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## Broiler Chickens' Performance and Prebiotic-potential of Wheat Offal and Palm Kernel Cake Supplemented with Xylanase

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### ABSTRACT

This study evaluated the performance, prebiotic potential and nutrient digestibility of broilers fed diets containing wheat offal (WO) and palm kernel cake (PKC) with/without xylanase supplementation. A 35-day feeding trial made up of a 3x2 factorial design was conducted using 288 1-day old Marshall broiler chickens. The birds were randomly allocated to six dietary groups. Each group was further divided into 6 replicates of 8 birds each. Birds were fed control (maize: 60%), corn-wheat offal (30% each) and corn-PKC (30% each) based diets with or without xylanase supplementation. Nutrient digestibility trial was done on day 21 of the experiment using 2 birds per replicate. On day 35, 3 birds per replicate were sacrificed to determine the microbial profile assay. Their crops were aesthetically removed and placed in sterilized sample bottles (used to convey them to the laboratory for analysis). Data collected were subjected to Analysis of Variance with 5 % significance in a Factorial Design. Feed intake (FI) increased ( $p < 0.05$ ) with wheat offal and PKC inclusion while weight gain (WG) and feed conversion ratio (FCR) were not affected. Xylanase supplementation had no effect ( $p > 0.05$ ) on FI and WG but significantly improved the FCR (1.99). Xylanase supplementation did not influence ( $p > 0.05$ ) crude protein (CP) and fat (CFa) retention but improved ( $p < 0.05$ ) crude fibre (CF) digestibility (58.79 %). Birds fed control diet recorded a higher ( $p < 0.05$ ) CP (77.83 %) and CFa (80.45 %) digestibility while birds fed test diets (WO and PKC) had higher CF digestibility. Total viable count (TVC) and fecal coliform count (FCC) was higher ( $p < 0.05$ ) in the control groups as compared to groups fed WO and PKC. Xylanase supplementation and WO inclusion resulted into higher ( $p < 0.05$ ) Lactobacillus count (1.46 cfu/mL) and lower TVC and FCC. This study concluded that xylanase supplementation enhanced FCR, CF digestibility and prebiotic potential of broiler chickens fed wheat offal and palm kernel cake.

**Keywords:** Palm kernel cake, performance, prebiotic potential, wheat offal, xylanase

### Introduction

More emphasis has been placed on digestive flora and microbial balance of animals' gut since European Commission banned the use of antibiotics growth promoters in animal production (EC Regulation No. 1831/20031). Prebiotics and probiotics are seen as viable alternatives as they protect beneficial microorganisms. Prebiotics can sustain the growth and proliferation of probiotics in the digestive system as they can be metabolized by probiotics (Markowiak and Śliżewska, 2017). Xylanase breaks down xylans, a major components of hemicellulose and the fermentable carbohydrate obtained from xylans produces prebiotic (Shahi *et al.*, 2016). Wheat offal and Palm kernel cake (PKC) are promising source of prebiotics as they contains xylans which can be further hydrolyzed (with the aid of enzyme treatment) into a prebiotic. This study

therefore aimed at evaluating broiler chicken's performance and prebiotic potential of wheat offal (WO) and palm kernel cake (PKC) supplemented with xylanase.

### Material and Methods

A 35-day feeding trial made up of a 3x2 factorial design was conducted using 288 1-day old Marshall broiler chickens. The birds were randomly allocated to six dietary groups. Each group was further divided into 6 replicates of 8 birds each. Birds were fed control (maize: 60%), corn-wheat offal (30% each) and corn-PKC (30% each) based diets with or without xylanase (endo-1,4- $\beta$  xylanase) supplementation. The composition of the experimental diets are presented in Table 1. Nutrient digestibility trial was done on day 21 of the experiment using 2 birds per replicate. On day 35, 3 birds per replicate were sacrificed to determine the microbial profile assay. Their crops were aesthetically removed and placed in sterilized sample bottles (used to convey them to the laboratory for analysis). Data collected were subjected to Analysis of Variance with 5 % significance in a Factorial Design using SAS, 2007.

**Table 1: Composition of experimental diets**

DIETS (%)	TREATMENTS					
	1	2	3	4	5	6
Control (Basal)	40	40	40	40	40	40
Wheat offal (WO)	-	-	30	30	-	-
Palm Kernel Cake (PKC)	-	-	-	-	30	30
Maize	60	60	30	30	30	30
Xylanase (100 ppm)	-	+	-	+	-	+
Total	100	100	100	100	100	100

### Results and Discussion

Feed intake (FI) increased ( $p < 0.05$ ) with wheat offal and PKC inclusion while weight gain (WG) and feed conversion ratio (FCR) were not affected. Xylanase supplementation had no effect ( $p > 0.05$ ) on FI and WG but significantly improved the FCR (1.99). The higher feed consumption may be because of the birds trying to meet their energy requirements, as the metabolisable energy in the wheat offal and PKC based diets is lower than the maize based diets. The higher feed intake in these groups may also be due to the faster rate at which feed passes through the digestive tract which is as a result of higher fibre content, high bulk density and lower holding capacity as reported by Sundu *et al.* (2006). Birds could also be trying to satisfy their foraging habit as reported by Van Krimpem *et al.*, (2005). The improved FCR in the xylanase group is due to nutrient availability due to the positive effect of xylanase supplementation in the diet. This is in line with the report of Choct, (2006) who reported that the degradation of  $\beta$  -mannan and 70% NSPs into soluble metabolizable products for monogastrics occurs with enzyme supplementation to high fibrous monogastric diets. This enhances the nutrient absorption and subsequently improves the FCR.

