

## COMPARISON OF FEEDING DIETARY PLANT AND ANIMAL PROTEIN ON LAYING HENS PERFORMANCE

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**Abstract:** *An experiment was conducted to determine the effect of feeding dietary plant proteins with lysine and methionine on the performance of laying hens, and to assess the economic advantage of feeding such diets. Forty Single Comb White Leghorn laying hens at age of sixty weeks were selected on the basis of uniform body weights and productivity and distributed randomly into 2 treatment groups with 4 replicates (5 birds/replicate) in a completely randomized design. Diets were formulated to be approximately isocaloric and isonitrogenous to meet the National Research Council (1994) nutrient requirements for layers. The experiment started at age of forty weeks of production and lasted for 10 weeks after one week adaptation period. Parameters measured were: feed intake, feed conversion ratio, hen day egg production, egg weight, egg mass and mortality %.*

*The results revealed no significant difference ( $P>0.05$ ) among the groups fed dietary plant or animal protein (layer concentrate) regarding feed intake, feed conversion ratio, egg production and masses. Feed cost per kilogram decreased by 12.5% and cost of kilogram eggs by 20.8% when hens were fed dietary plant.*

### INTRODUCTION

About 60-70 % of the cost of raising chicken goes for feed. The proper ration should provide the nutrient according to the requirement of chicks (Mukhtar, 2006). Most of feed used are deficient in essential amino acids , mainly lysine and methionine ,as the grains as plant protein sources are considered the main components of poultry diets which are deficient in the quantity of essential amino acid .The imbalance deficiency and unavailability of amino acid lead to growth depression (Sibbald, 1986) .

Khaled (2001) found that feeding broiler chicks on diets containing animal protein sources has no superiority over diets containing vegetable

protein sources in terms of body weight, feed conversion, and mortality rate .However, vegetable protein diets are safe and economical.

Maintaining laying hens performance at maximum productivity with low costs are important factors for successful egg production .In Sudan, the imported concentrates were provided for essential amino acids and other micro –nutrient which increase the total cost of poultry feed. Layer concentrate is considered one of the highest sources of animal protein in Sudan and it contains major amounts of essential amino acids, mineral and vitamins and it is imported from abroad compared to plant proteins which are locally available . Most of the research has been reported on the effects of feeding dietary plant proteins on the performance of broiler chicks (Jenson, 1991), (Omer, 2001) and (Mukhtar, 2006).The objective of this study was aimed to evaluate the performance of laying hens fed dietary plant and compared with those fed animal protein with its effects on the cost of feed and eggs.

## **MATERIALS AND METHODS**

The study was carried out at Alzaim Al-azhari University from June to Ougust, 2008.Average of minimum and maximum temperature was 27-40°C and relative humidity was 21-91%. Fourty Single, Comb White Leghorn laying hens; 60 weeks of age were used .The birds were divided randomly into 2 treatment groups; each with 4 replicates (5 birds/replicate).

Diet containing dietary plant protein was used and compared with a control diet (diet with layer concentrate). The nutrient composition, calculated and actual analyses of the experimental diets are shown in Table 1. The studied two experimental diets were formulated to be isocaloric and isonitrogenous, amino acids adjustment was made to meet the recommendations of National Research Council (1994) for essential amino acids for experimental diets, and the basal diet was formulated from sorghum, groundnut cakes and wheat bran. Samples of each diet were analyzed by proximate analysis for dry matter, crude protein, (Nx6.25), crude fiber, ether extract and ash according to procedure of Association of Analytical Chemists (AOAC, 1995).

## **Management**

Layers were allocated in a littered floor poultry house in an open system under the same management condition. Water and feed were offered ad-libitum. The birds were offered a known quantity of feed, by the end of each week all feeders were weighed and total actual feed consumed per week was calculated.

A day length of 14 hours, 12 natural day lengths and two artificial lights were provided to the birds at evening at height of 1.5 meter from the floor.

Eggs were collected and their number and weights were daily recorded.

