

THE COST EFFECTIVENESS OF USING SUPERNATANT OF FERMENTED MAIZE (*Omidun*) AS COMPARED WITH COMMERCIALLY PREPARED PROBIOTICS IN BROILER PRODUCTION

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ABSTRACT

The research aimed to study the cost benefits of using supernatant of fermented maize (SFM) (*Omidun*) as a probiotic on productivity of broiler chicken. One hundred- and fifty-day-old Cobb500 broiler chicks were divided into five groups of 30 birds each in triplicates. Group A served as the negative control, group B were given commercially prepared probiotics (Beta probiotics), while groups C, D and E were given standardized *Omidun* at 10, 5 and 2.5ml/l, respectively on daily basis for six weeks. Body weight (BW), weight gain (WG) and feed intake (FI) were measured weekly and feed conversion ratio was calculated. No significant ($P>0.05$) difference was observed in the growth parameters either weekly or cumulatively, although, group C had the best performance biologically. The highest mean cumulative FI was recorded in group B followed by groups E, C, D and A, respectively. Production cost was least in group A (₦377.38/bird), followed by groups E (₦403.22/bird), D (₦420.30/bird) and C (₦463.22/bird), while it was highest in group B (₦909.68/bird). Also, groups A and C had the highest gain margin, followed by those of groups D and E and least in group B. However, the lower production cost and gains from groups A, D and E were counteracted by higher mortalities recorded in these groups, compared to group C. Therefore, it was more cost effective to use SFM at 10ml/l than at lower doses of 5 and 2.5ml/l as well as than using commercially prepared probiotics.

Keywords: Fermented, Maize, Probiotics, Supernatant, Broiler.

INTRODUCTION

Global production of poultry meat is close to 100 million tons (GLEAM, 2016). Recently, the Nigerian poultry industry has been rapidly expanding and it is one of the most commercialized subsectors of Nigerian agriculture (United States Department of Agriculture, 2013). Antibiotic residues in poultry products may be deleterious to human consumers, coupled with the development of microbial resistance in humans. Probiotics are potential proxies for antibiotics in the food animal industry because they can reduce enteric diseases and potential foodborne pathogen contamination in poultry or poultry products (Reid and Friendship, 2002). According to the currently adopted definition by FAO/WHO (2001), probiotics are: "live microorganisms which when administered in adequate amounts confer a health benefit on the host". The specific role of lactic acid bacteria as probiotics has been discussed by Juven and Stern (1991). *Lactobacillus* and *Leuconostoc* have been reported as the occurring genera of lactic acid bacteria (LAB) in the SFM (*Omidun*) and fermented souring (*ogi*) (Okeke *et al.*, 2015). *Omidun* has been reported by Falanan *et al* (2011) to contain some microorganisms including *L. plantarum*, which have antimicrobial efficacy against some pathogenic microorganisms including *Escherichia coli* (Falana *et al.*, 2012). In poultry, improvement in the performance of broilers has been reported by some researchers (Mountzouris *et al.*, 2007; Rigobelo *et al.*, 2011).

MATERIALS AND METHOD

Experiment Design and birds' management

One hundred and fifty (150) day-old Cobb500 broiler chicks from Olam Hatcheries Limited, Kaduna State, were divided into five groups (A, B, C, D and E) of 30 birds each having three replicates. The experimental period of the study was six weeks.

The experiment was carried out at the Poultry Unit of the department of Theriogenology and Animal Production, Usmanu Danfodiyo University, Sokoto. Germicide was used to disinfect the pen before the arrival of the birds and the birds were raised on deep litter management system, feed and water were supplied *ad libitum*, and pens were kept clean. The birds were vaccinated against Gumboro and Newcastle virus diseases as at when due. Commercially prepared feed (Crown Flour Mill Limited) was used for this study.

Preparation of SFM and Standardization of Pure Isolates of LAB

Yellow maize variety was sourced from a local market within Sokoto metropolis and used for the study. Two kilograms of the maize was weighed into water four litres of water and steeped for 3 days. The SFM was prepared using the methods of Ayorinde *et al.* (2017).

