TRUE METABOLISABLE ENERGY AND TRUE DIGESTIBLE PROTEIN VALUES OF BAKER'S YEAST FERMENTED CASSAVA PEEL MEAL USING BROILERS

Obasi, I. U., [1]Obasi, E. N., Ezeokeke, C. T. and Etuk, E. B.
Department of Animal Science and Technology
Federal University of Technology, Owerri
[1]Department of Animal Breeding and Physiology
Michael Okpara University of Agriculture, Umudike.

ABSTRACT
This study determined true metabolisable energy (TME), true metabolisable energy corrected for nitrogen (TMEn) and true digestible protein (TDP) of fermented cassava peel meal using broilers. Thirty two (32) six-week old Marshall broiler chickens were each divided into four groups of 8 birds which was assigned to samples of cassava peel meal (CPM) which was treated with 0.6% baker's yeast and fermented for 72hours ($T_{0.60\%/72hours}$) which resulted in 14.48% crude protein and that treated with 0.2% baker's yeast, fermented for 72hours ($T_{0.20\%/72hours}$) which yielded 3526.69kcal/kg gross energy as well as CPM treated with 0.0% baker's yeast and fermented for 0hours ($T_{0.00\%/0hours}$) which served as the control in a completely randomized design (CRD). Results from the study indicted a TME ranging from 2864.47 to 3155.91Kcal/kg for broilers with treatment $T_{(0.0\%/0hrs)}$ and $T_{(0.20\%/72hrs)}$ recording significantly ($p<0.05$) lower and higher TME, TMEn value for broilers in this study and ranged from 2637.89Kcal/kg for the control ($T_{0.0\%/0hour}$) to 2920.07Kcal/kg while TDP values ranged from 62.77mg/g in treatment $T_{0.00\%/0hour}$ to 140.91mg/g in $T_{0.60\%/72hours}$. The group with the highest crude protein value recorded the highest TDP value which also, indicated significantly ($P<0.05$) higher percentage digestibility of protein than the control (8.78% vs 9.73%).

INTRODUCTION
In monogastric animals feeding, high fiber feed considered inadequate or waste in some instances, non-starch polysaccharides (NSP) can exert anti-nutritive activity on the animal. Cassava peel is very rich in carbohydrate but has high fibre content that makes it indigestible to monogastrics when included in their feed. Yeast have been shown to have cellulase enzyme which can degrade the fibre in cassava peel thereby making available more energy to form hydrolysis of the fibrous materials (Sani *et.al.*,1992; Raji *et.al.*,1998; Belewu and Banjo, 1999).This could ultimately promotes weight gain and overall improved performance (Atteh, 2000; Abdulrashid *et.al.,* 2007).

Measurements of digestibility are therefore essential in order to define the efficiency of utilization of nutrients within feed and feedstuff and to classify the nutritional quality of feed items and formulate diets for captive birds (Nguyen, 2005). The processes involved in digestion include; maceration, grinding of the feed in the gizzard and the action of the digestive enzymes in the alimentary canal (Sturkie, 1976). Added to this is the digestion within the alimentary canal caused by endogenous enzymes of the feed (McNab, 1976). Digestibility may be expressed in terms of apparent or true digestibility. Apparent digestibility is a relationship between the amount of nutrient consumed in the diets and the amount that appears from gastrointestinal tract: It is expressed mathematically as (Nutrient intake – nutrient in faeces/nutrient intake). Apparent digestibility indicate nutrient absorbed but then excreted back into the digestive tract, as well as by endogenous nutrient losses, such as those from the shedding of the intestinal epithelia and mucosa secretions (Bath *et al.,* 2001). True digestibility corrects for those components of the excreted nutrients that were not originally in the feed. It corrects the portion of nutrient in the feaces that is of endogenous origin. Thus the value obtain for true digestibility are always greater than those for apparent digestibility (Nguyem, 2005). The separation of endogenous losses arising from the digestive tract from the metabolic losses excreted in urine is difficult in birds, due to the simultaneous voiding of faeces and urine. In practical conditions, measurement that include endogenous losses for poultry are lacking (Bath *et al.,* 2001), therefore apparent digestibility of nutrients and amino acid has been applied commonly for monogastric animals especially chicken and duck. The objective of this study therefore, was to determine the true metabolisable energy and true digestible protein of cassava peel meal fermented with baker's yeast by broilers.

