Egyptian J. Anim. Prod. 35, Suppl. Issue, Dec. (1998):223-241.

OPTIMUM LEVELS OF METABOLIZABLE ENERGY AND CRUDE PROTEIN IN THE RATIONS FOR AVIAN- 34 BROILER CHICKS

Y. A. Attia[1], M.E. Nawar[2], Salwa and B. Abd El -Hady[3]

1- Department of Animal and Poultry Production, Faculty of Agriculture (Damanhour), Alexandria University, Egypt, 2- Poultry Strains Improvement Project, Beheira Governorate, Egypt, 3- Animal Production Research Institute, ARC, Ministry of Agriculture, Egypt

SUMMARY

Twenty seven thousand 1-d-old, Avian - 34 broiler chicks were used in this experiment under semi-intensive production system. During the 1-28d of age, growing period, chicks were distributed into three diets differed in metabolizable energy (ME, kcal/kg diet) and crude protein (CP) levels having the same C:P ratio of about 128. During the growing period, diets were: low in energy and protein growing diet (LEPGD) of 2815 kcal ME/kg diet with 22.04% CP, intermediate in energy and protein growing diet (IEPGD) of 3000 kcal ME/kg diet with 23.51% CP and high in energy and protein growing diet (HEPGD) of 3203 kcal ME/kg diet with 25.06% CP. During the 29-49 d of age, finishing period, chicks in each growing diet were sub-divided into three diets differed in metabolizable energy (kcal/kg diet) and crude protein levels, with equal C:P ratio being about 155. Each group was fed one of the three finishing ME and CP levels. Diets were: low in energy and protein finishing diet (LEPFD) of 2816 kcal ME/kg diet with 18.15% CP, intermediate in energy and protein finishing diet (IEPFD) of 3000 kcal ME/kg diet with 19.32% and high in energy and protein finishing diet (HEPFD) of 3201kcal ME/kg diet with 20.58% CP. During the growing and finishing periods, diets were from plant origin based on corn and soybean meal ingredients.

Body weight, weight gain and feed/gain ratio improved significantly with increasing ME and CP levels during the growing and finishing periods, and thus correlated with increased feed consumption. The increase in ME and CP levels resulted in increasing abdominal fat deposition, but dietary ME and CP had insignificant effect on dressing percentage. It was found that the optimum diet for Avian-34 broilers should contain either ME of 3000 kcal/kg diet with 23.51% CP or 3203 kcal/kg diet with 25.06% CP during the 1-28 d feeding period and 3201 kcal/kg diet with 20.58% CP during the finishing period. These diets resulted in improving net profit.

Issued by The Egyptian Society of Animal Production

Keywords: Broilers, metabolizable energy, crude protein, growth, carcass

INTRODUCTION

In the last two decades, there are substantial improvements in both growth and feed utilization of broiler chicks, due to the advancement in genetic potential and environmental conditions such as nutrition, housing, and husbandry. Dietary composition has been shown to influence the expression of genetic variation for body weight in meat-type chickens (Marks, 1990). Moreover, Lilburn (1985) and Saleh *et al.* (1993) found that genotype and diet interacted in performance of broiler chicks. They also added that genotype used in nutritional research can play a significant role in the interpretation of experimental data.

Maximum growth of broiler chicks are related to CP and ME concentrations of the diet. Moran (1980) and Olomu and Offiong (1980) found that the dietary ME level from 2800 to 3000 kcal/kg diet with a crude protein level of 23% for starter period and from 3000 to 3100 kcal /kg diet with 18% CP for finishing period, resulted in adequate growth and feed/gain ratio. Ghazalah *et al.* (1988) found that Lohmann broiler chicks should be fed diet containing either 20.1% or 21.13 or 22.01% CP with either 2862 or 3102 or 3135 kcal ME/kg diet during the starter period. During the growing period, diet should contain 19.0% CP with 3181 kcal ME/kg diet, while during the finishing period diet should contain 17.27% CP with 3060 kcal ME/kg diet. Coon *et al.* (1981) concluded that Hubbard broiler chicks fed diets containing various ME and CP levels within the range of 3135 kcal /kg diet with 23% CP and 3410 kcal/kg diet with 25% CP in the starter diets, and 3190 kcal/kg diet with 18.9% CP and 3465 kcal/kg diet with 20.5% CP during the finishing period had insignificant effect upon total body weight gain. While, feed/gain ratio was improved with feeding diet high in ME and CP concentrations during the starter and finishing periods. El- Serwy *et al.* (1992) found that Hubbard broiler chicks raised under Egyptian environmental conditions and fed starter diet containing 3409 kcal ME/kg diet with 24.80% CP and finishing diet containing 3414 kcal ME/kg diet with 23.40% CP had the largest body weight and best feed/gain ratio.

Metabolizable energy and crude protein levels in poultry diets has also a major impact on abdominal fat deposition. Increasing abdominal fat of broilers reduced consumer desire of broiler meat, due to increasing public awareness of increasing fat consumption on human health (El-Deek *et al.*, 1997). Increasing dietary ME level by fat addition increased fat deposition even when C:P was kept constant (Kubena *et al.*, 1974; Farrell, 1974). Increasing CP consumption was reported to decrease abdominal fat deposition (Jackson *et al.*, 1982; Whitehead, 1990; Moran *et al.*, 1992; Leeson *et al.*, 1996b). Recently, Eleraky and El-Sadawy (1997) found that Arbor Acres broiler chicks fed high ME and CP diets during the starter and finisher periods with constant

C:P ratio showed better feed/gain ratio and slightly but insignificant higher abdominal and carcass fat than those fed the control diet.

There are a lack of field data about the optimum metabolizable energy and crude protein levels in the diets for Avian-34 broiler chicks raised under Egyptian farm conditions, so that the present experiment aims to study the responses of Avian-34 broiler chicks to dietary ME and CP levels in constant C:P diets in order to establish the optimum ME and CP levels in their diets and facilitate their raising under Egyptian farms to maximize the economic profits.

MATERIALS AND METHODS

Birds, housing and management :

This experiment was carried out at Poultry Strains Improvement Project, Ferhash, Housh Eysa, Beheira Governorate, Egypt. A total number of 27000 unsexed 1-day-old broiler chicks of Avian-34 strain was utilized in this study. Chicks were raised under semi-intensive production system in wire side houses (semi open houses). During the experimental period, chicks were kept under similar managerial and hygienic conditions and reared on deep litter floor with a twenty four hours lighting program.

