Cooked sun-dried blood meal a potential source of lysine: I- Available lysine determined by chick bioassay

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SUMMARY

Lysine available in cooked sun-dried blood meal was estimated by using a broiler chick growth assay. Mild heating at 60 °C for 30 minutes and then sun drying for 10 days were used for blood meal processing. The bioavailable lysine was calculated using the slope ratio method where weight gain was regressed on dietary lysine level (%) (method A) or lysine intake (method **B).** Bioavailable lysine estimates reported in the present study compared favourably with those obtained for blood meals processed by conventional methods. At three-weeks of age the bioavailable lysine was 23% (method A) and 27% (method B) lower than at six weeks.

From the results of the present experiment it was concluded that mild cooking at 60 °C for 30 minutes and sun drying for 10 days had no effect on bioavailable lysine content of blood meal.

INTRODUCTION

In the Sudan blood meal is available as a cheap rich source of lysine (7.05 - 8.85%) but its processing is the most critical factor that limits its utilization in poultry feeding. Several processing methods have been described, Kramer et. al. (1978) and Noll et. al. (1984), but they are not easily adopted in the Sudan. For this reason the present study was initiated to investigate the effect of cooking and sun-drying on available lysine content of blood meal.

MATERIALS AND METHODS

The test material was one sample of sheep blood, prepared by heating at 60 °C for 30 minutes and left to dry with solar radiation for 10 days. Three hundred unsexed day-old broiler chicks (Lohman) were assigned to treatments after a preparotory period of 10 days, during which the chicks were fed on a low lysine diet (table 1). In each treatment there were three replicates each of ten chicks. Chicks of each replicate were housed in a pen (1 meter square) in an open-sided, deep litter, poultry-house.

The basal diet (table 1) was formulated to be deficient in lysine, but adequate in other nutrients known to be required by chicks (National Research Council, 1984).

A slope ratio bioassay was used (Finney, 1964) in which the standard and test materials were given at increasing levels. The standard material L-lysine (as L-lysine monohydrochloride) was included in the basal diet at 0, 0.1, 0.2, 0.3 and 0.4%. Similar levels derived from the test material (cooked-sundried blood meal) were also included in the basal diet. Additions of L-lysine HC1 and blood meal were made at the expense of sorghum.

Feed and water offered ad libitum. The light was continuous throughout the experimental period (7 weeks). Chicks were group weighed at a weekly intervals and feed consumption by each group was determined at the time of weighing.

Data were subjected to analysis of variance and regression analysis (Steel and Torrie, 1960). Regression analysis was used to obtain estimate of slope of weight gain regressed on percentage added L-lysine (method A) or L-lysine intake (method B). For the two methods, bioavailable lysine (g/ 16 g N) estimates were obtained by calculating the ratio of slopes between the test and standard curves.

RESULTS

The average daily weight gain and feed consumption for the standard diets containing L-lysine HC1 and the test diets are given in table 2.

Table 1: Composition of the basal diet.

Ingredient	
Sorghum	63.20
Groundnut meal	14.00
Sesame meal	14.00
Super concentrate (1)	5.00
Oyster shell	1.40
Salt (NaC1)	0.30
Minovit super (2)	0.20
L-lysine monohydrochloride	0.20
DL-methionine	0.20
Vegetable oil	1.50
	100.00
Calculated composition:	
Metabolizable energy (MJ/ kg)	12.66
Crude protein	22.56
Ca	1.00
P	0.50
Lysine	0.71
DL-methionine	0.56
Methionine + Cystine	0.87
Determined composition:	
Metabolizable energy (MJ/ kg)	12.37
Crude protein	21.88

(1) Super concentrate composition:
Crude fibre (%) = 2.52; Crude protein (%) = 41; Total P (%) = 4.8; Ca (%) = 12.3; Metabolizable energy (RV kg) = 8.37; Methionine (%) = 21.88; Methionine + cystine (%) + 1.73; Lysine (%) = 1.95; Threonine (%) = 1.37; Tryptophane (%) = 0.24; Linoleic acid (%) = 0.22.

