soybean meal in duck feed formulation is very limited (Shen, 1985). Therefore, an attempted was made to study the effect of vegetable protein source ingredient (soybean meal) in the rations of laying ducks on its production performance.

Materials and Methods

***Ducks and experimental design*:** The experiment was conducted for a period of ninety days in Regional Duck Breeding Farm (RDBF) Daulatpur, Khulna, Bangladesh. A total of 744 ducks aged 200 days of Jinding breed were used in the experiment, of which 90 were breeding drakes and the rest 654 were layer. The experimental birds were divided into two treatment groups as T_1, and T_2 of which T_1 was basal and T_2 was test diet groups. The ducks were randomly distributed in six pens of two sheds having equal dimensions. Feed was allotted at the rate of 160 g per head per day and given twice daily.

***Chemical Analysis of the feed stuffs and calculation of ME*:** Composition of experimental diets were analyzed for proximate components as per AOAC (1993) and the Metabolizable Energy (ME) content on the basis of the formula used by EEC (1986). The values were given in Table 1.

***Formulation of experimental diets*:** The experimental diets were formulated (Table-2) on the basis of CP and ME content of 18% and 2880 kcal/kg respectively. The experimental diets were isoenergetic and isonitrogenous. Basal diet was computed with animal protein concentrate while test diet was satisfied with soybean meal as a source of protein in test diet. Animal protein was Pro-PAK manufactured by H. J. BAKER and BRO 1Nc. USA and soybean meal used was imported from India. Breeder vitamin as well as

*Corresponding author: Tel.: 880-41-721791/720171-3, Ext. 211; Fax: 880-41-731224; e-mail: shafiq_ru@hotmail.com
DOI: https://doi.org/10.53808/KUS.2002.4.1.0212-L

other nutrients in the diets met NRC (1998) recommendations. The composition of the diets used is shown in Table 2.

Table 1. Chemical composition and estimated ME content of the experimental feed ingredients.

Items	Wheat	Rice polish	Soybean meal	Animal protein concentrate
Dry mater (DM) %	88.19	88.72	88.77	91.08
Crude Protein (CP)%	12.16	13.96	46.70	63.09
Crude Fiber (CP) %	3.16	5.96	6.70	1.33
Ether Extract (EE) %	1.90	3.28	0.91	3.20
Nitrogen Free Extract (NFE) %	69.72	49.10	27.38	200
Ash %	1.25	9.42	7.80	21.46
ME (Kcal /kg)	3081	3221	2777	2672

Table 2. Composition of the experimental diets

Ingredient	Basal diet (T_1) (Per cent used)	Test diets (T_2) (Per cent used)
Wheat	46.00	45.00
Rice polish	30.00	30.00
Soybean meal	15.00	19.00
Animal protein concentrate	03.00	---
Salt	00.50	00.50
Oyster shell	05.20	04.00
L-Lysine	---	00.80
DL-Methionine	---	00.40
Mineral-Vit. Premix (Breeder)[1]	00.30	00.30
Total	100	100
Nutrient level (analyzed as feed)		
ME (kcal/kg)	2880.27	2880.30
CP (%)	18.66	18.52
C/P ratio	154 : 1	155 : 1
Methionine (%)	0.31	1.09
Lysine %	0.50	0.87
Methionine + Cystine (%)	0.70	0.64
Calcium (%)	2.05	2.00
Available phosphorus (%)	0.73	0.68

[1]: Composition of Breeder Vit. Premix per Kg: Vit. A, 6000000IU; Vit. D_3, 1200000 IU; Vit E, 10 g; Vit. K_3, 1.6 g; Vit. B_1, 1 g; Vit. B_2, 3.2 g; Vit. B_6, 1.6 g; Vit. B_{12}, 4.8 mg; Nicotenic acid, 14 g; Calcium-D Pentothanite, 15 g; Folic acid, 3.2 g; Biotein,60 mg; cobalt, 0.2 g; Cu, 4 g; Fe, 16 g; I, 0.16 g; Mn, 24 g; Zn, 20 g; DL- Methionine, 20 g; L- lysine, 12 g; Ca, 290 g; Se, 60 mg.

Collection and analysis of the data: A 7 days preliminary period was given to the all ducks to adjust to the feed followed by 90 days trail. Hatchability was calculated on the basis of fertile egg. The experiment was conducted with a Randomized Complete Block Design (RCBD). The collected data were analyzed using Analysis of Variance (ANOVA), Chi-square test and SPSS programs.

