NSAP 47th Annual Conference (JOS 2022) CONFERENCE PROCEEDINGS
THEME: SECURING ANIMAL AGRICULTURE AMIDST GLOBAL CHALLENGES

ADDITION OF MOLASSES ENHANCED NUTRITIVE VALUE OF CASSAVA PEEL MEAL

[*1]Rebecca Richard, [*2]Makinde O. John, [3]Jafiya Lami, [2]Maidala, Aminu,[2]Sudik, S. David

[2]Department of Biological Science, Federal University, Gashua, Nigeria
[2]Department of Animal Science, Federal University, Gashua, Nigeria
[3]Department of Chemistry, Federal University, Gashua, Nigeria.
***Corresponding author:** kosigirijr@yahoo.com*

Abstract
This study examined the nutritive value of cassava peels treated with molasses at different hours. Dried cassava peels were collected at the cassava market in Minna, Nigeria. Four samples were taken to the laboratory for chemical analysis. The experiment was set up as completely randomized design (CRD) in three replications. The control (sample 1) contained 0% molasses while sample 2, 3 and 4 were all treated with 5 litre of molasses dissolved in 20 litre of water solution but differing in the fermentation hours. Samples 2, 3 and 4 were fermented for 12, 24 and 48 hr respectively. Samples from the four treatments were air dried and milled for proximate (crude protein, crude fibre, ash, ether extract) and mineral (K, Ca, Mg, P, Zn, Na) analyses. Fermentation of cassava peel meal (CPM) with molasses at different hours improved ($P<0.05$) the crude protein and metabolizable energy contents but decreased ($P<0.05$) the crude fibre content of the CPM. Also, all the mineral parameters analyzed were significantly increased ($P<0.05$) while hydrocyanide (HCN) content of the CPM was significantly reduced ($P<0.05$). Feeding trials are needed for better gauging the performance response of livestock to diets containing molasses treated cassava peels.

Keywords: Cassava peels, Molasses, Fermentation, Minerals, Nutrients

Introduction
In most Africa and pacific countries, it has been estimated that the average animal protein intake is as low as 10 g, which is very much lower than 35 g recommended by (FAO, 1986). This necessitates the search for alternative feed resources, such as cassava peels that are not consumed by man which when incorporated into animal feeds could lead to reduced cost of finished feeds. For instance, in Nigeria about 40-44 metric tons of cassava tubers are being produced annually (CBN, 2003).The peel constitutes about 10-20 % of the cassava tuber and this translates to 4-4.4 metric tons of cassava peels that are often left to rot away unharnessed (Aro *et al.*, 2010). Thus, improving on the nutritive contents of this waste may be of tremendous benefit to livestock feed industry.
Cassava peel has crude protein, crude fibre, ether extract and ash ranges of 3.7 to 5.9 g, 10.3 to 31.8 g, 0.0 to 3.3 g and 3.4 to 8.0 g/100 g respectively (INRA *et al.*, 2012). However, the utilization of cassava peel is limited by the presence of hydrocyanic acid (HCN) and high fibre, which may cause chronic toxicity in human and livestock particularly when inappropriately processed (Oluremi and Nwosu, 2002; Aro *et al.*, 2010). Fermentation technique has been reported to be of

tremendous importance in enhancing the nutrient potentials of cassava products such as protein (Nwafor and Ejulonemu, 2004), and detoxification of anti-nutrients (Oboh and Akindahunsi, 2003). Increasing demands for energy by productive animals increased the importance of molasses as an energy supplement with a concentrated source of fermentable sugars and low protein content (Broderick and Radloff, 2004). Molasses is extensively used in livestock feeding to improve palatability and to reduce dustiness (Hill *et al.*, 2008). However, there appears to be limited information on fermenting cassava peels with molasses in order to increase the energy content. This study therefore investigated the nutrient composition of cassava peel meal treated with molasses at different hours.

