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RESPONSE OF DOMYATI DUCKLINGS TO DIETS CONTAINING DIFFERENT LEVELS OF METABOLIZABLE ENERGY AND CRUDE PROTEIN

1- DURING GROWTH PERIOD

By

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Abstract : *A total number of 540 Domyati ducklings at one-day-old were used, weighed and divided into nine treatment groups of 3 replicates each to investigate the effect of different dietary levels of metabolizable energy (ME) and crude protein (CP) in (3x3) factorial design on growth performance, some blood constituents and carcass characteristics as well as nutrients digestibility of Domyati ducklings during the growing period (0-12 weeks of age). The dietary treatments fed from 0 - 6 weeks of age had 2600(Low), 2800(Medium) and 3000(High) kcal of ME/kg, each contained 18(Low), 20(Medium) and 22(High) % CP, whereas, from 7 - 12 weeks of age , these diets had 2550, 2650, and 2750 kcal of ME/kg, and each contained 12, 14 and 16 % CP.*

Results obtained could be summarized in the following:

1- *Varying levels of ME ,CP and their interaction resulted in non significant effect on live body weight (LBW), body weight gain (BWG), feed consumption (FC)and feed conversion ratio (FCR) .*

2- *Eviscerated carcass, edible parts and abdominal fat percentages significantly ($P \leq 0.05$) increased by increasing ME levels , whereas , all relative carcass parts of Domyati ducklings were not significantly affected due to varying levels of ME and CP and their interaction during growing period.*

3- *Ether extract and ash content of both breast and thigh meat were not affected due to varying levels of ME and CP in the diet , whereas, protein content was significantly increased as dietary ME level increased.*

4- *Plasma total lipids and cholesterol values of Domyati ducklings were significantly ($P \leq 0.01$) decreased by high ME level in the*

diet, whereas , plasma total protein values were significantly increased. On the other hand , all studied plasma parameters were not affected due to varying CP levels in the diet.

5- *All nutrients digestibility were not significantly affected due to ME level in the diet with the exception of EE which was significantly improved by low-ME level , whereas , medium-CP level improved nutrients digestibility of Domyati duckling during growing period. Both of TDN % and ME kcal/kg were insignificantly improved by feeding diet contained medium level of ME and CP.*

6- *Protein utilization efficiency (PUE) values were not affected due to varying ME level in the diet, whereas , it were significantly decreased by increasing CP levels in the diets during the periods 0-6 and 0-12 wks of age . Both of ME and CP level in the diet and their interaction did not significantly affect energy utilization efficiency (EUE) and production index (PI) of ducklings during the whole experimental period (0-12 wks).*

These results indicated that the combination of high-ME and low-protein level could be used in Domyati ducklings diets to maximize the productivity and carcass traits during growing period (0-12 wks of age).

INTRODUCTION

In poultry diets, energy and protein are important nutrients, representing majority of total cost of the diets. Also , all activities of poultry, including blood cycle, muscle movement, growth and producing products etc., need energy mainly derived from feeds ***(Leeson et al.,1993)***. Protein is the key component of cell, playing an important role in the process of life ***(Wang and Liu, 2002 and Kamran et al.,2004)***. At present, many studies were conducted to examine the effects of the dietary energy and protein level on the growth of broiler chickens ***(Dozier et al., 2006, 2007 and Ghaffari et al., 2007)***.Although duck response to dietary energy was reported by ***Wilson (1975)*** and ***Fan et al. (2008)***, their experiments were conducted on modern duck genotype , but the experiments on local duck strain in Egypt are lacking.

In Egypt, Domayti duck is popular in the north region . It have good meat quality, low carcass fat and high lean meat compared to other breeds of duck ***(Awad et al. ,2009 and Ghonim et al., 2009)***. Recently, the Domyati duck is increasing in demand by Egyptian consumers, especially in Dakahlia and Domyat. However, information of nutrient requirements of the Domyati duck are limited, particularly energy and protein. Therefore, in

order to improve the Domyati duck production , many attempts have been made to study their nutrient requirements .

The present study was undertaken to investigate the influence of varying levels of dietary energy and protein on Domyati ducklings performance and carcass quality during growing period (0-12 wks of age).

MATERIALS AND METHODS

Birds and management:

This study was carried out at El – Serw Water Fowl Research Station , Animal Production Research Institute , Agricultural Research Center, Ministry of Agriculture. Egypt. It was started in January and terminated at April 2009 . Five hundred and forty one-day-old Domyati ducklings obtained from a local hatchery were used, weighed and distributed into nine experimental groups. According to the treatment groups, the ducklings were arranged as 3x3 factorial in completely randomized design (three energy levels and three protein levels). Each treatment group was consisted of 3 replicates of 20 ducklings each. Ducklings were reared under similar hygienic, environmental and managerial conditions .They were housed in well ventilated brooding pens (1.75 x 3.5 m) from one-day up to 3 weeks of age, then allowed to go to out yards . Wheat straw was used as a litter, feed and water were provided *ad libitum* throughout the experimental period.

Experimental diets :

Nine starter and grower diets were formulated to contain the studied energy and protein levels. The studied dietary treatments fed from 0 to 6 week of age (starter) had 2600(Low), 2800(Medium) and 3000(High) kcal ME/kg of diet and each contained 18(Low), 20(Medium), or 22(High) % CP (Table 1). From 7 to 12 wks of age (grower) , these diets had 2550, 2650 and 2750 kcal ME/kg of diet, and each contained 12, 14 and 16 % CP (Table 2). The experimental diets in mash form were based on corn and soybean meal, while corn gluten and wheat bran were used to adjust the levels of protein and energy contents. Ducklings of the lowest energy and lowest protein treatment at 0 to 6 wks of age received the lowest energy and protein treatments at 7 to 12 wks of age.

Live body weight (LBW) of ducklings was recorded at day-old , 6 and 12 weeks of age. Also, feed consumption (FC) of ducklings was recorded from day-old to 6 weeks of age and from 7 to 12 weeks of age. While, body weight gain (BWG) and feed conversion ratio (FCR) were

calculated at the end of each period . Protein utilization efficiency (PUE) ,energy utilization efficiency (EUE) and production index (PI) were also calculated for each period. The PUE was calculated as weight gain (g) / crude protein consumed (g), EUE was calculated as total ME consumed / weight gain (g), whereas, PI was calculated as live weight (Kg)/ feed conversion x 100 according to ***North (1981)*** for the certain periods .

Slaughter test :

At the end of experimental period (12 wks of age), six ducklings per treatment group (one male and one female from each replicate) were randomly selected and slaughtered. Data of carcass traits (including eviscerated carcass, giblets , edible parts, breast, thigh, wings and head plus neck as well as abdominal fat) were calculated as % of live weight. Then , skinless-boneless pooled samples from breast and thigh muscles were chemically analyzed for crude protein (CP), ether extract (EE), and ash according to ***AOAC (1995)*** and the values were expressed on DM basis

Blood constituents :

At time of slaughter , blood samples from each duckling were collected in heparinized test tubes and centrifuged at 3500 rpm for 15 minutes to obtain blood plasma .Plasma were assigned for determination of total protein ***(Peters , 1968)*** , total cholesterol ***(Ellefson and Caraway , 1976)***,total lipids ***(Bucolo and David, 1973)*** and transaminase enzymes activities ALT and AST ***(Reitman and Frankel,1957)*** .

