Global Scientific JOURNALS

GSJ: Volume 10, Issue 4, April 2022, Online: ISSN 2320-9186

www.globalscientificjournal.com

Evaluation of ensiling period on the proximate compositions of ensiled blends of wet cassava peels meal and palm kernel meal

Emenike H.I.[1*] , Emenalom O.O.[2], Ogbuewu I.P[2], Aladi N.O[2] and Okehie N.U.[2]

[1] Advanced unmanned Aerial Vehicle laboratory Uburu. Ebony State . Nigeria
[2] Federal university of Technology Owerri Imo State. P.M. B 1526 Owerri. Nigeria

***Corresponding author : emenike4sure2008@yahoo.com**

Abstract

In many developing countries like Nigeria, complementary foods are usually made from plant sources with high anti-nutrient contents using less modification techniques to increase its nutrient density. The purpose of this study was to evaluate the effects of ensiling a blend of wet cassava peels meal and palm kernel meal on the proximate compositions of the composite meal. Wet cassava peels were ground into meal using an attrition mill and mixed with palm kernel meal in a ratio of 7:3. The cassava peel-based composite meal was then divided into 4 batches. The first batch was immediately sundried while the second, third and fourth batches were ensiled in black

polythene bags, under room temperature for 7, 14 and 21 days, respectively and sundried for 3-4 hours. Samples of the meals were analyzed for their proximate compositions. The 14 days ensiled composite meal had significantly ($p<0.05$) lower moisture (6.49%) and higher dry matter (93.51%) and crude protein values than the non-ensiled meal. Ensiling significantly ($p<0.05$) increased the fat content at 7 days but decreased the values at 14 and 21days when compared with the non-ensiled meal. The crude fibre values were significantly ($p<0.05$) decreased in the 7 and 14 days ensiled meals while the ash content decreased with increasing ensiling period when compared with the non-ensiled meal. The calculated energy value increased in the 7days ensiled sample but decreased with increasing ensiling periods. It is concluded that nutritionally improved and energy rich composite meals can be prepared from a blend of wet cassava peels meal and palm kernel meal and that ensiling the blend for 14 days encouraged higher dry matter and crude protein values.

Keywords: Composite meal, Blending, Ensiling, Cassava peels, Palm kernel meal, Proximate composition.

Introduction

Cassava peel is a waste product produced from the peeling of fresh cassava roots before processing into various products in Nigeria. It constitutes about 5 - 15% of the whole root when peeled mechanically (Aro *et al*., 2010) and 20 – 35% with hand peeling (Olanbiwoninu and Odunfa, 2012). The meal contains about 3.5% crude protein but is high in carbohydrates, crude fibre, minerals and hydrogen cyanide (HCN) (Onyimonyi and Ugwu 2007; Olorunnisomo, Ewuola, and Lawal, 2012; Jolaosho *et al*., 2013). Tewe, (2004) reported that the use of cassava peels as feed for non-ruminant animals is limited by its high crude fibre and hydrocyanic acid contents which is deleterious to their growth and development.

Various processing methods of cassava peels including soaking in water and retting (Salami and Odunsi, 2003), sun-drying (Akinfala *et al*., 2007), parboiling (Salami, 1999), treatment with alkaline solution of lye (Oladunjoye *et al*., 2010), ensiling (Dairo, 2011), wet grating prior to retting and drying (ILRN, 2015) and enzyme supplementation (Midau *et al*., 2011) among others have been used to reduce its high fibre and hydrocyanic acid contents for monogastrics. Of all these processing methods, drying has been found to be more effective but it takes approximately 3 to 5 days for the peels to properly dry, hence it is more feasible and effective during the dry season of the year (Adesehinwa *et al*., 2011).

