The Effect of Crude Protein Intake on Poultry Average Daily Gain

Daphne Ardizzone, Cody Gerber, Stephanie Hucko, Kedrick Miller, and Jamie Pozezinski
ANSC 324 Group 2 9:30 A.M.

Abstract

This study was conducted to determine if decreasing dietary crude protein (CP) would decrease average daily gain (ADG) in broilers. Three different types of diets each having a different amount of CP were fed to two replicate cages of five chicks per cage from day 1 to day 14. Chicks were weighed every seven days for two weeks. The CP levels for diets 1 (control), 2, and 3 were 23.0, 20.5, and 19.1 %, respectively. The control diet was formulated to meet NRC (1994) requirements for CP and the other diets were formulated to meet minimum NRC requirements for amino acids with the addition of synthetic amino acids. Data were analyzed using t-tests for equal variance. The result from our experiment indicated that between day 1 and day 14 decreasing CP with the supplementation of synthetic amino acids from 23.0 to 19.1 % does not affect broiler ADG.

Introduction

The most recent NRC (1994) lists the crude protein (CP) requirement of 0-3 week old broilers as 23%. Previous experiments have reported that decreasing dietary CP resulted in a decrease in average daily gain (ADG) (Bregendahl 2002). In addition to this, Bregendahl et al. (2004) reported a decreased feed efficiency and growth rate when low protein diets were fed to broilers. To replace the loss of CP and still maintain growth, synthetic amino acids can be used to meet the requirements for the limiting amino acids. Jiang et al. (2005) demonstrated that diets low in CP can be supplemented with synthetic amino acids to maintain performance. The NRC (1994) recommendations for CP are based on the amount of CP that needs to be in the diet to meet the requirements of essential amino acids present in the diet. This is done, assuming that no synthetic amino acids are supplemented to the diet and all amino acid sources are from typical ingredients that are fed to poultry commercially. It was observed that adding the synthetic amino acid glycine to diets low in CP prevented decreases in body weight due to a deficiency of glycine (Waldroup et al., 2005). Our hypothesis was that by decreasing dietary CP with supplementation of synthetic amino acids, ADG would be reduced. To test our hypothesis, we used 30 male broilers obtained on the day of hatch in a 14 day experiment to determine whether ADG and average daily feed intake (ADFI) would be affected by decreases in dietary CP.

Materials and Methods

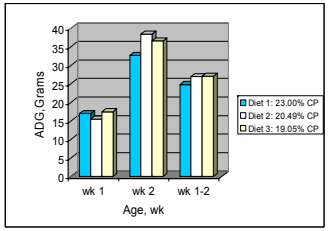
Thirty, day-old, male, broilers were randomly allocated to 6 cages with 2 cages per diet and 5 birds per cage. Birds were placed in Petersime battery cages with nipple waterers, trough feeders, and surface tension waterers. Pen body weight and feed intake were recorded on the first day and at the end of the first and second week. Birds had unlimited access to feed and water. Diets 1, 2, and 3, were formulated to contain 23.0, 20.5, and 19.1% CP, respectively. These values and ingredients were chosen to determine whether the amount of CP in a diet would affect growth rate. T-tests were used to determine the effects of the diet on ADG, ADFI, and gain to feed (G:F) ratio. Significance was determined by P≤0.1. Each pen served as the experimental unit.

Ingredient %	Control	Treatment 1	Treatment 2
Corn	41.58	50.82	56.23
Soybean Meal; 44%	43.75	36.13	31.51
Fat, Soy Oil	10.58	8.80	7.81
Dical. Phosphate	1.74	1.82	1.87
Limeston	1.42	1.43	1.44
Vit. Premix	0.25	0.25	0.25
Total	100.00	100.00	100.00
Calculated Composition			
CP %	23.00	20.49	19.05
Lys %	1.28	1.10	1.03
ME Kcal/kg	1445.00	1455.00	1455.00
Ca %	0.94	0.94	0.94
P %	0.73	0.72	0.71

Results

Dietary CP level showed no significant effect on the performance of broiler chicks. Despite the difference in percent of CP within our three diets, we observed no considerable change in ADG, ADFI, or G:F in chickens 0 to 2 weeks of age. Throughout the experiment and between the three diets, the ADG was between 49.6 to 54.1 grams/day (figure 1). ADFI ranged between 90.1 to 104.2 grams/day (figure 2) and G:F ratio ranged between 1.0 to 1.1 grams/day (figure 3). The range between the diets is too small to show significant data according to the T-tests performed; p-values were all greater than 0.10. Figure 1 and 2 illustrates consistency of the ADG and ADFI between diets. However, the ADG and ADFI increased numerically between weeks 1 and 2, regardless of the diet. While the ADG and ADFI increased with age, the G:F ratio is decreased, as seen in Figure 3.