Nutrients digestibility :

At the end of experiment , three ducklings per treatment group (one from each replicate) were randomly taken to evaluate the digestibility of nutrients of the experimental diets . The procedure described by ***Jakobsen et al.(1960)*** was used for separating fecal protein from excreta samples . Urinaly organic matter (UOM) was determined according to ***Abou-Raya and Galal(1971).*** Digestion coefficients of dry matter(DM) , organic matter (OM), crude protein (CP), crude fiber (CF) , ether extract(EE) and nitrogen free extract (NFE) as well as total digestible nutrient (TDN) and metabolizable energy (ME) were calculated (***Fraps ,1946***).

Statistical analysis:

Data obtained were statistically analyzed using the General linear model of ***SAS (1996)***. In this study, the model used was 3x 3 factorial design. Considering the metabolizabile energy and crude protein level as the main effects, as follows:

$Yijk = \mu + Ti + Rj + (TR)ij + eijk$

where : Yijk = An observation ; μ = Overall mean ;

T = Effect of ME level ; i= (1,2 and 3) ;

R = Effect of CP level ; j = (1, 2 and 3) ;

TR=Effect of interaction between ME and CP level ; and

eijk = Experimental random error.

Differences among treatment means were estimated by Duncan's multiple range test (***Duncan,1955***).

RESULTS AND DISCUSSION

Growth performance :

Results of Table (3) showed that no significant effect was detected among Domyati duckling on diets contained varying levels of both ME and CP on their live body weight (LBW) and body weight gain (BWG) during growth period (0-12 wks) . Although energy levels of experimental diets did not significantly affect LBW and BWG of ducklings, LBW and BWG were slightly improved (1.51 to 6.75 %) by high ME level compared to the low one. These results are in agreement with the observations of ***Wilson (1975)*** who reported that LBW of Pekin ducks could be improved by high-energy diets . Similarly , ***Leeson et al. (1996) and Nguyen and Bunchasak (2005)*** recorded that no significant effects of dietary energy content were observed on LBW and BWG of broiler chicks. In contrast to these results, ***Fan et al. (2008)*** reported that LBW and BWG of Pekin ducks were significantly increased by increasing ME from 2600- 3100 Kcal/kg during 2-6 wks of age.

Increasing dietary CP content in Domyati duckling diets insignificantly lowered LBW and BWG during experimental period. LBW was slightly decreased by 7.05 % of the group fed diet contained high CP as compared to the group fed diet contained low CP at 12 wks of age, whereas , BWG was decreased by 7.20 % for the same group at 0-12 wks of age . In contrast, ***Smith and Pesti (1998) and Temim et al.(2000)*** reported that increased dietary protein content in the broiler diet improved LBW and BWG. However, ***Zhuye et al.(2009)*** showed no significant effect of varying CP level in broiler diets on LBW and BWG during starter phase.

Surprisingly, the results of this study showed that the interaction between dietary ME and CP had no significant effect on LBW and BWG. On the other hand , interaction between ME and CP levels in the diet showed that the best BWG resulted by using diet contained high ME and

low CP levels at 0-6 and 0-12 wks of age as compared with other interactions. This phenomenon may be attributed to that the varying levels of energy and protein did not affect feed intake at these periods, also , it may be assumed that the tested ME and CP levels either met or exceeded the requirement of Domyati ducklings.

This is similar to the study of gosling chicks reported by ***Su and Ma (1997)*** who, showed that decreasing dietary CP from 24 to 20% and ME from 11.76 to 11.37 MJ in meat-type geese diet resulted in no significant effect on BWG. Also, ***Min et al. (2007)*** reported that the interactions between dietary CP and ME levels had no significant effect on gosling growth performance. This is contrary to reports of ***Chen (2003),*** who found that the ME * CP interaction had significant effect on the daily weight gain of goslings.

No significant effect was observed by feeding Domyati ducklings on diets contained varying levels of both ME and CP and their interactions on feed consumption (FC) and feed conversion ratio (FCR) at different growth periods (Table 4). Results showed that FC of duckling was insignificantly decreased as dietary ME increased during 7-12 and overall period (0-12 wks of age). It was decreased by 9.67 and 4.05 % of the group fed diet contained high ME level in the diets during 7-12 and 0-12 wks of age compared to the low ME level. These results may be due to that the effect of dietary ME on the performance of growing ducklings is dependent on the capacity of the duckling to alter FC to meet changing demands for calories. This observation is in agreement with reports of ***Golian and Maurice (1992) and Leeson et al. (1993),*** who reported that birds consume feed to primarily meet their energy requirements. Similarly , ***Veldkamp et al.(2005)*** and ***Min et al.(2007)*** reported that feed intake linearly decreased as dietary energy increased. Also, ***Nahashon et al., (2005 and 2006)*** have suggested that as dietary energy increases, birds satisfy their energy needs by decreasing feed intake. Moreover, ***Fan et al. (2008)*** reported that as dietary ME increased from 2600 to 3100 Kcal/kg FC of Pekin ducks significantly decreased during 2-6 wks of age.

FC was not influenced by varying levels of dietary CP in the diets. Ducklings fed diets contained both low and medium CP levels consumed insignificantly more feed than those fed high CP level during 7-12 and 0-12 wks of age. This result may be due to that dietary CP concentrations can modulate FC, and higher demand for CP at an early age or period of accelerated growth rate than at later ages***(Nahashon et al., 2005).*** This is similar to the study of ***Summers et al. (1992)*** who found no significant effect on feed intake of broilers when fed three levels of protein ranging

from 16.5 to 23.5% in the diets. Although, results of this study showed that the interaction between dietary ME and CP had insignificant effect on FC , interaction between ME and CP levels in the diet gave the higher value of FC by using diet contained low ME and low CP levels at 0-12 wks of age as compared with other interactions, whereas , the lowest FC was occurred by feeding diet contained high level of both ME and CP at the same period.

Although, differences in FCR of ducklings fed diets containing varying levels of ME were not significant at different growth studied periods (Table 4), the ducklings fed high-ME diets had better FCR by 2.39 , 11.77 and 8.44 % as compared to those fed low–ME diet during the periods 0-6 , 7-12 and 0-12 weeks of age, respectively. Although optimum environmental conditions were maintained uniformly to all experimental ducklings throughout the study period, the ducklings fed varying levels of ME diets exhibited inferior FCR at 7-12 wks of age when compared with other age periods. The worse FCR values were attributed to lower BW gains and possibly higher feed consumption of the experimental ducklings at 7-12 wks of age.

Generally , results showed that the improvement in FCR of ducklings appears to be due to the decrease in feed intake caused by high dietary energy. Similar results using , Pekin ducklings ***(Fan et al.,2008),*** goslings ***(Min et al.,2007)*** and broilers ***(Dozier et al., 2006, 2007and Ghaffari et al., 2007***) were reported .

Protein level had no significant effect on FCR during all growth studied periods (Table 4). The ducklings fed diets contained high or medium- CP recorded inferior FCR than those fed low- CP during all growth periods. The improve in FCR that is associated with decreasing in dietary CP levels may have been attributed to decreased feed consumption of ducklings which also tend to have lower energy-to-protein ratios. These results are in agreement with those obtained by ***Rezaei et al. (2004) and Mehr et al.(2007***) who indicated that reducing dietary protein level did not significantly influenced feed conversion ratio. Although differences in the interaction between dietary ME and CP did not significantly affected FCR during all growth periods, the best value of FCR observed by those fed diet containing high-ME and low-CP during the overall period (0-12 wks). These results are in agreement with those obtained by ***Novak et al.(2007)*** who reported that no significant effects were noted as a result of varying ME and CP levels on FCR of Bovans White Leghorns during the starter and developer periods.

