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

INFLUENCE OF PARTICLE SIZE ON THE QUALITY OF ENSILED CASSAVA PEEL-LEAF MIX.

*Odoemelam, V.U.,[1] Okonkwo, L. C.,[1] Anyanwu, N. J.,[1] Ekwe, C. C.,[2] Aladi, N.O.,[1]

Ahiwe, E. U. and Ukwu, P. C.[1]

[1]Department of Animal Science and Technology, Federal University of Technology, Owerrri, Imo State.

[2]National Root Crops Research Institute, Umudike – Umuahia. Abia State.

Abstract

A study was conducted to assess the influence of particle size on the quality of ensiled cassava peel-leaf mix. Two groups of cassava peels and cassava leaves were used. One group was chopped into small sizes of 2cm-3cm and ensiled at a proportion of 70%:30% Cassava peel and Cassava leaf respectively and ensiled, while the other group was left unchopped and also ensiled at a proportion 70%:30% Cassava peel and cassava leaf respectively. 24 samples were used, 12 samples per treatment. The independent samples T-test was employed in analyzing and comparing means. Results from Proximate composition, cyanide content and physico-chicemical characteristics (Colour, Texture, Smell, Mouldiness, pH, Temperature) showed that particle size significantly influenced quality of ensiled cassava peel-leaf mix. The Unchopped group of ensiled cassava peel-leaf mix though produced good silage, but Chopped ensiled cassava peel-leaf mix yielded significantly better ($p<0.05$) silage. Chopping cassava peel-leaf mix to small sizes of about 2cm-3ccm before ensiling is recommended.

Keywords: Cassava peels and leaves, ensiling, particle size and quality

INTRODUCTION

Ruminant species are exposed to nutritional stress, especially during the periods of the dry season when forage is scarce and of low quality resulting in poor performance (Odoemelam *et al.,* 2013). One of the solutions to this can be the conservation of forage materials and agro-industrial by-products like cassava leaves and peels, to ensure an all year round availability of feed materials. Post harvest waste of cassava which includes cassava leaves and cassava peels have been reported to contribute significantly to environmental pollution (FAO, 2001; Aro *et al,* 2010). However, these environmental pollution problems can be reduced if these by-products are well utilized by largely using them in livestock feeding. Ensiling has been reported as an efficient method for cyanide reduction in fresh cassava leaves and cassava peels (Obikaonu and Udedibie, 2006). However, ensiling of cassava leaves alone, like many other high protein leaves is difficult because of its high buffering capacity, there's therefore the need to ensile it with a material with high readily available fermentable carbohydrates. Cassava peels meets this demand, thus thus can be ensiled with cassava leaves thereby enhancing the nutritive content of the resultant product better than feeding only one of the two. Depending on the ensiling method, forages can be chopped to various degrees prior to ensiling. In theory, Chopping of the plant material favourably influences the quality of the silage (MCdonald *et al*., 1991). However, in practical this may not always be the case as other factors come into consideration including the type of plant materials involved.

The objective of this study is therefore to assess the influence of the particle size of cassava peels and leaves on the quality of ensiled cassava peel-leaf mix.

MATERIALS AND METHOD

Experimental location: This research was conducted at the Department of Animal Science and Technology, School of Agriculture and Agricultural Technology of Federal University of Technology, Owerri, Imo state.

Source and processing of materials: The fresh cassava leaves and peels were collected from farms around Federal University of Technology, Owerri. Cassava leaves and cassava peels were air-dried for 24 hours to reduce moisture content, there after the materials were divided into two parts. One part was packed together and chopped into equal length of about 2-3cm and the peels and leaves were mixed in a proportion of 70%:30% respectively. The other part was left whole and unchopped and the cassava peels and leaves mixed at the proportion of 70%:30% respectively. There after the materials were compacted in 1-liter glass containers and ensiled.

Physico-chemical analysis: The materials were ensiled for a period of 21 days and 49 days. After which, the silage was opened for quality assessment. Parameters considered were: Temperature, pH, Colour, Texture, Smell and Moldiness according to Babayemi and Igbekoyi, (2008). These properties were then converted to numbers on a scale of 1-5 for the purpose of statistical analysis as shown in Table 1.

