

RTBfoods WP3: High-throughput phenotyping protocols (HTPP)		
SOP: NIRS Measurement on Milled and Un-milled Gari		
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Table of contents

1	Scope and application	3
2	References	3
3	Reagents.....	4
4	Apparatus	4
5	Procedure	5
6	Expression of results.....	Error! Bookmark not defined.
7	Critical points or Note on the procedure	7
8	Revision record	9
9	Appendix.....	9

Abstract:

Gari is a creamy white granular flour produced from fermented and gelatinized cassava mash. Application of Near-infrared spectroscopic techniques in analyzing the chemical and functional properties of gari depends on the collection of quality spectral data. This SOP was developed to collect the spectra of gari using the NIRS equipment. Particle sizes of gari vary depending on the size of the sieve used during production. Therefore, the SOP covered the presentation of gari sample “as is” and as “milled gari” to obtain the uniform particle size. Spectral data of gari were collected in three replications, and each measurement involves taking fresh samples into the sampling ring cup. The SOP also included the materials required, repeatability test and the critical points for the measurement.

Keywords: Cassava roots, Gari, functional property, Spectra, NIRS

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27/10/	Karima Meghar	Reviewing
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1 SCOPE AND APPLICATION

Gari is a starch rich high energy and staple product derived from cassava (*Manihot esculenta* Cranz). It is regarded as a convenient product as it is stored and marketed in a ready-to-eat form and may be prepared with hot or cold water; this depends on the intended form in which it is to be consumed. Gari is the most common form in which cassava is sold and consumed in Nigeria and other African countries. Gari is obtained from cassava roots after several successive steps: peeling, washing, grating, pressing/fermenting, sieving, and cooking/drying (Escobar et al.,

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Analysis of milled gari using Near Infrared Spectrophotometer

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2018). This protocol is developed for the analysis of gari; a granulated cassava product using the Near-Infrared Reflectance Spectrometer.

2 REAGENTS

No reagent uses

3 APPARATUS

Material	Image
Electric power Blending machine This is used to for pulverizing the gari samples prior NIRS analysis.	
Near Infrared Reflectance Spectrophotometer (NIRS) XDS Rapid Content Analyzer Serial No: 3013-0857 Wavelength range of 400- 2495 nm	

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Date: 31/12/2020 to 31/10/2021

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4 PROCEDURE

Gari samples are presented for analysis “as is” (un-milled) or as milled using a laboratory mill. An electric milling machine is used to pulverize the gari to a fine and uniform particle (< 0.1 microns). Homogenized milled or un-milled samples are filled into samples cups and placed unto the sample compartment of the NIRS machine. Triplicate scans of each sample are taken during measurements. The samples ring cell are properly cleaned using dry soft tissue after each analysis.

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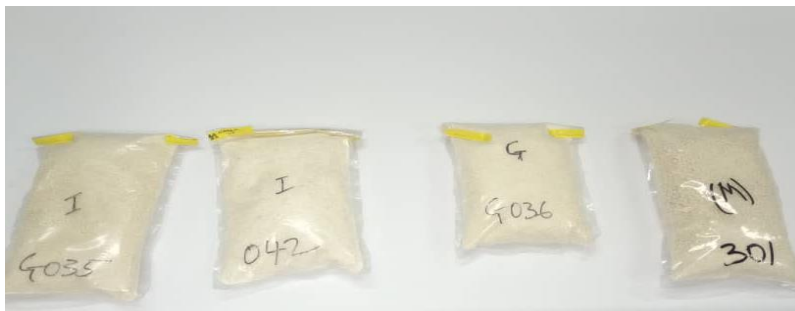


Figure 1: Work Flow for milled gari measurement using NIRS

5 EXPRESSION OF RESULTS

Results are expressed on dry weight basis of the unit of measurement e.g. % (w/w)

6 CRITICAL POINTS OR NOTE ON THE PROCEDURE

- The Tabletop Near Infrared Spectrophotometer must be switch on 30 minutes before taking spectra reading. Also, the diagnostics test of the equipment must be successfully completed.
- Minimum of triplicate spectra (different sampling from the sample sample) must be collected for each sample
- The repeatability test must be carried out by taking at least ten readings on the blended sample. Absorbances values repeatability is an indication of the stability and performance of the Near Infrared Spectrophotometer. The mean ($\bar{x}$) and standard deviation of the absorbances for the average spectra are estimated for each wavelength, and the root mean square error (RMS) was calculated using the equation below :

$$\text{RMS}(i) = \sqrt{\frac{\sum_j^p (X_{ij} - \bar{X}_j)^2}{p}}$$

Where:

$\bar{X}_j$ average of absorbance of wavelength j

p number of wavelengths (j variate from 1 to p).

X_{ij} is an absorbance value of spectra i for wavelength j.

