Laboratory Standard Operating Procedure

SOP for Determination of Ease of Peel of Cassava Root

Biophysical Characterization of Quality Traits, WP2

Umudike, Nigeria, 2022

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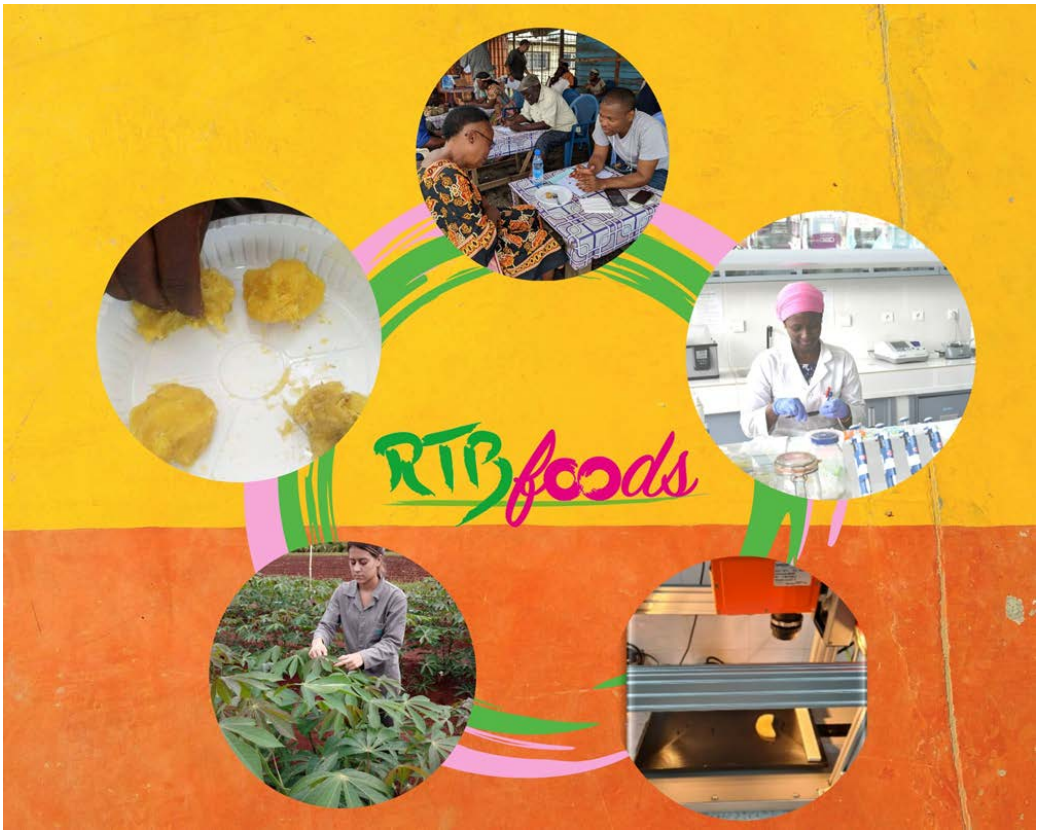

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Ethics: The activities, which led to the production of this manual, were assessed and approved by the CIRAD Ethics Committee (H2020 ethics self-assessment procedure). When relevant, samples were prepared according to good hygiene and manufacturing practices. When external participants were involved in an activity, they were priorly informed about the objective of the activity and explained that their participation was entirely voluntary, that they could stop the interview at any point and that their responses would be anonymous and securely stored by the research team for research purposes. Written consent (signature) was systematically sought from sensory panelists and from consumers participating in activities.

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WP2: Biophysical Characterization of Quality Traits

SOP: Determination of Ease of Peel of Cassava Root

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ABSTRACT

The ease of peeling fresh cassava root has been a major bottle neck which affects productivity of cassava processor in Nigeria and other cassava producing regions in the world. This study involves standardization of the protocol for measuring ease of peeling fresh cassava roots. This document describes the procedure for measuring ease of peel of cassava using root weight, length, circumference, ease of peeling , smoothness of skin, peel thickness, peel weight, and peeling time of different genotypes with different shape (cylindrical, conical and irregular) and size (small, medium and big). These root characteristics determine the ease of peeling cassava roots. The protocol involves evaluation of 3 roots from each different cassava genotype possessing contrasting root quality attributes (geometric characteristics) by three (3) champion processors

Key Words: Cassava, SOP, peeling time, Root quality attributes

1 SCOPE AND APPLICATION

The objective of the study is to establish a standard operating procedure (SOP) for measuring ease of peeling cassava roots with respect to different root quality attributes (shapes, length, skin smoothness, sizes etc).