During the 1-28 d of age growing period, chicks were allocated to three experimental houses, each of 12×90 m. Each house was divided into 3 partitions of 12×30 m; each was used for a replicate. During the 29-49 d of age finishing period, each house was divided into 9 partitions of 12×10m each; each was utilized for a replicate. Chicks were fed from hanged tube feeders and drank from automatic waterers. Feed and water were supplied *ad libitum*.

Experimental design and diets:

Corn-soybean meal diets were formulated based on NRC, (1994) tabulated values for feedstuffs (Table 1). During the 1-28 d of age feeding period, chicks were fed three diets which was low in ME and CP of 2815 kcal/kg diet with 22.04%, intermediate in ME and CP of 3000 kcal/kg diet with 23.51% and high in ME and CP of 3203 kcal/kg diet with 25.06% (Table 1).

Each diet was fed to three replicates of 3000 chicks. During the 29-49 d of age feeding period, chicks in each growing diet were divided into three dietary groups. Each group was fed one of the three finishing diets, so there were nine experimental treatments during the finishing period. Diets during the finishing period were low in ME and CP of 2816 kcal/kg diet with 18.15%, intermediate in ME and CP of 3000 kcal/kg diet with 19.32% and high in ME and CP of 3201 kcal/kg diet with 20.58%. Each finishing energy level was fed to 3 replicates of 1000 chicks. Crude protein levels were increased in both growing and finishing diets in the intermediate and high metabolizable energy diets to equalize C:P ratio. DL-methionine was added to the diets to keep approximately equal methionine : protein ratio.

Table 1. Composition of the experimental diets

Ingredients	Experimental diets					
	Growing diets			Finishing diets		
	2815/ 22.04	3000/ 23.51	3203/ 25.06	2816/ 18.15	3000/ 19.32	3201/ 20.58
Yellow corn	56.35	46.80	45.00	63.40	61.70	52.50
Soybean meal	39.20[1]	44.40[1]	44.23[2]	27.00[1]	32.00[1]	36.64[1]
Wheat bran	0.00	0.00	0.00	5.58	0.00	0.00
Cotton seed oil	0.60	4.95	6.90	0.20	2.46	7.00
Lime stone	0.50	0.50	0.50	0.50	0.50	0.50
Bone meal	2.60	2.60	2.60	2.60	2.60	2.60
Premix[3]	0.30	0.30	0.30	0.30	0.30	0.30
Salt	0.30	0.30	0.30	0.30	0.30	0.30
DL-methionine	0.15	0.15	0.17	0.12	0.14	0.16
Total	100.0	100.0	100.0	100.0	100.0	100.0
Calculated values						
ME kcal/ kg	2815	3000	3203	2816	3000	3201
Crude protein,%	22.04	23.51	25.06	18.15	19.32	20.58
C:P ratio	127.7	127.6	127.8	155.2	155.3	155.5
Methionine, %	0.492	0.508	0.546	0.413	0.448	0.480
Methionine, %[4]	2.23	2.16	2.18	2.28	2.32	2.33
Lysine, %	1.20	1.30	1.40	0.925	1.02	1.12
Lysine, %[4]	5.44	5.53	5.59	5.10	5.28	5.44
Crude Fiber, %	3.98	4.10	4.08	3.89	3.59	4.19
Crude Fat, %	3.05	7.08	9.05	2.99	5.06	9.29
Ca, %	1.01	1.02	1.01	0.98	0.99	1.00
Available P, %	0.49	0.50	0.49	0.47	0.47	0.48
Cost/ ton, L. E.	880.3	946.9	1005.4	773.9	837.3	903.9
Determined values[5]						
Crude protein,%	21.86	22.91	24.33	17.95	18.86	19.67
Ether extract, %	2.94	6.88	8.85	2.75	4.86	8.76

1- Soybean meal contains 44% CP. 2- Soybean meal contains 48% CP . 3- Premix provides per kilogram of diet: vitamin A, 8000 IU; vitamin E, 9 mg; menadione (as menadione sodium bisulfite), 150 IU; Vit. D3, 1,000 ICU; riboflavin, 4.0 mg; Ca pantothenate, 10 mg; nicotinic acid, 12 mg; choline chloride, 300 mg; vitamin B12,2 mg; vitamin B6, 1.2 mg;thiamine (as thiamine mononitrate), 2.0 mg; folic acid, 40 mg; d-biotin, 0.05 mg. Trace mineral (mg per kg of diet): Mn, 75; Zn, 40; Fe, 40; Cu, 3; Se, 0.15; iodine, 0.8 and 500 mg an antioxidant. 4- As a percent of crude protein content of the diet. 5- Crude protein and ether extract were determined according to A.O.A.C., (1980).

Criteria :

A total of 540, 1-day old chicks were wing banded and, also color marked for easy distinguish at weighing time. Chicks were weighed at 1, 28 and 49 d of age, as a hundred and eighty chicks representing each energy and protein level as sixty per replicate. During the 29-49 d finishing period, chicks were divided equally among experimental replicates assuming equal sex within replicate based on comb size and morphological appearance. The residual feed was weighed bi-weekly and total feed, protein and energy consumptions were calculated. Feed, protein and energy/gain ratios were calculated based on average replicate.

A total of 90, 49-d old broiler chicks were chosen and slaughtered after being fasted overnight, as 10 chicks from each treatment, represented the average treatment body weight. Chicks were bled and plucked, then weights for empty body weight without head, feet, wings and viscera were recorded. Abdominal fat was manually removed from around the cloaca, under the viscera, and from around the gizzard. The internal organs were carefully separated and accurately weighed including empty gizzard, liver and heart (giblets). Mortality rate was recorded daily throughout the experimental period.

Statistical analysis:

Data obtained during the growing and finishing periods were statistically analyzed separately according to method of analysis of variance (Snedecor and Cochran, 1967) using one way classification. To test the carry over effect of growing energy level on performance of broilers at the end of the finishing period as well as overall performance, data were analyzed using one way ANOVA besides two way classifications. Mean differences were tested using Duncan's new multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Growing period (1-28 d):

Body weight, weight gains and feed/ gain ratio of 28-d old chicks showed significant gradual improvement with increasing ME and CP levels, and this was associated with increasing feed, ME and CP consumptions significantly (Table 2). This indicates that the improvement in these parameters could be explained on the basis of increasing nutrient consumptions. Similarly, Pinchasov (1991), Noy and Pinchasov (1993) and Noy and Sklan (1996) showed that feed intake was the primary factor affecting growth of chickens.