Parameters studied were: Feed intake, feed conversion ratio, egg production, and egg mass. Feed costs per kilogram experimental diets and feed costs per kilogram eggs or dozen eggs were also calculated according to the average market prices at time of conducting the trial

## **Statistical Analysis**

A completely randomized design (CRD) was used and data were subjected to one-way analysis of variance using the SPSS statistical package. (2003)

## **RESULTS AND DISCUSSION**

Data of Table (2) shows the total feed intake and values of feed conversion ratio of the experimental and control group, were 5.5 versus 6.2 kg and 2.7 versus 2.9 respectively. The nutritive value of the diets was formulated to be approximately isocaloric and isonitrogenous and feed intake is a function of number of factors among those the environment in

which the bird is kept, energy level and physical conditions of the feed, the nutrient density of the mixture and the live weight of the bird (Nour, 1985). It was noticed in this study a slight decrease in feed intake in the group fed dietary plant protein compared to the control without significant difference ( $P > 0.05$ ).

In the present study and as shown in figure 1, weekly egg production of the two groups, and it is clear that the groups fed experimental diet performed similarly, with respect to egg production per hen compared to birds fed concentrate, they scored 54.1% and 53.1% respectively (Table 2) and this was in line with Wisal (2004) who found the same result when using the same diets.

**Table1.** Composition and analysis of the experimental diets (% as fed basis).

Ingredients (%)	Control diet	Experimental diet
Sorghum	58.0	58.0
Wheat bran	18.5	18.0
Layer concentrate*	5.0	0
Ground nut cake	11.0	14.9
Vitamin+mineral mixture	0.1	0.2
Limestone	7.0	8.0
Methionine	0.1	0.3
Lysine	0	0.3
Salt	0.3	0.3
Total	100	100
Calculated analysis (%)		
ME (kcal/kg)	2744	2741
Crude protein	17.3	17.2
Lysine	0.71	0.76
Methioine	0.49	0.52
Calcium	3.5	3.5
Av.Phosphorus	0.67	0.62
Actual analysis (% DM-basis)		
Dry matter	92.9	93.8
Crude protein	19.0	20.0
Ether Extract	8.2	9.5
Crude fiber	8.6	8.5
Ash	14.0	15.9
Nitrogen Free Extract	50.2	46.1
**ME (kcal /kg)	2683	2684

\*Layer concentrates(LNB International Feed) supplied/kg: energy k cal 2000, Crude protein 40%, Crude fat 8%, Crude fiber 3%, Salt 4%, Sodium 1.6%, Calcium 10%, Phosphorus 5.8%, Lysine 6% Methionine 2.8%, and Methionine &Cystine 3.10%. Vit A 240 000 I.U. Vit D3 60 000 I.U. Vit E 200 I.U. Vit K3 40 mg/kg, Vit B6 50 mg/kg Vit B1/Thiamine 30 mg/kg ,Vit B2/Riboflavine 100 mg/kg , Niacin 700 mg/kg ,Pantothenic acid 147 mg/kg, Vit B12 400 mg/kg , Choline 800 000 mg/kg, Folic acid 10 mg/kg ,Iron 1000 mg/kg,Manganese 1860 mg/kg, Copper 156 mg/kg, Zinc 1080 mg/kg. Iodine 20 mg/kg, Cobat 20 mg/kg , Selenium 5 mg/kg.

\*\*Metabolizable energy is calculated according to the equation of Lodhi et al (1976) =32.95(% CP+ EE X2.25 +%NFE)-29.2

The effects of treatment on egg number, weight and mass are presented in Table 2. Data showed that the experimental group recorded slight higher egg weight values and lower egg number versus the control group but these differences were not significant which is in agreement with Jensen and Penz, (1990).

Data on mortality in the control group revealed unexplainably 10% rate of mortality compared to the experimental group which was 0%.