Figure 1. The Effect of Dietary Crude Protein on Average Daily Gain.
There was no significance in the data P≥0.1.



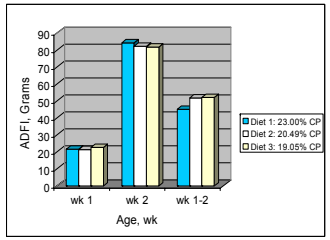
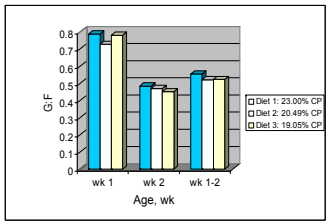


Figure 2. The Effect of Dietary Crude Protein on Average Daily Feed Intake.
There was no significance in data P≥0.1.

Figure 3. The Effect of Dietary Crude Protein on a Gain:Feed Ratio.
There was no significance in data P≥0.1.



Discussion

Based on the results of this experiment we reject the hypothesis that a decrease in dietary CP will cause a decrease in ADG. In contrast, Waldroup et al. (2005) reported that decreasing CP levels below 22% significantly decreased BW gain and increased the feed conversion ratio (FCR). In this same experiment, Waldroup et al. (2005) determined that supplementation with synthetic amino acids partially improved the loss in body weight gain. Our experiment shows similar data, when supplementation with synthetic amino acids in present there is no decrease in ADG. In order to achieve our hypothesis, a diet should have only consisted of a decrease in dietary CP without the addition of synthetic amino acids. Other research that supports our hypotheses shows that by decreasing CP and supplementing with essential amino acids body weight gain is negatively affected (Pinchasov, 1990). The difference between our results and the results of other research experiments could be due to the time length of the experiment. Other experiments ran for 21 days or more, whereas our research only lasted for 14 days. Even though our results and data do not prove our hypothesis correct, plenty of other experiments, such as Pinchasov (1990) and Waldroup et al. (2005), have been performed and successfully provide evidence supporting our hypothesis. Another reason that our results could have conflicted with our hypothesis and other experiments is due to experimental errors such as feed wastage, or problems in weighing the chickens as they became larger and more active.

Implications

This experiment determined that by decreasing CP with the supplementation of synthetic amino acids there is no decrease in average daily gain, feed efficiency, or growth:feed ratio. Supplementing diets with synthetic amino acids can decrease the dependency that producers have on high protein feed ingredients such as soybean meal. With corn prices continuing to increase and more corn producers breaking the crop rotation of corn/soybean meal, the economical value of using soybean meal should decline. Synthetic amino acids can be used to combat the increasing prices, without any negative affects on the growing broilers.

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NRC (1994) Lysine Requirement (1.10%) of 0-2wk Broilers Remains Sufficient for ADG and Gain:Feed

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ANSC 324 – 9:30am Group 3

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ABSTRACT

This study was designed to determine if the 1994 National Research Council (NRC) lysine requirement is sufficient for 0-2 wk old broiler chicks. To test this, three different diets were formulated and fed to a total of 30, day old, male broiler chicks, each diet varying only in the amount of lysine over a two week period. Diet 1 contained the NRC requirement of adequate lysine, 1.1%, diet 2 was lysine deficient, with only 1.0% lysine, and diet 3 contained extra lysine, with 1.2%. Each diet was fed to two replicate cages with five birds per cage. Each week, the birds and the feed consumed were weighed and data recorded. Average daily gain (ADG), average daily feed intake (ADFI), and gain to feed (G:F) were calculated from the data. Results were analyzed using the t-test procedure on Excel to determine the effects of lysine level on performance. Feed intake of birds on the diet containing extra lysine was higher ($P < 0.1$) than for birds on the diet containing deficient lysine during the first week. The feed efficiency (G:F) of birds on diet deficient of lysine was higher ($P < 0.1$) than for birds fed adequate or extra lysine. There was no effect of dietary lysine levels on performance during the second week. Therefore, the NRC requirement is sufficient based on ADG and G:F. Not only do the broilers eat less (ADFI), but they gain more efficiently over the two week period when fed the NRC 1.1% lysine diet. This is useful for producers because they can feed less with successful outcomes. The aim of this study was to determine if the 1994 NRC lysine requirement (1.1%) for 0-2 week broiler chicks is sufficient based on G:F, ADFI, and ADG.

