
QUALITY ASSESSMENT OF MIXED DIET OF CONCENTRATES AND CROP BYPRODUCTS FOR ALL-YEAR FEEDING OF RUMINANTS

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ABSTRACT

The addition of different plant part extracts in the diets of poultry has been reported to have some effects on animal physiology and biochemical functions. This study evaluated the growth performance of broiler chickens fed leaf meal, raw and toasted seed cakes of *Moringa oleifera* from 0-4 weeks. A total of 96 day-old chicks were allotted to 4 treatment groups of 8 birds each in a completely randomized design with 3 replications. The trial lasted for 28 days for the starter phase. The results showed significant differences ($p < 0.05$) in average final weight gain, average daily weight gain, average daily feed intake and feed conversion ratio. The birds fed the toasted *Moringa* seeds showed significantly higher weight gains than all other treatments. Therefore, it can be concluded that toasted *Moringa* seed cake, when included in the diet of starter broilers, promotes optimal growth and productivity, than raw *Moringa* seed cake, leaf meal as well as the control treatment. Therefore, toasted *Moringa* seed cake could effectively be used as growth promoter and can replace the use of other synthetic commercial additives especially for consumers who insist on organic products as well as for increased profitability of the poultry production business.

Key Words: Broiler Finisher, Feed additive, Growth Performance, *Moringa oleifera*,

INTRODUCTION

The spiraling costs of broiler feeds and the attendant reduction in profit margins has made many farmers to seek alternative methods not only to reduce feed costs but also to improve feed utilization for overall animal performance and profitability. Addition of natural pigments from plants to animal diets has been reported to improve efficiency of feed utilization and decreased mortality in fish (Watanabe and Aquis, 2003) improved sow fertility and survival of healthy piglets (Lignell and Inboor, 2000), improved feed utilization in poultry (Iheukwumere *et al.*, 2008). Besides the high contents of protein, they contain a variety of biologically active compounds that may serve as growth and health promoting substances. These compounds include vitamins, phenolic acids, flavonoids, isothiocyanates, tannins as well as saponins (Vergara-Jimenez *et al.*, 2017), others are alkaloids, terpenoids, steroids (Mashayekhi *et al.*, 2018). *Moringa oleifera* is indigenous to Northern India and Pakistan (Bosh, 2004) and is introduced throughout the tropics and sub-tropics becoming naturalized in many African countries. Yameogo *et al.* (2011) reported that, on a dry matter basis, *Moringa oleifera* leaves contained 27.2% protein, 5.9% moisture, 17.1% fat, and 38.6% carbohydrates. Anwar and Rashid (2007) observed that on a dry matter basis, *Moringa oleifera* seeds contained 34.80% ether extract, 31.65% protein, 7.54% fibre, 8.90% moisture, and 6.53% ash contents. Makkar and Becker (1997) found that the essential amino acid contents of the leaves and sulphur containing amino acids of the kernel were higher than the amino acid pattern of the FAO reference protein, but other essential amino acids of the kernel were deficient.

In a bid to meet the protein needs of an ever growing human population, Nigerians rely heavily on poultry products such as meat from broilers which is in high demand by households especially on weekends and during ceremonies. This has developed the live-chicken and processing segment of the poultry value chain, evident in most urban markers across Nigeria. The survival of the poultry industry in the region is premised on reduction of cost of production hence the search for alternative additives in broiler diets that are capable of improving feed efficiency at minimal cost. The improvement in feed utilization promotes lower feed consumption and reduces cost of production which before now was achieved by the use of

many synthetic growth promoters and probiotics, some of which may be harmful. In view of the concerns of the long-term health implication of prolonged use of synthetic products it becomes imperative to replace these synthetic feed additives/growth promoter with natural based products. Based on the foregoing therefore, this study was initiated. The objective of this study was to investigate the effect of inclusion of *Moringa oleifera* leaf and seed cake fractions on the growth performance of broiler starter birds.

MATERIALS AND METHODS

The experiment was carried out in the Poultry Unit of the Teaching and Research Farm of the School of Agriculture and Agricultural Technology (SAAT), Federal University of Technology, Owerri, Imo State Nigeria. Owerri is located at an altitude of 90m above sea level. The mean annual rainfall, temperature and humidity are 2500mm, 26.5-27.5°C and 70-80%, respectively. The duration of the dry season is 3 months with rainfall of 65mm and the mean annual evaporation of 1450mm. The soil is sandy loam with an average pH of 5.5.

