EFFECTS OF MAIZE EXTRACT AND LOCUST BEANS EXTRACT (PROBIOTICS) ON THE GROWTH PERFORMANCE OF BROILER CHICKENS

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Abstract
An experiment was conducted to investigate the comparative efficacy of two probiotics (live organisms) of different origins (fermented maize extract and fermented locust bean extract) on the growth performance of broiler chickens. One hundred and twenty day old chicks were purchased and were randomly alloted to 4 dietary treatments and each dietary treatments had 3 replicates of 10 chicks each. The four dietary treatments were designated as D1, D2, D3 and D4 respectively with iso-caloric and iso-nitrogenous (ME 3003.45 kcal/ kg and CP 24.02%) broiler starter and finisher (ME 2908.55 kcal/ kg and CP 21.02%) diets were formulated containing fermented maize extract, fermented locust bean extract and mixture (50:50) of both except dietary treatment one (D1) which was control. Birds were raised for first week on diet containing none of the test ingredients (probiotics). Data were generated and calculated on growth performance. Non significant (P>0.05) effects were observed on overall performance parameters of the birds fed diet containing probiotics (fermented maize extract and fermented locust bean extract). However, birds fed with combination of fermented locust beans extract and fermented maize extract (D4) recorded the highest final weight gain of birds (363.89g), followed by the control (D1) having a final weight gain of (309.26g), then fermented locust beans extract (D3) having a final weight gain of (296.48g) and fermented maize extract (D2) having the least final weight gain of the birds (286.90g). However, there were no significant differences (P>0.0.5) between the four dietary treatments. Dietary treatment four (the combination of fermented locust beans extract and fermented maize extract) performed better than the control and other dietary treatments. It is therefore recommended, that dietary treatment four (combination of fermented locust bean extract and fermented maize extract) can be used as probiotics because birds fed this diet performed better in terms growth and performance of broiler chickens than other treatment groups.

Keywords :Probiotics, maize, locust beans , extract , chickens , performance

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1. INTRODUCTION

The term *probiotics* is defined as live microorganisms that can be propagated into numerous special kinds of products, including dietary supplements, foods, and drugs. Genus of *Lactobacillus* and *Bifidobacterium* are mainly the universal organisms reprocess a probiotic, although yeast *Saccharomyces cerevisiae* with a few *E. coli* and *Bacillus* species are as well recycled as probiotics. Lactic acid bacteria, including *Lactobacillus* genus, that are been used to safeguard food for thousands of years ago by fermentation, plays a dual role as agents of foods fermentations as well as imparting health assistance potentially. Firmly, the word "probiotic" ought to exist as a live microorganism that has been revealed to elicit man's knowledge in imparting healthy assistance. Lower pH and distinctive flavor profiles are provided by fermented rations, and which also prevent infection by latent organisms. Fermentations are worldwide functional, with regard to maintenance of a variety of dairy cattle raw materials (i.e. meat, milk), fish, cereals, tubers, roots, vegetables and fruits etc.) (Khan, *et al*., 2011).

In recent times, the application of probiotics have received considerable attention in the discussion about developing suitable alternative for antibiotic growth promoters in the poultry industry. However, the effects of probiotics supplementation put into practice is highly inconsistent, because of the strain differences, various diet composition, age of the animal, its contacts with environmental factors, and as well as its dose level. (Loh *et al.*, 2008; Khan, *et al.*, 2011).

The poultry industry has suited a vital economic activity in numerous countries. In large-scale rearing facilities, where poultries are exposed to stressful circumstances, problems relating to diseases and deterioration of ecological circumstances often arise and result into serious economic losses. Lutful (2009) reported that, hindrance and management of diseases have lead to a significant increase in the use of veterinary medicines for the duration of recent decades. On the contrary, the effectiveness of antimicrobial agents as a precautionary measure has been questioned, given extensive documentation of the advancement of antimicrobial resistances among pathogenic bacteria. Consequently, the possibility of antibiotics ceasing to be used as growth stimulants designed for poultry and the concern about the side-effects of their utilization as therapeutic agents has formed a climate in which both the consumers and manufacturers are looking for alternatives.

