GROWTH PERFORMANCE OF BROILER CHICKS FED VARYING LEVELS OF RUMEN FILTRATE-FERMENTED EARTH BALL (*ICACINIA MANNI*) MEAL DIETS

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ABSTRACT
The research was designed to evaluate the feeding value of rumen filtrate fermented *Icacinia manni* (earth ball) meal on broiler chicks.The rumen filtrate was prepared by submerging fresh rumen digesta obtained from the rumen of cattle, immediately after slaughtering in water on capped plastic container at the rate of 1kg of digesta /litre of water. The mixture was centrifuged vigorously using a metal rod for 5 minutes, residue filtered and the filtrate incubated for 72 hours under room temperature (24^0C). The incubated filtrate was used to ferment the peeled earth ball for 48hours. The fermented sample was drained and sundried prior to proximate analysis and feed formulation. Five broiler starter diets were formulated with Diet I designated as control, while diets 2, 3, 4 and 5 had maize in the control diet replaced with *I. manni* meal. A total of one hundred and fifty (150), day-old broiler chicks were divided into five (5) groups of 30 chicks per group, with each group assigned to one of the experimental diets in a completely randomized design (CRD). The proximate composition showed that *I. manni* meal was inferior to maize in its crude protein content but better than maize and cassava meal in ash and ether extract composition. The weights of birds decreased significantly with the increasing levels of the *I. manni* in the diets. Birds fed control diet recorded the highest average daily feed intake. The cost per kg of feed reduced with increase in dietary level of the rumen filtrate fermented *I. manni* meal. Birds fed control diet had the highest cost of feed consumed; while birds on 60% processed *I. manni* meal had the least cost/kg. It was concluded that rumen filtrate fermented *I. manni* can replace up to 30% of maize in broiler starter's diet.
Keywords: Rumen filtrate, fermentation anti nutrients, earth ball.

INTRODUCTION
One of the major constraints to increasing animal production in developing countries is unavailability and lack of all year round conventional feed resources (Tobias-Marino *et al.*, 2010). To meet the high demand for livestock products and fulfill the future hope of feeding the ever growing population and enhanced food security, improvement in the utilization of non-conventional feed resources is imperative. There is need to identify and introduce new and lesser known food and feed resources into feed industry.

One of such alternative feed resources of energy origin is *I. manni*. *I. manni* is a shrub with a modified tuber which is mainly carbohydrate and not directly consumed by man (Isika *et al.*, 2006).

It is one out of the known species of Icacinia plant, all season evergreen shrubs with well-defined root, stem and leaves. Mature tubers can weigh up to 20kg and their shape and colour vary depending on the soil type and stage of maturity (Asuquo, 2012). It is most abundant in the humid tropics of Akwa Ibom State of Nigeria (Akobundu and Agyakwa, 1998).

One serious factor limiting the use of *I. manni* tuber as energy feed stuff is the present of anti-nutritional factors such as hydrogen cyanide, phytic acid, and high fibre components (Isika *et al.*, 2005). Plain water fermentation (Umoren *et al.*, 2008) and toasting (Effiong *et al.*, 2014) have been employed in reducing these effects on the earth ball meal with limitedsuccess. It is therefore imperative to employ alternative methods in the treatment of the *I. manni* to improve its value and acceptability by animals.

This study was therefore designed to evaluate the performance of broilers chicks fed diets containing graded levels of rumen filtrate fermented *I. manni* meal.

MATERIALS AND METHODS

Experimental site

The proximate composition of the processed *I manni* meal was carried out in the Eastern Premier Feed Mill Laboratory, Calabar, while the feeding trial was conducted at the Teaching and Research Farm of the Department of Animal Science, University of Calabar, Calabar.