In this study, cost of the experimental diet (without concentrate) or with concentrate (control) per kilogram is 0.7 versus 0.8 Sudanese Pound (Ls) respectively (Table 3). These results clearly demonstrate that lysine and methionine could replace concentrate successfully in the diet of laying hens with a reduction in the cost of feed by 12.5%, cost of kg eggs by 20.8% and dozen eggs by 13.8% versus control without any negative effect on the performance of laying hens.

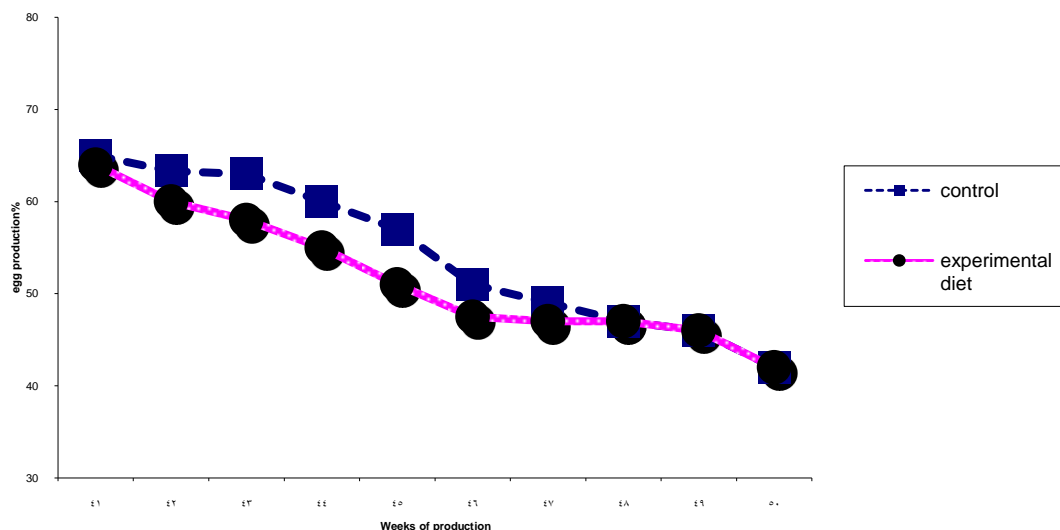
This research could make a contribution in reducing cost of feeding laying hens in Sudan as layer concentrates are imported with hard currency leading to increasing the cost of production.

**Table 2.** The production performance of laying hens fed control and experimental diets. (Values are means  $\pm$ SD)

Feed/bird/day(g)	87.0 $\pm$ 3.7	79.0 $\pm$ 4.9
Total feed intake/bird (kg)	6.2 $\pm$ .17	5.5 $\pm$ .40
Feed conversion ratio (Kg feed/kg egg)	2.9 $\pm$ .39	2.7 $\pm$ .45
Number of eggs laid (HD)/week	3.9 $\pm$ .33	3.7 $\pm$ .51
Production % (HD)	53.1 $\pm$ 6	54.1 $\pm$ 9
Egg Mass kg /HD	2.1 $\pm$ .22	2.1 $\pm$ .12
Egg weight(g)	51.6 $\pm$ 1.1	55.5 $\pm$ 4.3
Mortality (%)	10%	0%

Values with no superscripts in the same row are not significantly different ( $p > 0.05$ )

Figure 1. Egg production of laying hens fed experimental diets



**Table 3.** Production cost of laying hens fed control and experimental diets in Sudanese Pound (Ls)

Items	Control diet	Experimental diet
Cost/kg feed(Ls)	0.8	0.7
Cost of total feeding (Ls)	5	3.9
Cost/kg eggs (Ls)	2.4	1.9
Cost/dozen eggs (Ls)	1.5	1.3

### REFERENCES

- Association of Official Analytical Chemists, (1995).** *Official Methods of Analysis. (Sixteenth Edition).* Association of Official Analytical Chemists, Washington, DC, USA
- Jenson, L.S. (1991).** *Broiler performance as affected by intact protein versus synthetic amino acid.* Page 38-39 in *proceeding Georgia Nutrition Conference. Atlanta, GA*
- Jenson, L.S. and Penz, A.M (1990).** *Egg weight and components as influenced by dietary protein and amino acids.* 107-112 in: *Proceeding Georgia Nutrition Conference, Atlanta, GA*

