

**Proximate and Mineral Composition of Ripe Plantain Peels, Palm Oil Mill Slurry
Obtained from Different Locations in Edo State, a part of Southern Nigeria**

Abstract

This study was initiated to investigate the proximate and some mineral compositions of ripe plantain peels and palm oil mill slurry obtained from some locations in Edo State, Nigeria. Results showed that the ripe plantain peels collected from Auchi, Ekpoma and Benin gave crude protein (CP) of 10.50, 11.08 and 10.50 % respectively; EE of 24.03, 25.02 and 23.84% respectively, Ash of 11.93, 12.47 and 11.00 % and 30.73, 34.87 and 37.15 % for NFE respectively. The results also showed that CF and NFE were significantly ($P < 0.05$) different with regard to Locations as the highest value 10.66 % were obtained from Benin City, which significantly ($P < 0.05$) differ from Ekpoma (7.99 %) and close to the value 9.59 % recorded for Auchi. The proximate composition of the palm oil mill slurry (POMS) from OKOMU, PRESCO, UDO and Benin City revealed crude protein (CP) values of 2.62, 2.04, 3.79 and 3.21 % respectively, EE of 15.76, 17.59, 12.50 and 17.62 % respectively. The comparison between local processor and industrial processor revealed that the locally processed oil palm slurry gave higher crude protein content of 3.50 % compared with 2.33 % from industrially processed slurry and the locally processed slurry had higher crude fat content. This may be accounted for by the efficiency of industrial facilities and processing methods.

Key words: Ripe Plantain Peels, Palm Oil Mill Slurry, Proximate and Mineral Composition, Location.

Introduction

Plantain peels are discarded as wastes after the inner fleshy portion has been taken, thereby constituting menace to the environment (Okareh *et al.*, 2015). According to Aduku (1993) plantain peels contains about 12 % crude protein, 16 % crude fibre and 1300 kcal/kg energy on dry matter basis. Ripe or unripe plantain wastes can be used to feed livestock or in the production of local soap but in the areas where these are not feasible, these wastes end up polluting the environment, Williams (2001). Palm oil mill slurry is basically a waste material from the palm oil mill industry. It is the remains after the palm oil has been carefully removed in an oil extraction process. The heavier fraction which settles at the bottom Madsen and Walker, 1982; Egbe, 1985). The quality of life in the rural areas is still affected by the environmental pollution of palm oil mill slurry. Palm oil mills now employ conventional biological treatment systems, such as anaerobic digestion tanks and facultative ponds in series (Chavalparit, 2006). However, some mills are still not able to treat their wastewater in ways that meet effluent standards. In the rainy season, overflow from the waste water treatment plants causes heavy water pollution to nearby waterways (Chavalparit, 2006). In every oil extraction process, palm oil slurry is a major waste product usually more than palm oil, which is the primary product (Heuzé *et al.*, 2015).

According to FAO (2013) Nigeria is one of the largest producers of plantain in the world. Advantage can be taken of the abundance of these two agro by-products and its utilization will not only expand the choice of feed resource available to pig farmers but as well create disposal alternative to the oil miller and minimize its environmental pollution problem.

Materials and Methods

Sources of plantain peel and experimental location

In the study, samples of ripe plantain peels were collected from plantain processing Centers, from Edo North, Edo Central, and Edo South Senatorial District, Edo State, Nigeria. Palm oil mill slurry was collected from Industrial (OKOMU and PRESCO) and Local processor in UDO Community and Benin Sapele Road, Edo South, Nigeria.

Collection and preparation of plantain peels

Fresh ripe plantain peels collected from Benin City, Edo South, Nigeria were properly sun dried (30-35°C), well ground and analyzed for proximate and mineral composition.

Proximate analysis

Using the method of AOAC (2010) samples of the dried and milled plantain peels and freshly collected palm oil mill slurry (POMS) were used for the determination of dry matter, crude protein, crude fibre, ash, ether extract, nitrogen free extract, Calcium and Phosphorus.

