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EFFECTS OF POULTRY FEED AND STOCKING DENSITY ON BROILER PERFORMANCE

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ABSTRACT: This study was carried out with the objective to evaluate the effects of poultry feed under different stocking densities on Feed Conversion Ratio (FCR) and growth of broiler strain Ross 308. An experiment was conducted with three types of feed under three stocking densities. A total of 450 unsexed Day-Old Chicks (DOC) were used for the study. The types of feed tested were Karma feed, BMG feed and Samrat feed. The three stocking densities were low density (6 birds m^{-2}), medium density (8 birds m^{-2}) and high density (10 birds m^{-2}). The areas allocated were 8.33 m^{-2}, 6.25 m^{-2} and 5.0 m^{-2} for low, medium and high densities, respectively. Each area was stocked with 50 birds. Feed type showed a significant effect on the final live body weight. Mortality was not significantly affected by feed. At the end of experiment (42 days), the final live body weight was greatest for birds fed with Samrat feed in stocking density of 8 birds m^{-2}. The lowest body weight was recorded for birds fed with BMG feed in stocking density of 10 birds m^{-2}. The average final live weight across all stocking densities was recorded for Karma feed. The study results suggest that Samrat feed is the best among three feed brands for commercial broiler Ross-308.

Keywords: Broiler; feed brand; Feed Conversion Ratio; poultry; stocking density.

1. INTRODUCTION

Poultry production is practiced worldwide and provides an acceptable form of animal protein, minerals and vitamins in human diet (Szőllősi et al. 2014). Broiler farming has been recognized as a profitable enterprise and is much-preferred agro-business than ruminants (Beg et al. 2011) with the competitive edge that it can be harvested for human consumption within short time. According to Shahimi et al. (2006), the important economical traits considered for broilers are growth rate, Feed Conversion Ratio (FCR), mortality and carcass quality. Srivastava et al. (2013) reported that feed is a major component, affecting net return from poultry, as it accounts about 65 to 70% cost of broiler production. In the recent years, with escalating feed cost in the market, profit from poultry has been declining every year (Vasanth et al. 2015). FCR determines the profitability and economic viability of broiler farm. FCR in broiler production varies from region to region and farm to farm due to different management practices. According to Scott (2005), when feed intake is increased, the greater proportion of nutrients is used for growth and better FCR is achieved. Samarakoon and Samarasinghe (2012) noted that FCR increases with increasing age in both sexes of broiler from day 1 to 42.

In broiler production, Skrbic et al. (2009) stated that stocking density is a very important welfare

factor, which directly and indirectly influences and determines the level of growth of chicken body weight. Many studies on stocking density have produced variable results in broiler production. Some studies have shown great benefits under low stocking density, while others revealed little or no differences. Tayeb et al. (2011) revealed no difference in live body weights and feed conversion ratio at 7 weeks of age under different stocking densities.

In Bhutan, poultry farming has gained popularity and is one of the important livestock components. Poultry development in Bhutan started in the first five-year plan in 1961 with an aim to improve nutrition of rural population and alleviate poverty through increased egg and meat production. Further, it was intended to replace local birds by exotic breeds to enhance production (Nidup et al. 2005). Rearing of broiler chicken was not introduced in spite of poultry development because of the religious belief and other social stigmas (Nidup et al. 2005). The chicken meat demand was mainly met through import from neighboring states of India (Dahal 2007). With the increase in chicken consumption, rearing of broilers has slowly gained momentum, especially in southern Bhutan. The commonly used strain of broiler chicken is Ross-308. Although, Ross-308 is popular, FCR of Ross 308 has never been studied. Therefore, a study was conducted with the objective evaluate the effects of stocking density and feed type on growth and FCR of commercial Ross-308.

2. MATERIALS AND METHODS

2.1 Experimental site

The experiment was conducted at National Poultry Research and Development Centre, Sarpang district. The experimental area has wet tropical to humid subtropical type climate, characterized by hot summer and moderately cool winter. The average annual temperature is 22ºC and the average annual rainfall ranges from 1200 mm to 2500 mm.

