EFFECT OF LOW CRUDE PROTEIN DIETS FORTIFIED BY LYSINE AND METHIONINE WITH PHYTASE ON PRODUCTIVE PERFORMANCE AND SOME PHYSIOLOGICAL TRAITS OF BROILER CHICKS

S.Z. El-Damrawy[1], S.M. Shalash[2] and M.H. Abo Khashaba[1]

[1]Animal Production Department, Faculty of Agriculture, Tanta University, Egypt

[2]Animal Production Research Institute, Agricultural Researches Center, Egypt

SUMMARY

This experiment was conducted to study the effect of using low crud protein level fortified by lysine and methionine with or without microbial phytase on growth, feed utilization, carcass characteristics, blood constituents and economic efficiency of broiler chicks. Corn – soy bean basal diet was formulated to 23 - 21 – 19 % CP and 3000 - 3100 – 3200 kcal ME / Kg diet, used during starter, grower and finisher experimental periods. While, the second group fed low crud protein 3% points (20 – 18- 16 % CP) and lysine (Lys) and methionine (Met) level containing diets 90% with 500 FTU phytase during experimental periods compared to control basal diet, whereas the third groups fed 2 diets without phytase respectively, the fourth and fifth groups received the same diet fortified by lysine and methionine 100% from the requirements of strain recommendation with or without phytase supplemented respectively. While, groups 6 and 7 fortified their diet by Lys and Met up to 110% from the requirements of strain recommendation with or without phytase supplemented respectively. A total of 315 unsexed day-old Ross × Ross 308 broiler chicks were randomly distributed into 7 groups of similar chick numbers. The criteria considered were live body weight (LBW), body weight gain (BWG), relative growth rate (RGR), feed consumption (FC) and conversion ratio (FCR), protein intake, metabolizable energy intake and utilization (MEU), lysine intake (Lys.I), methionine intake (Met.I), slaughter characteristics and blood constituents. The economic efficiency of the product was also calculated. The obtained data showed that reducing the protein concentration resulted in (LBW), (BWG), (RGR), (FC), (FCR), protein efficiency ratio (PER), protein conversion ratio (PCR), MEU), (Lys.I), (Met.I), Liver weight, relative weight of dressing and abdominal fat, serum total protein and albumin, net return (NR) and economic efficiency significantly increased by fortified Lys & Met with phytase supplementation than other groups. The results indicate that it is possible to reduce crude protein diets by 3% and fortified Lys & Met in starter, grower or finisher broiler chicken rations with adding phytase to these rations without negative effect on growth performance, feed utilization, carcass characteristics and blood constituents.

Keywords: *Lysine, methionine, phytase, productive and physiological performance*

INTRODUCTION

Protein is the most important component of feed ingredients. Twenty-two different amino acids are the building block of protein. Amino acids obtained from protein are used by chicken to fulfill a diversity of function; proteins are primary constituent of structural and protective tissues such as skin, feathers, bone matrix, ligaments, soft tissues, including organs and muscles. Methionine and lysine are the first and second limiting amino acids of most plant protein sources (Gill, 2003). Ciftci and Ceylan (2004) reported that broiler chicks fed highest crude protein (21.30%) recorded a poorer performance than those fed a low crude protein (19.13 and 17.97%) supplemented essential amino acids containing diets.

Results from previous research on the impact of phytase on amino acid availability are quite variable, but overall, tended to indicate an improvements in protein or amino acid digestibility and availability for chickens. They found also, some amino acids tend to be more available than others supplemented phytase diets (Ravindran *et al.,* 2000; Rutherford *et al.,* 2004).

Panda, et al., (2011) reported that body weight gain of broiler was lowest and feed intake and feed conversion ratio was poorest as the lowest concentration of lysine up to 110% with 1904 crude protein containing diet. While, The BWG increased and FCR decreased linearly as dietary Lys increased up to 1.3% with 22.5% crude protein. Hassan *et al.* (2011) showed that body weight gain (BWG), feed intake

(FI) and feed conversion ratio (FCR) were significantly improved phytase or lysine supplementation to a basal diet contained 90% of lysine requirements for broiler chicks. Handique *et al.* (2019) reported that body weight gain of broiler chicks was significant (P<0.001) affected by dietary L- lysine and DL-methionine supplemented diet, and it is possible to reduce the inclusion of crystalline amino acids (lysine, methionine and threonine) in the diets supplemented with protease, considering that their digestibility is up to 40% higher than the real digestibility when corn, soybean meal is used as ingredients.

Youssef *et al.* (2020) reported that no- negative effect were recorded on growth performance carcass yield and meat quality of broiler fed low protein containing diet supplemented with methionine and lysine, raised under hot climate conditions during the finisher period. The present study conducted to evaluate the effect of complementary low protein containing diets by lysine and methionine with or without phytase supplementation on growth performance, carcass characteristics, blood constituents and the economic efficiency of broiler chicks.