Carcass traits :

Result of Tables (5 and 6) show the effect of different ME and CP levels in the diets on some carcass traits (expressed as percentages of LBW) of Domyati ducklings at 12 wks of age . Eviscerated carcass , edible parts and abdominal fat percentages were significantly ($P \leq 0.01$) higher by increasing ME levels as compared to low-ME in duckling diets during the growth period ,whereas, total giblets percentage was not significantly affected (Table 5). The improvement of eviscerated carcass and edible parts percentages were 4.52 and 4.24 % for ducklings fed high-ME as compared with those fed low-ME diet. These results are in agreement with those obtained by ***Albuquerque et al. (2003)*** who reported that carcass and edible part yields were significantly lowered of broiler fed low-ME than birds fed high-ME at 42 days of age. ***Min et al. (2007)*** found that eviscerated carcass and abdominal fat percentages of goslings at growing period were significantly higher when feeding diet contained high-ME (12.87 MJ/kg) compared to low–ME (10.87 MJ/kg). Also , ***Summers et al., (1992) , Al-Harthi et al. (2002), Ghaffari et al. (2007) and Ghazalah et al. (2008)*** reported that abdominal or carcass fat was significantly increased in broiler fed diet contained high dietary energy. Similarly , ***Fan et al.(2008)*** reported that abdominal fat significantly increased ($P < 0.05$) by using ME in Pekin duckling diets above 2700 kcal/kg.

Varying CP levels did not affect all carcass traits of Domyati duckling (Table 5) . These results are in agreement with those obtained by ***Leeson et al. (1996) , Smith and Pesti (1998) and Nguyen and Bunchasak,(2005)*** who reported that varying dietary protein levels did not affect carcass yield of the Betong chicks. Also , ***Abd-Elsamee (2001) and Abou- Elwafa et al.(2001)*** reported that reducing protein level in broiler diets had no significant effect on carcass traits. Similarly, ***Hidalgo et al. (2004)*** found no differences in carcass yield, breast meat yield, and abdominal fat in broilers fed low-CP diets with a constant ME:CP ratio. In contrast, ***Kidd et al. (1997)*** found that Hot or cold carcass of toms as a percentage of LBW were significantly ($P<0.01$) decreased when dietary CP was decreased to 76 or 84 % of NRC recommendations as compared with those receiving diets containing 100% of NRC.

Also , there was no statistical interaction effect between ME and CP levels on carcass traits of Domyati duckling (Table 5). The combinations of high-ME and any level of CP in the diet had higher carcass and edible parts percentages. These results are in agreement with ***Dozier and Moran (2001, 2002)*** who reported that feeding broiler diets formulated to contain

suboptimal concentrations of CP and ME impaired the amount and yield of carcass parts. Also, ***Hassanein (2006)*** reported that decreasing of CP by 2% and ME by 200 Kcal/ kg diet than ***NRC (1994)*** recommendations had no significant effect on broiler carcass traits.

Data in Table (6) shows that all carcass parts % of Domyati ducklings were insignificantly affected due to ME and CP and their interaction at 12 wks of age. Breast and thigh percentages were insignificantly higher due to increasing ME level, whereas, wings, head plus neck and drumstick percentages were approximately similar. Moreover, all carcass parts percentages of Domyati ducklings were approximately equal in spite of varying levels of CP in the diets. The higher percentages of breast parts due to the interaction between ME and CP were occurred by feeding diets contained medium- ME with medium or high CP levels followed by high-ME with low or medium-CP, whereas higher thigh percentage occurred by either medium-ME and CP or high-ME with low-CP containing diets.

These results are in agreement with those obtained by ***Fan et al. (2008)*** who reported that high dietary energy did not affect breast and leg meat ($P < 0.05$) when dietary AME was above 2700 kcal/kg and ***Kamran et al. (2008)*** who reported that breast meat yield, thigh yield, abdominal fat, and relative liver and heart weights were not affected by the C/P ratio of broilers at 35 days of age. Also, ***Hidalgo et al. (2004)*** reported no differences in breast meat yield in broilers fed low-CP diets with a constant ME:CP ratio and ***Nguyen and Bunchasak (2005)*** found that breast, thigh and wings meat percentages were not affected due to varying levels of ME and CP in Beton chicken diets during growth period. Similarly, ***Min et al. (2007)*** reported that breast meat and leg meat percentages were insignificantly higher by feeding goslings on 20% CP than from those fed on 15 % CP in the diet. Moreover, Zhuye ***et al. (2009)*** reported that breast and thigh meat were insignificantly decreased by feeding broiler chicks on Low-ME (12.13 MJ/kg) and low-CP (20%) as compared with those fed high-ME (12.97 MJ/kg) and high-CP (23%) at 21 day of age.

Muscle compositions:

Data of muscle compositions of both breast and thigh of Domyati ducklings due to treatments are presented in Tables (7).The results revealed that no significant differences were observed for all muscle contents of both breast and thigh meat due to varying levels of ME and CP in the diet. Ether extract values of breast meat were insignificantly increased by about 6.48 and 16.75% for group fed high ME level as compared to groups fed diet contained low or medium level of ME ,whereas , it were 14.47 and

33.63 % in thigh meat for the same group, respectively. Also, protein content of both breast and thigh meat was insignificantly increased by about 9.46 and 3.84 % in the group fed diet contained high ME level , respectively as compared to ducklings fed on diet containing low ME. Ash content of both breast and thigh meat was nearly equal in spite of feeding different ME levels. Varying levels of CP in the diet resulted in non significant effects on protein content of both breast and thigh meat, which were decreased by increasing CP level in the diet (Table 7). Ether extract and ash contents of both breast and thigh meat due to varying CP levels in the diet had the same trend of varying ME levels. Interaction between ME and CP in the diet showed no significant effects on all meat components of both breast and thigh of Domyati ducklings.

Blood plasma constituents:

Plasma constituents of Domyati ducklings, measured in the present study, were estimated to show the metabolic status of ducklings and their health as affected by feeding varying ME and CP levels in the diet. Results presented in Table (8) show significant differences between treatments only on plasma total protein and cholesterol, whereas other studied plasma constituents were not significantly affected due to ME level. Whereas, varying CP levels did not affect on all parameters. Plasma total lipids and AST were insignificantly decreased in the group fed diet contained high ME level, whereas plasma total cholesterol values of Domyati ducklings were significantly ($P \leq 0.01$) decreased in the same group . On the other hand, plasma total protein values were significantly ($P \leq 0.01$) increased by feeding high-ME level. The interactions between varying levels of ME and CP did not affect on all plasma constituents of Domyati ducklings

Nutrients digestibility:

The effects of dietary ME and CP and their interaction on nutrients digestibility of the experimental diets are presented in Table (9). It is worthy to note that the digestion coefficient values of dry matter (DM) , crude protein (CP), crude fiber (CF), nitrogen free extract (NFE) and organic matter (OM) were nearly similar and no significant effects were observed due to varying ME level in the diet , whereas , ether extract (EE), ash and nitrogen (N) retention values were significantly affected . Ash and nitrogen retention values were significantly increased by increasing ME level in the diet. Moreover, values of DM , EE , NFE and OM digestibility were significantly ($P<0.01$) increased by the medium level of CP compared to either low or high level, whereas, CP digestibility values were increased with the medium and high level of CP compared to the low level. On the other hand, data showed that the best values of DM, CP, EE, , NFE and OM

digestibility were occurred by the interaction between low ME and medium CP levels, whereas, the lowest values of DM , CP , CF and OM digestibility were occurred by the interaction between the low level of both ME and CP.

