**BIOGLOBIA Vol. 7 (2): 104 –107, 2020** **ISSN: 2349-5626**

# Cyanide Content of Cooked Dried Cassava Chips, Abacha

**C. O. ONWURAH**

Department of Food Technology, Federal Polytechnic, Oko, Anambra State, Nigeria
**Author's e-mail: christianobiekwe2007@yahoo.com**
**Received: 28.07.2020** **Revised: 30.08.2020** **Accepted: 27.09.2020**

## ABSTRACT

Cyanide contents of fresh cassava tuber, dry Abacha processed from the cassava tubers and commercial dried Abacha samples were determined in this study using Alkaline titration method. The various cyanide obtained were 44.2mg/100g, 2.53mg/100g and 4.27mg/100g for the raw cassava tuber processed Abacha and commercial dried Abacha samples. These results also showed fermentation is involved in multistep processing stages greatly reduced cyanogen contents of the cassava. From the result, the cyanide content were below 10ppm, recommended by World Health Organization as the lethal dose of 10mg HCN per Kg body weight as the processed samples were below lethal dose and consumption of these products should be promoted and efforts made in processing method to further reduce cyanide contents of the products.

**Keywords:** *Cassava, Cyanide, Cooked, Abacha chips, Fermentation.*

## INTRODUCTION

The tropical root crop cassava (*Manihot esculanta* crantz of Family: Euphorbiaceae) constitutes one of the major stable foods for an estimated 300 million people in the tropical world (Akinrele, 2014). The major processed forms of the cassava tubers include instant cassava flour and cooked cassava chips (Abacha) (Onwumere, 2015). Cassava like other foods also has anti-nutritional and toxic factors of particular concern are, the cyanogenic glucosides of cassava, which are linamarin and lotaustralin. These ion hydrolysis, release hydrocyanic acid (HCN). The presence of cyanide in cassava is of concern for human and for animal consumption. The concentration of these anti-nutritional and unsafe glycosides various considerably between varieties and also climatic and cultural conditions (Akinrele, 2014). Cassava roots and leaves should not be consumed raw because of the presence of cyanogenic glucosides. Some commonly processed cassava meals includes; chips, Abacha, fufu, loi-loi, tapioca, cassava flour and garri (Ihenkoronye *et al*., 2005 and Iwuoha 1996). Nevertheless, the dynamism in food habits coupled with industrial food processing and marketing needs have directed research attention towards new products. Cassava is also a source of feed to farm animals and raw materials for industries (Oboh and Elusiyan, 2007). Kamulu and Oghome (2012) studied the starch and cyanide contents in Etche manufactured garri. In this study, they discovered that mechanical presser removed more starch at a shorter time than manual pressed garri. But at a prolong time manual pressing removed slightly higher amount of starch for the reduction of hydrogen cyanide which is carcinogenic, therefore mechanical pressing should be used. For manually pressing garri, if the number of days for fermentation be increased, further reduction in the amount of HCN may occur. Orjiekwe *et al*., (2013) worked on determination of cyanogenic glucosides in cassava products sold in Okada, Edo state, Nigeria showed that the three cassava products studied ranged from 5 to 10ppm which is relatively very safe and within acceptable limit of 10mg HCN equivalent 1kg body weight recommended by FAO/WHO (1991). Among the three

samples tested for cyanide, fufu has the highest concentration of 10ppm, cassava flour has 6ppm and garri has the lowest of 5ppm. Cyanide, a toxic contaminant occurs naturally in most plants but has high concentration in cassava and bamboo shoot. Exposure to small amounts of cyanide can be deadly regardless of the rate of exposure of cyanide (Iwuoha, 1996). Cassava containing (50 – 60) mg/kg is therefore to be pretreated to reduce cyanide (Iwuoha, 1996). The recommended World Health Organization (WHO) maximum acceptable level of cyanide in foods meant for human consumption is below 10mg/kg (WHO, 1991). Cassava tubers of all cultivators contain cyanide above this recommended level. Cyanide is usually removed by fermentation, boiling, steaming, drying, roasting and other methods. In this study, efforts are made to effect the removal of cyanide from sweet cassava cultivators using heat (boiling) which are available methods to local consumers. The aim and objective of this study is to determine the hydrogen cyanide content of cooked dried cassava (Abacha) produced by me.