MATERIALS AND METHODS

The experiment was carried out at the Poultry Unit, School of Agriculture and Agricultural Technology (SAAT) Teaching and Research Farm, Federal University of Technology Owerri, Imo State. Samples of cassava peel meal (CPM) used for this study were treated as CPM treated with 0.6% baker's yeast, fermented for 72hours ($T_{0.60\%/72hours}$), 0.2% baker's yeast, fermented for 72hours ($T_{0.20\%/72hours}$); CPM treated with 0.0% baker's yeast and fermented for 0hours ($T_{0.00\%/0hours}$) which served as the control. Other materials used were metabolic cage improvised from battery cage units for laying birds fitted with individual cage feeder, drinker and tray placed under each cage (above the ground) for the collection of droppings. A funnel fused glass tube was also used for force-feeding the birds.

Thirty two (32), six-week old healthy Marshall broiler chickens (1.0 – 1.2kg live weight) were divided into four groups of 8 birds (4 males and 4 females). Each group was replicated four times and each replicate comprised one male and one female broiler. Each replicate was placed in one cage with an empty cage separating each from another to prevent mix up of droppings. The three CPM treatment samples were then randomly assigned to the groups in a completely randomized design (CRD). The fourth group was used as fasted birds. The true metabolisable energy (TME) of the droppings was determined based on the method outlined by Sibbald (1976), True metabolisable energy corrected for nitrogen balance (TMEn) was calculated by the method of Parson *et al* (1982) while True digestible protein (TDP) was calculated using the equation of Sibbald (1976). Data obtained were subjected to Analysis of Variance (ANOVA) according to Steel and Torie (1980). Means of significant effect were separated by Least Significant Difference (LSD) according to Obi (1990) using the R-Core Team (2012) application.

RESULTS AND DISCUSSION

The crude protein and gross energy values of the treated CPM are listed on table 1and 2. There was an inverse relationship between crude protein and gross energy for the CPM treated with baker's yeast.

True metabolisable energy (TME): The TME value of the fermented cassava peel meal in the control (T0.005/0hrs), highest energy sample (T0.20%/72hrs) and highest crude protein sample (T0.60%/72hrs) ranged from 2864.47 to 3155.91Kcal/kg for broilers with treatment T(0.0%/0hrs) and T(0.20%/72hrs) recording significantly ($p<0.05$) lower and higher TME, respectively compared to other group (Table 1). The TME value corresponded with the gross energy value for the groups. The TME value for the control T (0.0%/0.0hrs) was lower than the TME value (3481kcal/kg) reported by Akanno (1998) for untreated cassava peels. Ukachukwu (2005) however, reported a much lower range (1.80 to 2.74 Kcal/g) for composite cassava products using adult broilers. This disparity might be attributed to differences in the composition of the cassava products and the variety of the cassava peels (Ukachukwu, 2005).

True metabolisable energy corrected for nitrogen (TMEn): TMEn value for broilers in this study were expectedly lower than the TME and ranged from 2637.89Kcal/kg for the control (T0.0%/0hour) to 2920.07Kcal/kg for broilers on T0.20/72hours, (Table 1). Treatment T0.20/72hours and T0.60%/72hours recorded significantly ($p<0.05$) higher TMEn value than the control (T0.00%/0hrs) and corresponded with their higher gross energy value. Akanno (1998) reported a TMEn value for cassava peels using broilers that was within the range of the values obtained in this study. Ogbonna *et al.*, (1998) also reported values similar to those obtained in this study for unfermented cassava peels.

True digestible protein (TDP): The TDP values obtained in this study ranged from 62.77mg/g in treatment T0.00%/0hour to 140.91mg/g in T0.60%/72hours. These TDP values corresponded with the crude protein values for the groups, (Table 2). Expectedly the group offered CPM with the highest (1448mg/g) crude protein value recorded the highest TDP (140.91mg/g) TDP value which also, indicated significantly ($P<0.05$) higher percentage digestibility of protein than the control (8.78% vs 9.73%). This TDP value nevertheless, was lower than the 160.40mg/g reported by Akanno (1998) for fermented cassava peels meal using broilers. The baker's yeast and fermentation process did not appear to have significantly improved the TDP as suggested by Oyedeji *et al.* (2008) though marginal increase were observed.