Materials and Methods

The study was conducted at the Research laboratory, Centre for Biotechnological Research, Federal University of Technology, Minna, Bosso campus, which has been previously described by Makinde *et al.* (2019). About 10 kg dried cassava peels were collected from farmers at cassava market in Minna, Nigeria. Thereafter, 5 litre of molasses was dissolved in 20 litre of water solution and added to 5 kg of dried cassava peels and mixed thoroughly according to the procedures of Musa et al. (2020). This was done to improve the nutritive value of cassava peels. The experiment was set up as completely randomized design (CRD) in three replications. Samples were then divided into 3 batches and packed in thick jute bags and closed tightly for anaerobic fermentation. Batches 2, 3 and 4 were fermented for 12, 24 and 48 hr respectively. Thereafter, the jute bag was removed and the fermented peels were air dried for three days at 25^{O}C. The peels were later milled using hammer mill with a sieve size of 3mm and samples were taken to the Centre for Biotechnological Research, FUT, Minna laboratory for chemical analysis according to the AOAC (2006) procedures. The control (Sample 1) contained 0% molasses and was not fermented. The metabolizable energy was estimated by the method outlined by Panzenga (1985):
Metabolizable Energy ME (Kcal/kg) = 37 x % CP + 81.8 x % EE + 35.5 x %NFE.

Statistical Analysis

Data collected were subjected to Analysis of Variance (ANOVA) using the statistical analysis software, version 9.3 (SAS, 2015). Significance was accepted at $P < 0.05$.

Results

Table 1 shows the nutrient compositions of cassava peel meal treated with molasses (CPMM). There were significant differences (P<0.05) in all the parameters analyzed except for dry matter, ether extract, ash and nitrogen free extract contents of the CPMM. Fermentation of CPM with molasses at different hours improved (P<0.05) the crude protein and metabolizable energy contents but decreased (P<0.05) the crude fibre content of the CPMM. Also, there were significant increase (P<0.05) in all the mineral contents analyzed while HCN content of the CPMM was significantly reduced (P<0.05).

Table 1: Nutrient composition of cassava peel meal treated with Molasses

	Fermentation period (hours)					
Parameters (%)	**Control**	**12**	**24**	**48**	**SEM**	**P-value**
Dry matter	93.44	93.18	93.31	93.27	0.13	0.4505
Crude protein	5.00^{c}	5.87^{a}	5.90^{a}	5.61^{b}	0.07	<.0001

Crude fibre	21.38[a]	18.67[b]	18.74[b]	18.19[b]	0.45	0.0094
Ether extract	1.85	1.83	1.83	1.84	0.04	0.9783
Ash	5.76	5.81	5.79	5.88	0.36	0.9783
Nitrogen free extract	59.45	60.97	61.05	61.73	0.98	0.0997
Metabolizable energy (Kcal/kg)	2416.92[b]	2501.35[a]	2504.59[a]	2519.96[a]	16.98	0.0208
Minerals (mg/100g)						
K	89.45[d]	95.33[c]	108.15[a]	105.57[b]	0.09	<.0001
Ca	12.35[d]	13.81[c]	13.93[b]	14.36[a]	0.03	<.0001
P	0.37[d]	0.41[c]	0.52[b]	0.56[a]	0.02	<.0001
Mg	11.74[d]	12.29[c]	12.96[b]	13.84[a]	0.13	<.0001
Na	8.46[d]	9.07[c]	9.93[b]	9.98[a]	0.02	<.0001
Zn	4.96[d]	5.32[c]	5.88[b]	6.04[a]	0.02	<.0001
Phytochemical (mg/100g)						
*HCN (mg/100g)	3.43[a]	2.57[b]	2.27[b]	2.50[b]	0.19	0.0009

*HCN= hydrocyanide. SEM=Standard error of mean.

Discussion

Fermentation technique has been reported to be of tremendous importance in enhancing the nutrient potentials of cassava products (Nwafor and Ejulonemu, 2004). In this study, the improvement observed in the nutritional content of cassava peel meal as a result of molasses addition at different hours may be attributed to the synergistic effect of beneficial fermentation microbes (Ari *et al.*, 2012) and the nutrients embedded in molasses itself. For instance, Senthilkumar *et al.* (2016) reported that molasses contained 74% dry matter, 6.5% crude protein, 65% sugar and Metabolizable energy (MJ/Kg DM) of 12.5. Also, our results concur with the reports of several authors, who have evaluated the effects of adding molasses at different percentages of inclusion (0 control, 5% and 10%) during forage fermentation (Singh *et al.*, 1985; Loest *et al.*, 2001). The authors reported that the nutritive values of forage fermented with molasses were improved. Additionally, health, welfare status and the quality of livestock products (milk in particular) of the animals fed forage fermented with molasses were enhanced.