2.2 Experimental design and treatments

A total of 450 unsexed Day-old Chicks (DOC) of Ross-308 strain were used as experimental birds. Three types of feed were applied across three stocking densities. The feeds were Karma, BMG and Samrat feed. Each bird was an experimental unit from where measurements were recorded. Stocking density was not replicated. The conditions and standards of the experiment were in accordance with the standard management guidelines of commercials Ross 308 (2015). The DOCs were randomly allocated to three-stocking density of 6 birds m^{-2} (low stocking density), 8 birds m^{-2} (medium stocking density) and 10 birds m^{-2} (high stocking density). The areas allocated to low, medium and high stocking densities, were 8.33 m^{-2}, 6.25 m^{-2} and 5.0 m^{-2}, respectively. Each area was stocked with 50 birds.

On zero day, chicks were fed *ad libitum* and from day 1 to 23, birds were fed with chick starter in accordance with standard management guidelines of Ross 308. On 24th day, 70% chick starter (crumble) and 30% broiler finisher (mash) were fed. On the following day, birds were provided 50% each of starter and finisher. On 26th day, birds were fed with 30% starter and 70% finisher accordingly. From 27th day, the birds were provided with finisher till 42nd day. Birds were provided with 24 hours of lighting on day one. In subsequent days, one-hour darkness was provided till seven days of age. From 8th to 21st day, six hours darkness was provided and from 22nd day, birds were provided with 12 hours of lighting till 42nd day. To avoid diseases entry into the experimental site, all biosecurity measures were incorporated and birds were vaccinated timely.

2.3 Brooding of birds

The chicks were vaccinated against Marek disease at the hatchery. Feed and water were provided *ad libitum* on day zero. From day 1 to 7, chick plates were used for feeding and round drinkers were used. After 1 week, feeds were provided in round feeders and heights of the feeders were adjusted according to the height of birds. The average temperature and humidity at birds' level were 31.9°C Celsius and 78%, respectively. Fresh, clean and sundried saw dusts were used as bedding materials. Liquid petroleum gas and electric brooders were used for brooding.

2.4 Data collection

The data was collected over a period of 42 days from 15th March to 26th April, 2017. The body weights were measured weekly and mortality was recorded on daily basis. FCR, mortality and Average Daily Gain (ADG) were determined on weekly basis by using the following formula.

$$FCR = \frac{Total\ feed\ intake\ (g)}{Final\ weight\ gain\ (g)}$$

$$\text{ADG} = \frac{Final\ weight - Initial\ weight\ (g)}{Age\ (Days)}$$

$$Mortality = \frac{No.of\ dead\ birds}{No.of\ initial\ birds} \times 100$$

2.5 Data analysis

The data were entered in Microsoft Excel 2010. The normality of data was tested with Shapiro Wilk test and homogeneity of variance was tested with

Levene's test. Under each stocking density, the effects of feed on FCR and growth of broiler were tested with One-Way Analysis of Variance (ANOVA). The independent variable was feed and the dependent variables were FCR and body weight. Difference in dependent variables was considered significant when p values were below 0.05. The statistical software Statistical Package for Social Science (SPSS) version 23 was used for analyzing the dataset.

3. Results and Discussion

3.1 Growth rate

At the start of experiment, there was no significant difference in average body weight of broiler DoCs, distributed across different feed brands and stocking density. After 42 days, the birds fed with Karma and Samrat feeds had attained better marketable weight compared to birds fed with BMG feed (Figure 1). The marketable weights of birds were 2456.56 g and 2498.12 g for Karma and Samrat feed, respectively, compared to the body weight of 1448.04 g of birds fed with BMG feed. Karma and Samrat feeds did not differ significantly in terms of body weight but their body weights were significantly higher than the body weight produced by BMG feed. A study by Pathak et al. (2015) reported an average body weight of 1967.95±3.07 g up to 42 days, which is much lower than the body weights produced by Karma and Samrat feeds. However, it is slightly higher than the body weight produced by BMG feed. The study revealed almost one kg live body weight difference when fed with equal quantity of feed. Our findings suggest that Karma and Samrat feeds are of superior quality than BMG feed, although we did not analyze the quality of feeds.

