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EFFECT OF DIETARY PROTEIN LEVEL ON PERFORMANCE OF SQUABS

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A total number of 24 pairs of baladi adult pigeons at the 9th month old (24 females and 24 males) and 24 pairs of squabs (which were hatched from the parents of the squabs), were used in this experiment.

Pigeons and squabs were divided into 4 equal experimental groups of 12 adult pigeons (6 females and 6 males). The first group fed diet contained 11% crude protein (CP), while the other three groups fed diets containing 13, 15 and 17 % protein levels and the metabolizable energy (ME/kg) was 2900 kcal ME/kg. The experimental diets were isocaloric and isofibrous.

The experiment aimed to evaluate the effect of different protein levels on the performance of squabing pigeons.

Results obtained could be summarized as follows:

The final live body weight and body weight change during the whole experimental period decreased not significantly among the different experimental adult pigeons.

There were no significant differences between groups during hatchability and incubation periods. All groups had similar values of hatchability percentage and incubation periods.

Live body weight and body weight gain were significantly decreased ($P<0.05$) with the increasing of protein levels in the squabs diets, where the 13% protein level recorded heavier body weight than the other protein levels.

Feed intake during the whole experimental period significantly ($P<0.05$) increased with decreasing dietary crude protein level.

Feed conversion ratio (g feed/g gain) became significantly worst ($P<0.05$) by decreasing protein levels in the squabs diets, where 11% recorded the lowest values.

Protein intake recorded significant decrease ($P< 0.05$) with decreasing CP level, while efficiency of protein utilization recorded significant increase ($P<0.05$) with decreasing CP level.

Decreasing protein levels in diets caused non significantly decreases in dressing percentage.

Digestibility coefficients of CP, crude fiber (CF)% and the nutritive values expressed as digestible crude protein (DCP),

total digestible nutrients (TDN) % and ME kcal/kg significantly varied ($P<0.01$ or $P<0.05$) among the different experimental diets, however, digestion coefficients of ether extract (EE) and nitrogen free extract (NFE) was not significantly influenced by the different levels of protein.

The 13% level of dietary protein showed the best net return as well as the highest value of economic efficiency among all experimental squabs groups.

Based on results obtained in the present study, it could be concluded that moderate protein level 13% in the growing squab diet had no adverse effect on growth performance and carcass quality. Also moderate crude protein diet improved the net return and economic efficiency.

Keywords: Protein level, pigeons, squabs, performance, digestion trials, carcass traits.

A major feed gap exists between the requirements of animal protein and sources of animal protein for human. Therefore, it is necessary to ameliorate the present situation by increasing the sources of animal protein, which would help to replace part of the deficient sources of protein and increasing poultry production at lower costs, particularly in developing countries. Squab (young pigeon) as one of these sources of animal protein is already on some countries, but found squabs production decreasing in developing countries.

Squabs' production is an accepted industry in overseas countries for meat production, particularly Europe and the United States, while in Egypt squabs' production is very low.

Squabs don't fly and don't eat any thing except pigeon milk, which is formed in the crops of both parents during the incubation period. Pigeon milk looks like thick custard and is very high in protein. Squabs are totally helpless and must be feed by parents, for the market age up to 4 weeks.

Squabs are ready to fly and leave their nest at about 26-30 days of age and are ready to market for the table.

There is little information in literature about the using protein levels in feeding squabs under our local conditions. Among few studies on the protein requirements, Frank (1951) indicated that 13.5-15% of CP is good for squabs growth. Morley (1974) reported that the pigeon diet should contain 14% protein and not over 5% crude fiber. Bottcher *et al.* (1985) established that 14% dietary crude protein content is enough for good squab production of breeding pairs. Waldie *et al.* (1991) reported that 22% crude protein diet with or without corn and 16% crude protein diet without corn with 2900 kcal

ME /kg diet gave similar responses for production of breeding pairs and growing squabs.

