

INFLUENCE OF DIETARY SUPPLEMENTATION OF AIDAN (*TETRAPLEURA TETRAPTERA*) AND OR TURMERIC (*CURCUMA LONGA*) ON PERFORMANCE AND BIO-ECONOMICS OF BROILER CHICKENS

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ABSTRACT

Effect of supplementation of aidan powder alone or in combination with turmeric as feed additives on the performance and economics of production of broiler chickens was studied. A total of 180-day old broiler chicks, were assigned into six groups of 30 chicks each and three replicates of 10 chicks per replicate. The chicks were allotted to six diets labelled T1, T2, T3, T4, T5 and T6. T1 (control) diet had no aidan and turmeric. Diets T2, T3, T4, T5 and T6 contained 0.5% aidan, 1.0% aidan, 0.5% aidan + 0.5% turmeric, 1.0% turmeric and 0.5% turmeric, respectively. The study lasted for 56 days. Starter diets had 23.0 % crude protein and 2,800.0 kcal (ME)/kg energy while finisher diets had 20.0 % crude protein and 3,200.0 kcal (ME)/kg energy. The birds were fed and supplied water *ad libitum*. The research used a Completely Randomized Design (CRD) format, one-way analysis of variance. Results indicate that adding 0.5% aidan + 0.5% turmeric powders (T4) to broiler chicken diet improve final weight and weight gain while reducing feed intake, feed conversion ratio and cost of feed per weight gain than adding any of the two spices alone. We conclude that diet T4 is the best and should be added to broiler diets for better performance.

Key words: Phyto-additives, spices, gross margin, weight gain

INTRODUCTION

Globally, commercial broiler chicken farmers aim for better birds' performance and economics of production (TPS, 2019; Karaskova *et al.*, 2015). Achieving that goal may involve adding growth-enhancing antibiotics to poultry feeds (Puvaca *et al.*, 2013). However, many farmers abuse the use of antibiotics, causing antibiotic resistance and environmental pollution (EC, 2005). Hence, the European Union and other countries banned antibiotics use in poultry production beginning 2006 (USGAO, 2011; EC, 2005; Puvaca *et al.*, 2013). This created opportunity for using natural spices to replace growth-promoting antibiotics (Ingweye *et al.*, 2019). Such commonly used spices in Nigeria include ginger, garlic and turmeric (Khan *et al.*, 2012; Karangiya *et al.*, 2016). Consequently, their demand for use in food and pharmaceuticals is huge (Mani and Kabiraj, 2019), making them unaffordable to smallholder farmers. Thus, research shifted to the use of locally available and cheaper Nigerian spices to reduce or replace conventional antibiotic growth-promoters in animal feed (Ingweye *et al.*, 2019). One indigenous Nigerian spice that could replace conventional spices in livestock diets is aidan. Ingweye *et al.* (2019) assessed the effect of co-administered aidan and turmeric powders as feed additives on blood chemistry, proximate composition and organoleptic indices of broiler chickens. This study intends to provide more information, thus the study examined the effect of lone supplementation of aidan and its combination with turmeric powders on the growth performance and bioeconomics of broiler chickens.

MATERIALS AND METHODS

Research site location

The experiment was carried out in the Teaching and Research Farm, University of Port Harcourt, Choba, Rivers State, located at latitude 4°52'11.26" N, longitude 6°54'31.82" E, 16 m above sea level and 28°C average annual temperature (Oyegun and Adeyemo, 1999).

Research animals, feed materials and diets

Day-old broiler chicks of Cobb-500 strain, were used for the study. The feed ingredients were sourced from Obo market, Etim Ekpo Local Government Area, Akwa Ibom State. Aidan pods and turmeric rhizomes were chopped into small pieces, sun-dried and milled to powder. Starter diets were formulated to 23 % crude protein and 2,800 kcal (ME)/kg energy while finisher diets were compounded to yield 21 % crude protein and 3,200 kcal (ME)/kg energy. The composition of the diets is shown in Table 1.

Feeding and other management procedures

The chicks were raised in an open-sided deep litter house. Equipment and house were washed and disinfected two weeks before arrival of the chicks. Wood shavings as litter material, was spread on the floor to 5.0 cm depth. Adequate heat was provided using kerosene lanterns and stoves. Initial brooding temperature for the first week was maintained at 35°C but reduced by 2.8°C each week till end of 3-week. Experimental diets and drinking water were offered *ad libitum*. The chicks were vaccinated against Newcastle and Gumboro diseases as well prophylactically treated against avian Coccidiosis according to methods described by Ingweye *et al.* (2008).