Recently, Yirga (2015) reported that probiotics are parallel to competitive exclusion products. It has been assumed to advance the overall health of an animal by improving the microbial balance in its gut. The lack of proof as to their mechanism of action and of the effects on host animals is the major limitation of probiotics. The effectiveness of probiotics are in sure cases, conspicuously in infant animals or those that have been treated with antibiotics, where they have the same effect as competitive exclusion products. They may also be useful in boosting up feed adaptation rates and weight gain. Researchers have reported that this may aid the maturity of the immune system by motivating the fabrication of antibodies and increased phagocytic activity (McDonald *et al*., 2010). As the immune system is betrothed into subsequent exposure to probiotic bacteria, any aggressive bacteria are also noticed, following the increased observation by *leukocytes*, and hence prospective pathogens are eliminated (Hughes and Heritage, 2002). Some probiotic strains such as *Lactobacillus* have confirmed to be competent of encouraging the immune system. However, it is difficult to entirely conclude that probiotics contribute drastically to the immune system of the host as they are not proposed to eliminate menacing pathogens in the gastrointestinal tract. For that reason, such observed improvements or confirmatory effects are always some-what compromised due to the animal's immune system status and the various applied situations (Cho*et al.*, 2011). Jimenez (2012) reported that probiotics help to prevent imbalances and enhances the growth of the healthy microflora.

It has been reported by several workers that probiotics have useful effects on growth performance of poultry. In broiler, supplementations of a diet with probiotics have resulted into a superior feed adaptation rate and average live weight in contrast to the control group.

There are numerous information on the effect of probiotics on broiler performances, but little work has been done on using maize and locus bean extract as a probiotic source.

The production stream of poultry in the world is facing many problems, mainly on performance of the birds due to ecological, economic and management of the birds. However, the use of probiotics will help in resolving some of the constraints. Since it have been revealed that supplementation of probiotics in a diet have advantageous impacts on growth performance of poultry birds by improving feed conversion rate, average live weight and health of the birds.

The aim of this research is to assess the performance of broiler chickens fed diet containing probiotics on the development and performance of broiler chickens.

2. MATERIALS AND METHODS

2.1 Location of the Experiment

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm, Department of Animal Production, Faculty of Agriculture, Ibrahim Badamasi Babangida University Lapai, Niger State. Lapai is located between latitude 9^0 31 E and longitude 9^0 45, East of the equator (Usman, 2013). The area fall within the Southern Guinea savannah

vegetation zone of Nigeria with mean rainfall ranges in the middle of 1100mm to 1600mm and a mean temperature sandwiched between 21^0C and 36.5^0C (Usman, 2013).

2.2 Source of Feed Ingredients

The feed ingredients used for the experiment were purchased from a neighboring market in Lapai and Minna, Niger State.

2,3 Experimental Design and Management of Birds

One hundred and twenty (120) day-old broiler chicks were purchased from step-by-step veterinary and animal feed store in Minna, Niger State. The birds were allowed adjustment period of one week before the commencement of the experiment. The birds were then allotted to four treatment groups and replicated three (3) times with ten (10) birds in each replicate and a total of thirty birds per treatment in a completely randomized design. The chicks were brooded in a deep litter floor pen, using rechargeable touch light and clay pots as source of light and heat equally. Feed and water were given *ad-libitum* to the birds precisely in the course of the experimental period. Routine vaccines and drugs were administered as at when due. Feed intake, weight gain, feed conversion ratio and percent mortality were calculated as illustrated in the content 2.6. The experiment lasted for 42 days (six weeks).

2.4 Preparation of Probiotics (Maize and Locust Beans Extracts)

Two kilogram (2 kg) each of maize and locust beans were soaked for 48 hours and 72 hours before they were grinded. They were sieved immediately after grinding and allowed to ferment in 2 liters of water for 72 hours after which the extracts were collected.

2.5 Experimental Diets

The experimental diets were formulated and designated as in Tables 1 and 2. Diets were formulated to meet the NRC (1994) standard requirements. Both at starter and finisher phases of growth (0-4 and 4-6 weeks), the birds were supplied with water and feeds a*d-libitum* throughout the trial period.

Experimental diet 1 (control) contained none of the probiotics.(100 kg: 00 kg)

Experimental diet 2 (treatment 2) contained 100cl of fermented maize extract.(99 kg: 1kg)

Experimental diet 3 (treatment 3) contained 100cl of fermented locust bean extract.(99 kg: 1kg)

Experimental diet 4 (treatment 4) contained 50:50cl of mixture of fermented locust bean and maize extract (99 kg : 0.5kg: 0.5kg)

Key:

99 kg= Feed compounded per each treatment

00 kg, 1kg and 0.5kg =Quantity of extract innoculated per each treatment

2.6. Data collection

Feed intake (FI) = Quantity of feed served (g) – Left-over (g) = (g)

