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EFFECT OF LOW DIETARY CRUDE PROTEIN, METABOLIZABLE ENERGY AND IDEAL AMINO ACIDS LEVELS ON PRODUCTIVE PERFORMANCE OF BROILER CHICKS.

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ABSTRACT : The goal of the study was to evaluate reduced dietary crude protein and energy levels, with or without supplemental amino acids, on broiler chicks' productive performance. At one day old, 270 Arbor Acres broiler chicks were divided randomly into six equal groups, containing 45 chicks /group in three replicates (15 birds/each). The chicks were allocated to the following diets, (T1) fed basal diets (BD) of 23,21 and 18 % CP and 3000,3100 and 3200 kcal/kg diet ME (control); (T2) fed BD reduced -3% CP and -100 kcal ME; (T3) fed BD reduced 3% CP and recommended ME supplemented with AAs (Lys, Met, Thr and Trp); (T4) fed BD reduced 3% CP and recommended ME supplemented with AAs (Lys, Met, Thr, Trp and Val). (T5) fed Bd with a reduced 3% CP and 100 kcal ME supplemented with AAs (Lys, Met, Thr and Trp); (T6) fed BD with a reduced 3% CP and 100 kcal ME supplemented with AAs (Lys, Met, Thr, Trp and Val). From 1 to 35 d of age during starter, grower and finisher periods, there was a highly significant ($P \leq 0.001$) effect between treatments on LBW, BWG, FI, FCR and PI, at all periods of estimation. Birds of treatments 1, 6 and 4, respectively had the higher averages LBW and BWG and significantly improved ($P \leq 0.001$) FCR and PI compared with other treatments applied. Birds of treatments 1 and 2 had significantly ($P \leq 0.001$) higher FI than other treatment. Birds of treatments 6, 4 and 5, respectively showed the highest averages of relative economic efficiency (REE), compared with other treatments. It could be recommended for broiler diets that CP level can be reduced by 3% and ME by 100 kcal/kg with maintaining the same AA levels (Lys, Met, Thr, Trp, and Val) to give equal performance of strain recommendation diets.

Keywords: Broilers, Crude Protein, Metabolizable energy, Amino Acids, Performance .

INTRODUCTION

Dietary protein is one of the most important factors affecting poultry production. Information about feeding of amino acids has been progressed in the last two or three recent decades. This progress is undoubtedly due to the production of synthetic amino acids. BW and breast growth have been shown to increase linearly with increasing dietary AA levels while reducing abdominal fat deposition (Oviedo-Rondón *et al.* (2021). Combining CP feed reduction with compensating with essential AA appears to be the most successful nutritional strategy for reducing the global warming potential (GWP) and nitrogen emissions associated with broiler production, without negatively affecting growth performance (Gonzalo and Lambert., 2022).

Aletor *et al*., (2000) reported that the effects of supplemental amino acids in reducing protein, feed intake (FI), and environmental pollution by reducing excretion of pollutants (ammonia nitrogen) by farm animals, are some of the main reasons for using such supplements. Lowering dietary protein levels and use of synthetic amino acids, while reducing the cost of diet and reduce environmental nitrogen pollution (Bregendahl *et al*., 2002). On the other hand, Zaman *et al.,* (2008) reported that increasing metabolizable food energy (ME) significantly increased body weight gain, low FI and improved feed conversion (FCR) (Nogueira *et al.,* 2013). Note that decreases in CP and ME feed content leads to weight gain (WG) and (FCR) was negatively affected while increased FI (Kamran *et al.,* 2008). However, other researchers have noted that reducing CP, and ME in the diet had negative effect FI (Nawaz *et al.,* 2006) BW, FCR and protein efficiency ratio (PER) (Dairo *et al.,* 2010). Abdel Maksoud *et al*., (2010) observed that birds fed dietary low-protein diets supplemented with essential amino acids (EAAs) showed significantly higher BW and better FCR than those on the optimized CP diet.

Abbasi *et al*., (2014) indicated that it is possible to reduce the dietary CP level by up to 10% of that recommended by breeders after the starting period without any detrimental effect on growth performance and recorded the impact of different dietary CP, Thr levels on broiler performance. Also, supplementation of amino acids in low CP diet can avoid performance decline due to low CP content in diet and at the same time reduce nitrogen excretion in broiler chickens.

Adela *et al.,* (2013) observed that the low level of nutrients, especially CP and ME is practiced in the poultry feed industry which had a significant impact on productive performance. Energy is defined as the engine for feed consumption and also, for the formation of the body of fattening chickens. Therefore, the level of feed energy is usually a general starting point in the composition of feed (Rajendran *et al.,* 2015).

The main objective of the present study was to evaluate the effect of reduced dietary protein and metabolic energy and the addition of the optimal level of amino acids on the productive performance of broilers.

MATERIALS AND METHODS:

The experimental work of the present study was carried out at private poultry farm at Moshtohor, El Qalubyia Governorate, Egypt during the period from 10 December(2021) to 13 of January (2022).