The present results agree with those reported by Griffiths *et al.* (1977) and Wiseman (1988). Also El-Serwy *et al.* (1992) found that Hubbard broilers fed diets containing 3205 kcal ME /kg diet with 23.40% CP or 3409 kcal ME/kg with 24.80% CP were larger than those received 3003 kcal ME/kg with 21.90% CP. Also, Eleraky and El-Sadawy (1997) found similar results with

Arbor Acres broiler chicks. However, Coon *et al.* (1981) found no difference in weight gains of chicks fed diets either high- or low- in ME and CP during the growing period. The present results also reveal that decreasing ME and CP levels while keeping constant C:P ratio improved caloric and protein conversion efficiency values (Table 2).

Table 2. Effect of feeding different metabolizable energy (kcal/kg diet) and crude protein levels in the growing diets on performance and net profit from 1 to 28 d of age

Criteria	Metabolizable energy and crude protein levels in the growing diets				
	2815/ 22.04	3000/ 23.51	3203/ 25.06	SEM	P value
Initial body weight 1 d old,g	41.0	40.8	40.7	1.2	NS
Final body weight 28 d old, g	724.7^{c}	814.3^{b}	885.0^{a}	9.2	0.01
Body weight gain from 1 to 28 d, g	683.7^{c}	773.5^{b}	844.4^{a}	9.7	0.01
Feed consumed from 1 to 28 d, g	1173.2^{b}	1276.8^{a}	1344^{a}	5.2	0.01
Energy consumed from 1 to 28 d, kcal ME	3302.0^{c}	3831.0^{b}	4306.2^{a}	17.9	0.01
Protein consumed from 1 to 28 d, g	258.41^{c}	300.2^{b}	336.81^{a}	4.1	0.01
Feed/gain ratio from 1 to 28 d, g/g	1.716^{a}	1.649^{b}	1.591^{b}	0.03	0.01
Energy/gain ratio from 1 to 28 d, kcal/g	4.830^{b}	4.948^{ab}	5.099^{a}	0.04	0.01
Protein /gain ratio from 1 to 28 d, g/g	0.378^{c}	0.388^{b}	0.399^{a}	0.003	0.01
Mortality, %	2.10	4.00	2.50	ND	ND
Net profit[1], P.T.	46.3	64.7	78.9	ND	ND

^{abc} Means within a row with no common superscripts differ significantly $P \leq .05$, based on Duncan's test, NS, not significant, ND, not done, [1] Net profit= selling income - total costs.

The data indicate that the optimum diet during the 1-28 d feeding period for Avian -34 broilers should contain 3203 kcal ME/kg diet with 25.06 CP%. Mortality percentage was not much affected by ME and CP concentrations. Net profit was improved by feeding either 3000 kcal ME/kg diet with 23.51% CP or 3203 kcal ME/kg diet with 25.06% CP during the growing period.

Finishing period (29-49 d):

Weight gains and feed/gain ratio enhanced significantly with increasing ME and CP levels in the finishing diets (Table 3). The best weight gains and feed/gain ratio were from groups fed IEPGD prior to being fed HEPFD and those fed HEPFD after being fed HEPGD. While, weight gains and feed/gain

Table 3. Effect of feeding different metabolizable energy (kcal/kg diet) and crude protein levels in the finishing diets on performance and net profit of broiler chicks from 29 to 49 d of age

Criteria	Metabolizable energy and crude protein levels in the growing diets										
	2815/22.04			3000/23.51			3203/25.06				
	Metabolizable energy and crude protein levels in the finishing diets										
	2816/ 18.15	3000/ 19.32	3201/ 20.58	2816/ 18.15	3000/ 19.32	3201/ 20.58	2816/ 18.15	3000/ 19.32	3201/ 20.58	SEM	P value
Body weight gain, g	758.0^{f}	878.0^{de}	950.0^{bc}	924.0^{cd}	940.0^{bc}	1045.0^{a}	836.0^{e}	881.0^{de}	990.0^{ab}	6.1	0.01
Average		862.0^{c}			969.7^{a}			902^{b}			0.01
Feed consumed (29-49 d), g	2129.0^{e}	2326.8^{cd}	2431.8^{ab}	2494.8^{a}	2452.8^{ab}	2471.7^{a}	2257.5^{d}	2307.9^{d}	2394.0^{bc}	12.1	0.01
Average		2295.9^{b}			2473.1^{a}			2319.8^{b}			0.01
Energy consumed (29-49 d), kcal	5996.1^{e}	6981.1^{c}	7784.7^{a}	7026.4^{c}	7359.1^{b}	7912.4^{a}	6358.0^{d}	6924.4^{c}	7663.7^{ab}	39.3	0.01
Average		6920.6^{b}			7432.6^{a}			6982.0^{b}			0.01
Protein consumed (29-49 d), g	386.2^{d}	449.5^{bc}	500.5^{a}	452.6^{bc}	473.9^{b}	508.7^{a}	409.5^{cd}	445.9^{bc}	492.7^{ab}	2.1	0.01
Average		445.4^{b}			478.4^{a}			449.4^{b}			0.01
Feed/ gain ratio (29-49 d), g/g	2.809^{a}	2.650^{bc}	2.560^{de}	2.700^{b}	2.609^{cd}	2.365^{f}	2.700^{b}	2.620^{bcd}	2.418^{f}	0.02	0.01
Average		2.673^{a}			2.558^{b}			2.579^{b}			0.01
Energy/gain ratio (29-49 d), kcal/g	7.910^{bc}	7.951^{b}	8.194^{a}	7.604^{d}	7.829^{bc}	7.572^{d}	7.605^{d}	7.860^{bc}	7.741^{cd}	0.21	0.01
Average		8.018^{a}			7.668^{b}			7.735^{b}			0.01
Protein/gain ratio (29-49 d), g/g	0.509^{ab}	0.512^{a}	0.527^{a}	0.490^{ab}	0.504^{ab}	0.487^{b}	0.490^{b}	0.506^{ab}	0.498^{ab}	0.004	0.01
Average		0.516^{a}			0.494^{b}			0.498^{b}			0.01
Mortality, %	2.75	1.95	2.44	2.60	3.24	2.58	2.44	2.76	1.58	ND	ND
Average		2.38			2.81			2.2 6			ND
Net profit [1], P.T.	76.9	97.2	100.3	110.9	109.0	134.8	89.7	95.2	121.6	ND	ND
Average		91.5			118.2			102.2			ND

^{abc} Means within the same row with no common superscripts differ significantly P≤.05 based on Duncan's test, ND, not done. [1] Net profit=selling income-total costs.

ratio of groups fed low ME and CP levels during the growing and finishing periods were the poorest, as a result of significantly lower feed consumption of these groups (Table 3).