MATERIALS AND METHODS

This experiment was conducted to study the effect of using low crud protein containing diet fortified by lysine and methionine with or without microbial phytase supplementation on growth performance, feed utilization, carcass characteristics, blood constituents and economic efficiency of broiler chicks. A total number of 315 one-day old unsexed Ross × Ross 308 broiler chicks, broiler chicks were obtained from commercial hatchery individually weighted and randomly divided into 7 equal experimental groups of 45 birds each. Birds of each group were further sub divided into three replicates of 15 birds of each replicate and housed in floor peens. All experimental birds were kept under similar managerial and veterinarian conditions and offered feed and water ad libitum till 42days of age.

Corn – soy bean basal diet was formulated to contains 23% CP/ 3000 Kcal, 21% CP/ 3100 Kcal and 19 % CP / 3200 kcal ME / Kg diet were used as a control diet during starter, grower and finisher experimental periods respectively, the other three experimental diets were prepared to be low in crud protein by 3% compared with the control diet containing 90 or 100% or 110% from lysine (Lys) and methionine (Met) recommended by strain with or without 500 FTU phytase kg diet during experimental periods respectively. One of the seven experimental groups was fed basal diet as control, while, the remaining six treatment groups from 1 to 6 were fed basal diet lowered in crude protein by 3% containing 90%, 100% or 110% from lysine and methionine of strain recommendation. The composition and calculated analysis of the experimental diets (without phytase supplementation) are presented in Table (1).

The criteria of growth performance in terms of weekly body weights, weight gain, feed consumption, feed conversion ratio and mortality rate were estimated throughout the experimental period from day-old to 6 weeks of age. At 42 days of age, three birds from each replicate were taken randomly were sacrificed scalded de-feathered and carcass were eviscerated. Data on carcass yields were collected. The heart, gizzard, liver, were excised and weighed. The head, neck and feet were removed, and the carcass weight was then determined, and the carcass yield percentage was calculated by dividing the carcass weight by the live body weight of birds multiplied by 100. Blood samples were collected from each bird during slaughtering, to harvest serum by center fusion. Blood serum samples were analyzed for the concentration of total lipids (Frings and Dunn, 1970), cholesterol (Allain, 1974) and triglyceride (Fossati and Prencipe, 1982) were determined using commercial kits. Concentration of serum total proteins and albumin were calorimetrically estimated (Doumas *et al.*, 1971). While serum globulin concentration was obtained by subtracting the concentration of albumin from total proteins.

Statistical Analysis

Data were statistically analyzed by one-way analysis of variance using the General Linear Models (GLM) procedure of SPSS (1997). Tests of significance for the differences among means of different variables were done according to Duncan's new multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Growth performance

Effects of feeding low crude protein containing diets fortified by Lysine and Methionine with or without phytase supplementation on growth performance of broilers are presented in Table (2). Initial body weight of all chicks group was nearly similar indicating that birds were randomly disturbed into the experimental groups. At the end of experimental period (6 weeks of age) it can be notice that live body weight (LBW) and weight gain were significantly affected by dietary treatments whereas, in spite of either body weight or weight gain were linearly $P<0.05$ increased with increasing lysine and methionine up to 110% or phytase supplementation but they were lowered than the control except that fed dietary T3 recorded heavier body weight and weight gain (2105gm and 2060gm) compared with that of the control (2015gm and 1980gm), respectively. A significant poorer body weight and weight gain were (1694.0gm and 1613.0gm) recorded of these fed dietary T4 followed by 1753.3 and 1708.0gm) of these fed dietary T5 respectively.

Generally, at the end of experimental periods live body weight and body weight gain were significantly increased with increasing Lys & Met of bird fed low crude protein containing diets with 500 FTU phytase /kg diet supplementation. Concerning of relative growth rate (RGR) values it noticed that increasing response were recorded of birds fed lower protein fortified by Lys and Met with or without phytase supplementation. But was less responsive than the control/group except those fed dietary T3 whereas the highest value (191.66) recorded of birds fed dietary T3 followed by 191.34, 191.07 and 191.00 of those fed control, T6 and T2 respectively. While the worst value 189.4 and 190.00 of the fed dietary T4 and T5 respectively.

At all events birds fed dietary T3 (110% Lys & Met with or without 500 FTU/kg diet phytase) followed by this fed control basal diet recorded superior relative growth rate RGR than others experimental groups. Data presented in table (2) showed also, mean feed intake/bird were significantly affected by dietary treatments during experimental periods. Whereas the decreased fed intake was observed as Lys and Met increased with or without phytase supplementation. The highest fed intake value (3645gm, 3613.3gm, 3606.3gm and 3585.7 gm) of birds fed dietary T1, T4, T2, and T3 compared with control respectively. While the lowest values 3575.30, and 3543.30 gm recorded of these fed T5 and T6 compared with control respectively.

