Growth and Carcass Performance of Broiler Chickens When Maize is Replaced with PM Under Namibian Weather Conditions.

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Introduction

The broiler chicken industry is an important source of animal protein in Namibia, as evidenced by the increased demand (e.g. 60 000 kg per month in the northern regions of Namibia) for broiler meat by consumers (MAWF, 2008). The major advantage of broiler chicken meat is its lower iron contents (Farrell, 2010), lean meat, as well as more desirable unsaturated fatty acids (Appleby, (Ed.) 2010), therefore it is perceived as healthy and nutritious as compared to beef and lamb. Amazingly, there are no universally accepted criteria for defining meat quality throughout the world (Monin, 2004). Therefore according to Borggaard and Andersen (2004), consumers decide on the goodness of the quality of the meat which may differ according to culture. The feed intake of nutrients by broiler chickens is a function of the amount of feed eaten and the nutrient levels in the diet (Choct, 2012). Therefore, a successful broiler production is dependent upon supplying the birds with feed of the highest achievable quality, in terms of ingredients used, processing procedures applied as well as the form in which the diet is presented to broilers (Arbor Acres, 2009). There was no study done in Namibia to determine the value of the local PM grains as a commercial broiler feed, as compared to maize which is commonly used in broiler chicken diets by broiler commercial operations. The objective of this experiment was to study the performance of commercial broiler chickens fed pearl millet as a replacement of maize.

Materials and Methods

This study was conducted at the poultry units at Neudamm Agricultural Campus of the University of Namibia. Neudamm Agricultural Campus is situated between 22°30.105‟S and 017°20.824‟E in the Khomas Region, located about 34 km east of Windhoek, the capital city of Namibia. Soya bean meal and vitamin-minerals premixes were bought from Feedmaster Ltd. Maize grains were purchased from Shadikongoro Irrigation Project in Ndoga Linena in Okavango region and pearl millet from a communal farm in Omusati region in the northern part of Namibia. Unpolished pearl millet grains ground with a 2 mm sieve were incorporated into the diets (a starter and a finisher). The saw dust was obtained from a local company and used as bedding throughout the experiment. Experimental diets were formulated on a computer and mixed manually as a mash. All of the ingredients used to formulate experimental diets were analyzed for dry matter, crude protein, energy, crude fiber, ether extract, calcium and phosphorus according to official Methods of Analysis (AOAC, 1995). One hundred and one (70) day-old broiler (mixed sex) Cobb500 chicks were supplied by the Namib Poultry Industries (the only commercial broiler farm in Namibia) and were used for the study which lasted for 7 weeks. A two phase feeding regime was used comprising three weeks starter phase and 4 weeks finishers phase. Statistical analyses were performed using the General Linear Model (GLM) procedure of IBM SPSS Statistics 20 (2011) package.

Results and Discussion

The pearl millet grains used in this study contained 120 g of crude protein per kg, 21 g of crude fiber per kg, 16 mg of calcium per 100 g, 4 g of fat per kg. Crude protein, fat and crude fiber contents of pearl millet observed in the present study are in the agreement with a previous study by Davis et al. (2003) and quite different from those reported by Mehri et al. (2010). The amount of soybean meal required to formulate experimental diets was reduced by 1.5% at 100% inclusion of pearl millet (19.5% of soybean was used) as compared to that of the 0% inclusion of pearl millet (maize-soybean based, which is the experimental control diet) where 21% was required. Since protein is the most expensive nutrient in feeds, the use of pearl millet reduces feed costs. Experimental finisher diets (T1 – T5) used to study the effects of replacing maize with pearl millet contained 12.0, 12.1, 12.0, 11.9 and 11.8 ME/MJ/Kg energy contents and 16.3, 16.2, 16.3, 16.0 and 16.1 % protein contents respectively. Research findings of the present study have revealed that replacing maize with pearl millet in broiler diets had no adverse effect on production responses of broiler chickens.

Table 1. Effects of replacing maize with pearl millet on feed intake (g/bird/day), weight gain (g/bird/day) and feed conversion ratio (FCR) (g feed/g live weight gain) of Cobb 500 broiler chickens from 21 to 49 days of age.

