

Rel. gizz. contents <sup>3</sup>	M	0.51 <sup>b</sup>	0.84 <sup>b</sup>	0.54 <sup>b</sup>	0.75 <sup>b</sup>	1.17 <sup>a</sup>	0.77 <sup>A</sup>		
	P	0.15 <sup>b</sup>	0.43 <sup>a</sup>	0.19 <sup>ab</sup>	0.26 <sup>ab</sup>	0.33 <sup>ab</sup>	0.27 <sup>B</sup>	<0.001	0.362
AME <sup>4</sup> , MJ/kg	M	11.3 <sup>b</sup>	11.6 <sup>ab</sup>	11.9 <sup>a</sup>	11.7 <sup>ab</sup>	11.4 <sup>ab</sup>	11.6 <sup>B</sup>		
	P	11.6	11.8	11.8	12.0	11.7	11.8 <sup>A</sup>	0.026	0.66
Starch digestibility <sup>5</sup>	M	0.94 <sup>c</sup>	0.97 <sup>ab</sup>	0.97 <sup>ab</sup>	0.97 <sup>ab</sup>	0.95 <sup>bc</sup>	0.96		
	P	0.95 <sup>b</sup>	0.94 <sup>b</sup>	0.97 <sup>a</sup>	0.97 <sup>a</sup>	0.94 <sup>b</sup>	0.96	<0.001	0.023

<sup>1</sup>M and P denote mash and pelleted diets, respectively, HM and RM denote hammer mill and roller mill grinding, respectively, and the numbers 3,6 and 9 denote the coarseness of grinding.

References and a full description of this work can be found in *Animal Feed Science and Technology* 117, 281-293.

### Performance of Broilers Fed on Low Protein Diets Fortified with Graded Levels of Methionine

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#### Abstract

In a 2 × 3 factorial arrangement, the effect of dietary protein and methionine (Met) levels on performance of Ross broiler chicks from 7 to 49 days of age were evaluated. Two hundred and fifty two 7-day old chicks as a mixture of both sexes were utilized. The chicks were randomly allocated to 18 pens containing 14 chicks each with three replicates and assigned to receive one of the six iso-energetic (3000 Kcal/Kg) dietary groups. Dietary treatments consisted of three levels of protein (21.56, 19.40, and 17.25 in starter, 18.75, 16.87, and 15 in grower, and 16.87, 15.19, and 13.50 g/Kg in finisher period) and two levels of Met (0.47 and 0.56 in starter, 0.36 and 0.43 in grower, and 0.3 and 0.36 g/Kg in finisher period). The results of this study showed that reducing dietary protein by 10% could have no adverse effect on broiler performance. In addition, increasing Met level by 20% above the NRC recommendation could be effective in improving broiler performance.

#### Introduction

There has been great interest in reducing N concentration in poultry litter in recent years. Lowering crude protein is effective in decreasing N excretion in poultry production (Blair *et al.*, 1999). Excess dietary protein also increases heat production and water consumption which increases moisture content of litter (Alleman and Leclercq, 1997). Reducing CP diets by 2% in starter period did not affect body weight gain (Moran and Stiborn, 1996). Some researchers have shown that reduced crude protein-amino acid supplemented diets support good growth and feed consumption of broilers (Yamazaki *et al.*, 1998; Aletor *et al.*, 2000). However, other researches evaluating the impact of low crude protein-amino acid supplemented diets have demonstrated negative effects on broiler productivity (Bregendahl *et al.*, 2002). Addition of Met over and above the recommended requirement of broilers improves their performance in terms of body weight gain and food conversion efficiency (Simon *et al.*, 1995 and Ohta and Ishibashi, 1995). Recent research has suggested that levels of lysine and Met in excess in NRC (1994) recommendations may result in enhanced performance (Schutte and Pack, 1995). Therefore the objective of this study was to evaluate the Met and protein level effects on performance with recommended level protein and other diets lower in protein than the recommended level, with various Met supplements equal and above requirements recommended by NRC (1994).

