Proceedings of the Third African Regional Conference on Sustainable Development
Volume 3, Number 12, July, 14-16 2009, Commassie Hall, Imo State University, Owerri, Nigeria

PHYSICO-CYANIDE EVALUATION OF GARI FROM UGHELLI ,BIDA AND OBA AKOKO

Olugbenga[1] A.G , Ajakaye[2] .O.N. and Sunday[2] .U.B
[1]Department of Chemical Engineering Federal University of Technology Minna , Niger State.
[2]Department of Chemical Engineering Federal Polytechnic Bida , Niger State

ABSTRACT

Cassava is a stable food crop in Nigeria , Brazil and some other African countries. It is usually processed into fermented products such as Gari, Lafun, Tapical , Kokonte and acheke. Gari is a particular popular food product because it comes in ready-to –eat form. There are Process for converting dried Cassava into Gari and other products, usually derived from fresh Cassava and have to be simple and affordable. This paper presented the physico- cyanide evaluation of Gari from Ughelli, Bida. and Oba Akoko. For the physical properties, Ughelli Gari sample has the highest swelling capacity of 156cm^3 followed by Oba Akoko's Gari with a swelling capacity of 146cm^3 .Bida Gari has the least swelling capacity with a swelling capacity of 111cm^3 ,this low swelling capacity may not be unconnected with reduced starch content. Similarly, Ughelli Gari has the highest starch content of 95%, followed by Oba Akoko Gari with 90% starch content . But Bida Gari has the least value of 75% among the three Gari locations. Also, Bida Gari has the highest value of fiber content and it gave 25% fiber content , this was followed by Oba Akoko with fiber content of 10% and the least was Ughelli with 5% fiber content this may likely be connected with proper grating of the cassava tubers, sieving and over maturity of the tubers. The overall acceptability showed that 19 people out of 20 prefer both Ughelli and Oba Akoko Gari while only 12 people out 20 prefer Bida Gari. However, The Gari samples have a $_pH$ range from 4.92-5.06 and the total titriable acidity was between 0.816%-0.960%. Bida has the highest $_pH$ of 4.9. There is connectivity between $_pH$ and titriable acidy as observed in the result. The lower the $_pH$ the lower the titriable acidity. And Ughelli Gari samples has a the least value of $_pH$ OF 5.06 the lowest tiriable acidity of 0.816%. Hydrocyanic acid(HCN) which is a measure of Cyanogenic glycoside (Cyanide content) ,In all the samples their HCNmg/100g were higher than the recommended value of 2.0HCNmg/100g by Standard organization of Nigeria. Ughelli has the least Hydrocyanic content of 2.376mgHCN/100g which implies lowest cyanide content this was followed by Oba Akoko Gari with 2.808mg HCN/100g , while Bida has the highest Hydrocyanic content of 3.024mgHCN/100g .However, according to Akinrele that 3.0mgHCN/100g it implied for consumption only Ughelli and Oba Akoko Gari can be said to be safe and consumable while Bida Gari may be said not suitable for eating. Nevertheless, since the three samples HCNmg/100g were above the recommended2.0mg/100gHCN value by SON (Standard Organization of Nigeria) , it showed that all the Gari samples from the three locations needed a process technology that will reduced the Hydrocyanic content (Cyanide).

Keywords: Fiber content, Hydrocyanic content, $_pH$, process Technology, starch content Swelling Capacity. Physico-cyanide

INTRODUCTION

Gari is a popular West African granular starch food traditionally made from fermented , gelatinized fresh Cassava tubers. Fresh Cassava tubers must be processed into Gari within two to three days of harvesting, otherwise, it is no longer suitable for use. Use of dried cassava tubers for Gari production is a technical innovation. Peel fresh cassava tubers are chipped into thin flakes that are dried until crispy, either in the sun or in ovens at low temperature. Preservatives can not be used because they will hinder the fermentation process.(www.undp.org/sie/experience/voll/cassava) Cassava cultivation and harvesting are not mechanized. It is difficult and time consuming to uproot cassava roots from dry soil, so the price of Gari tends to go up in the dry season. Traditionally, dried Cassava has been fermented and used to produced Cassava flour ('Lafun') rather than Gari. In Nigeria, most rural areas where Cassava is grown have poor feeder roads. As a result , the cost of transporting bulky, freshly harvested Cassava roots to processing centers is very high .