Treatment	ADFI	ADG	FCR
21 to 42 days of age			
T1	62.3±2.62^{a}	49.6±2.37^{a}	1.3^{a}
T2	69.1±4.85^{a-b}	57.2±1.78^{b}	1.2^{a-b}
T3	75.4±2.73^{b}	60.3±2.34^{b}	1.3^{a}
T4	69.2±4.45^{a-b}	60.9±2.85^{b}	1.1^{b}
T5	70.7±2.55^{a-b}	59.9±3.26^{b}	1.2^{a-b}
21 to 49 days of age			
T1	64.0±2.56^{a}	53.9±1.83^{a}	1.2^{a}
T2	68.0±4.65^{a-b}	60.1±0.88^{b}	1.1^{b}
T3	74.7±2.72^{b}	63.0±1.75^{b}	1.2^{a}
T4	67.6±4.34^{a-b}	62.7±2.62^{b}	1.1^{b}
T5	68.7±2.74^{a-b}	61.3±2.30^{b}	1.1^{b}

$^{a-b}$Means within a column without a common superscript differ significantly (P < 0.05). ADFI = Average daily feed intake; ADG= Average daily gain. T1= Control diet; T2 = 25% of Maize replaced with pearl millet; T3 = 50% Maize replaced with 50% of pearl millet; T4 = 75 % Maize-based replaced with PM; T5 = 100 % Maize replaced with of PM

Similar findings were reported by Davis et al. (2003); Tornekar et al. (2009) and Baurhoo et al. (2011). Broiler chickens fed pearl millet (PM) diets (PM 25%, PM 75 %, PM 100 %), especially those fed 50 % PM, gained significantly more weight than the control – based diets. It is not clear why the chickens fed PM 50 % diets resulted in significantly heavier birds than the ones fed PM 25 %, PM 75 % and PM 100 %. Perhaps it could be a result of a longer adaptation period required for the gizzards to adapt to a new diet, which should be obviously longer in broilers fed PM 100 % and PM 75 % since they were introduced to totally different diets. However, no studies were accessed to back up this statement. The present study observed that replacement of maize with pearl millet had no significant (P > 0.05) effect on feed intake and FCR (g feed/g live weight gain) of broiler chickens from 21 to 49 days of age. However, from visual observations for the feed intakes, birds fed dietary levels of pearl millet as a replacement of maize had higher feed intake as compared to those which were fed maize-based diet. The same observations were reported by Baurhoo et al. (2011). FCR values obtained in this experiment ranged between 1.14 to 1.25 (pearl millet based diets) and 1.30 (control diet) at 42 days of age and between 1.08 to 1.19 for pearl millet based diets and 1.19 for the control diet at 49 days of age. These figures are in the same range as the ones reported by Atil (2007). Results of the present study have shown that, the relative gizzard weights were significantly higher in birds fed PM 25 % (46.3 g) and PM 50 % (45.0 g) than those from birds fed the control diet (37.5g) at 42 days of age. Studies have shown that, moderate amounts of fiber in the broiler chicken diets improve the development of the gizzard (Gonzales-Alvarado et al., 2007; Hetland and Svihus, 2007). Regardless of the age at slaughter, there was no significant difference (P > 0.05) in the abdominal fat deposition, breast and weight (g) of thighs for the broilers fed maize-based diet (control diet) and those which were fed pearl millet diets. Although pearl millet grains are more expensive, diets formulated with pearl millet produced birds with heavier weights than those of maize based diets (Table 3). If pearl millet makes its way into the feed manufacturing value chain, this may stimulate more production which will eventually lower the prices. Local farmers will benefit from increased farm incomes.

Conclusion

The research findings of the present study have revealed that replacing maize with pearl millet (PM) in broiler diets had no adverse effects on overall production responses of broiler chickens. Broiler chickens fed PM 50 % diets resulted in significantly heavier birds. In situations where there is no maize, pearl millet can be used as the sole energy source albeit with some slight reduction in performance.

Recommendations

In this study, treatments were imposed on the finisher stage of maturity. Therefore, research is recommended to test the treatment from day old chickens. Repeated feeding trials on a larger scale is recommended before pearl millet and A. karroo can be safely used by feed manufacturers. The same research should be done with different broiler breeds (indigenous chickens).

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