## Materials and Methods

Three hundred one-day Ross broiler chicks were given *ad libitum* access to a commercial starter diet for six days. On day seven, 252 chicks as a mixture of male and female were selected and utilized for 42-day experimental period. The chicks were randomly allocated to 18 pens containing 14 chicks each with three replicates and assigned to receive one the six iso-caloric dietary treatments (3000 Kcal/Kg). Dietary groups consisted of three levels of protein (100%, 90%, and 80% of NRC recommended for crude protein) and two levels of supplementary Met (100% and 120% of NRC recommended for Met). Birds were fed diets (starter: 7-21d, grower: 22-42, and finisher 43-49) based on NRC (1994). The birds were fed *ad libitum* from 7-49 day of age. The birds and feed consumed were weighed on days 21, 42, and 49 to allow the calculation of live weight gain, feed intake, and feed: gain ratio. The factorial arrangement of 6 treatments consisting of three levels of protein and two levels of Met with CRD design were analyzed using the GLM procedures of SAS (SAS Institute, 1996). Means were separated for significance by Duncan's multiple range test at significance level of  $P < 0.05$  or as indicated.

## Results and Discussion

The results of broiler performance are given in table 1. Reducing dietary protein by 20% decreased chicks' body weight in 42 and 49 days of age ( $P < 0.05$ ). This result is in consist with the report of Jianlin et al. (2004) who demonstrated that reducing crude protein below 20% while providing indispensable amino acids resulted in significant reduction in BW. However, reducing dietary protein by 10% had no significant effect on chicks' body weight ( $P > 0.05$ ). Increasing dietary Met levels increased body weight in 42 days of age ( $P < 0.05$ ) but had no significant effect on body weight in 21 and 49 days of age ( $P > 0.05$ ). Feed intake did not affect by protein and Met levels. Rezaei *et al.* (2004) also shown that decreasing dietary protein had no adverse effect on feed intake in grower and total period of the trail. Reducing dietary protein by 20% increased feed to gain ratio in grower period ( $P < 0.05$ ). Supplementary Met improved feed to gain ratio in grower and total period of the experiment ( $P < 0.05$ ) which is in consist with other research (Simon *et al.*, 1995 and Ohta and Ishibashi, 1995). It is concluded that under the conditions of this experiment reducing dietary protein by 10% could have no inappropriate effect on broiler performance. In addition, increasing Met level by 20% above the NRC recommendation could improve broiler performance.

## References

- ALETOR, V. A., HAMID, I. I., NEIB, E. and PFEFFER, E. (2000) Low-protein amino acid supplemented diets in broiler chickens: effects on performance, carcass characteristics, whole body composition and efficiency of nutrient utilization. *Journal of Science, Food and Agriculture*. **80**: 547-554.
- ALLEMAN, F. and LECLERCQ, B. (1997) Effect of dietary protein and environmental temperature on growth performance and water consumption of broiler chickens. *British Poultry Science*. **38**: 607-610.
- BLAIR, R., JACCOP, J. P., IBRAHIM, S. and WANG, P. (1999) A quantitative assessment of reduced protein diets and supplements to improve nitrogen utilization. *Applied Poultry Research*. **8**: 25-47.
- BREGENDAHL, K., SELL, J. L. and ZIMMERMAN, D. R. (2002) Effect of low-protein diets on growth performance and body composition of broiler chicks. *Poultry Science*. **81**: 1156-1167.
- JIANLIN, SI., FRITTS, C. A., BURNHAM, D. J. and WALDROUP, P. W. (2004) Extent to which crude protein may be reduced in corn-soybean meal broiler diets through amino acid supplementation. *International Journal of Poultry Science*. **3** (1): 46-50.
- MORAN, E. T., Jr. and STILBORN, B. (1996) Effect of glutamic acid on broiler given sub marginal crude protein with adequate essential amino acids using feeds high and low in potassium. *Poultry Science*. **75**: 120-129.
- OHTA, Y. and ISHIBASHI, T. (1995) Effects of dietary glycine on reduced performance by deficient and excessive methionine in broilers. *Japanese Poultry Science*. **31**: 81-89.
- REZAEI, M., NASSIRI MOGHADDAM, H., POUR REZA, J. and KERMANSHAHI, H. (2004) The effects of dietary protein and lysine levels on broiler performance, carcass characteristics and N excretion. *International Journal of Poultry Science*. **3** (2): 148-152.

