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THE USE OF MUNGBEAN SEEDS (*Vigna radiata*) IN BROILER DIETS

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ABSTRACT

An experiment was conducted to study the effect of feeding diets comprise different levels of mungbean at expense of soybean meal protein on growth performance and carcass characteristics of Arbor-Acres broiler chicks from 0-7 weeks of age. Two hundreds and forty day-old broiler chicks were randomly divided into four experimental treatment groups with three replicates each. The different experimental diets (0, 20, 30, 40 % mungbean at expense of soybean meal protein) were maintained iso-nutritive. At the end of 28 days of age, weight gain and feed conversion values of chicks fed mungbean diets were approximately similar to those recorded by chicks fed control diet. At the end of experiment (7 weeks) the values of weight gain, feed conversion, protein and energy utilization, performance index and carcass characteristics of birds fed the mungbean diets had also no significant differences with those fed the control diet.

It could be concluded that mungbean seeds could be used in broiler diets as promising source of plant protein up to 40% of soybean protein

Keywords: broilers, mungbean, soybean meal.

INTRODUCTION

Reducing the feed cost, which represents at least 65% of poultry production, is one of the important targets in poultry production operation. In Egypt, hard currency is spent to import either plant or animal protein sources. Therefore, a considerable attention has been paid to use locally available feed substances in formulating poultry diets to achieve a suitable efficiency of nutrients utilization and economic efficiency of production.

Mungbean (Vigna radiata) is grown widely in the tropical zones of Asia and is commonly used as a human food (Thompson et.al ,1976; Sood et al., 1982, Rosalah et al.,1993 and El-Damhougy et al.,1996). Based on chemical analysis, mungbean is considered to be a good source of protein, essential amino acids, minerals and energy (Benzon and Guinita,1964; Shehata and Thannoun, 1980; Khalaf Allah, 1995, Iqtidar and Saleem,1995 and El-Damhougy et al.,1996). In addition, raw mungbean do not appear to contain anti-nutritional factors such as soybean (Almquist and Merritt, 1952; Creswell, 1981, El- Kowicz and Sosulski,1982 and Chitra et al.,1995).

Kowmi –1 variety of mungbean (Vigna radiata) was introduced to Egypt in last few years by National Research Centre (NRC) and is cultivating now in some reclaimed areas in Egypt. However, there are little information about mungbean utilization in poultry feeding.

Few workers have used mungbean seeds as a feed ingredient for poultry (Creswell ,1981; Yamazaki et al., 1998, and El- Alfy,1998) .The main objective of the present experiment is to study the effect of using mungbean seeds in broiler diets on growth performance and carcass characteristics.

MATERIALS AND METHODS

The present study was carried out in poultry experimental farm at Faculty of Agriculture, Ain-Shams Univ. and Animal and Poultry Nutrition and Production Dept., National Research Centre (NRC), Dokki, Egypt.

A total number of 240 one - day- old Arbor-Acres broiler chicks were wing banded, individually weighed to the nearest gram and randomly divided into 4 treatment's groups with 3 replicates each (20 birds x 3 replicates x 4 treatment's groups). Those birds were kept in previously cleaned and fumigated batteries of wire floored cages in an open – system house. The treatment's experimental diets (Table-1) were formulated to substitute 0,20,30 and 40% of soybean protein provided diets by equivalent amounts of mungbean protein. All experimental diets were iso – caloric and iso-nitrogenous. The birds fed the experimental diets and had free access to feed and water all over the experimental period. Heating and lighting as well as vaccination were provided according to brooding and rearing standards protocols.

This study was started from day-old and lasted for 49 days of age. Data on live body weight, feed consumption, feed conversion and mortality rate were recorded. Protein utilization (PU) and efficiency of energy utilization (EEU) were calculated as follows:

PU = Weight gain (g) / Protein consumed (g)

EEU = ME consumed (K.cal) / Weight gain (g)

Performance index (PI) was calculated according to North (1981) as follows:

PI = (Live body weight (kg) /feed conversion) x 100

At the end of the experiment (7 weeks of age), three birds near to the average live body weight of each replicate were sacrificed to study carcass traits. The assigned birds were derived of feed for 12 hours, after which they were individually weighed, slaughtered to complete bleeding, followed by plucking the feathers. The organs were removed and weighed. Weights of such organs were expressed relative to live body weight of birds.