MATERIALS AND METHODS

A total number of 24 pairs of baladi adult pigeons at the 9th month old (24 females and 24 males) besides, 48 of squabs from their parents were used in this experiment. Each parents group involved 12 pigeons (6 females and 6 males) in 3 replicates, also squabs were divided randomly into 4 equal experimental groups, each included 12 squabs in 3 replicates.

The first group was fed 11% protein diet, while the other three groups were fed 13, 15 and 17% protein diets, while metabolizable energy (ME kcal/kg) values for experimental diets were calculated to be 2900 kcal ME/kg.

The compositions of the experimental diets were isocaloric and isofibrous as shown in table (1).

Table (1). Composition and chemical analysis of the experimental diets.

Ingredients, %	Levels of protein %			
	11	13	15	17
Ground yellow corn	78.53	74.28	70.50	66.50
Soybean meal, (44% CP)	6.00	5.00	6.77	9.50
Corn gluten, (60% CP)	0.00	4.00	6.50	8.75
Wheat bran	11.00	12.40	12.00	11.25
Vit. & Min. Premix*	0.30	0.30	0.30	0.30
Limestone	2.00	2.00	2.00	2.00
Dicalcium phosphate	0.90	0.80	0.80	0.70
L- Lysine	0.86	0.85	0.80	0.63
DL- Methionine	0.29	0.25	0.21	0.25
Salt	0.12	0.12	0.12	0.12
Total	100	100	100	100
Proximate chemical analysis, %				
CP	11.07	13.11	15.17	17.15
CF	3.50	3.21	3.5	3.46
Calculated analysis:				
ME, Kcal/kg**	2908	2910	2911	2911
Methionine + Cystine%	0.75	0.75	0.75	0.75
Lysine%	1.30	1.30	1.30	1.30
Methionine%	0.51	0.52	0.52	0.52
Calcium%	0.89	0.88	0.88	0.86
Available phosphorus%	0.30	0.30	0.30	0.30
Price, L.E/Ton***	1125	1130	1220	1270

* Each 3 kg Vitamins and minerals premix contains (per ton of feed), Vit. A 12000000 IU, Vit. D_3 2000000 IU, Vit.E 10g, Vit.K_3 1000 mg, Vit. B_1 1000 mg, Vit. B_2 5g, Vit. B_6 1.5g, Vit. B_{12} 10 mg, Pantothenic acid 10g, Niacin 30g, Folic acid 1g, Biotin 50 mg, Iron 30g, Manganese 60g, Choline chlorite 10g, Iodine 300 mg, Copper 4g, Zinc 50g and Selenium 100 mg.

** ME, kcal/kg, calculated according to NRC of poultry (1994).

***Calculated according to price of feed ingredients at the time of the experiment (2005).

A preliminary period of 15 days served to obtain a constant ingestion of feed and to accustom the pigeons to their feed. During this period all pigeons were individually weighed.

Pigeons and squabs were used and kept under similar managerial and hygenic conditions in a private farm at Al-Khatatba, Al-Boheira Governorate, during March to May 2005.

The experimental adult pigeons were housed in galvanized wire cages (60×55×40 cm) in each replicate during the experimental period and the squabs were housed in nest box for a pair about 30×30×30 cm and fitted with a 20 cm wide external platform to allow pigeons easy access to the nest.

Feed and water were offered *ad-libitum*. Chemical analysis of the experimental diets, meat and feces were assayed using methods of A.O.A.C (1990). Live body weight and feed intake were determined biweekly. Body weight gain, feed conversion ratio (g feed/g gain), protein intake (g/d) and efficiency of protein utilization (g gain/ g protein intake) were calculated. Mortality rate was also recorded.

At the end of the experiment, digestibility coefficients of various nutrients and the nutritive values of the experimental diets were determined using 12 adult pigeons males (3 from each group).

