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# THE INFLUENCE OF VARYING ENERGY LEVELS IN BROILER FEEDS

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An experiment involving 150 day-old broiler chicks of mixed sexes was conducted in two phases to determine an appropriate energy level with 23 percent protein in broiler starter ration and 20 percent protein in broiler finisher ration. The levels of metabolizable energy were decreased from 3154 to 2849 and from 3350 to 3050 Kcal per kg diet in five broiler starter and finisher rations, respectively. The results revealed non-significant differences in respect of weight gain, feed consumption, feed efficiency and cost of production. However, a gradual increase in feed intake and ultimate decline in feed efficiency was observed on low calorie rations.

## INTRODUCTION

To overcome the animal protein deficit in human diet, the broiler offers a genuine solution in a minimum possible time. In modern broiler production, consideration should be given to optimise inputs so as to maximise economic returns. Among the inputs, feed certainly is the most costly item. Economical broiler raising, therefore, depends very much on the degree of success achieved in decreasing the cost of quality feed, which can only be formulated with a sound knowledge of the nutritive requirements of the bird. A protein level of 23 percent and metabolizable energy at 3000 Kcal per kg in broiler starter ration and a protein level of 20 percent and metabolizable energy at 3200 Kcal per kg in finisher ration have been recommended

by NRC (1984). However, to achieve increased efficiency of production, the trend has shifted to increased level of energy in broiler rations. Better results have been achieved by fortification of such rations with vitamins, minerals and balancing them with quality protein. To ensure maximum utilization of each and every nutrient in the ration, the nutrients must be present in right proportion which favours better utilization of one another. This will not only facilitate the optimum growth of birds but will also minimise the unscrupulous use of vital and costly components such as protein and much needed energy in the diets of birds of all ages. The present study was an attempt to determine optimum energy level for broiler starter and finisher rations while keeping the protein content at constant level.

## MATERIALS AND METHODS

The experiment was conducted in two phases based on completely randomised design, using 150 day-old broiler chicks of mixed sexes. The chicks were randomly distributed into 15 experimental units of 10 chicks each and assigned to floor pens (2.5' x 4.0') which were heated during first four weeks of chicks age. Each experimental diet was fed to three pens of ten chicks. Feed and water were supplied ad libitum. Continuous lighting was provided throughout the experiment.

The experimental rations consisted of 23 percent and 20 percent protein, each with five different metabolisable energy (ME) levels in starting and finishing broiler rations, respectively. The ME levels were calculated using the individual ME values of the ingredients (Anonymous, 1987). The nutrient composition of experimental rations is shown in Table 1.

In the first phase of the experiment, day-old chicks averaging 45 g per chick were used and the birds were fed on five broiler starter rations namely A, B, C, D and E (Table 1). This phase of the experiment terminated when the birds were four weeks old. In the second phase of the experiment, the same birds were shifted to five broiler finisher rations namely $A_1$, $B_1$, $C_1$, $D_1$ and $E_1$ (Table 1). This phase of the experiment continued till the birds were seven weeks old. During the experiment all the birds were weighed individually at the start and

Table 1. *Nutrient composition of experimental rations*

| Description | Rations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | $A_1$ | B | $B_1$ | C | $C_1$ | D | $D_1$ | E | $E_1$ |
| Crude protein (%) | 23 | 20 | 23 | 20 | 23 | 20 | 23 | 20 | 23 | 20 |
| ME (Kcal/kg) | 3154 | 3350 | 3077 | 3275 | 3001 | 3200 | 2925 | 3124 | 2849 | 3050 |
| Calorie:protein | 137.0 | 167.5 | 134.0 | 163.7 | 130.5 | 160.0 | 127.0 | 156.2 | 124.0 | 152.2 |
| Available lysine (g/kg) | 11.84 | 10.87 | 11.91 | 10.94 | 11.98 | 11.01 | 12.05 | 11.07 | 12.11 | 11.14 |
| Available methionine (g/kg) | 8.11 | 7.66 | 8.12 | 7.67 | 8.14 | 7.68 | 8.15 | 7.70 | 8.16 | 7.71 |
| Available Ca (%) | 1.59 | 1.17 | 1.59 | 1.17 | 1.60 | 1.18 | 1.60 | 1.18 | 1.60 | 1.19 |
| Available P (%) | 0.87 | 0.77 | 0.87 | 0.77 | 0.87 | 0.77 | 0.87 | 0.78 | 0.87 | 0.78 |

at weekly intervals thereafter. Feed consumption was recorded for each replicate at weekly intervals. The data thus collected were subjected to analysis of variance and significance was assessed at 5 % and 1 % levels of significance (Steel and Torrie, 1981).