Birds and their management:

A total number of 270 day-old unsexed Arbor Acres broiler chicks were used in this study. Chicks were kept under similar standard hygienic and environmental conditions in separate pens with 15 birds/1.5m^2 stoking density until the end of the experiment. Wood shaving was used at 10 cm depth as a litter. Floor brooders with gas heaters were used for broodings chicks. Brooding temperature was maintained at 35°C during the first 5 days of chicks age, then decreased by 2°C weekly until the end of the 5th week . Feed and water were offered *ad-libitum*. The light program was 24h light at the first 5 days of age, then from 6 to 35 days of the age(the end of the experiment) 23h light and 1h dark was applied. Chicks were fed starter, grower and finisher diets. The basal diet was formulated according to the recommended requirements of NRC (1994) as shown in Tables 1,2 and 3.

Experimental design :

A total number of 270 one day-old Arbor Acres broiler were used in this study. Chicks were randomly divided into six experimental groups each of 45 chicks in 3 replicates (15 chick /each).The experimental treatments were as the following:

T1: Fed Basal diets (Bd) with recommended levels of CP and ME (control group)

T2: Fed Bd reduced by 3% CP and 100 kcal ME than recommendation.

T3: Fed Bd with -3 % CP and recommended ME supplemented with four AAs (Lys, Met, Thr and Trp).

T4: Fed Bd with -3% CP and recommended ME supplemented with five AAs (Lys, Met, Thr, Trp and Val).

T5: Fed Bd with a reduced -3% CP and -100 kcal ME than recommendation supplemented with four AAs (Lys, Met, Thr and Trp).

T6: Fed Bd with a reduced -3% CP and -100 kcal ME than recommendation supplemented with five AAs (Lys, Met, Thr, Trp and Val).

estimated and data collection:

Chicks were weight individually at 1,10,25 and 35 days of age. Live body weight (LBW), Body weight gain (BWG) were calculated individually according to (Broody,1949). Performance index (PI) was estimated for different experimental groups at the whole periods of the experiment according to North (1984), (PI%) =(LBW(kg) / FCR)*100.

Feed intake (FI) was measured weekly for each treatment and expressed as an average in grams per chick at the periods from (1 to 10),(11 to 25),(26 to 35) and (1 to 35) days of age. Feed conversion ratio (FCR) was calculated according to the following formula: FCR=Feed intake (g) / Body weight gain(g).

Mortality rate (%)= [(I-E)/ I*100] whereas, I= initial number of birds and E=number of live birds at the end of the experimental period.

Economic Efficiency:

The economic efficiency **(**EE**)** was calculated as the following formula :

EE=100× [(sale price per total gain – total feed cost) / total feed cost]. Relative economic efficiency (REE) was calculated assuming the REE of the control = 100.

The relative economic efficiency (REE) for meat production was estimated as the amount of feed consumed/bird during the entire experimental period multiplied by the price of kg of diet to calculate the total feed cost based on local current prices at the experimental time.

Statically Analysis: Data collected were subjected to General Linear Model procedure of SAS users guide **(**SAS, 2001). Differences between means were tested using Duncan's multiple range tests (Duncan,1955). One way analysis model was applied for experiment:

$Y_{ij} = \mu + T_i + e_{ij.}$ Where: - Y_{ij} = an observation, - μ = overall mean,

-T_i = Effect of I^{th} treatments (i =1,…, 6),

- e_{ij} = Experimental error.

RESULTS AND DISCUSSION

1-Growth Performance:

1.1-Live Body Weight:

The experimental data for the three growth phases starter, grower and finisher are shown in Table (4). There were no significant differences in LBW of chicks between treatments (P<0.819) at the initial, but LBW of birds fed recommended energy and protein (T1) significantly increased (p < 0.001) LBW at all period of estimation followed by T6,then by T4 compared with other treatments applied. However, chicks of T2 significantly decreased LBW during the periods from (1-10 d), also chicks of T3 significantly decreased LBW during the periods from (11-25 d) and (26-35 d) of age. These results are in harmony with those of Prabhakaran *et al.*, (2018) who revealed that different levels of ME and CP in the diet had a significant (P < 0.05) effect on LBW, compared to the rest of the treatment. Hai-ming *et al.*, (2015) reported that there were significant higher LBW of broilers chicks at 42 d of age between energy and protein decreasing. Jariyahatthakij *et al.*, (2018) stated that when low CP and energy diets, the addition of Met improved LBW during the day (11-24). The LBW of the control group was better than the other groups (P < 0.01).

.Abudabos and Aljumaah., (2012) reported that the cumulative body weight of 12- to 33-day-olds was not adversely affected by increasing AAs to broiler diets of 12 to 33-day-olds of production and it could be reduce CP and ME to 19.5% and 3050 kcal/kg diet, respectively. The calorie: protein ratio in diets has been found to play a prominent role on broiler performance (NRC, 1994 and Aftab *et al.*, 2006). Reda *et al.*, (2015) investigated (LBW) at 3 weeks of age during (1-3 weeks) of age, they found it was significant (P≤0.01) maximized LBW when birds fed 22% CP compared to those receiving 23.5 and 25% CP. The present result obtained disagree with those reported by Zhai *et al.*, (2014) who stated that reducing energy diet containing up levels of AA lowered the body weight of broilers. Waldroup *et al.*, (2005) showed significantly reduced performance of broilers fed low CP diets despite maintenance of essential amino acid levels according to requirements.