Regardless of ME and CP levels fed during the 1-28 d feeding period, feeding HEPFD increased feed consumption by 6.05 and 2.96% compared with chicks fed LEPFD and IEPFD, respectively (Table 3). The corresponding values for ME and CP consumptions were 20.54, 9.86% and 20.31, 9.68%; respectively. These indicate that improved growth and feed/gain ratio are related to increased nutrient consumptions (Table 3). Similar results were reported by El-Serwy *et al.* (1992), who showed that nutrient consumptions were increased by feeding medium- and high-ME and CP finishing diets, and resulted in larger body weight and better feed/gain ratio. In partial agreement with the current results, Coon *et al.* (1981) and Leeson *et al.* (1996a) found that dilution of the ME and CP concentrations during the 35-49 d of age finishing period resulted in a significant linear reduction in body weight at 42 d of age, but not at 49 d of age and impaired feed/ gain ratio.

Mortality percentage did not much differ among the experimental ME and CP levels. An improvement in net profit was shown with increased ME and CP levels in the finishing diets, i.e. 8.5 and 28.5%, respectively for IEPFD and HEPFD compared with LEPFD (Table 3). The present results indicate that the optimum diet during the finishing period for Avian-34 chicks should contain 3201 kcal ME/kg diet with 20.58% CP.

Combined period (1-49 d):

Body weight, weight gains and feed/gain ratio at 49 d of age were significantly impaired by feeding diets low in ME and CP during the growing and finishing periods (Table 4), as a result of low feed consumption of these groups. These impairments in growth and feed utilization may be due to differential repartitioning of energy among maintenance, growth and activities, since excess protein can also be metabolized as an energy source.

An improvement in weight gains and feed/gain ratio were found in the groups fed the higher ME and CP levels during the growing and finishing periods. This was followed by a decreasing order of those fed HEPFD after being fed IEPGD (Table 4), and this connected with increased nutrient consumptions of these groups. Similarly, Ghazalah *et al.* (1988) showed that ME could be from 2861.8 to 3135 kcal/ kg diet and CP from 20.1% to 22.01 during the starter period. During the growing period, 3181 kcal ME/kg diet with 19.0% CP should be fed, while 3060 kcal ME/kg diet with 17.27% CP should be fed during the finishing period. Olomu and Offiong (1980) and Hulan and Proudfoot (1982) found similar results.

Results indicate that growth and feed/gain ratio of chicks fed diets low in ME and CP concentrations during the 1-28 d feeding period were not completely recovered when fed either intermediate- or high-ME and CP during the 29-49d finishing period (Table 4). This reveals little evidence for

Table 4. Effect of feeding different metabolizable energy (kcal/kg diet) and crude protein levels during the growing and finishing periods on overall performance and net profit of broiler chicks from 1 to 49 d of age

Criteria	Metabolizable energy and crude protein levels in the growing diets										
	2815/22.04			3000/23.51			3203/25.06				
	Metabolizable energy and crude protein levels in the finishing diets										
	2816/ 18.15	3000/ 19.32	3201/ 20.58	2816/ 18.15	3000/ 19.32	3201/ 20.58	2816/ 18.15	3000/ 19.32	3201/ 20.58	SEM	P value
Final body weight (49 d), g	1482.7^{e}	1602.7^{d}	1674.7^{c}	1738.3^{bc}	1754.3^{b}	1859.3^{a}	1721.0^{bc}	1766.0^{b}	1875.0^{a}	7.8	0.01
Average		1586.7^{b}			1783.9^{a}			1787.3^{a}			0.01
Total body weight gain (1-49 d), g	1441.7^{e}	1561.7^{d}	1633.7^{c}	1697.5^{b}	1713.5^{b}	1818.5^{a}	1680.3^{bc}	1725.3^{b}	1834.3^{a}	9.2	0.01
Average		1545.7^{b}			1743.2^{a}			1746.6^{a}			0.01
Total feed consumed (1-49 d), g	3302.2^{d}	3500.0^{c}	3605.0^{b}	3771.6^{a}	3728.6^{ab}	3748.5^{ab}	3601.5^{bc}	3651.5^{b}	3738.0^{ab}	14.3	0.01
Average		3469.1^{c}			3749.6^{a}			3663.7^{b}			0.01
Energy consumed(1-49d),kcal ME	9299.2^{f}	10284.2^{e}	11087.8^{bc}	10856.8^{cd}	11189.5^{b}	11742.8^{a}	10662.8^{d}	11229.2^{b}	11968.5^{a}	44.8	0.01
Average		10223.7^{b}			11263.0^{a}			11286.8^{a}			0.01
Protein consumed (1-49 d), g	644.8^{e}	708.1^{d}	759.1^{bc}	752.8^{cd}	774.1^{bc}	808.9^{ab}	746.3^{cd}	782.7^{bc}	829.5^{a}	3.7	0.01
Average		704.0^{b}			778.6^{a}			786.2^{a}			0.01
Feed /gain ratio (1-49 d), g/g	2.290^{a}	2.241^{ab}	2.207^{bc}	2.222^{bc}	2.176^{cd}	2.061^{ef}	2.143^{d}	2.116^{de}	2.038^{f}	0.03	0.01
Average		2.246^{b}			2.153^{ab}			2.099^{a}			0.01
Energy/gain ratio (1-49 d), kcal/g	6.450^{bc}	6.585^{ab}	6.787^{a}	6.396^{bc}	6.530^{abc}	6.457^{bc}	6.346^{c}	6.509^{abc}	6.525^{abc}	0.19	0.01
Average		6.607^{a}			6.461^{b}			6.460^{b}			0.01
Protein/gain ratio (1- 49 d), g/g	0.447^{b}	0.453^{ab}	0.465^{a}	0.443^{b}	0.452^{ab}	0.445^{b}	0.444^{b}	0.454^{ab}	0.452^{ab}	0.004	0.01
Average		0.455			0.447			0.450			NS
Mortality, %	4.79	4.00	4.48	6.49	7.11	6.47	4.88	5.19	4.04	ND	ND
Net profit, P. T.	123.2	143.5	146.5	175.6	173.7	199.5	168.6	174.1	200.5	ND	ND
Average		137.7			182.9			181.1		ND	ND

abc Means within the same row with no common superscripts differ significantly P≤.05 based on Duncan's teat, NS, not significant, ND, not done,

[1] Net profit=selling income - total costs.

compensatory growth from 29 to 49-d, as 49-d body weight and gains were lower in birds that had received the LEPGD. These results agree with those reported by Malone *et al.* (1980), Leeson *et al.* (1991), Leeson *et al.* (1992) and Sizemore and Siegel (1993).