## MATERIALS AND METHODS

**Source of Materials**

Fresh cassava roots were purchased from Eke Oko market in Anambra State of Nigeria.

**Sample Preparation**

The cassava roots were peeled and cut into chunks, one portion was analyzed (raw sample) with the others chunks were processed into dry cassava chips (Abacha) as follows: Dry cassava chips (Abacha) was prepared using FAO (1997) method. Cassava roots were cut into chunks of about 7.0cm and 8.0cm length, followed by washing and then boiling for ten minutes at $100^0$C and cooled. The cooled product was shredded using a local shredder. The shredded product was then washed gently four times with distilled water and soaked in distilled water for 24hrs. It was then rinsed thoroughly drained and thinly spread on a tray and sun-dried at about $60^0$C for five days to form chips. A sample of dried cassava chips was purchased from the market for comparison. The flour chart for production of dried cassava chips (Abacha) shown below.

Fresh cassava roots
↓
Peeling
↓
Washing
↓
Cutting into chunks (7.0 – 8.0cm)
↓
Boiling/Cooling
↓
Slicing
↓
Soaking for 24hrs
↓
Washing
↓
Fresh wet abacha chips
↓
Sun drying ($60^0$C for 5days)
↓
Dried cassava chips (Abacha)

**Flow chart of production of dried cassava chips Abacha.**

**Determination of Cyanide Content**

The cyanide content was determined using the method (AOAC, 2005). 20g of the sample was placed in extraction flask and followed by addition of 100ml of distilled water and allowed to stand for two hours, in order to set free all the bound hydrocyanic acid. The sample was distilled into the sample holder containing the 2.5% NaOH. Until about 10ml was collected. It was carefully transferred to a 100ml volumetric flask and the sample holder rinsed with distilled water successively and also poured into volumetric flask. It was made up to the mark. Twenty-five millimeters (25ml) of the distillate was pipetted into a conical flask, 2ml of 6m NH40H was added and 0.5ml of 10% K/iodided solution, it was titrated with 0.02m $AgNO_3$ to first turbid color. The average titer was used to calculate the cyanide content using the relation 1ml of 0.02m $AgNO_3$ = 1.08mg cyanide.

## RESULTS AND DISCUSSION

**Table 1**
**Cyanide Content of Three Samples**

| Sample | 1st run (mg/100g) | 2nd run (mg/100g) | 3rd run (mg/100g) | Average (mg/100g) |
|---|---|---|---|---|
| RCT | 44.20 | 44.27 | 44.16 | 44.21 |
| PCT | 2.50 | 2.55 | 2.53 | 2.53 |
| CCT | 4.27 | 4.25 | 4.30 | 4.27 |

The results from the analysis showed reduction in cyanogen contents of processed dried Abacha when compared to raw cassava tubers from which they were all produced. The various cyanide content obtained were 44.21, 2.53 and 4.27mg/100g for RCT samples (raw cassava tuber), PCT samples (processed cassava tubers) and CCT (commercial dried Abacha samples) respectively. Drying of the wet Abacha slices have been indicated to further reduced the HCN content since that could explain reason for lowest cyanide content from the processed Abacha sample when compared to the commercial samples. This confirm that HCN can readily be volatilized by heat and reduced during drying process (Okaka *et al*., 1992). Similar observation was made for garri produced from flesh cassava and dried chips (Ekwu and Ehirim, 2008) and Abacha produced from fresh cassava tubers (Ekwu, *et al*., 2009). Abacha produced from dried chips were slightly different from Abacha produced from fresh cassava in the HCN content. The processing method significantly ($P<0.05$) affected the HCN of the some of the Abacha samples. The total cyanogen contents of the Abacha samples processed and from the market is still lower than WHO (1991) safe level of 10ppm. However, these processing methods did not remove all the cyanogen from the Cassava products but reduced it below 10ppm, recommended by the WHO (1991) as safe limit, suggesting that the cassava underwent proper processing to produce safe products. The implication is that the usage of the Abacha made from these varieties of cassava for human consumption may not confer any toxic to the user. This is because the body has natural metabolic pathway to detoxify cyanide that employs Rhodanase. This residual cyanide in the cassava varieties may serve as a substrate for Rhodanase in the liver (Rosling, 1994).

