# Effect of Different Dietary Levels of Energy on the Growth Performance and Meat Yield of Indigenous Chicken Reared in Confinement under the Rural Condition of Bangladesh

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## ABSTRACT

An experiment was carried out to investigate the effects of different dietary levels of energy on growth performance and meat yields of indigenous (*desi*) chickens up to the target weight of 950 g in rural condition. One hundred indigenous unsexed chicks aged 4 weeks were considered for the feeding trial until the body weight reached at 950g. Chicks were divided into two dietary treatments having five replications (10 chicks per replication) and reared on littered floor in an open sided house by providing 0.092 m² floor space per bird. Two iso-nitrogenous diets (23% CP) differing in energy contents were formulated to constitute dietary treatments. Diets for comparison were: moderate energy density (MED): ME 2800 kcal/kg and high energy density (HED): ME 3000 kcal/kg. The contents of CP, ME, Calcium (Ca) and total Phosphorous in MED diet were fitted with the requirements of Bureau of Indian Standard (BIS 1992). Body weight, feed intake, FCR and survivability had no significant effect between the two dietary groups during a rearing period of 3-14 weeks. Similarly breast, drumstick, thigh, wing, neck, liver and head weight had no significant effect between the two dietary groups. Profit per bird increased slightly with increasing level of the dietary energy densities. It was concluded that a nutrient density of 3000 ME kcal/kg and 23% CP would be enough to optimize growth rate and FCR of indigenous (*desi*) chickens in rural condition.

**Keywords:** energy densities, indigenous chicken, meat quality, performance, village condition

## INTRODUCTION

In Bangladesh, native indigenous chicken, broiler and layer are commercially produced for consumption. It has been stated that the national share of commercial strain of chickens to indigenous family poultry in terms of egg production is almost equal (50:50) and that of meat production is 60:40 (Bhuiyan, 2011). Meat characteristics of the indigenous chicken are similar to that of spent hens but are much different from the broiler meat (Chuaynukool *et al.*, 2007). The indigenous chicken generally has a slower growth rate than the commercial broiler when raised under the same commercial conditions. In addition, they have the traits of fighting cocks, including strong and firm muscles. This possibly contributes to the differences in the meat properties and quality of both types of chicken. A broiler aged 28–35 days has 1.4-1.8 kg live weight, while a indigenous chicken aged 4–6 months will be of the same live weight. However, the indigenous chicken can be raised with lower production costs. Farmers generally simply raise them as free range using any organic feed or supplement with the some feed ingredients. The fact is that meat and eggs of indigenous poultry are preferred widely by consumers because of good taste, lean meat, better pigmentation and also suitable for preparing different dishes (Chowdhury, 2013), although they are costlier than commercial broilers marketed today.

It is also an alternative for consumers preferring low fat and antibiotic free white meat. Indigenous chicken meat is an increasing trend due to consumer believes that its meat obtained from free drugs or hormones.

A few authors claimed that rearing of indigenous chickens in small groups under scavenging system, although treated as a low input and low output system, is a profitable system (Sazzad, 1986; Haque *et al*., 1990). According to Ukil (1992) scavenging feed is far from balanced and especially deficient in protein. Therefore the increased productivity of *desi* chicken may not be obtained solely on scavenging feed. To increase meat and egg production in the village level *desi* chickens need a type of diet that is adequate in terms of quality and quantity. Desi chicken may be more productive with improved diets when reared in confinement (Chowdhury *et al.*, 2006) but growth target or weight at marketing is yet to be determined as per demand of the consumers. Nutritional manipulation to develop *desi* chicken as a meat type bird is to be carried out with diets of adequate nutrient density by rearing them in confinement in rural condition.

Therefore the experiment was undertaken to investigate the growth potentials of indigenous (*desi)* chicks of Bangladesh in confinement by feeding diets containing different levels of energy and proteins under village condition. The evaluation of the potential of indigenous *(desi)* chicks fed varying levels of energy and protein in confinement for higher meat yield in a cost-effective manner seemed worthwhile under village condition.