Sources and preparation of experimental materials. The earth ball tubers were uprooted from the fallow land at Akpabuyo Local government area, Cross River State. The rumen digesta was collected, immediately the cattle was slaughtered from the Akim abattoir in Calabar and conveyed to the laboratory in an air tight polyethene bag. The rumen filtrate was prepared by rapidly submerging the rumen digesta into water in a capped plastic container at the rate of 1kg of digesta /litre of water. The mixture was vigorously centrifuged using a metal rod to dislodge the microbes. The residue was filtered out and the filtrate incubated for 72 hours under room temperature (24^0C).The harvested earth ball tubers were peeled, washed to remove dirt and contaminants, divided into four portions, sliced into smaller sizes and packed into the drum containing the rumen filtrate and allowed to ferment at room temperature (24^0C) for 48 hours. The plastic drums were covered to minimize air penetration. At the end of the fermentation, the samples were drained and sundried, milled using harmer mill with 2mm mesh and stored prior to proximate analysis and feed formulation.

Proximate analysis of the test samples

Proximate analysis of the test sample was carried out according to the methods described by AOAC (2013). The total ash, crude protein, crude fibre, either extracts and nitrogen free extract were determined. The metabolizable energy of the test sample was calculated using Zoo Technical International World Poultry Science Association formula {ME Kcal/kg = (37x% Cp + 81.8 x % EE + 35.5 x NFE)}.

Diets formulation

Five broiler starter diets (Table 1) were formulated to supply 23% crude protein and 2,900kcal/Kg of metabolizable energy. Diet I was control contained while diets 2, 3, 4 and 5 had maize in the control diet replaced with *I. manni* meal at 15, 30, 45 and 60%, respectively.

Experimental animals and design

A total of one hundred and fifty (150), day- old broiler chicks from FIDAN hatchery limited were weighed and divided into five (5) groups of 30 chicks per group on weight equalization basis. Each group was assigned to one of the experimental diets described earlier in a completely randomized design (CRD). The experiment was replicated three times with ten (10) birds per replicate; with eat diet fed as mash throughout the experimental period. The experiment lasted for 28 days, during which the average daily feed intake and daily weight gain were measured. The feed conversion ratio was computed, using the average daily feed intake. Data collected were subjected to analysis of variance procedures (Steel and Torrie, 1980) and significant means separated using Duncan multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Proximate composition of rumen filtrate fermented *Icacinia manni*

The results for the proximate composition of rumen filtrate fermented *Icacinia manni* meal, cassava and maize arepresented in Table 2. The processed *Icacinia manni* meal was inferior to maize in its crude protein content but significantly ($P<0.05$) better than maize and cassava meal in ash and ether extract composition. The crude fibre value of 7.50%observedin *I. manni* meal was significantly ($P<0.05$) higher than 3.05% and 2.20% found in cassava and maize, respectively. The nitrogen free extract content of *I. manni* meal (78.16%) compared favourably to 84.08% for cassava meal and (83.00%) for maize.

Performance of broiler chicks fed graded levels of *I. manni* meal at starter phase

The result of the performance of broiler chicks fed diets with rumen filtrate fermented *I. manni* meal are presented in Table 3. The total weight gain and the average daily weight gain of the chicks were significantly ($P<0.05$) influenced by the treatment. The weights of birds decreased with the increasing levels of the *I. manni* in the diets, as weights of birds on *I. manni* meal diets were inferior to birds on control diet. Birds fed control diet recorded the highest average daily feed intake, while those fed 60% rumen filtrate fermented *I. manni* diet had the lowest feed intake of 18.48g. Variation in the average daily feed intake was significant ($P< 0.05$) among the

treatment groups. The average daily feed intake followed the same trend as the total weight gain and the average daily weight gain, in that they decreased with increasing levels of *I. manni* in the diet. Feed conversion ratio for birds fed rumen filtrate fermented *I. manni* compared (P>0.05) favourably with those on control diet. Reduced weight gain noted among broiler chicks fed the experimental diets maybe attributed to the presence of the non-starch polysaccharides, which have been considered to interfere with the digestion of other feed stuffs that furnish nutrients, such as protein and fat, or could inhibit absorptive capacity of animals (Choct *et al.,* 1995). Umoren *et al.* (2007) also suggested that the loss in weight of birds may be attributed to the poor palatability, lightness and dustiness of the feed. Madubuike (2006) reported that wild tubers are unpalatable.

