Growth response of crossbred village (kampung) chickens to starter diets of differing energy contents

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Abstract

A study was carried out on crossbred Malaysian village (kampung) chickens to investigate the effect of dietary energy in the starter feed on growth performance. The dietary treatments were 13.5, 12.5, 11.5 and 10.5 MJ apparent metabolisable energy (AME)/kg feed, imposed from day one until the termination of the trial on day 21. All diets were iso-nitrogenous at 21% crude protein level. Energy efficiency (energy intake per kg body weight gain) was significantly lower ($p<0.05$) with treatment 10.5 MJ/kg than with other treatments, with a trend of increasing efficiency values with increasing dietary energy levels. Between treatments, differences in body weight gain and feed conversion efficiency were not significantly different while differences in feed intake were inconsistent. It is concluded that for the crossbred kampung chicken during the starter phase, low dietary energy levels in the vicinity of 10.5 MJ/kg might prove to be relatively economical as compared to the use of dietary energy level of 12.5 MJ/kg or higher as usually practiced for commercial broiler starter feeds.

Key words: Dietary energy, starter feed, growth, crossbred kampung chicken

Introduction

Crossbred kampung (village) chickens are the most popular coloured meat birds in Malaysia. Commercially they are raised mainly on broiler starter and finisher feeds formulated to meet the energy and protein requirements for broilers as recommended by NRC (1994). This is due to the fact that nutrient requirements specific for the relatively slow-growing kampung crossbreds have yet to be fully established.

Energy is the most significant component in poultry feed, particularly insofar as production cost is concerned. Derivable from fats, proteins and carbohydrates mainly, feed energy contributes to some 70% of the total cost of poultry feed (Skinner *et al*., 1992). It is therefore imperative that judicious formulations of poultry feed be carried out to ensure that optimal efficiency is achieved, not only in the utilization of total feed but in the use of its energy as well. Numerous studies on the modern market broiler chicken have demonstrated that on complete balanced feeds, improved growth and feed conversion efficiency (FCR) could be achieved with increased level of dietary energy (Saleh *et al*., 2004; Ghazalah *et al*., 2008; Niu *et al*., 2009). This was also observed with the relatively slow-growing crossbred Malaysian kampung chicken in the finishing phases (Engku Azahan, 2007).

During the post-hatching starter or brooding phase (1 - 21 days), some research has also been conducted on the response on the modern broiler chick to dietary energy level (Sizemore and Siegel, 1993; Hidalgo *et al*., 2004; Dozier *et al*., 2008). Results obtained have not been consistent. While Sizemore and Siegel (1993) and Hidalgo *et al*. (2004) showed that high energy diets promoted greater weight gains than the low energy feed, no difference in growth response was observed by Dozier *et al*. (2008) with chicks reared to 15 days of age on diets of increasing energy content of 3,040 to 3,140 kcal/kg. With the crossbred local kampung chick no such work has been reported. This study was therefore carried out to investigate how crossbred kampung chickens in their starter phase respond to variations in dietary energy.

Materials and Methods

Three hundred day-old mixed-sex chicks from a popular commercial strain of crossbred kampung chickens were utilized in this study. The birds were individually brooded in wire-floor cages measuring 50.8 cm wide x 55.9 cm deep x 61.0 cm high. Artificial heating for the first 14 days was provided by electric bulbs. There were four dietary treatments, namely 13.5, 12.5, 11.5 and 10.5 MJ apparent metabolisable energy (AME)/kg feed, equivalent to energy values of 3224, 2986, 2747 and 2508 kcal/kg, respectively. Each of the dietary treatments was imposed on 75 birds with each bird representing a replicate. The resultant 300 replicate cages were arranged in a completely randomized design. All diets were iso-nitrogenous at 21% crude protein (CP) level.

Chicks were earlier vaccinated at the hatchery for Marek's disease while Newcastle disease (ND), infectious bronchitis (IB) and Gumboro (NBD) vaccinations were administered via drinking water during the trial period. Feed and water were provided ad libitum. Performance data were collected on individual bird basis and these measurements included initial body weight, body weight at the end of the trial, feed intake over 21 days and mortality. From these data, body weight gain, FCR, energy intake and energy efficiency (EE, MJ intake/kg body weight gain) for each bird were calculated. Data were analysed statistically using the procedure of SAS (1991) for the total number of surviving birds. Analyses included data for both the combined male and female birds as well as for birds on the basis of sex.

Results and Discussion

The total mortalities recorded over the 21-day starter period for each of the four dietary energy treatments of 13.5, 12.5, 11.5 and 10.5 MJ/kg were 4, 3, 5 and 1 bird, respectively. These data were not amenable to statistical analysis. For the other growth parameters, results of the analysed data for all the surviving birds are presented in Tables 1, 2 and 3.

When data on all birds were analysed together without consideration of sex, there was a trend of increasing feed intake with declining dietary energy level (Table 1). There was also a trend towards improvement of FCR with increases in dietary energy level but results were not consistent. Body weight gain (BWG) was not significantly affected by dietary energy level while the efficiency in converting feed energy into weight gain (energy efficiency) was significantly higher (p<0.05) for the lower energy groups (11.5 and 10.5 MJ/kg) than that of the highest energy group (13.5 MJ/kg).