1.2-Body Weight Gain :

Data presented in Table (5) showed the average body weight gain (BWG) of birds for all experimental groups. Result indicated a high significant effect (P < 0.001) by analysis of variance between the different treatments applied in BWG at all periods of estimation. The result obtained reveal that broiler chicks of T1 (1820.77g) showed the highest average BWG, followed by those of T6 (1779.80g) and T4 (1746.27g), respectively, compared with other treatments applied at the finish of the experimental phase. However, chicks of T2 showed significantly (P<0.001) the lowest average of BWG (1461.10g).

These results are in harmony with those of Roy (2013) who found that BWG of the broilers supplemented with 1.6 and

2.0 % Thr. with 21 and 19 % CP, respectively was highly significant (P<0.01) than other treatments. Ahmed (2014) mentioned that dietary crude protein can be reduced by 1 unit in commercial broiler diets without compromising the lower bird performance including BWG. Reda *et al.,* (2015) indicated that the effect of dietary levels of protein, energy and Lys on growth performance and (BWG) during (1-3WKs) of age was high significantly (p≤0.01) when birds fed 22% CP compared to those received 23.5 and 25% CP. Yang *et al.,* (2016) observed the effects of reduced energy and protein feedings from (8–14 d) on growth performance (GP) and (14–42 d), birds already fed lower energy and protein feeds showed a comparable increase in BW.

Mohamed *et al.,* (2019) reported that the highest values of BWG were observed in the positive control and low CP diets supplemental with amino acids. The result obtained disagree with those reported by Abd El-Hady., (2012) who found that BWG decreased linearly with lower dietary ME and CP levels during the overall experimental phase. Hidalgo *et al.*, (2004) reported that BWG was negatively affected when broilers were fed diets containing lower CP and ME concentration from (1-17d) of age.

1.3- Feed Intake :

Data of (FI) as influenced by reducing dietary crude protein levels and supplemented with AA in broilers diets are presented in Table (6). Data reveal that dietary treatments had significant effect (p < 0.001) on FI. Broiler fed the diet of T2 (3037.33g/bird),T1 (2997.00 g/bird) and T5 (2981.67g/bird) significantly (p < 0.001) increased average FI during (1-35d) compared with different treatment applied. However chicks of T3 decreased significantly FI (2930.33g) followed by T4 (2943.33g) and T6 (2975.33g/bird), respectively. during the same period than other treatments applied.

This result was in agreement with reports by Tooci *et al.,* (2009) who reported that the intake of broiler was negatively affected by the energy content of the feed. Concentrated diets (3010, 3150, and 3200 kcal/kg, respectively) for all stages versus reduced diets (2800 kcal/kg).It is evident that the decrease in the CP level diet with amino acid supplementation had no negative effect on FI compared to the recommended dietary CP level. Houshmand *et al.,* (2011) indicated that broilers fed low-energy diets were weighty than those on basal diet. Also, these results are in harmony with those of, Zhai *et al.,* (2014) who reported that a low-energy diet containing higher levels of AAs reduced the FI and WG of broilers. In this study, the effect of the energy level of the diet on body weight was negative; However, FI was lower.

In contrast, Tancharoenrat and Ravindran (2014) observed that the increase in energy level led to improved WG and FCR without any effect on FI, while Yang *et al.*, (2016) investigated observed the effects of reduced energy and protein feedings from (8–14 d) on growth performance and (14–42 d), birds already fed lower energy and protein feeds showed a comparable intake of feed to well-fed birds.

The result obtained differs with that reported by (Summers *et al.*, 1992) they showed that the effect of the energy-to-protein ratio on feed intake or their interaction on feed intake was reported to be nonsignificant (P > 0.05). On the other hand, decreases in dietary CP and ME lead to increasing in FI. The improvement of FI and WG by birds have been a decrease in hyperthermia, which was associated with excess protein metabolism . A lower increase in heat reduces heat stress and thus improves FI and WG (Kamran *et al.*, 2008).

1.4- Feed Conversion Ratio (FCR):

The results of FCR are illustrated in Table (7). Results obtained showed that FCR during the period from (11-25),(26-35) and (1-36) days of birds age was significantly (P<0.001) affected by experimental treatments.

Birds of T1,T6 and T4 significantly improved FCR (1.65,1.67 and 1.69 g feed/g gain),respectively, while chicks of T2 showed significantly increased average of FCR (2.08g feed/g gain) followed by those of T3 and T5, respectively during the period from (1-35d) when compared with different treatments applied.

Results obtained are in harmony with those of Liu (2007) who stated that the changes in the dietary digestible tryptophan (Trp) from 0.11 to 0.13 % significantly improved FCR when dietary CP was reduced. Abdel Maksoud *et al.*, (2010) showed significantly better FCR. improved by increasing levels of dietary lysine up to 1.25% when birds fed low protein diets (21%) supplemented with EAAs.

This observation was consistent with those previously reported by Girish and Payne., (2013) who reported the effects of altered metabolizable dietary energy (ME) and crude protein (CP) on birds fed low ME had a significantly higher FCR effect (p < 0.002) compared to those fed medium and high. However, there was not significant effect of decreasing This result seemed quit logic since these experimental treatments had significant dietary CP on the FCR. Rajendran *et al.*, (2015) showed that the energy and protein of the diet significantly affected BW, cumulative FI and FCR in broiler chickens. Jariyahatthakij *et al.,* (2018) in low CP and energy diets, stated that the addition of Met improved growth performance and FCR during the day (11-24). The growth performance of the control group was better than the other groups (P < 0.01).