It is worthwhile to note that the broilers fed on low-CP fortified by Lys & Met with phytase containing diets had a similar FI to that fed on respective control diet. Low protein diet fortified by lysine and Methionine supplementation of phytase were significantly ($P<0.01$) increased feed intake (FI) compared with control grope. Also, phytase supplemented diet increased feed intake (FI) compared with un supplemented phytase. Mostly reducing dietary crude protein and Lys & Met levels led to a significant increasing in feed intake of broilers but phytase was not affected. At the end of experimental period (6 weeks of age) birds fed low CP fortified by Lys & Met with phytase recorded a significant improvement of feed conversion ratio compared with these fed un supplemented phytase containing diet. While, the superior values 1.74 and 1.78 recorded of groups fed T3 and control group compared with other groups.

These results are in good agreement with those of **Youssef *et al.* (2020)** evaluate the effect of low-protein diets with amino acid supplementation on growth performance and carcass yield, of broilers raised under hot climate conditions they reported that reducing the CP level to 15% with amino acid supplementation can maintain the same growth performance of finishing broilers as 18% CP containing diet indicates also 15% CP diet supplemented with Met + Lys showed no significant differences in FCR compared to the positive control diet.

Osti and Pandey (2004) reported that higher ($P<0.05$) feed intake and improvement feed conversion were observed with addition of high level of methionine in the broiler ration. Additionally, J. van Harn *et al.* (2019) observed that, crude protein in broiler could be reduced by 2.2–2.3 percentage points (from 19.8%) without negative effects on bird performance if the essential amino acids were correctly.

Abdel-Maksoud *et al.* (2010) reported that body weight and feed conversion were insignificantly affected of broiler chicks fed 21% CP diet supplemented with the essential amino acid compared to those fed 23% CP containing diets. Moreover, they reported also birds fed the high CP basal diet (23%) had lower FC and better PER compared to those fed on the low CP diet with or without essential amino acid supplementation. Hassan *et al.* (2011) showed that broiler chicks received phytase or lysine supplemented to the basal diet significantly ($P<0.01$) improved body weight gain, feed intake and feed conversion ratio. Also, addition of either lysine or phytase increased FI. Feed conversion ratio was improved by the addition either phytase or increasing dietary lysine levels. Similarly, Motawe *et al.* (2012) showed that supplementation of phytase or lysine to the basal diet significantly improved BWG, FI and FCR of broiler chicks. Also, Panda *et al.* (2011) they found that body weight gain (BWG) was lowest and feed conversion ratio (FCR) was poorest for broiler fed the lowest concentration of Lys (1.1%) and (19.04%)

crude protein containing diet. They found also, BWG increased and FCR decreased linearly as dietary Lys increased up to 1.3% with 22.5% CP containing diet.

Khan *et al.* (2011) reported that lysine supplementation to broiler diets significantly improved the BWG and FCR. Mukhtar (2007) remarked that chicks fed the diet contained 1.5% lysine + methionine 0.63%(E) recorded the highest values for feed intake, average live body weight and body weight gain, this may be due to high digestibility and More availability of synthetic lysine and methionine. Others have also shown a reduced feed intake when broiler fed LCP diets (Si *et al.*, 2004; Jiang *et al.*, 2005). Feed conversion ratio (FCR) was slightly improved by decreasing dietary CP level. The difference was, however, non-significant. Kidd *et al.* (2001), Bregendahl *et al.* (2002) and Ferguson *et al.* (1998), who noted significant increase in FCR of broiler chicks fed diets with 20% CP supplemented with essential amino acids (EAA) compared to those fed a diet with 23% CP.

Ciftci and Ceylan (2004) reported that chicks fed a basal diet containing high CP (21.30%) showed poorer performance than those fed a low CP (19.13 and 17.97%) plus AAs during starter period. Also, Selle *et al.* (2007) reported that lysine and phytase supplemented diets improved ($p<0.05$) weight gain and feed efficiency of broiler chicks. In addition, Samantha Sigolo (2019) suggest that 110 and 120% Lys levels supplemented diets decreased average daily feed intake, average daily energy intake, and average daily protein intake and consequently the average daily gain of broiler chicks during experimental period.

Carcass traits

The carcass traits measured as relative weight of heart, liver, gizzard, giblets, dressing and total edible parts and abdominal fat are shown in Table (3). The relative weight of heart, gizzard and giblets were insignificantly affected by dietary treatments while relative weight was significantly decreased compared with control, dressing and total edible parts to live body weight. The relative dressing weights of broiler chickens were significantly affected by dietary treatments whereas the heavier dressing yield were 75.55 of birds feed dietary T3 followed by 73.70 and 73.58 dietary T6 and control compared other treatments. Generally, total edible parts were statically equal and insignificantly affected by dietary treatments shown in table 3.

The relative weight of abdominal fat of birds fed dietary treatments were significant decreased with lysine and methionine increased with or without phytase supplementation except those fed dietary T4 was increased compared with control group as shown table 3. The previous observation is in good agreement with the Youssef et al. (2020) showed that non-significant influences on carcass yield, abdominal fats, and total lipids of meat indicated that these traits are not compromised feeding the low-protein diet supplemented with Met and Lys. Similarly, Ojano - Dirain and Waldroup (2002) reported that increasing Lys levels from 1.03 to 1.12% in a control broiler diet significantly improved breast yield and reduced abdominal fat but it had no significant effect on dressing percentage, while, increasing Met from 0.38 to 0.44% resulted in significant improvements in dressing percentage and breast yield.

