ECRONICON OPEN ACCESS

EC AGRICULTURE
Research article

Evaluation of American Yam Bean Storage Roots for Gari Production

Omodamiro RM*, Nwadili VU, Amadi CO, Egesi, C Ironkwe AG, Aniedu C and Ukpabi UJ

National Root Crops Research Institute, Umudike, Abia State, Nigeria

***Corresponding Author**: Omodamiro RM, National Root Crops Research Institute, Umudike, Abia State, Nigeria.

Received: August 20, 2015; **Published:** May 24, 2016.

Abstract

Matured fresh storage roots of American Yam Bean (AYB), identified as genotypes: 209022, 209019, 209013, 209041, 209018, 209015, 209016 and 209046 were investigated for their potential in processing of *gari*. The *gari* was further evaluated for preparation of *eba* (*gari* paste). Moisture content of the gari ranged from 10.19 to 14.327%. The crude fibre content was relatively high, 2.090 (209019) to 5.257 (209018) with corresponding high ash contents 0.613 (209019) to 3.113 (209018) the *gari* may serve as good source of crude fibre. The lipid is relatively moderate 3.077 (209016) to 6.630 (209013). All the parameters were significantly ($p > 0.05$) different among the genotypes.

Keywords: *American Yam Bean; Gari; Pachyrhizus ahipa; National Root Crop Research Institute; MOUAU*

Introduction

American Yam Bean (*Pachyrhizus ahipa*) is a round, fleshy tap root vegetable of bean family, native to Central America. It is also known as Ajipa (a-hee-pa), Yam Bean, Andean Jicama, Andean Yam Bean in local languages. It is an indispensable ingredient of Mexican cuisine similar to potato and the roots are richer in proteins compared to yam and cassava. American yam bean has numerous potential for both food production and high quality. It was reported to have both food and non-food uses, some of which includes lactation agent in nursing mothers, as well as digestive and antipyretic remedial in respiratory and urinary tract ailments, ant-itching ointments against mange and many other medicinal uses [1]. It has several food uses particularly as vegetable. AYB roots can be processed into many food forms and can be washed, peeled, sliced and eaten raw to provide a great source of starch (energy). When cooked it retains its crispiness [2]. *Gari* is a dry, free flowing, granular, fermented, acidic (pH< 4.5) product, made from peeled fresh cassava roots. National Root Crop Research Institute, Umudike had just acquired AYB accessions from CIP and hence it is necessary to investigate the possible utilization of the crop for *gari* production.

Objective of this preliminary work is therefore to investigate its potential for preparation of *gari* using the storage roots of AYB in the hope of making a significant contribution to food supply, especially where resources are poor.

Materials and Methods

American yam bean *gari* processing

Freshly harvested matured American Yam Bean (AYB) tubers, identified as genotypes: 209022, 209019, 209013, 209041, 209018, 209015, 209016 and 209046 were harvested and normal procedure for *gari* processing was employed in the operational and sub operational units [3] to process AYB *gari* as shown in Figure 1 and 2.

Proximate analysis of the AYB Tubers Products

Standard methods [4] of analysis were used to evaluate the following: Moisture content (MC), dry matter (DM), crude fibre (CF), Ash content and Lipids.

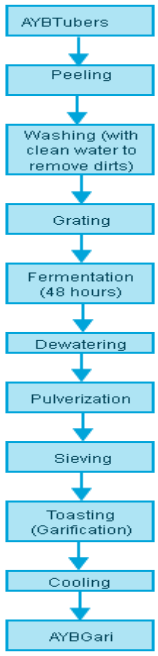

Figure 1: *Flow chart for American Yam BeanGari processing stages.*

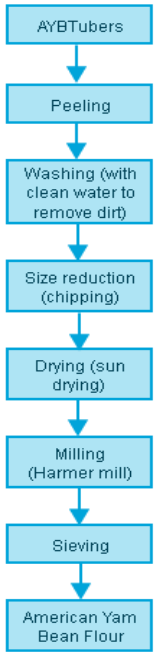

Figure 2: *Flow chart for AYB Tubers Flour processing.*

Sensory Evaluation

Organoleptic quality of the *eba* (paste) was conducted in the product development Programme of National Root Crops Research Institute (NRCRI), Umudike. A twenty-member sensory panel drawn from NRCRI staff and post graduate students of Food Science and Tech-

nology, Michael Okpara University of Agriculture (MOUAU) was used for the sensory evaluation. The formulated paste was subjected to sensory evaluation for color, taste, mouth feel, aroma and general acceptability quality attributes using 9- point Hedonic scale [5].

Statistical Analysis

All data were subjected to analysis of variance using SAS and Microsoft excel.

Results and Discussion

The proximate composition results of *gari* made from fresh AYB tubers is shown in Table 1. Moisture content ranged from 10.19 to 14.327%. The crude fibre content of *gari* is relatively high, 2.090 (209019) to 5.257 (209018) with corresponding high ash contents 0.613 (209019) to 3.113 (209018) the *gari* may serve as good source of crude fibre. The lipid is relatively moderate 3.077 (209016) to 6.630 (209013). All the parameters were significantly (p> 0.05) different among the genotypes.