Blood samples were collected at the time of slaughtering from each bird and blood serum was separated by centrifugation at 3000 r.p.m for 15 minutes. The obtained serum was kept frozen at –20ºC until analyzed. Serum total protein, albumin and creatinine were estimated by colorimetic methods using commercial kits supplied from Biomerieux (Poains, France). Globulin and albumin / globulin (A/G) ratio were calculated. Serum glutamic- pyruvic transaminase (GPT) and glutamic – oxalo acetic transaminase (GOT) enzymes were assayed by the method of Reitman and Frankel (1957).

Table 1. Composition and calculated analysis of the experimental diets

	Treatments

Ingredients %	Starter / Grower				Finisher			
	1	2	3	4	1	2	3	4
Yellow corn	61.60	55.50	52.40	49.35	70.17	65.03	62.53	59.96
Soybean meal (44%)	30.00	24.00	21.00	18.00	25.00	20.00	17.50	15.00
Mungbean (25%) *	-	10.56	15.84	21.11	-	8.80	13.20	17.60
Corn gluten meal (62%)	4.00	4.87	5.29	5.70	0.81	1.52	1.85	2.18
Di-calcium phosphate	1.75	1.75	1.75	1.75	1.80	1.80	1.80	1.80
Lime stone	1.10	1.10	1.11	1.11	0.81	0.83	0.80	0.82
NaCl	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
DL.methionine	0.10	0.11	0.13	0.15	0.06	0.06	0.08	0.09
Lysine HCl	0.06	-	-	-	-	-	-	-
Vit. & Min. mixture **	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Poultry fat	0.70	1.42	1.79	2.14	0.66	1.27	1.55	1.86
Total	100	100	100	100	100	100	100	100
Calculated analysis : ***								
Crude protein %	21.03	21.00	21.00	21.01	17.50	17.50	17.51	17.50
ME (Kcal \ Kg diet)	2945	2950	2952	2954	2995	2999	3001	3002
Calcium %	0.92	0.91	0.91	0.91	0.81	0.81	0.80	0.81
Available phosphorus %	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Methionine %	0.46	0.46	0.47	0.49	0.35	0.35	0.36	0.36
Methionine + Cystine %	0.80	0.77	0.77	0.77	0.65	0.61	0.62	0.61
Lysine %	1.06	1.05	1.07	1.09	0.86	0.90	0.91	0.93
Na %	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
EE %	3.38	4.00	4.32	4.63	3.55	4.07	4.31	4.58
CF %	3.51	3.28	3.17	3.05	3.30	3.12	3.02	2.93

*** Mungbean seeds contains : DM 90.47% ; crude protein 25% ; ether extract 1.53%; crude fiber 3.01% ; ash 3.06 ; nitrogen free extract 57.87; calcium 0.14% , Phosphorus 0.59 % ; methionine 0.24% Cystine 0.10% and lysine 1.97%.**

****Each 3 Kg. contains :Vit.A 12mIU; Vit.D_3 2.2mIU; Vit.E 10g; Vit.K 2g; Vit.B_1 1g; Vit.B_2 5g;Vit.B_6 1.5g; Vit.B_{12} 10mg; Niacin 30g; Pantothenic acid 10g; Folic acid 1g; Biotin 50mg; Choline 300g; Iron 30g; Iodine 1g;Zinc 50g; Manganese 60g; Copper 4g.Selenium 100 mg.,Cobalt 100 mg.**

*****According to NRC (1994)**

Data were statistically analyzed using the linear model (SX,1992). A simple one way classification analysis was used followed by LSD test for testing the significance between means.

RESUTLS AND DISCUSSION

The effects of feeding mungbean seeds at various levels (0,20,30 or 40 %) of soybean meal protein on the performance of young chicks are shown in Table (2). The results revealed that, during the periods of starter/ grower (0-4 weeks) and finisher (4 – 7 weeks) as well as the whole experimental period (0-7 weeks), the addition of mungbean seeds at any studied level resulted in no significant differences in live body weight gain ($P < 0.05$). The values of weight gain for the treatment groups T_2 (20% replacement), T_3 (30% replacement) and T_4 (40% replacement) in comparison to the control group T_1 (0% mungbean) recorded 107.8, 105.1

and 102.9% at 0-4 weeks; 100.3,102.5 and 106% at 4-7 weeks and 103.1, 103.5 and 104.9% at 0-7 weeks, respectively. These results showed that the chicks fed on T_4 diets (40% replacement of soybean meal protein by mungbean seeds) had the highest values of weight gain among all treatments either at 4-7 weeks or at 0-7 weeks periods. These results suggested that mungbean seeds could be used in broiler diets up to 40% of soybean meal protein without any deleterious effect on body weight gain.

Table 2. The effect of using different dietary levels of mungbean on the performance of broiler chicks .