The Federal Institute of Industrial Research (FIRO) developed a simple process for obtaining dried Cassava chips that are suitable for Gari production. It also develop simple process for converting the dried chips into Gari . (www.imdp.org.uk/manual/gari/html) . Pre –process storage is the main problem of Cassava utilization in an individual scale. Because of the large amounts of material required for industrial processing , two to three days of pre- process storage (Akingala et al, 2004 and Ihedioha et al, 1996) Several methods of storage have been proposed for Cassava roots. However, most of the methods are not economically viable for storing the roots prior to processing in an industrial scale. Richard and Coursey reported that cassava roots were stored in moist saw dust for up to 8weeks with minimum deterioration . Storage of Cassava roots in trenches also reduced spoilage. Roots pre- treated with a microbial protectant and sealed in polyethylene bags have exhibited reduced moisture loss and cyanide content can be determined using a method described by Ikediobi etal. The rasping of Cassava roots enhanced contact between the enzyme linamarase and the cynogenic glycosiders so that most of glycoside can be hydrolyzed to prussic acid .There are two major cyanogenic glycosides, lianmarin and lotaustrain. Both glycoside are hydrolyzed to produced hydrocyanic or prussic acid (HCN) , a poison when they come in contact with the enzyme linamarase, which is released when cells of Cassava roots are ruptured. The presence of cyanigenic glycoside necessitate a certain degree or detoxication before consumtion. (Ikediobi et al 1980)

MATERIALS AND METHOD

MATERIALS

Gari samples were obtained from three retailers of Gari from Ughelli main market in Ughelli town in Delta Sate . Oba Akoko Gari was also obtained from three retailers in Oba Markets Ondo State and lastly ,Bida Gari was obtained from three retailers in Bida post office market in Niger State. Ughelli Gari was labeled A Oba Akoko Gari was labeled B and Bida Gari was labeled C. It should be noted however, that the samples were taken after a brief interviewing the retailer to be sure that the products they sell are purchase from a local source around the area. Chemical of analytical grade used for the chemical evaluations and a simple questionnaire was structured to evaluate the sensory quality of the products.

METHODS

Cyanide content was determined using a method described by ikediosi et al and the total titriable acidity (TTA) was evaluated as lactic acid as was determined by Lees The physical properties of Gari samples were determined in these turns: Size reduction of Gari samples were determined on a sieve with opening of 1.70mm-1.18mm respectively, using 1kg of sample and shaking was done for 10minutes. Swelling capacity of Gari was determined as described by Akinrele. While The Gari sample was dried at 60°C for 24hrs. A 250 mls graduated cylinder was filled with dry Gari to 50mls level and filled to the 250mls mark with water. The mixture was inverted 5 times, allowed to stand for 15minutes before the water was decanted off and the volume of the hydrated Gari was read. (John et al,) Evaluation of sensory of quality of Gari was done by a semi- trained panel of 20 people made of student and staff of Federal Polytechnic Bida who are familiar with Gari evaluation, its aroma, taste, colour, particle size and overall acceptability. The parameters were rated on a hedonic scale of 1- 5 where one was very poor, 3 was average and 5 was very good. Gari samples 100g were presented in a plate as dry granules, for evaluation. Evaluation involves the chewing of the Gari sample by panelist. After each sample was evaluated the panelist used portable water to rinse their mouth before another sample was evaluated. And subsequently, the panelist fill the questionnaires on the hedonic scale before them..

RESULTS

Table 1. is a table showing the Mean Particle Size Distribution of Gari Samples.