Also, Motawe *et al.* (2012) showed that supplementation of phytase or lysine to the basal diet increased carcass weight ($P<0.001$), percentage of dressed carcass ($P<0.05$), breast yield ($P<0.001$) and drum stick weight ($P<0.05$) and decreased abdominal fat ($P<0.001$). Phytase supplementation insignificantly improved carcass characteristics. In addition, Khan *et al.* (2011) reported that lysine supplementation to broiler diets significantly improved the carcass weight and dressing percentage, while, the average weight of liver, heart, gizzard and spleen for various group of broilers were found non-significant. Also, in this respect Attia (2003) reported that Lysine and/or phytase did not affect carcass yield. However, lysine level at 0.95/0.80% and 1.01/0.87% significantly decreased abdominal fat deposition compared to control.

Blood serum constituents:

Effect of diet low crud protein fortified by lysine and methionine with or without phytase supplemented diet on biochemical traits of serum blood are presented in Table (4). The determined serum total protein were significantly affected by dietary treatments whereas the highest $P<0.05$ statistically equal value were (3.67, 3.56, 3.49 and 3.36) of birds fed dietary control, T3, T6, and T2 compared other treatments respectively while the lowest were recorded of those fed dietary T4 and T1, respectively.

Also, the highest were 2.35 and 2.09 recorded Albumin content of birds fed dietary control and T3 compared with other groups respectively. While, the lowest values were 1.36, 1.46 and 1.53 of those fed dietary T4, T5 and T1 respectively. The highest $P<0.05$ serum Globulin content were 1.89, 1.65, 1.59, 1.56 and 1.52 of birds fed dietary T5, T2, T1, T4 and T6 compared with control respectively. While, the lowest $P<0.05$ values 1.46 recorded of those fed dietary T3 compared to control group.

Our results showed that Albumin / Globulin ratio value of groups fed control diet and dietary T3 were 11.78 and 10.51 significantly higher than those of other groups. While, in significant difference were observed of these fed dietary T1, T2, and T4 respectively. At last the mean value of triglyceride was found to be 52.70 mg/100 ml for chicks received the control group and it was ranged between 63.20 and 54.8 mg/100 ml for chicks received dietary T1 and T6 respectively. Also, the results recorded that serum concentrations of cholesterol and creatinine were not significantly affected by experimental groups.

These results are in good agreement with those of Samantha Sigolo *et al.* (2019) the effects of different levels of Met and Lys on blood serum parameters are shown in Table 4. In particular, a Lys level of 110% increased the uric acid level (Lys, $P = 0.05$; qudratic, $P = 0.03$). HDL cholesterol tended to increase with increasing Met level (Met, $P = 0.09$; linear, $P = 0.04$).

In another study, Hassan *et al.* (2011) showed that Serum uric acid was lower in birds fed the low-CP diets compared to the control, this result support the finding of Corzo *et al.* (2005) who reported that feeding low-protein diet fortified with essential AAs and non-essential AAs resulted in decreased uric acid.

CONCLUSIONS

Our study of broilers showed that optimal growth performance, carcass traits, and blood serum parameters were achieved when fortified lysine and methionine in low crud protein with 500 FTU/kg diet phytase in broiler chickens' diets.

REFERENCES

Abdel-Maksoud, F. Yan, S. Cerrate, C. Coto, Z. Wang and P.W. Waldroup (2010). Effect of dietary crude protein, lysine level and amino acid balance on performance of broilers 0 to 18 days of age. Int. J. Poult. Sci., 9 (1): 21-27.

Abd-Elsamee M.O. (2002). Effect of different levels of crude protein, sulphur amino acids, microbial phytase and their interaction on broiler chick performance. Egypt. Poult. Sci. J., 22: 999-1021.

Abd-Elsamee, M.O., O.M. El-Husseiny and A.M. Ali (2001). Effects of dietary crude protein and enramycin supplementation on broiler performance. Egypt. Poult. Sci., 21(II): 507-520.

Abdalqadir M. O and S.A. Arabi (2014). The effect of different Lysine and Methionine levels on broiler chickens performance. Int. J. Innovative Agric. & Bio. Res., 2(4): 46-52.

Attia Y.A. (2003). Performance, carcass characteristics, meat quality, and plasma constituents of meat type drakes fed diets containing different level of lysine with or without microbial phytase. Archiv Animal Nutrition, 56:39-48.

Bregendahl K., J.L. Sell and D.R. Zimmerman (2002). Effect of low-protein diets on growth performance and body composition of broiler chicks. Poult. Sci., 81: 1156-1167.

Chrystal P.V., A.F. Moss, A. Khoddami, V.D. Naranjo, P.H. Selle, S.Y. Liu (2020). Impacts of reduced-crude protein diets on key parameters in male broiler chickens offered maize-based diets. Poult. Sci., 99, 505–516.