**SAS INSTITUTE.**1996. SAS® User's Guide: Statistics (Cary, NC, SAS Institute Inc.).

**SCHUTTE, J. B. and PACK, M.** (1995) Sulfur amino acid requirement of broiler chicks from fourteen to thirty-eight days of age. 1. Performance and carcass yield. *Poultry Science*. **74**: 480-487.

**SIMONE, A., BERGNER, H. and BUIVAN, D.** (1995) Methodological investigation on the metabolism oriented determination of methionine requirement of broiler chickens. 3. degradation of <sup>14</sup>C-(CH<sub>3</sub>)-and <sup>35</sup>S-methionine after feeding of synthetic diets. *Archive in Animal Nutrition*. **47**: 229-244.

**YAMAZAKI, M., MURAKAMI, H. and TAKEMASA, M.** (1998) Effects of ratios of essential amino acids to non-essential amino acids in low protein diet on excretion and fat deposition of broiler chicks. *Japanese Poultry Science*. **35**: 19-26.

**Table 1.** Body weight (g), Feed intake (g /chick /day) and Feed conversion ratio (g: g) of chicks given

	Body weight (g)			
	Day 7	Day 21	Day 42	Day 49
Protein level (PL)				
80 % of NRC	109.88	467.97	1586.33 <sup>b</sup>	2123.53 <sup>b</sup>
90 % of NRC	110.60	506.74	1843.46 <sup>a</sup>	2388.19 <sup>a</sup>
100 % of NRC	109.88	521.75	1870.18 <sup>a</sup>	2455.04 <sup>a</sup>
Pooled MSE	0.45	16.16	51.04	84.74
Methionine level (ML)				
100 % of NRC	110.16	490.11	1678.82 <sup>b</sup>	2313.00
120 % of NRC	110.08	506.53	1854.49 <sup>a</sup>	2331.51
Pooled MSE	0.37	13.20	41.67	69.20
Source of variation			P value	
Protein level (PL)	0.457	0.091	0.003	0.040
Methionine level (ML)	0.881	0.369	0.011	0.853
PL × ML	0.332	0.671	0.294	0.764
	Feed intake ( g /chick /day )			
	Days 7-21	Days 22-42	Days 43-49	Days 7-49
Protein level (PL)				
80 % of NRC	56.33	122.31	207.83	113.51
90 % of NRC	51.36	128.07	216.45	118.09
100 % of NRC	50.86	123.65	223.78	113.41
Pooled MSE	2.69	2.13	12.11	2.18
Methionine level (ML)				
100 % of NRC	55.10	122.96	228.94	116.58
120 % of NRC	50.60	126.40	203.10	113.43
Pooled MSE	2.19	1.73	9.89	1.78
Source of variation			P value	
Protein level (PL)	0.315	0.222	0.657	0.264
Methionine level (ML)	0.173	0.205	0.089	0.236
PL × ML	0.713	0.452	0.828	0.546
	Feed conversion ratio (g : g)			
	Days 7-21	Days 22-42	Days 43-49	Days 7-49
Protein level (PL)				
80 % of NRC	2.106 <sup>a</sup>	2.3367 <sup>a</sup>	2.852	2.465
90 % of NRC	1.830 <sup>b</sup>	2.125 <sup>b</sup>	3.144	2.334
100 % of NRC	1.783 <sup>b</sup>	2.131 <sup>b</sup>	3.097	2.254
Pooled MSE	0.072	0.053	0.233	0.073
Methionine level (ML)				
100 % of NRC	1.97	2.34 <sup>a</sup>	2.97	2.46 <sup>a</sup>
120 % of NRC	1.84	2.07 <sup>b</sup>	3.08	2.24 <sup>b</sup>
Pooled MSE	0.07	0.04	0.19	0.06
Source of variation			P value	
Protein level (PL)	0.03	0.011	0.646	0.163
Methionine level (ML)	0.16	0.001	0.673	0.022
PL × ML	0.56	0.475	0.890	0.959