## MATERIALS AND METHODS

The experiment was conducted with 4 weeks old indigenous unsexed chicks and it continued up to the achievement of body weight of 950g. Chicks (n=100) were divided into two dietary treatments having five replications with 10 chicks per replication (table-1) and reared on littered floor in an open sided house by providing 0.092 m² floor space per bird. Dietary treatments consisted of an arrangement of two diets that contained moderate energy density (MED): ME 2800 kcal/kg + CP 23% and high energy density (HED): ME 3000 kcal/kg + CP 23% (table-2). All diets were formulated using locally available feedstuffs. The contents of CP, ME, Calcium (Ca) and total Phosphorous in MED diet were fitted with the requirements of broilers as suggested by Bureau of Indian Standard (BIS, 1992).

Feed and water were provided *ad libitum* throughout the experiment. Body weight and feed consumption were recorded weekly. FCR, return per bird and BCR were calculated. One bird from each replication was randomly selected for processing after termination of the experiment. After processing the dressed weight was recorded. In addition, the weight of breast meat, thigh meat, drumstick meat and wing were taken by an electric balance. Data were analyzed statistically using T-test by SAS 2008.

**Table 1:** Layout of the experiment

| Diet | Replication and number of birds | | | | | Total number of birds |
|---|---|---|---|---|---|---|
| | $R_1$ | $R_2$ | $R_3$ | $R_4$ | $R_5$ | |
| MED | 10 | 10 | 10 | 10 | 10 | 50 |
| HED | 10 | 10 | 10 | 10 | 10 | 50 |
| Grand total | | | | | | 100 |

Moderate energy density (MED): ME 2800 kcal/kg +CP 23%, high energy density (HED): ME 3000 kcal/kg + CP 23%

**Table 2:** Ingredients and nutrient composition of the diets of experiment

| Ingredients (kg) | Diets | | | |
|---|---|---|---|---|
| | Starter (0-8 weeks) | | Grower (8 weeks onwards) | |
| | MED | HED | MED | HED |
| Maize | 15 | 35 | 12 | 12 |
| Rice polish | 18 | 10.5 | 22 | 20 |
| Wheat Bran | 4 | 0 | 14 | 5 |
| Wheat | 7 | 6 | 6 | 15 |
| Broken rice | 17 | 8 | 24 | 25 |
| Soybean Meal | 22 | 22 | 7 | 7 |
| Protein Concentrate | 1 | 1 | 0.5 | |
| Mustard oil cake | 12.5 | 14 | 11 | 12.5 |
| DCP | 1 | 1 | 1 | 1 |
| Methonine | 0.1 | 0.1 | 0.1 | 0.1 |
| Lysine | 0.1 | 0.1 | 0.1 | 0.1 |
| Salt | 0.5 | 0.5 | 0.5 | 0.5 |
| Lime stone | 1.6 | 1.6 | 1.6 | 1.55 |
| Vitamin mineral premix | 0.25 | 0.25 | 0.25 | 0.25 |
| Total | 100 | 100 | 100 | 100 |
| **Nutrient composition** | | | | |
| M E (kcal/ kg) | 2838 | 3022 | 2731 | 2923 |
| CP (%) | 23.31 | 23.37 | 17.27 | 17.39 |
| Ca (%) | 1.236 | 1.221 | 1.175 | 1.132 |
| Total P (%) | 0.865 | 0.825 | 0.783 | 0.762 |
| Lysine (%) | 1.326 | 1.311 | 0.929 | 0.906 |
| Methonine (%) | 0.563 | 0.523 | 0.582 | 0.491 |
| ME: CP | 121.7 | 129.3 | 158.14 | 168.09 |

Starter diets, MED= moderate energy density: ME 2800 kcal/kg + CP 23% and HED=high energy density: ME-3000 kcal/kg + CP 23%. Growing period: MED=moderate energy density: ME 2700 kcal/kg + CP 17% and HED= high energy density: ME 2900 kcal/kg + CP 17%

## RESULTS

### *Growth performance*

The growth performance of experimental chick**s** is presented in Table 3. The highest body weight gain was attained in HED (768g) and lowest in MED group (758g) from 4 to 14 weeks of age. The feed intake in MED (3294g) and in HED group (3271g) was statistically non significant. FCR decreased with an increase of energy in the diet although no statistical difference was observed. The survivability result was also close to each other, which ranged between 86 and 88 percent.