INTRODUCTION

Amino acids are essential in an animal's diet since amino acids are the building blocks of protein used by the body. Dietary lysine, in particular, has significant effects on growth rate and development. Lysine is crucial to broiler chicks because it is their second limiting amino acid—the amino acid found in the diet at the lowest concentration relative to the animals' requirements. The minimum requirements for broilers are given by the National Research Council (NRC), most recently published in 1994. NRC recommends feeding 0-3wk old broiler chicks 1.1% lysine in the diet (90% DM). Previous research suggested that the 1994 NRC requirement for dietary lysine may be too low for 0-3wk old broiler chicks (Si, et al., 2001). Feeding lysine deficient diets to broiler chicks decreases growth rate. In a study conducted by Tessaraud, et al. (1992), it was determined that in growing chicks, a deficiency in lysine reduces growth rate and has great effect on the development of the pectoralis major muscle. Amino acids play an important role even at an early age, thus ensuring they will grow at an optimal rate later in life. When comparing dietary lysine levels to the concentration of all essential amino acids in broiler diets, it was determined that the NRC (1994) lysine levels and other essential amino acids are adequate for optimum performance of male broilers processed at 56 days but may be less than adequate at younger ages (Si, et al., 2001). From this we hypothesized that the NRC (1994) lysine requirement (1.10%) for 0-3 week old broiler chicks is to low. Therefore, this experiment was conducted to determine if the NRC (1994) levels are adequate, too high, or too low for 0-2 week old broiler chicks based on growth performance and feed efficiency.

MATERIALS & METHODS

- Thirty, day old, male broiler chicks were used in a 2-week experiment to evaluate the (1994) NRC lysine requirement.
- Five birds were randomly assigned to each of the 6 cages with 2 cages per diet.
- Birds were allowed free access to water and feed.
- Pen body weight and feed intake were recorded weekly.
- Pen served as experimental unit.
- Results were analyzed using the t-test procedure of Excel.
- All diets were corn and soybean meal based and contained the following levels of lysine:
  - **DIET 1**: Control diet (1.1%)
  - **DIET 2**: Lysine deficient diet (1.0%)
  - **DIET 3**: Extra lysine diet (1.2%)

DIET FORMULATION

	Diet 1	Diet 2	Diet 3
Ingredients	%	%	%
Corn	59.16	62.85	58.87
Soybean meal	30.19	26.90	30.24
Soybean oil	5.25	4.75	5.36
Dical Ph	2.01	2.03	2.01
Limestone	1.40	1.41	1.40
Premix*	1.99	2.06	2.12
Premix* formula			
Salt	.48	.48	.48
Premix	.25	.27	.25
Met	.24	.25	.24
Lys	.01	.06	.14
L-Thr	.01	0.0	.01
Corn	1.0	1.0	1.0

CALCULATED COMPOSITION OF DIETS

	Diet 1	Diet 2	Diet 3
Dry Matter %	89.7	89.6	89.6
Met. Energy %	1455	1455	1455
Crude Protein %	19.9	18.6	18.8
Lysine %	**1.10**	**1.00**	**1.20**
Meth+Cystine %	.90	.90	.90
Threonine %	.79	.74	.74
Calcium %	1.0	1.0	1.0
aP %	.45	.45	.45
Sodium %	.20	.20	.20

RESULTS

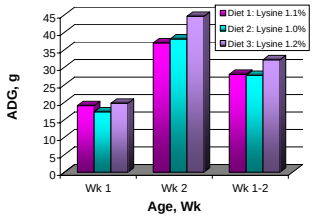

Figure 1. Average Daily Gain (ADG): Dietary lysine level had no effect (P>0.1) on ADG during week 1, week 2, or overall.

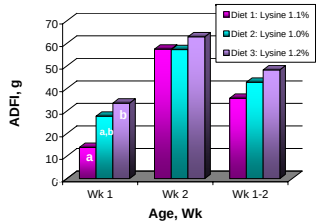

Figure 2. Average Daily Feed Intake (ADFI): Different subscripts represent significant differences (P<0.1) within each week.

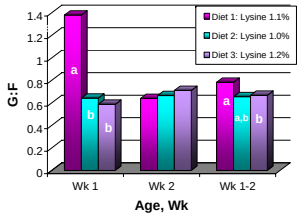

Figure 3. Gain to Feed (G:F): Different subscripts represent significant differences (P<0.1) within each week.

DISCUSSION

According to Tesseraud et al. (2001), lysine deficiency decreases feed efficiency and feed intake and reduces muscle weights and the protein content of the carcass. According to another study by Han et al. (1991), maximal G:F was achieved in different strains of broilers at a digestible lysine level not greater than 1.21% of the diet.