ITEM	Mungbean levels (% of Soybean meal protein)				
	Zero	20 %	30 %	40 %	SE*±
0 - 4 weeks of age:					
Live body weight (g / bird)	604.4 a	649.40	634.26	627.55	45.98
Body weight gain (g / bird)	570.13	614.73	599.20	586.90	46.25
Feed consumption (g / bird)	1066.3	1130.3	1079 a	1043.3	96.9
Feed conversion	1.87 a	1.84 a	1.80 a	1.78 a	0.05
4 - 7 weeks of age :					
Live body weight (g / bird)	1591.4	1640.1	1646.1	1668 a	63.14
Body weight gain (g / bird)	987.03	990.30	1011.8	1046.3	59.84
Feed consumption (g / bird)	2226.6	2204 a	2191.3	2263 a	148.9
Feed conversion	2.25 a	2.23 a	2.17 a	2.16 a	0.09
0 - 7 weeks of age :					
Live body weight (g / bird)	1591.4	1640.1	1646.1	1668 a	63.14
Body weight gain (g / bird)	1557.1	1605 a	1611 a	1633.2	63.45
Feed consumption (g / bird)	3293 a	3334 a	3270.3	3301 a	176.5
Feed conversion	2.11 a	2.08 a	2.03 a	2.02 a	0.05

*** Standard error for comparison .**

a, b, c.....means with different superscript(s)in the same row are significantly different (P < 0.05).

No significant differences (P < 0.05) were detected in feed intake among different dietary treatment during starter/ grower period, finisher period or the whole experimental period (Table- 2). The average feed consumption values at starter / grower period (0-4 weeks) were 1066, 1130,1079 and 1043 grams for T_1,T_2,T_3 and T_4 , respectively. While it were 2227, 2204, 2291 and 2263 grams and 3293,3334,3270 and 3301 grams for finisher period (4-7 weeks) and allover the experimental period (0-7 weeks), respectively. These results indicated that increasing the dietary mungbean level had no negative effect on the amount of feed consumed.

A trend towards improvement in feed conversion was observed with increasing the dietary mungbean protein level (Table-2). Overall means of feed conversion were 2.08, 2.03 and 2.02 for T_2,T_3 and T_4, respectively as compared to 2.11 for control treatment (T_1). Although there were no significant differences in feed conversion values among dietary treatments,

the best feed conversion value had been obtained by the highest incorporated dietary mungbean seeds level (40% replacement of soybean meal protein by mungbean seeds).

Generally, these results showed that feeding graded levels of untreated mungbean seeds up to 40% replacement of soybean meal protein (21.11and 17.6% of the diet for the starter/ grower and finisher diets, respectively) resulted in no significant differences among treatments in weight gain, feed intake and feed conversion values comparing to that given by the control group. These results are in agreement with those reported by Creswell (1981) and El- Alfy (1998) who found that the weight gain and feed conversion values of chicks fed mungbean diets up to 20% of the diet were similar ($P < 0.05$) to those of chicks fed control diets. In this connection, El-Waly (1993) found that lupin seeds can be used to replace soybean meal in diets for meat chicks with no adverse effect on performance. Similarly, Quarantelli and Bonomi (1991) reported that the partial replacement of soybean meal up to 15% by pea meal in rations of broiler chicks resulted in similar performance among groups.

Although the groups fed on diets supplemented with mungbean had mostly better values of protein utilization (PU) than the control group for all periods studied the differences among treatments were not significant (Table-3). During the experimental periods (0-4, 4-7and 0-7 weeks) the PU was improved gradually in T_2,T_3 and T_4 groups than the control one by 1.97 %, 3.94 % and 5.51 % ; 1.18 % ,3.54 % and 4.33 % and 1.41 % , 2.36 % and 4.72 % , respectively. These results show that the chicks of mungbean groups utilized protein more efficient than the control group.

With respect to efficiency of energy utilization (EEU), results show that the birds fed control diets required insignificantly more metabolizable energy to gain one unit of live body weight as compared to mungbean groups (Table-3). Also, performance index (PI) did not show any statistical differences among treatments. Khalifah (1995) found that when nigella seed oil meal (NSOM) replaced soybean meal protein up to 50%, feed consumption was insignificantly affected in comparison to the control, also protein consumption showed similar trend. He found some indications that feed conversion ratio and protein utilization improved with feeding 20% NSOM protein of SBM protein.

Table 3 : The effect of using different dietary levels of Mungbean on protein utilization (PU), efficiency of energy utilization (EEU) and performance index (PI).