Ciftci I. and N. Ceylan (2004). Effects of dietary threonine and crude protein on growth performance, carcass and meat composition of broiler chickens. Brit. Poult. Sci., 45: 280-289.

Corzo A., D. William and D. Kidd (2005). Dietary lysine needs of late- developing heavy broilers. Arch. Anim. Nutr. Poult. Sci., 85: 457-461.

Duncan D. B. (1955). Multiple Range and Multiple F Tests. Biometric, 11: 1-42.

Ferguson N.S., R.S. Gates, J.L. Taraba, A.H. Cantor, A.J. Pescatore, M.J. Ford and D.J. Burnham (1998). The effect of dietary crude protein on growth, ammonia concentration and litter composition in broilers. Poult. Sci., 77:1481–1487.

Ghazalah A.A., A.H. Abd El-Gawad, M.S. Soliman and Amany W. Youssef (2005). Effect of enzyme preparation on performance of broilers fed corn-soybean meal-based diets. Egypt. Poult. Sci. J., 25: 295–316.

Ghazalah A.A. and M.A. Alsaady. (2008). Effect of dietary metabolizable energy and microbial phytase levels on broiler performance, nutrients digestibility and minerals utilization. Egypt. Poult. Sci., (28) (III): 815-832.

Gill C. (2003). Pig and Poultry: Value-added' ingredients or more amino acids? Feed International, 24(4) :27-29.

Handique B., G. Saikia, R. Dowarah, B.N. Saikia and S. Tamuly (2019). Effect of supplementation of synthetic lysine and methionine on serum biochemical profile, carcass characteristics and meat composition in broiler chicken. Indian J. Anim. Nutr., 36(1): 40-46.

Hassan H.M.A., M.A. Mohamed and T.M. El-Afifi (2011). Effect of phytase or lysine supplementation on performance of broilers fed lysine deficient diet from 21 to 42 days of age. Egypt. Poult. Sci., 31: 111-120.

J. van Harn, M.A. Dijkslag and M. M. van Krimpen (2019). Effect of low protein diets supplemented with free amino acids on growthperformance, slaughter yield, litter quality, and footpad lesions of malebroilers. J Poultry Science, 98:4868–4877.

Jiang Q., P.W. Waldroup and C.A. Fritts (2005). Improving utilization of diets low in crude protein for broiler chicken, 1. Evaluation of specific amino acid supplementation to diets low in crude protein. Inter. J of Poult. Sci., 4: 115-122.

Kamran Z., M.M. Aslam, Ahsan-ul-Haq and S. Mahmood (2004). Effect of decreasing dietary protein levels with optimal amino acids profile on the performance of broilers. Pakistan Veterinary Journal, 24: 165-168.

Kidd M.T. and B.I. Fancher (2001). Lysine needs of starting chicks and subsequent effects during the growing period. J. Applied Poult. Res., 10: 385-393.

Motawe, H.F.A., T.M. EL-Afifi1, H.M.A. Hassan and Y.A. Attia (2012). Addition of phytase to broiler diets contained different lysine levels. Egypt. Poult. Sci., 32 (I): 117-13).

Mukhtar A.M., A. Mekkawi and M. ELTigani (2007). The effect of feeding increasing levels of synthetic lysine and methionine in broiler chicks. Res. J. Anim. & Vet. Sci., 2: 18-20.

National Research Council (1994). Nutrient Requirements of Poultry. 9th revised edn. National Academy Press. Washington DC., USA.

Ojano-Dirain C.P. and P.W.Waldroup (2002). Evaluation of lysine, methionine and threonine needs of broilers three to six weeks of age under moderate heat stress. Inter. J of Poult. Sci., 1: 16-21.

Osti. N.P. and S.B. Pandey (2004). Methionine and lysine supplementation in low quality feed ingredient based diets on the performance of broiler chicken. Paper presented on Fourth National Conference on Science and Technology, organized by Royal Nepal Academy of Science and Technology (RONAST), Kathmandu, Nepal from March 23 – 26,

Panda A.K., S.V. Rama Rao, M.V. L.N. Raju, G. Lavanya, E. Pradeep Kumar Reddy and G. Shyam Sunder (2011). Early growth response of broilers to dietary lysine at fixed ratio to crude protein and essential amino acids. Asian-Aust. J. Anim. Sci., 24(11):1623-1628.

Rattana N., C. Bunchasak , K. Markvichitr, A. Choothesa, S. Prasanpanich and L.J. Wiriya (2011). Effects of Methionine supplementation in low protein diets and subsequent re- feeding on growth performance, liver and serum lipid profile, body composition and carcass quality of broiler chickens at 42 days of age. J. Poult. Sci., 48:229-238.

Ravindran V., S. Cabahug, P.H. Selle and W.L. Bryden (2000). Response of broiler chickens to microbial phytase supplementation as influenced by dietary phytic acid and non-phytate phosphorus levels. II. Effects on apparent metabolizable energy, nutrient digestibility and nutrient retention. Br. Poult. Sci., 41: 266 –274.