Results indicate that both intermediate and high ME and CP growing-diets resulted in (13%) improvement in weight gains and (4-6.5%) improvement in feed/gain ratio over low ME and CP growing-diets (Table 4). Also, chicks fed HEPFD were significantly larger by 9.69 and 5.72% than those fed LEPFD and IEPFD, respectively, and thus utilized the feed more efficiently, i. e, 5.23 and 3.62%, respectively (Table 5). In constant with the current results, Leeson *et al.* (1996a and 1996b) found that male broiler chicks fed diets diluted in ME and CP during the starter and finishing periods had significantly lower body weight and higher feed/gain ratio. Moreover, Coon *et al.* (1981), Wiseman (1988) and El-Serwy *et al.* (1992) showed that high ME and CP diets improved weight gains and feed conversion of broilers. However, Moran *et al.* (1992) found that live body weight were unaffected by reducing CP level from 23% to 20% with 3200 kcal ME/kg diet in the starter diet and from 20 to 17% CP with 3200 kcal ME/kg diet during the finishing period, but feed/gain ratio was improved by feeding high protein diets during the starter and finisher feeding periods. Likewise, Eleraky and El-Sadawy (1997) found that Arbor Acers broiler chicks fed diets containing 10% fat, 3225 kcal ME/kg diet with 24% CP or 5% fat, 3090 kcal ME/kg diet with 23% CP during the starter period and 10% fat, 3337 kcal ME/kg with 21.2% CP or 5% fat, 3193 kcal ME/kg diet with 20.3% CP during the finisher period had the best feed/gain ratio compared with those fed the other ME and CP levels with constant C:P ratio.

To obtain better performance of Lohmann broiler chicks, Ghazalah *et al.* (1988) reported that they should be fed diets containing 20.1% or 21.13 or 22.01% CP with either 2861.8 or 3102 or 3135 kcal ME/kg diet during the starter period, 19.0% CP with 3181 kcal ME/ kg during the growing period, 17.27% CP with 3059.6 kcal ME/kg diet during the finishing period. The differences found herein between the present results and those showed by Ghazalah *et al.* (1988) could be expected on basis of genotypes differences as well as experimental conditions. In this concern, Marks (1990) and Saleh *et al.* (1993) found that dietary composition affected the expression of genetic variation for body weight in meat-type chickens. Moreover, Lilburn (1985) indicated that genotype used in nutritional research can play a significant role in the interpretation of experimental data. However, Whitehead (1990) found that over the range of CP from 21 to 26%, there were no significant differences in body weight of broilers from chicks of fat lines. Pesti (1985) concluded that growth and ME intake are dependent on the CP and supplemental fat levels of the feeds.

Table 5. Effect of feeding different metabolizable energy (kcal/kg diet) and crude protein levels in the finishing diets irrespective of metabolizable energy levels fed in the growing diets on overall performance and net profit of broiler chicks from 1 to 49 d of age

Criteria	Metabolizable energy and crude protein levels in the finishing diets				
	2816/ 18.15	3000/ 19.32	3201/ 20.58	SEM	P value
Final body weight 49d old, g	1647.3^{c}	1707.7^{b}	1803.0^{a}	7.8	0.01
Body weight gain from 1 to 49d, g	1606.5^{c}	1666.8^{b}	1762.2^{a}	9.7	0.01
Feed consumed from 1 to 49d, g	3558.4^{b}	3626.7^{ab}	3697.2^{a}	14.3	0.01
Energy consumed from 1 to 49d, ME kcal	10272.9^{c}	10900.9^{b}	11599.7^{a}	44.8	0.01
Protein consumed from 1 to 49d,g	714.61^{c}	754.9^{b}	799.21^{a}	3.7	0.01
Feed/gain ratio from 1 to 49d, g/g	2.215^{a}	2.178^{b}	2.098^{c}	0.03	0.01
Energy/gain ratio from 1 to 49d, kcal/g	6.395^{b}	6.540^{a}	6.583^{a}	0.19	0.01
Protein/ gain ratio from 1 to 49d, g/g	0.445	0.453	0.454	0.004	NS
Mortality, %	5.39	5.43	5.00	ND	ND
Net profit[1], P.T.	155.8	163.7	182.2	ND	ND

^{abc} Means within a row with no common superscripts differ significantly P≤.05, based on Duncan's test, NS, not significant, ND, not done, [1]Net profit=selling income - total costs.

The improvement in growth and feed/gain ratio indicate that the optimum corn-soybean diets for Avian-34 broiler chicks should have 3203 kcal ME/kg diet with 25.06% CP during the 1-28 d growing period and 3201 kcal ME/kg diet with 20.58% CP during the 29-49 d finishing period. Similarly, Nagian (1981) reported that the optimum protein and energy levels in the broiler starter and finisher diets were 22.10% CP with 3100 kcal ME/kg diet and 19.4% CP with 3400 kcal ME/kg diet. It is worth noting that the increase in growth criteria was associated with a significant increase in total feed, ME and CP consumptions (Table 4). Pinchasov (1991), Noy and Pinchasov (1993) and Noy and Sklan (1996) indicated that feed intake is the main factor affecting final body weight of individual chicks.

The increase in fat contents in the intermediate and high ME and CP diets, could be justified the increase in feed consumption showed of these groups (Tables 2 and 4). Likewise *et al.* (1984) found that energy intake was significantly affected by the protein and added fat contents of the diet, but not by the metabolizable energy content. A marked preference in feed intake by broilers fed high-fat-containing diet was shown (Dale and Fuller, 1978; El-Samra, 1990). Fats also are known to improve palatability and texture of the diet (Sell and Owings, 1984; Moran, 1985). The results indicated also that broiler chicks could tolerate up to 9.29% crude fat in their diets. Fuller and

Renden (1979), Deaton *et al.* (1981) and Abd El-Ghany (1986) reached similar conclusion. It was also showed that the broiler chicks could make appropriate choices in diets varying in CP concentrations, indicating that CP could also affect feed consumption of broiler chicks (Shariatmadari and Forbes, 1993).

Mortality rate for the entire experimental period ranged from 4.00 to 7.11%, with no differences among ME and CP levels. Similar results were reported by Malone *et al.* (1980) and Sizemore and Siegel (1993). Chicks fed diet either containing 25.06% CP with 3203 kcal ME/kg diet during the growing period and 20.58% CP with 3201 kcal ME/kg diet during the finishing period, or 23.51% CP with 3000 kcal ME/kg diet during the growing period and 20.58% CP with 3201 kcal ME/kg diet during the finishing period had the best net profit. These results are similar to those reported by Coon *et al.* (1981) and El-Serwy *et al.* (1992). They indicated that feeding Hubbard broiler diets having 3200 kcal ME/kg diet with 23.40% CP in the growing and 3400 kcal ME/kg diet with 20.30% CP in the finishing practical type of diet that containing corn, soybean and protein concentrate resulted in better performance and higher economic efficiency.

