

## PERFORMANCE AND COST BENEFIT OF REPLACING WHEAT OFFAL WITH XYLANASE-SUPPLEMENTED RICE OFFAL IN THE DIETS OF BROILER FINISHER CHICKENS

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### ABSTRACT

Increasing cost of conventional feed ingredients used in the formulation of poultry diets has continued to be a great challenge for poultry producers in developing countries like Nigeria. Consequently, readily available and cheaper alternatives need to be explored. An experiment was conducted to evaluate the performance and cost benefit of finisher broilers fed Xylanase-supplemented rice offal (XSRO) based diets as replacement for wheat offal. Three hundred finisher broiler chickens were assigned to five diets in which XSRO replaced wheat offal at 0 (diet 1), 25 (diet 2), 50 (diet 3), 75 (diet 4), and 100% (diet 5) levels in a completely randomized design. Xylanase was supplemented at 1g/10kg rice offal and the study lasted for 4 weeks. Daily feed intake, daily weight gain, feed conversion ratio, mortality rate, feed cost per kg, feed cost per kg gain and cost saving, were the main parameters studied. Results showed no significant difference in daily feed intake, daily weight gain and feed conversion ratio. However, feed cost per kg gain (₦) decreased with increased level of XSRO in the diet. It was therefore concluded that Xylanase-supplemented rice offal can completely replace wheat offal in the diets of finisher broilers without compromising performance. Also, the replacement of XSRO for wheat offal at 100% level resulted in a cost saving of ₦162.60.

Key words: Broiler, wheat offal, rice offal, Xylanase, Performance, cost.

### INTRODUCTION

Ensuring higher returns on investment at minimum expenditure on feed, is the principal target of any poultry business. This could be achieved when costly, highly competitive conventional feed ingredients are replaced with those that are cheaper, less competitive and readily available. Accordingly, the use of cereal by-products as dietary fibre source to replace the conventional wheat offal in poultry diets has been advanced by researchers (Dafwang and Shwarmen, 1996; Ajighjigh *et al.*, 2017; Egbunu *et al.*, 2020). Cereal by-products arise from dry milling (to produce flour), wet milling (starch and glucose production) and brewing. Commonly available among these products is rice offal.

According to Wudiri, (1991), Nigeria had the potential to produce 200,000 metric tonnes of rice offal per year. This quantity must have increased greatly in recent years due to increased level of rice production and processing in the country. Rice offal or rice milling waste, is the by-product obtained from small-scale rice mills. It contains husk, bran, polishing and small quantity of broken rice (Akinusi, 1999). Its commercial value is very low and it has a proximate composition of 4.25% CP, 27.01% CF, 7.15% EE, 41.14% NFE and 0.38, 0.04% calcium and phosphorus respectively (Ajighjigh *et al.*, 2017). However, its profile and efficiency of utilization could be improved through processing techniques such as chemical treatment with urea or the addition of exogenous enzymes (Tiemako, 1994).

The use of fibrolytic exogenous enzymes in poultry diets to improve efficiency of nutrient utilization, has been studied (Anuradha and Barun, 2015). The positive nutritional effects achieved by the addition of these enzymes could be attributed to several mechanisms, one of which is, the reduction of intestinal viscosity. High intestinal viscosity results in reduced feed conversion ratio, reduced weight gain as well as wet droppings in poultry (Paloheimo *et al.*, 2011).

Against this background, the aim of this study was to evaluate the performance and cost benefit of utilizing rice offal supplemented with Xylanase as replacement for wheat offal in broiler finisher diets.

## MATERIALS AND METHODS

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm, Abubakar Tafawa Balewa University, Bauchi. The study area is located within the GPS coordinates of 10° 18' 50.9724" N and 9° 50' 46.6152" E, with a mean annual rainfall of 1009 mm. (World Atlas, 2015). The test materials (rice offal, Xylanase) and other feed ingredients were procured from Muda Lawal market, Bauchi.

Five broiler finisher diets were formulated to contain 0, 25, 50, 75 and 100% Xylanase-supplemented rice offal (1g/10kg) as replacement for wheat offal. The diets were designated as 1, 2, 3, 4 and 5 respectively. Composition of ingredients in the experimental diets is presented in Table 1. A total of three hundred (300) finisher broilers weighing 852.00 - 940.31 g were randomly allotted to five diets in replicates of three, containing twenty birds each. Feed and water were served *ad libitum* and the study lasted for 4 weeks. Daily feed intake was measured as the differences between quantity of feed offered and left-over collected the following day. Body weight gain was determined as the difference between two consecutive weighing (1-week interval), while feed conversion ratio was calculated using the relationship of daily feed intake and daily weight gain. Mortality was recorded as it occurred. Financial benefit was computed using feed cost per kg, total feed intake and total weight gain. All data was subjected to analysis of variance (ANOVA) using the SPSS software version 25, and where significant differences were observed, Duncan's Multiple Range Test (Duncan, 1955) was used to separate them.

