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EFFECT OF DIETARY ENERGY AND PROTEIN LEVELS ON GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF GOLDEN MONTAZAH MALE CHICKS

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Abstract

The present study was conducted to evaluatre the response of male Golden Montazah chicks fed diets containing different levels of energy and protein. A toal number of 360 Golden Montazah male chicks aged 4 WKS were fed on starter diet (22% CP and 3000 Kcal ME/kg diet) for 28 days. Chicks were distributed into 8 treatments each treatment contained 45 chicks in 3 replicates. Two levels of protein, i.e 20% and 18% at grower period and 18 and 16% at finisher period within each four levels of energy 2800, 2900, 3000 and 3100 at grower period and 2900, 3000, 3100 and 3200 at finisher period were used.

The results indicated that, increasing dietary energy levels significantly ($P<0.05$) improved body weight (BW), body weight gain (BWG) and feed conversion (FC) at grower period (4-8 wks) and the entire experimental period (4-12 wks). The dietary protein levels had no significant effect on BW, BWG and FC throughout the exprimental period. Feed intake (FI) was not significantly affected by the dietary energy and protein levels throughout experimental period, except for the protein levels during grower period (4-8 wks). The dietary treatments had no significant effect on mortality rate and carcass characteristics. The best economic efficiency (E.E) was recorded with chicks fed 18 or 16% CP with 2900 or 3000 Kcal ME/Kg diet at grower and finisher periods, respectively. Generally, EE decreased with increasing level of energy and vice versa with protein level in the diet.

The results of this study may suggest 18% CP with 2900 Kcal ME/Kg diet (at grower period) and 16% CP with 3000 Kcal ME/kg diet (at finisher period) for fattening male Golden Montazah chicks.

INTRODUCTION

In Egypt, Golden Montazah breed is a new developed strain from a cross between the Rhode Island and Dokki 4. It is more adapted to the local environmental conditions and may also serve as a genaetic basis for establishing new hybrid for egg and meat production (Mahmoud *et al.*, 1974b).

A large number of research has been reported on protein and energy requirements of broiler chicks to maximize weight gain (ProudFoot and Hulan 1980, Leeson *et al.*, 1989 and Summers *et al.*, 1992).

There is also a substantial work showing the influence of dietary protein and energy levels on carcass traits of broiler chicks (Olomu and Offiong 1980, Cabel and Waldroup 1991 and Summers *et al.*, 1992).

There is a lack of information about the nutrient requirements for fattening of the local male breeds. Using the nutritional requirements published by NRC, 1994 in feeding local strains chicks may be in economic. Therefore, there are a need for determining the requirements of these males of chicks for fattening to reduce the cost per unit of production. Thus, the present study aimed to study the effect of different energy and protein levels on performance and carcass characteristics of male Golden Montazah chicks.

MATERIALS AND METHODS

1. Birds and diets

An experiment was carried out at El-Kanater El-Khairya Poultry Research Station and Poultry Nutrition Department, Animal production Research Institute, Agricultural Research Centre, Ministry of Agriculture, Egypt.

A total number of 360 Golden Montazah male chicks aged 4 WKS were obtained from El-Takamoly Poultry Project, El Fayoum, Egypt. Chicks were fed on a starter diet (22% with 3000 Kcal ME/Kg diet)from 1 to 28 days of age and kept under similar conditions of mangament. At 28 days of age, chicks were divided equally into eight treatments of 45 chicks each in three replicates. Chicks were housed in gas heated batteries. The eight expriemental diets (Table 1) were arranged as a 4x2 factorial desgin with four levels of energy (2800, 2900, 3000 and 3100) at grower period (28 to 56 days of age) and (2900, 3000, 3100 and 3200 Kcal ME/Kg) at finisher period (56 to 84 days of age) and two levels of protein (20 and 18% at grower period and 18 and 16% at finisher period). Diets were supplemented with DL-methionine to cover total sulphur amino acids (TSAA) and L-ysine according to the NRC (1994) requirements. Calcium and available phosphorus were approximately equal. Feed and water were provided ad-libitum.