However, the innovative processing of cassava peels by grating, pressing, sieving and drying developed by International Livestock Research Institute (ILRI 2015) to produce High Quality Cassava Peel (HQCP) fine mash has reduced the drying time drastically from 3 to 5 days to about 6 hours, resulting in improvement of the product, in terms of quality and quantity. The method also substantially reduced the HCN content and dustiness in cassava peels based products but the low crude protein content, poor amino acid profile and high fibre content remained unchanged (Okike *et al*., 2015). Aladi *et al*., (2013) reported that solid-state fermentation (SSF) of a mixture of grated cassava roots and palm kernel cake increased its crude protein content while Emenalom *et al.* (2019) reported that ensiling a blend of dried cassava root meal and wet brewer's grains at a ratio of 1.0: 1.5 (wt/wt) for 0, 7 and 14days, respectively, enhanced its nutrient and gross energy values and performance of broiler chicks.

The present study was therefore designed to determine the effect of ensiling periods on the proximate compositions of ensiled blend of wet cassava peels meal and palm kernel meal.

Materials and methods

Sources and processing of test materials

Fresh cassava peels were collected from small-to-medium scale processing plants and networks of producers, processors and marketers (supplying fresh tubers and selling finished cassava products) in and around Umuagwu communities in Imo state, Nigeria. The fresh peels were ground into meal using an attrition grinding mill. The wet cassava peels meal was blended with palm kernel meal in a ratio of 7:3 to produce the cassava peels-based composite meal. The composite meal was then divided into 4 batches. The first batch was sundried immediately while the second, third and fourth batches were bagged inside 3 black polythene bags, pressed to eliminate traps of air, sealed and stored under room temperature for 7, 14 and 21 days, respectively. The ensiled cassava peels-based composite meals were then sun dried for 5-6 hours depending on the intensity of the sun.

Proximate Analysis

Proximate compositions like moisture content, crude protein, and crude fat, and total ash were analyzed using standard method of Association of Official Analytical Chemist (AOAC, 2010). The carbohydrate contents were determined by differences. Metabolizable energy's of composite meals were also calculated using the formula; 37×%CP +81.8 × %fat +35.5 × %NFE for poultry (Fisher and Boorman, 1986). All analyses were done in triplicates.

Statistical Analysis

All the proximate and energy values were expressed as mean ± standard deviation. Means were compared using the least significant difference (LSD) at 5% level of significance.

Results and Discussions

According to Table 1, the moisture contents of the cassava peels-based composite meals were in the range of 6.49 to 8.21%. Composite meals with lower content of moisture (<10%) is suitable for inactivation of microbes as a result the shelf life of the meals can be extended. Ensiling the composite meal for 7days caused a significant ($p<0.05$) increase in its moisture content when compared with the non-ensiled sample. Increasing the ensiling period to 14day significantly ($p<0.05$) lowered the moisture content and increased the dry matter contents but the values were better than those of the 21days ensiled sample. The increased moisture content of the 21 days ensiled meal when compared with the 14 days tends to show that 14 days was the optimum period of ensilage for higher DM value.

The ash contents of the cassava peels-based composite meals in this study were between 8.36 to 14.87% which is higher than that of sole cassava peels meal and palm kernel meal. Ensiling significantly ($p<0.05$) decreased the ash contents of the composite meals. The decrease in ash content with increasing ensiling period may be attributed to microbial build up and usage of minerals. A similar decrease was also reported in study conducted on ensiled cassava peels meal (Obasi *et al.*, 2018).

Fiber contents of the composite meals were in the range of 28.30 to 37.87% which is higher than that of high quality cassava peel meal fine (Okike *et al.*, 2015) and palm kernel meal (Sundu *et al.*, 2005). The slightly reduced crude fibre values of the 7 and 14 days but very high value of the 21 days ensiled meals is an indication that ensiling above 14day should not be encouraged. Ensiling increased the fiber content from 28.30 % to 37.87%, respectively. This observation is in agreement with the previous studies conducted on ensiled wet cassava peels meal (Obasi *et al.*, 2018).