The result obtained disagree with those reported by Waldroup *et al.,* (2005) they carried out an experiment by formulating diets to contain 16, 18, 20 and 25% CP and supplemented with 0.2 and 0.4 % Thr, FCR was poor as CP level reduced. Chicks fed a diet with twice CP and ME lead to had significantly increased BW and FCR. Despite this, birds provided a low CP diet and a low ME diet increased FI but could not compensate for the lower growth and did not allow full improve of final BW (Kamran *et al.,* 2008).

1.5 Performance Index:

Data of Performance Index (PI) as influenced by reducing dietary crude protein levels, metabolizable energy and supplemented with AA in broilers diets are presented in Table (8).

The data indicate that the nutritional treatments had a significant (P < 0.001) effect on PI during the period from (0-5) weeks of age of the birds. The higher performance index values were shown in treatment 1, 6 and 4 **(**113.089,108.89 and 106.03**%** respectively) compared with different treatments applied. However, lower PI value (72.24%) was recorded by the birds of treatment 2.

improvement in body weight and FCR of broiler chicken that they are used in calculation of PI.

1.6 Mortality:

Data presented in Table (8) showed the average of mortality rate (%) of birds of all experimental groups as affected by treatments applied. Results obtained showed that mortality during the all periods from (1-35) days of birds age was not significantly affected by treatments applied. The lowest mortality rate (%) was recorded in T2 and T6 (0.00 and 0.00% respectively). On contrast, T1 and T5 showed the higher mortality rate percentage (4.44 and 4.44%, respectively), while the percentage of mortality rate in T3 and T4 were found to be intermediate (2.22 and 2.22%, respectively). The results obtained are in harmony with Kamran *et al.,* (2008) they reported that poultry feed containing low protein and energy diets with a constant ME:CP ratio had no significant difference in mortality rate either., Downs *et al*., (2006) found that mortality rate did not affect significantly in broiler fed two levels of energy (low, 3026, 3026,3098 and 3135 kcal vs. high, 3136, 3172, 3208 and 3245 kcal, for starter, grower, finisher and with drawal periods, respectively).

Economic efficiency :

Data listed in Tables (9) show the economic efficiency (EE) and the relative economic efficiency (REE) of birds of different experimental groups as affected by studied factors. The result obtained in (Table 11)showed that the highest (REE) were recorded in broiler chicks of T6 (96.76),T4 (94.87),T5 (87.15) and T3 (87.11%) respectively, when compared with T1 as positive control and T2 as a negative control which showed the lowest value of REE (52.26%).

These results agree with those reported by Sarwar *et al.,* (2015) who evaluated three experimental diets and concluded that reducing CP by 0.50% with 50 kcal/kg ME gave better results in terms of production cost and profit. Moraes *et al,*. (2013) reported that the lowest feed cost per kg live weight of chickens was found in the group containing 115% threonine of requirement which due to FCR suitability in this experimental group was compared to the other groups.

CONCLUSION

It could be recommended for broiler diets, that CP level can be reduced 3% and ME 100 Kcal/Kg diet with maintaining the same amino acids levels (Lys, Met, Thr, Trp, and Val) to give equal performance of the strain fed recommendation diets.

Table(1): Composition of starter diets (1-10 d).

Ingredient	Control	(Bd) with – 3%CP- 100 kcal	(Bd) with – 3% CP + Lys+Met + Trp +Thr.	(Bd) with – 3% CP + Lys.+Met. +Trp.+Thr.+ Val.	(Bd) with – 3% CP + Lys+Met + Trp +Thr.- 100 kcal	(Bd) with – 3% CP + Lys+Met + Trp+Thr.+ Val - 100 kcal
Yellow corn	55.35	63.2	61.20	61.20	63.42	63.40
Soybea meal (44%)	31.0	29.8	30.1	30.1	30.1	30.0
Corn Gluten (60%)	7.4	3.3	2.0	1.8	1.8	1.70
Soya Oil	1.87	-	2.0	2.0	-	-
Di calcium phosphate.	1.85	1.85	1.85	1.86	1.86	1.86
Calcium Carbonate	1.15	1.15	1.14	1.14	1.14	1.14
L-lysine	0.33	-	0.40	0.40	0.39	0.40
DL-methionine	0.26	-	0.41	0.41	0.40	0.41
L. tryptophan	-	-	0.02	0.02	0.02	0.02
L-threonine	0.06	-	0.18	0.18	0.17	0.19
L-valine	0.03	-	-	0.19	-	0.18
Vit &Min. premix*	0.30	0.30	0.30	0.30	0.30	0.30
CholineChloride (60%)	0.01	0.01	0.01	0.01	0.01	0.01
Sodium Chloride	0.30	0.30	0.30	0.30	0.30	0.30
Sodium bicarbonate	0.10	0.10	0.10	0.10	0.10	0.10
Calculated analysis**						
CP (%)	23.00	20.0	20.0	20.0	20.0	20.0
ME (Kcal/kg)	3003	2900	3006	3006	2902	2906
C F	3.48	-	3.48	3.48	3.35	3.52
E E	4.39	-	4.60	4.61	2.70	3.83
Ca (%)	1.01	1.01	1.01	1.01	1.01	1.01
Avail Ph (%)	0.48	0.48	0.48	0.48	0.48	0.48
L-lysine (%)	1.45	1.06	1.45	1.45	1.45	1.45
Methionine (%)	1.08	0.71	1.08	1.08	1.08	1.08
Treptophan (%)	0.23	0.22	0.23	0.23	0.23	0.23
Threonine (%)	0.97	0.82	0.97	0.97	0.97	0.97
Valine (%)	1.11	0.97	0.93	1.11	0.92	1.11