These results may be due to varying ME and CP levels, which could contribute to the higher digestive enzymes activity in intestinal fluid of ducks ***(Fan, 2003). Maiorka et al. (2004)*** reported that overfeeding and dietary ME and CP content had effects on the activity of amylase, lipase, trypsin, chymotrypsin, and disaccharidase in pancreas or intestinal digesta of chicks, which mean that dietary nutrients were mediating these endogenous digestive enzyme levels. ***Zhao et al. (2007)*** reported that amylase, trypsin, and chymotrypsin activity in jejunal fluid of ducks adapted to the dietary CP content but not to dietary ME content.

Protein Utilization Efficiency (PUE):

Results of Table (10) show the effect of varying ME, CP levels in the diets and their interaction on Domyati duckling protein utilization efficiency during different periods of age. The PUE values were not influenced by different levels of ME and interaction between ME and CP levels. These results may be due to that ME levels in the diet create a suitable condition to appraise similar PUE values during the subsequent periods. These results are in agreement with those obtained by ***Nguyen and Bunchasak (2005)*** who reported that varying ME diets did not affect protein efficiency ratio (PER) of the Betong chicks and ***Kamran et al.(2008)*** who reported that PER values were insignificantly affected by varying ME levels in the diet during starter period in broilers chickens.

The PUE values were significantly decreased by increasing CP levels in the diets during 0-6 and 0-12 wks of age. The PUE values were decreased by 17.05 and 22.33 % for the group fed diet contained high-CP as compared with those fed low-CP during the periods 0-6 and 0-12 wks of age, respectively. All combinations of low CP level with different ME levels had higher PUE than other combinations during 0-6 wks of age, whereas, the combination of low CP with medium ME levels recorded the best values during growing period (7-12) and overall period (0-12) wks of age. This result agree with ***Cheng et al. (1997),*** who observed a linear increase in PER with the reduction in dietary CP content from 24 to 16%. Also, ***Nguyen and Bunchasak (2005)*** reported that the Betong chicks fed lower protein diet converted protein to body weight gain more efficiently than those fed higher protein diets ($P<0.01$).

Energy Utilization Efficiency (EUE):

Results of Table (10) showed that dietary ME level had a significant effect on EUE only during the period 7-12 wks of age. The EUE values were insignificantly affected due to CP levels during experimental periods with the exception between 0-6 wks of age which were significantly affected. The highest value of EUE was recorded for ducklings fed diets contained medium CP level during all experimental periods than other CP levels. The interaction between dietary ME and CP values had no significant effect on EUE during different periods of experimental periods. The EUE of ducklings fed diets contained medium ME with high CP level was insignificantly higher than other combinations during the overall period, whereas , the lowest EUE values were occurred by feeding diets contained low ME with high CP and high ME with low CP levels .

Production Index (PI):

Results of PI values were nearly similar with no significant differences within all treatments due to ME level during the periods 0-6 and 0-12 wks of age , whereas , PI was significantly low in high ME level compared with medium one during 7-12 wks (Table 11). Moreover, PI values were insignificantly decreased by increasing CP level in the diets during 0-6 and 0-12 wks of age. The interaction between ME and CP level in the diets did not significant effect on duckling PI during the different periods of age. The PI values were higher for ducklings fed diet contained low ME and high CP as well as high ME and medium CP level during 0-6 wks. Whereas, the highest value was recorded for those fed diet containing medium ME and high CP level during 7-12 wks. The best value of PI allover experimental period was occurred by feeding diet contained low ME and high CP followed by dietary high ME and medium CP.

Nutritive value:

The effects of dietary ME and CP and their interaction on nutritive value (TDN % and ME kcal/kg) of the experimental diets are presented in Table (11). Results show that both of TDN (%) and ME (kcal/kg) were not significantly affected due to ME and CP levels in the diets.

The ducklings fed medium ME and CP in their diet had almost the best values of TDN and ME as compared to those fed other levels of ME or CP in their diets. This result may be due to the improvement of nutrients digestibility of all diet nutrients by dietary medium-CP level.

CONCLUSION

The combination between high-ME and low-CP (3000 Kcal/kg , 18% CP in starter diet followed by 2750 Kcal/kg , 12%CP in grower diet) could be used to maximize the productivity and carcass traits of Domyati ducklings.

Table (1): Composition and calculated analysis of starter diets (0-6 wks) .

Ingredients %	Energy level (Kcal ME/kg)								
	L (2600)			M (2800)			H (3000)		
	Protein level (%)								
	L (18)	M (20)	H (22)	L (18)	M (20)	H (22)	L (18)	M (20)	H (22)
Yellow corn	53.9	49.9	46.0	63.0	57.6	52.7	69.9	65.4	60.9
Soy bean mea l(44%)	20.0	20.8	16.2	19.2	18.4	16.0	18.9	15.9	15.6
Gluten meal (60%)	2.10	5.30	11.80	4.00	8.00	13.0	5.20	10.7	14.5
Wheat bran	20.0	20.0	22.0	9.80	12.0	14.3	2.00	4.00	5.00
Di-calcium phosphate	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Limestone	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.40
Vit & Min. premix *	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Salt (NaCl)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
DL. Methionine (97%)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Total	100	100	100	100	100	100	100	100	100
Calculated Analysis **									
Crude protein %	18.02	20.01	22.00	18.02	20.03	22.02	18.00	20.01	22.01
ME (Kcal / kg)	2607	2610	2636	2823	2800	2800	2991	3004	3001
Calcium (%)	0.98	0.98	0.98	0.97	0.97	0.97	0.96	0.96	0.96
Av. Phosphorus (%)	0.42	0.42	0.42	0.41	0.41	0.41	0.40	0.40	0.40

*Each 3 kg of the Vit and Min. premix manufactured by Agri-Vit Company, Egypt contains: Vitamin A 10 MIU, Vit. D 2 MIU, Vit E 10 g, Vit. K 2 g, Thiamin 1 g, Riboflavin 5 g, Pyridoxine 1.5 g, Niacin 30 g, Vit. B_{12} 10 mg, Pantothenic acid 10 g, Folic acid 1.5 g, Biotin 50 mg, Choline chloride 250 g, Manganese 60 g, Zinc 50 g, Iron 30 g, Copper 10 g, Iodine 1g, Selenium 0. 10 g, Cobalt 0.10 g. and carrier $CaCO_3$ to 3000 g..

** According to NRC (1994) L= Low . M= Medium , H= High

Table (2): Composition and calculated analysis of grower diets (7-12 wks).

