PERFORMANCE, ORGAN DEVELOPMENT AND ILEAL MICROBIAL POPULATION OF BROILER CHICKS FED HIGH QUALITY CASSAVA PEEL (HQCP) SUPPLEMENTED WITH YEAST

Okeke, Precious Chiamaka and *Ajayi, Helen Inikpi
Department of Animal Science and Animal Technology
Benson Idahosa University, Benin City. Edo state.
Corresponding author email: hajayi@biu.edu.ng; Phone No. +2348036086864

ABSTRACT
Ninety-six (96) day old Ross 308 chicks were used to investigate the effect of High-Quality Cassava Peel (HQCP) diet supplemented with yeast; on their performance, organ measurement and ileal microbial population at 0-3 weeks. The chicks were randomly allocated to four dietary treatments with three replicates each. Treatment 1 had 0 % HQCP and 0g yeast Treatment 2 had 0 %HQCP and 0.1% yeast, Treatment 3 had 15.12 % HQCP and 0% yeast, and Treatment 4 was 15.12% HQCP and 0.1% yeast. Treatment 3 and 4 had HQCP levels to replace 28% of the maize content in the control diet (Treatment 1). The result showed that there was a significant difference ($p<0.005$) in feed intake, body weight gain, feed conversion ratio (FCR) and organ measurement but none ($p>0.005$) on ileal microbial population. Birds fed T1 and T3 diets had the highest feed intake, 5.10kg and 4.27kg, respectively while birds fed T1 and T4 had highest body weight gain (4.97kg and 4.13kg, respectively). Lowest FCR (0.84) was recorded for birds fed HQCP and 0.1g of yeast, same birds also had highest microbial population (101,000 cfu). Birds fed HQCP and yeast benefited from the yeast supplementation at 0-3 weeks.
Key-words: HQCP, yeast supplementation, broiler chicks, ileal microbes, performance

INTRODUCTION

Maize is an energy concentrate used in poultry feed formulation because of its high energy, low fibre and essential fatty acids (Panda *et al.,* 2013) but due to its high cost (as a result of the competition between man and animals) alternatives are being researched and searched out. High Quality Cassava Peel (HQCP) is a feed ingredient derived from cassava peels (a waste from cassava processing) that can be an alternative to maize. The proximate composition of HQCP shows a metabolizable energy of 3039kcal/kg and fat content of about 2.6%, which are similar to values for maize.

According to Amole *et al*. (2019 and 2022), HQCP may replace 28% of the maize in a diet, due to its high energy content of 9 MJ/kg DM which is nearly two-thirds the energy content of maize grain.

Yeasts are unicellular organisms, 5–10µm in size, belonging to the fungi kingdom. They are important in many complex ecosystems and are involved in symbiotic, mutualistic, parasitic, and competitive interactions with other microorganisms (Kiarie *et al.,* 2019). Yeast has been used (as a probiotic) in high fibre poultry diets with beneficial effects (Oyedeji *et al.,* 2008) and can serve as potential alternative to feed antibiotics Tengfei *et al.,* (2021).

The competition for maize increases its demand and making it expensive, this necessitates the search for sustainable and cheaper alternatives for farmers. The use of HQCP as part replacement for maize is a sustainable alternative to maize in animal feeding.

This study sought to evaluate the performance, organ development and gut microbial population of broiler chicks fed High Quality Cassava Peel (HQCP) supplemented with yeast at 0-3 weeks of age.

MATERIALS AND METHODS

Ninety-six (96) day old Ross 308 chicks were allotted to 4 dietary treatments of three replicates each, with eight birds per replicate. Heat was provided during the brooding period. All birds were offered diets and cool clean water *ad-libitum* throughout the experimental period. There were four-treatment diets: Treatment 1 (0% HQCP and 0g yeast); Treatment 2 (0% HQCP and 0.1% yeast); Treatment 3 (15.12% HQCP, replacing 28% of maize) and Treatment 4 (0.1% yeast plus 15.12% HQCP). HQCP used in this study was produced by International Livestock Research Institute (ILRI).

