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Abstract

Nine hundred and sixty day-old chicks of both sexes were divided into 24 groups of 40 birds each and fed for 42 days. Diets were prepared and fed over two phases (1-21 and 22-42 days of age). They were calculated to be deficient either in methionine and sulfur amino acids (negative control diet) or supplemented with 0.24% DL-Methionine (DL-M) or 0.37% Methionine Hydroxy Analogue (MHA). Weight gain and feed intake were calculated so that an evaluation of the efficacy of the 2 sources of methionine could be made. A significant response ($P < 0.05$) in the average weight gain over negative controls (0.55+0.01 kg/bird) was found for DL-M supplemented diets (0.59± 0.01 kg/bird) in phase I, whereas MHA (0.57±0.01kg/bird) did not show any improvement. The feed conversion ratio of DL-M (1.80±0.03) and MHA (1.82±0.04) was significantly different to the negative control (1.93±0.03). There were no significant differences in all performances during phase II. The overall results showed that broilers fed with 0.24% DL-Methionine or 0.37% Methionine Hydroxy Analogue fortified rations showed the same growth rates. It may be concluded that MHA was 65% as efficient as DL-methionine in broiler chicks during the 1-21 day old period of their lives.

Keywords : DL-Methionine, Methionine Hydroxy Analogue, Efficacy, Broiler chicks

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Introduction

Methionine is considered as the first limiting amino acid in broiler feed. There are two commercial products available in the market, DL-Methionine (DL-M) and Methionine Hydroxy Analogue (MHA). Both products are converted by the animals with complete utilization and therefore both should be converted with equal efficiency. This point has been researched and reviewed by many people. van Weerden and Schutte (1983) tested both products by feeding a practical diet deficient in sulfur amino acids (corn-soy diet) to broiler chicks between 1 and 38 days of age. They found that DL-Methionine Hydroxy Analogue Free Acid (MHA-FA) was utilized less efficiently than DL-M. On an equimolar basis, MHA had an efficacy 72% and on a weight basis 63% compared to DL-M. This result was in close agreement with the results reported by Boebel and Baker (1982) and Muramutsu *et al.* (1984), that MHA-FA was 76.5±5 and 70±14.9% as efficacious as DL-M when compared on an equimolar basis, in chicks fed with methionine deficient, semipurified, feather meal diet and a diet completely devoid of sulfur-containing amino acids, respectively. Potter (1984) estimated that DL-Hydroxy Methionine Analogue (HMA) had 75% of the molar activity of L-Methionine (L-M). This translates to 66% efficacy on a weight or concentration basis. Thomas *et al.* (1991) conducted an experiment to determine the bioefficacy of MHA-FA in male broilers from 7 to 21 days of age. They showed that the bioefficacy values of the MHA-FA were 72±5 and 73±7%; when based on weight gain and feed conversion, compared with the value of DL-M on an equimolar basis. Eduardo *et al.* (1991) reported that based on weight gain and feed conversion, 69 and 66% of DL-M was needed to provide the same activity as MHA-FA. In contrast, Waldroup *et al.* (1981) reported that the performance of chicks fed MHA-FA was equal to L-M and DL-M when based on an equimolar basis. Elkin and Hester (1983) found no differences between the effectiveness of supplements of HMB, DL-M and L-M when producing market weight broilers, data which was supported by Garlich (1985).

One important aim in animal production is to formulate good quality feed at the lowest cost. Before choosing any sources of ingredient, efficacy and cost should be taken into consideration. DL-M and MHA are widely used as a source of methionine in feed formulation. This experiment was conducted to compare the growth performance of broilers receiving diets fortified with either 0.24% DL-Methionine or 0.37% Methionine Hydroxy Analogue.

Material and Methods

960, day-old Arbor Acre chicks of both sexes, were randomized into 24 groups of 40 birds each. Three treatments were carried out, with 8 replications per treatment. The chicks were allowed free access to feed and water until 42 days of age. The average ambient temperature and the relative humidity during the experiment was 30.02±6.69°C and 98.11±3.27%. The composition of the trial feeds is shown in Table 1. Diets, with the exception of methionine and sulfur containing amino acid were calculated to meet or to exceed the amino acid levels recommended by the National Research Council (NRC, 1994). The negative control diets were calculated to contain 0.36 and 0.32% methionine and 0.69 and 0.65 % methionine plus cystine, for phases I and II (1-21 and 22-42 days periods) respectively. The test diets consisted of the negative control diet and the diet supplemented on weight basis with 0.24% DL-M and 0.37% MHA in both phases. The analytical values of the amino acids in the diets (Table 2) were close to the calculated figures.

All chicks and feeds were group weighed at 21 and 42 days. The data on body weight, feed intake and feed conversion were statistically analyzed by an ANOVA procedure using the SPSSPC statistical program. Differences between treatments were tested by Duncan's New Multiple Range Test.

