

Growth performance characteristics of broiler starter birds fed three *Moringa oleifera* fractions as additive without mineral and amino acid supplementation

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Abstract

The addition of different plant parts as supplement 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 starter chickens fed leaf meal, raw and toasted seed meals of *Moringa oleifera* from 0-4 weeks. A total of 96 day-old chicks were allotted to four treatment groups of eight birds each in a completely randomized design with three replications. The trial lasted for 28 days. The parameters measured were average final weight gain, average daily weight gain, and average daily feed intake and feed conversion ratio. The result showed significant differences ($p < 0.05$) in average final weight gain, average daily weight gain, average daily feed intake and feed conversion ratio. It was revealed that different moringa plants parts exert different effects on the animal probably due to the contents of different biochemical compounds. The leaf meal notably depressed feed intake compared to the control and the raw and toasted seed meals. The birds fed the toasted moringa seeds showed significantly higher weight gains than all other treatments. Therefore it can be concluded that moringa seed meal could effectively replace the use of commercial additives at the starter phase of broiler production, hence its use is recommended to reduce production cost and increase profitability of poultry production business.

Keywords: Broiler starter, feed additive, growth performance, *Moringa oleifera*

Caractéristiques de performance de croissance des poussins de poulet de chair nourris avec trois fractions de *Moringa oleifera* comme additif sans supplémentation en minéraux et acides aminés



Résumé

Il a été rapporté que l'ajout de différentes parties de plantes comme supplément dans le régime alimentaire des volailles a des effets sur la physiologie animale et les fonctions biochimiques. Cette étude a évalué les performances de croissance de poulets de chair nourris avec de la farine de feuilles, des farines de graines crues et grillées de *Moringa oleifera* de 0 à 4 semaines. Un total de 96 poussins d'un jour ont été répartis dans quatre groupes de traitement de huit oiseaux chacun dans une conception complètement randomisée avec trois répétitions. Le procès a duré 28 jours. Les paramètres mesurés étaient le gain de poids final moyen, le gain de poids quotidien moyen et la prise alimentaire quotidienne moyenne et le rapport de conversion alimentaire. Le résultat a montré des différences significatives ($p < 0,05$) dans le gain de poids final moyen, le gain de poids quotidien moyen, la prise alimentaire quotidienne moyenne et le taux de conversion alimentaire. Il a été révélé que différentes parties des plantes de moringa exercent des effets différents sur l'animal, probablement en raison de la teneur en différents composés

biochimiques. La farine de feuilles a considérablement diminué la prise alimentaire par rapport au témoin et aux farines de graines crues et grillées. Les oiseaux nourris avec les graines de moringa grillées ont montré des gains de poids significativement plus élevés que tous les autres traitements. Par conséquent, on peut conclure que la farine de graines de moringa pourrait remplacer efficacement l'utilisation d'additifs commerciaux lors de la phase de démarrage de la production de poulets de chair, son utilisation est donc recommandée pour réduire les coûts de production et augmenter la rentabilité des activités de production de volaille.

Mots clés : finisseur de poulets de chair, additif alimentaire, performance de croissance, Moringa oleifera

Introduction

The spiraling costs of broiler chicken 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, natural plants contain a variety of biologically active compounds that may serve as growth and health promoting substances which serve as feed additives. These compounds include vitamins, minerals, phenolic acids, flavonoids, isothiocyanates, tannins as well as saponins (Vergara-Jimenez *et al.*, 2017), others are alkaloids, terpenoids, steroids (Mashayekhi *et al.*, 2018). Feed additives which could be natural or synthetic are added to broilers diets to improve productive performance by increasing growth rate, better feed conversion efficiency and health in poultry birds (Meshram *et al.*, 2019). Besides the natural ingredients, there also exist a wide variety of synthetic feed additives in the market, used as probiotics and growth promoters. The long term effects of some of these synthetic feed additives has not been

adequately studied. *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. It is widely distributed around the north central and semi-arid regions of Nigeria, where it is highly revered as a medicinal plant rich in essential nutrients for young children and pregnant women. Broiler chickens at the starter phase require adequate supply of essential vitamins and minerals to make a head start in the growth process. Abdusalam *et al.* (2015) observed that addition of *Moringa* leaf meal up to 1 % level of inclusion significantly depressed weight gain, feed efficiency and body weight during starter phase of growth. Onu and Aniebo (2011) reported increased body weight and growth performance of broiler starter at 5 % level but a depressed weight at 7.5% level of inclusion. Meshram *et al.* (2019) reported an optimum inclusion level of 0.5% leaf meal for improved final body weight, average weight gain, feed intake and feed conversion ratio but a depressed weight at 1% level of inclusion in broiler finisher birds. Jones *et al.* (2017) found no effect ($P > 0.05$) of inclusion of moringa leaf meal on intake, growth and live weight changes on broiler finisher chickens at 5 to 20 g/ Kg⁻¹ but it improved ($P < 0.05$) nitrogen retention of the chickens. Also, seed meal inclusion had no effect ($P > 0.05$) on meat nitrogen, ash, pH and colour but it improved ($P < 0.05$) lipid and energy contents of the meat. Tesfaye *et*