ITEM	Mungbean levels (% of soybean protein)				
	Zero	**20%**	**30%**	**40%**	**SE*±**
0- 4 weeks of age :					
PU	2-54	2.59	2.64	2.68	0.07

Relative	100	101.97	103.94	105.51	
EEU	5.53	5.44	5.31	5.25	0.15
Relative	100	98.37	96.02	94.94	
PI	32.30	35.40	35.23	34.93	3.23
Relative	100	109.60	109.07	108.14	
4- 7 weeks of age:					
PU	2.54	2.57	2.63	2.65	0.1
Relative	100	101.18	103 54	104.33	
EEU	6.76	6.70	6.51	6.49	0.25
Relative	100	99.11	96.30	96.10	
PI	70.70	73.57	76.03	77.13	3.97
Relative	100	104.06	107.54	109.09	
0-7 weeks of age :					
PER	2.54	2.58	2.60	2.66	0.06
Relative	100	101.41	102.36	104.72	
EEU	6.31	6.20	5.98	6.04	0.18
Relative	100	98.24	94.77	95.76	
PI	75.37	78.87	81.17	82.97	3.45
Relative	100	104.64	107.70	110.08	

*** Standard error for comparison .**

Absolute and relative weight values of carcass, abdominal fat, liver, gizzard and heart were not significantly affected by mungbean supplementation to chick diets as the four experimental treatments had nearly similar values of these traits (Table-4). It must be mentioned that the control group recorded slightly lower values of relative weight of abdominal fat and liver than the groups fed diets supplemented with mungbean seeds at any studied level. On the other hand, the chicks of control group recorded higher values of relative weight of gizzard and heart than the chicks of mungbean treatments. These results may be due to the fact that mungbean seeds contain more soluble fibbers, non- starch carbohydrate compared to maize or soybean meal of control diet (Gooneratne et al., 1994), then gizzard weight decreased in chicks fed more mungbean diet compared to that fed control one. The increase in the relative weight of the gizzard, which observed at control group probably, resulted from direct irritation to this organ.

Generally, there were no significant differences in all carcass traits between treated groups and the control. These results indicated an improvement in dressing percentage in groups T_2 (20%) and T_3 (30%) as compared to the control group ,but this improvement was not significant . These results are expected based on equal dietary protein, energy and C/P ratio; moreover, no alteration in diet composition was induced.

Similar results were reported by EL- Alaily et al., (1981) concerning carcass characteristics and composition of broiler chicks fed rations based on different protein sources. Ali (1988); Gamal (1988); Mady et al., (1991) and Ismaiel (1992) showed that carcass characteristics did not change among both sexes of broilers due to different protein sources. The current results coincide with those cited above.

Table 4. The effect of using different dietary levels of Mung bean on carcass characteristics of broiler chicks .

ITEM	Mungbean levels (% of Soybean meal				
	Zero	20 %	30 %	40 %	SE*±
Live body weight (g / bird)	1586.30	1637.30	1622 a	1675.30	55.5
Slaughter weight (g / bird)	1421.80	1492.30	1481.10	1522.60	55.4
% of live body weight	89.61 b	91.13 a	91.28 a	90.87	0.64
Carcass weight (g / bird)	1044 a	1083.50	1075.10	1098.50	45.9
% of live body weight	65.77 a	66.14 a	66.25 a	65.53 a	0.97
Abdominal fat (g)	28.33 a	35.33 a	33.33 a	34.17 a	5.99
% of live body weight	1.80 a	2.16 a	2.07 a	2.06 a	0.38
Liver (g)	27.33 a	30.33 a	28.50 a	29.67 a	2.40
% of live body weight	1.72 a	1.85 a	1.75 a	1.78 a	0.13
Gizzard (g)	31.33 a	27.67 a	28.67 a	28.50 a	2.75
% of live body weight	1.98 a	1.69 a	1.77 a	1.71 a	0.17
Heart (g)	7.83 a	6.67 a	7 a	7.50 a	0.53
% of live body weight	0.49 a	0.41 b	0.43 ab	0.45 ab	0.04

*** Standard error for comparison .**
a, b, c..... means with different superscript(s)in the same row are significantly different (P < 0.05).