Carcass characteristics :

Data for carcass characteristics are shown in Table (6). The data indicate that increasing ME and CP levels during the growing and finishing periods improved total edible parts (carcass weight) and carcass weight without giblets. The best values were from those fed HEPGD and HEPFD or HEPFD after being fed IEPGD. Similar results were reported by El-Serwy *et al.* (1992). Dressing percentage (oven ready) of broiler chicks showed no significant differences among ME and CP concentrations. These results confirm those reported by Mollison and Guenter (1984), Leeson *et al.* (1991), El-Serwy *et al.* (1992), Sizemore and Siegel (1993) and Leeson *et al.* (1996a and 1996b). Giblets weight (g) and percentage showed a significant effect of dietary ME and CP, revealing that feeding LEPGD and LEPFD increased giblets weight and percentage. Similar results were also shown by El-Serwy *et al.* (1992).

There were significant effects of ME and CP levels on abdominal fat criteria (Table 6). Results indicate that increasing ME and CP levels in the growing and finishing diets increased abdominal fat deposition, this could be partially due to increasing energy utilization from fat (Rand *et al.*, 1958), as well as from also excess CP which could be metabolized as energy source. Likewise, Eleraky and El-Sadawy (1997) found that high ME and CP-fat-supplemented diets resulted in insignificantly higher abdominal and carcass fat than the control diet. Caloric restriction in early life decreased abdominal fat deposition (Leeson *et al.*, 1991), also carcass fat deposition can be altered by modifying energy intake during the finishing period (Summers and Leeson, 1984; Leeson *et al.*, 1992; Leeson *et al.*, 1996a). Increasing dietary ME level by fat

Table 6. Effect of feeding different metabolizable energy (kcal/kg diet) and crude protein levels during growing and finishing periods on carcass characteristics of 49 d old broiler chicks

Criteria	Metabolizable energy and crude protein levels in the growing diets										
	2815/22.04			3000/23.51			3203/25.06				
	Metabolizable energy and crude protein levels in the finishing diets										
	2816/ 18.15	3000/ 19.32	3201/ 20.58	2816/ 18.15	3000/ 19.32	3201/ 20.58	2816/ 18.15	3000/ 19.32	3201/ 20.58	SEM	P value
Body weight of 49-d old, g	1470.0^{e}	1620.0^{d}	1675.0^{cd}	1750.0^{b}	1770.0^{b}	1850.0^{a}	1700.0^{bc}	1765.0^{b}	1900.0^{a}	6.5	0.01
Total edible parts, g	1065.7^{e}	1205.0^{d}	1247.0^{d}	1307.0^{c}	1304.0^{c}	1365.0^{ab}	1244.0^{d}	1327.0^{bc}	1406.0^{a}	5.8	0.01
Average		1172.5^{b}			1325.3^{a}			1325.7^{a}			0.01
Carcass weight, g[1]	981.7^{e}	1120.0^{d}	1158.0^{d}	1224.0^{c}	1217.0^{c}	1281.0^{ab}	1158.0^{d}	1250.0^{bc}	1320.0^{a}	5.6	0.01
Average		1086.6^{b}			1240.7^{a}			1242.7^{a}			0.01
Dressing, %[2]	66.8	69.1	69.1	69.9	68.8	69.2	68.1	70.8	69.5	2.8	NS
Average		68.3			69.3			69.5			NS
Giblets, g[3]	84.0^{b}	85.0^{b}	89.0^{a}	82.8^{b}	86.5^{ab}	83.6^{b}	86.2^{ab}	77.0^{c}	86.0^{ab}	0.52	0.01
Average		86.0			84.3			83.1			NS
Giblets, %[2]	5.71^{a}	5.25^{a}	5.31^{a}	4.73^{b}	4.89^{b}	4.52^{b}	5.07^{ab}	4.36^{b}	4.53^{b}	0.32	0.01
Average		5.42^{a}			4.71^{b}			4.65^{b}			0.01
Abdominal fat, g	28.96^{d}	30.62^{d}	38.02^{c}	37.62^{c}	36.11^{c}	47.18^{b}	36.04^{c}	45.71^{b}	49.97^{a}	2.4	0.01
Average		32.53^{b}			40.30^{a}			43.91^{a}			0.01
Abdominal fat, %[2]	1.97^{cd}	1.89^{d}	2.27^{b}	2.15^{b}	2.04^{c}	2.55^{a}	2.12^{bc}	2.59^{a}	2.63^{a}	0.31	0.01
Average		2.04^{b}			2.25^{ab}			2.45^{a}			0.01
Abdominal fat, %[4]	2.72^{d}	2.55^{ed}	3.05^{b}	3.08^{b}	2.97^{bc}	3.46^{a}	2.90^{c}	3.46^{a}	3.56^{a}	0.32	0.01
Average		2.77^{b}			3.17^{a}			3.31^{a}			0.01

[1] Head, giblets, feet and eviscerate were not included. [2] As relative to live body weight. [3] Giblets including liver, heart and gizzard.
[4] As relative to total edible parts. [abc] Mans within the same row with no common superscripts differ significantly P≤.05, based on Duncan's test.
NS, not significant.

addition increased fat deposition even when C:P ratio was kept constant among treatments (Kubena *et al.*, 1974; Farrell, 1974).

There was a progressive increase in all abdominal fat criteria with increasing ME and CP levels in the growing diets. Percentage abdominal fat as affected by growing ME and CP levels, increased by 10.29 and 20.10% by feeding IEPGD and HEPGD over LEPGD. The corresponding values for finishing diet were 4.33 and 19.23% (Table 6). This indicates that increasing ME and CP levels in the growing and finishing diets yielded comparable effect in adipose cells proliferation. These results are similar to those reported by Coon *et al.* (1981), Jackson *et al.* (1982), El-Serwy *et al.* (1992) and Leeson *et al.* (1996a and 1990 b).

In conclusion, the results recommended that corn soybean diets for Avian-34 broiler chicks should contain either 3000 or 3203 kcal ME/kg diet with either 23.51% or 25.06% CP during the 1-28 d growing period and 3201 kcal ME/kg diet with 20.58% CP during the 29-49 d finishing period. The results also supported the NRC (1994) recommended ME and CP levels during the 1-21 d of age starter-feeding period of 3200 kcal ME /kg diet with 23% CP and 22-42d of age finisher-feeding period of 3200 kcal ME/kg diet with 20% CP.

REFERENCES

Abd El-Ghany I. A., 1986. Studies on meat production in poultry. Ph. D Thesis, Cairo Univ. Egypt.