## CONCLUSION

Consumption of these products however, will not lead to the lethal dose of 10mg HCN per kg body weight because the consumers consume far lower quantity of these products than quantity that can give this dose. The percentage cyanogen lost by multistage processing showed that the processing methods involved are efficient resulting in cyanogen

levels that are not high enough to cause cyanide toxicity when the amount of cassava product consumed in a meal is taken into consideration. Hence, the processed cassava products are safe for consumption and combinations of many processing methods which enable removal of cyanogen contents of the cassava should be encouraged. The study therefore recommends that for further reduction of HCN, the fermentation period can be increased beyond 48hours. Cassava products should be regularly monitored and analyze to avoid cyanide poisoning. Hence the processed cassava products are safe for consumption and combinations of many processing methods which enables maximum removal of cyanogen content of the cassava should be encouraged.

## REFERENCE

1. Akinrele, I. A. 2014. Fermentation of cassava. *J. Sci. Food Agricul*, 15: 5-9.
2. AOAC 2005. Official Method of Analysis (15th edition). Association of Analytical Chemists, Washington DC.
3. Ekwu, F. C., Ngoddy, P. O., and Anekwe, C. O. 2009. Abacha making qualities of selected cassava cultivars. *Nigerian Food J*, 22(1): 49-55.
4. Ekwu, F. L. and Ehirim, C. 2008. Comparative evaluation of garri samples produced from fresh cassava roots and dried cassava chips. *Nigeria Food J*, 26(2):60-68.
5. FAO (Food and Agriculture Organization) 1997. Traditional Storage of yams and Cassava and its improvement on Cassava. http://www.fao/inopho/content/ulibrary/gtshtml
6. FAO/WHO 1991. Codex Alimentarius Commission. Codex Standard for edible cassava flour.
7. Ihenkononye, I. A. and Ngoddy, P. O. 1985. Integrated Food Science and Technology for the tropics. Macmillan Publisher Limited, London, *p.* 270-276
8. Iwuoha, C. I. and Eke, O. S. 1996. Nigerian indigenous fermented food, their traditional process operation, inherent problems, improvement and current status. *Food Res. Int*, 29:527-540.
9. Kamalu, C. I. and Oghome, P. 2012. A study of starch and cyanide contents in Etiche manufactured garri. *J. Emerging Trends in Engineering and Applied Science* (JEJEAS), 3(4): 589-593.
10. Oboh, G. and Elusiyan, C. A. 2007. Changes in the nutrient and anti-nutrient content of micro-fungi fermented cassava flour produced from low and medium cyanide variety of cassava tubers. *Afr. J. Bio. Technol*, 6:2150-2157.
11. Okaka, J. C., Akobundu, E. N. T., and Okaka, A. N. C. 1992. Human Nutrition: An integrated approach, Enugu State University of Science and Technology, Enugu Nigeria.
12. Onwumere, J. and Ichie, V. A. 2013. Response of Nigerian cassava expansion initiatives in climatic changes, economic growth and some policy instrument. *Int. J. Food Agricul. Eco*, 1(2): 65-72.
13. Orjiekwe, C. L., Solola, A., Iyen, E., and Imade, S. 2013. Determination of Cyanogenic glucosides in cassava products sold in Okada, Edo State, Nigeria. *African J. Food Science*,7(12):468-472. DOI: 10.5897/AJFS2013.1012
14. Rosling, H. 1994. Measuring effects in humans of dietary cyanide exposure from cassava. *ACTA Horticulture*, 375: 271-284.