The standardization was achieved by 0.5 McFarland turbidity standards. Preparation of 0.5 McFarland turbidity standard was done as described by McFarland (1907). The solution was thoroughly mixed. This is the stock solution of the 0.5 McFarland turbidity standards. The solution was then transferred into capped tube and stored at 4°C until ready for use. The accuracy of the density of McFarland standard was checked using a spectrophotometer at absorbance reading of 0.08 to 0.1 at 630-nm.

Administration of SFM and Commercial Probiotics and data collection

Standardized LAB was administered in drinking water from days 8 to 49 of age. Birds in group A served as the negative control, those in group B were given commercially prepared probiotics (Beta probiotics) containing *Lactobacillus spp.* (2.7×10^6 CFU/ml), *Bacillus cereus* (6.5×10^6 CFU/ml), *Bacillus subtilis* (7.8×10^6 CFU/ml), Protease, (250,000 IU), Lipase (70,000 IU) and Amylase (500,000 IU), while group C, D and E were given standardized SFM at 10, 5 and 2.5ml/l, respectively on daily basis throughout the experimental period.

Growth performance parameters were measured as describe by Mountzouris *et al.* (2007). Parameters such as body weight (BW), weight gain (WG), feed intake (FI), feed conversion ratio (FCR), defined as FI:WG (g:g) were determined on weekly basis. Overall WG, FI and FCR were calculated for the whole duration of the experiment. Mortality was recorded throughout the period of the experiment.

Statistical analysis

All data collected on weekly growth performance were subjected to one-way analysis of variance (ANOVA) using SPSS version 20. Meanwhile the cumulative growth parameters were analyzed using one-way repeated measure ANOVA. In all the analyses, means were significantly different at 5% ($P < 0.05$). Turkey Test was used for all pairwise comparison using SPSS version 20.

RESULTS AND DISCUSSION

In this research, the results of cost benefit analysis of birds given graded doses of SFM and a dose of commercial probiotic is summarized in Table 1. It was observed that the cost of production per live broiler was highest in the group that were given commercially prepared probiotics (₦909.68/bird), followed by groups C (₦463.22/bird), D (₦420.30/bird) and E (₦403.22/bird), while it was lowest in the negative control group (group A) (₦377.38/bird). It was also observed that negative control birds and those given 10ml/l of SFM yielded the highest profit ((₦628.48/bird and ₦626.79/bird) respectively, profits of ₦617.47/bird and ₦591.19/bird were recorded in groups D and E respectively, while commercially prepared probiotics groups yielded the lowest profit margin of ₦124.70/bird. However, the lower production cost and higher gains obtained in groups A, D and E were rubbed off by higher mortalities recorded in these groups (25.51, 17.55 and 17.63%), respectively. Group B is undesirable as it had the highest production cost, the least profit margin and fairly high mortality. However, group C, although had a fairly high cost of production, had a fairly high profit margin and the lowest mortality rate (6.78%). Mortality recorded in this study was due to heat stress, this also suggested that SFM at 10ml/l

(group C) ameliorated the effect of heat stress the best. More so, *Omidun* is a byproduct of *Ogi* which at times were discarded as waste. This implies that the administration of *Omidun* at 10ml/l in the drinking water of broiler chicken could give more profit for the unit amount of money spent, since it kept mortality at the lowest.

CONCLUSION

It can be concluded from this study that *Omidun* at higher dose (10ml/l) is relatively more cost effective as compared to *Omidun* at lower doses (5 and 2.5ml/l) and the commercially prepared probiotics. The mortality observed in this study was caused majorly by heat stress.

RECOMMENDATION

From this study *Omidun* has proven to be a good antioxidant and as well cheaper as compared to the commercially prepared probiotics, therefore poultry farmers can be encouraged to use it for their birds. We therefore recommend further study to evaluate higher inclusion rate of SFM on the productivity and immune response of broiler chickens.