- Khaled, O. (2001).** *Effect of various protein containing diets on performance and immunity of broiler chicks. Poultry Middle East and North Africa 160, 10*
- Lodhi, G.N, Singh, D. and Lchopui,J.G. (1976).** *Variation in nutrient content of feeding stuffs rich in protein and reassessment of chemical method for metabolizable energy estimation for poultry. J.Agric.Sci., 86:293-303.*
- Mukhtar,M.A.(2006).** *Effect of different levels of dietary lysine and methionine on broiler chicks. Ph.D. Thesis. Sudan University of Science and Technology*
- National Research Council (1994).** *Nutrient Requirements of Poultry. 9<sup>th</sup> Ed. National Academy of Sciences, Washington, DC, USA.*
- Nour, A. I (1985).** *Effect of energy level and stocking density on performance of laying hens. Thesis of MSc .Khartoum University ,Sudan*
- Omer, M. (2001).** *Replacement of super concentrate by L-lysine and DL-methionine at different levels in broiler rations. Thesis of MSc .Khartoum University, Sudan*
- Sibbald , I.R.(1986).** *Effect of dietary lysine and feed intake on energy utilization and tissue synthesis by broiler chicks poult. Sci. 651 98-108.*
- SPSS. (2003).** *SPSS User Guide Statistical. Version. Copyright SPSS Inc., USA*

### المراجع العربية

- \*وصال نصرالدين بابكر(2004). اضافة الميثيونين واللايسين المصنوعين والبريمكس لعلائق الدجاج البياض كبديل للمركز .  
بحث تكميلي لنيل درجة الماجستير مقدمة لجامعة امدرمان الإسلامية

## الملخص العربي

### مقارنة عليقة نباتية وعليقة حيوانية على الأداء الانتاجي للدجاج البياض

سهام على خالد وحسين عبدالله على

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تم إجراء هذه التجربة لمعرفة الأداء الانتاجي للدجاج البياض تمت تغذيته على عليقة تحتوى على مكونات نباتية و مقارنتها بأخرى تحتوى على بروتين حيواني وتقييم أسعار هذه العلائق تم توزيع أربعين من الدجاج البياض على أساس الوزن المتساوي والإنتاج في عمر 60 أسبوع وتم توزيعهم عشوائيا إلى معاملتين حيث قسمت كل معاملة إلى أربعة مكررات (5 طائر/مكرر) حيث تم تقديم عليقة تحتوى على بروتين نباتي وتمت مقارنتها بأخرى تحتوى على بروتين حيواني تساوت فيها تقريبا نسب الطاقة والبروتين. استمرت التجربة مدة 10 أسابيع بعد فترة تأقلم استمرت أسبوع.

القياسات التي تم أخذها هي معدل استهلاك الغذاء، نسبة إنتاج البيض أوزان البيض وكمياته ومعدل التحويل الغذائي. كما تم حساب تكلفة واحد كيلوجرام من العليقة وتكلفة إنتاج واحد كيلو جرام من البيض أو دسنة البيض.

أظهرت النتائج إن الدجاج الذي تغذى على عليقة نباتية بدون مركز كان معدل استهلاكه من العليقة أقل من العليقة المقارنة والتي تحتوى على المركز أما نسبة إنتاج البيض فلم تظهر أى فروقا معنوية بالإضافة لأعداد وأوزان البيض الكلية . ( $p>0.05$ )

أوضحت النتائج المتحصل عليها من هذه الدراسة إن استخدام بروتين نباتي في علائق الدجاج البياض يؤدي إلى خفض تكلفه واحد كيلوجرام من العليقة بمعدل. % 12.5 وخفض تكلفة إنتاج كيلوجرام من البيض بمقدار %20.8 وتكلفة إنتاج دسنة البيض بمقدار %13.8 مقابل العليقة المقارنة وذلك تحت ظروف هذه التجربة.