A STUDY OF NUTRITIONAL PROBLEMS AFFECTING THE SMALLHOLDER BROILER INDUSTRY IN PAPUA NEW GUINEA

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ABSTRACT

Nutrition deficiencies of lysine and methionine were investigated as possible factors in the poor performance of the smallholder broiler industry in Papua New Guinea. The commercial feed used by the growers was supplemented with lysine, methionine or lysine plus methionine at levels of 5, 10 and 20% of the requirements.

Significant responses of body weight and feed conversion ratio were achieved with lysine and lysine plus methionine supplementations. Methionine supplementations alone did not improve performance. No significant effects on feathering were noted.

INTRODUCTION

The smallholder broiler industry in Papua New Guinea was faced with problems of high mortality, poor growth rate and bare back. Previous investigation (Abdelsamie, unpublished) showed that incorrect brooding of day old chickens by the farmers was the main factor responsible for the high mortality and poor growth rate. Debeaking was effective in reducing the incidence of bare back. The study also showed that growth performance of chickens when managed correctly remained below the strain's performance as indicated by the breeder (A.A. Tegel Pty Ltd, Australia).

The investigation was extended to study the nutritional quality of the only commercial feed available to the growers as a possible factor contributing to the poor growth performance. Field trials indicated that the addition of soluble vitamins to the drinking water did not appreciably improve growth rate of chickens fed on that feed. The effect of lysine and methionine supplementations on growth performance and feathering is reported here.

MATERIALS AND METHODS

Two thousand one-day-old commercial broilers (A.A. Tegel Pty Ltd, Australia) were used in this investigation. Mild debeaking and vaccination against fowl pox were carried out on arrival of the chickens.

The basal feed used in this experiment was part of a large shipment intended for supply to the broiler growers. No information was available on ingredient composition of the feed. Biological determination of metabolizable energy was carried out on the feed using four week old broilers of the same strain following the method of Hill and Anderson, 1958. The amino acid profile of the feed was determined after hydrolysis with 6N HCL for 24 hours in an open flask using a Jeol JLC-6AH amino acid analyser with Model 1-DK integrator and Model-2 printer. Proximate analyses were also carried out (Association of Official Analytical Chemists 1975).

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The feed was supplemented with l lysine and dl methionine, or both at levels of 5, 10 and 20% of the broiler requirements (National Academy of Sciences – National Research Council 1971).

The day-old chickens were initially divided into 10 groups of 200 chickens in each group. They were brooded for one week. Nine groups were fed on the experimental feeds and one group received the basal feed and served as control. On day 8, each group was divided into four groups of approximately equal body weight, randomly allocated to the experimental pens and fed on the same feed (each initial group formed 4 replicates). Measurements of body weight, feed intake and feed efficiency (g feed/g gain) were carried out on the chickens every week for a period of five weeks when the experiment terminated. Treatments' effects on feather development were also assessed. Growth performance parameters were analysed statistically by analysis of variance (Steel and Torrie 1960).

RESULTS

The basal ration contained 88.5% dry matter and 12.34 MJ metabolizable energy/kg. The crude protein, ether extract and acid detergent fibre expressed on a dry matter basis were 25.6, 3.9 and 7.1%, respectively. Amino acid analysis indicated that the feed contained 0.87% lysine and 0.78% methionine plus cystine.

There was a stepwise increase in body weight over time as a result of lysine and lysine plus methionine supplementations. Methionine alone did not improve body weight above that of the control group when added at levels of 5 and 20% of the NRC requirements, but the addition of 10% methionine improved body weight.

Treatment means and comparisons between means for body weight and feed conversion of the chickens at 5 weeks of age are presented in *Table 1.* There were significant overall treatment effects for both variables ($P<0.01$). The methionine treatments gave a significantly ($P<0.01$) lower feed conversion than the control and no significant effect on body weight. For those treatments receiving lysine plus methionine, there was a slight but significant ($P<0.05$) effect on body weight and no significant effect on food conversion when compared with treatments receiving lysine alone. Qualitative observations on the effects of treatments on feather development did not show any abnormality among all groups.

DISCUSSION

The results of this experiment indicate that the feed was deficient in lysine. Lysine level in the feed (0.87%) was only 70% of the NAS-NRC (1971) recommended requirements for broilers up to six weeks of age (1.25% of the diet). There was a dramatic response of body weight and feed conversion to added lysine, and to a lesser extent when lysine plus methionine were added. On the other hand, methionine supplementation alone appeared to have no effect on body weight and significantly reduced the efficiency of feed conversion. This was evident at levels of inclusion of five and 20% of the requirements. No explanation can be offered for the discrepancy in the results of methionine supplementation (i.e. no effect on body weight as a result of adding 5 and 20% methionine, while 10% improved body weight and feed conversion). However, an error in formulating the feed (i.e. adding lysine instead of methionine for that particular batch) cannot be ruled out; since this treatment produced roughly the same effect as that of 10% lysine supplementation. It is also probable that the reason for the significant depression in feed conversion associated with methionine supplementations was

Table 1.—**Performance at 5 weeks of chickens fed diets supplemented with amino acids**

Treatments	Body Weight g	Feed Conversion
Control	549.8	2.129
5% Lysine	639.8	2.116
10% Lysine	655.8	2.081
20% Lysine	682.8	2.012
5% Methionine	540.4	2.330
10% Methionine	621.2	2.140
20% Methionine	548.6	2.407
5% Lysine + 5% Methionine	584.1	2.137
10% Lysine + 10% Methionine	654.9	2.061
20% Lysine + 20% Methionine	661.6	2.133
SED	21.7	0.055
F	14.25**	11.29**
Comparisons		
Control	549.8	2.129
Methionine	570.1	2.292
SED	17.7	0.045
F	1.13^{NS}	13.22**
Lysine	659.5	2.070
Lysine + Methionine	633.5	2.110
SED	12.5	0.032
F	4.28*	1.64^{NS}

Notes: SED: Standard error of the difference between means
NS: not signficant; *$p<0.05$; **$p<0.01$; ***$p<0.001$

due to amino acids imbalance (i.e. excess methionine in relation to other amino acids).

All treatments, including the control, showed normal feather development. These results contradict previous observations of poor feathering in which the same source of feed was used. It is possible that differences in environmental conditions could be responsible for the difference between the two experiments. This experiment was conducted during the wet season when the area experiences a mild temperature compared with the previous experiment which was conducted during the dry season when the temperature was higher.

The study demonstrated the danger of relying on a single source of feed supply. It appears that inadequacy of feed was one reason for the poor performance in the broiler industry. Diversifying of feed supplies to encourage competitiveness and careful monitoring of the feed should prevent similar problems occurring in the future.

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