Results and Discussions

The result of egg production is given in Table 3. Weekly average hen day egg production during the experimental period is shown in Figure-1. From the result it is evident that replacement of animal protein ingredient with that of Soybeanmeal (vegetable protein) did not preclude egg production of the birds used in the experiment ($P>0.05$). A concomitant rate of egg production was obtained and indicated that ducks receiving basal and treatment rations response equally.

But in basal diet 3% level of animal protein concentrate (PRO-PAK) was used. Both the diet contains same magnitude of energy (ME) and protein (CP), which were 2880 Kcal/kg and 18% respectively. Level of calcium and available phosphorus were same for all diets. Range of essential amino acids especially Methionine, Lysine, Methioninet cystine varied slightly (Table 2). The fact of egg production can be compared by the findings of Pan *et al.*, (1981). They conducted an experiment with white domestic laying ducks, feed partial corn soybean diets containing various levels of protein and energy which were adjusted to the designated levels by changing the proportion of corn, soybean and tallow in the diet. The result of the experiment indicated that egg production and egg weight were significantly ($P< 0.05$) increased, with an increase dietary CP from 15 to 19 %.

Egg weight of different dietary treatment groups are presented in Fig. -2 and in Table 3. It is evident that both the diets responded in regard to the weight of eggs of the duck (P>0.05).

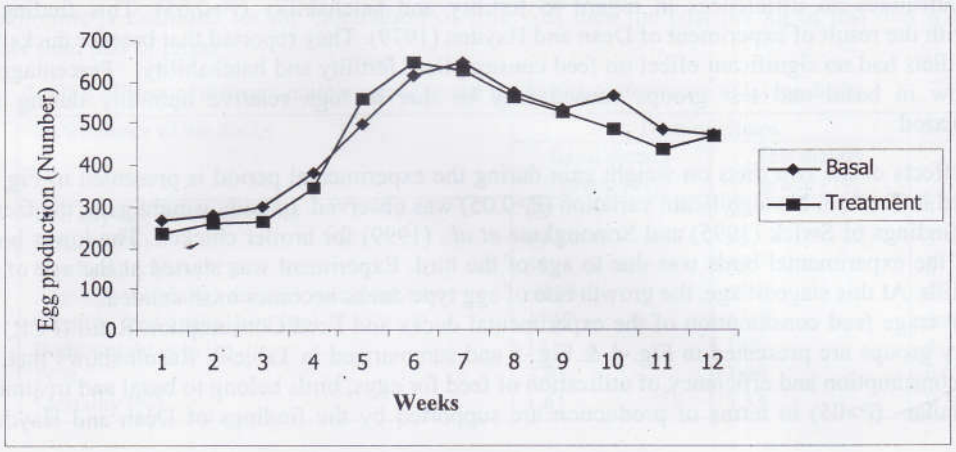

Fig. –1. Weekly hen day egg production.

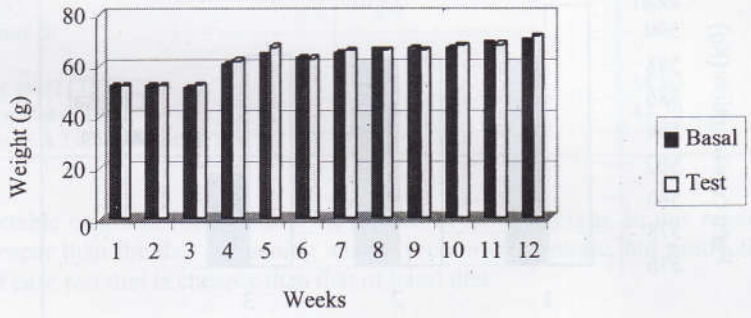

Fig. -2. Weekly average egg weight during the experimental period.

This result does not agree the finding of Park, *et al.,* (2002). They conducted an experiment to know the effect of three different Soybeanmeal source (CP, 18 %) on layer performance and found that egg weight of layers depends at least partly on the dietary protein source (P< 0.05).

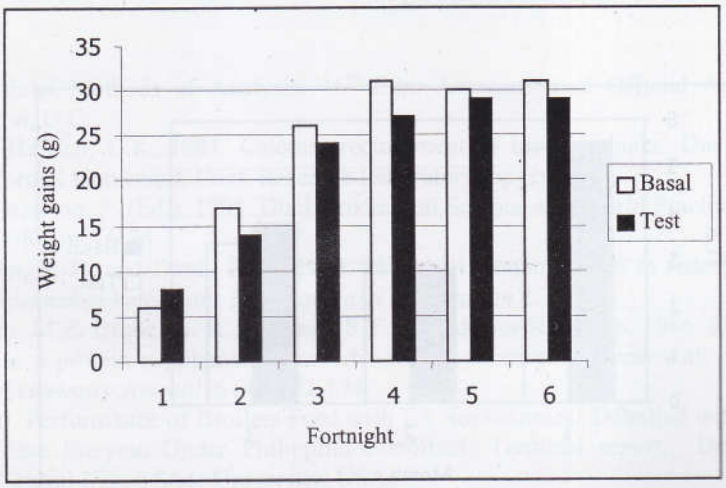

Fig. -3. Fortnightly body weight gain during the experimental period.