3.2 Feed Conversion Ratio (FCR)

FCR was significantly affected by feed brand at 42 days of age (Figure 2). No significant difference in FCR between Karma and Samrat feed was observed in all stocking densities. The final average FCR for Samrat and Karma were 1.81 and 1.84, respectively. The lowest FCR of 2.82 was observed for BMG feed. The results of this study on FCR are in agreement with the findings of Nidup and Wangchuk (2007), who found better FCR with Samrat feed. A study by Zakeri et al. (2013) revealed no significant difference in FCR among three dietary groups. Tayeb et al. (2011) also revealed no significant difference in live body weights and FCR at 7 weeks of age under different stocking densities. In contrast, Ullah et al. (2012) revealed significant difference in FCR among different experimental diets. According to Aviagen (2012), the standard in Ross 308 broiler, as-hatched performance, is 2.77 kg live weight with FCR of 1.72 at 42 days of age. The current study failed to achieve this level of FCR. However, it is in congruence with the result of Szőllősi et al. (2014) who observed final live weight of 2.59 kg with a FCR of 1.88 at 42 days of age.

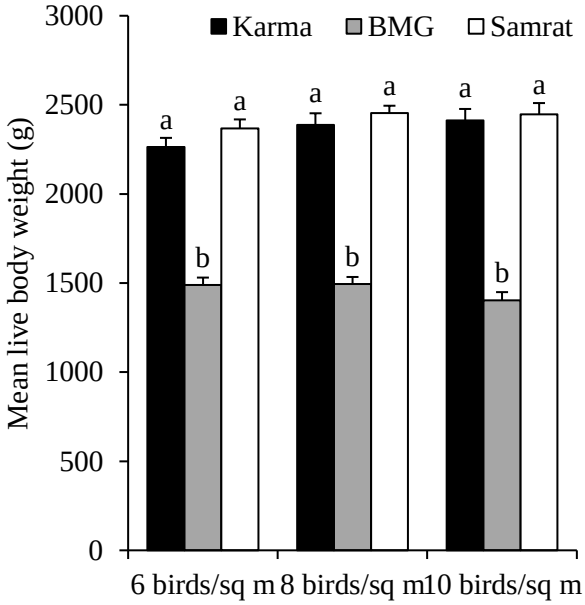

Figure 1: Average live body weight of birds fed with different feeds after 42 days. Means with different letters are significantly different at p≤0.01.

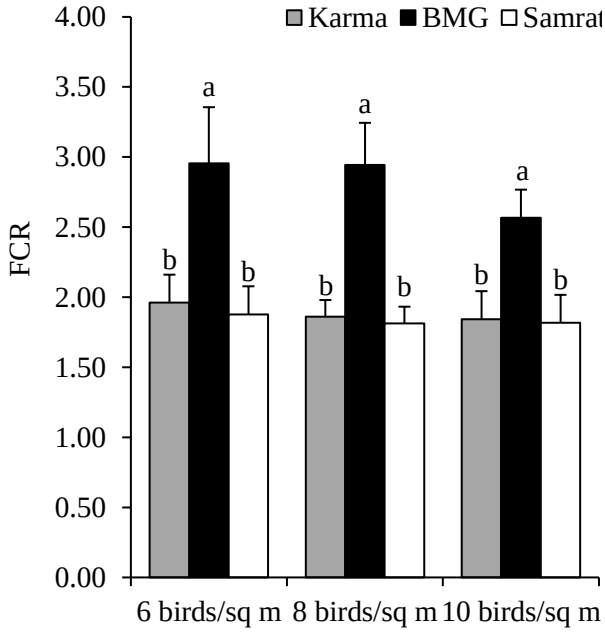

Figure 2: Effects of feed on FCR after 42 days under three stocking densities. Means with different letters are significantly different at p≤0.01.

3.3 Mortality

On an average, 4.67% (21) mortality was observed during the experiment. Of this, 4% mortality was recorded in the first week of brooding and 0.67% occurred in the next 5 weeks. The mortality did not

differ significantly between feed brands. This study contradicts the findings of Ali et al. (2012) who reported significant difference in mortality under different stocking densities and flock size. Further, a study by Hall (2001) showed significant increase in mortality with increase in stocking density. In contrast, Ali et al. (2012) revealed increased percentage of mortality with age of birds.

4. CONCLUSION

The final body weight and FCR were comparable between Samrat and Karma feed types. Feed types had no effect on mortality during the experiment. Samrat feed is the best among three feed brands for commercial broiler Ross-308.

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