Experimental design

One hundred and eighty (180) day-old broiler chicks were used for the 56-day study. The chicks were divided into six groups of 30 chicks each. Groups were further shared into three replicates of 10 chicks each. Average initial weights of the chicks across groups were balanced. Groups of chicks were randomly allotted to six dietary treatments. Treatment 1 (T1) diet was the control, having neither aidan nor turmeric. Treatments T2, T3, T4, T5 and T6 diets contained 0.5% aidan, 1.0% aidan, 0.5% aidan plus 0.5% turmeric, 1.0% turmeric and 0.5% turmeric, respectively. The research was set up in a Completely Randomized Design (CRD), one-way analysis of variance.

Data collection procedure

Feed intake, weight gain, feed conversion ratio (FCR), mortality rate and economics of production were assessed. Feed offered and leftover were recorded once a day while live weights were recorded once a week. Feed intake was calculated by subtracting the quantity of feed left over from feed offered after 24 hours. Weight gain was calculated by subtracting the present weight from the previous week weight. Feed conversion ratio was calculated by dividing the feed intake by weight gain. Economics of production was calculated using market cost of ingredients (₦), feed intake and weight gain to compute cost of feed (₦), cost of feed consumed (₦/kg) and cost of weight gain (₦/kg).

Data analysis

The data collected were subjected to One-Way ANOVA using the procedure of SPSS software. Significant treatment means were separated using the Duncan's Multiple Range Test and statistical differences declared at 5% ($P < 0.05$).

Table 1: Composition of broiler chicken experimental diets containing supplementation of either or both aidan and tumeric

Ingredients	Treatment groups											
	Chicken starter diets						Chicken finisher diets					
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6
Aidan	-	0.5	1.0	0.5	-	-	-	0.5	1.0	0.5	-	-
Turmeric	-	-	-	0.5	1.0	0.5	-	-	-	0.5	1.0	0.5
Maize	48.0	47.5	47.0	47.0	47.0	47.5	52.0	51.5	51.0	51.0	51.0	51.5
Soybean meal	36.0	36.0	36.0	36.0	36.0	36.0	28.0	28.0	28.0	28.0	28.0	28.0
Fish meal	5.0	5.0	5.0	5.0	5.0	5.0	4.00	4.0	4.0	4.0	4.0	4.0
Wheat offal	6.0	6.0	6.0	6.0	6.0	6.0	10.0	10.0	10.0	10.0	10.0	10.0
Bone meal	2.5	2.5	2.5	2.5	2.5	2.5	3.0	3.0	3.0	3.0	3.0	3.0
Salt	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Methionine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin premix	0.5	0.5	0.50	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Palm oil	1.0	1.0	1.00	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	1.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.	100.0	100.0	100.0	100.0	100.0
Crude protein (%)	23.1	23.0	23.0	23.0	23.0	23.0	20.9	21.0	21.0	21.0	21.0	21.0
Energy(ME Kcal/kg)	2,828.0	2,811.0	2,794.0	2,794.0	2,794.0	2,811.0	3,215.0	3,210.0	3,270.0	3,200.0	3,210.0	3,195.0

Table 2: Performance of broiler chickens fed diets supplemented with either or both aidan and turmeric

Parameters	Treatment groups					
	T1	T2	T3	T4	T5	T6
Initial weight (g)	48.40±0.02 ^{NS}	48.0±0.01 ^{NS}	48.30±0.00 ^{NS}	48.0±0.03 ^{NS}	48.30±0.02 ^{NS}	48.40±0.02 ^{NS}
Final weight (g)	2456.11±42.11 ^b	2458.50±45.65 ^b	2585.66±53.00 ^{ab}	2778.67±56.12 ^a	2460.90±43.55 ^b	2365.55±30.12 ^b
Weight gain (g)	2407.71±27.00 ^c	2410.50±29.01 ^c	2537.36±23.33 ^b	2730.67±28.10 ^a	2412.60±29.43 ^c	2317.15±24.22 ^d
Feed intake (g)	6979.55±65.23 ^a	6902.20±60.76 ^a	6846.50±62.88 ^a	6366.30±64.69 ^c	6789.93±60.08 ^a	6548.28±65.01 ^b
Feed conversion ratio	2.90±0.03 ^a	2.86±0.05 ^a	2.70±0.03 ^b	2.33±0.13 ^c	2.81±0.09 ^a	2.83±0.03 ^a
Mortality rate (%)	6.70±0.02 ^{NS}	6.00±0.00 ^{NS}	6.00±0.02 ^{NS}	5.50±0.00 ^{NS}	6.00±0.00 ^{NS}	6.00±0.01 ^{NS}

^{a,b,c,d}Means in same row with different superscript are significantly different (p<0.05); ^{NS}Not significantly different (P>0.05)