*Each3.0 Kg of the Vit. and Min. premix contains: **Additives it.Vit A12000000 IU, Vit D3 2200000 IU, Vit E 10000 mg, Vit B1 1000 mg, Vit B2 5000 mg, Vit B6 1600 mg, Vit B12 10 mg, Niacin-30000 mg, Calcium-D-Pantothenic acid 10000 mg, Biotin-50 mg, Folic Acid-1000 mg and Choline 250000 mg,Vit-K-4000mg , antioxidant,10g,. Trace mineral mixture: Iron 30000 mg, Iodine 1000 mg, Copper 10000 mg, Manganese 60000 mg, Zn 50000 mg, Selenium 100 mg, Cobalt 100 mg, and carrier (Calcium Carbonate) up to 3kg.,
According the Egyption Regional Center for Food and Feed (RCFF,2001

Table (2) : Composition of grower diets (11-25 d).

Ingredient	Control	(Bd) with – 3%CP - 100 kcal	(Bd) with – 3% CP + Lys+Met + Trp +Thr.	(Bd) with – 3% CP + Lys.+Met. +Trp.+Thr.+Val.	(Bd) with – 3% CP + Lys+Met + Trp +Thr. -100 kcal	(Bd) with – 3% CP + Lys+Met + Trp+Thr.+ Val - 100 kcal
Yellow corn	58.70	67.55	63.07	63.07	65.49	65.19
Soybean meal (44%)	27.5	24.5	28.67	28.67	28.20	28.83
Corn Gluten (60%)	7.2	4.1	0.64	0.50	0.80	0.25
Soya Oil	2.78	0.50	3.50	3.50	1.40	1.50
Di calcium phosphate	1.65	1.68	1.66	1.66	1.65	1.65
Carbonate Calcium	0.95	0.97	0.96	0.96	0.98	0.96
L-lysine	0.27	-	0.29	0.29	0.29	0.28
DL-Methionine	0.22	-	0.38	0.38	0.37	0.38
L.treptophan	-	-	0.01	0.01	0.01	0.01
L-thrionine	0.03	-	0.12	0.12	0.11	0.11
L-valine	-	-	-	0.14	-	0.14
Vit, Mineral premix*	0.30	0.30	0.30	0.30	0.30	0.30
Cholin Chloride 60%	0.05	0.05	0.05	0.05	0.05	0.05
Sodium Chloride	0.30	0.30	0.30	0.30	0.30	0.30
Sodium bicarbonate	0.10	0.10	0.10	0.10	0.10	0.10
Calculated analysis **						
CP (%)	21.5	18.50	18.50	18.50	18.50	18.50
ME (Kcal/kg)	3100	3000	3105	3104	3001	3001
C F	3.31	-	3.40	3.40	3.42	3.46
E E	5.38	-	6.10	6.10	4.12	4.20
Ca (%)	0.88	0.89	0.88	0.88	0.88	0.88
Avail Ph (%)	0.44	0.44	0.44	0.44	0.44	0.44
L-lysine (%)	1.29	0.93	1.29	1.29	1.29	1.29
Methionine(%)	1.0	0.68	1.0	1.0	1.0	1.0
Treptophan(%)	0.22	0.20	0.22	0.22	0.22	0.22
Threonine (%)	0.86	0.76	0.86	0.86	0.86	0.86
Valine(%)	1.01	0.9	0.87	1.01	0.87	1.01

*Each3.0 Kg of the Vit. and Min. premix contains: **Additives it.Vit A12000000 IU, Vit D3 2200000 IU, Vit E 10000 mg, Vit B1 1000 mg, Vit B2 5000 mg, Vit B6 1600 mg, Vit B12 10 mg, Niacin-30000 mg, Calcium-D-Pantothenic acid 10000 mg, Biotin-50 mg, Folic Acid-1000 mg and Choline 250000 mg,Vit-K-4000mg , antioxidant,10g,. Trace mineral mixture: Iron 30000 mg, Iodine 1000 mg, Copper 10000 mg, Manganese 60000 mg, Zn 50000 mg, Selenium 100 mg, Cobalt 100 mg, and carrier (Calcium Carbonate) up to 3kg.,

According the Egyption Regional Center for Food and Feed (RCFF,2001

Table(3): Composition of finisher diets (26-35 d).