Table 1: Scale used for scoring

Scale	Mold	Smell	Colour	Texture
1	No mold	Pleasant	Light Green	Very Firm
2	Slightly moldy	Fairly pleasant	Greenish brown	Firm
3	Average Mold	NDS	Brownish green	Slightly firm
4	Moldy	Slightly pungent	Brownish	Slightly soft
5	Very Moldy	Pungent	Dark brown	Soft

Source: Adapted from Hassan (2004) NDS: No distinct Smell.

Experimental design and Statistical Analysis: A total of (24) samples were used, 12 samples per treatment, each treatment representing a replicate. Data obtained were analysed and means compared by employing the Independent Sample T-test.

Chemical analysis: The silages were analysed for proximate composition using the procedure of AOAC (2004), employing the Kjeldahl method for Crude protein determination. The hydrocyanic acid was determined using the alkaline picrate method with modifications (Onwuka, 2005). All analysis was conducted in triplicate.

RESULT AND DISCUSSION

Table 2 and 3 shows the proximate composition and hydrogen cyanide content of unchopped and chopped ensiled cassava peel-leaf mix ensiled for 21 and 49 days respectively. There were significant differences ($P<0.05$) in the proximate compositions of chopped and un-chopped ensiled cassava peel-leaf mix. HCN content of unchopped and chopped ensiled cassava peel-leaf mix were also significantly different ($P<0.05$). Unchopped ensiled cassava peel-leaf mix had higher Crude Protein (CP), lower Moisture Content (MC), lower cyanide content and Ether extract values at 21 days of ensiling. Result at 49 days

followed a similar pattern for these parameters. The values for moisture content obtained in this study are in the same range reported by Nhi *et al.* (2006). The higher moisture content of the chopped Cassava peel-leaf mix could be attributed to higher surface area to volume ratio of the chopped material, hence, high water retaining capacity. As moisture content decreases there is less acidity that is needed to inhibit undesirable bacteria that are more sensitive to low moisture than desirable lactic acid bacteria, while low moisture is one factor that explains why wilting is beneficial. The CP values of the unchopped CP-L mix were higher than that of the Chopped CP-L mix. This is suggestive of more pronounced microbial presence in the un-chopped CP-L mix thus contributing to the CP content. This may be as a result of less ease of compaction when compared to the more compact chopped CP-L mix. The reason why silage materials are cut to small sizes is to encourage effective compaction. The lower cyanide content of the unchopped CP-L mix both at 21 days and 49 days compared to chopped CP-L mix corroborates this assertion as more fermentation has been reported to reduce cyanide content (Agugu and Okeke, 2005). The crude fiber of 4.82% and 4.87% was lower in unchopped cassava peel-leaf mix compared to chopped cassava peel-leaf mix of 5.49% and 4.41% for 21 days and 49 days respectively. The ether extract of unchopped CP-L mix (4.30% and 4.32%) was lower ($P<0.05$) compared to that of chopped (4.37% and 4.51%) for 21 and 49 days respectively. Ether extract and crude fiber of the ensiled CP-L were within the expected range 4.02-15.2 and 4.8-15.4 (Anaeto, 2013).

Table 2: Proximate Composition and HCN Content of Ensiled Chopped and Unchopped Cassava peel leaf mix at 21 days

Treatment	Components						
	MC	CF	CP	ASH	EE	NFE	HCN (mg/100g)
Unchopped	30.408	4.820	19.400	4.250	4.300	36.822	2.240
Chopped	33.433	5.490	15.860	3.930	4.370	33.370	4.190
S.E.D	0.167*	0.015*	0.463*	0.017*	0.011*	0.394*	0.027*

SED= Standard error of difference of means; * =Significant ($p<0.05$); NS= not Significance ($p>0.05$)

Table 3: Proximate Composition and Hydrogen Cyanide content of Ensiled Cassava Peel-Leaf mix (70:30) at 49 days

Treatment	Components						
	MC	CF	CP	ASH	EE	NFE	HCN (mg/100g)
Unchopped	35.167	4.870	18.380	4.300	4.317	32.967	1.983
Chopped	44.000	4.410	15.973	4.817	4.510	26.300	2.117
S.E.D	0.105*	0.013*	0.195*	0.015*	0.021*	0.133*	0.024*

SED= Standard Error difference of means; * Significant ($p<0.05$).