Based on the results of this experiment, our original hypothesis was incorrect. In fact, the NRC requirement is sufficient for our strain of birds. However, other research suggests that the 1994 NRC lysine requirement for 0-3 week broiler chicks may be too low (Si, et al., 2001), which disagrees with the results.

In contrast to ADG, there is a difference in ADFI between the adequate (NRC) lysine diet and the extra lysine diet during week one only. Feed wastages may be responsible for inaccurate data regarding the amount of feed intake. Also, there is a significant difference in G:F between the adequate lysine diet and both the lysine deficient and the adequate lysine diets during week one only. There is also a difference in G:F between the adequate lysine diet and extra lysine diet throughout the two weeks overall. There was no difference in G:F between the deficient and extra lysine diets during week one. This contrasts what previous research has suggested (Si, et al., 2001).

Therefore, birds fed the NRC lysine requirement (1.1%) had better performance overall. This is beneficial because not only do the chicks eat less (ADFI), but gain more efficiently (G:F) within the first two weeks post hatching. This will reduce the cost on feeding supplemental lysine.

CONCLUSION

Lysine is a very important component of broiler chick diets. Future studies are needed using a larger number of broilers over a longer period of time. Also, several different strains of broilers could be studied by feeding different amounts of lysine in the diet and comparing that data to previous research. Overall, the 1994 NRC lysine requirement of 1.1% is sufficient for 0-2wk old broilers based on the results of these experiments.

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The Effects of Using Alternate Sources of Calcium and Phosphorus in Place of Dicalcium Phosphate and Limestone

Leslie Linderleaf, Joshua Koontz, Melissa Elischer, and Kristen Brodt
ANSC 324 - 9:30am Laboratory Group 4

Abstract

A two-week study was designed to test the growth and performance of broiler chicks fed a corn-soybean meal (C-SBM) based control diet with dicalcium phosphate (DCP) and limestone compared to chicks fed diets in which Ca and P were supplied with meat and bone meal (MBM), fish meal (FM), and alfalfa meal (AM). Thirty broiler chicks were randomly allocated to three diets with two replicate cages per diet (5 birds/cage). The three diets were formulated to contain ingredients that would meet or exceed the Ca and P requirements of 0-3 wk old chicks. The control diet was a C-SBM based diet with DCP and limestone. Dicalcium phosphate and limestone were replaced with MBM to meet or exceed Ca and P requirements in diet 2, and the third diet used a combination of MBM, FM, and AM to replace DCP and limestone. On d 1 and at the end of every week, pen body weight (BW) and feed intake were recorded. Average daily gain (ADG), average daily feed intake (ADFI), and feed to gain ratio (F:G) were calculated for each week. No significant difference was seen in ADG, ADFI, and F:G in chicks fed diets containing alternate Ca and P sources.

Introduction

Calcium and phosphorus are required in poultry diets to sustain growth rates and for skeletal integrity. However, sources of Ca and P vary depending on the geographic location's resources. The poultry and swine industries are predominant consumers of meat and bone meal because of its high calcium, available phosphorus, and lysine content (Miles and Jacob, 2007). According to the Institute of Poultry Research, meat and bone meal can be successfully used in broiler diets with concentrations reaching 10% of the diet, (Bozkurt, et al., 2004). Our hypothesis was that similar growth and performance to chicks fed a corn-SBM based control diet with DCP and limestone can be obtained by adding meat and bone meal, fish meal, and alfalfa meal to meet the Ca and P requirements in place of DCP and limestone. To test our hypothesis, thirty, male, broiler chicks were fed three different diets: a control diet with DCP and limestone, a diet containing meat and bone meal in place of DCP and limestone, and a diet with meat and bone meal, fish meal, and alfalfa meal to replace DCP and limestone.

Materials and Methods

- 30 male broilers obtained on day of hatch
- Fed an adjustment diet for 1 day
- Randomly allotted to Petersime battery cages with nipple waterers and trough feeders
- Housed at 5 birds/pen at 2 pens/diet
- Allowed ad libitum access to feed and water
- All diets were corn-SBM based and were formulated to meet or exceed all nutrient requirements (NRC 1994)
- Diets were (Table 1):
  1. Corn-SBM control with DCP and limestone
  2. Corn-SBM based with meat and bone meal
  3. Corn-SBM based with meat and bone meal, fish meal, and alfalfa meal
- Chicks were checked daily
- Pen body weight (BW) and feed intake recorded weekly
- Mortality and morbidity recorded daily
- Average daily gain, average daily feed intake, and gain to feed ratios calculated each week
- T-tests performed on ADG, ADFI, and G:F
- Level of significance was set at P<0.1