Males were housed individually in metabolic cages (20×30×20 cm). The digestibility trials extended for 8 days, 4 days of them as a preliminary period followed by 4 days as collection period. The individual live body weights were recorded during the main collection period to determine any loss or gain in the live body weights. During the main period, excreta were collected daily and weighed dried at 60°C bulked finally ground and stored for chemical analysis. The faecal nitrogen was determined according to Jakobsen *et al.* (1960). Urinary organic matter was calculated according to Abou-Raya and Galal (1971).

The digestion coefficients % of crude protein, crude fiber, ether extract and nitrogen free extract of the experimental diets were estimated.

The nutritive values expressed as digestible crude protein, total digestible nutrients were calculated. Metabolizable energy was calculated as 4.2 kcal per gram as suggested by Titus (1961).

Finally, four squabs from each treatment were randomly chosen for slaughter test, weighed then slaughtered and after complete bleeding, feather was removed. Dressing percentage was calculated as a carcass weight divided by the pre slaughter weight. Carcass parts were weighed and calculated as a percentage of live body weight.

The economical efficiency of feed was calculated from the input-output analysis based on the differences in both selling cost / squab and feeding cost.

Data were statistically analyzed by the computer program of SAS (1996) using the simple one-way analysis of variance as follow:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where:

Y_{ij} = Represented observation in j^{th} protein levels

μ = Overall mean

T_i = Effect of j^{th} protein levels (j = 11,13,15 and 17%)

e_{ij} Random error

Duncan's New Multiple Range Test (Duncan, 1955) separated differences among treatment means.

RESULTS AND DISCUSSION

Body Weight and Body Weight Change of Adult Pigeons

Effects of feeding different protein levels on performance of adult pigeons during the experimental period are summarized in table (2). The final live body weight and body weight change during the whole experimental period varied non-significantly among the different experimental parent pigeons.

It is worthy to note that the final body weight of pigeons males is heavier than females and not improved, when the protein level increases in the diet, this may be due to the main function of the female of egg laying and it is more responsible of brooding and caring of squabs than male. Moreover, all parent pigeons lost body weight during the experimental period, this may be due that the squab had the peak of its growth at 28 days since they are given in this period crop milk, which contains a high level of protein. In this connection, Bottcher *et al.* (1985) found that the live body weight of parent pigeons was not affected by the increase of protein content in the diet.

Incubation Period

Data of incubation period showed that protein level fed had non-significant effect on incubation period (Table 2). In this respect, Oud *et al.* (1991) found that incubation period of pigeons ranged from 17.30 to 18.00 days.

Hatchability, %

Data of hatchability of eggs, fed different levels of protein recorded no significant difference between groups. All groups had similar values of hatchability percentage, which were found to be 100 % (Table 2). Begin and Insko (1972) and Lee *et al.* (1981) also found that protein level had non significant effect on hatchability in quail.

Table (2). Effect of feeding different levels of protein on performance of adult pigeons (mean ±SE).

Traits	Levels of protein%				Sig.
	11	13	15	17	
Initial live body weight (g) of pigeons					
Males	457.95±1.12	454.04±2.30	455.42±1.72	452.11±2.21	ns
Females	399.13±1.52	390.32±1.80	383.80±2.01	390.25±1.91	ns
Final Live body weight (g) of pigeons					
Males	457.38±1.15	453.46±1.80	454.82±1.93	451.29±2.12	ns
Females	398.50±2.01	389.64±3.01	382.95±2.51	389.35±3.11	ns
Body weight change (g) of pigeons					
Males	-0.57±0.60	-0.58±0.58	-0.60±0.79	-0.82±1.01	ns
Females	-0.63±1.02	-0.68±1.14	-0.85±1.18	-0.90±2.01	ns
Egg weight (g)	18.01±0.29	18.29±0.35	18.41±0.32	18.56±0.41	ns
Incubation period (d)	17.79±0.51	18.01±0.54	18.12±0.75	18.20±0.98	ns
Hatchability %	100	100	100	100	ns

Sig.= Significant ns= not significant

Live Body Weight and Body Weight Gain of Squabs

Average live body weight, body weight gain and feed utilization of squabs as affected by the different levels of protein are reported in table (3). Average live body weight during the experimental period (0-4 weeks of age) was significant ($P<0.05$) among the different levels of protein. It is worth noting that 13% protein levels recorded heavier body weight than the other protein levels.