**Table 3:** Performance of indigenous (*desi*) chicks fed on different nutrient density diets (4 to 14 weeks) under intensive village condition

| Variables (g/chick) | Nutrient density | | Level of significance |
|---|---|---|---|
| | MED | HED | |
| Initial Body weight | 171.80 ±2.596 | 172±2.213 | NS |
| Final body weight | 930±3.535 | 940±4.743 | NS |
| Body weight gain | 758.20 ±2.059 | 768±3.449 | * |
| Average daily gain | 7.737±.0209 | 7.837±.035 | * |
| Feed Intake | 3294.00±69.613 | 3271.80± 42.323 | NS |
| FCR | 4.466± .085 | 4.315±.060 | NS |
| Survivability % | 86±2.449 | 88±2.00 | NS |

+NS, P>0.05; *P<0.05 , moderate energy density (MED) diet containing ME 2800 kcal/kg + CP 23% and high energy density (HED) diet containing ME 3000 kcal/kg + CP 23%

### *Carcass yield*

The carcass characteristics and meat yields of indigenous chicks under different nutrient density diets are shown in Table 4. This study showed that indigenous chick's dressing yield was 61.80% for MED and 62.92% for HED at 14 weeks of age. Dressing percentage was significantly higher in HED group than MED groups. Breast, thigh, drumstick, wing, neck, gizzard and liver weight had no significant effect between the two dietary groups (Table 4).

**Table 4:** Edible meat yield characteristics of *desi* chicken fed on diets of varying energy concentrations (4 to 14 weeks)

| Variables | Nutrient density | | Level of Significance |
|---|---|---|---|
| | MED | HED | |
| Dressing % | 61.80±.330 | 62.92±.339 | * |
| Breast meat % | 26.00±.411 | 26.38±.297 | NS |
| Thigh meat % | 10.00±.298 | 10.28±.374 | NS |
| Drumstick meat % | 8.00±.298 | 8.46±.529 | NS |
| Wing % | 8.25±.370 | 8.30±.340 | NS |
| Neck % | 7.30±.334 | 7.66±.249 | NS |
| Gizzard % | 5.14±.370 | 5.25±.213 | NS |
| Liver % | 4.24±.237 | 4.49±.215 | NS |

Moderate energy density (MED): ME 2800 kcal/kg + CP 23% and high energy density (HED): ME 3000 kcal/kg + CP 23%

### *Profitability analysis*

Data related to cost and return were calculated and the results of benefit cost analysis for profit measurement of *desi* chicks fed on different energy density diets are presented in Table 5. Feed cost was higher in HED diet and lower was in MED group. Total cost of production was found higher in HED diet and lower was in MED group. Return/bird was highest in HED (Tk. 211.50) diet and lowest was in MED (Tk. 209.25) group. Return/bird increased with

increasing level of the dietary energy densities. Increasing dietary energy levels increased net return and BCR. There was no significant difference between the two dietary groups with respect to total cost of production, return, net return, net return/kg and BCR (Table5).

**Table 5:** Cost and return of different dietary groups of *desi* chickens

| Variables(BDT) | Nutrient density | |
|---|---|---|
| | **MED** | **HED** |
| Feed cost | 109.89 | 110.77 |
| Chick cost | 20 | 20 |
| Labour cost | 21 | 21 |
| Medicine and vaccine cost | 10 | 10 |
| Others cost | 10 | 10 |
| Mortality cost | 29.295 | 25.38 |
| Total costs | 200.19± 3.002 | 197.16±3.431 |
| Gross return | 209.25±.795 | 211.50±1.067 |
| Net return/bird | 9.06±3.476 | 14.34±3.480 |
| Net return/kg | 9.70±3.716 | 15.24±3.684 |
| Cost benefit ratio | 1.046±.0179 | 1.074±.018 |