- The root means square error (RMSE) for 10 repetitive spectra of the milled gari sample ranged from 3060 – 14603 μabs and an average of 6888 μabs . Also, RMSE for Un-milled gari had a range of 25189-19102 μabs and average values of 83640 μabs , respectively. The considerable difference in the average RMSE shows that spectral data collection is better from milled gari than unmilled gari (this is because of non-uniform particle size)

RTBfoods-WP3

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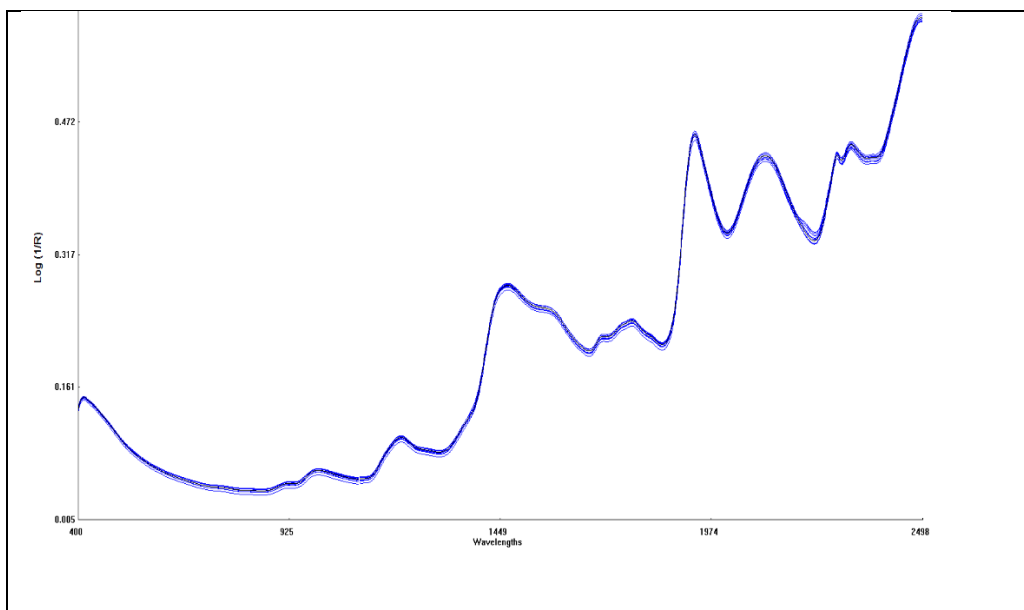


Figure 2: Spectra of 10 replications of milled gari using the NIRS

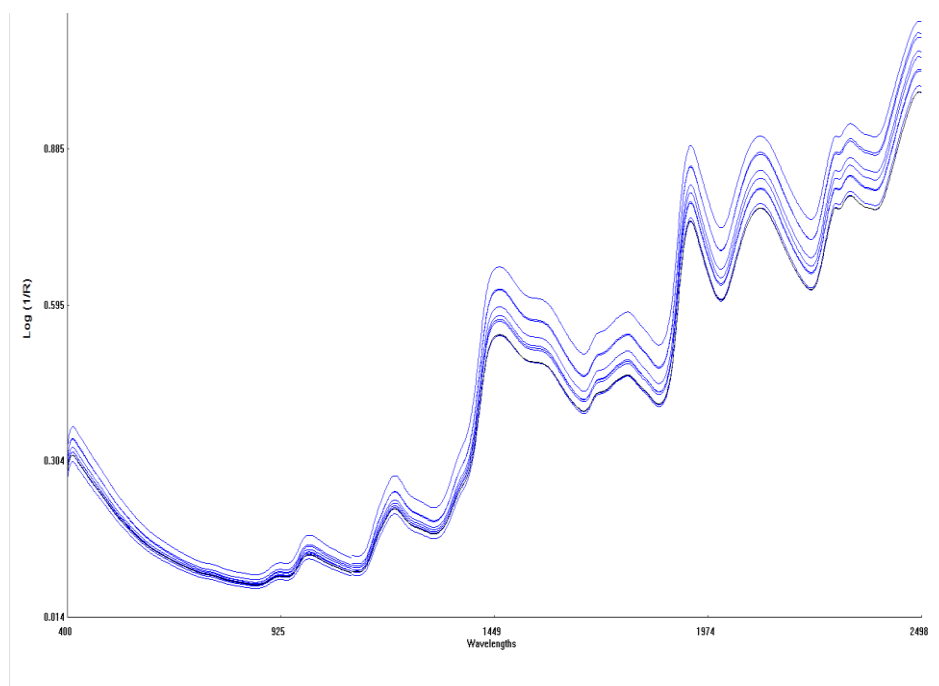


Figure 3: Spectra of 10 replications Un-milled gari using the NIRS

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7 REVISION RECORD

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8 APPENDIX