2. Data collection

Chicks were weighed every 4 weeks during the experimental period and the

Table 1. Composition of the experimental diets used during the grower period (4-8 weeks).

Ingredient	20% CP				18% CP			
	ME Kcal/kg							
	2800	2900	3000	3100	2800	2900	3000	3100
Yellow corn	61.209	62.610	60.109	57.956	65.019	68.120	66.820	64.720
Soyabean meal	33.66	33.400	34.000	34.400	28.000	27.500	28.000	28.314
Vegetable oil	-	0.700	2.600	4.450	-	-	1.700	3.500
Bone meal	2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500
Limestone	0.120	0.120	0.12	0.120	0.176	0.176	0.176	0.162
Salt	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
Premix*	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
DL-Methionine	0.071	0.070	0.071	0.073	0.130	0.130	0.130	0.130
L-Lysine	-	-	-	-	0.080	0.075	0.074	0.074
Sand	1.800	-	-	-	3.500	0.899	-	-
Total	100	100	100	100	100	100	100	100
Calculated analysis								
CP%	20.01	20.08	20.11	20.00	18.00	18.00	18.00	18.00
ME Kcal/kg	2804.0	2901.2	3000	3101.3	2800	2900	3000	3100
EE%	2.59	3.34	5.15	6.92	2.69	2.80	4.46	6.18
CF%	3.70	3.71	3.70	3.67	3.39	3.42	3.43	3.40
Ca%	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Av.P	0.45	0.45	0.45	0.45	0.43	0.43	0.43	0.43
Methionine	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
Meth+CYs.	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Lysine	1.06	1.06	1.06	1.06	1.00	1.00	1.00	1.00
C:P ratio	140	1.45	150	155	155	161	166	172

* Supplied per Kg of diet: Vit. A, 12000 IU;Vit. D3, 2200 ICU; Vit. E, 10 mg; Vit. K3 2 mg; Vit. B1, 1 mg; Vit. B2 4 mg, Vit B6, 1.5 mg; Vit. B12, 10 micro g; Nicotinic acid, 20 mg; Folic acid, 1 mg; Pantothenic acid, 10 mg; Biotin, 50 micro g; Choline chloride, 500 mg; Copper, 10 mg; Iron, 30 mg; Manganese, 55 mg; Zinc, 50 mg; Iodine, 1 mg; Selenium, 0.1 mg.

Table 2. Composition of the experimental diets used during the finisher period (8-12 weeks of age).

Ingredient	20% CP				18% CP			
	ME Kcal/kg							
	2800	3000	3100	3200	2900	3000	3100	3200
Yellow corn	68.000	68.000	65.880	63.490	71.560	75.140	72.800	70.500
Soyabean meal	28.000	28.000	28.210	28.700	22.510	21.870	22.410	22.810
Vegetable oil	-	1.200	3.100	5.000	-	-	1.800	3.700
Bone meal	1.500	1.500	1.500	1.500	1.550	1.550	1.550	1.550
Limestone	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
Salt	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
Premix*	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
DL-Methionine	-	-	0.010	0.010	0.060	0.060	0.060	0.060
L-Lysine	-	-	-	-	0.080	0.080	0.080	0.080
Sand	1.200	-	-	-	2.940	-	-	-
Total	100	100	100	100	100	100	100	100
Calculated analysis								
CP%	18.10	18.14	18.00	18.02	16.10	16.14	16.00	16.00
ME Kcal/kg	2902.4	3008.0	3109	3205	2905	3010	3102	3200
EE%	2.80	4.00	5.82	7.64	2.90	3.03	4.74	6.56
CF%	3.45	3.45	3.42	3.40	3.15	3.18	3.17	3.14
Ca%	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Av.P	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Methionine	0.296	0.296	0.293	0.292	0.328	0.330	0.329	0.328
Meth+CYs.	0.603	0.603	0.597	0.595	0.605	0.609	0.607	0.605
Lysine	0.93	0.93	0.93	0.93	0.87	0.86	0.87	0.87
C:P ratio	161	166	172	177	181	187	193	200