Table 1: Ingredients Composition (%) and Calculated Analysis of Xylanase-Supplemented Rice Offal Fed to Finisher Broilers

| Ingredient                     | Diets         |               |               |               |               |
|--------------------------------|---------------|---------------|---------------|---------------|---------------|
|                                | 1             | 2             | 3             | 4             | 5             |
| Maize                          | 51.97         | 51.76         | 51.76         | 51.76         | 51.76         |
| Full-fat soya bean             | 14.72         | 14.72         | 14.72         | 14.72         | 14.72         |
| Groundnut cake                 | 12.02         | 12.02         | 12.02         | 12.02         | 12.02         |
| Wheat offal                    | 15.00         | 11.25         | 7.50          | 3.75          | 0.00          |
| Rice offal                     | 0.00          | 3.75          | 7.50          | 11.25         | 15.00         |
| Fish meal                      | 5.00          | 5.00          | 5.00          | 5.00          | 5.00          |
| Bone meal                      | 2.50          | 2.50          | 2.50          | 2.50          | 2.50          |
| Limestone                      | 1.00          | 1.00          | 1.00          | 1.00          | 1.00          |
| Salt                           | 0.25          | 0.25          | 0.25          | 0.25          | 0.25          |
| Premix* (Finisher)             | 0.25          | 0.25          | 0.25          | 0.25          | 0.25          |
| Methionine                     | 0.30          | 0.30          | 0.30          | 0.30          | 0.30          |
| Lysine                         | 0.20          | 0.20          | 0.20          | 0.20          | 0.20          |
| <b>Total</b>                   | <b>100.00</b> | <b>100.00</b> | <b>100.00</b> | <b>100.00</b> | <b>100.00</b> |
| <b>Calculated analysis (%)</b> |               |               |               |               |               |
| ME (Kcal/kg)                   | 3006.45       | 3018.11       | 3029.74       | 3042.03       | 3053.18       |
| Crude Protein (%)              | 20.07         | 19.70         | 19.51         | 19.33         | 19.14         |
| Crude Fibre (%)                | 3.88          | 3.97          | 4.11          | 4.22          | 4.33          |

## RESULTS AND DISCUSSION

Results of growth performance showed no significant ( $P>0.05$ ) effect of diet on daily feed intake (81.59 - 98.43 g) daily weight gain (35.39 - 39.67 g) and feed conversion ratio (2.23 - 2.71), while 1.67% mortality was recorded on diet 1. This agrees with Egbunu *et al.* (2020), but contradicts Isikwenu *et al.* (2000). However, due to the higher fibre content of the experimental diets, it is expected that at least feed intake would be significantly higher, since birds usually eat to satisfy their

energy needs. Energy availability in diets containing relatively higher levels of fibre is usually low. Hence birds consume more of the diet in order to attain their energy requirement. The findings of this study could further be explained by the activity of supplemental enzyme which was shown to have the capacity to increase efficiency of digestion by helping to break down anti-nutritional factors, such as fibre and phytate (Altersy *et al.*, 2015). In a recent study, Salami and Odunsi (2019) reported that performance of broiler chickens fed dietary crude fibre up to 8% would not be compromised when Roxazyme G® was supplemented at 200 mg/kg feed.

Total feed intake revealed that birds on diet 1 consumed more feed (2.76 kg) than those on other diets, with those on diet 4 consuming the least (2.28 kg). Feed cost per kg (₦) decreased from ₦118.11 on diet 1 to ₦87.72 on diet 5. This was due to the comparatively lower cost of rice offal. Total feed cost decreased steadily from ₦325.98 on diet 1 until ₦216.74 (diet 4) and later increased to ₦221.05 on diet 5. Feed cost per kg gain (₦) decreased from ₦428.93 on diet 1 to ₦266.33 on diet 5. This could be informed by the concomitant decrease in feed cost per kg gain (₦). The ability of supplemental enzyme to increase nutrient bio-availability and digestion could also be implicated in the reduction of feed cost (Felix *et al.*, (2018).

Table 2: Performance of Broiler Finisher Chickens Fed Diets Containing Xylanase-Supplemented Rice Offal

| Parameters            | Diets   |         |         |         |         | SEM                  |
|-----------------------|---------|---------|---------|---------|---------|----------------------|
|                       | 1       | 2       | 3       | 4       | 5       |                      |
| Initial weight (g)    | 919.11  | 852.73  | 940.31  | 939.94  | 908.35  | 61.94 <sup>NS</sup>  |
| Final weight (g)      | 1682.88 | 1596.06 | 1773.38 | 1707.56 | 1735.13 | 107.79 <sup>NS</sup> |
| Total feed intake (g) | 2756.04 | 2560.04 | 2481.36 | 2284.52 | 2518.32 | 159.38 <sup>NS</sup> |
| Daily feed intake (g) | 98.43   | 91.43   | 88.62   | 81.59   | 89.94   | 8.25 <sup>NS</sup>   |
| Daily weight gain (g) | 36.37   | 35.39   | 39.67   | 36.55   | 38.85   | 2.37 <sup>NS</sup>   |
| Feed conversion ratio | 2.71    | 2.57    | 2.24    | 2.23    | 2.37    | 0.24 <sup>NS</sup>   |
| Mortality (%)         | 1.67    | 0       | 0       | 0       | 0       | -                    |