The protein contents of the blended composite meals were in the range of 9.13 to 9.90%. This result is higher than that of sole cassava peels meal (4.20%) and maize (8.24%) (Dayal *et al*., 2018). These could be due to incorporation of palm kernel meal which is known to be superior in its protein content than cassava peels. Similar finding was observed when cassava peels meal was ensiled with yeast (Obasi *et al*., 2018). Ensiling a blend of wet cassava peels meal and

Table 1: Effect of ensiling period on proximate compositions of ensiled blend of wet cassava peels meal and palm kernel meal

Parameter	0 day	7days	14days	21days	SE
Dry Matter	92.24^{b}	91.79^{b}	93.51^{a}	92.02^{b}	0.38
Moisture	7.76^{a}	8.21^{a}	6.49^{b}	7.98^{a}	0.38
Crude Protein	9.13^{b}	9.64^{a}	9.90^{a}	9.13^{b}	0.19
Ether Extract	4.90^{b}	5.62^{a}	4.68^{b}	4.66^{b}	0.23
Crude Fibre	31.62^{b}	28.30^{b}	29.74^{b}	37.87^{a}	2.11
Ash	14.87^{a}	9.43^{b}	8.97^{b}	8.36^{b}	1.50
NFE	31.71^{b}	38.80^{a}	40.22^{a}	32.00^{b}	2.23
*ME (Kcal/kg)	1855^{b}	2193^{a}	2177^{a}	1855^{b}	95.32

ab; Means within a row with different letter superscript are significantly ($p<0.05$) different.

palm kernel meal decreased the protein content of the composite meal at 21days of ensiling, which could be due to progressive microbial use of the nitrogenous substances during fermentation.

In this study, the fat contents were in the range of 4.66 to 5.62%. This result is higher than sole cassava peel meal and maize, respectively, (Dayal *et al*. , 2018). These observations were due to the blending of wet cassava peels meal and palm kernel meal in the composite meal which has a high amount of fat. On the other hand, ensiling the wet cassava peels-based composite meal beyond 7days decreased its fat content. The decrease might be attributed to increasing microbial needs and use of fat.

The nitrogen free extract (NFE) values ranged from recorded 31.71 to 40.22%. The NFE values increased with increasing period of ensiling up to 14 days but decreased at 21days of ensiling. The 14 days ensiled meal had the highest NFE value while the non-ensiled meal had the lowest value. This tends to show that ensiling improved the NFE value of the meal and the 14 days ensiling period gave better NFE value than 7 and 21 days period.

The calculated energy value of the ensiled cassava peels-based composite meals ranged from 1855 to 2193Kcal/kg. The energy value of the 7 and 14 days ensiled composite meals were significantly ($p<0.05$) higher than those of the non-ensiled and 21days ensiled samples. This may be attributed to microbial actions in the different proximate component which decreased and/or increase with increasing ensiling period. The results tend to show that ensiling improved the energy value of the meal, and that 7 days ensiling period gave better energy value than non-ensiled and 21 days ensiled meals.

Conclusions

Blending wet cassava peels meal with palm kernel meal in a ratio of 7:3 prior to ensiling for 14 days before drying, improved its dry matter and protein contents. Ensiling the composite meal for 21day decreased its proximate values except the crude fibre which was increased. All the cassava peels - based composite meals prepared in this study had higher crude protein values

than sole cassava peels meal or maize. Therefore, in this study nutritionally improved composite feedstuffs are prepared from a blend of wet cassava peels meal and palm kernel meal.

REFERENCES

Adesehinwa, A. O. K., Obi, O. O., Makanjuola, B. A., Oluwole, O. O. and Adesina, M. A. (2011):Growing pigs fed cassava a peel based diet supplemented with or without Farmazyme_ 3000 proenx: Effect on growth, carcass and blood parameters. Afri. J. Biotechnol 10(14): 2791-2796.

Akinfala, E.O. Matanmi, O. & Fatufe, A.A. (2007). Effect of residual cyanogenic glucosides in cassava based diets on serum metabolites of cockerel chicks. In Proc. 32nd Animal Production Conference.Nigerian Society for Animal Production, University of Calabar. pp. 105–107.

Aladi, N.O., Isinguzo, C., Okorondu, S., Okoli, I.C & Okeudo, N.J. (2013).Improvement on the root pulp and palm kernel cake mixture under solid state fermentation.Journal of Agricultural Technology. 9 (5), 1111-1124.