Average body weight gain (g/period) of squab at the age intervals showed the same trend. Body weight gain was significantly ($P<0.05$) different among the different levels of protein.

It is worth noting that feeding squab on 13% level of crude protein resulted increasing in body weight 2.17, 5.28 and 10.12% than that of 11, 15 and 17% protein level, respectively, at the periods 0-4 weeks of age.

The decrease in body weight gain may be due to the decrease in feed intake and digestibility of nutrients in diets.

Squabs fed 13% protein level in diet showed the highest body weight and recorded the highest body weight gain compared to the other experimental groups.

Feed Intake and Feed Conversion Ratio

Feed intake (g/day) during the whole experimental period (0-4 weeks) gradually decreased significantly ($P<0.05$) with the increase of protein levels as shown in table (3).

These results are in agreement with those of Waldie *et al.* (1991) who found that feed intake decreased significantly ($P<0.05$) with the increase of dietary protein level in squab diets. Shalan-Hedaia (1993) and Mohammed (1990) who found that increasing level of protein in the quail grower diets caused a decrease in the amount of feed consumption. Aggoor *et al.* (1997) found that feed intake of broiler decreased significantly ($P<0.05$) with increasing protein levels in the diets.

Feed conversion ratio (g feed intake / g weight gain) revealed a significant difference ($P<0.05$) among experimental groups. It was observed in this study, that squab fed 13 and 15% protein diets recorded the best feed conversion ratio, while the worst one was 11% protein diets.

These results are in agreement with those of Salmon *et al.* (1983), Fancher and Jensen (1989) and Moran *et al.* (1992), who found that increasing protein levels improved feed conversion of broiler diets.

Table (3). Effect of feeding different levels of protein on performance of squabs (mean±SE).

Traits	Levels of protein%				Sig.
	11	13	15	17	
Live body weight (g) of squab/period					
Initial	15.54±0.39	15.63±0.30	15.75±0.29	15.82±0.32	ns
2 weeks	172.10±1.15 ^{a}	170.22±2.65 ^{a}	165.81±2.82 ^{ab}	155.69±3.11 ^{b}	*
4 weeks	308.56±2.09 ^{a}	314.95±2.11 ^{a}	298.42 ±2.51 ^{ab}	280.59±3.21 ^{b}	*
Body weight gain (g) of squab/period					
0-2 weeks	156.56±0.57 ^{a}	154.59±1.07 ^{a}	150.06±1.86 ^{ab}	139.87±2.1 ^{b}	*
2-4 weeks	136.46±1.99 ^{a}	144.73±1.25 ^{a}	132.61±1.20 ^{ab}	124.9±1.19 ^{b}	*
0-4 weeks	293.02±2.45 ^{a}	299.32±2.52 ^{a}	282.67±2.01 ^{ab}	264.77±2.5 ^{b}	*
Feed intake per squab (g/d)					
0-2 weeks	57.99±1.09 ^{a}	55.77±1.16 ^{a}	53.27±1.59 ^{ab}	50.15±1.25 ^{b}	*
2-4 wks	62.95±1.10 ^{a}	62.09±1.23 ^{a}	57.86±1.01 ^{ab}	57.03±1.70 ^{b}	*
0-4 wks	60.47±1.85 ^{a}	58.93±1.30 ^{a}	55.57±1.9 ^{ab}	53.57±1.20 ^{b}	*
Feed conversion ratio (g feed/g gain)					
0-2 wks	5.19±0.07 ^{a}	5.05.±0.12 ^{ab}	4.97±0.15 ^{b}	5.02±0.10 ^{ab}	*
2-4 wks	6 46±0.06 ^{a}	6.00±0.04 ^{b}	6.11±0.03 ^{ab}	6.39±0.05 ^{ab}	*
0-4 wks	5.78±0.05 ^{a}	5.51±0.03 ^{b}	5.50±0.04 ^{b}	5.67±0.06 ^{ab}	*
Protein intake per squab (g/d)					
0-2 wks	6.42±1.01 ^{b}	7.31±0.96 ^{ab}	8.08±1.00 ^{a}	8.60±1.01 ^{a}	*
2-4 wks	6.97±1.05 ^{b}	8.14±0.80 ^{ab}	8.78±.0.99 ^{a}	9.78±1.10 ^{a}	*
0-4 wks	6.69±1.03 ^{b}	7.73±1.02 ^{ab}	8.43±1.10 ^{a}	9.19±1.03 ^{a}	*
Protein utilization efficiency (g gain/ g protein intake)					
0-2 wks	1.52±0.02 ^{a}	1.72±0.04 ^{a}	1.33±0.03 ^{ab}	1.16±0. 04 ^{b}	*
2-4 wks	1.40±0.01 ^{a}	1.27±0.02 ^{a}	1.08±0.09 ^{ab}	0.91±0.08 ^{b}	*
0-4 wks	1.57±0.06 ^{a}	1.38±0.04 ^{ab}	1.20±0.08 ^{b}	1.03±0.07 ^{b}	*
Mortality rate	0.00	0.00	0.00	0.00	