RESULTS AND DISCUSSION

Table 2 shows the performance of broiler chickens fed diets containing supplementation of either or both aidan and turmeric. Chickens in T4 showed the highest ($p<0.05$) final live weight (2778.67 ± 56.12 g) and weight gain (2730.67 ± 28.10 g) followed by those in T3. These values were higher than those reported for birds fed diets containing garlic, ginger and their combination (Karangiya *et al.*, 2016). Differences could be due to duration of the studies as present study was 14 days longer. Nevertheless, the highest final weight and weight gain observed in T4 implied that combining turmeric with aidan at 0.5% each could improve feed utilization in broiler chickens. Similarly, chickens in T4 (6366.30 ± 64.69 g) consumed the least ($p<0.05$) feed, further supporting the assertion that supplementation of both aidan and turmeric each at 0.5%, improved nutrient utilization. Thus, the chickens ate less feed because they satisfied their nutrient requirement. This is consistent with the report of Karaskova *et al.* (2015) who stated that combination of phyto-additives could improve feed efficiency in chickens. Feed intake increased among chickens in T6 (6548.28 ± 65.01 g) while those in T1, T2, T3 and T5 consumed the highest. Chickens in T4 (2.33 ± 0.13) showed the best ($p<0.05$) feed conversion ratio, followed by those in T3 (2.70 ± 0.03), while chickens in T1, T2, T5 and T6 showed the poorest ($p<0.05$) results. Also, that T4 group had the least feed intake and feed conversion ratio values than others indicate that the birds were more efficient in converting their lower feed intake to meat. This agrees with reports that phyto-additives could increase feed efficiency of birds (Karaskova *et al.*, 2015) and that additive effect is better felt when two or more spices are combined in diets. Mortality rate of the birds was not affected ($p>0.05$) by inclusion of turmeric and aidan in feed either alone or in combination.

Table 3: Economics of production of broiler chickens fed diets supplemented with either or both aidan and turmeric in diets

Parameters	Treatment groups					
	T1	T2	T3	T4	T5	T6
Cost of feed (₦/kg)	94.98 $\pm$ 3.11 NS	105.56 $\pm$ 3.0 1 ^{NS}	115.90 $\pm$ 2.9 0 ^{NS}	113.34 $\pm$ 2.2 2 ^{NS}	110.77 $\pm$ 3.0 1 ^{NS}	100.23 $\pm$ 2.5 1 ^{NS}
Cost of feed consumed (₦)	662.92 $\pm$ 10. 00 ^c	728.60 $\pm$ 12. 56 ^b	793.51 $\pm$ 13. 04 ^a	721.56 $\pm$ 12. 57 ^b	752.12 $\pm$ 31. 90 ^{ab}	656.33 $\pm$ 11. 11 ^c
Feed cost/weight gain (₦/kg)	275.44 $\pm$ 5.9 0 ^b	301.90 $\pm$ 6.7 6 ^a	312.93 $\pm$ 7.0 0 ^a	264.08 $\pm$ 5.9 9 ^b	311.26 $\pm$ 6.6 6 ^a	283.65 $\pm$ 5.9 8 ^{ab}

^{a,b,c} Means in same row with different superscript are significantly different ($p<0.05$); ^{NS} Not significantly different ($P>0.05$)

Economics of producing broiler chickens fed diets supplemented with either or both aidan and turmeric is presented in Table 3. There was no significant difference ($p>0.05$) in the costs of the six experimental diets. Chickens in group T3 (₦793.51 $\pm$ 13.04) recorded the highest ($p<0.05$) cost of feed consumed, which was not different ($p>0.05$) from that of T5 (₦752.12 $\pm$ 31.90), while groups T1 and T6 had the least values ($p<0.05$). The cost of feed per weight gain values (₦/kg) showed that weight gained by chickens fed T4 (264.08 $\pm$ 5.99) and T1 (275.44 $\pm$ 5.90) diets were the least, though not different ($p>0.05$) from that of T6 (283.65 $\pm$ 5.98). The cost of feed was within the range reported for broiler chickens by Odoemelam *et al.*, (2013), however, the feed cost per weight gain was higher in this study is higher than that reported for broiler chickens by Odoemelam *et al.* (2013). Differences could be due to the higher cost of the spices, especially aidan. T3 had the highest aidan inclusion level of 1.0% and the highest cost of feed consumed and feed cost per weight gain.

CONCLUSION

Influence of aidan and turmeric powders supplemented singly or mixed in diets of broiler chickens was evaluated for growth performance and bio-economics in this study. The study concluded that

supplementation of 0.5% aitan and 0.5% turmeric powders (T4) in broiler diet could improve weight gain while reducing feed intake, improving feed conversion ratio and lowering feed cost per weight gain.

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