## RESULTS AND DISCUSSION

The results of the first phase of the experiment are presented in Table 2. Weight gain and feed efficiency showed a stepwise decline when the energy level was decreased from 3154 to 2849 Kcal/kg broiler starter ration. Maximum was observed on starter ration B with a ME level of 3077 Kcal/kg, while the best feed efficiency was obtained on ration A which had the highest ME content among all the five starter rations. The results obtained from this study agree with previous findings (Farrell et al., 1973; Olomu, 1976) that there is an optimum energy concentration in a ration beyond which performance of chicks does not appear to improve and in some cases actually deteriorates.

The data on feed intake indicated that the chicks tended to consume relatively higher quantities of rations which were relatively low in energy content. Perhaps this was an attempt to meet their daily calories requirement. However, these differences in feed intake on various rations were non-significant. Relative increase in feed intake with decreasing energy content of the ration was also observed by Mosanghini (1976) and Singh et al. (1978). The cost of feed per kilogramme liveweight during first four weeks age was minimum on ration C followed by A, B, D and E. However, the differences among rations were non-significant.

The results of the second phase of the experiment are shown in Table 3. Weight gain and feed efficiency showed a similar trend as was observed in the first phase of the experiment. The analysis of variance revealed a non-significant difference among the five rations tested in this phase of the experiment. This shows that within the test range of energy content (with 20 percent protein) in broiler finisher ration, the weight gain and feed efficiency do not improve significantly. It may be noted that although the differences among various rations regard-

Table 2. *Effect of varying energy levels with 23 percent protein on performance of starting broiler chicks (0 to 4 weeks: phase I)*

| Rations | Energy level (Kcal / kg) | Average Wt. gain (g) | Average feed consumption per bird (g) | Feed efficiency (feed / gain) | Feed cost/kg liveweight gain (Rs.) |
|---|---|---|---|---|---|
| A | 3154 | 593.93 | 1117.7 | 1.88 | 5.91 |
| B | 3077 | 605.43 | 1151.1 | 1.90 | 5.92 |
| C | 3001 | 601.83 | 1153.6 | 1.92 | 5.87 |
| D | 2925 | 560.80 | 1168.1 | 2.09 | 6.32 |
| E | 2849 | 552.63 | 1178.0 | 2.14 | 6.39 |

Table 3. *Effect of varying energy levels with 20 percent protein on performance of finishing broiler chicks (5 to 7 weeks : phase II)*

| Rations | Energy level (Kcal / kg) | Average Wt. gain (g) | Average feed consumption per bird (g) | Feed efficiency (feed / gain) | Feed cost/kg liveweight gain (Rs.) |
|---|---|---|---|---|---|
| $A_1$ | 3350 | 933.97 | 2145.9 | 2.32 | 7.77 |
| $B_1$ | 3275 | 983.80 | 2224.6 | 2.26 | 7.40 |
| $C_1$ | 3200 | 917.80 | 2275.6 | 2.49 | 7.98 |
| $D_1$ | 3124 | 871.50 | 2332.4 | 2.69 | 8.41 |
| $E_1$ | 3050 | 868.70 | 2387.2 | 2.75 | 8.38 |

ing weight gain and feed efficiency were statistically non-significant, yet the two values deteriorated gradually when energy content of the ration was decreased. The trend of improving weight gain and feed efficiency with increasing dietary energy for finishing broiler chicks is in agreement with previous findings (Mosanghini, 1976; Singh et al., 1978). These findings are also in line with those reported earlier by Griffiths et al. (1977) who varied calorie : protein ratio from 139 to 188 in broiler finisher ration by varying energy levels between 2970 and 3190 Kcal / kg and found that neither energy content nor energy : protein ratio of the diet affected body weight gains.

Feed consumption, however, tended to icrease with decrease in energy content of the ration. The bird consumed more feed to meet their daily energy requirement. The trend showing increase in feed intake with decreasing energy content of the ration has also been reported by Griffiths et al. (1977) and Dumansky et al. (1977). The cost of production was minimum with fiisher ration $B_1$ followed by $A_1$, $C_1$, $E_1$ and $D_1$. However, the differences among rations were non-significant. One reason for non-significant differences in respect of cost of production among various rations could be that energy levels were varied by replacing rice with maize which were quite different in their metabolizable energy content but had little difference in prices.

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