Weekly feed intake was measured in kilograms and grams. Weight gained was measured and expressed for replicate group of birds as kg/group, and g/bird. Feed Conversion Ratio (FCR) was computed by calculating the amount of feed consumed per body weight gained.
On day 21, a bird was randomly selected from each pen, weighed, slaughtered and the weight of the heart, liver, gizzard, proventriculus and crop were taken in grams and recorded. Length of the gut was taken, measuring from the esophagus to the ileoceca junction and recorded. The gut was cut from the meckel's diverticulum to the ileoceca junction and the contents flushed with distilled water into a specimen tube with cap, kept at about 4ºC until microbial population analysis was carried out.

Table 1: Experimental Diet Composition (%)

Ingredients	Treatment Diets			
	Diet 1 (0% HQCP, 0% yeast)	Diet 2 (0% HQCP, 0.1% yeast)	Diet 3 (28% HQCP, 0% yeast)	Diet 4 (28% HQCP, 0.1% yeast)
Maize	54.00	54.00	38.88	38.88
Soy bean meal	29.00	29.00	27.00	27.00
Fish meal	8.00	8.00	10.00	10.00
Palm oil	2.00	1.90	2.00	1.90
Wheat Bran	3.00	3.00	3.00	3.00
HQCP	0.00	0.00	15.12	15.12
Vit/Min Premix*	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Dicalcium Phosphate	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00
NaCl	0.25	0.25	0.25	0.25
Yeast	0.00	0.10	0.00	0.10
TOTAL	100	100	100	100
Calculated Nutrient Level				
Parameter				
ME (Kcal/Kg)	3011.11	3002.93	2817.66	2809.48
CP (%)	23.33	23.38	22.97	23.01
Ca (%)	0.45	0.13	0.44	0.44
P (%)	1.97	1.97	1.92	1.92

*Supplied per kg of diet - Vit A, 30,000,000i.u; Vit D3, 6,000,000.00 i.u; Vit E, 30,000.00i.u; Vit K, 2g; Vit B2, 5g; Vit C, 20g; Niacin, 40g; Pantothenic Acid, 12g; Vit B6, 1.5g; Vit B12, 10g; Folic Acid, 1g; Biotin, 0.4g; Choline Chloride, 300g; Cobalt, 0.2g; Copper, 1.2g; Iodine, 20g; Iron, 40g; Manganese, 100g; Selenium, 0.15g; Zinc, 30g; Antioxidant, 1.25g. HQCP = High Quality Cassava Peel, ME = Metabolizable Energy, CP = Crude Protein

Nutrient agar media was prepared according to Anupama (2022). 1ml of the ileal digesta was introduced into a test tube containing 9ml of peptone water and labelled as the stock solution, this solution was serially diluted in 6 other test tubes. 1ml from each test tube was plated on duplicate nutrient agar plates and incubated for 24 hours. After 24 hours, microbial count was taken and recorded.
All feed samples were analysed by the method of AOAC (2000) for their proximate composition.
All data generated were analyzed statistically using SPSS 16.0 for windows (2007) and the means were separated using Tukey's at $p<0.005$.

RESULTS AND DISCUSSION
The performance of Ross 308 broiler chicks fed the different experimental diets at week 0-3 (Table 3) shows that there was significant difference in feed intake, body weight gain and feed conversion ratio among treatments.