Body weight gain (BWG) = Final weight (g) – Initial weight (g) =(g)

Feed conversion ratio (FCR) = $\frac{\text{Feed intake (g)}}{\text{Body weight gain (g)}}$ =(g)

Percent mortality = $\frac{\text{Number of subject dead}}{\text{Total numbers of initial subject}} \times 100$ =(%)

Table 1: Ingredients composition of broiler starter diets

Ingredients (kg)	Control	M_{zex}	L_{bex}	M_{zex}/L_{bex}
Maize	52.60	51.60	51.60	51.60
Fish meal	2.50	2.50	2.50	2.50
GNC	34.50	34.50	34.50	34.50
Wheat offal	5.00	5.00	5.00	5.00
Bone meal	3.15	3.15	3.15	3.15
Limestone	1.10	1.10	1.10	1.10
Methionine	0.30	0.30	0.30	0.30
Lysine	0.30	0.30	0.30	0.30
Vitamin premix	0.25	0.25	0.25	0.25

Salt	0.30	0.30	0.30	0.30
M_{zex}	-	**	-	-
L_{bex}	-	-	***	-
M_{zex}/L_{bex}.	-	-	-	****
Total Calculated values	100.00	100.00	100.00	100.00
CP (%)	24.04	24.04	24.04	24.04
ME (Kcal/kg)	3003.45	3003.45	3003.45	3003.45

Keys:
CP = Crude protein,
ME = Metabolizable energy,
GNC = Ground nut cake,
D1=Control = feed formulated without probiotics,
D2=M_{zex} = Fermented maize extract,
D3=L_{bex} = Fermented locust bean extract,
D4=M_{zex}/L_{bex} = Mixture of fermented locust beans extract with maize extract,
** = Fermented maize extract,
*** = Fermented locust beans extract,
**** = Mixture of fermented locust beans extract with fermented maize extract.

Table 2: Ingredients composition of broiler finisher diets

Ingredients (kg)	**control**	**M_{zex}**	**L_{bex}**	**M_{zex}/L_{bex}**
Maize	48.81	47.81	47.81	47.81
GNC	26.69	26.69	26.69	26.69
Wheat offal	17.70	17.70	17.70	17.70
Bone meal	4.50	4.50	4.50	4.50
Limestone	1.10	1.10	1.10	1.10
Methionine	0.30	0.30	0.30	0.30
Lysine	0.30	0.30	0.30	0.30
Vitamin premix	0.30	0.30	0.30	0.30
Salt	0.30	0.30	0.30	0.30
M_{zex}	-	**	-	-
L_{bex}	-	-	***	-
M_{zex}/L_{bex}.	-	-	-	****
Total Calculated values	100.00	100.00	100.00	100.00
CP (%)	21.02	21.02	21.02	21.02
ME (Kcal/kg)	2908.55	2908.55	2908.55	2908.55

Keys:
CP = Crude protein,
ME = Metabolizable energy,
GNC = Ground nut cake,
D1=Control = feed formulated without extract,
D2= M_{zex} = Fermented maize extract,
D3= L_{bex} = Fermented locust bean extract,
D4= M_{zex}/L_{bex} = Mixture of fermented condiment extract with maize extract
, ** = Fermented maize extract,
*** = Fermented locust bean extract,
**** = Mixture of fermented locust beanss extract with fermented maize extract.

2.7. Statistical Analysis

All the data collected from the experiment were subjected to Analysis of Variance (ANOVA). The means were separated using Least Significant Differences (LSD) as described by Steel and Torrie (1980) at 5% probability level.

3. RESULTS AND DISCUSSION

Results of proximate composition of experimental diet are shown Table 3. The values obtained for ash were within the range of 6.27% (D1) to 6 .91 % (D4) . Crude protein values were lower at diet two (20. 25 %) with highest value recorded at diet four (22.07 %). Crude fibre had higher value at diet three (5.65 %) and the least were recorded at diet two (4.29 %).The growth performance of broiler chickens fed with four different dietary treatments is shown in Table 4. the results obtained from the trial showed that there were no significant difference (P>0.05) between the values obtained for growth parameters across the four dietary treatments. Nevertheless, the values obtained for final body weight gain treatment four had the highest value (363.89g) lowest in treatment two (286.90g). Also dietary treatment four has the highest value of average daily weight gain (0.87g) while diet two had the least value (0.68g). For total feed intake, dietary treatment four has the highest value (17921.20g) while dietary treatment three has the lowest (17492.20g). The values obtained for average daily feed intake dietary treatment four had the highest value (42.67g) while dietary treatment one had the least value (41.95g). The result recorded for feed conversion ratio shows that diet two had the highest value (16.73g) while dietary treatment four has the lowest value (14.67g). For feed conversion efficiency, dietary treatment four has the highest value (0.080g) while dietary treatment two and three has the lowest value (0.067g). And the values obtained for percentage mortality diet three had the highest value of (10.00 %) while diet one had the lowest (7.22%).