Table 1: Metabolisable energy of cassava peel meal fermented with baker's yeast using broilers

Parameters	Control	Highest Gross Energy	Highest Crude Protein	SEM
	$T_{0.00\%/0hours}$	$T_{0.20\%/72hours}$	$T_{0.60\%/72hours}$	
Gross Energy	3208.44	3526.69	3464.52	
True metabolisable energy (Kcal/kg)	2864.47[c]	3155.91[a]	3119.26[b]	50.14
TME Yield (%)	**89.28**	**89.49**	**90.03**	**0.69**
True Metabolisable Energy corrected for nitrogen (Kcal/kg)	2637.98[b]	2920.07[a]	2831.11[a]	44.86
TMEn Yield (%)	**82.22**	**82.80**	**81.72**	**0.80**

[abc] Means within a row with difference superscript are significantly different ($P<0.05$)
TME = True metabolisable energy
TMEn = True metabolisable energy corrected for nitrogen

Table 2: True digestible protein (TDP) of cassava peel meal fermented with baker's yeast using broilers

Parameters	Control	Highest Gross Energy	Highest Crude Protein	SEM
	$T_{0.00\%/0hours}$	$T_{0.20\%/72hours}$	$T_{0.60\%/72hours}$	
Crude protein (CP) (mg/g)	716.00	917.00	1448.00	
True digestible protein (mg/g)	62.77[c]	90.75[b]	140.91[a]	11.44
TDP Yield (%)	**8.76[a]**	**9.02[b]**	**9.73[b]**	**0.30**

[abc] Means within a row with difference superscript are significantly different ($P<0.05$)
TDP = True digestible protein

REFERENCES

Akanno, E. C. (1998). True metabolisable energy and true digestible protein of selected non-conventional feeding stuffs using Poultry B. Agric Project, Federal University of Agriculture Umudike pp. 34.

Abdulrashid, M., Agwuobi, L. N., Jokthan, G. E. and Abdul, S. B. (2007). Carcass quality characteristics of broiler finisher fed taro (*Colocasia esculanta*) cocoyam meal In : Book of abstract of the 32nd annual conference, NSAP, held at the university of Calabar, Calabar, Nigeria. 32: 457 – 460.

Atteh, J. O. (2000). Use of enzyme to improve the nutritive value of wheat bran in poultry diets.

Bath, D., Dunbar, J., King J., Berry, S. and Olbrichs, S. (2001). By-products and unusual feedstuffs. In: Feedstuff 73: 30 - 37

Belewu G I .and Banjo NO (1999). Biodegradation of rice husk and sorghum stover by edible mushroom (*Pleurotussajo caju*). *Tropical Journal of Animal science*. 2: 137 -142.

Nguyem, T. K. (2005). Evaluation of agro Industrial by-products as protein sources for duck production in the Mekong Delta of Vietnam. Ph.D Thesis, Swedish University of Agricultural Science, Uppsala pp. 27 – 144.

Obi, I. U. (1990). Statistical methods of detecting differences between treatment means. Snap Press, Enugu, Nigeria

Ogbonna, J. U. (1998). Effects of sun-dried cassava peel meal as replacement for maize and wheat offal on the performance and nutrient utilization of cockerels. *Nigerian Journal of Animal Production*, 20: 61 – 70.

Oyedeji, J. O., Ajayi, H. and Egere, T. (2008). The effect of increasing levels of yeast culture (Levucel SB) in a higher fibre diet on the performance and nutrient retention of broiler chicks *Asian Journal of Poultry Science*, 2: 53 – 57.

Parsons, C. M., Portar, L. M. and Blus, B. A. (1982). Measurement of True metabolizable energy corrected to nitrogen equilibrium. *Poultry Science.* 61: 2241 – 2250.

R-Core Team (2012). R: A language and environment for statistical computing. R. Foundation for statistical computing Vienna Austria. ISBN 3-900051 – 07 – 0. URL-http://www.R.project.org.

Raji, A. I. and Okeniyi, S. O. (1998) Optimization of cellulase enzyme production from *Aspergillus fumigatus*- CSS36. *Spectrum Journal*, 5: 164-168.

Sani A., Awe, F. A. and Akinyanju, J. A. (1992). Amylase synthesis in *Aspergillus niger* and *Aspergillus flavus* grown on cassava peel. *Journal Industrial Microbiololgy*. 10: 55-59.

Sibbald, I. R. (1976). Bioassay for true metabolizable energy in feeding stuffs. *Poultry Science*, 55: 303 – 308.

Steel, R. G. and Torrie, J. H. (1980). Principles and procedure of statistical analysis. Biometric approach edition, McGraw Hill Book Co.

Sturkie, P. D. (1976). Secretion of gastric and pancreatic juice, pH of tract, digestion in alimentary canal, liver, bile and absorption. Sturkie edition Avian Physiology 3rd edition, springer Verlag, New York. Pp 196-209

Ukachukwu S. N. (2005). Studies on the nutritive value of composite cassava pellet for poultry: chemical composition in metabolisable energy. *Livestock Research for Rural Development* 17 (11): 2005.