Effects of dietary treatments on serum chemistry are presented in Table (5) .The levels of mungbean seeds used did not exert any significant effect on total protein, albumin (A), globulin (G) and A/G ratio. However, these values were 2.58 –2.86; 1.71 –1.82, 0.87- 1.04 g. /100 ml and 1.69-1.96 for total protein; albumin, globulin and A/G ratio, respectively. These obtained values of tested blood protein fractions in chicks received experimental diets were within the normal range, which previously published by Malaze et al., (1992). They reported that the reference values of total protein ranged from 2.58 to 5.22 g. /100 ml and those of albumin ranged from 1.70to 2.74 g. /100 ml for broiler chicks. Similarly, Koncicki et al., (1990) reported that total protein levels in plasma were not affected by replacement of different levels of rapeseed meal, faba bean, peas and lupines for soybean meal in broiler rations. EL- Waly (1993) found that the replacement of different levels of lupine seed for soybean meal did not affect significantly total protein, albumin and globulin concentrate in plasma. Fathy et al. (1992) found no significant variations in serum albumin and albumin /globulin ratio between birds fed control ration and those maintained on treated rapeseed meal.

Table 5. The effect of using different dietary levels of mungbean on some blood parameters.

ITEM	Mungbean levels (% of Soybean meal protein)

	Zero	20 %	30 %	40 %	SE*±
Total protein g/100ml	2.59	2.86	2.58	2.77	0.18
Albumin (A) g/ 100ml	1.71	1.82	1.71	1.74	0.07
Globulin (G) g/ 100ml	0.87	1.04	0.87	1.04	0.12
A / G ratio	1.94	1.74	1.96	1.69	0.23
Creatinine g / 100ml	0.22	0.28	0.28	0.26	0.03
GOT	353	261	256	235	60.62
GPT	7.67	7.38	7.40	7.42	1.40

*** Standard error for comparison.**

Concerning serum creatinine content, the higher value (0.28 mg/100ml) was observed in groups T_2 (20% mungbean) and T_3 (30% mungbean), followed by growpT_4 (0.26 mg /100ml). These results show that there were no significant differences in serum creatinine content among different groups. With respect to GOT and GPT activities, the statistical analysis did not show any significant differences among all groups. These enzymes have been considered to represent the products of disintegration of cells undergoing normal wear and tear (Zimmerman et al., 1965) These enzymes were used in diagnosis of liver diseases (Kaneko, 1989). However, the control group recorded the highest level of GOT and GPT that is meant that utilization of mungbean improved liver function. Mandour et al., (1998) in broiler chicks observed that black seed did not alter the liver enzyme activities,

The present study indicated that mungbean seed provided enough and adequate nutrients for normal growth of broiler chicks. Based on these observations, mungbean had no adverse effect on growth performance .It could be concluded that mungbean seeds can be used in broiler diets as promising source of plant protein.

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إستخدام بذور فول المانج في علائق دجاج اللحم

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أجريت تجربة لدراسة تأثير التغذية بمستويات مختلفة من بذور فول المانج على المظاهر الانتاجية وصفات الذبيحة وبعض قياسات الدم لدجاج اللحم من عمر يوم حتى عمر ٧ أسابيع. أستخدم ٢٤٠ كتكوت "أربورإيكرز" قسمت عشوائيا الى أربع مجاميع تمثل كل مجموعة معامله غذائية وبكل مجموعة ٦٠ طائر(فى ثلاث مكررات بكل منها ٢٠طائر). تم تكوين العلائق التجريبية المختلفة بحيث تكون متساوية فى محتواها من الطاقة والبروتين وباقى المركبات الغذائية ولكن كان الأختلاف فى محتواها من بذور فول المانج حيث تم أحلاله محل صفر ، ٢٠ ، ٣٠ ، ٤٠ % من نسبة بروتين كسب فول الصويا .

أوضحت النتائج عند عمر ٢٨ يوما أن معدل الزيادة فى وزن الجسم وقيم معامل التحويل الغذائى كانت تقريباً متشابهه فى المجموعات المغذاه على العلائق المحتوية على نسب مختلفة من فول المانج مع مجموعة المقارنة. أيضا عند عمر ٤٩ يوما لم يكن هناك تأثير معنوى لوجود بذور فول المانج بأى مستوى فى العلائق فيما يتعلق بكل من معدل الزيادة فى الوزن ،معامل التحويل الغذائى ،كفاءة استخدام كل من البروتين والطاقة ،ودليل كفاءة النمو (PI) وكذلك صفات الذبيحة وبعض قياسات الدم . وبالتالى يمكن إستنتاج أنه يمكن إستخدام بذور فول المانج الخام فى علائق دجاج اللحم حتى نسبة ٤٠% من بروتين كسب فول الصويا فى كل من مرحلتى البادى / النامى والناهى والحصول على نفس الأداء الانتاجى للطيور المغذاه على علائق المقارنة.