Ingredients %	Energy level (Kcal ME/kg)								
	L (2600)			M (2800)			M (2800)		
	Protein level (%)								
	L (18)	M (20)	H (22)	L (18)	M (20)	H (22)	L (18)	M (20)	H (22)
Yellow corn	61.5	58.5	55.5	65.7	62.8	60.0	70.0	67.2	64.3
Soy bean meal(44%)	4.5	10.8	17.1	5.5	11.9	18.2	6.7	13.0	19.3
Wheat bran	30.05	26.8	23.5	24.8	21.4	17.9	19.3	15.85	12.5
Di-calcium phosphate	1.55	1.50	1.50	1.60	1.50	1.50	1.60	1.55	1.50
Limestone	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Vit & Min. premix *	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Salt (NaCl)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
DL. Methionine(97%)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100	100	100	100	100
Calculated Analysis **									
Crude protein %	12.01	14.02	16.02	12.00	14.02	16.01	12.02	14.01	16.01
ME (Kcal / kg)	2558	2553	2551	.2650	2651	2652	2750	2751	2751
Calcium (%)	0.98	0.98	0.99	0.98	0.98	0.99	0.98	0.98	0.99
Av. phosphorus (%)	0.41	0.41	0.42	0.42	0.41	0.41	0.41	0.41	0.41

*Each 3 kg of the Vit and Min. premix manufactured by Agri-Vit Company, Egypt contains: Vitamin A 10 MIU, Vit. D 2 MIU, Vit E 10 g, Vit. K 2 g, Thiamin 1 g. Riboflavin 5 g, Pyridoxine 1.5 g, Niacin 30 g, Vit. B_{12} 10 mg, Pantothenic acid 10 g, Folic acid 1.5 g, Biotin 50 mg, Choline chloride 250 g, Manganese 60 g, Zinc 50 g, Iron 30 g, Copper 10 g, Iodine 1g, Selenium 0. 10 g, Cobalt 0.10 g. and carrier $CaCO_3$ to 3000 g..

** According to NRC (1994) L= Low , M= Medium , H= High

Table (3): Effect of dietary energy and protein levels on live body weight (LBW) and body weight gain (BWG) at different ages during growing period of Domyati ducklings .

Treatments		LBW (g)			BWG (g)		
		At hatch	6 wks	12 wks	0-6 wks	7-12 wks	0-12 wks
Energy level							
Low		46.7±0.9	1621.1±62.9	2235.6±29.0	1574.4±40.0	614.4±48.8	2188.9±28.9
Medium		48.2±0.9	1597.8±41.3	2292.2±50.0	1549.6±41.6	694.4±40.4	2244.0±50.3
High		47.2±0.8	1705.6±40.8	2326.7±40.5	1658.3±40.5	621.1±53.1	2279.4±40.9
Protein level							
Low		46.7±0.9	1711.1±27.3	2364.4±34.9	1664.4±27.2	653.3±39.7	2317.8±35.2
Medium		48.7±1.0	1592.2±48.2	2292.2±39.7	1543.6±48.6	700.0±52.7	2243.6±39.8
High		46.8±0.7	1621.1±41.2	2197.8±31.2	1574.3±41.1	576.7±44.5	2151.0±31.4
Interactions							
Energy	Protein						
Low	Low	46.0±0.9	1680.0±68.1	2310.0±25.2	1634.0±66.8	630.0±91.6	2264.0±26.0
	Medium	48.0±1.4	1613.3±84.1	2246.7±11.9	1565.3±86.6	633.3±89.7	2198.7±11.3
	High	46.0±0.6	1570.0±63.5	2150.0±52.9	1524.0±64.1	580.0±106.0	2104.0±52.5
Medium	Low	48.0±2.0	1693.3±29.7	2350.0±48.2	1645.3±28.7	565.7±69.8	2302.0±48.2
	Medium	49.7±1.6	1543.3±107.4	2356.7±117.2	1493.7±108.5	813.3±47.0	2307.0±117.5
	High	47.0±1.7	1556.7±33.8	2170.0±55.7	1509.7±34.2	613.3±37.5	2123.0±57.0
High	Low	46.0±1.6	1760.0±40.0	2433.3±88.9	1714.0±41.5	673.3±73.1	2387.3±88.9
	Medium	48.3±1.8	1620.0±86.6	2273.3±43.7	1571.7±84.9	653.3±115.6	2225.0±43.7
	High	47.3±1.2	1736.7±72.2	2273.3±37.5	1689.3±71.0	536.7±98.2	2226.0±38.5

No significant differences were observed among treatments in all parameters studied.

Table (4): Effect of dietary energy and protein levels on feed consumption (FC) and feed conversion ratio (FCR) at different growing periods of Domyati ducklings .

Treatments		FC (g/duck)			FCR (g feed / g BWG)		
		0-6 wks	7-12 wks	0-12 wks	0-6 wks	7-12 wks	0-12 wks
Energy level							
Low		3363.3±106.7	3941.1±201.3	7304.4±123.1	2.14±0.04	6.55±0.27	3.34±0.04
Medium		3380.0±72.9	3901.1±142.9	7281.1±114.1	2.19±0.06	5.72±0.28	3.26±0.09
High		3448.0±65.0	3560.0±201.8	7008.9±186.2	2.09±0.05	5.86±0.22	3.08±0.06
Protein level							
Low		3412.2±44.8	3841.1±183.1	7253.3±35.2	2.05±0.03	5.95±0.21	3.13±0.07
Medium		3244.4±64.1	4052.2±173.8	7296.7±126.5	2.11±0.04	5.96±0.35	3.26±0.07
High		3535.6±99.7	3508.9±173.6	7044.4±147.1	2.25±0.05	6.20±0.21	3.28±0.08
Interactions							
Ener.	Prot.						
Low	Low	3393.3±125.7	4146.7±302.0	7540.0±179.0	2.08±0.01	6.71±0.45	3.33±0.05
	Med.	3223.3±149.8	4153.3±362.0	7376.7±239.0	2.06±0.02	6.70±0.58	3.36±0.12
	High	3473.3±286.4	3523.3±364.7	6996.7±121.7	2.27±0.09	6.24±0.49	3.33±0.03
Med.	Low	3430.0±62.4	3643.3±311.4	7073.3±255.6	2.09±0.03	5.63±0.55	3.07±0.11
	Med.	3170.0±77.7	4296.7±157.1	7456.7±150.7	2.14±0.09	5.34±0.53	3.25±0.18
	High	3540.0±133.2	3763.3±51.7	7303.3±171.3	2.35±0.08	6.18±0.39	3.44±0.12
High	Low	3413.3±63.6	3733.3±377.0	7146.7±410.0	2.00±0.03	5.55±0.06	2.99±0.11
	Med.	3340.0±115.9	3706.7±335.0	7046.7±251.2	2.13±0.10	5.86±0.60	3.17±0.10
	High	3593.3±127.2	3240.0±396.6	6833.3±398.4	2.13±0.08	6.16±0.36	3.07±0.13

No significant differences were observed among treatments in all parameters studied.

Table (5): Effect of dietary energy and protein levels on some carcass traits of Domyati ducklings at 12 wks of age .