Experimental design and statistical analysis

Palm oil Mill Slurry comparison was done based on the processing technology (Industrial vs Local Processor). In the ripe plantain peels, means were separated based on agro-ecological zones of Edo State (South vs Central vs North). Data collected were subjected to one way Analysis of Variance, using GENSTAT (2009) (12th Edition) package and means were separated using Duncan's Multiple Range Test (Steel and Torrie, 1980) at 5 % level of probability.

Results and Discussion

Table I: Proximate Composition of Ripe Plantain Peels Collected From Three Locations in Edo State

COMPOSITION	LOCATION			±SEM
	AUCHI	EKPOMA	BENIN	
Dry matter (%)	86.78 ^c	93.14 ^a	93.41 ^b	0.27
Crude protein (%)	10.50	11.08	10.50	0.67
Crude fat (%)	24.03	25.02	23.84	0.40
Crude fibre (%)	9.59 ^{ab}	7.99 ^b	10.66 ^a	0.51
Ash (%)	11.93	12.47	11.00	0.31
NFE (%)	30.73 ^b	34.87 ^{ab}	37.15 ^a	1.30
Ca (mg/kg)	86.12 ^a	72.67 ^b	62.15 ^c	0.67
Mg (mg/kg)	16.24 ^a	12.84 ^b	9.39 ^c	0.37
Na (mg/kg)	8.73 ^b	10.15 ^a	7.92 ^a	0.28

K (mg/kg)	202.86 ^a	183.22 ^b	179.46 ^c	0.97
P (mg/kg)	22.65 ^b	24.39 ^b	32.69 ^a	0.63
Pb (mg/kg)	0.34	0.35	0.42	0.03
Fe (mg/kg)	23.14 ^a	24.36 ^a	19.98 ^b	0.60

^{abc} means with different superscripts in the same row differ significantly (P<0.05). SEM - Standard Error of Means

The plantain peels collected from Auchi, Ekpoma and Benin (Table 1) were not significantly (P >0.05) different in crude protein, crude fat and ash. The crude protein was 10.50, 11.08 and 10.50 % respectively; EE of 24.03, 25.02 and 23.84 respectively, Ash of 11.93, 12.47 and 11.00 % and NFE values of 30.73, 34.87 and 37.15 % respectively. As NFE, the CF was significantly (P<0.05) different with location as the highest value was obtained from Benin City (10.66 %) which significantly (P<0.05) differ from Ekpoma (7.99 %) and statistically similar to Auchi (9.59 %). It was also observed that ripe plantain peels gave Potassium values of 202.86, 183.22 and 179.46 mg/kg respectively, Calcium values of 86.12, 72.67, and 62.15 mg/kg and Phosphorus values of 22.65, 24.39 and 32.69 mg/kg respectively.

The crude protein values obtained for Auchi (10.50 %) and Ekpoma (11.08 %) were similar to those reported by Okoeguale (2017). It was slightly higher than 9.19 % report by Akinmutimi *et al.* (2006) and 9.98 % reported by Fanimo and Odu (1996). The crude fibre value was 9.59, 7.99 and 10.66 respectively. It was higher than the 5.36 % CF value reported by Fanimo and Odu (1996), Akinmutimi *et al.* (2006) CF value (6.43 %) and 5.63 % value of Okoeguale (2017). The EE values of 24.03, 25.02 and 23.84% respectively where significantly higher when compared to the value as reported by Fanimo and Odu (1996), Akinmutimi *et al.* (2006) and Okoeguale (2017). The observed disparity may be attributed to the species (or ecotype) and soil properties of the location. The ripening stage may also have influenced the composition of the ingredient. The ash content value of 11.93, 12.47 and 11.00 were lower than 13.16 % reported by Fanimo and Odu (1996) and 16.83 % reported by Okoeguale (2017).

Table II: Proximate Composition of Palm Oil Mill Slurry (POMS) Collected from Different locations in Edo state, Nigeria.