Conclusions and Recommendation

This study has shown that fermentation of cassava peels with molasses at different hours enhanced its nutritive value. However, feeding trials are needed for better gauging the performance response of livestock to diets containing molasses treated cassava peels.

Acknowledgment

This research is part of the Project financially supported by The Tertiary Education Trust Fund (TetFund) through the Federal University, Gashua, Nigeria.

References

AOAC. (2006). Official Method of Analysis of the Association of Official Analytical Chemists (W.Horwitz Editor) 18th Edition. Washinghton D.C.

Ari, M.M., Ayanwale, B.A., Adama, T.Z. and Olatunji, E.A. (2012). Effects of Different fermentation methods on the proximate composition, Amino Acid profile and some anti-

nutritional factors in Soyabeans (*Glycine Max*) Fermentation Technology and Bioengineering. 2:6-13.

Aro, S.O., Aletor, V.A., Tewe, O.O. and Agbede, J.O. (2010). Nutritional potentials of cassava tuber wastes: A case study of a cassava starch processing factory in south-western Nigeria. *Livestock Research and Rural Development.* 22(11).

Broderick, G.A and Radloff, W.J. (2004). Effect of molasses supplementation on the production of lactating dairy cows fed diets based on alfalfa and corn silage. *Journal of Dairy Science*. 87:2997–3009.

CBN (2003). Annual Report and Statement of Accounts for the Year Ended 31st December, 2003, Central Bank of Nigeria.

FAO. (1986). Africa agriculture in the next 25 years. Food and Agriculture Organization. Rome. Italy.

Hill T.M., Bateman, H.G., Aldrich, J.M and Schlotterbeck, R.L. (2008). Effects of feeding different carbohydrate sources and amounts to young calves. *Journal of Dairy Science*. 91(8):3128–37.

INRA, CIRAD, AFZ and FAO. (2012). Cassava peels, fresh. Feedipedia – Animal Feed Resources Information System. www.feedipedia.org/node/11944 (14/04/2015).

Loest, C.A., Titgemeyer, E.C., Drouillard, J.S., Lambert, B.D. and Trater, A.M. (2001). Urea and biuret as non-nitrogen sources in cooked molasses blocks for steers fed praire hay. *Animal Feed Science and Technology*, 94, 115–126.

Musa, A.R., de Evan T., Alao J.S., Iglesias E., Escribano F. and Carro M.D. (2020). Effects of different additives on the quality of typha grass (*Typha latifolia)* silages. Proceedings of 25th Annual Conference of ASAN 2020, Abuja, Nigeria, 589-592.

Makinde, O.J., Aremu, A., Alabi, O.J., Jiya, E.Z. and Ajide, S.O. (2019). Effects of Different Processing Methods on Nutrient and Anti-Nutrient Compositions of African Star Apple (*Chrysophyllum albidum*) Kernels. *African Journal of Food, Agriculture, Nutrition and Development,* 19(4):14848-14862.

Nwafor, O. and Ejulonemu, F.E. (2004). Bio-conversion of cassava wastes for protein enrichment using amylolytic fungi: a preliminary report. *Global Journal of Pure and Applied Science,* 10: 505-507.

Oboh, G. and Akindahunsi, A.A. (2003). Chemical changes in cassava peels fermented with mixed culture of *Aspergillus niger* and two species of *Lactobacillus* integrated bio-system. *Applied Tropical Agriculture,* 8: 63-68.

Oluremi, O.I.A. and Nwosu, A. (2002). The effect of soaked cassava peels on weaning rabbits. *Journal of Food Technology in Africa,* 7: 12-15.

Panzenga, U. (1985). Feeding parent-stock. Zootechical International, Dec., 1985

SAS (2015). Statistical Analysis System Institute. User's guide. Version 9.3, SAS Institute Inc. Cary, N. C.

Senthilkumar, S., Suganya, T., Deepa, K., Muralidharan, J. and Sasikala, K. (2016). Supplementation of Molasses in livestock feed. *International Journal of Science, Environment and Technology,* 5(3): 1243 – 1250.

Singh, R., Kamra, D.N. and Jakhmola, R.C (1985). Ensiling of leguminous green forages in combination with different dry roughages and molasses. *Animal Feed Science and Technology*, 12, 133–139.