Tables 4 and 5 shows results obtained for Physico-chemical assessment of Unchopped and Chopped ensiled CP-L mix at 21 and 49 days respectively. Chopped ensiled CP-L mix had significantly better results for Colour, Texture, Temperature and pH but had similar ($P>0.05$) scores for Smell and Moldiness as unchopped ensiled CP-L mix at 21 days. At 49 days Chopped ensiled CP-L mix also had better results ($P<0.05$) for all Physico-chemical characteristics (Colour, Texture, Smell, Mouldiness and pH) except for temperature. All values obtained for both chopped and unchopped ensiled CP-L mix were within the acceptable range for good quality silage according to Hassan (2004). The scores for Colour of Unchopped and Chopped enslled CP-L mix indicates that they were close to greenish brown and light green respectively. Nannatje, (1999) had reported that a good silage usually preserves the original or close to the

original color of the ensiled material. This implies that both groups still retained vitality and enough nutrient content (Hassan, 2004). Unchopped ensiled CP-L mix scored 2.00 for Texture which implies that the material was firm when touched while the Chopped ensiled CP-L mix scored 1.33 showing that the ensiled material was much more very firm, than the unchopped group. Texture is important as it indicates the condition of the silage. Poor silage is unusually soft indicating that spoilage has set in. Texture is also important in avoiding excessively resultant watery dung from ruminants that feed from such silage. Scores for moldiness of the unchopped CP-L and Chopped were were similar ($p>0.05$) for Moldiness, indicating no mould. Values for Chopped and unchopped CP-L mix Unchopped and chopped ensiled CP-L mix had significantly different values (1.66 and 1.33) for Smell at 21 days, indicating a fairly pleasant smell for the unchopped while the chopped had a pleasant smell. The smell is indicative that both silages were in good condition. A similar trend was observed at 49 days. The temperature of unchopped ensiled CP-L mix was higher ($P<0.05$) than that of the chopped CP-L mix. The pH value of the unchopped ensiled CP-L mix was 5.00 while that of chopped was 4.00 implying that the unchopped was better, although they were all within the acceptable range for a good silage. Obua (2005) reported that the pH for good silage should be within the range of 3.8-5.0. Generally, pH is one of the simplest and quickest ways of evaluating silage quality. However, pH may be influenced by the moisture content and the buffering capacity of the original material.

Table 4: Physico – Chemical Assessment of Ensiled Cassava Peel- Leaf Mix at 21 days

	Parameters					
Treatment	**Colour**	**Texture**	**Mouldiness**	**Smell**	**Temperature**	**pH**
Unchopped	1.667	2.000	1.333	1.667	30.000	5.000
Chopped	1.000	1.333	1.333	1.333	29.333	4.100
S.E.D	0.210^{*}	0.211^{*}	0.470^{NS}	0.298^{NS}	0.211^{*}	0.082^{*}

SED= Standard Error difference of means; * Significant ($p<0.05$); NS= not Significance ($p>0.05$)

Table 5: Physico – Chemical Assessment of Ensiled Cassava Peel- Leaf Mix at 49 days

	Parameters					
Treatment	**Colour**	**Texture**	**Mouldiness**	**Smell**	**Temperature**	**pH**
Unchopped	2.333	2.333	2.000	4.333	31.00	4.033
Chopped	1.000	1.000	1.000	3.667	31.33	3.800
S.E.D	0.210 *	0.421^{*}	0.365^{*}	0.298 *	0.167^{NS}	0.067 *

SED= Standard Error difference of means; * Significant ($p<0.05$); NS= not Significance ($p>0.05$)

CONCLUSION AND RECOMMENDATION

The study shows that ensiled unchopped and chopped cassava peel and cassava leaves at 70%:30% respectively, gave good quality silage. However, it was observed that Chopped ensiled CP-L mix yielded a better silage considering resuts for Colour, Texture, Smell, Mouldiness, pH and Temperature. It can thus be concluded that chopping and ensiling cassava peel-leaf mix produced silage of better quality compared to the unchopped. Chopping cassava peel-leaf mix to small sizes of about 2cm-3ccm before ensiling is recommended.