Ingredients, %	**Diet 1**	**Diet 2**	**Diet 3**
Corn	50.10	57.09	48.17
SBM, 47.5% CP	38.14	26.67	19.29
Soybean oil	6.53	4.78	7.93
Meat & Bone Meal	0.00	9.72	2.94
Fish Meal	0.00	0.00	10.00
Alfalfa Meal	0.00	0.00	10.00
Dicalcium Phosphate	1.96	0.00	0.00
Limestone	1.37	0.00	0.00
Salt	0.48	0.31	0.31
D,L-Methionine	0.16	0.19	0.11
Poultry Vit/TM premix[a]	0.25	0.25	0.25
Calculated Composition			
CP, %	23.00	23.00	23.00
Lys, %	1.32	1.26	1.26
ME, Kcal/kg	1455	1455	1455
Ca, %	1.00	1.00	1.00
P, %	0.45	0.48	0.48

[a] Poultry Vit/TM premix includes Zinc at 40mg/kg, Manganese at 60mg/kg, Vitamin D at 200 ICU/kg, and Vitamin E 10 IU/kg

Results

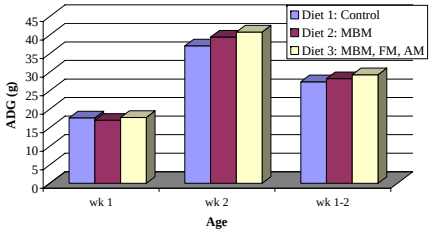

Figure 1. Effects of alternate sources of Ca and P on average daily gain in 0-2 wk old broilers. There were no effects (P>0.10) of diet on ADG.

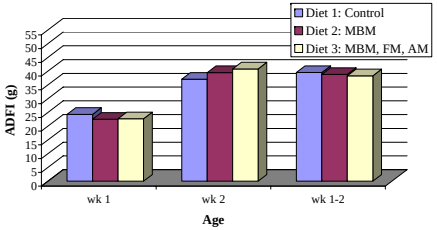

Figure 2. Effects of alternate sources of Ca and P on average daily feed intake in 0-2 wk old broilers. There were no effects (P>0.10) of diet on ADFI.

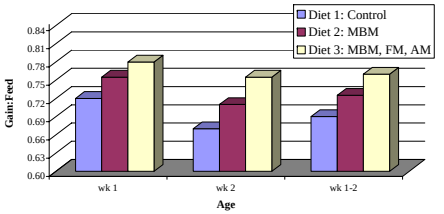

Figure 3. Effects of alternate sources of Ca and P on gain to feed in 0-2 wk old broilers. There were no effect (P>0.10) of diet on G:F.

Discussion

This two-week experiment indicates that alternative sources of Ca and P (such as meat and bone meal, fish meal, and alfalfa) were effective in meeting the Ca and P requirements of broiler chicks. Our results are supported by the findings of Bozkurt, et al. (2004), who used MBM as the source of Ca and P for turkeys for their experiment. Bozkurt, et al. (2004) also reported that high levels of MBM in the diet resulted in a slight increase (P>0.05) in ADG, compared to the birds fed the control diet. This same phenomenon was observed in our results, but was not significant.

The percent of MBM included in the diet was kept under 10%, which seems to offer the greatest benefits to the chicks. Experiments with up to 40% MBM have been conducted, but the accepted inclusion rates generally fall between 2-7%, with 10% as the upper limit ((Miles and Jacob, 2007). Although no change in ADG, ADFI, or F:G were observed, the alternate sources of Ca and P may offer other benefits from additional nutrients, such as vitamin B12, amino acids, zinc, and iron found in meat and bone meal. Though specific research on the affects of fish meal and alfalfa were not obtained, we feel that these two ingredients made positive contributions to the diet because. Both of these feeds offer other important nutrients, such as high levels of niacin, amino acids, and selenium in fish meal, and high concentrations of bioavailable P, beta-carotene, vitamin E, and pantothenic acid in alfalfa.

Implications

•The results from this experiment did not show any significant difference in the ADG, ADFI, or F:G in the birds on the three diets, but we feel that the alternate sources may be beneficial because they provide other nutrients for the animals.

•These alternatives are may be less costly for some producers, thus there could be an economic advantage to using these different ingredients (Bozkurt et al., 2004).

•Due to high levels of Ca and P in these alternate sources, there is a limit to the inclusion level in the diet to avoid environmental problems from excess excretion of these nutrients.