The results showed that there were no significant differences (P > 0.05) in all the treatment groups with regards to all the parameters observed. This means that all the dietary treatments were the similar for the all parameters measured throughout the experimental period. However, treatment four recorded the highest final body weight gain and average daily weight gain. This indicated a better utilization of feed by birds for weight gain compared with those of other treatment groups. This difference may be due to different source of probiotics in the ration. This result also disagrees with the result reported by (Jimenez, 2012) who reported that probiotics help to prevent imbalances and enhances the growth of the healthy of broiler chickens.

There were no significant difference (P>0.05) in the feed intake for broiler chickens fed these test ingredients. The intakes were lower than the result reported by Nawaz, *et al*. (2016). This agreed with the concept that broiler chickens eat more to satisfy their energy needs (Smith, 2001).

Table 3: proximate composition of the experimental diet

Parameters (%g)	control	M_{zex}	L_{bex}	M_{zex}/L_{bex}
Moisture	16.07	28.19	27.91	29.05
Ash	6.27	6.31	6.47	6.91
Crude protein	21.11	20.25	21.31	22.07
Crude fibre	4.48	4.29	5.65	5.03
Ether extracts	2.98	3.03	3.11	3.16
Nitrogen free extracts	65.16	66.12	63.46	62.83

Key:
D1=Control diet= contain no extract .
D2== Fermented maize extract
D3=L_{bex} = Fermented locust bean extract,
D4= M_{zex}/L_{bex} = Mixture of fermented locust extract with maize extract.

Table 4: Performance characteristics of broiler chickens fed test ingredient

Parameters	D1	D2	D3	D4	SEM (±)	SED	LSD
IBWG (g)	50.00	50.00	49.00	50.00	0.25	0.71	NS
FBWG (g)	309.26	286.90	296.48	363.89	13.88	34.95	NS
ADWG (g/b/d)	0.74	0.68	0.71	0.87	0.33	0.83	NS
TFI (g)	17616.67	17768.93	17492.20	17921.20	119.81	363.36	NS
ADFI (g/b/d)	41.95	42.31	42.31	42.67	0.29	0.87	NS
FCR	15.24	16.73	16.13	14.38	0.41	1.02	NS
FCE	0.070	0.067	0.067	0.080	0.002	0.04	NS
MRT (%)	7.22	8.33	10.00	9.44	0.51	1.30	NS

Key:
S.E.M: Standard error of mean, LSD = least standard deviation, SEG = Significant, NS = Not significant,
D1 (control) = No test ingredients,
D2 = fermented maize extracts,
D3 = fermented locust beans extracts,
D4 =mixture of fermented maize extract and locus beans extracts,
IBWG = Initial Body Weight Gained, FBWG = Final Body Weight Gained, ADWG = Average Daily Weight Gained, TFI = Total Feed Intake, ADFI = Average Daily Feed Intake, FCR = Feed Conversion Ratio, FCE = Feed Conversion Efficiency, MRT = Mortality Rate.

Feed conversion ratio obtained from the research were higher than the result reported by Nawaz *et al.* (2016) (1.79 – 2.06) for broiler chickens fed test ingredients containing probiotics. This implies poorer feed utilization, but there was no significant difference (P>0.05) in the feed conversion ratio.

Non-significant differences in final weight, total weight gain high feed conversion ratio observed in probiotics supplemented groups were line with the findings of Yeo and Kim (1997) who also observed significant improvement in the daily body weight gain and feed intake of broilers chickens when their fed was supplemental probiotics . Sahane (2001) and Pelicia *et al* (2004) were of the view that the improvement might be due to ileal digestibility of nutrients as influenced by the supplement

4. CONCLUSION

Inoculation of probiotics in the diets of broiler had no adverse effects on their growth rate and health. Conclusively, despite there were no significant difference (P>0.0.5) between the four diets. Diet four (the combination of fermented locust beans extract and fermented maize extract) performed better than the control and other diets (Diets 1,2 and 3).