COMPOSITION	LOCATION				±SEM
	OKOMU (I)	PRESCO (I)	UDO (L)	BENIN (L)	
Moisture Content (%)	74.23 ^{ab}	72.79 ^{bc}	75.11 ^a	71.96 ^c	0.519
Crude Protein (%)	2.62 ^{bc}	2.04 ^c	3.79 ^a	3.21 ^{ab}	0.25
Crude Fat (%)	15.76 ^b	17.59 ^b	12.5 ^c	17.62 ^a	0.34
Ash (%)	4.91 ^{ab}	4.16 ^b	5.16 ^a	4.66 ^{ab}	0.36
NFE (%)	2.48 ^a	3.42 ^a	2.92 ^a	2.56 ^a	0.71
Ca (mg/kg)	315.77 ^a	188.58 ^c	306.67 ^b	176.04 ^d	0.90
Mg (mg/kg)	281.93 ^a	175.52 ^c	241.76 ^b	156.16 ^d	1.04
Na (mg/kg)	11.65 ^c	14.94 ^b	15.06 ^b	21.39 ^a	0.41
K (mg/kg)	476.98 ^a	365.33 ^c	408.09 ^b	363.57 ^c	1.28
P (mg/kg)	27.54 ^a	9.95 ^b	10.53 ^b	9.86 ^b	0.26
Pb (mg/kg)	0.17 ^c	0.78 ^a	0.37 ^b	0.36 ^b	0.03
Fe (mg/kg)	10.97 ^d	18.02 ^c	21.26 ^b	29.93 ^a	0.43

^{abc} means with different superscripts in the same row differ significantly (P<0.05). SEM - Standard Error of Means, I - Industrial processor, L - Local processor

The chemical composition of the palm oil mill slurry from OKOMU, Presco, Udo and Benin City (Table 2) revealed crude protein values of 2.62, 2.04, 3.79 and 3.21 % respectively, EE of 15.76, 17.59, 12.50 and 17.62 % respectively. Samples from Udo gave the highest crude protein (3.21 %) and lowest crude Fat (12.50 %). These results are in line with previous study in Edo State (Abiola-Olagunji *et al.*, 2014).

Table 3: Proximate Composition of Collective samples of Palm Oil Mill Slurry (POMS) From Industrial and Local Processors

COMPOSITION	PROCESSING		±SEM
	LOCAL	INDUSTRIAL	
Moisture Content (%)	73.53	73.51	0.64
Crude Protein (%)	3.50 ^a	2.33 ^b	0.21
Crude Fat (%)	16.67	15.09	0.88
Ash (%)	5.13	4.54	0.30
NFE (%)	2.95	2.74	0.48
Ca (mg/kg)	241.00	252.00	28.8
Mg (mg/kg)	199 ^b	229 ^a	21.6
Na (mg/kg)	18.23	13.30	1.16
K (mg/kg)	386	421	19.0
P (mg/kg)	10.2 ^b	18.7 ^a	2.79
Pb (mg/kg)	0.37	0.48	0.10
Fe (mg/kg)	25.60	14.50	1.79
Ph	4.70 ^a	4.05 ^b	0.12

^{abc} means with different superscripts in the same row differ significantly (P<0.05) SEM - Standard Error of Means

The comparison between local processor and industrial processor revealed that the locally processed palm oil mill slurry gave higher crude protein content of 3.50 % compared with 2.33 % from industrially processed slurry and the locally processed slurry had higher crude fat content. This may be accounted for by the efficiency of industrial facilities and processing methods.



Fig.1 Palm Oil Mill (Local)



Fig.2 Palm Oil Mill (Industrial)



Fig.3 Collection Process (Local)



Fig.4 Collection Process (Industrial)



Fig.5 Dried Ripe Plantain peels

Conclusion

The results from this study showed that the plantain peels collected from Auchi, Ekpoma and Benin were not significantly ($P > 0.05$) different in crude protein, crude fat and ash. The Crude Fat (CF) was significantly ($P < 0.05$) different with location. The locally processed palm oil mill slurry gave higher crude protein content of 3.50 % compared with 2.33 % from industrially processed slurry and the locally processed slurry had higher crude fat content. This may be accounted for by the efficiency of industrial facilities and processing methods.

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