* Supplied per Kg of diet: Vit. A, 12000 IU;Vit. D3, 2200 ICU; Vit. E, 10 mg; Vit. K3 2 mg; Vit. B1, 1 mg; Vit. B2 4 mg, Vit B6, 1.5 mg; Vit. B12, 10 micro g; Nicotinic acid, 20 mg; Folic acid, 1 mg; Pantothenic acid, 10 mg; Biotin, 50 micro g; Choline chloride, 500 mg; Copper, 10 mg; Iron, 30 mg; Manganese, 55 mg; Zinc, 50 mg; Iodine, 1 mg; Selenium, 0.1 mg.

residual feed was weighed weekly, body weight gain and feed conversion values were calculated. Mortality was recorded daily and the economical efficiency values were calculated.

3. Carcass characteristics

At the end of the 12 weeks of age, three birds from each treatment were taken around the average of each treatment for salughter test, and values were calculated as percentage of live body weight.

4. Statistical analysis

The data were subjected to the ANOVA using (SAS Institute, 1990). A 4X2 factorial design of treatment was used in the experiment using the following model:

$Yijk = M + Ei + Pj + (EP) ij + eijk$

Where :

Yijk = individual observation; M = overall mean

Ei = The effect of energy levels;

pj = The effect of protein levels; (EP) ij = The effect of interaction between energy and protein levels;

eijk=The random error term.

Means were separated by Duncan's multiple range test.

5. Economic efficiency (EE)

Total feed costs have been calculated on the basis of the cost of kilogram of feed intake of grower and finisher diets. Economic efficiency is defined as the net revenue per unit feed cost calculated from input-output analysis (Table 6).

RESULTS AND DISCUSSION

Growth performance

Live body weight (LBW) and body weight gain (BWG) of male chicks Golden Montazah fed the experimental diets were summarized in Table 3. Results indicated that LBW and BWG at 8 and 12 weeks of age were significantly affected ($P<0.05$) by increasing dietary energy level. Chicks fed 2800 or 2900 Kcal ME/Kg diet at grower and finisher period recorded the lowest LBW and BWG value than those fed the other dietary energy levels (2900/3000, 3000/3100 and 3100/3200 Kcal ME/kg

Table 3. Effect of dietary protein and energy levels from 4 to 12 weeks of age on body weight and body weight gain of male Golden Montazah chicks.

Protein levels (CP%)	Energy levels (ME Kcal/kg)				
	2800	2900	2800	3100	Overall
	8 WKS Body weight				
20%	791	830	840	841	826±7.49
18%	798	812	827	848	821±9.74
Overall	794±13.83b	821±11.05^{ba}	834±8.60^{a}	844±1.94^{a}	
	12 WKS Body weight				
	2800-2900	2900-3000	3000-3100	3100-3200	
20-18%	1307	1322	1365	1376	1345±11.98
18-16%	1322	1335	1344	1365	1341±7.95
Overall	1314±21.03b	1333±4.21^{ab}	1354±8.45	1370±4.66^{a}	
	4-8 WKS Body gain				
	2800	2900	3000	3100	
20%	489	529	537	541	524±7.58
18%	492	509	525	543	517±9.71
Overall	491±13.86b	519±11.12^{ab}	531±8.28^{a}	542±0.84^{a}	
	4-12 WKS Body gain				
	2900	3000	3100	3200	
18%	515	501	524	534	519±8.19
16%	524	523	516	517	520±5.51
Overall	519±14.68	512±12.00	520±4.27	526±5.72	
	4-12 WKS Body gain				
	2800-2900	2900-3000	3000-3100	3100-3200	
20-18%	1005	1031	1062	1075	1043±12.06
18-16%	1016	1032	1042	1061	1038±7.87
Overall	1010±21.13b	1031±4.17^{ab}	1052±7.50a	1068±5.12b	

a-b Means within the same row having different superscript are significantly different ($P<0.05$).