a,b: Means within the same row showing different letters are significantly different
Sig.=Significant, *=($P<0.05$), ns=not significant

Protein Intake (g/day) and Protein Utilization Efficiency

Protein intake (g/day) during the whole experimental period (0-28 days of age) was significantly increased ($P<0.05$) among the different experimental groups.

It is clear that protein intake was increased by increasing protein levels in the experimental diets (Table 3), this may be due to the increasing of protein intake with increasing percentage of protein levels in the diet.

Efficiency of protein utilization (g weight gain / g protein intake) during the feeding of squab period (0-4 weeks of age) was significantly decreased ($P<0.05$) among the different experimental groups by increasing

protein levels in the diet. These results showed that, 17% level of protein recorded the least efficiency of protein utilization.

These results are in agreement with those of Aggoor *et al.* (1997) found that protein intake increased with increasing protein level, while efficiency of protein utilization decreased with increasing dietary protein level. Zeweil (1996) found that efficiency of protein utilization improved significantly ($P<0.01$) by decreasing protein level of quail diet. Also Patrick and Schaible (1981) reported that protein requirement per unit of gain is similar in different species of poultry, ducks and squabs make better gain per unit of protein than chickens or turkeys. Walide *et al.* (1991) showed that daily intake of protein requirement of pigeon ranged from 17.4 to 23.4 g per pair.

Mortality Rate, %

Results on morality rate showed no incidence of mortality occurred during the experimental period (Table 3). Vohra and Roudybush (1971), Johri and Vohra (1977) and Mohammed (1990) found that the mortality rate during growing or laying periods of Japanese quail not affect by dietary protein levels. Totsuka *et al.* (1993) found that mortality rate was not affected by change in dietary protein levels of laying hens.

Carcass Traits and Chemical Analysis of Meat

Results on some carcass characteristics of squabs and chemical analysis of meat as affected by different dietary protein levels are illustrated in table (4).

Table (4). Carcass traits of slaughtered squab and chemical analysis of meat (Breast muscle) as affected by feeding different levels of protein.