Association of Official Analytical Chemists, (A.O.A.C), 1980. Methods of Analysis. 13th ed., Assoc. Offici. Anal. Chem., Arlington, USA.

Coon, C.N., W.A. Becker and J.V. Spencer, 1981. The effect of feeding high energy diets containing supplemental fat on broiler weight gain, feed efficiency and carcass composition. Poultry Sci., 60: 1264-1271.

Dale, N. M., and H. L. Fuller, 1978. Effect of ambient temperature and dietary fat in feed preference of broilers. Poultry Sci., 57:1635-1640.

Deaton, J.W., J.L. McNaughton, F.N. Reece and B.D. Lott, 1981. Abdominal fat of broilers as influenced by dietary level of animal fat. Poultry Sci. 60:1250-1253.

Duncan, D. B., 1955. Multiple range tests and F tests. Biometrics. 11: 1-42.

El-Deek, A. A., M. Barakat, Y. A. Attia and A.S. El-Sebeay, 1997. Effect of feeding Muscovy ducklings different types of protein sources: Performance, ω-3 fatty acid contents and acceptability of their tissues. Journal of the American Oils Chemists' Society (JAOCS), 74 (8):999-1009

Eleraky, A.W. and H. A. El-Sadawy, 1997. Effect of feeding high energy diets containing supplemental fat on growth, performance, some blood parameters, yield and body composition of broiler chicks. Egyptian Poultry Sci., 17(I):151-169.

El-Samra, Somaya, H., 1990. Effect of dietary level and sources of fat on performance and carcass composition of broilers chick. J. Agric. Sci., Mansoura Univ. 15:153-169.

El-Serwy, A.A., M.A. Ali and El-Samra H. Abou-Agala, 1992. The effect of sex and feeding different levels of energy during starter and finishing period on broilers performance. Egyptian Poultry Sci.,12 (I):417- 442.

Farrell, D. J., 1974. Effects of dietary energy concentration on utilization of energy by broiler chickens and body composition determined by carcass analysis and predicted using tritium. Br. Poultry Sci., 15: 25-41.

Fuller, H., and M. Renden, 1979. Metabolism and nutrition, energetic efficiency of corn oil and poultry fat at different levels in broiler diets. Poultry Sci., 45:548-552.

Ghazalah, A. A., M. R. El-Abbady, A. I. Labib and N. E. Omar, 1988. Effect of different dietary protein and energy levels in a three-stage diet system on general performance of broiler chicks. Egyptian Poultry Sci., 8:195-213.

Griffiths, L., S. Leeson and J. D. Summers, 1977. Fat deposition in broilers: Effect of dietary energy to protein balance, and early life caloric restriction on productive performance and abdominal fat pad size. Poultry Sci., 56: 638- 646.

Hulan, H.W. and F.G. Proudfoot, 1982. The effect of different dietary energy regimens on the performance of two commercial chicken broiler genotypes reared to roaster weight. Poultry Sci., 61:510-515.

Jackson, S., J.D. Summers, and S. Leeson, 1982. The response of male broilers to varying levels of dietary protein and energy. Nutr. Rep. Int. 25:601-606.

Kubena, L.F., J.W. Deaton, T.C. Chen and F.N. Reece, 1974. Factors influencing the quantity of abdominal fat of broilers 1. rearing temperature, sex, age or weight and dietary choline chloride and inositol supplementation. Poultry Sci., 53:211-214.

Leeson, S., J.D. Summers and L.J. Caston, 1991. Diet dilution and compensatory growth in broilers. Poultry Sci., 70:867-873.

Leeson, S., J.D. Summers and L.J. Caston, 1992. Response of broilers to feed restriction or diet dilution and compensatory growth in the finisher period. Poultry Sci., 71:2056-2064.

Leeson, S., L.J. Caston and J.D. Summers, 1996a. Broiler responses to energy or energy and protein dilution in the finisher diet. Poultry Sci., 75:522-528.

Leeson, S., L.J. Caston and J.D. Summers, 1996b: Broiler response to diet energy. Poultry Sci., 75:529-535.

Lilburn, M.S., 1985. The importance of genetics when conducting broiler nutrition research. Pages 121-127 *in*: Proc. 1985 Georgia Nutrition Conference for the Feed Industry, Atlanta, Georgia, USA.

Malone, G.W., G.W. Chaloupka, E.W. Walpole and L.H. Littlefield, 1980. The effect of dietary energy and light treatment on broiler performance. Poultry Sci., 59:576-581.

Marks, H.L., 1990. The effect of hormones and genetic selection on the nutritional requirements of growth in Poultry Pages 29-35 *in :* Proc. 1990 Georgia Nutrition Conference for the Feed Industry, Atlanta, Georgia, USA.

Mollison, B. and W. Guenter, 1984. Abdominal fat deposition and sudden death syndrome in broilers: The effects of restricted intake, early life caloric (fat) restriction and calorie:protein ratio. Poultry Sci., 63:1190-1200.

Moran, E. T., Jr., 1980. Early protein restriction of the broiler chickens and carcass quality upon later marketing. Poultry Sci., 59: 379-382

Moran, E. T., Jr., 1985. Aspects of fat metabolism importance to performance in fowl. Page 18 *in*: Proc. of the Arkansas Nutrition Conference. Fayetteville, Ark, USA.

Moran, E.T., Jr., R.D. Bushong and S.F. Bilgili, 1992. Reducing dietary crude protein for broilers while satisfying amino acid requirements by least-cost formulation: live performance, litter composition, and yield of fast-food carcass cute of six weeks. Poultry Sci., 71:1687-1694.

Nagian, M.F., 1981. Energy and protein requirements of broiler chickens for maximum profit in the tropics. Nut. Abst. and Rev., 53(b), 1983.

National Research Council, 1994. Nutrient Requirements of Poultry 9*th* revised ed., National Academy of Sciences, National Research Council, Washington, DC, USA.

Noy, Y. and Y. Pinchasov, 1993. Effect of a single posthatch intubation of nutrients on subsequent early performance of broiler chicks and turkey poults. Poultry Sci. 72:1861-1866.

Noy, Y. and D. Sklan, 1996. Uptake capacity *in vitro* for glucose and methionine and in Situ for oleic acid in the proximal small intestine of posthatch chicks. Poultry Sci., 75:998-1002.

Olomu, J. M. and S. A. Offiong, 1980. The effects of different protein and energy levels and time of change from starter to finisher ration on the performance of broiler chickens in the tropics. Poultry Sci. 59:828-835.

Pesti, G. M., 1985. Factors involved in economically optimizing protein and energy concentrations of broiler diets. Pages 169-174 *in* : Proc. 1985 Georgia Nutrition Conference for the Feed Industry, Atlanta, Georgia, USA.