A.O.A.C.(2010): Association of Official Analytical Chemists *Official Methods of Analysis*, Washington, DC

Aro S.O, Aletor VA, Tewe OO,& Agbede J.O.(2010). Nutritional potentials of cassava tuber wastes: A case study of a cassava starch processing factory in south- western Nigeria. Livest Res Rural Dev., 22 (11): 57-62.

Dairo FAS.(2011).Utilization of ensiled metabolizable mixture of cassava peel and caged layers' manure as energy source in broiler diets.*Afr J Food Agric Nutr Dev*;11(5)

Dayal, A.D., Tapong, V., NdamuKong ,K, & Enokenwa, O., (2018). Substituting maize for processed cassava peels: A cost –benefit analysis in poultry farming .International .Volume ,2(4):2348-3997).

Fisher, C. & Boorman ,K.N.(1986):Nutrient requirement of poultry and nutitional research:*Brit.Poult. Sci.Symposium* 19,Butterworths. London.

Jolaosho, A., Dele, P., Olanite, J., Arigbede, O., Ojo, V. & Okukenu, O. (2013).Chemical composition of silage from guinea grass, cassava peel, and brewery waste as affected by ensiling duration.*Pacific Journal of Science and Technology*. 14(2):463-467.

International Livestock Research Institute (ILRI,2015): Scaling the use of cassava peels as quality livestock feed in Africa.

Midau A., Augustine C., Yakubu B., Yahaya S.M., Kibon A.,& Udoyong A.O.(2011) :Performance of broiler chicken fed enzyme upplemented cassava peel meal based diets *Int J Sust Agric*, 3 (1) pp. 1-4.

Obasi I.U, Obasi,E.N,, Ezeokeke C.T & EtukE.B.(2018) : Physio-chemical composition of feed grade cassava meal fermented with different levels of baker's yeast ,*Nig.journal .Anim.Prod.* 45(3)144-154.

Okike I, Samireddypalle A, Kaptoge L, Fauquet C, Atehnkeng J, Bandyopadhyay R, Kulakow P, Duncan A, Alabi & Blummel M (2015). Technical innovations for small-scale producers and households to process wet cassava peels into high quality animal feed ingredients and aflasafe™ substrate. http://www.developmentbookshelf.com/doi/abs/10.3362/2046-1887.2015.005.

Oladunjoye I.O. , Ojebiyi O. & Amao O.A.(2010), : Effect of feeding processed cassava (*Manihot esculenta crantz*) peel meal based diet on the performance characteristics, egg quality and blood profile of laying chicken Agric Tropica Subtropica, 43 (2). 119-126

Olanbiwoninu A. A. & Odunfa S. A. (2012).Enhancing the Produc8on of Reducing Sugars from Cassava Peels by Pretreatment Methods.*International Journal of Science and Technology*. 2(9) 650 – 652.

Olorunnisomo, O.A., EwuoIa, E.O. & LawaI, T.T. (2012). Intake and blood metabolites in red Sokoto goats fed elephant grass and cassava peel silage. *Journal of Animal Production Advances.*2:420-428.

Onyimonyi A.E,& Ugwu, S.O.C.(2007): Bioeconomic indices of broiler chicks fed varying ratios of cassava peel/bovine blood. *Int J PoultSci*;6(5):318-21.

Salami R.I.(1999). The use of two empirical methods of substitution of feedstuffs: Parboiled cassava peel meal versus maize in the diets of growing cockerels. *Nigeria. Journal of Animal Production.*; 26:78–83.

Salami R.I,& Odunsi A.A.(2003),: Evaluation of processed cassava peel meals as substitutes for maize in the diets of layers *Int J Poult Sci*, 2 (2). 112-116

Sundu, B., Kumar, A. & Dingle, J. (2005c): Comparison of feeding values of palm kernel meal and copra meal for broilers.Recent Advances in Animal Nutrition Australia15, 16A

Tewe O.O. (2004): Cassava for Livestock Feed in Sub-Saharan African. Plant Production and Protection Division, Food and Agricultural Organization, Rome, Italy.