Traits	Levels of protein%				Sig
	11	13	15	17	
Live body weight(g)	312.7±2.30 [a]	318.21±2.1 [a]	280.05±2.2 [b]	272.12±2.4 [b]	*
Dressing %	73.39±2.02	73.46±1.9	73.66±2.2	73.70±2.55	ns
Liver %	2.59±0.18	2.55±0.22	2. 53±0.30	2.51±0.32	ns
Gizzard %	2.48±0.29	2.47±0.30	2.46±0.26	2.46±0.28	ns
Heart %	1.49±0.25	1.50±0.19	1.51±0.21	1.50±0.30	ns
Edible giblets %	6.56±0.55	6.52±0.48	6.50±0.52	6.47±0.50	ns
Small intestine %	5.12±0.20	5.02±0.18	5.00±0.20	4.39±0.10	ns
Chemical analysis of meat (Breast muscle)					
Moisture %	59.83±0.41 [b]	61.55±0.30 [ab]	62.21±0.35 [a]	64.79±0.52 [a]	*
CP %	20.11±0.20 [b]	21.47±0.19 [ab]	21.69±0.30 [ab]	21.95±0.37 [a]	*
EE %	3.11±0.22	3.17±0.20	3.20±0.30	3.35±0.29	ns
Ash %	3.89±0.08	4.01±0.10	4.05±0.05	4.10±0.09	ns

a.b: Means within a row with different superscripts are significantly different
Sig= Significance, * ($P< 0.05$), ns= not significant
Edible giblets = liver, heart and grizzard weights
EE: Ether extract, CP: Crude protein

Data in the present study showed that dressing percentages were not significantly affected with increased protein levels that is may be due to the decrease in dressing percentage and to the decrease in live body weight. Mahapatra *et al.* (1984) and Lee *et al.* (1990) have given similar results, as they reported that the diets containing different protein levels had no significant differences on dressing percentage for broiler.

The edible giblets ranged from about 6.47 to 6.56 %. These results did not differ statistically among the different levels of protein.

Similar results were obtained by Sherif (1989) who found that protein level had insignificant effect on viscera and giblets percentage. Shalan-Hedaia (1993) found that carcass, liver, gizzard, heart, giblets and feather percentages were insignificantly affected by different protein level. Zeweil (1996) found that total edible parts were decrease with increased protein level for quail diets and protein level had insignificant effect on viscera and giblets percentages.

Regarding chemical analysis of squabs meat, it is worthy noting that the results of moisture and protein percentage in carcass increased significantly ($P<0.05$) among the different experimental groups when increasing the protein level, while ether extract and carcass ash percentage not significantly increased with the increase of protein level.

Similar results were obtained by EL-Naggar *et al.* (1997) who found that the carcass moisture and carcass protein increased with the increase of crude protein level in the broiler diets. Zelenka *et al.* (1984) who applied feeding with varied crude protein level did not demonstrate significant differences in the breast muscle content or carcass fat content in quail.

Moreover, no significant effect of protein level on carcass fats was observed by Daghir (1983). Hardy *et al.* (1975) found that the diet containing higher protein appeared to produce a bird higher ash content. Abdel-Azzeem *et al.* (2001) found that abdominal fat percentage was increased when protein level increased in quail diets.

Digestibility and Nutritive Values of the Experimental Diets

The digestion coefficients % and nutritive values of the experimental diets are shown in table (5). The digestibility of CP % showed a significant decreasing ($P<0.05$) for diets with increase of protein level. This may be due to the fact that the increase in protein level results in consequent increase of uric acid, consequently the digestion coefficient decreases. Yamazaki *et al.* (1996) showed that the excretion of nitrogen increased as protein level increased. Mitchell (1942) found that when protein intake exceeds the efficiency of protein requirement, its utilization decreases rapidly, since protein can not be stored in body to any appreciable extent.

These results are in agreement with those reported by Aggoor *et al.* (1997), Ghazalah *et al.* (1988) and Attia (1986), who found that by increasing protein levels the digestibility of CP % is decreased. Hassanein

(2004) found that increasing of protein levels lead to the digestibility decrease of DM, OM, CP, CF % and nutritive values in quail diets.

Results indicated that the increase of protein level in the diet cause the decrease ($P<0.01$) of CF % digestibility. On the other hand, it is worthy noting that there were no significant differences in digestibility of EE and NFE among the different experimental diets.

