GROWTH PERFORMANCE AND NUTRIENT DIGESTIBILITY OF STARTER BROILER CHICKENS FED DIETS CONTAINING RED AND WHITE SORGHUM SUPPLEMENTED WITH TANNASE

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ABSTRACT
The study was conducted to determine the growth performance and nutrient digestibility of starter broiler chickens (0-28 days) fed diets containing red sorghum (RS) and white Sorghum (WS) with or without tannase supplementation. A total of 240 1- day old unsexed Arbor acres broiler chicks were randomly assigned to eight (8) dietary treatments which were divided into 3 replicates each of 10 birds in a completely randomized design 2 x 4 factorial arrangement. Eight (8) diets were formulated in which sorghum replaced maize at 0, 100 RS, 100 WS and 50RS:50WS%. The first 4 without tannase then the other 4 diets supplemented with tannase. Growth performance data was collected weekly and nutrient digestibility at the 28th day. Birds fed 100% WS diet and those fed tannase supplemented diets at 50WS:50RS had the highest (P<0.05) final weight and weight gain. The FCR and Average daily feed intake were not significantly (p>0.05) affected. None of the nutrient digestibility indices were significantly (P>0.05) influenced by sorghum-based diet and tannase supplementation. In conclusion, red and white sorghum with or without tannase can be used to replace maize at 100% WS in the absence of tannase but with tannase, 50WS:50RS may be applied as a total replacement for maize in starter broilers diet for optimum performance and nutrient digestibility. Similarly, it could be observed that the addition of tannase to the diet even in the absence of sorghum can also enhance performance and nutrient digestibility.
Keywords: Growth, Significantly, Sorghum, Tannase, Starter broilers

INTRODUCTION

The minimum per capita daily protein intake as recommended by Food and Agriculture Organization (FAO) is 53.8g, where as a paltry 45.4g is consumed in Nigeria (FAO, 2020). The observed low animal protein consumption may be attributed to the declining animal protein production occasioned by high cost of feeds, particularly energy feed sources like maize which is a major component for poultry feed (Oluyemi and Roberts, 2013). The competition between man and livestock for maize, coupled with its increased industrial uses have led to the scarcity and elevated price of maize (Lakurbe *et al*., 2018) which has necessitated the quest for alternative sources of energy that can replace maize and contribute to increased supply of animal protein at an affordable price (Anthony, 2009; Mafimidiwo *et al*., 2023). Sorghum grain is an interesting energy ingredient in poultry diets due to its nutritional composition like maize. Maize and sorghum contain 3432 and 3256 kcal/kg metabolizable energy, 9.0 and 11.0% crude protein respectively (Gunawan *et al*., 2022). Sorghum is a less competitive cereal grain, readily available and can be grown in harsh weather condition (Abdulkadir *et al*., 2016). The utilization of sorghum grain by non-ruminant animal, however, is limited due to the presence of anti-nutritional factors such as tannin and phytates (Etuk *et al*., 2012). The use of improved sorghum varieties with low tannin concentration greatly improve nutrient digestibility for poultry (Scott, 2013). Tannase can be used to reduce the concentration of tannin in sorghum by catalyzing the hydrolysis of tannin to release glucose and gallic acid (Selwal *et al*., 2011). This study evaluated the effects of replacing maize with red and white sorghum in the diets of starter broilers supplemented with or without tannase.

MATERIALS AND METHODS

Preparation of test ingredients and diets: The red and white sorghum were procured from a reputable feed mill at Abeokuta and were dehulled to obtain sorghum bran which was broken and dried at 40-50°c and then autoclaved to obtain dried moldy bran. The moldy sorghum bran was then

crushed using the mechanical crusher, milled and stored for usage. Tannase was produced at Animal Nutrition laboratory, Federal University of Agriculture, Abeokuta.