Table 1 Composition of the basal diets (%)

Ingredient	Phase I (1-21 days)	Phase II (22-42 days)
Corn	50.50	50.50
Rice bran	8.90	9.65
Soybean meal	27.00	28.00
Fish meal	6.00	3.00
Dicalcium phosphate	1.20	1.20
Oyster shell	0.65	0.90
Vegetable oil	5.00	6.00
Salt	0.35	0.35
Premix	0.25	0.25
Syn. lysine	0.05	0.05
Monensin	0.10	0.10
Calculated analysis (DM-basis)		
Crude Protein	21.04	19.89
Lysine	1.25	1.15
Methionine	0.36	0.32
Methionine + Cystine	0.69	0.65
Calcium	1.01	0.90
Phosphorus	0.50	0.42
Metabolizable energy (Kcal/Kg)	3,155	3,149

Table 2 Chemical analysis of diets (% of DM)

Nutrients	Phase I (1-21 days)			Phase II (22-42 days)		
	Control	DL-M	MHA	Control	DL-M	MHA
Crude Protein	21.16	20.91	20.50	18.68	18.91	19.24
Amino acid [1/]						
Methionine	0.38	0.63	0.38[2/]	0.30	0.51	0.31[2/]
Cystine	0.36	0.35	0.34	0.33	0.33	0.33
Methionine + Cystine	0.73	0.99	0.72	0.63	0.84	0.64
Lysine	1.25	1.22	1.19	1.00	0.99	1.01
Threomine	0.79	0.78	0.76	0.68	0.68	0.70
Arginine	1.38	1.35	1.26	1.24	1.25	1.25
Isoleacine	0.87	0.86	0.84	0.78	0.80	0.80
Leucine	1.69	1.67	1.64	1.54	1.56	1.57
Valine	1.00	0.98	0.98	0.88	0.89	0.89
Histidine	0.55	0.54	0.56	0.50	0.49	0.49
Phenylalanine	0.97	0.97	0.93	0.92	0.93	0.93
Glycine	1.07	1.07	0.96	0.88	0.87	0.89
Serine	0.95	0.95	0.91	0.88	0.88	0.89
Alanine	1.15	1.14	1.10	0.99	1.00	1.10
Aspatic acid	2.00	1.97	1.85	1.79	1.81	1.83
Glutamic acid	3.14	3.08	3.18	3.00	2.99	3.04

1/ Oxidation method for amino acid analysis

2/ MHA can not be detected by the oxidation method for amino acid analysis

Results

The average weight gain, feed intake and feed conversion of the chicks are presented in Table 3. In the 1st phase, chicks fed diets fortified with either DL-M or MHA gave a higher average weight gain and a lower feed conversion ratio than the chicks fed the negative control diet ($P < 0.05$). Chicks fed on DL-methionine supplemented diets had a tendency to perform better than those fed on MHA. In phase II, no significant difference was found. However, chicks fed the fortified diets tended to have a superior average weight gain compared to the negative controls. MHA diet gave slightly better feed conversion than DL-M diets.

Overall, the experiment only showed significant differences in the average weight gain ($P < .05$) between the negative controls and the supplemented groups. Chicks fed diets fortified with DL-M and MHA tended to have a better feed conversion compared to the controls. No significant differences in feed intake were observed in all phases. Mortality was less than 5% for each treatment.

Table 3 Performance of broiler chicks[1/]

Observation	F-Prob[2/]	Negative control	DL-methionine	MHA
Phase I (1-21 days)				
Av.weight gain, kg/bird	0.019*	0.551 ±0.01^{A}	0.587±0.01^{B}	0.567 ±0.01^{AB}
Av. feed intake, kg/bird	0.430	1.063 ±0.02	1.057±0.02	1.033 ±0.02
Feed conversion	0.037*	1.931 ±0.03^{A}	1.802±0.03^{B}	1.824 ±0.04^{B}
Phase II (22-42 days)				
Av. weight gain, kg/bird	0.141	1.108 ±0.02	1.147±0.01	1.141 ±0.01
Av. feed intake, kg/bird	0.069	2.693 ±0.05	2.835±0.04	2.766 ±0.01
Feed conversion	0.645	2.432 ±0.03	2.472±0.05	2.425 ±0.03
Whole period (1-42 days)				
Av. weight gain, kg/bird	0.038*	1.659 ±0.03^{A}	1.735±0.02^{B}	1.708 ±0.01^{AB}
Av. feed intake, kg/bird	0.136	3.757 ±0.06	3.892±0.05	3.800 ±0.02
Feed conversion	0.573	2.264 ±0.02	2.245±0.04	2.224 ±0.02

[1/] Mean ± Standard Error

[2/] A, B Means within each row with different superscripts are significantly different ($P < 0.05$)

Discussion

On a weight basis, the result clearly showed that the weight gain and the feed conversion ratio of the group supplemented with DL-methionine was not significantly different to MHA in phase I. This means that MHA had 65% of the efficacy of DL-M which confirms previous studies (Boebel and Baker, 1982 ; van Weerden and schutte, 1983 ; Potter, 1984 ; Eduardo *et al.*, 1991 and Thomas *et al.*, 1991) and which are strongly supported by Huyghebaert (1993). Huyghebaert reported that the bioefficacy of MHA-FA was calculated as 73% for weight gain and 68% for feed conversion, when based on an equi-

molar basis. This corresponds to an efficiency of Alimet® of between 60 and 64%, relative to DL-M on a weight for weight basis.