diet). No significant differences in LBW and BWG at 8 and 12 weeks of age were noted when dietary energy was increased from 2900 or 3000 to 3100 or 3200 Kcal ME/Kg diet. The 2800 and 2900 Kcal ME/Kg at grower and finisher diets, respectively, were deficient in energy, causing a decreased LBW and BWG. These results are in agreement with those reported by Mendes and Cury (1987). They indicated that, increasing dietary energy level from 2900 to 3200 Kcal ME/Kg diet increased body weight gain of broiler chicks from 35 to 56 days of age. Also, the results of the present study supported the finidings of Holsheimer and Veerkamp (1992) who showed that body weight gain of male broiler chicks fed 3200 Kcal ME/Kg diet was significantly larger than those fed 2880 Kcal ME/Kg diet at 42, 49 and 56 days of age. In contrast, Olomu and Offiong (1980) reported that dietary energy level had no significant effect on body weight gain from 42 to 63 days of age.

The dietary protein levels for grower (20 or 18%) and finisher (18 or 16%) periods had no significant effect on LBW and BWG (Table 3). These results are in agreement with those reported by Hulan and ProudFoot (1981) and Daghir (1983), who showed insignificant differences among the three protein levels tested (18, 15 and 12%) on male broiler weight gains from 6 to 10 weeks of age. On the contrary to the present results, Mahmoud *et al.* (1974) reported that 22% CP significantly improved body weight of Golden Montazah chicks compared to 20% Cp. Also, El-Hammady *et al.* (1992) concluded that 19% CP improved BW and BWG of Fayomi and Dandarawi up to 20 weeks of age.

Regarding mean vlaues of feed intake (FI) during the grower period (4-8 wks) and the finisher period (8-12 wks) (Tabl 4), no significant differences were observed for males fed various dietary energy levels, as well as, for the accumulating FI for the entire experimental period (4-12 wks). These results are in agreement with those reported by Olomu and Offiong (1980) and Ali (1990) who reported that insignificant differences were observed among the three energy levels tested (2800, 3000, and 3200 Kcal ME/Kg diet) on feed intake of broiler chicks from 35 to 63 days of age.

No significant differences were observed between the two levels of protein during finisher period (8-12 wks) and accumulating FI for the experimental period (4-12 wks). However, significant difference ($P<0.05$) was observed during grower period (4-8 Wks) between the two levels of protein (20/18% CP). These results are in agreement with those reported by El-Hammady *et al.* (1992), and Sherif (1989) who showed insignificant differences in feed intake 14, 17 and 20% CP from 10 to 20 weeks old Dokki 4 chicks.

Table 4. Effect of dietary protein and energy levels from 4 to 12 weeks of age on body weight and body weight gain of male Golden Montazah chicks.