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The Effect of Organic Acids on Average Daily Gain in Chicks

Colt Daugherty , Mallory Distler, Jamie Kreiter and Anne Kurosawa

Purdue University, Department of Animal Science 9:30 am Group 5

Abstract

Thirty, day-old broiler chickens were used in a 14 day trial to evaluate the effects of organic acids on average daily gain, ADFI and feed efficiency. Three diets with two different organic acids were used in this experiment: Diet 1 contained 2% cellulose, Diet 2 contained 2% fumaric acid and Diet 3 contained 2% citric acid. Each of the diets was fed to two pens each containing five chicks. Pen body weights and feed intakes were recoded each week. Organic acids had no effect (P>0.10) on average daily gain. The chicks that were fed diet 1 had an ADG of 24.87g, chicks fed diet 2 had an ADG of 28.27g and chicks fed diet 3 had an ADG of 29.52g. The addition of organic acids to the diet had no effect on ADFI (P>0.10). Chicks fed diet 1 had an ADFI of 32.51g, diet 2 had an ADFI of 33.90g and diet 3 had an ADFI of 34.77g. There was no effect (P>0.10) of adding organic acids to the diet on G:F. G:F ratio for chicks fed diet 1 was 0.75, for diet 2 was 0.83 and diet 3 was 0.85. Therefore, according to the results of the study, addition of organic acids to poultry diets does not increase growth rate or feed efficiency.

Introduction

The use of antibiotic additives in poultry feed is a common method used to promote growth and to decrease bacterial growth. However, concerns have increased over antibiotic resistant strains of bacteria including Escherichia coli and Salmonella (Hernandez et al., 2003). Organic acids have been shown to have similar effects as antibiotics and may be used as an alternate means to promote growth and performance in poultry (Denli et al., 2003). Organic acids have been shown to reduce the intestinal pH of the animal to control bacterial growth. In addition, organic acids release substances that change the enzymatic reactions of bacteria and their nutrient transport systems, eventually leading to bacterial death (Hernandez et al, 2006). Hernandez et al (2006) reported that the use of organic acids increased feed efficiency and average daily gain, while decreasing bacterial growth in the intestines. We hypothesized that the use of fumaric or citric acids would positively impact body weight gain of broiler chickens. Therefore, this project was designed to evaluate the performance response of broiler chickens in terms of their average growth rate and feed consumption.

Materials and Methods

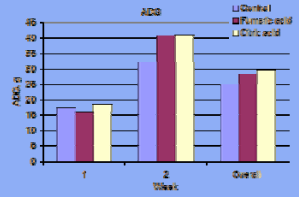
- 30, male broilers were obtained on the day of hatch
- Fed a supplemental diet for 1 day
- Randomly assigned to 6 petersime battery cages, all containing nipple waterers and deep trough feeders
- 5 birds per pen, 2 pens per diet
- Birds had ad libitum access to feed and water
- Morbidity and Mortality recorded daily
- Diets 1, 2, and 3 were corn-soybean meal based and formulated to meet all nutrient requirements of 0-3 week old chicks (NRC, 1994)
- In diets 2 and 3 acids (Fumaric and Citric) were substituted in place of cellulose, respectively
- Pen body weights and feed intake were recorded weekly
- T-test procedures on Microsoft Excel were performed to compare diet means

Results

Figure1. Dietary Composition (As-Fed)

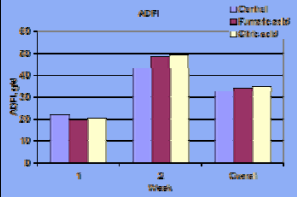
	Diets		
	1	2	3
Ingredients %			
Ground Corn	40.90	40.90	40.90
SBM, CP 47.5%	39.12	39.12	39.12
Soybean Oil	8.21	8.21	8.21
Meat & Bone Meal	7.40	7.40	7.40
Cellulose	2.00	0.00	0.00
Fumaric Acid	0.00	2.00	0.00
Citric Acid	0.00	0.00	2.00
Vit/TM Premix [a]	2.37	2.37	2.37
Calculated Composition			
Dry Matter, %	90.52	90.52	90.52
ME, kcal/kg	661.36	661.36	661.36
CP, %	26.39	26.39	26.39
Ca, %	1.00	1.00	1.00
aP, %	0.45	0.45	0.45
DL-Methionine,%	0.10	0.10	0.10
Lysine, %	1.54	1.54	1.54

a. Provided Composition: Dicalcium Phosphate, Limestone, Premix, Salt



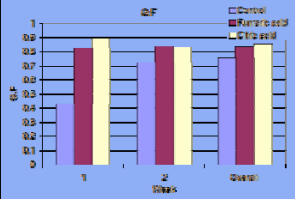
This graph shows little distinction between all three sets of data, signifying minimal significance in the results. Our t-test also concluded that the difference is not significant.