Treatment		LBW	%			
			Evisc. carcass	Total giblets	Edible parts	Abd. fat
Energy level						
Low		2383.3±81.7	68.43±0.71 [b]	5.90±0.31	74.33±0.87 [b]	0.79±0.09 [b]
Medium		2401.1±75.3	70.56±0.83 [a]	5.78±0.20	76.43±0.71 [a]	1.26±0.09 [a]
High		2473.3±56.3	71.52±0.63 [a]	5.96±0.29	77.48±0.46 [a]	1.46±0.16 [a]
Significance		NS	0.01	NS	0.01	0.01
Protein level						
Low		2427.8±95.7	70.17±0.82	5.68±0.30	75.85±0.64	0.99±0.11
Medium		2417.8±65.3	70.81±0.60	6.35±0.23	77.15±0.37	1.24±0.08
High		2412.2±51.8	69.52±1.06	5.70±0.21	75.22±1.99	1.27±016
Significance		NS	NS	NS	NS	NS
Interactions						
Energ.	Protein					
Low	Low	2436.7±192.2	68.36±1.24	5.92±0.43	74.28±1.12	0.62±0.24
	Med.	2403.1±176.1	69.72±0.90	6.61±0.47	76.33±0.78	0.86±0.14
	High	2310.0±88.9	67.20±1.42	5.18±0.50	72.37±1.82	0.89±0.14
Medium	Low	2220.0±174.4	70.90±1.14	5.46±0.18	76.36±1.18	1.09±0.21
	Med.	2536.7±59.0	71.34±1.24	6.33±0.50	77.68±0.63	1.33±0.02
	High	2446.7±88.3	69.64±2.12	5.83±0.16	75.24±1.65	1.36±0.17
High	Low	2626.7±32.0	71.25±1.66	6.67±0.90	77.92±0.60	1.28±0.18
	Med.	2313.3±63.5	71.75±0.94	6.10±0.33	77.85±0.40	1.52±0.14
	High	2480.0±91.6	71.95±0.95	6.10±0.12	78.05±1.30	1.57±0.43
Significance		NS	NS	NS	NS	NS

a,b, :means in the same column within each item bearing different superscripts are significantly different ($P \leq 0.05$).
NS= not significant

Table (6): Effect of dietary energy and protein levels on carcass parts % of Domyati ducklings at 12 wks of age.

Treatment		%				
		Breast	Thigh	Wings	Head + neck	Drumstick
ME level						
Low		24.58±0.88	23.13±0.79	6.83±0.64	8.74±0.27	5.16±0.62
Medium		26.04±0.88	24.97±0.61	6.43±0.77	8.66±0.25	5.34±0.64
High		26.58±0.86	24.71±0.88	6.41±0.14	8.66±0.33	5.16±0.45
CP level						
Low		25.40±0.67	23.23±0.63	7.27±0.19	8.71±0.24	5.55±0.35
Medium		26.44±0.69	23.12±0.69	7.58±0.33	8.76±0.34	4.89±0.58
High		26.38±1.15	23.51±0.99	5.83±0.85	8.59±0.26	5.22±0.72
Interactions						
ME level	CP level					
Low	Low	24.89±1.11	22.39±1.16	6.97±0.27	8.47±0.29	5.74±0.52
	Medium	24.64±1.45	22.21±1.14	8.23±0.66	8.86±0.76	5.68±0.31
	High	25.71±1.42	23.27±1.30	5.28±1.46	8.89±0.41	4.04±1.82
Medium	Low	23.94±1.42	23.19±1.08	7.86±0.26	9.39±0.22	6.46±0.30
	Medium	27.54±1.19	24.65±0.73	6.70±0.45	8.40±0.35	4.05±1.74
	High	27.34±0.95	23.64±0.80	4.75±2.10	8.18±0.40	5.51±0.55
High	Low	27.31±1.06	24.24±0.96	6.98±0.10	8.26±0.45	4.46±0.26
	Medium	27.15±1.11	22.85±1.70	7.80±0.23	9.01±0.77	4.94±0.50
	High	26.19±2.80	23.50±2.28	7.45±0.13	8.71±0.29	6.10±1.17

No significant differences were observed among treatments in all parameters studied.

Table (7): Effect of dietary energy and protein levels on breast and thigh meat composition of Domyati ducklings at 12 wks of age.

Treatments		Breast meat			Thigh meat		
		Crude protein %	Ether extract %	Ash %	Crude protein %	Ether extract %	Ash %
Energy level							
Low		77.36±0.39	14.66±1.45	4.74±0.20	78.82±2.10	14.58±1.20	4.01±0.13
Medium		83.72±1.50	13.37±1.44	4.37±0.12	79.89±0.61	12.49±2.02	3.86±0.13
High		84.68±0.99	15.61±1.54	4.30±0.23	81.85±0.35	16.69±0.67	4.02±0.09
Protein level							
Low		83.74±1.79	15.33±1.27	4.28±0.20	82.18±1.61	14.75±1.64	4.11±0.11
Medium		80.22±0.83	12.50±1.60	4.77±0.20	79.99±0.84	13.32±1.50	4.06±0.11
High		81.81±1.64	15.80±1.38	4.35±0.13	78.38±1.12	15.70±1.29	3.72±0.09
Interactions							
Ener	Prot.						
Low	Low	76.69±0.85	13.58±0.57	4.90±0.20	87.87±0.54	12.47±1.88	4.30±0.20
	Med.	78.32±0.45	12.83±1.83	4.93±0.44	77.48±0.78	14.09±2.12	4.07±0.11
	High	77.07±0.43	15.57±2.90	4.40±0.37	74.10±0.63	17.19±2.04	3.65±0.21
Med.	Low	87.35±0.79	12.29±1.11	4.23±0.13	76.84±0.33	17.81±2.56	3.81±0.16
	Med.	78.91±0.54	14.46±2.74	4.63±0.27	79.52±0.41	14.31±2.23	4.22±0.25
	High	87.92±0.92	13.36±0.68	4.24±0.14	80.30±0.91	17.37±2.61	3.56±0.06
High	Low	87.17±0.54	18.13±0.59	3.72±0.32	81.83±0.38	13.97±0.73	4.22±0.06
	Med.	83.43±0.24	13.21±0.67	4.75±0.46	82.93±0.22	11.57±1.71	3.89±0.22
	High	80.44±0.51	16.49±1.63	4.42±0.19	80.75±0.20	12.55±1.18	3.96±0.09

No significant differences were observed among treatments in all parameters studied.

Table (8): Effect of dietary energy and protein levels on plasma constituents of Domyati ducklings at 12 wks.

Treatments		Blood plasma				
		Total protein g/dl	Total lipids mg/dl	Total cholesterol mg/dl	AST U/L	ALT U/L
Energy level						
Low		4.32±0.44 ^{ab}	525.04±60.08	272.67±19.54 ^{a}	17.22±2.79	11.89±1.84
Medium		4.06±0.21 ^{b}	668.20±35.99	245.09±22.61 ^{a}	13.22±2.13	12.94±0.94
High		5.24±0.24 ^{a}	505.16±52.38	202.56±23.52 ^{b}	13.11±2.06	13.72±1.35
Significance		0.05	NS	0.05	NS	NS
Protein level						
Low		4.29±0.33	583.94±60.83	245.49±26.50	13.00±1.58	13.33±1.75
Medium		4.85±0.22	553.26±52.17	233.60±24.48	12.22±2.18	11.0±1.69
High		4.47±0.13	549.20±57.53	234.22±26.40	15.33±2.80	14.22±1.26
Significance		NS	NS	NS	NS	NS
Interactions						
Ener.	Prot.					
Low	Low	4.66±0.78	443.97±52.62	278.27±38.42	13.00±1.73	8.00±2.31
	Med.	4.60±0.12	565.57±108.23	262.67±39.00	14.67±6.22	12.33±2.59
	High	3.70±1.19	565.60±154.15	277.07±38.84	24.00±2.65	15.33±3.84
Med.	Low	3.64±0.47	734.10±30.76	267.07±40.21	11.00±2.64	15.33±1.67
	Med.	4.44±0.21	663.93±72.85	230.00±17.30	11.00±2.64	10.67±1.33
	High	4.09±0.34	606.57±72.19	220.20±55.08	17.67±4.98	12.83±0.83
High	Low	4.56±0.35	573.77±139.72	199.13±14.78	15.00±3.99	16.67±2.60
	Med.	5.52±0.42	430.27±43.21	208.13±58.72	11.00±2.65	10.00±1.15
	High	5.63±0.21	475.43±77.94	205.40±46.67	13.33±5.08	14.50±1.44
Significance		NS	NS	NS	NS	NS

a,b,c :means in the same column within each item bearing different superscripts are significantly different ($P \leq 0.05$).
NS = not significant

Table (9): Effect of dietary energy and protein levels on nutrients digestibility (%) of Domyati ducklings during growing period.