2 DEFINITIONS

Terms interest:

Peeling : It is the removal of unwanted or undesireable layer of skin from raw produce

Conical : Having the shape of a cone

Cylindrical : Having straight parallel sides and a circular or oval cross-section ; in the shape of a cylinder

Irregular : Not even or balanced in shape

3 PRINCIPLE

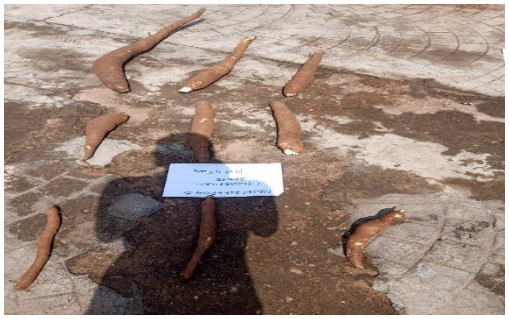
The cassava tuber has two layers, the outer layer (periderm) and the inner layer (cortex). The lack of uniformity in size, weight and shape of cassava root has been the major problem facing peeling of cassava roots. Variation in thickness, texture and strength of adhesion of peel to flesh is also responsible for difficulties experienced by processors during peeling of cassava root. The irregularity of root shape results in considerable loss valuable of time and material during processing (Hahn et al. 1992) and therefore are major constraints during harvesting and post-harvest processing of cassava (Yonis et al. 2020). The principle of this SOP therefore comprises the influence of some morphological properties of cassava root on the ease or difficulty experienced during removal of peel from the outer layer (periderm) and the inner layer(cortex) of the root. Measurement of root weight, length, circumference (mid portion), smoothness of skin (using a scale of 1- extremely smooth to 5- extremely rough), easy to peel (using a scale of 1- extremely difficult to 5- extremely easy), peel thickness (using a scale of 1- extremely thick to 5 – extremely thin), peel weight, and peeling time (min) are obtained from 3 roots per cassava genotypes having contrasted shapes (cylindrical, conical and irregular) and, sizes (small, medium and big) using semi-trained champion processors. Furthermore, the study involves establishing the putative relationship between these characteristics of root, peeling time and/or yield.

4 APPARATUS

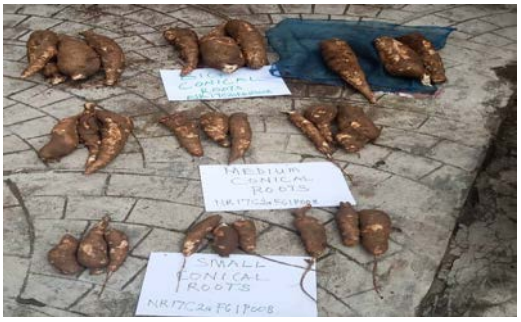
- Salter weighing balance with a precision of 0.05g
- Stainless steel kitchen knives
- Stop watch
- Measuring tape

5 PROCEDURE

- ✓ Sort the elite cassava varieties not more than 12 months old into the different categories of shapes and sizes.



Cylindrical

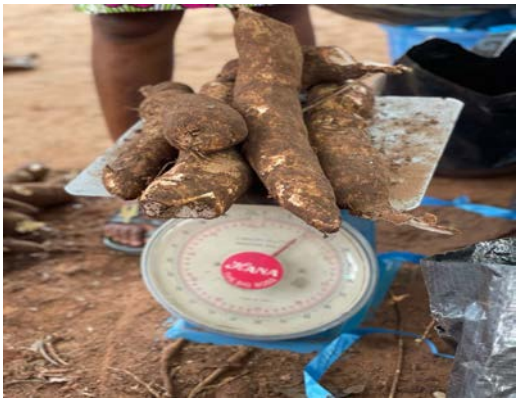


Conical

Irregular

Fig 1. Labelled samples of different categories and sizes

- ✓ Evaluate geometric characteristics of 9 roots from different genotype having contrasting morphological attributes using three (3) champion processors
- ✓ Take the weight of each category of root on a salter weighing balance.precision of 0.05g
- ✓ Measure the length and circumference of the middle of each category with a measuring tape
- ✓ Note smoothness of skin using a scale of 1- extremely smooth to 5- extremely rough
- ✓ Peel with a high-grade stainless steel kitchen knife to ensure minimal loss of the flesh.
- ✓ Take note of the start and end of peeling of each processor with a stop watch



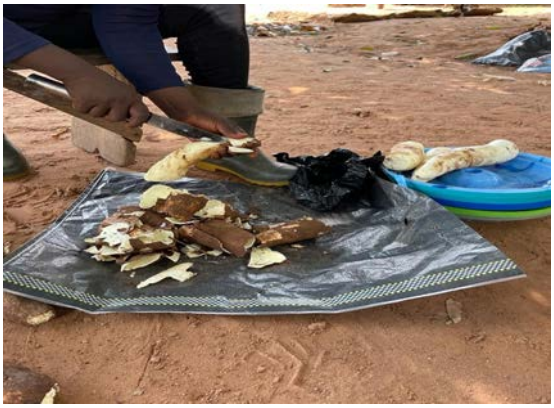


Fig 2. Weighing and peeling process

- ✓ Measure the thickness of the peel visually on a scale of 1 – 5 or with venier caliper
- ✓ Measure the easiness/difficulty in peeling, smoothness and thickness using a scale of 1 - 5
- ✓ Take the weight of the peeled roots and the peels using a Salter weighing balance (0.05g precision)