Rutherfurd S.M., T.K. Chung, P.C.H. Morel and P.J. Moughan (2004). Effect of microbial phytase on ileal digestibility of phytate phosphorus, total phosphorus, and amino acids in a low-phosphorus diet for broilers. Poult. Sci., 83: 61-68.

Samantha Sigolo, A. Seidavi, A. Gallo and A. Prandini (2019). Effects of dietary surpluses of methionine and lysine on growth performance, blood serum parameters, immune responses, and carcass traits of broilers. Journal of applied Animal Research, 47(1).

Selle P.H. and V. Ravindran (2007). Review. Microbial phytase in poultry nutrition. Anim. Feed Sci. Technol., 135:1-41.

Si J., J.H. Kersey, C.A. Fritts and P.W. Waldroup (2004). An evaluation of the interaction of lysine and methionine in diets for growing broilers. International Journal of Poultry Science, 3: 51-60.

SPSS (2001). SPSS for windows 10.0 Base system user's guide, release 10.0 SPSS Inc. USA.

Youssef A.A., F. Bovera, J. Wang, M.A. Al-Harthi and W.K. Kim (2020). Multiple amino acid supplementations tolow-protein diets: effect on performance, carcass yield, meat quality and nitrogen excretion offinishing broilers under hot climate conditions. Animals, 2020, 10, 973.

تأثير العلائق منخفضة البروتين المدعمة باليسين والميثيونين مع الفيتيز على الأداء الإنتاجي وبعض الصفات الفسيولوجية لكتاكيت التسمين

سعد زغلول الدمراوى[1] و سيد شلش[2] و محمد عبد حمدى ابو خشبة[1]

[1]قسم الانتاج الحيواني - كلية الزراعة – جامعة طنطا – مصر.
[2]معهد بحوث الإنتاج الحيواني- مركز البحوث الزراعية – مصر

أجريت هذه التجربة لدراسة تأثير استخدام البروتين الخام المنخفض المدعم باللايسين والميثيونين مع أو بدون إنزيم الفايتيز على معدلات تاللنمو والكفاءه الغذائيه وخصائص الذبيحة ومكونات الدم والكفاءة الاقتصادية لكتاكيت التسمين. وتحتوى عليقة الكنترول على بروتين خام بنسبة 23 - 21 - 19٪ والطاقه الممثله على 3000 - 3100 - 3200 كياو كالوري / كجم عليقه ، تستخدم خلال فترات البادئ والنامى والناهى. بينما تم تغذية المجموعه الثانيه عاى عليقه مستوى البروتين بها منخفض بنسبة 3٪ (CP ٪16 - 18 - 20) وكان مستوى الليسين والمثيونين بها بنسبة 90% من احتياجات السلاله مع اضافة 500 وحده من انزيم الفيتيز خلال الفترات التجريبية مقارنة بعليقة الكنترول. في حين أن المجموعه الثالثه تم تغذيتها على عليقة المجموعه الثانيه بون اضافة انزيم الفايتيز، بينما تم تغذية المجموعتان 4) و 5) على نفس عليقة المجموعه الثانيه لكن بمستوى ليسين ومثيونين بنسبة 100% من احتياجات السلاله مع او بدون اضافة 500 وحده من انزيم الفيتيزعلى التوالي. بينما تم تغذية المجموعتان 6) و 7) على نفس عليقة المجموعه الثانيه لكن تم تدعيم مستوى الليسين والمثيونين ليصل الى نسبة 110% من احتياجات السلاله مع او بدون اضافة 500 وحده من انزيم الفيتيزعلى التوالي. وتم توزيع عدد 315 من كتكوت تسمين روس × روس 308 غير مجنس بعمر يوم بشكل عشوائي إلى 7 مجموعات بكل مجموعه 45 كتكوت قسمت الى 3 مكررات بكل مكرر 15 كتكوت.

وشملت القياسات التي تم تقييمها ما يلي:

وزن الجسم الحي ، زيادة وزن الجسم ، معدل النمو النسبي ، استهلاك العلف وكفاءة التحويل الغذائى التغذية ، البروتين الماكول ، الطاقه الممثله الماكوله ، وكفاءة الطاقه الممثله ، الماكول من اللايسين ، الماكول من الميثيونين ، خصائص الذبيحه ، ومكونات الدم. كما تم حساب الكفاءة الاقتصادية. أظهرت البيانات التي تم الحصول عليها أن تقليل تركيز البروتين أدى إلى وزن الجسم الحي (LBW) ، وزيادة وزن الجسم (BWG) ، ومعدل النمو النسبي (RGR) ، وكمية العلف الماكول (FI) ، ومعدل التحويل الغذائي (FCV) ، ونسبة كفاءة البروتين (PER).) ، كفاءة الطاقة الممثله (MEU) ، الماكول من الليسين (Lys.I) ، المتناول من الميثيونين (Met.I) ، وزن الكبد ، الوزن النسبي للذبيحه ، الوزن النسبي لدهون البطن ، البروتين الكلى ، الألبومين ، العائد الصافي (NR) والكفاءة الاقتصادية زادت بشكل ملحوظ من خلال تدعيم العلائق باليسين والمثيونين وباضافة انزيم الفايتيز مقارنة بالمجموعات الأخرى.