Treatment		Digestibility %						Ash retention	N. retention
		DM	CP	EE	CF	NFE	OM		
Energy level									
Low		79.36±1.08	91.96±0.74	68.14±5.85 **a**	53.26±2.38	89.50±0.63	83.24±0.82	51.78±2.99 **b**	70.15±1.94 **b**
Medium		80.24±1.04	91.95±0.52	59.93±3.07 **c**	56.12±2.18	89.51±0.90	84.39±0.85	45.76±2.95 **b**	77.29±1.57 **a**
High		80.47±0.65	92.05±0.49	64.33±2.05 **b**	59.18±2.80	88.99±0.58	83.83±0.65	60.35±3.06 **a**	74.46±3.07 **a**
Significance		NS	NS	0.01	NS	NS	NS	0.01	0.05
Protein level									
Low		78.86±0.85 **b**	90.84±0.57	63.50±4.42 **b**	52.89±2.74	87.89±0.39 **b**	83.13±0.73	46.90±2.51 **b**	76.77±2.76
Medium		82.18±0.74 **a**	92.62±0.51	72.60±2.53 **a**	56.12±2.13	91.13±0.69 **a**	85.26±0.66	61.12±2.62 **a**	72.20±1.98
High		79.03±0.79 **b**	92.52±0.47	56.30±3.09 **c**	55.55±2.37	88.98±0.51 **b**	83.07±0.70	49.86±3.65 **b**	72.95±2.42
Significance		0.01	NS	0.01	NS	0.01	0.01	0.01	NS
Interactions									
Ene.	Prot.								
Low	Low	76.79±0.46	89.36±0.96	78.37±1.73 **a**	44.87±1.59	87.25±0.31	81.27±0.45	48.74±1.88 **cd**	68.32±3.22 **d**
	Med.	83.62±0.01	93.89±0.35	80.90±0.70 **a**	56.18±2.82	91.47±0.47	86.40±0.07	62.54±0.45 **a**	75.71±1.67**bc**
	High	77.67±0.32	92.69±0.25	45.16±3.09 **d**	58.72±1.78	89.80±0.20	82.05±0.43	43.65±1.87 **cd**	66.42±2.79 **d**
Med.	Low	77.90±0.49	90.70±0.48	49.32±3.35 **d**	55.37±2.35	87.35±0.68	82.38±0.53	39.79±0.86 **d**	77.19±3.07 **abc**
	Med.	82.04±1.86	91.87±0.59	66.92±2.75 **bc**	59.06±4.24	91.71±1.71	85.81±1.55	52.99±4.65 **bc**	73.73±0.7**bc**
	High	80.77±2.15	93.30±1.04	63.55±2.73 **bc**	53.94±5.14	89.47±1.24	84.98±1.66	44.49±5.77 **cd**	80.97±2.55 **a**
High	Low	81.90±0.99	92.5±0.7	62.82±2.94 **bc**	58.43±5.62	89.07±0.5	85.75±0.72	48.74±1.88 **cd**	84.79±1.93 **a**
	Med.	80.89±1.09	92.1±1.2	69.97±3.84 **b**	53.12±4.43	90.22±1.40	83.57±0.79	62.94±0.45 **a**	67.15±4.86 **e**
	High	78.6±0.37	91.57±0.8	60.20±1.24 **c**	65.99±0.91	87.68±0.45	82.19±0.39	43.65±1.87 **cd**	71.44±1.28 **cd**
Significance		NS	NS	0.01	NS	NS	NS	0.01	0.05

a,b,c,d,e :means in the same column within each item bearing different superscripts are significantly different (P≤ 0.05).

Table (10): Effect of dietary energy and protein levels on protein utilization efficiency (PUE) and, energy utilization efficiency (EUE) of Domyati ducklings during growing period .

Treatment		Protein utilization efficiency (PUE)			Energy utilization efficiency (EUE)		
		Period (wks)			Period (wks)		
		0 -6	7- 12	0 -12	0 -6	7 -12	0 -12
Energy level							
Low		2.36±0.09	1.19±0.05	1.85±0.06	6.52±0.20	18.28±0.89 ^{ab}	9.74±0.22
Medium		2.29±0.09	1.29±0.12	1.87±0.10	6.83±0.60	15.79±1.42 ^{b}	10.85±0.85
High		2.35±0.08	1.75±0.10	1.93±0.09	6.17±0.11	19.75±1.21 ^{a}	10.01±0.25
Significance		NS	NS	NS	NS	0.05	NS
Protein level							
Low		2.64±0.05 ^{a}	1.37±0.08	2.06±0.04 ^{a}	6.51±0.16 ^{ab}	17.34±1.01	9.72±0.21
Medium		2.23±0.05 ^{b}	1.17±0.04	1.80±0.04 ^{b}	7.19±0.17 ^{a}	18.69±0.67	10.69±0.24
High		2.19±0.04 ^{b}	1.05±0.10	1.60±0.07 ^{c}	5.98±0.52 ^{b}	17.79±1.92	10.09±0.87
Significance		0.01	NS	0.01	0.05	NS	NS
Interactions							
Ene.	Prot.						
Low	Low	2.70±0.02	1.23±0.11	2.02±0.05	6.09±0.04	19.08±1.70	9.70±0.32
	Med.	2.21±0.09	1.16±0.10	1.77±0.04	7.18±0.32	19.07±1.48	10.33±0.08
	High	2.18±0.04	1.20±0.13	1.77±0.05	6.29±0.03	16.70±1.57	9.19±0.36
Med	Low	2.61±0.13	1.54±0.14	2.10±0.11	6.61±0.32	15.55±1.66	9.72±0.57
	Med	2.14±0.07	1.17±0.07	1.73±0.06	7.56±0.20	18.85±1.06	10.79±0.30
	High	2.15±0.01	0.91±0.25	1.54±0.20	4.90±1.51	12.96±2.90	12.03±2.63
High	Low	2.61±0.12	1.35±0.15	2.06±0.04	6.82±0.28	17.39±1.88	9.44±0.28
	Med	2.35±0.09	1.17±0.07	1.91±0.06	6.83±0.25	18.15±1.36	9.74±0.31
	High	2.09±0.03	0.79±0.02	1.50±0.01	6.74±0.10	23.70±0.44	10.84±0.06
Significance		NS	NS	NS	NS	NS	NS

a,b,c :means in the same column within each item bearing different superscripts are significantly different (P≤ 0.05).
NS = not significant

Table (11): Effect of dietary energy and protein levels on Production index (P I) and nutritive value of Domyati ducklings diets during growing period.