Ingredient	**control**	**(Bd) with – 3%CP - 100 kcal**	**(Bd) with – 3% CP + Lys+Met + Trp +Thr.**	**(Bd) with – 3% CP + Lys.+Met. +Trp.+Thr.+ Val.**	**(Bd) with – 3% CP + Lys+Met + Trp +Thr. - 100 kcal**	**(Bd) with – 3% CP + Lys+Met + Trp+Thr.+ Val - 100 kcal**
Yellow corn	70.60	70.63	68.39	68.39	70.6	60.0
Soybean meal (44%)	22.88	22.87	22.87	22.8	22.78	28.0
Corn Gluten (60%)	0.60	0.70	0.80	1.0	1.6	3.62
Soya Oil	2.00	2.00	4.00	4.00	2.0	5.0
Di Calcium Phosphate	1.43	1.43	1.43	1.43	1.42	1.40
Carbonate Calcium	0.9	0.9	0.9	0.9	0.9	0.9
L-lysine	0.31	0.31	0.31	0.31	-	0.15
DL-Methionine	0.34	0.34	0.34	0.34	-	0.22
L.treptophan	0.01	0.01	0.01	0.01	-	0.01
L-thrionine	0.11	0.11	0.12	0.12	-	-
L-valine	0.12	-	0.13	-	-	-
Vit.&Min. premix*	0.30	0.30	0.30	0.30	0.30	0.30
Cholin chloride (60%)	0.05	0.05	0.05	0.05	0.05	0.05
Sodium Chloride	0.30	0.30	0.30	0.30	0.30	0.30
Sodium bicarbonate	0.10	0.10	0.10	0.10	0.10	0.10
Calculated analysis**						
CP (%)	19.50	16.5	16.5	16.5	16.50	16.50
ME (Kcal/kg)	3203	3100	3203	3204	3101	3103
E F	3.33	-	3.11	3.12	3.16	3.16
E E	7.54	-	6.77	6.76	4.86	4.86
Ca (%)	0.79	0.79	0.79	0.79	0.79	0.79
Avail Ph (%)	0.395	0.395	0.396	0.395	0.395	0.395
L-lysine (%)	1.16	0.86	1.16	1.16	1.16	1.16
Methionine(%)	0.91	0.60	0.91	0.91	0.91	0.91
Tryptophan(%)	0.22	0.18	0.19	0.19	0.19	0.19
Threonine (%)	0.79	0.69	0.78	0.78	0.78	0.78
Valine (%)	0.93	0.80	0.78	0.90	0.78	0.90

*Each3.0 Kg of the Vit. and Min. premix contains: **Additives it.Vit A12000000 IU, Vit D3 2200000 IU, Vit E 10000 mg, Vit B1 1000 mg, Vit B2 5000 mg, Vit B6 1600 mg, Vit B12 10 mg, Niacin-30000 mg, Calcium-D-Pantothenic acid 10000 mg, Biotin-50 mg, Folic Acid-1000 mg and Choline 250000 mg,Vit-K-4000mg , antioxidant,10g,. Trace mineral mixture: Iron 30000 mg, Iodine 1000 mg, Copper 10000 mg, Manganese 60000 mg, Zn 50000 mg, Selenium 100 mg, Cobalt 100 mg, and carrier (Calcium Carbonate) up to 3kg.,According the Egyptian Regional Center for Food and Feed (RCFF,2001).

Table (4): Least- square means and standard error($\bar{X}$ ±SE) for Live Body weight (g) at days of different experimental periods as affected by studied factors.

Periods / Treatments	Live body weight (g) at days			
	Hatch 1d	**1-10d**	**11-25d**	**26-35d**
T1	40.23±3.93	333.67^{a} ±1.76	1253.33^{a} ±5.0^{a}	1861.00^{a} ±4.97
T2	40.57±1.37	287.33^{e} ±4.93	938.33^{f} ±3.33^{f}	1501.67^{f} ±4.33
T3	40.53±0.33	297.00^{d} ±1.52	1155.00^{e} ±2.88	1717.67^{e} ±4.33
T4	40.40±0.40	307.00^{c} ±1.73	1195.00^{c} ±2.89	1786.67^{c} ±1.67
T5	40.47±0.07	299.67^{d} ±1.76	1179.33^{d} ±2.96	1745.00^{d} ±2.89
T6	40.20±0.06	317.00^{b} ±1.73	1229.00^{b} ±1.15	1820.00^{b} ±2.89

$^{a-f}$ means have different superscripts in the same column are significantly(P<0.05) differed.

Table (5): Least- square means and standard error($\bar{X}$ ±SE) for Body weight gain (g) of different experimental periods as affected by studied factors.

Periods / Treatments	Body weight gain (g) during days			
	1-10d	**11-25d**	**26-35d**	**1-35d**
T1	293.43^{a}±3.93	919.67^{a} ±1.76	607.67^{a} ±5.04	1820.77^{a} ±4.97
T2	246.77^{e}±1.37	651.00^{d} ±4.93	563.33^{c} ±3.33	1461.10^{f} ±4.33
T3.	256.47^{d}±1.20	858.00^{c} ±1.53	562.67^{c} ±1.45	1677.13^{e} ±4.06
T4	266.60^{c}±1.40	888.00^{b} ±4.04	591.67^{b} ±1.67	1746.27^{c} ±1.89
T5	259.20^{d}±1.78	879.67^{b} ±4.18	565.67^{c} ±5.81	1704.53^{d} ±2.83
T6	276.80^{b}±1.70	912.00^{a} ±0.58	591.00^{b} ±1.73	1779.80^{b} ±2.86

$^{a-f}$ means have different superscripts in the same column are significantly(P<0.05) differed.