تشير النتائج إلى أنه من الممكن تقليل مستوى البروتين الخام بنسبة 3٪ مع التدعيم بالاحماض الامينيه الليسين والمثيونين فى علائق البادئ والنامى والناهى مع اضافة انزيم الفايتيز دون اى تاثير سلبى على كلا من معدل الاداء الانتاجى والكفاءه الغذائيه وصفات الذبيحه ومكونات الدم

Table (1): The composition and calculated analysis of experimental starter, grower and finisher diets.

Ingredients	Starter				Grower				Finisher			
	23%	20% (90% Lys&Met)	20% (100% Lys&Met)	20% (110% Lys&Met)	21%	18% (90% Lys&Met)	18% (100% Lys&Met)	18% (110% Lys&Met)	19%	16% (90% Lys&Met)	16% (100% Lys&Met)	16% (110% Lys&Met)
Yellow corn	57.20	63.00	65.50	65.3	56.50	65.90	69.80	70.10	62.00	69.34	70.50	70.82
Soya bean meal (44%)	28.00	25.00	22.00	22.00	31.50	25.00	18.00	17.50	25.50	21.50	19.50	19.00
Corn gluten meal 62%)	10.00	6.70	8.00	8.00	4.50	3.00	7.00	7.00	5.00	2.00	3.00	3.00
Soybean oil	1.00	1.00	0.10	0.10	4.00	2.55	1.00	1.00	4.30	3.80	3.25	3.25
Limestone	1.50	1.91	1.73	1.725	1.25	1.207	1.46	1.46	1.10	1.25	1.275	1.27
Di calcium phosphate	1.60	1.70	1.70	1.70	1.65	1.65	1.70	1.70	1.50	1.45	1.60	1.60
Salt	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Premix**	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
L Lysine	0.10	0.09	0.045	0.475	0.00	0.093	0.44	0.59	0.00	0.05	0.045	0.365
D L Meth.	0.00	0.00	0.325	0.100	0.00	0.00	0.00	0.05	0.00	0.01	0.230	0.095
Total	100	100	100	100	100	100	100	100	100	100	100	100
Calculated analysis												
Crude protein(%)	23.019	20.089	20.015	20.173	21.001	18.022	18.049	18.020	19.090	16.092	16.111	16.076
ME (Kcal/Kg)	3000	3005	3002	3002	3109	3101	3101	3107	3204	3209	3200	3206
Ether extract(%)	2.814	2.916	2.995	2.987	2.719	2.945	3.076	3.080	2.849	3.001	3.038	3.042
Crud fiber(%)	3.559	3.408	3.273	3.268	3.689	3.401	3.059	3.030	3.388	3.204	3.105	3.076
Calcium (%)	1.009	1.173	1.099	1.097	0.934	0.954	0.983	0.986	0.829	0.846	0.898	0.893
Available phosphorus(%)	0.451	0.461	0.458	0.458	0.459	0.448	0.449	0.449	0.421	0.421	0.428	0.427
Methionine %)	0.552	0.497	0.552	0.606	0.479	0.444	0.480	0.527	0.468	0.426	0.469	0.515
Lysine (%)	1.142	1.026	1.141	1.258	1.11	0.999	1.113	1.217	0.951	0.860	0.955	1.047
SAA	0.855	0.743	0.792	0.845	0.746	0.653	0.682	0.725	0.699	0.597	0.636	0.679
Cost / ton (PE)	5829	5530	5625	5702	5838	5480	5514	5579	5750	5410	5525	5536

** *Each 3kg of premix contained: Vit. A 12000IU, Vit. D 2200IU, Vit. E 10mg, Vit. K_3 2000mg, Vit. B_1 1000mg, Vit. B_2 3000mg, Vit. B_6 1300mg, Vit. B_{12} 10mg, Pantothenic acid 10mg, Niacin 30mg, Folic acid 1000mg, Biotin 50mg, Choline chloride 300mg, Manganese 60mg, Zinc 50mg, Copper 10mg, Iron 30mg, Iodine 1000mg, Selenium 100mg, Cobalt 100mg and $CaCo_3$ to 3g.*

Table (2): Effect of dietary low crud protein fortified Lysine and Methionine with or without phytase supplementation LBW, BWG, RGR, FI and FCR of broiler chicken.