Gari Samples	Yield (%) Sieve Seize 1.70mm	1.18mm	Yield (%) Through
Ughelli	21.00	21.00	58.00
Bida	6.00	35.00	59.00
Oba Akoko	17.00	16.00	67.00

Source: Experimental, 2008

Table 2: Is a table Showing Mean Swelling Capacity of Gari Sample from Ughelli, Bida and Oba Akoko.

Time (min)	Swelling Capacity		
	Ughelli	Bida	Oba Akoko
10.00	140	100	132
20.00	146	102	138
30.00	150	105	140
40.00	153	107	142
50.00	155	109	144
60.00	156	111	146
70.00	156	111	146

Source : Experimental, 2008

Table 3 is Table showing Moisture content Starch and Fiber Content Evaluation of Gari Samples .

Parameter Evaluated	Gari Samples		
	Ughelli	Bida	Oba Akoko
Moisture Content(%)	0.00	0.00	0.00
Starch (%)	95.00	75.00	90.00
Fiber Content(%)	5.00	25.00	10.00

Source: Experimental , 2008

Table 4 is a Table showing Mean $_{P}H$ value and Total Titriable acidity.

-Gari Samples	$_{P}H$	Total Titratable (%)
Ughelli	5.06	0.816
Bida	4.92	0.960
Oba Akoko	4.99	0.912

Source: Experimental, 2008

Table 5 is a Table Showing Mean Hydrocyanic acid Evaluation

Gari Samples	**HCN mg/100g**	**HCN g/kg**
Ughelli	**2.376**	**0.0002376**
Bida	**3.024**	**0.0002808**
Oba Akoko	**2.808**	**0.0003024**

Source: Experimental, 2008

Table 6 is a table showing Mean Sensory quality test for 20 Panelist

Gari Samples	**Aroma** Pleasant not pleasant	**Taste** Sour not Sour	**Colour** Creamywhite Milky Grey	**Particle** Coarse Intermediate Fine	**Overall Acceptance** Gari is OK	Gari not OK
Ughelli	20 ------	16 04	20 --- - ----	08 04 08	19	01
Bida	10 10	07 13	---- 06 14	----- 08 12	19	01
Oba Akoko	20 ------	16 04	---- 16 04	05 05 10	12	01

Source: Experimental, 2008

DISCUSSION OF RESULT

Table 1-3 and 6 showed the Physical properties of Gari Samples from Ughelli , Bida and Oba Akoko. Particle size is one of the major attributes that determine the quality and use of Gari. The preference is generally for the fine Particle sizes. Oba Akoko as shown in table 1 has the highest fine particles of 67%

followed by Bida with 59% and the least Ughelli with 58%. It is also shown in table 2 that Ughelli Gari has the Highest swelling Capacity of 156cm^3 ,followed by Oba Akoko with Swelling Capacity of 146cm^3 and while Bida has the least Swelling capacity of 111cm^3 . In table 3 Ughelli Gari has the highest Starch content of 95% and the least fiber content of 5% while Oba Akoko Gari has a starch content of 90% while Bida Gari has starch content of 75% and the highest fiber content of 25% . Table 4 showed the $_pH$ and titriable acidity. Bida Gari is the most acidic with $_pH$ value of 4.92 followed by Oba Akoko Gari and the least was Ughelli with $_pH$ value of 5.06 the titriable acidity is highest for Bida followed by Oba Akoko Gari and the least was also, Ughelli with Titriable acid value of 0.816% Table 5 showed the Hydrocyanic acid which is a function of Cyanide content in the Gari Samples .Bida Gari has the highest cyanide content with hydrocyanic acid content of 3.024mg/100g followed by Oba Akoko with hydrocyanic value of 2.808mg/100g and the least was Ughelli Gari with hydrocyanic content of 2.376mg/100g.