Economics of dietary inclusion of processed *I. manni* meal in broiler chicks' diets

Result of the economics of dietary inclusion of processed *I. manni* meal in broiler chicks' diets (Table 3) showed thatthe cost per kg of feed reduced with increase in dietary level of the rumen filtrate fermented *I. manni* meal. The cost of feed consumed was highest for birds on diet containing maize as sole energy source and reduced progressively with the increase in the level of processed *I. manni* meal in the diets. Birds on diet containing 60% processed *I. manni* meal had the least cost of feed consumed. Birds on 60% processed *I. manni* meal had the least cost/kg weight gain, where as it was most expensive producing a kg meat on diet with maize as sole main energy source.

CONCLUSION

From the economic point of view, it was concluded that rumen filtrate fermented *I. manni* can replace up to 60% of maize in broiler starter's diet. It was therefore recommended that rumen filtrate fermented *I. manni* should be supplemented with exogenous enzyme to further reduce the burden of crude fibre in the meal. Feed sweeteners could be included in the diet to improve feeds palatability.

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Table 1: Composition of experimental diets starter phase

	Percentage Levels of *I.manni* meal				
Ingredients	**0**	**15**	**30**	**45**	**60**
maize	52	44.2	36.4	28.6	20.8
I.manni meal	-	7.8	15.6	23.4	31.2
Soybean meal	34.7	34.7	35.7	35.7	35.7
Fish meal	2.0	2.0	2.0	2.0	2.0
Wheat offal	5.0	5.0	4.0	4.0	4.0
Palm kernel cake	3.0	3.0	3.0	3.0	3.0
Salt	0.3	0.3	0.3	0.3	0.3
Bone meal	2.5	2.5	2.5	2.5	2.5
Lysine	0.1	0.1	0.1	0.1	0.1
Methionine	0.1	0.1	0.1	0.1	0.1
*Vitamin/min. premix	0.3	0.3	0.3	0.3	0.3
Total	**100**	**100**	**100**	**100**	**100**
Determined analysis					
% crude protein	23.00	23.00	23.00	23.00	23.00
ME(kcal/kg)	2,850	2,850	2,850	2,850	2,850
Crude fibre	3.81	4.24	4.70	5.12	5.56

Table 2: Proximate composition of *I. manni* meal, cassava and maize (% DM)

Components	**Fermented *I. manni* meal**	**Cassava**	**Maize**
Crude protein	4.37[b]	2.60[c]	8.60[a]
Ash	5.00[a]	0.79[c]	1.70[b]
Ether extract	5.00[a]	1.79[c]	3.70[b]
Crude fibre	7.50[a]	3.05[b]	2.20[b]
Nitrogen free extract	78.16	84.08	83.00

Means are values of triplicate determination
Means with different superscript on the same row are significantly (P<0.05) different

Table 3: Growth performance of broilers chicks fed processed *I. manni meal* diets.

	Percentage Levels of *I. manni*					
Parameter	**0**	**15**	**30**	**45**	**60**	**SEM**
Initial weight/bird(g)	42.20	42.20	42.20	42.20	42.20	± 0.00
Final body weight (g/bird)	1127.00[a]	809.90[b]	734.92[b]	533.30[b]	482.10[c]	±114.86
Total weight gain (g/bird)	1084.00[a]	767.70[b]	692.72[b]	491.10[c]	439.90[c]	±114.73
Av. Daily weight gain (g/bird)	38.71[a]	27.41[b]	24.74[b]	17.54[c]	15.71[c]	±4.01
Av.daily feed intake (g)	45.30[a]	32.48[b]	30.38[b]	19.92[c]	18.48[c]	± 4.86
Feed conversion ratio	1.17	1.18	1.22	1.14	1.18	±0.01
Economics of production						
Cost/kg of feed (N)	116.45	111.7	108.79	104.11	99.48	±2.94
Cost of feed consumed (N)	147.69[a]	101.66[b]	92.54[b]	58.08[c]	51.46[c]	±17.25
Cost of weight gain (N)	126.32[a]	85.81[b]	69.28[b]	51.13[bc]	43.76[c]	±14.69

Means with different superscript on the same row are significantly (P<0.05) different
SEM: standard error of mean