REFERENCES

Agugu, G. O. and Okeke, G. C. (2005). Effect of replacing maize with cassava root meal in the diet of pullet chicks. *Proceedings of the 30th Annual conference of the Nigeria Society for Animal production, held at the University of Nigeria, Nsukka, 20th-24th March, 2005. Pp. 235-236.*

A.O.A.C (2004). Association of Official Analytical Chemists. Official methods of analysis. 16th Edition, Washington, D. C.

Anaeto, M., Sawyer, A. E., Alli, T. R., Tayo, G. O., Adeyeye, J. A. and Olarinmoye, A. O. (2013). Cassava leaf Siage and Cassava Peel as dry season feed for West African Dwarf Sheep. *Global Journal of Science Frontier Research, Agriculture and Veterinary Sciences13(2): 1-5*

Aro, S. O, Nector, V.A, Tewe, O.O, Agbede, J.O [2010]. Nutritional Potentials of Cassava Starch Processing Factory in South Western Nigeria. *Livestock, Research Rural Development, 22(11):68-94.*

Babayemi, J. O. and Igbekoyi, J. A. (2008). Ensiling pasture grass with pods of browse plant is potential in solving dry season feed shortage for ruminant in Nigeria: *In Eric Tielkes (ed). Competition for resources in the changing world: New drive for rural development*. *Proceedings of the Conference of the International Research on Food Security, Natural Resource Management and Rural Development*. Tropentag, 7th -9th October, 2008.

FAO (2001). Shortage Environmental Assessment. An Assessment of Cassava Production & Processing On the Environmental Biodiversity Production and Validation Forum on the Global Cassava Development Strategy, (5), FAO,

Hassan, D. (2004). Physical properties of Guinea grass (*Panicum maximum*) and Cassava leaves (*Manihot esculentus crantz*) Silage using low cost containers. *B.Sc Project report University of Agriculture, Abeokuta, Ogun State, Nigeria.*

McDonald, P., A.R. Henderson, and S.J.E. Heron. (1991). The Biochemistry of Silage. Chalcombe Publications, Bucks, UK. 2nd Ed. *Pp. 340*.

Nhi ,D.L., Sanh, M.V and Ly, L.V., (2001) Supplementing Cassava root meal and Cassava processed leaf to diet based on Natural grasses, Maize Stover and Rice straw for Fattening young swamp Buffaloes. *Proceedings buffalo workshop, December 2001. Retrived January 19, 2008*.

Obikaonu, H.O and Udedibie, A.B.I [2006]. Comparative of Sundried and Ensiled Cassava Peel Meals as Substitute for Maize in Broiler Starter Diets. *International Journal of Agricultureand Rural Development, 7(2): 52*

Obua, B.E., (2005). Forage conservation in Nigeria. *Concave publications Owerri Nigeria*,

Odoemelam, V.U., Ahamefule, F.O, Ibearuchi, J.A, Nwachukwu, E.N and Etuk, I.F (2003). Milk

Yield and Compositionof West Africa Dwarf (WAD) Does Fed Bambara nut Meal Based Diets. *Nigerian Journal of Animal Science 15(1), 134-144.*

Odugowa, B.O., Jolaossh, A.O., and Ayakoso, M.T., (2007). Effect of ensiling on the physical properties, Chemical composition and mineral content of Guinea grass and cassava top Silage University of Agriculture Abeokuta, Nigeria. *Nigerian Journal of Animal Production.* 34 (1):100-106.