Protein levels (CP%)	Feed intake					Feed conversion				
	ME Kcal/kg									
	2800	2900	3000	3100	Mean	2800	2900	3000	3100	Mean
	4-8 WKS									
20%	1578	1556	1592	1543	1567±8.73	3.22±0.08	2.94±0.04	2.96±0.07	2.84±0.01	2.99±0.04
18%	1614	1589	1599	1612	1603±9.95	3.29±0.18	3.13±0.17	3.04±0.07	2.96±0.01	3.10±0.06
Mean	1596±15.81	1573±20.35	1595±4.40	1577±16.20		3.25±0.09	3.03±0.09	3.00±0.05	2.90±0.05	
	8-12 WKS ME Kcal/Kg									
	2900	3000	3100	3200		2900	3000	3100	3200	
18%	2059	2077	2078	2092	2076±20.02	4.02±0.27	4.13±0.05	3.95±0.03	3.91±0.14	4.00-0.06
16%	2102	2068	1961	1982	2028±26.21	4.00±0.07	3.95±0.10	3.79±0.11	3.82±0.08	3.89±0.04
Mean	2081±34.30	2073±22.16	2019±33.80	2037±43.96		4.01±0.11	4.04±0.06	3.87±0.06	3.87±0.07	
	4-12 WKS ME Kcal/kg									
	2800-2900	2900-3000	3000-3100	3100-3200		2800-2900	2900-3000	3000-3100	3100-3200	
20-18 CP%	3637	3634	3670	3635	3644±20.72	3.62±0.15	3.51±0.01	3.45±0.04	3.37±0.06	3.49±0.04
18-16 CP%	3716	3658	3560	3594	3632±25.32	3.65±0.08	3.52±0.04	3.41±0.07	3.38±0.04	3.49±0.04
Mean	3677±36.74	3646±18.93	3615±33.52	3615±37.24		3.64±0.07	3.51±0.20b	3.43±0.03	3.38±0.03	

a-b Means within the same row having different superscript are significantly different ($P<0.05$).

Feed conversion (FC) druing the grower period (4-8wks) and accumulating FC for the entire experimental period (4-12 wks). Table 4 showed significant differences ($P<0.05$) between various dietary energy levels. However, insignificant differences were observed during finisher period (8-12 wks). These results coincide with those of Olomu and Offiong (1980) and Holsheimar and Rusink (1993) who reported that feed conversion of male broiler chicks fed either 3000 or 3250 kcal ME/kg diet was significantly better than of those fed 2750 Kcal ME/Kg diet from 1 to 49 days of age.

The dietary protein levels (20 or 18%) at grower period and (18 or 16%) finisher period had no significant effect on FC (Table 4). These results are in agreement with those reported by Holsheimer and Veerkamp (1992). They found insignificant effect of protein level on feed conversion during 6 to 9 weeks of age. On the other hand, El-Hammady *et al.* (1992) concluded that 19% CP improved feed efficiency of Fayoumi and Dandarawi up to 20 weeks of age compared to 16% CP.

Mortality rate was 0.8% between 4 and 12 weeks of age. The dietary treatments had no effect on mortality rate. These results are in agreement with those reported by Holsheimer and Ruesink (1993) who found that mortality rate was not significnatly affected by dietary energy level from 1 to 49 days of age. Similar results were also observed by Attia (1986) who found that mortality rate was not significantly influenced by the dietary protein level.

2. Carcass characteristics

These included dressing, giblets, total edible parts and abdominal fat percentages at 12 weeks of age. Table 5 showed that, these traits were not affected by dietary treatments. These results are in agreement with those reported by Olomu and Offiong (1980) and Cable and Waldroup (1991) who found that protein and energy levels had no significant effect on carcass dressing percentage of broiler chicks at 8 weeks of age. Also, Coon *et al.* (1981) did not observe an increase in abdominal fat as dietary energy level increased. However, Kubena *et al.* (1974) noted that abdominal fat increased as dietary energy increaed.

3. Economic efficiency (E.E)

The results of E.E (Table 6) indicated that the maixmum E.E. was recorded with chicks fed 18 or 16% CP with 2900 or 3000 Kcal ME/Kg. However, the minimum E.E was recorded with chicks fed 20 or 18% CP with 3100 or 3200 Kcal ME/

Table 5. Effect of dietary protein and energy levels from 4 to 12 weeks of age on carcass characteristics of male Golden Montazah chicks.