Pesti, G. M. and C.F. Smith, 1984. The responses of growing broiler chickens to dietary contents of protein, energy and added fat. Br. Poultry Sci. 25:127-138.

Pinchasov, Y., 1991. Relationship between the weight of hatching eggs and subsequent early performance of broiler chicks. Br. Poultry Sci. 32:109-115.

Rand, N. T., H. M. Scott and F. A. Kummerow, 1958. Dietary fat in nutrition of growing chick. Poultry Sci. 37: 1075-1085.

Saleh, K., H. Younis and A. El-Hakim, 1993. Magnitude of the interaction between genotype and nutritional level in broilers. 4th Symp. Anim. Poult. & Fish Nut., El-Fayoum, Egypt.

Sell, J. L. and W. J. Owings, 1984. Effect of feeding supplemented fat by age sequence on the performance of growing turkeys. Poultry Sci. 63:1184.

Shariatmadari, F. and J. M. Forbes, 1993. Growth and food intake responses to diets of different protein contents and a choice between diets containing two concentrations of protein in broiler and layer strains of chickens. Br. Poultry Sci. 34:959-970.

Sizemore, F.G. and H. S. Siegel, 1993. Growth, feed conversion, and carcass composition in females of four broiler crosses fed starter diets with different energy levels and energy to protein ratios. Poultry Sci., 72:2216-2228.

Snedecor, G. W.,and W. G. Cochran, 1967. "Statistical Methods" 6th ed. The Iowa State Univ. Press, Ames, Iowa, USA.

Summers, J. D. and S. Leeson, 1984. Influence of dietary protein and energy level on broiler performance and carcass composition. Nutr. Rep. Int. 29:757-767.

Whitehead, C.C., 1990. Responses of body composition, growth and food efficiency to dietary protein in genetically lean and fat broilers up to seven weeks of age. Br. Poultry Sci., 31:163-172.

Wiseman, J., 1988. Nutrition and carcass fat. Poultry International. July, 1988, pp 12-13.

المستوى الأمثل من الطاقة الممثلة و البروتين الخام في علائق كتاكيت اللحم Avian-34

يوسف عبد الوهاب عطية[1]، محمد السيد نوار[2]، سلوي بخيت عبد الهادي[3]

١- قسم الإنتاج الحيواني والدواجن -كلية الزراعة (دمنهور)- جامعة الإسكندرية، ٢- مشروع تحسين السلالات الداجنة بفرهاش -حوش عيسى -محافظة البحيرة ، ٣- معهد بحوث الإنتاج الحيواني و الدواجن -مركز البحوث الزراعية-وزاره الزراعة

أجريت هذه الدراسة تحت نظام الإنتاج شبة المكثف بمشروع تحسين السلالات الداجنة بفرهاش -حوش عيس- محافظة البحيرة. درس تأثير التغذية على علائق نباتية تحتوى على ثلاث مستويات من الطاقة الممثلة بالكيلو كالورى/كجم علف والبروتين الخام في ذات العليقه ٢٨١٥ مع ٢٢,٠٤٪، ٣٠٠٠ مع ٢٣,٥١٪، ٣٢٠٣ مع ٢٥,٠٦٪ في مرحلة النامي (١-٢٨ يوم من العمر) وفى مرحلة الناهي (٢٩-٤٩ يوم من العمر) قسم كل مستوى من مستويات الطاقة الممثلة (كيلو كالوري/كجم علف) و البروتين الخام في مرحلة النامي الي تحت ثلاث مستويات من الطاقة الممثلة (كيلو كالوري/كجم علف) و البروتين الخام ٢٨١٦ مع ١٨,١٥٪، ٣٠٠٠ مع ١٩,٣٢٪، ٣٢٠١ مع ٢٠,٥٨٪ بحيث تواجدت في مرحلة الناهي ٩ معاملات غذائية واستخدم هذا التصميم لتقليل اثر اختلاف النسبة بين الطاقة الممثلة و البروتين الخام علي أداء كتاكيت اللحم. واحتويت كل عليقه على ثلاث مكررات في كل مرحلة وعند نهاية التجربة ذبح عشرة طيور من كل معاملة لدراسة مواصفات الذبيحة ودلت النتائج على الأتي:-

١-تحسنت معدلات النمو معنويا بزيادة مستوى الطاقة الممثلة و البروتين الخام في مرحلتي النامي والناهي كما ادئ زيادة مستواهما تحت ثبات النسبة بينهما الي زيادة استهلاك الغذاء و تحسين الكفاءة الغذائية معنويا وكانت افضل معدلات النمو و الكفاءة الغذائية من المجموعة التي غذيت علي عليقه تحتوى على ٣٢٠٣ كيلو كالورى طاقه ممثلة/كجم علف و ٢٥,٠٦٪ بروتين خام في مرحلة النامي و ٣٢٠١ كيلو كالورى طاقه ممثلة/كجم علف و ٢٠,٥٨٪ بروتين خام في مرحلة الناهي.

٢ -أدى زيادة مستوى الطاقة الممثلة و البروتين الخام في ذات العلائق تحت ثبات النسبة بينهما الي زيادة في معدل ترسيب الدهن في منطقة البطن معنويا.

٣-لم تتأثر نسبة التصافي معنويا بمستوى الطاقة الممثلة و البروتين الخام بالعلف تحت ثبات النسبة بينهما.

٤-تحسن العائد الصافي عند التغذية على عليقه تحتوى على ٣٠٠٠ كيلو كالورى طاقة ممثلة/كجم علف مع ٢٣,٥١٪ بروتين خام أو ٣٢٠٣ كيلو كالورى طاقة ممثلة/كجم علف مع ٢٥,٠٦٪ بروتين في مرحلة النامي و ٣٢٠١ كيلو كالورى طاقة ممثلة/كجم علف مع ٢٠,٥٨٪ بروتين خام في مرحلة الناهي.

و من هذا يمكننا التوصية باستخدام علائق تحتوى على مستوي ٣٠٠٠ كيلو كالورى من الطاقة الممثلة /كجم علف مع ٢٣,٥١٪ بروتين خام أو ٣٢٠٣ كيلو كالورى طاقة ممثلة/كجم علف مع ٢٥,٠٦٪ بروتين خام في مرحلة النامي و ٣٢٠١ كيلو كالورى طاقة ممثلة/كجم علف مع ٢٠,٥٨٪ بروتين خام في مرحلة الناهي لبداري التسمين من سلالة Avian-34 المرباة تحت ظروف الإنتاج شبة المكثف بمحافظة البحيرة في مصر.