REFERENCES

- Ayorinde, O. A, Funmilola A. A. and Werner R. (2017). Antagonistic and Quantitative Assessment of Indigenous Lactic acid Bacteria in Different Varieties of *Ogi* against Gastrointestinal Pathogens. *PAN African Medical Journal*; 27:22.
- Falana, M.B, Bankole M. O., Omemu A. M. and Oyewole, O. B (2012). Antimicrobial potentials of some selected Microorganisms associated with supernatant solution of fermented maize mash *Omidun* from two varieties of maize grains. *African Journal of Microbiology Research*, 6:4095-4101.
- Falana, M.B, Bankole M. O., Omemu A. M. and Oyewole, O. B (2011). Microorganisms associated with supernatant solution of fermented maize mash *Omidun* from two varieties of maize grains. *Researcher* 3(7):1-7
- FAO/WHO. (2001). Health and nutritional properties of probiotics in food including powder milk with live lactic acid bacteria; Report of a Joint FAO/WHO Expert Consultation on Evaluation of Health and Nutritional Properties of Probiotics in Food Including Powder Milk with Live Lactic Acid Bacteria; Amerian Córdoba Park Hotel, Córdoba, Argentina pp. 1–34.
- GLEAM (2016). Global Livestock Environmental Assessment Model. FAO, Rome. Available at <http://www.fao.org/gleam>. (Accessed on 20 /6/2019).
- Juven, B. J and Stern N. J. (1991). A review: Antagonistic effects of Lactobacilli and Pedococci to control intestinal colonization by human enteropathogens in live poultry. *Journal of Applied Bacteriology*, 70: 95-103.
- McFarland, J. (1907). Nephelometer: an instrument for estimating the number of bacteria in suspensions used for calculating the opsonic index and for vaccines. *Journal of the American Medical Association*, 14: 1176-1178.
- Mountzouris, K C., Tsirtsikos, P., Kalamara, E., Nitsch, S., Schatzmayr, G. and Fegeros K. (2007). Evaluation of the efficacy of probiotic containing *Lactobacillus*, *Bifidobacterium*, *Enterococcus*, and *Pediococcus* strains in promoting broiler performance and modulating cercal microflora composition and metabolic activities. *Poultry Science*, 86:309–317.
- Okeke, C. A., Ezekiel C. N., Nwangburuka C. C., Sulyok M, Ezeamagu C. O., Adeleke R. A., Dike, S. K. and Krska, R. (2015). Bacterial Diversity and Mycotoxin Reduction During Maize Fermentation (Steeping) for *Ogi* Production. *Frontier in Microbiology*, 15(6):1402.
- Reid, G. and Friendship, R. (2002). Alternatives to antibiotic use: Probiotics for the gut. *Animal Biotechnology*, 13 :97–112.
- Rigobelo, E. C., Maluta, R.P. and Ávila, F.A. (2011). Desempenho de frangos de corte suplementados com probiótico. *Ars Veterinaria, Jaboticabal*, 27(2):111-115.
- United States Department of Agriculture (USDA) (2013). International Egg and Poultry Report.

Table 1: Cost benefit analysis of birds given graded doses of supernatant of fermented maize as compared with the commercially prepared probiotics

Parameters	Treatments				
	A	B	C	D	E
(a) Feed cost/kg (₦)	146	146	146	146	146
(b) Feed intake (kg)	0.53	0.58	0.57	0.55	0.57
(c) Cost of probiotics and SFM/bird (₦)	0.00	525.00	80.00	40.00	20.00
(d) Cost of chick (₦)	300	300	300	300	300
(e) Total cost of feed/bird plus cost of Probiotics and SFM/bird (₦)	77.38	609.68	163.22	120.3	103.22
(f) Total cost of production (₦) (d + e)	377.38	909.68	463.22	420.30	403.22
(g) Body live weight (g)	1005.86	1034.38	1090.01	1037.77	994.41
(h) Sale price @ ₦1000/kg live weight	1005.86	1034.38	1090.01	1037.77	994.41
(i) Profit from sale of bird/Kg (h – f)	628.48	124.70	626.79	617.47	591.19
(j) Mortality (%)	25.51	10.23	6.78	17.55	17.63

Key: A: Negative control, B: Positive control given commercially prepared probiotics, C: *Omidun* at 10ml/l, D: *Omidun* at 5ml/l, E: *Omidun* at 2.5ml/l