In phase II, there were no significantly changes in the performance when DL-M and MHA were supplemented. This could be explained by the possibility that the level of methionine and sulfur amino acid in the negative control diet was not low enough to exhibit a poor growth performance, even though the levels of those amino acids were lower than the recommended levels of NRC (1994). Schutte and Pack (1995) reported that the minimum levels of methionine and sulphur amino acid in feed for growth and feed conversion were 0.34 and 0.64%, respectively. These were close to the levels used in the negative control diet in phase II, which contained 0.32 and 0.65%, respectively. Suboptimal lysine levels in the feed, compared to the calculated level might have contributed to the lack of any performance response.

For the whole period, a significant difference was found only in the growth rate during the first phase. The feed conversion ratio was not different because of the higher feed intake in the supplemented groups compared to the negative control, in phase II, even though there was a significant difference in phase I.

This study showed that broilers fed with 0.24% DL-Methionine or 0.37% Methionine Hydroxy Analogue fortified rations showed the same growth rate during the first 21^{th} days of the growing period. From this it is concluded that MHA had 65% of the efficacy of DL-methionine when compared on a weight basis in broiler chicks over the 1-21 day period.

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ประเมินประสิทธิภาพการใช้ ดี-เอล เมทไทโอนีน และ เมทไทโอนีนไฮดรอกซี่อนาล็อก ในอาหารไก่กระทง

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บทคัดย่อ

ไก่กระทงคละเพศอายุ 1 วัน จำนวน 960 ตัว ถูกแบ่งออกเป็น 24 กลุ่มๆละ 40 ตัว เลี้ยงเป็นเวลานาน 42 วัน สูตรอาหารควบคุมที่ใช้เลี้ยงคำนวณให้มีระดับกรดอมิโนเมทไทโอนีนและกรดอมิโนที่มีซัลเฟอร์เป็นองค์ประกอบอยู่ต่ำกว่าความต้องการของไก่กระทงทั้ง 2 ช่วงของการเจริญเติบโต (1-21 วัน และ 22-42 วัน) และเสริมด้วย ดี-เอล เมทไทโอนีน 0.24% และเมทไทโอนีนไฮดรอกซี่อนาล็อก 0.37% ทั้ง 2 ช่วง ทำการเก็บข้อมูลน้ำหนักตัวที่เพิ่มขึ้นและปริมาณอาหารที่กิน เพื่อใช้ในการประเมินประสิทธิภาพการใช้กรดอมิโนเมทไทโอนีนจาก 2 แหล่ง จากการทดลองในช่วง 1-21 วัน พบความแตกต่างอย่างมีนัยสำคัญทางสถิติ ($P < 0.05$) ของน้ำหนักตัวที่เพิ่มระหว่างกลุ่มที่เสริม ดี-เอล เมทไทโอนีน (0.587+0.01 กก/ตัว) กับกลุ่มควบคุม (0.551+0.01 กก/ตัว) ขณะที่กลุ่มที่เสริมเมทไทโอนีนไฮดรอกซี่อนาล็อก (0.567+0.01) ไม่แตกต่างจากกลุ่มอื่น ส่วนอัตราการแลกเนื้อ กลุ่มที่เสริมทั้ง 2 กลุ่มมีแนวโน้มที่ดีกว่ากลุ่มควบคุมแต่ไม่มีความแตกต่างกันทางสถิติ สำหรับในช่วง 22-42 วัน ไม่พบความแตกต่างในทุกค่าที่สังเกตุ ผลการทดลองแสดงให้เห็นว่าการเสริมกรดอมิโนเมทไทโอนีน ในรูปของดี-เอล เมทไทโอนีนที่ระดับ 0.24% และเมทไทโอนีนไฮดรอกซี่อนาล็อกที่ระดับ 0.37% ให้ผลต่อการเจริญเติบโตไม่แตกต่างกันในช่วง 1-21 วัน หรืออาจกล่าวได้ว่าเมทไทโอนีนไฮดรอกซี่อนาล็อกมีประสิทธิภาพ 65% ของ ดี-เอล เมทไทโอนีน ในไก่กระทงช่วงอายุ 1-21 วันแรก

คำสำคัญ: ประสิทธิภาพ ดี-เอล เมทไทโอนีน เมทไทโอนีนไฮดรอกซี่อนาล็อก ไก่กระทง

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