(2) Minovit supplied by Bladel, Farvet laboratories, Holland.

Table 2: Body weight gain and feed consumption of chicks fed standard and test diets:

Source	Supplemental lysine (%)	Weight gain (g/ bird/ clay)	Feed consume.= don (g/bird/day)
L-lysine HC1	0.00	18.6 [a]	70.1a
	0.10	23.0 ,ab	74.7 [a]
	0.20	26.2	76.7
	0.30	30.0 b	82.1
	0.40	31.3 b	83.9 +
S.E.		± 2.29	2.5
Blood meal	0.00	18.6 [a]	70.1a
	0.10	26.1 b	74.8a
	0.20	28.1 b	75.5a
	0.30	29.2 b	77.6a
	0.40	32.2 c	80.4a
S.E.		± 2.30	+ 1.7

1- Mean values of 3 replicates per treatment ± standard error S.E.
a, b, c means within a colum followed by the same letter were not significantly different ($p < 0.05$).

Increasing the dietary level of lysine (derived from L-lysine HC1 or blood meal) or its consumption caused a progressive and significant increase ($p < 0.05$) in weight gain (g/ bird/ day). Daily feed consumption tended to increase with increasing the dietary level of lysine, but the differences were not significant. The contents of biologically available lysine (method A and B) in g per 16g N are presented for each week in table 3. At three - weeks of age the bioavailable lysine was 23%

(method A) and 27% (method B) lower than at six weeks. On average method B estimates were 2.96% greater than method A. At seven - week old (table 4), method B again gave greater bioavailable lysine content than method A. Mortality rate was low (1.9%) and not related to dietary treatment.

Table 3: Weekly bioavailable lysine of cooked-sundried blood meal (g1 16g N).

Weeks	1 Method A	3	2 Method B	3
	Bioavailability ± S.E.	r	Bioavilability ± S.E.	
1st	8.04 ± 1.39	0.98	8.21 ± 1.74	0.99
2nd	8.05 ± 0.70	0.97	8.29 ± 0.41	0.98
3rd	7.51 ± 1.60	0.93	7.38 ± 1.13	0.90
4th	11.29 ± 2.63	0.98	11.66 ± 1.38	0.98
5th	8.64 ± 1.34	0.96	9.59 ± 1.25	0.96
6th	9.16 ± 0.23	0.93	9.16 ± 0.21	0.96
Average	8.78 ± 1.31		9.05 ± 1.03	

1 = Available lysine estimate based on regression of average weekly gain on percent added lysine.
2 = Available lysine estimate based on regression of average weekly gain on weekly consumption of dietary lysine.
3 = Correlation coefficients (r) are all statistically different ($p < 0.01$).
S.E. = Standard error of estimate.

Table 4: Bioavailable lysine at 7-week old (gl 16g N).

	1 Method A Slope ± S.E.	3 r	2 Method B Slope ± S.E.	3
Standard (Y1)	1591 ± 151	0.99	29.5 ± 2.05	0.99
Test (Y2)	1482 ± 316	0.94	32.2 ± 6.03	0.95
Bioavailable lysine	8.04 ± 2.61		9.41 ± 0.70	
'Regression equaations	Y1= 954 + 1591X Y2 = 1084 +1482X		Y1 = 961 + 29.5 X Y2 =1006 + 32.2X	

1, 2 and 3 = See footnote in table 3.

DISCUSSION

Blood meal processing methods used in the present study gave biologically available lysine estimates similar to those obtained by conventional processing methods. This may indicate that cooking of blood meal at 60 °C for 30 minutes and then sun-drying for 10 days had no destructive effect on its bioavailable lysine content.

From the results obtained in this experiment it can be inferred that blood meal was not sensitive to heat conditions used. A similar conclusion was reached by Kratzer and Green (1957); Hamm and Searcy (1976) and Waibel, et. al. (1977). The high bioavailable lysine estimate of method B compared to method A has been reported previously (Noll et. al., 1984).

The high bioavailable lysine estimates at the older age is consistent with the fact that chicks dietary lysine requirement decreases with age.

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