Xylanase supplementation did not influence ( $p > 0.05$ ) crude protein (CP) and fat (CFa) retention but improved ( $p < 0.05$ ) crude fibre (CF) digestibility (58.79 %). The higher CF digestibility in xylanase supplemented group may be due to xylanase supplementation which helps to break the NSP content in fibrous feed into forms that will be available for the birds. This is in line with the report of Choct, (2006).

Birds fed control diet recorded a higher ( $p < 0.05$ ) CP (77.83 %) and CFa (80.45 %) digestibility while birds fed Wheat offal (WO) and Palm kernel cake (PKC) had higher CF digestibility. This protein content in maize is relatively available and the NSP content of maize is lower when compared to high fibrous diets (Breghendal, 2007), this aids utilization of protein by the birds. Although WO and PKC has higher crude protein value than maize, they cannot be fully utilized

by the monogastric birds due to the high level of NSP. The higher fibre content of WO and PKC probably resulted to higher fibre digestibility.

**Table 2: Effect of Xylanase supplementation on performance of broilers fed Wheat offal and Palm Kernel Cake**

Diets	Feed Intake (g/day)	Weight gain (g/day)	Feed conversion ratio
Control	41.61 <sup>b</sup>	19.85	2.10
WO	44.40 <sup>a</sup>	20.46	2.17
PKC	45.68 <sup>a</sup>	21.30	2.15
Xylanase			
Without	45.44	19.94	2.29 <sup>b</sup>
With	42.35	21.13	1.99 <sup>a</sup>
Pooled SEM <sup>±</sup>	1.12	0.54	0.56
P value	0.050	0.147	0.020

*Means with different superscript are significantly different (P<0.05)*

**Table 3: Effect of Xylanase supplementation on Nutrient Retention of broilers fed Wheat offal and Palm Kernel Cake**

Diets	Crude protein (%)	Crude fibre (%)	Crude fat (%)
Control	77.83 <sup>a</sup>	55.09 <sup>b</sup>	80.45 <sup>a</sup>
WO	73.54 <sup>b</sup>	58.85 <sup>a</sup>	77.09 <sup>b</sup>
PKC	74.58 <sup>b</sup>	58.09 <sup>a</sup>	76.82 <sup>b</sup>
Xylanase			
Without	73.14	54.89 <sup>b</sup>	77.22
With	77.49	59.80 <sup>a</sup>	79.02
Pooled SEM <sup>±</sup>	1.13	0.80	0.78
P value	0.050	0.022	0.050

*Means with different superscript are significantly different (P<0.05)*

Total viable count (TVC) and faecal coliform count (FCC) was higher (p<0.05) in the control groups as compared to groups fed WO and PKC. Xylanase supplementation and WO inclusion resulted into higher (p<0.05) Lactobacillus count (LBC) and lower TVC and FCC. Stimulation of LBC growth by diet containing wheat offal suggests the efficacy of xylanase supplementation in enhancing the prebiotic potential of WO, which subsequently reduced the pathogenic organisms in the crop of broiler chickens.

**Table 4: Effect of Xylanase supplementation on microbial profile of broilers fed Wheat offal and Palm Kernel Cake**

Diets	Total Viable Count (cfu/ml)	Faecal Coliform Count (cfu/ml)	Lactobacillus Count (cfu/ml)
Control	7.00 <sup>a</sup>	1.86 <sup>a</sup>	1.35 <sup>b</sup>
WO	5.15 <sup>b</sup>	0.52 <sup>b</sup>	1.46 <sup>a</sup>
PKC	3.37 <sup>b</sup>	0.00 <sup>b</sup>	1.39 <sup>b</sup>
Xylanase			
Without	6.20 <sup>a</sup>	1.23 <sup>a</sup>	1.34 <sup>b</sup>
With	4.15 <sup>b</sup>	0.36 <sup>b</sup>	1.46 <sup>a</sup>
SEM <sup>±</sup>	0.63	0.31	0.15
P value	0.001	0.001	0.020

*Means with different superscript are significantly different (P<0.05)*

## **Conclusions and Outlook**

This study concluded that xylanase supplementation enhanced FCR and CF digestibility of broiler chickens fed wheat offal and palm kernel cake. Wheat offal and PKC supplementation increased the feed intake of broiler chickens. Xylanase supplementation enhanced the prebiotic potential of wheat offal.

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