Treatment		Production index (P I) %			Nutritive value	
		Period (wks)				
		0 -6	7-12	0 -12	TDN %	ME(Kcal/kg)
Energy level						
Low		76.25±.85	37.30±2.54 ^{ab}	69.49±2.31	70.71±0.74	2955.5±31.1
Medium		76.08±0.74	47.41±6.51 ^{a}	67.91±4.67	71.46±0.75	2987.2±31.5
High		77.44±0.79	34.11±2.81 ^{b}	67.90±2.81	69.81±0.56	2952.4±23.2
Significance		NS	0.05	NS	NS	NS
Protein level						
Low		75.98±3.57	39.68±2.84	70.77±2.64	69.50±0.46	2904.9±19.3
Medium		72.51±3.02	35.90±1.61	67.40±2.17	72.15±0.70	3015.8±29.3
High		71.61±8.11	43.24±7.40	67.13±4.76	70.33±0.66	2939.8±27.6
Significance		NS	NS	NS	NS	NS
Interactions						
Ener.	Protein					
Low	Low	78.36±4.81	34.08±3.29	67.13±2.51	68.05±0.23	2844.3±9.5
	Med.	69.13±1.16	35.06±3.83	64.66±2.08	73.01±0.25	3051.0±10.4
	High	81.27±2.38	42.76±5.39	76.68±3.63	70.96±0.23	2966.2±9.6
Med.	Low	73.04±8.60	45.09±5.40	73.26±7.72	69.51±0.50	2905.8±20.9
	Med.	66.52±2.71	35.45±2.85	63.22±3.53	73.12±1.38	3056.4±57.6
	High	69.67±25.75	51.83±6.73	67.25±12.86	71.85±1.21	3003.3±50.5
High	Low	76.54±6.87	39.86±5.16	71.92±2.70	70.93±0.42	2964.8±17.8
	Med.	81.89±5.76	37.192.67	74.31±1.87	70.31±1.18	2939.0±49.2
	High	73.89±1.09	25.28±1.09	57.46±1.11	68.18±0.25	2849.9±11.4
Significance		NS	NS	NS	NS	NS

a,b :means in the same column within each item bearing different superscripts are significantly different (P≤ 0.05).
NS = not significant

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الملخـص العربـــي

استجابة كتاكيت البط الدمياطى للعلائق المحتوية على مستويات مختلفة من الطاقة والبروتين

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استخدام فى الدراسة عدد ٥٤٠ كتكوت بط دمياطي عمر يوم تم وزنهم و تقسيمهم إلى تسع مجاميع تجريبية وبكل مجموعة ثلاث مكررات وذلك لدراسة تأثير إستخدام علائق تحتوى على ثلاث مستويات مختلفة من الطاقة والبروتين (٣x٣) فى تغذية كتاكيت البط الدمياطي خلال فترة النمو (من الفقس حتى ١٢ أسبوع) على أداء النمو وصفات الذبيحة وتركيبها الكيماوي وبعض صفات الدم ومعاملات هضم العناصر الغذائية.

تم تكوين العلائق التجريبية المستخدمة فى الفترة من الفقس حتى ٦ أسابيع من العمر بحيث تحتوى على ثلاث مستويات من الطاقة (٢٦٠٠(منخفض) ، ٢٨٠٠ (متوسط)،٣٠٠٠ (عالي) كيلو كالورى / كجم) وبكل مستوى منها ثلاث مستويات من البروتين (١٨ (منخفض) ، ٢٠ (متوسط)، ٢٢ (عالي)%).

و فى الفتره من ٧ - ١٢ أسبوع من العمر احتوت العلائق على ثلاث مستويات من الطاقة (٢٥٥٠ (منخفض) ، ٢٦٥٠ (متوسط)،٢٧٥٠ (عالي) كيلو كالورى / كجم) وبكل مستوى منها ثلاث مستويات من البروتين (١٢ (منخفض) ، ١٤ (متوسط)، ١٦(عالي) %) وتم تقديمها للمجموعات التجريبية بنفس الترتيب خلال الفترة التجريبية .

تم تسجيل الوزن الحى والعليقة المستهلكة خلال مدة التجربة ، و عند نهاية التجربة تم اجراء تجربة هضم لتقدير معاملات الهضم للعناصر الغذائية المختلفة بالعليقة . تم أخذ عينات دم من كتاكيت البط عند عمر ١٢ أسبوع أثناء إجراء اختبار الذبح لتقدير محتويات بلازما الدم من البروتين الكلى والليبدات الكلية والكولسترول الكلى وإنزيمات الترانس أمينيز (AST,ALT) كما أخذت عينات اللحم من الصدر والفخذ لإجراء التحليل الكيماوي لها .

وبتحليل النتائج اتضح الآتي :

١ - المستويات المختلفة من الطاقة والبروتين وكذلك التداخل بينهم لم يؤثر معنويا علي وزن الجسم الحي ومعدل الزيادة في وزن الجسم للكتاكيت و كمية العليقة المستهلكة والكفاءة التحويلية.

٢ - لم تتأثر معنويا قياسات الذبيحة المدروسة المختلفة من البروتين والطاقة و التداخل بينهم فيما عدا نسبة الذبيحة المجوفة والأجزاء المأكولة ودهن البطن حيث ارتفعت معنويا بزيادة محتوى العليقة من الطاقة.

٣ - لم يتأثر محتوى اللحم من الدهون والرماد بالمستويات المختلفة من البروتين والطاقة فى العليقة بينما ازدادت نسبة البروتين فى لحم كل من الصدر والفخذ بزيادة محتوى العليقة من الطاقة .

٤ -انخفض معنويا محتوى البلازما من الليبيدات الكلية و الكوليستيرول بينما ارتفع معنويا محتوي البلازما من البروتين الكلي وذلك بزيادة محتوى العليقة من الطاقة.

٥ - لم تتأثر معاملات الهضم معنويا بالمستويات المختلفة من الطاقة فى العليقة فيما عدا المستخلص الاثيرى الذى تحسن معنويا بالمستوى المنخفض من الطاقة بالعليقة ، بينما تأثرت هذه المعاملات معنويا بالمستويات المختلفة من البروتين حيث سجلت أعلى القيم بالتغذية على العليقة ذات المحتوى المتوسط من البروتين،كما تحسنت المركبات المهضومة الكلية والطاقة الممثلة بالتغذية على العليقة ذات المستوى المتوسط لكل من الطاقة والبروتين.

٦ - لم يتأثر معدل الاستفادة من البروتين والطاقة وكذلك الدليل الانتاجى معنويا بالمستويات المختلفة من الطاقة والبروتين خلال فترة التجربة (صفر – ١٢ أسبوع) فيما عدا معدل الاستفادة من البروتين حيث انخفض معنويا بزيادة نسبة البروتين بالعليقة.

من النتائج السابقة يمكن الاستنتاج بأن إستخدام المستوى الأعلى من الطاقة مع المستوى المنخفض من البروتين في علائق كتاكيت البط الدمياطى خلال فترة النمو يمكن أن يؤدى إلى تحسن مقاييس الأداء الإنتاجي للنمو وصفات الذبيحة .