Table 3: Performance characteristics of broiler chicks fed HQCP supplemented with yeast at 0-3 weeks

Parameters	T1	T2	T3	T4	SEM
FI (kg/bird)	5.10[a]	3.50[c]	4.27[b]	3.47[c]	0.22
BWG (kg/bird)	4.97[a]	3.47[c]	3.60[c]	4.13[b]	0.21
FCR	1.03[b]	1.02[c]	1.19[a]	0.84[d]	0.05

[a,b,c,d] means on the same row are significantly different, p<0.005
FI = Feed intake, BWG = Body weight gain, FCR = Feed conversion ratio, SEM = Standard Error Mean, T1= 0% HQCP and 0g yeast, T2= 0% HQCP and 0.1% yeast, T3= 15.12% HQCP, replacing 28% of maize, T4= 0.1% yeast plus 15.12% HQCP (replacing 28% of maize)

Table 4: Organ measurement of broiler chicks fed HQCP supplemented with yeast at 3 weeks

Parameters	T1	T2	T3	T4	SEM
Gut length (cm/bird)	139.27[a]	93.9[d]	126.77[b]	119.47[c]	6.65
Heart weight (g/bird)	5.86[a]	3.29[d]	4.69[c]	5.41[b]	0.44
Liver weight (g/bird)	14.63[a]	7.49[c]	13.92[a]	11.53[b]	1.18
Gizzard + Prt (g/bird)	17.67[a]	11.62[d]	14.67[c]	16.04[b]	1.09
Crop weight (g/bird)	6.54[a]	4.91[b]	4.68[c]	5.37[b]	0.55

[a,b,c,d] means on the same row are significantly different, p<0.005
Prt = Proventriculus, SEM = Standard Error Mean, T1= 0% HQCP and 0g yeast, T2= 0% HQCP and 0.1% yeast, T3= 15.12% HQCP, replacing 28% of maize, T4= 0.1% yeast plus 15.12% HQCP (replacing 28% of maize)

Table 5: Ileal microbial population of broiler chicks fed HQCP supplemented with yeast at 3 weeks

Parameter	Microbial count (cfu)
T1	54,333.33[b]
T2	83,666.67[a]
T3	83,000.00[b]
T4	101,000.00[a]
SEM	7673.94

[a,b,] means on the same row are significantly different, p<0.005, SEM = Standard Error Mean
T1= 0% HQCP and 0g yeast, T2= 0% HQCP and 0.1% yeast, T3= 15.12% HQCP, replacing 28% of maize, T4= 0.1% yeast plus 15.12% HQCP (replacing 28% of maize), cfu = Colony forming units.

The feed intake for birds on the control diet was the highest (5.10kg) and significantly different from those of birds fed treatment 3 diet, (4.27kg) but there was no significant difference between birds on treatment 2, 0% HQCP and 0.1% yeast and treatment 4, 0.1% yeast plus 15.12% HQCP (replacing 28% of maize). Adekeye *et al.,* (2020) noted that feed conversion ratio of birds was highest among birds containing 28% maize replacement with HQCP. Eltazi *et al* (2014) also reported that yeast derived products in broiler chicken diets could improve body weight gain and feed conversion ratio. For FI and BWG, birds fed the control diet were significantly different from birds fed treatment 3 diet, birds on treatment 4, had the lowest feed conversion ratio (0.84) compared to other dietary treatments. Onifade (2006) reported that broiler birds fed with yeast had heavier gizzard and lengthier gut. Organ measurement of broiler chicks fed HQCP supplemented with yeast at 3 weeks (Table 4) reveals that gut length, heart weight, liver weight, gizzard plus proventriculus and crop weight were significantly different for each dietary treatment. Ileal microbial population per treatment of broiler chicks (Table 5) were not significantly different for T2, T3 and T4. Broiler chicks on control diet were not significantly different to birds on treatment 3, and birds on treatment 4, were not significantly different to birds fed treatment 2. Treatment 4, 0.1% yeast plus 15.12% HQCP (replacing 28% of maize), had the highest microbial population (101,000) probably because HQCP and yeast promote the growth of gut bacterial.

CONCLUSION

Birds fed HQCP and 0.1g yeast per kg feed benefited from yeast supplementation without detrimental effect on their performance, organ measurement and ileal microbial population. This work confirms HQCP can replace 28% of maize in diet for poultry without negative effects.

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