T1: Fed basal diet (BD) with recommended levels of CP and ME (control group),T2: fed BD reduced by 3% CP and 100 kcal ME. T3: fed BD with -3% CP and recommended ME supplemented with four AAs (Lys, Met, Thr and Trp), T4: fed BD with -3% CP and recommended ME supplemented with five AAs (Lys, Met, Thr, Trp and Val), T5: fed BD with -3% CP -100 kcal ME supplemented with four AAs (Lys, Met, Thr and Trp), T6: fed BD with -3% CP -100 kcal ME supplemented with five AAs (Lys, Met, Thr, Trp and Val).

Table (6): Least- square means and standard error($\bar{X}$ ±SE) for Feed intake (g/bird) of different experimental periods as affected by studied factors.

	Feed intake (g/bird) during days			
Treatments / Periods	**1-10d**	**11-25d**	**26-35d**	**1-35d**
T1	239.67±1.45	1391.67[a] ±11.67	1365.67[b]±2.96	2997.00[b]±8.54
T2	242.00±1.73	1412.00[a] ±5.68	1383.33[a]±4.41	3037.33[a]±3.38
T3.	226.00±2.08	1350.00[b] ±2.88	1354.33[c]±2.96	2930.33[c]±7.54
T4	226.00±2.08	1367.33[b] ±1.45	1350.00[c]±2.88	2943.33[c]±2.40
T5	236.67±4.40	1391.67[a] ±6.01	1353.33[c]±4.40	2981.67[b]±11.67
T6	226.67±2.03	1402.3[a] ±6.22	1346.3[c] ±2.02	2975.33[b]±6.69

[a-c] means have different superscripts in the same column are significantly($P<0.05$) differed.

Table (7): Least- square means and standard error ($\bar{X}$ ±SE) for feed conversion ratio (g feed/g gain) of different experimental periods as affected by studied factors.

	Feed conversion ratio (g feed/g gain) during days			
Treatments / Periods	**1-10d**	**11-25d**	**26-35d**	**1-35d**
T1	0.817±0.015	1.513[c] ±0.012	2.247[c] ±0.019	1.646[d] ±0.006
T2	0. 981±0.010	2.169[a] ±0.025	2.455[a] ±0.015	2.079[a] ±0.007
T3.	0.881±0.012	1.573[b] ±0.006	2.407[ab] ±0.011	1.747[b] ±0.008
T4	0.847±0.006	1.539[ab]±0.007	2.282[c] ±0.011	1.686[c] ±0.001
T5	0.913±0.012	1.582[b] ±0.014	2.393[b] ±0.029	1.749[b] ±0.007
T6	0.818±0.002	1.537[ab]±0.008	2.278[c] ±0.009	1.672[c] ±0.001

[a-c]means have different superscripts in the same column are significantly($P<0.05$) differed.

T1: Fed basal diet (BD) with recommended levels of CP and ME (control group),**T2:** fed BD reduced by 3% CP and 100 kcal ME. **T3:** fed BD with -3% CP and recommended ME supplemented with four AAs (Lys, Met, Thr and Trp), **T4:** fed BD with -3% CP and recommended ME supplemented with five AAs (Lys, Met, Thr, Trp and Val), **T5:** fed BD with -3% CP -100 kcal ME supplemented with four AAs (Lys, Met, Thr and Trp), **T6:** fed BD with -3% CP -100 kcal ME supplemented with five AAs (Lys, Met, Thr, Trp and Val).

Table (8): Least- square means and standard error (X¯±SE) Performance index and mortality rate (%) during (0-5 wks.) of the different experimental periods as affected by studied factors.

Treatments	Performance index (%) during (0-5 WKs).	Mortality rate (%) during (0-5 WKs).
T1	113.089[a]±0.633	4.44[a] ±4.44
T2	72.245[e]±0.462	0.00±0.00
T3	98.346[d]±0.696	2.22[a] ±2.22
T4	106.033[c]±0.141	2.22[a] ±2.22
T5	100.274[d]±0.536	4.44[a] ±2.22
T6	108.895[b]±0.099	0.00±0.00
P	0.0001	0.6434

[a] means have different superscripts in the same column are significantly($P<0.05$) different.
Mortality= I-E/I*100. - PI(%)=LBW(kg) / FCR*100.