It is of great importance to note that the results of the digestion trials coincided generally with growth performance and feed conversion ratio.

Regarding the nutritive values, it is clear that DCP was increased significantly ($P<0.01$) by increasing of protein level up to 17% and vice-versa in case ($P<0.05$) of TDN and ME values.

Table (5). Effect of feeding different levels of protein on apparent digestibility coefficients and nutritive values (mean±SE) of experimental diets.

Items	Levels of protein%				Sig
	11	13	15	17	
Apparent digestion coefficients %					
CP	88.72±1.05^{a}	88.21±1.19^{a}	86.25±1.99^{ab}	83.96±2.07^{b}	*
CF	32.52±2.19^{a}	32.41±2.57^{a}	28.51±3.05^{ab}	25.39±2.29^{b}	**
EE	89.52±1.11	88.90±1.52	87.25±2.01	88.05±2.23	ns
NFE	88.53±1.23	89.01±1.55	88.55±1.41	87.52±1.65	ns
Nutritive values					
DCP%	9.82^{b}±0.59^{b}	11.56±0.80^{ab}	13.08±0.67^{a}	14.40±0.99^{a}	**
TDN%	67.19±0.97^{a}	66.82±1.03^{a}	65.91±1.01^{ab}	64.69±1.05^{b}	*
ME (kcal/kg)	2822±13.97^{a}	2806±10.15^{a}	2768±12.12^{ab}	2717±11.16^{b}	*

a,b: Means within the same row showing different letters are significantly different
Sig.=Significant ,*=($P<0.05$),**=($P<0.01$)
EE: ether extract, CP: crude protein, CF: Crude fiber, NFE: nitrogen free extract,
DCP: digestible crude protein, TDN: total digestible nutrients

Economic Efficiency of Feed

The collective data that show different levels of protein effect on feed cost, net return and economic efficiency are established in table (6) and Fig.(1).

It is clear that the cost of kg feed increased with increasing the levels of protein, where diet 17% protein recorded the higher value and diet 11% protein recording the lowest one.

The level of 13% protein showed the best net return as well as the highest value of economic efficiency compared to other levels, this may be due to the increase of live weight of squabs in groups with the decrease of feed cost.

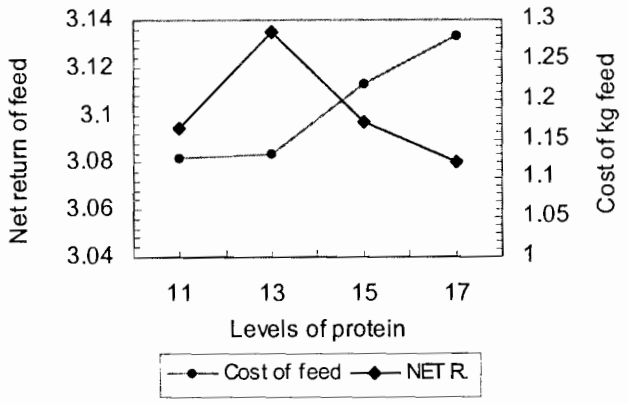

Fig. (1). Economic evaluation of different levels of protein by growing squabs.

Table (6). Economic evaluation of feeding different levels of protein by growing squabs.

Items	Levels of protein%			
	11	13	15	17
Feed intake (g/squab)	1693	1650	1560	1500
Cost of kg feed (L.E.)	1.125	1.130	1.220	1.270
Feed cost of one squab (L.E.)	1.905	1.865	1.903	1.920
Market price of one squab (L.E.)	5.00	5.00	5.00	5.00
Net return / squab (L.E.)	3.095	3.135	3.097	3.080
Economic efficiency	162.47	168.10	162.74	160.42

The local market price of one squab at the experimental time was 5 L.E.

CONCLUSION

The moderate protein level 13% in the growing squab diet had no adverse effect on growth performance and carcass quality. Also, moderate crude protein diet improved the net return and economic efficiency.