CONCLUSION

The Gari Samples from Ughelli , Oba Akoko have very high swelling capacity and the least was that of Bida. From the general Overall acceptance, 19 people out of 20 prefer Ughelli and Oba Akoko Gari than Bida Gari with acceptance of 12 people. However, the hydrocyanic content in Gari samples for Ughelli and Oba Akoko is within the recommended value by Akinrele 1969 ,which was 3.0mgHCN/100g while all the Gari samples from the three location is above the 2.0mgHCN/100g recommended concentration by standard organization of Nigeria (SON)

RECOMMENDATION

If the Standard Organization of Nigeria recommended 2.0mgHCN/ 100g and some of the Gari samples are Higher than 2,0mgHCN/100g ,it showed there is need to develop processes that can reduced the cyanide content to the recommended value. Also, Research should be done on development of spot check of cyanide content even at the market this can easily make one to know the substandard Gari. And
Gari produced from other part of the country can be investigated and see if there is need to improve on the processing technology to reduce the cyanide content and improve the physico-chemical properties.

REFERENCES

Abass, A.B. (1992). Effect of some processing parameters on Gari qualities. Msc. Thesis Food Technology Department , University of Ibadan. Ibadan, Nigeria.

Akingala . J.O, Oguntimein , G.B and Bolade, M.K.(1993). Effect of Unit operations of production on the cyanide content and acceptability of Garri .J.Food proc.press.17.337-350.

Akingala, J.O., Osunsanmi, A.T and Oguntimehin G.B (1989) .Effect of Storage on stach content and modification of cassava starch/starke PP 41: 54-57

Akinrele, A.I (1969) Cited by Edward, C.C, Aluko, B.A and Ozumba, A. 1981 .Quality assessment of Gari from various mechanized operations FIRO(Federal Industrial Institute Oshodi , Nigeria a, Anunal Report 6:1-9

Akinrele, A.I (1964). Fermentation of Cassava .J. Food Science 15: 589-594.

F.D.A . 1980. Gari regulation (1980). Nigeria food and drugs Agency .Food and Drugs decree. Nigeria official Gazette 35, 1974.

Ikediobi , C.O. Onyia , G.O and Eluwa, C.E (1980) .A rapid and inexpensive enzymatic assay for total cyanide in cassava (manihot esculenta) and Cassava products. Journal of Agric Biochem.44:2803-2809

Ikedioha , O.C, Akingala, J.O.and Oguntimehin ,G.B. (1996) .The effect of holding Cassava roots for up to four days on quality characteristics of flour milled from the roots. Journal of Food processing pp 20: 13-23

John O.Akin Gbala, Olussa B, Oyewole, Phylips Kamota O. Karim and Galls.H Bacuss Taylor. (2005) Evaluating sored cassava qualities in Gari production Journal of Food Agriculture and Enviromental Vol"3 (1) 75-80.

Larimond, E. (1977). Laboratory Methods for sensory evaluation of food Canada Development of Agriculture publication No 1637. Ottawa.

Lees, R. (1975) .Food Analysis , Analytical and control Methods for the manufacturer and buyer 3rd ed CRS press.

Lozano, J.C, Coock, J.M and Castano, J. (1978). New development in cassava storage . Proceedings. Cassava protection Workshop, CIAT, Cail Colombia. 7-12 Nov.

Mahungu, N.M, Yamaguchi, Y., Alamazan, A.M and Hahn, S.K.1987.Reduction of Cyanide during processing of Cassava into traditional African food. Agric 1: 11-15

Ngaba . P.R and Lee , J.S (1979). Fermentation of Cassava Manihot esculenta crantz J. Food Science 44: 1570-1571.

Richard , J.E (1985) Physiological deterioration of Cassava roots J. Sci. Food Agric 39: 167-176

Richard J.E and Coursey, D.G 1981. Cassava,D.G. (1981) Cassava part 1" storage of reach cassava roots trop. Sci 23: 1-32

Sanni, M.O. (1991). Hazard analysis of critical Control points in the commercial production of high quality garri. Nigeria Journal of Science 24.

www.rmrdc.gov.ng/fabricator/Fabricator. Retrieved 01 / 09/ 2008

www.rmrdc.gov.ng/AgroRaw MaterialCassava. Retrieved 01 / 09/ 2008

www.Cassavavabiz.org/posthavest Retrieved 01 / 09/ 2008

www.worldFood.net/scientific journal. .