Fresh leaves of *Moringa* were harvested from within the University Campus and surrounding areas and were spread under the sun to facilitate drying for 5-7 days until the leaves became crispy while still retaining its greenish colouration. The dried leaves were then ground into a meal using a motorized electric grinding mill to produce *Moringa oleifera* leafmeal (MOLM). Similarly, the dry seeds of *Moringa* were sorted, cleaned and divided into two batches, one batch was toasted for 10-15 mins, in a frying pan using dry heat, while the other one was left raw. The toasted and raw *Moringa* seeds were then separately ground into a meal using a motorized electric grinding mill to produce *Moringa oleifera* seed cake (MOSC).

A total of 96 (ninety – six) day old broiler chicks of Cob-strain were used for the experiment. The birds were divided into 4 groups and randomly assigned to the four experimental diets in a completely randomized design (CRD). Each group was further subdivided (replicated) into 3 groups of 8 birds each. They were housed in a deep litter system with wood shavings used as litter materials. Feed and water were provided *ad-libitum* during the trial period. Litter was changed periodically to reduce build-up of pathogenic microbes as well as the observance of other routine poultry management practices. Four experimental starter broiler diets were formulated such that the diets contained 0 % (control), and 5% inclusion of leafmeal, raw and toasted seed cakes respectively, at the starter phase.

The parameters measured were, initial body weight, final body weight, weekly body weight gain, average daily body weight gain, average daily feed intake and feed conversion ratio. Birds were weighed together at the beginning of experiment and at the end of each week and the weights recorded. The average weight per treatment was obtained by dividing the total weight of birds in the treatment by the number of birds in that treatment group.

Statistical Analysis: Data on each of the parameters were subjected to analysis of variance using the (ANOVA) as a completely randomised design (CRD). The Duncan New Multiple Range test was used to determine differences between treatment means in accordance with SAS (2002).

RESULTS AND DISCUSSION

There were significant ($P < 0.05$) differences in average final weight gain, average daily weight gain, average daily feed intake, and feed conversion ratio with treatment 2 showing superior performance when compared with the rest of the treatments and treatment 4 having the least. This could be as a result of the fibrous nature of the leaf meal which also resulted in a lower average daily feed intake. The results also showed that Treatments 1 and 3, were statistically similar ($p > 0.05$) in average final body weight, average daily weight gain, average feed intake and feed conversion ratio but differed significantly ($p < 0.05$) from treatment 4. These results are in line with the findings of Soad, (2010) and Banjo, (2010) who reported significant differences in broiler diets at various levels at the inclusion of *Moringa* plant fractions in the diet of broiler birds.

The feed conversion ratio showed that treatment 1 and 2 had better conversion ratio although not significant ($p > 0.05$). The lower feed intake observed in treatment 4 may be result from the fibrous nature

of the leaf meal fraction, the lower nutritional composition of the leaf meal and probably the absence of feed enzymes. Abou - Elezz et al.(2012) demonstrated that Moringa seed cake contained higher vitamin and mineral, and amino acid content as compared to the leaf meal.

Table 1: Percentage composition of experimental diets at the starter phase

Ingredients	Diet 1 (Control)	Diet 2 (Toasted Seed Cake)	Diet 3 (Raw Seed Cake)	Diet 4 (Leaf Meal)
Maize	60	60	60	60
Soya bean	25	20	20	20
Wheat offal	10	10	10	10
Moringa plant fraction	0.0	5	5	5
Fish meal	1	1.75	1.75	1.75
Bone meal	3	3	3	3
Lysine	0.25	0.0	0.0	0.0
Methionine	0.25	0.0	0.0	0.0
Vit/min premix*	0.25	0.0	0.0	0.0
Salt	0.25	0.25	0.25	0.25
TOTAL	100	100	100	100

Table 2: Performance of broiler birds from 0-4 weeks of growth.

	T 1	T 2	T 3	T4	SEM
Average initial body weight	25	25	25	25	-
Average final body weight	413 ^{ab}	450 ^a	392 ^b	229 ^c	35.26
Average weight gain	388 ^{ab}	425 ^a	367 ^b	204 ^c	23.39
Average daily weight gain	13.86 ^{ab}	15.18 ^a	13.11 ^{ab}	7.29 ^c	2.22
Average daily feed intake	32.99 ^{ab}	36.39 ^a	32.93 ^{ab}	26.72 ^c	3.29
Feed conversion ratio	2.38 ^a	2.40 ^{ab}	2.51 ^{ab}	3.67 ^c	0.52
Mortality	-	-	-	4	

Means across rows with different superscripts are significantly different (P<0.05).

CONCLUSION

The result of this study demonstrated that inclusion 5% level of toasted *Moringa oleifera* seed cakes to broiler starter feeds significantly increased the growth performance of birds leading to for optimum weight gains and therefore could serve as effective natural growth promoter thereby improving feed utilization and reduction of cost of production.

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