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تأثير مستوى البروتين على أداء زغاليل الحمام

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استخدم في هذا البحث عدد ٢٤ زوج حمام بلدي بالغ عمر ٩ شهور (٢٤ أنثى +٢٤ ذكر) و٢٤ زوج حمام صغير (زغاليل الحمام) من فقس بيض الآباء. قسم الحمام البالغ والزغاليل إلى أربعة معاملات تجريبية متساوية. اشتملت كل معاملة على عدد ١٢ حمام (٣ مكررا ت بكل منها ٤ حمام). هدفت الدراسة إلى تقييم تأثير مستوى البروتين على أداء زغاليل الحمام. استمرت فترة التجربة من الفقس حتى عمر التسويق (٤ أسابيع) . تم تغذية الحمام على علائق متدرجة في نسبة البروتين الخام ١١،١٣،١٥ و ١٧% وطاقة ممثلة ٢٩٠٠ كيلو كالورى/كيلوجرام.
ويمكن إيجاز أهم النتائج في النقاط التالية:
– زيادة مستوى البروتين أثر تأثيراً سلبياً على كل من وزن الجسم والتغير في وزن الجسم لقطيع الاباء البالغ أثناء الفترة التجريبية.
– لم تتأثر نسبة الفقس وفترة الحضانة في الحمام مع زيادة نسبة البروتين في العليقة.
– سجلت المعاملة المغذاة على نسبة بروتين خام ١٣% تحسناً في صفات وزن الجسم النهائي ومعدل الزيادة اليومية للجسم.
– لوحظ انخفاض معدل إستهلاك الغذاء اليومي إنخفاضاً معنوياً (عند مستوى ٥%) خلال فترة التجربة وذلك بزيادة نسبة البروتين الخام في العليقة، حيث سجلت المعاملة المغذاة على ١٧% أقل القيم (٥٣,٥٧ جم/يوم) بينما سجلت المعاملة المغذاة على ١١% أعلى القيم (٦٠,٤٧ جم/يوم).
– وجد أن هناك فروق معنوية (عند مستوى ٥%) لمعدل التحويل الغذائي مع زيادة نسبة البروتين الخام في العليقة وقد سجلت المعاملة ١٥% أفضل القيم (٥,٥٠) بينما سجلت المعاملة ١١% أقلها (٥,٧٨) خلال فترة التجربة.
– لوحظ زيادة معدل استهلاك البروتين زيادة معنوية (عند مستوى ٥%) خلال فترة التجربة وذلك بزيادة نسبة البروتين الخام في العليقة.
– لوحظ وجود تحسناً معنوياً (عند مستوى ٥%) في الكفاءة النسبية للبروتين بانخفاض مستوى البروتين في العليقة.
– لم يكن هناك أى اختلافات معنوية في جميع قياسات الذبيحة وقد سجلت المعاملة المغذاة على ١٧% بروتين خام أفضل نسبة تصافى (٧٣,٧٠%) بالمقارنة بباقي المعاملات ولوحظ زيادة كل من نسبة البروتين الخام والرطوبة والرماد ونسبة الدهن في لحوم الزغاليل وذلك عند زيادة مستوى البروتين في العليقة.
– سجلت معاملات الهضم الظاهرية لكل من البروتين الخام والألياف الخام والقيم الغذائية إنخفاضاً معنوياً وذلك بزيادة مستوى البروتين في العليقة، بينما لم تظهر النسب المختلفة من البروتين اختلافات معنوية في معاملات الهضم الظاهرية للمستخلص الخالي من النيتروجين ومستخلص الأثير.
– تحقق افضل عائد اقتصادي عند مستوى ١٣% بروتين مقارنة بباقي مستويات البروتين المختلفة في العليقة.
من الوجهة الغذائية والإقتصادية توصى هذه الدراسة باستخدام البروتين الخام بنسبة تصل إلى ١٣% في عليقة زغاليل الحمام دون تأثير سلبي على أداء النمو وصفات الذبيحة و العائد الاقتصادي.