The fertility and hatchability of different dietary groups are shown in Table 3. Result shows that the replacement of animal protein with that of vegetable protein especially soybean meal in the diets of the laying ducks attributes no differences in regard to fertility and hatchability (P>0.05). This finding is concomitant with the result of experiment of Dean and Hayden (1979). They reported that breeder ducks fed corn/ soybean diets had no significant effect on feed consumption, fertility and hatchability. Percentage of hatchability low in basal and test groups caused may be due to high relative humidity during the experimental period.

Result of the effects of the two diets on weight gain during the experimental period is presented in Fig. -3 and summarized in Table 3. No significant variation (P>0.05) was observed. In body weight gain, the fact is similar to the findings of Swick (1995) and Srinongkote *et al.*, (1999) for broiler chicken. The lower body weight gain of the experimental birds was due to age of the bird. Experiment was started at the age of 28 weeks of the birds. At this stage of age, the growth rate of egg type ducks becomes most stunted.
Result of the average feed consumption of the experimental ducks and Feed Consumption Ratio (FCR) of different dietary groups are presented in Fig.-4 & Fig.-5 and summarized in Table-3. Result shows that, in regard to feed consumption and efficiency of utilization of feed for eggs, birds belong to basal and treatment group were similar (P>05) in terms of production are supported by the findings of Dean and Hayden, (1979).

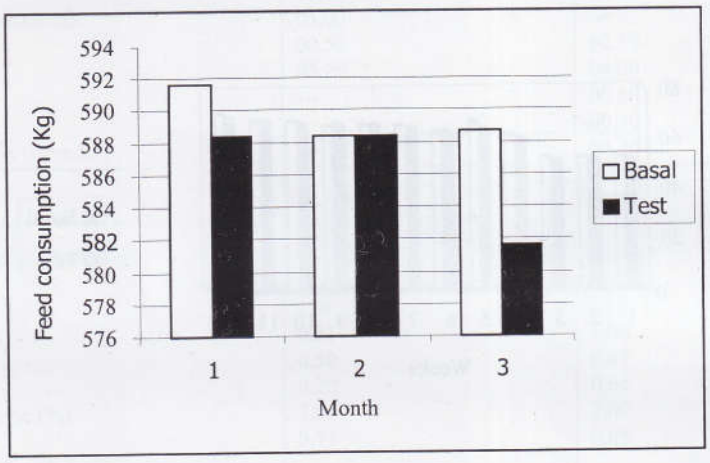

Fig. - 4. Monthly feed consumption during the experimental period

Result of vegetable protein diet and animal protein inoculated diet on mortality are insignificant (P>0.01) which is summarized in Table 3. It was ascertained from the postmortem reports that the mortality of the ducks attributed due to injury, not due to the effect of feed. Park *et al.* (2002), reported similar result that the mortality rate was not significant in all dietary groups fed by soybean meal of different origins for both growing and laying periods in case of broiler and layer.

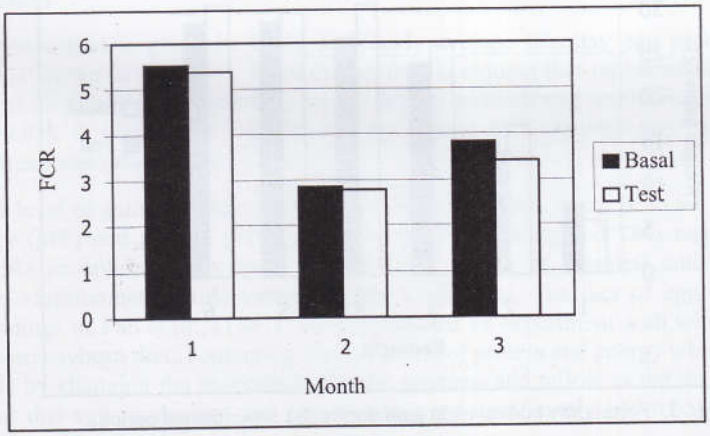

Fig. - 5. Monthly FCR during the experimental period

Data presented in Table 4 showing the economic gain of two diets. The higher cost per Kg of test diet was due to the inclusion of costly amino acids L-lysine and DL-methionine. If the cost of L-lysine and DL-methionine is excluded for the calculation of feed cost then the cost per kg of test diet will become 6 % lesser than that of basal

Table 3. Effect of different protein source on the productive performance of laying ducks.