Sample	MC	DM	CF	ASH	LIPIDS
209015	14.327^{a}	85.673^{g}	4.580^{b}	1.903^{b}	3.323^{d}
209019	12.693^{c}	87.307^{e}	2.090^{f}	0.613^{e}	3.107^{e}
209016	10.190^{f}	89.810^{b}	3.080^{e}	0.800^{d}	3.077^{e}
209013	11.283^{d}	88.717^{d}	3.803^{d}	1.187^{c}	6.630^{a}
209018	10.370^{e}	89.643^{c}	5.257^{a}	3.113^{a}	3.330^{d}
209041	13.080^{b}	86.920^{f}	2.113^{f}	0.623^{e}	6.127^{b}
209046	11.610^{g}	89.390^{a}	4.440^{c}	1.223^{c}	3.837^{c}
LSD 0.05	0.064	0.064	0.037	0.042	0.048

Table 1: *Sensory Evaluation of eba made from AYB tubersgari.*

Variety 209016 had the highest percentage *gari* yield, while variety 209014 had the lowest percentage yield. The results of the sensory evaluation of *gari* made from the AYB and the reconstituted *gari* into paste or fufu (eba) is shown in Table 2 and 3 respectively. Over 70% of the AYB varieties gave acceptable *gari*. The *gari* from variety 209022 was mostly acceptable and differed (p< 0.05) significantly from all others. There was significant (p< 0.05) difference in the colour of the *eba*. Variety 209022 *eba* was mostly acceptable and differed significantly from every other variety. All the *eba*, except variety 209046 gave acceptable colour as judged by the taste panel. In term of hand feel and mould ability over 80% of the *gari* gave acceptable *eba*. Variety 209022 aroma was mostly acceptable and significantly different from other samples. Generally variety 209019 compared favourably with variety 209022.

S.N0	Genotypes	Colour	Hand feel	Mould Ability	Aroma	G/Accept
1	209022	8.00^{a}	7.16^{a}	7.67^{a}	7.44^{a}	7.66^{a}
2	209019	5.05^{bc}	5.77^{bc}	6.39^{abc}	5.72^{b}	6.55^{ab}
3	209013	5.88^{bc}	5.77^{bc}	5.61^{bcd}	5.61^{b}	5.83^{b}
4	209041	6.11^{b}	6.44^{ab}	6.89^{ab}	5.94^{b}	6.38^{b}
5	209018	5.27^{bc}	5.05^{cd}	4.89^{d}	4.94^{b}	5.44^{c}
6	209015	4.94^{c}	5.72^{bc}	6.56^{ab}	5.61^{b}	6.16^{c}
7	209016	4.88^{c}	4.50^{d}	4.61^{d}	4.89^{b}	4.66^{c}
8	209046	3.72^{d}	4.94^{cd}	5.16^{cd}	4.89^{b}	4.55^{c}
	LSD	1.133	1.172	1.301	1.116	1.139

Table 2: *Sensory Evaluation of gari made from AYB tubers.*

S.N0	Variety	Colour	Aroma	G/Accept
1	209022	8.2222[a]	7.7778[a]	8.1111[a]
2	209019	5.4444[c]	6.0000[b]	6.0000[bc]
3	209013	5.7778[bc]	6.1667[b]	6.0556[bc]
4	209041	6.5556[b]	5.8889[b]	6.2222[b]
5	209018	5.3333[c]	5.8333[b]	5.5556[bc]
6	209015	5.0556[c]	5.2222[b]	4.8889[cd]
7	209016	5.0000[c]	5.1111[b]	4.9444[cd]
8	209046	5.1111[b]	4.0000[c]	4.0556[d]
	LSD	1.1045	1.1001	1.172

Table 3: *Sensory Evaluation of gari made from AYB tubers.*

Percentage gari yield is as shown in Figure 1. The yield ranged from 11.67 to 25%. Variety 209016 had the highest yield, while variety 209014 had the lowest percentage yield. Though the sensory result revealed lower numerical score in terms of acceptance of both the gari and eba made from the variety with highest percentage yield (209016), it could still be used for gari production because statistically the eba and the gari acceptance compared favourably with some other varieties (209018 and 209015) that were acceptable.

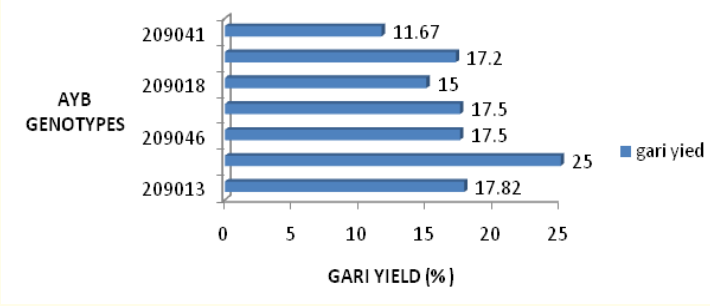

Figure 1: *Percentage gari yield of AYB tubers.*

Recommendation

Variety 209022 may be more suitable for gari production due to its gari and eba good qualities. Varieties 209013, 209041 and 209018 could be used as well. While variety 209016 could be used for composite gari production. Further work should be done on the fresh root for more food uses. There is need to screen the crop for phytochemicals, proximate composition to exploit both the food and other uses as well as varietal characterization of this valuable new crop.

Bibliography

1. Wolfgang G American Society of Agronomy. "High Protein Yam Bean: A Nearly Forgotten Crop." Science Daily (2007).

2. Umesh Rudrappa (2009).

3. Ukpabi UJ., *et al.* "Feasibility of using sealed polyethylene film in prolonged storage of gari". *Advances in Applied Science Research* 3.3 (2012): 1239-1243.

4. AOAC. Official methods of Analysis of the Association of Official Analytical Chemists, Washington DC USA (1990).

5. Iwe MO. "A hand book of sensory methods and Analysis". First edition Rejoint Communication Service Ltd. 65 Adelabu St. Uwani Enugu. (2002): 71.

Volume 3 Issue 3 May 2016