Table 1. Growth response of combined-sex crossbred kampung chickens to feeds with differing energy levels during the starter phase (means ± standard error)

Parameter	Treatment diets			
	13.5 MJ/kg	12.5 MJ/kg	11.5 MJ/kg	10.5 MJ/kg
21-d body weight, g/bird	256 ± 5[a]	267 ± 4[a]	264 ± 5[a]	256 ± 4[a]
Body weight gain, g/bird	218 ± 5[a]	230 ± 4[a]	225 ± 5[a]	223 ± 4[a]
Feed intake, g/bird	395 ± 6[a]	413 ± 6[ab]	422 ± 6[b]	418 ± 6[b]
Feed conversion ratio	1.84 ± 0.02[ab]	1.81 ± 0.02[b]	1.90 ± 0.03[a]	1.91 ± 0.02[a]
Energy efficiency, MJ/kg	24.87 ± 0.32[a]	22.66 ± 0.24[b]	21.84 ± 0.29[b]	20.01 ± 0.26[c]

[abc]Means in the same row with different superscripts differed (p<0.05); all diets were iso-nitrogenous at 21% crude protein level.

Table 2. Growth response of male crossbred kampung chicks to feeds with differing energy levels during the starter phase (means ± standard error)

Parameter	Treatment diets			
	13.5 MJ/kg	12.5 MJ/kg	11.5 MJ/kg	10.5 MJ/kg
21-d body weight, g/bird	264 ± 8[a]	279 ± 5[a]	268 ± 6[a]	276 ± 4[a]
Body weight gain, g/bird	225 ± 8[a]	241 ± 5[a]	230 ± 6[a]	238 ± 4[a]
Feed intake, g/bird	401± 9[a]	427 ± 8[ab]	429 ± 7[ab]	443 ± 6[b]
Feed conversion ratio	1.80 ± 0.03[a]	1.78 ± 0.03[a]	1.89 ± 0.03[a]	1.87 ± 0.03[a]
Energy efficiency, MJ/kg	24.30 ± 0.44[a]	22.30 ± 0.36[b]	21.72 ± 0.31[b]	19.60 ± 0.28[c]

[abc]Means in the same row with different superscripts differed (p<0.05); all diets were iso-nitrogenous at 21% crude protein level.

Table 3. Growth response of female crossbred kampung chicks to feed with differing energy levels during the starter phase (means ± standard error)

Parameter	Treatment diets			
	13.5 MJ/kg	12.5 MJ/kg	11.5 MJ/kg	10.5 MJ/kg
21-d body weight, g/bird	253 ± 6[a]	255 ± 6[a]	257± 7[a]	246 ± 7[a]
Body weight gain, g/bird	214 ± 6[a]	217 ± 6[a]	218 ± 7[a]	208 ± 7[a]
Feed intake, g/bird	392 ± 8[a]	397 ± 8[a]	411 ± 10[a]	396 ± 9[a]
Feed conversion ratio	1.86 ± 0.03[a]	1.84 ± 0.02[a]	1.91 ± 0.05[a]	1.94 ± 0.04[a]
Energy efficiency, MJ/kg	25.15 ± 0.42[a]	23.06 ± 0.30[b]	22.02 ± 0.57[b]	20.38 ± 0.41[c]

[abc]Means in the same row with different superscripts differed (p<0.05); all diets were iso-nitrogenous at 21% crude protein level.

Analysis of the data on a sex basis revealed a general lack of consistent effects of dietary energy level on most of the growth parameters investigated (Tables 2 and 3). Consistent responses observed in both sexes were the significant improvements in energy efficiency with the decline in dietary level ($p<0.05$) and the lack of effect of dietary energy level on body weight gain.

Within the limits of the experimental conditions imposed, growth of the crossbred kampung chicken during the starter phase, as measured by BWG, was not affected by dietary energy level. This finding, while being consistent with that of Nguyen and Bunchasak (2005) on the Betong native chicken of Thailand and Dozier et al. (2008) on modern broiler chicks, was contrary to the observations made by other researchers (Sizemore and Siegel, 1993; Hidalgo *et al*., 2004; Niu *et al*., 2009) on commercial broilers. Results from this study also indicated that FCR was not consistently affected by dietary energy level, consistent with reports by Nguyen and Bunchasak (2005) on the Betong chicken and by Hidalgo *et al*. (2004), Dozier *et al*. (2008) and Niu *et al*. (2009) on broiler chicks, but contradicted the findings of Sizemore and Siegel (1993), Saleh *et al*. (2003) and Ghazalah *et al*. (2008) who obtained improved FCR with higher energy feeds. The inconsistencies in response to dietary energy during the starter phase were further shown by the reports of Maiorka *et al*. (2008) who observed improved body weight and FCR with increased dietary energy in the third week but not in the first two weeks of the starter period. Differing study conditions, among other factors, could have accounted for the discrepancies.

Body weight, growth rate and feed conversion efficiency have been considered as important parameters in assessing the potential of feeding programs of meat poultry. In this study however, no significant response in BWG was observed while results on FCR had not been consistent. One consistent effect obtained was the improvement in energy efficiency with the usage of low energy diets, consistent with the findings of Dozier *et al*. (2008) and Niu *et al*. (2009) on broilers. Separate analyses on male and female birds as well as analysis on all the birds combined revealed significant differences in the ability of young brooding chicks to convert dietary energy into body weight. Chicks on the lowest dietary energy were the most efficient in converting feed energy to body mass.

Conclusion

In commercial practice, dietary apparent metabolisable levels set for starter feeds to be given to commercial broiler chicks during the starter period range from 12 to 13 MJ/kg feed with a level of 12.5 MJ/kg being more commonly used. For the relatively slow-growing crossbred kampung chicken in the starter phase, results from this study indicated that lower dietary energy levels in the range of 10.5 to 11.5 MJ/kg might prove to be relatively economical. The use of an energy level of 12.5 MJ/kg as usually practiced for commercial broiler starter feeds might not be justified for the crossbred Malaysian kampung chicken. However, in the light of various conflicting reports presented on the work with the broiler chicken on the subject, this contention needs to be regarded as tentative until verified or supported by further research.

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