Items	ME Kcal/kg				
	2800-2900	2900-3000	3000-3100	3100-3200	Overall
Dressing %					
20-18% CP	63.99±0.81	63.93±1.08	65.87±2.36	63.45±0.70	64.30±1.06
18-16 CP	65.32±4.12	65.78±1.06	66.28±2.67	64.97±2.63	65.58±0.56
Overall	64.66±2.77	64.86±1.48	66.08±2.26	64.21±1.91	
Heart %					
20-18% CP	0.51±0.03	0.63±0.05	0.58±0.07	0.63±0.06	0.59±0.07
18-16 CP	0.66±0.13	0.52±0.06	0.73±0.26	0.63±0.14	0.63±0.16
Overall	0.59±0.11	0.57±0.08	0.66±0.19	0.63±0.09	
Liver %					
20-18% CP	2.10±0.22	1.91±0.11	1.86±0.25	2.12±0.15	2.00±0.21
18-16 CP	1.97±0.61	2.06±0.19	2.00±0.40	2.06±0.19	2.02±0.34
Overall	2.03±0.34	1.98±0.18	1.93±0.31	2.09±0.15	
Gizzard%					
20-18% CP	1.90±0.30	1.90±0.26	1.70±0.07	1.88±0.26	1.84±0.25
18-16 CP	2.12±0.11	1.62±0.14	1.96±0.19	1.72±0.08	1.85±0.24
Overall	2.01±0.27	1.76±0.28	1.83±0.19	1.80±0.19	
Giblets%					
20-18% CP	4.52±0.54	4.44±0.22	4.15±0.17	4.65±0.41	4.44±0.40
18-16 CP	4.76±0.62	4.20±0.35	4.70±0.76	4.41±0.34	4.52±0.52
Overall	4.64±0.59	4.32±0.29	4.42±0.58	4.53±0.36	
Abd. Fat%					
20-18% CP	1.48±0.72	1.36±0.52	2.15±1.43	1.46±0.93	1.61±0.97
18-16 CP	1.98±1.43	1.84±1.46	1.20±1.08	3.24±1.31	2.06±1.37
Overall	1.73±1.10	1.60±1.04	1.67±1.25	2.35±1.47	
T.E.P.%					
20-18% CP	68.52±0.35	68.38±1.13	70.02±2.39	68.10±0.29	68.75±1.38
18-16 CP	70.08±3.51	69.99±0.95	70.99±2.41	69.39±2.51	70.11±2.23
Overall	69.30±2.39	69.18±1.28	70.50±2.21	68.74±1.75	

Abd. fat = Abdominal fat & T.E.P. = Total edible parts.

Kg diet at grower and finisher period. This means that the Golden Montazah male chicks will achieve the same results if they are fed low protein diets supplemented with synthetic essential amino acids instead of feeding them higher protein diets. Generally, E.E was significantly decreased ($P<0.05$) with decreasing the level of energy and vice versa with protein level in the diet. These results are in agreement with those reported by Hulan and proudfoot (1981) who reported that the optimum net revenue was recorded by feeding 16% CP with 3200 Kcal ME/Kg diet from 50 to 70 days old broilers.

It would be probably wise to use 18% CP with 2900 Kcal ME/Kg (at grower period) and 16% CP with 3000. Kcal ME/Kg diet (at finisher period) for fattening male Golden Montazah chicks. This system of feeding might be considered satisfactory and profitable.

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Table 6. Effect of dietary protein and energy levels from 4 to 12 weeks of age on economic efficiency of male Golden Montazah chicks.

Items	20-18% CP				18-16 % CP			
	2800-2900	2900-3000	3000-3100	3100-3200	2800-2900	2900-3000	3000-3100	3100-3200
Average body weight	1.307	1.332	1.365	1.376	1.322	1.335	1.344	1.365
Price/Kg body weight	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Total revenue/chick LE	8.4955	8.6580	8.725	8.9440	8.5930	8.6775	8.7360	8.8725
Total feed intake/chick/kg	3.637	3.634	3.670	3.635	3.716	3.658	3.560	3.594
Price Kg/feed L.E	0.713	0.738	0.779	0.818	0.698	0.709	0.748	0.787
Total feed cost/Chick LE	2.5931	2.6818	2.8589	2.9734	2.5937	2.5935	2.6628	2.8284
Net revenue/ chick/L.E	5.9023	5.9761	6.0135	5.9705	5.9992	6.0839	6.0731	6.0440
E.E.	2.276±0.10	2.228±0.01	2.103±0.03	2.008±0.05	2.313±0.05	2.346±0.04	2.281±0.06	2.137±0.04
R.E.E	100	97.89	92.39	88.22	101.62	103.07	100.22	93.89
Mean effect (E.E)	2.154±0.04d				2.269±0.03e			
Levels of energy	2800-2900		2900-3000		3000-3100		3100-3200	
Mean effect (E.E)	2.294±0.05^{d}		2.287±0.03^{d}		2.192±0.05^{de}		2.073±0.04^{e}	