Eight experimental broiler starter diets were formulated (table 1) in which maize was replaced with sorghum (RS=Red variety, WS=White variety of sorghum) at 0, 100RS, 100WS, 50RS: 50WS % levels tagged Diets 1,2,3 and 4 which were without tannase, while diets 5,6,7 and 8 had the same composition as diets 1,2,3 and 4 but supplemented with tannase 0.5 g/kg feed. Formulated diets and cool clean water were offered to the birds *ad libitum* for 28 days of the trials

Table 1: Gross composition of experimental broiler starter diets (g/100gDM)

	Without Tannase				With Tannase			
Ingredients	**Diet 1**	**Diet 2**	**Diet 3**	**Diet 4**	**Diet 5**	**Diet 6**	**Diet 7**	**Diet 8**
Maize	52.00	-	-	-	52.00	-	-	-
Red Sorghum	-	52.00	-	26.00	-	52.00	-	26.00
White Sorghum	-	-	52.00	26.00	-	-	52.00	26.00
Fish meal (72% CP)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Soya bean meal	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0
Palm oil	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Wheat offal	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Limestone	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Dicalcium Phosphate	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
Lysine	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Methionine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Broiler Premix	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Salt (NaCl)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Toxin binder	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Tannase	-	-	-	-	+	+	+	+
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
ME (kcal/kg)	2920.20	2867.81	2811.00	2839.41	2920.20	2867.81	2811.00	2839.41
Crude Protein (%)	24.30	24.82	24.51	24.69	24.30	24.82	24.51	24.69
Crude Fat (%)	3.68	3.04	3.16	3.10	3.68	3.04	3.16	3.10
Crude Fibre (%)	3.33	3.18	3.31	3.26	3.33	3.18	3.31	3.26
Calcium (%)	1.01	1.00	1.02	1.01	1.01	1.00	1.02	1.01
Av. Phosphorus (%)	0.43	0.38	0.54	0.46	0.43	0.38	0.54	0.46

Experimental Design

Two hundred and forty 1-day old unsexed Arbor acre broiler chicks were allotted into 8 dietary treatments of 30 birds and each treatment sub-divided into 3 replicates of 10 birds each in a completely randomized design 2x4 factorial arrangement.

Data Collection

For growth performance, the initial body weight of the birds was recorded at the beginning of the experiment and subsequently on weekly basis till the end of experiment to determine their weekly body weights and weight gain. Daily feed intake was recorded by deducting the leftover feed from the initial feed supplied and feed conversion ratio was calculated. At the 28th day of the experiment, three birds per replicate were randomly selected and transferred into a metabolic cage for digestibility trial. A three-day acclimatization period was allowed prior to the collection of excreta. Records of feed supplied, feed intake and voided excreta samples were collected on daily basis for 3 consecutive days, weighed and dried at 60°C for 72 hours. The dried excreta samples were pooled together, and proximate composition of the experimental diets and excreta samples were used to determine the digestibility of constituent nutrients (AOAC, 2000). Data obtained were statistically analyzed using Minitab Statistical package (Minitab, 2017) and the significant ($P<0.05$) difference among treatment means were separated by Tukey's procedure of the same package at 99.95% confidence limit.

RESULTS AND DISCUSSION

The final weight and weight gain improved ($P < 0.05$) for starter broilers fed diets 3 and 4 as well as for birds fed tannase supplemented sorghum diets. This agrees with the report of Kwari *et al*. (2012) who observed that feeding of sorghum-based diets to starter broilers positively influenced the final weight, weight gain and feed intake. The improved ($P < 0.05$) weight gains reported for birds fed tannase supplemented diets could be attributed to the effect of tannase enzyme in reducing the concentration of tannin in Sorghum. This is in tandem with the report of Gidado *et al*. (2020) who observed significant increase in growth performance of starter broiler chickens when fed maize -

sorghum based diets supplemented with tannase. The no significant (P > 0.05) influence of sorghum and tannase in all the nutrient digestibility indices, indicated that sorghum based diet was effectively utilized by the birds and the tannin content in the sorghum used in this study may be within the tolerable limit for improved variety of sorghum thus had no negative effect on the nutrient digestibility. This agrees with the submission of Scott (2013) that low tannin sorghum can replace maize in poultry diet and can greatly improve nutrient digestibility.