Performance of the ducks	Dietary groups		SEM
	Basal dietary group (T_1)	Test dietary group (T_2)	
Hen day egg production (%)	62	60	3
Fertility (%)	89	86	3
Hatchability (%)	54	55	2
Avg. egg weight (g) during experiment time	68.06	68.78	0.75
Monthly feed intake/ bird (kg)	1768	1758	3.46
Body weight gain (g)	141	135	4
FCR	3.83	3.96	0.03
Mortality (%)	1.61	3.33	0.36

Table 4. Feed cost for egg production during the laying phase

Item	Dietary group	
	Basal dietary group (T_1)	Test dietary group (T_2)
Feed cost/ kg (Tk)*	10.87	11.99
Feed cost / kg (Tk) (Excluding L-lysine & D-Lmethionine)	10.87	10.23
Feed cost/ kg egg mass (Tk)	46.08	58.80
Feed cost/ Kg egg mass (Tk) (Excluding L-lysine & DL- methionine)	46.08	44.70

□ $ 1= Tk 58

The protein of vegetable origin is cheaper than the protein of animal origin. In this regard diet containing Soybeanmeal is cheaper than the diet containing animal protein concentrate, but production of egg was al most similar. In that case test diet is cheaper than that of basal diet.

Conclusion

The findings of the present study indicates that soybeanmeal can be inoculated as vegetable protein in the diets of laying ducks without any adverse effect on their performances such as egg production, fertility & hatchability, egg weight, FCR, body weight gain, and mortality.

Acknowledgements

The authors wish to acknowledge Agrotechnology Discipline, Khulna Unibersity, Khulna for providing finical support for the study. The help and assistance received from Regional Duck Breeding Farm, DLS, Daulatpur, Khulna, is also duly acknowledged.

References

AOAC. 1993. Official Methods of Analysis. 16th Edn. Association of Official Agricultural Chemists, Washington, D.C.

Dean, W. F. and Hayden, D.K. 1981. Calcium requirement of breeder ducks. Duck Research Progress Report. Cornell University, Duck Research Laboratory, pp. 26.

Farrel, D. J. and Stapleton, P. (Ed.). 1995. Duck Production Science and World Practice. University of New England. UK, pp. 16-26.

Hanh, T. T., Nagan, P. H. and Danh, P. N. 1994. Microbial contamination in fish meal used for animal feeding. *Journal of Veterinary Technique and Information* 2: 26-30.

Inam-ul-Hag, Alam, M.Z. Brque, A. R., Hussain, S.T. and Atiq-ur-Rahaman. 1986. Utilization of soybean oil meal as a protein supplements in starter rations at varying levels with or without fish meal. *Pakistan Veterinary Journal*. 6 (4): 172-174.

Martin, E. A. 2000. Performance of Broilers Feed with US Soybeanmeal Dehulled with and without Alpha Galactosidase Enzyme Under Philippine Condition. Terminal report, Department of Animal Science, Central Luzon State University, USA.

NRC. 1998. Nutrient Requirments of Poultry, 9th Revised Edn. National Academy of Sciences, Washington, D.C.

Oloum, J. M., Offiong, S.A. and Smulikowska, S. 1981. Methionine and lysine in practical broiler rations in the tropics. *Journal of Animal Production Research*. Nigeria. 1: 69-88.

Pan, C.M., Lin, E.I. and Chen, P.C. 1981. Protein and energy requirements of Tsaiya ducks. *Taiwan Livestock Research*. 14: 34-44.

Park, H. Y., Kim, K., H., Kim, S., H., Lee, S. H., Shin, S., I. and Whang, Y. K. 2002. Effect of three different Soybeanmeal sources on layer and broiler performance. *Asian-Australasian Journal of Animal Sciences*. 15(2): 254-265.

Shen, T. F. 1985. Nutrient requirements of laying ducks. Duck Production Science and World Practic. Farrel, D.J. and Stapleton, P (Ed.) University of New England. pp. 16-26.

Srinongkote, S. , Kilttiwarawech, S. and Wilaipan, P. 1999. Performance of broiler chickens fed non-fish meal diets. Trial Report No. AB99055B. Bangkok Animal Research Center. Bangkok, Thailand.

Swick, R. A. 1995. Selection and use of Soybeanmeal in swine feed. ASA Technical Bulletin No. 083/12/94 ASA, Singapore.