E.E. = Economic efficiency
R.E.E. = Relative economic efficiency
a-b Means within the same row having different superscript are significantly different (P<0.05).

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تأثير مستويات الطاقة والبروتين على النمو وصفات الذبيحة لذكور كتاكيت المنتزة الذهبية

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تهدف الدراسة الى تقييم اداء ذكور كتاكيت المنتزة الذهبى المغذاة على علائق تحتوى على مستويات مختلفة من الطاقة والبرتين . استخدم ٣٦٠ كتكوتا غذيت على عليقة بادى (تحتوى على ٢٢ ٪ بروتين خادم و٣٠٠٠ كيلو كالورى طاقة ممثلفة) لمدة ٢٨ يوما ، ثم تم توزيعها عشوائيا على ٨ معاملات (مستويين بوتين ٢٠ ، ١٨ X اربع مستويات طاقة ٢٨٠٠، ٢٩٠٠ ، ٣٠٠٠ ، ٣١٠٠ كيلو كالورى فى فترة النامى (٤-٨ أسابيع) } و { مستويين بروتين خام ١٨، ١٦ X أربع مستويات طاقة ٢٩٠٠ ، ٣٠٠٠ ، ٣١٠٠ ، ٣٢٠٠ كيلو كالورى طاقة ممثلة فى فترة الناهى (٨-١٢أسبوع) } واشتملت كل معاملة على ٤٥ كتكوتا فى ثلاث مكررات .

أوضحت النتائج تحسنا معنويا فى وزن الجسم والزيادة فى الوزن ومعامل التحويل الغذائى فى فترة النامى (٤-٨ أسابيع) والفترة الكلية (٤-٨ أسابيع مع زيادة مستويات الطاقة . بينما لم يتاثر وزن الجسم والزيادة فى الوزن ومعامل التحويل الغذائى خلال الفترة التجريبية بمستويات البروتين . بالنسبة للغذاء المستهلك خلال الفترات التجريبية لم يكن هناك فرق معنوى راجع الى مستويات الطاقة والبروتين فيما عدا فترات النامى (٤-٨ أسابيع) حيث كان هناك فرق معنوى مع مستويات البروتين . ولم يتاثر معنويا معدل النفوق وصفات الذبيحة بمستويات الطاقة والبروتين . تم الحصول على افضل كفاءة اقتصادية مع الذكور التى غذيت عليقة تحتوى على ١٨ و ١٦ ٪ بروتين مع ٢٩٠٠ و ٣٠٠٠ كيلو كالورى طاقة ممثلة فى فترة النامى والناهى على التوالى . بصفة عامة تحسنت الكفاءة الاقتصادية مع نقص مستوى البروتين والعكس مع مستوى الطاقة فى العليقة .

يستخلص من نتائج هذا البحث أنه يفضل استخدام عليقة تحتوى على ١٨ ٪ بروتين خام مع ٢٩٠٠ كيلو كالورى طاقة ممثلة فى فترة النامى (٤-٨ أسابيع) وعليقة تحتوى ١٦ ٪ بروتين مع ٣٠٠٠ كيلو كالورى طاقة ممثلة فى عليقة الناهى (٨-١٢ أسابيع) لتسمين ذكور المنتزة الذهبى.