Table 2: Effects of sorghum-based diets with or without tannase on growth performance of starter broiler chickens

Replacement level (%)	Tannase supplementation	Average Initial Weight (g/bird)	Average Final Weight (g/bird)	Average Weight Gain (g/bird)	Average Feed Intake (g/bird)	FCR
0S	+Tannase	36.48	515.99^{a}	480.52^{a}	1022.70	2.13
100RS	+Tannase	36.37	476.70^{bc}	440.33^{bc}	1027.70	2.34
100WS	+Tannase	37.26	512.72^{ab}	475.47^{ab}	1040.50	2.19
50RS:50WS	+Tannase	36.57	514.87^{ab}	478.30^{ab}	1083.50	2.27
0S	No Tannase	38.82	469.93^{c}	431.12^{c}	1073.40	2.50
100RS	No Tannase	38.00	478.87^{abc}	440.87^{abc}	1051.80	2.39
100WS	No Tannase	37.10	517.49^{a}	480.39^{ab}	1044.00	2.17
50RS:50WS	No Tannase	37.06	507.33^{abc}	470.28^{abc}	1054.70	2.25
Pooled SEM		1.67	8.03	8.20	50.3	0.13
0S	-	37.65	493.46^{ab}	455.82^{ab}	1048.00	2.31
100RS	-	37.19	477.78^{b}	440.62^{b}	1039.70	2.36
100WS	-	37.18	515.11^{a}	477.93^{a}	1042.20	2.18
50RS:50WS	-	36.81	511.10^{a}	474.29^{a}	1069.10	2.26
SEM Level		1.18	5.67	5.80	35.60	0.09
Tannase						
-	+Tannase	36.67	505.32^{a}	468.65^{a}	1043.60	2.23
-	No Tannase	37.74	499.41^{b}	455.66^{b}	1056.00	2.33
SEM Tannase		0.84	4.01	4.01	25.20	0.06

^{abc}: Means in the same column with different superscript are significantly different (P < 0.05)
S - Sorghum, RS - Red sorghum, WS - White sorghum

Table 3: Effects of sorghum-based diets with or without tannase on nutrient digestibility of starter broiler chickens.

Replacement level (%)	Tannase supplementation	Dry matter(%)	Ash (%)	Crude Protein(%)	Ether extract(%)	Crude fibre (%)
0S	+Tannase	74.47	78.24	74.67	75.47	75.83
100RS	+Tannase	77.33	77.52	77.20	79.66	75.30
100WS	+Tannase	78.70	77.11	76.61	73.91	75.80
50RS:50WS	+Tannase	73.09	77.07	74.71	75.39	74.08
0S	No Tannase	76.52	79.57	76.18	76.83	78.94
100RS	No Tannase	76.40	79.68	75.35	76.92	72.34
100WS	No Tannase	77.68	78.00	76.19	75.62	81.69
50RS:50WS	No Tannase	78.00	77.81	76.44	76.05	75.46
Pooled SEM		0.99	0.91	0.59	0.85	0.78
0S	-	75.50	78.90	75.42	76.15	77.38
100RS	-	76.86	78.60	76.27	78.29	73.82
100WS	-	78.19	77.55	76.40	74.76	78.75
50RS:50WS	-	75.54	77.44	75.57	75.72	74.77
SEM Level		2.23	2.13	1.35	1.88	1.28
-	+Tannase	75.90	77.48	75.80	76.11	75.25
-	No Tannase	77.15	78.76	76.04	76.36	77.11
SEM Tannase		1.57	1.51	0.95	1.33	0.90

CONCLUSION AND RECOMMENDATION

Red or white sorghum supplemented with tannase can totally replace maize in the diet of starter broiler chickens. Hence, recommended for optimum growth and nutrient digestibility in starter broiler chickens.

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