T1: Fed basal diet (BD) with recommended levels of CP and ME (control group),T2: fed BD reduced by 3% CP and 100 kcal ME. T3: fed BD with -3% CP and recommended ME supplemented with four AAs (Lys, Met, Thr and Trp), T4: fed BD with -3% CP and recommended ME supplemented with five AAs (Lys, Met, Thr, Trp and Val), T5: fed BD with -3% CP -100 kcal ME supplemented with four AAs (Lys, Met, Thr and Trp), T6: fed BD with -3% CP -100 kcal ME supplemented with five AAs (Lys, Met, Thr, Trp and Val)

Table (9): Economical efficiency of broiler chicks as affected by studied factors**.**

Trt.	BWG Kg	Total FI g	Total feed cost/chick L.E	Other cost 30% L.E	Total Cost L.E	Total revenue L.E	Net revenue L.E	EE L.E	REE L.E (%)
T1	1.821	2997	27.724	8.317	36.04	63.735	27.70	0.7686	100
T2	1.461	3037	28.088	8.433	36.52	51.135	14.63	0.4006	52.26
T3	1.677	2930	27.044	8.113	35.16	58.695	23.54	0.6695	87.11
T4	1.746	2943	27.182	8.155	35.34	61.11	25.77	0.7292	94.87
T5	1.705	2982	27.584	8.275	35.86	59.675	23.52	0.6692	87.15
T6	1.780	2975	27.508	8.252	35.76	62.35	26.59	0.7437	96.76

T1: Fed basal diet (Bd) with recommended levels of CP and ME (considered as control group),T2: fed Bd with -3% CP and -100 kcal ME. T3: fed Bd with -3% CP and recommended ME supplemented with four AAs (Lys, Met, Thr and Trp), T4: fed Bd with -3% CP and recommended ME supplemented with five AAs (Lys, Met, Thr, Trp and Val), T5: fed Bd with -3% CP -100 kcal ME supplemented with four AAs (Lys, Met, Thr and Trp), T6: fed Bd with -3% CP -100 kcal ME supplemented with five AAs (Lys, Met, Thr, Trp and Val).

- Price of one kg feed was 12,10 and 8 L.E of starter, grower and finisher respectively. - Price of one kg live weight gain was 35.00 L.E. - Total feed cost = Total feed intake × Kg feed cost. - Total revenue = price of kg BWG × final BWG. - Net revenue =Total revenue – Total cost. - EE=net revenue / total cost. -REE= EE for treatment/EE for control*100.

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Broilers, Crude Protein, Metabolizable energy, Amino Acids, Performance

الملخص العربى

تأثير خفض البروتين الخام والطاقة الممثلة في العليقة والمستويات المثلي من الأحماض الامينية علي الأداء الإنتاجي لدجاج التسمين.

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كان الهدف من الدراسة هو تقييم انخفاض مستويات البروتين والطاقة الغذائية ، مع أو بدون الأحماض الأمينية التكميلية ، على الأداء الإنتاجي لكتاكيت التسمين. في عمر يوم واحد ، تم تقسيم 270 كتكوت آربور ايكرز اللاحم عشوائياً إلى ست مجموعات متساوية ، تحتوي على 45 كتكوت / في ثلاث مكررات (15 طائر / لكل مجموعة). تم توزيع الكتاكيت على العلائق التالية: (T1) تغذيه على العليقة الاساسية 23%، 21%، 18% بروتين خام و 3100،3000 و 3200 ك كالوري /كجم عليقة طاقة ممثلة (المجموعة الضابطة). (T2) تغذيه على العليقة الاساسية مخفضة -3٪ بروتين خام و-100 ك كالوري طاقة ممثلة ؛ (T3) تغذيه على العليقة الاساسية مخفضة - 3٪ بروتين خام مع استكمال الاحماض الامينية الليسين والمثيونين والثريونين والتريبتوفان (T4) تغذيه على العليقة الاساسية مخفضة - 3 ٪ بروتين خام مع استكمال الاحماض الامينية الليسين والمثيونين والثريونين والتريبتوفان والفالين. (T5) تغذيه على العليقة الاساسية مخفضة - 3٪ بروتين خام و- 100 ك كالوري طاقة ممثلة مع استكمال الاحماض الامينية الليسين والمثيونين والثريونين والتريبتوفان. (T6) تغذيه على العليقة الاساسية مخفضة - 3٪ بروتين خام و- 100 ك كالوري طاقة ممثلة مع استكمال الاحماض الامينية الليسين والمثيونين والثريونين والتريبتوفان والفالين. من 1 إلى 35 يومًا من العمر خلال فترات البادي والنامي والناهي ، كان هناك تأثير معنوي ($P < 0.001$) بين المعاملات على وزن الجسم الحي والزيادة الوزنية واستهلاك العلف وكفاءة التحويل الغذائي وكذلك معدل الاداء ، في جميع فترات التقدير. طيور المعاملات 1 و 6 و 4 على التوالي كان لها متوسطات أعلى في وزن الجسم الحي والزيادة الوزنية وتحسن معنويا في كفاءة التحويل الغذائي ومعدل الاداء ($P < 0.001$) مقارنة مع المعاملات الأخرى المطبقة. طيور المعاملة 1 و 2 كان لديها استهلاك للعلف أعلى معنوياً ($P < 0.001$) من المعاملات الأخرى. أظهرت طيور المعاملات 6 و 4 و 5 على التوالي أعلى متوسطات الكفاءة الاقتصادية النسبية (REE) مقارنة بالمعاملات الأخرى. يمكن أن يوصى بخفض مستوى البوتين الخام بنسبة 3٪ و الطاقة الممثلة بمقدار 100 كيلو كالوري / كجم عليقة مع الحفاظ على نفس مستويات الاحماض الامينية (الليسين – المثيونين – الثريونين – التريبتوفان – الفالين) لإعطاء أداء متساوي للسلالة المغذاه علي العلائق الموصي بها.