al.(2013) reported that the addition of 10-20% of moringa resulted in a significant ($P<0.05$) reduction in feed intake as compared to control. Banjo (2012) also reported that *Moringa olifera* leaf meal at 0%, 1%, 2% and 3% did not significantly enhance feed intake in broiler birds. There has been some argument as to the possibility of achieving the same effect produced by the synthetic feed additives by the use of natural feed additives such as *Moringa olifera*. In view of the surging consumer demand for organically produced meat products and the concerns of the long-term health implication of prolonged use of synthetic products, it becomes imperative to search for alternative natural products which can replace these synthetic feed additives/growth promoters. Furthermore, so much has been reported on moringa and its rich nutrient profile (Loren, 2007; Murro *et al.*, 2003), that it has become necessary to evaluate the efficacy of its addition in poultry diets in the absence of conventional vitamin and mineral premixes, including supplemental amino acids such as methionine and lysine. Previous studies had investigated the effects of the inclusion of *moringa* leaf meal alone or the *moringa* seed meal alone in broiler diets. The comparative effect of the leaf meal and seed meal in broiler birds has not been previously reported. Based on the foregoing therefore, this study was initiated. The objective was to investigate the effect of inclusion of *Moringa oleifera* leaf and seed meal 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 a.s.l. 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 is 1450 mm. 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 (MOSM). A total of 96 (ninety – six) day old broiler chicks of cob-strain were purchased from a distributor in Owerri. 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 meals respectively. The parameters measured were, initial body weight, final body weight, weekly body weight, average daily body weight, average daily feed intake

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and feed conversion ratio. Birds were weighed together at the beginning of experiment and at the end of each week and the weight recorded.

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's New Multiple Range test was used to determine differences between treatment means in accordance with SAS (2002).

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 additive	10	10	10	10
	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 starter broiler chicks fed three Moringaoleifera fractions

	T 1 (Control)	T 2(Toasted Seed Cake)	T 3 (Raw Seed Cake)	T4 (Leaf Meal)	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).

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 weight gain, Table 2. These results are in conformity with previous studies (Onu and Aniebo 2011; Abdusalam *et al.* 2015; Meshram *et al.*, 2019). It does appear that higher levels of inclusion of moringa leaf meal up to 5% as can be observed from this study,

significantly depressed weight gains in starter broilers. Therefore, it may be apposite to say, from the result of this and other previous studies, that inclusion of moringa leaf meal powder should not exceed 1 % especially at the starter phase. Although, there had been a few other studies, (Onu and Aniebo, 2011) that recorded improvement in weight gain at 5%, but suffice it to say that most of the reports with improved weight gains and feed conversion ratio were less than 1 %. Higher levels of inclusion beyond 1 % appears to increase the fibre content of the

feed which is inversely correlated with intake and digestibility in broilers (Esonu *et al.*, 2002). At the starter phase the broiler chicks are unable to consume the highly fibrous feed with the result of reduced intake of feed. The birds may be able to tolerate higher inclusion levels at later stages of maturity. The reduction in feed intake gave rise to the lower average daily feed intake and weight gains. The result from the inclusion of seed meals in the diet showed that the birds had significantly higher feed intake and average weight gain compared to the control in the case of the toasted moringa seed meal and comparable results with the raw seed meal. This goes to show that the broiler birds at the starter phase are able to tolerate the seed meals better than the leaf meal probably due to the less fibrous nature of the seed meal and the rich content of protein, essential amino acids and fatty acids. The heat treated seed meal appeared to have given higher weight gain probably due to the absence of antinutritive factors which may have been eliminated by heat. From the result of this study, we are convinced that any inclusion of *Moringa oleifera* leaf meal in broiler starter diets, should be at a micro level, probably below 1%. Higher levels reduce intake and appear to interfere with the digestive processes of the young chicks. These results are in line with the findings of Banjo (2012) who reported significant differences in weight gains at various levels of inclusion of *moringa* in the diet of broiler birds. Also, Anyanwu *et al.* (2020) recorded significant reduction in the feed intake and weight gains among birds fed diets containing *Moringa oleifera* and *Pueraria phaseoloides* leaf meals at 5% level of inclusion. The reduced weight of the birds fed moringa leaf meal appears to have been accentuated by the exclusion of methionine and lysine and starter premix in the diet. However, the chicks fed toasted and raw seed meal appeared to cope and perform

comparatively and even better than chicks that were fed control diet with full complement of amino acids and mineral premix. This confirmed that *Moringa oleifera* seed meal can effectively replace the synthetic feed additives thereby reducing cost of feed.

Conclusion

This study showed that the inclusion of toasted and raw *Moringa oleifera* seed meals at 5% level in broiler starter diets significantly improved growth performance whilst the inclusion of moringa leaf meal at 5% level depressed feed intake and live weight gains. Therefore, it is recommended that inclusion of leaf meals in broiler starter diets should not exceed 1% if favourable outcomes are anticipated.

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