Figure 1. The effect of organic acids on ADG.



This graph shows little distinction between all three sets of data, signifying minimal significance in the results. Our t-test also concluded that the difference is not significant.

Figure 2. The effect of organic acids on average daily feed intake.



This graph shows little distinction between all three sets of data, signifying minimal significance in the results. Our t-test also concluded that the difference is not significant.

Figure 3. The effect of organic acids on the gain to feed ratio.

Discussion

The objective of this experiment was to increase average daily gain and feed efficiency of broilers. We hypothesized that the addition of citric or fumaric acid, would improve ADG and feed efficiency, with the greatest improvement from the addition of fumaric acid to the diet. Krause et al. (1994) reported that the addition of organic acids such as fumaric and citric acids and NaHCO3 improve broiler performance and ADG.

In contrast, no improvements in ADG, ADFI and G:F with the addition of the two organic acids were observed in this experiment. It is important to note that the addition of these organic acids is to replace the use of antibiotics (Hernandez et al. 2003). Therefore, if there is no disease challenge in these chicks during the two week duration of the experiment, then there would be no reason for chicks to show improvement in performance. In this experiment, we can not say that there was indeed a disease challenge because there was no microbiology done to the chicks to confirm or deny this factor. If this study was performed for a long enough duration for disease formation, the results may have varied. This study was also performed with only two reps for each diet leading to very little data for analysis.

According to Krause et al (1994), when only organic acids were added; there were no signs of increased ADG or ADFI. These findings therefore, agree with our experimental data. Eckel et al. (1992) reported that the addition of fumaric acid to the diet did not change feed intakes, but the addition of citric acid to the diet reduced feed intake. Thus, it would explain one potential reason the ADG in our study was not improved with the addition of the organic acids. Finally, Partanen & Mroz et al. (1999) concluded that it was difficult to determine the optimum level at which organic acids should be fed in the diet. Thus, from our research and specifically Dr. Radcliffe's lecture, we determined our added amounts or organic acid to be 2%. However, with the observations of Partanen and Mroz, a potential factor for no significant results may have been due to our level of inclusion of the organic acids. Although our experiment resulted in no improvements in ADG, ADFI or G:F, a longer duration, use of a positive control and more chicks may lead to significant results in future studies.

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The Effects of Crude Protein in the Diet on Increased Broiler Gain

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Lab 9:30 Group 1

ABSTRACT

A two-week study was designed to test the hypothesis that increasing the amount of dietary crude protein (CP) in broiler diets would increase the rate of gain and decrease the number of days to reach market weight. Thirty, day-old male broilers were selected at random and divided into six cages of five birds each with two replicates per diet. Diets were formulated to contain 23, 26, and 29% CP. Pen body weight and feed intake were determined weekly and average daily gain (ADG), average daily feed intake (ADFI), and gain to feed ratio (G:F) were calculated. During week two, birds fed 26% CP grew faster (P< 0.1) than birds fed 23% or 29% CP levels; however, there was no effect on growth rate during week one. Birds fed 29% CP did show an increase in average daily gain compared to birds fed 23%; however, not at the rate of birds fed 26% CP died. In support of our hypothesis feeding 26% dietary CP increases average daily gain during week two, but further increases in dietary crude protein were detrimental.

INTRODUCTION

Reducing days to market may increase profitability in the broiler industry. The best way to increase growth rate is to make appropriate dietary changes. During days 0 to 21, chicks fed 17% dietary protein resulted in smaller weight gain and poorer feed conversion than chicks fed 19, 21 or 23% crude protein (Nguyen et al. 2005). The NRC (1994) states the requirement for 0-2 week old broilers is 23% crude protein. An adequate level of crude protein is required to make sure there is enough nitrogen to allow the body to synthesize non-essential amino acids (BOA. 1004). Rezaei et al. (2004) experimented with feeding broilers 208.4 g/kg and 178.4 g/kg crude protein. Birds fed 178.4 g/kg of crude protein had decreased weight gain and daily feed consumption compared to birds fed 208.4 g/kg crude protein (Rezaei et al. 2004). In addition, dietary crude protein fed at 120% of the recommended crude protein levels in starter diets increased body weight gain in the starter phase and in the consecutive grower phase (P. J. A. Wijtten. 2004). Moreover, it was shown that a delay in body weight gain due to suboptimal crude protein levels in the starter diet decreased growth rate in the growing phase of broilers (P. J. A. Wijtten, 2004). Therefore, the objective of this experiment was to evaluate the effects of higher dietary protein levels on gain. We hypothesized that increasing dietary crude protein would increase growth rate.