NS= Not significant; SEM = Standard Error of Means

Table 3: Cost-Benefit of Finisher Broiler Chickens Fed Xylanase-Supplemented Rice Offal

| Parameters                | Diets  |        |        |        |        |
|---------------------------|--------|--------|--------|--------|--------|
|                           | 1      | 2      | 3      | 4      | 5      |
| Total feed intake (kg)    | 2.76   | 2.56   | 2.48   | 2.28   | 2.52   |
| Feed cost (₦/kg)          | 118.11 | 112.04 | 104.38 | 95.06  | 87.72  |
| Total feed cost (₦)       | 325.98 | 286.82 | 258.86 | 216.74 | 221.05 |
| Total weight gain (kg)    | 0.76   | 0.74   | 0.83   | 0.77   | 0.83   |
| Feed cost per kg gain (₦) | 428.93 | 387.60 | 311.88 | 281.48 | 266.33 |
| Cost saving (₦)           | -      | 41.33  | 117.05 | 147.45 | 162.60 |

## CONCLUSION AND RECOMMENDATION

From the results obtained of this study, it was concluded that rice offal supplemented with Xylanase at 1g/10kg can completely replace wheat offal in broiler finisher diets without compromising performance. Furthermore, replacement of wheat offal with xylanase-supplemented rice offal at 100% resulted in 37.91% decrease in feed cost. The use of rice offal along with 1g/10kg Xylanase as main fibre source in broiler finisher diets is therefore recommended.

## REFERENCES

- Ajighigh, D. T., Doma, U. D., Egbo, M. L. Mahmood, M., Maidala, A. A. and Zagi, S. P. (2017). Response of broiler chickens to different dietary fibre sources. *International Journal of Science, Engineering and Management*. 2 (12): 2456 – 1304.
- Akinusi, O. (1999). *Utilization of rice milling waste (RMW) in cockerel finisher ration*. Proceedings of the 25<sup>th</sup> Annual Conference of the Nigerian Society for Animal Production, 21 – 25 March, 1999, Ilorin. Pp 120 – 122.
- Alsersy H., Salem, A. Z. M., Borhami, B. E., Olivares, J. G., Ado, H. M., Mariezcurrena, M. D. *et al.* (2015). Effect of Mediterranean saltbush (*Atriplex harimus*) ensilaging with two developed enzyme cocktails on feed intake, nutrient digestibility and ruminal fermentation in sheep. *Animal Science Journal*, 86: 51 – 58.
- Anuradha, P. nad Barun, R. (2015). Effect of supplementation of fibre degrading enzymes on performance of broiler chickens fed diets containing de-oiled rice bran. *Asian Journal of Animal and Veterinary Advances*. 10: 179 – 184
- Dafwang, I. I. and Shwarmen, E. B. N. (1996). Utilization of rice offal in practical rations for broiler chicks. *Nigerian Journal of Animal Production*. 23 (1): 21 -23
- Duncan, D.B. (1955). Multiple Range and Multiple F. Test. *Biometrics*.11, 1-42.
- Felix, N., Prabu, E., Kannan, B. and Manikandan, K. (2018). An evidential review on potential benefits of enzyme in aqua feed industry. *International Journal of Current Microbiology and Applied Science*, 7(12): 2053 – 2074.
- Egbunu, P. E., Tuleun, C. D., Orayaga, K. T. and Adejoh, S. K. (2020). Effects of dietary rice offal inclusion level and enzyme (Natuzyne) supplementation on the performance and digestibility of finisher broiler chicken. *Asian Journal of Research in Animal and Veterinary Sciences* 5 (2): 10 – 23.
- Isikwenu, J. O., Akpodiete, O. J., Emegha, I. and Bratt, L. (2000). *Effect of dietary fibre (Maize cob) on the growth performance of broiler birds*. 25<sup>th</sup> Annual Conference of the Nigerian Society of Animal production (NSAP), Umudike, Abia sate, pp 158 -160.
- Paloheimo, M., Piltonen, J. and Vehmaanpera, J.- (2011). Xylanases and cellulases as feed additives. In: *Enzymes in Farm Animal Nutrition*, 2<sup>nd</sup> Ed. MPG Books Group, Bodmin, UK pp 12 – 53.
- Salami, R. I. and Odunsi, A. A. (2019). Performance of broiler chickens fed 8% crude fibre diets at three energy levels with or without enzyme during the starter and finisher phases. *International Journal of poultry science*, 18(9); 423 – 430.
- Tiemako, Y. (1994). Effects of using rice polishing in broilers. *Poultry Abstract*, 2615:78
- World Atlas (2015): Where is Bauchi. Retrieved September 14, 2018 from <https://www.worldatlas.com/af/ng/ba/where-is-bauchi>.
- Wudiri, B. B. (1991). Production of cereal crops in Nigeria. From research to farmers' fields. A seminar paper delivered to staff and students at the Plateau State College of Agriculture, Lafia.