Items	Lysine and Methionine requirements as recommended by the strain							
		% Lys and Met with phytase 500 FTU/kg diet			% Lys and Met without phytase 500 FTU/kg diet			sig
	Control	T1 (90%)	T2 (100%)	T3 (110%)	T4 (90%)	T5 (100%)	T6 (110%)	
IBW	44.78±0.05	44.77±0.07	44.78±0.08	44.76±0.04	44.78±0.07	44.81±0.07	44.81±0.05	**NS**
FBW	2015.20±12.53^{b}	1894.40±9.47^{d}	1952.20±21.21^{c}	2105.00±13.22^{a}	1649.00±13.10^{f}	1753.30±15.27e	1966.20±17.84^{c}	*
BWG	1980.40±12.51^{b}	1849.60±9.46^{d}	1874.10±21.21^{c}	2060.20±13.22^{a}	1613.20±13.09^{f}	1708.50±15.30^{e}	1836.40±17.94^{d}	**
RGR	191.34±0.05^{b}	190.76±0.0^{d}	191.00±0.09^{c}	191.66±0.09^{a}	189.41±±0.08^{f}	190.00±0.09^{e}	191.07±0.09^{c}	**
FI	3527.30±16.22^{c}	3645.00±11.35^{a}	3606.30±17.28^{ab}	3585.70±12.23^{abc}	3613.30±13.19^{ab}	3575.30±12.54^{bc}	3543.30±18.80^{c}	*
FCR	1.78±0.02^{d}	1.97±0.02^{c}	1.92±0.04^{c}	1.74±0.02^{d}	2.23±0.01^{a}	2.09±0.03^{b}	1.92±0.01^{c}	**

Means of each column followed by the same letter are not significantly different at the 5% level according to Duncan's Multiple Range Test.
NS indicate not significant - indicate P<0.05 -** indicate P<0.01 -*** indicate P<0.001*

Table (3): Effect of dietary low crude protein fortified Lysine and Methionine with or without phtyase supplementation on carcass characteristics (% in LBW) of broiler chicken.

Items		% Lys and Met with phytase 500 FTU/kg diet			% Lys and Met without phytase 500 FTU/kg diet			sig
	Control	T1 (90%)	T2 (100%)	T3 (110%)	T4 (90%)	T5 (100%)	T6 (110%)	
Heart	0.50±0.05	0.46±0.09	0.53±0.00	0.49±0.01	0.54±0.03	0.57±0.02	0.56±0.01	NS
Liver	3.46±0.01a	3.18±0.12ab	3.12±0.11b	3.05±0.06b	3.29±0.13ab	3.18±0.05b	3.20±0.01ab	*
Gizzard	2.42±0.16	2.75±0.08	2.44±0.11	2.63±0.21	2.86±0.08	2.65±0.01	2.71±0.17	NS
Giblets	6.37±0.31	6.37±0.11	6.10±0.04	6.19±0.28	6.70±0.24	6.41±0.01	6.49±0.20	NS
carcass	73.70±1.49ab	72.79±1.92ab	73.52±2.95ab	75.55±0.24a	69.56±0.62b	70.43±0.17ab	73.58±1.52ab	*
TEP	80.09±1.78	79.19±1.92	79.63±2.95	81.75±0.53	76.26±0.87	76.85±0.17	80.07±1.72	NS
Abdominal fat	1.17±0.11ab	1.02±0.07bc	1.09±0.03abc	0.98±0.00bcd	1.28±0.10a	0.90±0.01cd	0.760.04d	***

Means of each column followed by the same letter are not significantly different at the 5% level according to Duncan's Multiple Range Test.
NS indicate not significant - indicate P<0.05 -** indicate P<0.01 -*** indicate P<0.001*

Table (4): Effect of dietary low crude protein fortified Lysine and Methionine with or without phtyase supplementation on some blood constituents (% in LBW) of broiler chicken.

Items		Lysine and Methionine requirements as recommended by the strain						
		% Lys and Met with phytase 500 FTU/kg diet			% Lys and Met without phytase 500 FTU/kg diet			sig
	Control	T1 (90%)	T2 (100%)	T3 (110%)	T4 (90%)	T5 (100%)	T6 (110%)	
Total protein(g/100ml)	3.67±0.07a	3.09±0.17bc	3.36±0.09ab	3.56±0.08a	2.89±0.05c	3.35±0.09ab	3.49±0.05a	**
Albumin(g/100ml)	2.35±0.08a	1.53±0.03de	1.70±0.05cd	2.09±0.17ab	1.36±0.08e	1.46±0.08de	1.90±0.11bc	**
Globulin(g/100ml)	1.32±0.01b	1.56±0.14ab	1.65±0.03ab	1.46±0.21b	1.52±0.03ab	1.89±0.17a	1.59±0.06ab	**
A/G	1.78±0.08a	1.00±0.08c	1.02±0.01c	1.51±0.31ab	0.90±0.07c	0.79±0.12c	1.20±0.11bc	**
Triglyceride (mg/100ml)	52.70±3.01b	63.20±4.09a	60.56±2.10ab	55.30±0.89ab	62.86±2.92a	57.60±0.98ab	54.80±2.04ab	*
Cholesterol(mg/100ml)	60.60±2.03	56.20±3.51	55.26±5.68	57.70±2.36	53.80±4.27	54.60±3.23	62.63±2.15	NS

Means of each column followed by the same letter are not significantly different at the 5% level according to Duncan's Multiple Range Test.
NS indicate not significant - indicate P<0.05 -** indicate P<0.01*