MATERIALS AND METHODS

- 30 Male broilers were obtained on the day of hatch
- Randomly allotted to Petersime battery cages with nipple waterers and trough feeders
- Housed at 5 birds/pen with 2 pens/diet
- Allowed ad libitum access to feed and water
- Three diets were formulated: Diets 1, 2, and 3 containing 23, 26, and 29% CP
- All diets were formulated to meet nutrient requirements for 0-3wk old broilers
- Pen body weight and feed intakes were recorded weekly
- Diet means were compared using the t-test procedure of excel
- Pen was the experimental unit

Table 1. Diet Composition

	Diet		
Ingredients, %	**23% CP**	**26% CP**	**29% CP**
Corn	49.92	47.17	55.22
SBM, 48% CP	39.08	40.62	31.33
Soybean Oil	6.74	8.08	9.42
Dical Phosphate	1.95	1.9	1.86
Limestone	1.37	1.35	1.33
Premix[a]	0.93	0.88	0.84
Calculated Composition			
MET. Energy KCAL	1455	1455	1455
Lysine	1.30	1.52	1.74
Phosphorous	.45	.45	.45

a. Premix shown in Table 2.

Table 2. Diet Composition of Premix

	Diet		
Premix	**23% CP**	**26% CP**	**29% CP**
Salt	.48	.48	.48
Vitamins/ TM premix	.25	.25	.25
DL Methionine	.2	.15	.11

RESULTS

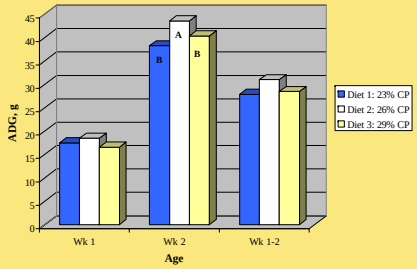

Figure 1. The effects of CP on ADG

Diet means within week that have different superscripts are different (P<.10)

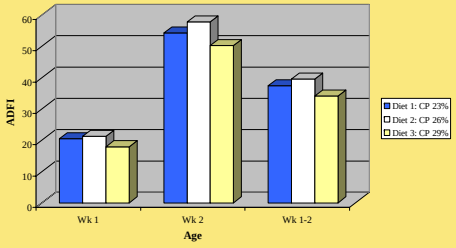

Figure 2. The effects of CP on ADFI

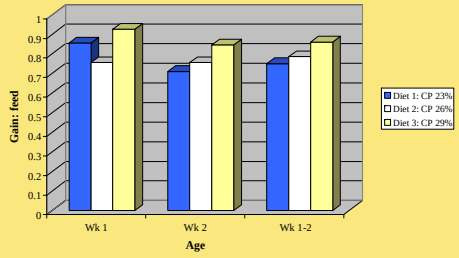

Figure 3. The effects of CP on gain to feed ratio

DISCUSSION

- By the end of week two, birds fed 26% CP were heavier than birds fed 23% and or 29% CP diets. In the study by Nguyen and Bunchasak, higher CP levels resulted in faster gain in broiler chicks. (Nguyen and Bunchasak, 2005).
- The lack of effects of CP on gain in the first week was similar to Rezaei,et al. (2004) and Nguyen and Bunchasak (2005). This could be due to chicks not getting started on feed well and not having a great amount of feed intake in the first few days as they are still gaining nutrients from the remnants of the yolk (4-H Virtual Farm, 2007).
- The only data from the results that were significant from the t-test analysis were in week two, diet two 26% CP, which showed there was a significant difference in the affect of average daily gain. In studies performed by Bunchasak and Nguyen, they had more significant differences in the result of their data and also used a P-Value <0.05, where we used a P-Value < 0.1.
- Another reason for a lack of significant difference in our data is the fact that the study was conducted for only two weeks and most of the results found in other studies were broken down into 0-3 week old bird studies and from 4-6 week old birds, as well as 0-42 day studies, when the birds were harvested. Also, another reason for the unexpected outcome of the birds in diet three may have been that in pens closer to the floor there was a difference of 2-3 degrees Fahrenheit lower than the birds of the other diets and that may have affected feed intake in the first few days of age.

IMPLICATIONS

- Higher dietary crude protein resulted in increased gain (Wk2), hence the poultry producers can take advantage of this and finish the broilers quicker.

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