Moderate energy density (MED) diet containing ME 2800 kcal/kg + CP 23% and high energy density (HED) diet containing ME 3000 kcal/kg + CP 23%

## DISCUSSIONS

### *Growth performance*

The final body weight was non significant in HED (940g) and MED (930g) groups. The results of weight gain showed that differences were statistically significant ($P<0.05$) between the treatments (Table 3). The achievement of body weight close to target in this experiment was close to the previous result of Miah *et al.*, 2014 with HED diet containing 23% and 17% CP during brooding and growing period respectively. Faruque *et al.* (2013) also found that Bangladeshi indigenous grower chicks attained 716g body weight at 12 weeks after feeding a diet containing 20% CP and 2900 kcal ME/kg DM; 18% crude protein and 2900 kcal ME/kg DM during brooding and growing period respectively. Several researches have shown that feed efficiency is influenced by changes in dietary energy concentration in two partially dependent pathways. Firstly, as dietary energy increases, feed efficiency is improved as less feed is taken to satisfy the energy needs of the chickens. Secondly, growth rate is promoted by increasing levels of dietary energy (Jackson *et al*., 1982; Pesti *et al*., 1983; Plavnik *et al*., 1997).

The growth performance in terms of body weight of the *desi* chicken as obtained in this study also agreed with the performances of Thai indigenous chicken (Choprakarn *et al.*, 2002). The FCR of the *desi* chicken as obtained in this study also agreed with the FCR of Betong chicks in Thailand at 12 weeks of age (Nguyen *et al.*, 2010), with diet containing ME 3000 kcal/kg + CP 21% . The survivability of *desi* chicks was higher in improved energy diet groups. Survival rate of Bangladeshi indigenous grower chicks varied from 83 to 95% with a mean of 87% as showed by feeding a balanced diet (Sarkar and Golam 2009).

### *Carcass yield*

This study showed that indigenous chicks dressing yield was 61.80% for MED and 62.92% for HED at 14 weeks of age. Dressing yield close to these results (60.26) was reported for normal *desi* genotype (Faruque *et al.,* 2011). In an earlier experiment (Miah *et al.,* 2014), dressing yield was found to be 62.2% at 12 weeks after feeding a diet containing 23% CP and 3000 kcal ME/kg DM; 19% CP and 2900 kcal ME/kg DM during brooding and growing period respectively which were close to the results of HED diet containing 23% and 17% CP that was fed during brooding and growing period respectively. Dressing percentage was relatively higher in HED group than in birds that received MED diet. There was no effect of diet on breast, thigh, drumstick meat, and also for wing, neck, gizzard and liver weight.

### *Profitability analysis*

Although return per bird, net return and BCR increased with increasing level of the dietary energy densities, no statistical difference between diets imply that both diets are equally effective from economical point of view. The result of BCR was 1.07 in HED group which was greater than MED group. It indicates that if *desi* chicken rearers invest of Tk.1.0 then they can earn Tk. 1.07. So, profit was Tk. 0.07 and it was Tk.14.34 per bird. In our previous experiment (Miah *et al.,* 2014), it was found that profit with chicks was Tk. 15. 1 at 14 weeks after feeding a diet containing 23% CP and 3000 kcal ME/kg DM; 19% CP and 2900 kcal ME/kg DM during brooding and growing period respectively which were close to the results of HED diet containing 23% and 17% CP during brooding and growing period respectively.

## CONCLUSIONS

It may be concluded that, a nutrient density of 3000 ME kcal/kg and 23% CP (HED diet) would be required to achieve a target weight of 940g at 14 weeks age if reared in confinement under rural areas. An improvement in meat yield characteristics in terms of dressed weight, breast meat, drumstick meat is possible during this period of growth. Feeding HED diet to such chicks was most profitable. However, this result would have to be confirmed under rural condition where bird could be allow for scavenging alongside supplemental feeding, thus enabling more saving of the cost of feed to maximize profit.

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## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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