Recommendations

It is therefore recommended, that diet four (combination of fermented locust bean extract and fermented maize extract) can be used as probiotics because birds fed this diet performed better in terms of growth and performance of broiler chickens than other treatment groups

It is advisable to use other sources of plant protein (soyabeans) than ground nut cake because the extracts is in liquid form and when inoculated in to feed containing ground nut cake and not properly air dried could get rancid, when fed to the chickens can lead to mortality

5. REFERENCES

[1]. Cho, J.H., Zhao, P. Y. & Kim, I. H. (2011). Probiotics as a Dietary Additive for Pigs. Journal of Animal and Veterinary Advances 10: 2127-2134.

[2]. Hughes, P. and Heritage, J. (2002). Food and Agriculture Organization. Antibiotic growth promoters in food animals. Retrieved from Leeds, U.K.

[3]. Jiménez, G. (2012). Probiotics in Animal Nutrition - a Century of Research. Issues and constraints. World Poultry Science Journal. 16: 298-307.

[4]. Khan, S.H., Atif, M., Mukhtar, N., Rehman, A. & Farid, G.(2011). Effects of supplementation of multi enzyme and multispecies probiotic on production performance, egg quality, cholesterol

level and immune system in laying hens. Journal of Applied Animal Research 39:386398.

[5]. Loh, T. C., Lee, T. M., Foo, H. L., Law, F. L. & Rajion, M. A. (2008). Growth performance And faecal microflora of rats offered with metabolites from lactic acid bacteria in drinking water.Journal of Applied Animal Research. 34:6164.

[6]. Lutful Kabir, S. M. (2009). The role of probiotics in the poultry industry: The poultry industry has become an important economic activity in many countries. International Journal of Molecular Science.,10 (8), 3531-354 doi: 10.3390/ijms10083531.

[7]. McDonald, P., Edwards, R. A., Greenhalgh, J. F.D., Morgan, C. A. & Sinclair, L.A. (2010), Animal Nutrition (7th edition.) Pearson Books.

[8]. Nawaz, H., Abbas Irshad, M., Mubarak, A. & Ahsan-ul-Haqm,(2016). Effect of probiotics on growth performance, nutrient digestibility and carcass characteristics in broilers: Institute of Animal Sciences, University of Agriculture, Faisalabad, 38040, Pakistan. The Journal of Animal & Plant Sciences, 26(3): 2016, Page: 599-604 ISSN: 1018-7081

[9]. NRC (1994). Nutrient Requirement of Poultry 9th Ed: National Academy Press, Washington, DC.

[10]. Pelicia, J. A. & Mendes, A, A., Saldanha, F.S., Piazzolande, C. and Takashash., S.(2004). Probiotic and prebiotic utililisation in diets for free rangebroilers chickens.British Journal of poultry Science 92: 99-104.

[11]. Sahane, M. S. (2001).Mannan oligosaccharides in poultry nutrition: Mechanism and benefits, proceeding Altltechs 17th Annual Symposium Eds. Lyons, T. P & Jacques, K.A., Notting ham University Press. Pp 65-77

[12]. Smith, A. J. (2001). Poultry. The tropical Agriculturist. Centre for Tropical Veterinary Medicine,University of Edingburgh, U.K. C.T.A. Publication. Macmillan Education LDT, London and Oxford.Second (revised) Edition.

[13]. Steel, R.G. & Torrie, S.H. (1980). Principles and Procedure of Statistics: a biometrical approach. 2nd Edition. London.

[14]. Tewe, O, O. (1983). Thyroid cassava toxicityin animals, Pages 114-118 in cassava toxicityand thyroid : research and public health issues. Proceedings, internationai Workshop on cassava Toxicity , edited by F Delange and R. Ahhuwailia, 31 May-2 June 1982, Ottawa, Canada,IDRC-207e:Ottawa.

[15]. Usman, B. A. (2013). Vulnerability and adaptation capabilities of the rural poor to climate change effects in Kwara State, Nigeria. Lapai sociological review, 4 (1): 142-162.

[16]. Published by Department of Sociology, Ibrahim Badamasi Babangida University, Lapai, Niger State, Nigeria.

[17]. Yeo, J . & Kim, K. (1997). Effect of feeding diets containing an antibiotics, a probiotics , or Yucca extract on growth and intestinal urease activity in broilers chicks. Poultry Science 76 :381-385

[18]. Yirga, H.(2015). The use of probiotics in animal nutrition. Journal of Probiotic Health 3:132. doi:10.4172/2329-8901.1000132.