6 APPENDIX

Template of the analysis report of the fresh cassava roots used for the activities (processor 1)

					processor 1							
ascession name	category	size	root wt.(kg)	length (cm)	circumference (cm)	peeling time (min)	wt. of peel (kg)	wt. of peeled root (kg)	thickness of peel	easiness	general easiness	general smoothness
NR17C2aF99P002	cylindrical	big	2.8	46.7	19	3:31	0.72	2.08	4	3		
		medium	1.6	32.5	16.8	2:25	0.38	1.22	4	3	3	3
		small	0.4	20.4	10.3	1:43	0.13	0.27	4	3		
NR17C2aF61P008	conical	big	3.2	37.7	23.6	3:46	0.42	2.78	2	4		
		medium	1.2	22.7	16.1	1:58	0.19	1.01	2	4		4
		small	0.3	14.3	12.7	1:31	0.17	0.13	2	4		
NR17C2aF70P008	irregular	big	2.4	55.3	16.4	4:10	0.58	1.82	4	2		
		medium	1.1	39.7	12	2:30	0.38	0.72	4	2	2	2
		small	0.2	20	10.8	1:34	0.13	0.07	4	4		
NR17C2aF14P016	conical	big	1.4	36	25.5	1:43	0.19	1.21	4	4		
		medium	1	28	22.5	0:40	0.19	0.81	2	3	4	3
		small	0.5	18	18	0:19	0.13	0.37	2	4		
NR17C2aF7P043	cylindrical	big	1.2	50.3	20.2	1:05	0.22	0.98	2	3		
		medium	1.1	41	19.2	0:55	0.22	0.88	3	3	3	4
		small	0.3	30.5	15.8	0:40	0.09	0.21	3	3		
IITA-TMS-IBA00070	irregular	big	1.5	38	25.5	1:43	0.21	1.29	3	3		
		medium	0.8	40	22.5	0:40	0.16	0.64	4	4	2	2
		small	0.5	26	18	0:19	0.08	0.42	4	4		

Template of the analysis report of the fresh cassava roots used for the activities (processor 2)

		processor 2										
ascession name	category	size	root wt.(kg)	length (cm)	circumference (cm)	peeling time (min)	wt. of peel (kg)	wt. of peeled root (kg)	thickness of peel	easiness	general easiness	general smoothness
NR17C2aF99P002		big	4.6	65.3	19.7	2:19	0.5	4.1	3	5		
	cylindrical	medium	1.3	38.3	16.7	1:11	0.29	1.01	3	4	3	2
		small	0.8	21.7	9.7	0:38	0.091	0.709	3	5		
NR17C2aF61P008		big	4	35.7	28.3	1:21	1.1	2.9	3	3		
	conical	medium	1.4	30.7	18.3	1:17	0.47	0.93	3	4	3	2
		small	0.5	17	14.7	0:27	0.097	0.403	3	3		
NR17C2aF70P008		big	2	33.3	19.3	1:04	0.64	1.36	4	4		
	irregular	medium	1	29.3	13.7	1:11	0.27	0.73	4	4	2	2
		small	0.3	26	9.3	0:48	0.14	0.16	4	4		
NR17C2aF14P016		big	1.42	28	29	0:31	0.33	1.09	2	4		
	conical	medium	0.92	30	24	0:55	0.34	0.58	2	4	2	3
		small	0.45	23	19	0:51	0.11	0.34	2	4		
NR17C2aF7P043		big	1.29	74	18	1:48	0.33	0.96	4	2		
	cylindrical	medium	0.89	38	21	0:59	0.17	0.72	4	4	4	4
		small	0.21	38	12	0:37	0.11	0.1	4	2		
IITA-TMS-IBA00070		big	1.27	48	23	1:36	0.23	1.04	4	2		
	irregular	medium	0.95	28	23	1:52	0.12	0.83	4	4	4	4
		small	0.43	27	18	1:01	0.073	0.357	4	4		

Template of the analysis report of the fresh cassava roots used for the activities (processor 3)

						processor 3						
ascession name	category	size	root wt.(kg)	length (cm)	circumference (cm)	peeling time (min)	wt. of peel (kg)	wt. of peeled root (kg)	thickness of peel	easiness	general easiness	general smoothness
NR17C2aF99P002	cylindrical	big	4.4	51.7	21.5	7:23	0.46	3.94	5	5		
		medium	2	30.7	20.2	4:07	0.15	1.85	5	4	4	4
		small	0.2	15	10.3	2:15	0.13	0.07	5	3		
NR17C2aF61P008	conical	big	3.8	35.3	24.2	4:25	1.22	2.58	2	3		
		medium	1	20.7	17.2	2:18	0.57	0.43	2	3	5	5
		small	0.8	15.3	14.7	3:02	0.1	0.7	2	3		
NR17C2aF70P008	irregular	big	2.01	51.3	17.5	6:01	0.62	1.39	5	4		
		medium	1	21.7	14.8	4:47	0.24	0.76	5	4	4	3
		small	0.6	15.7	12.5	3:16	0.14	0.46	5	4		
NR17C2aF14P016	conical	big	1.6	31	26	2:57	0.25	1.35	2	4		
		medium	1	23	24	1:43	0.14	0.86	2	4	4	3
		small	0.4	16	23.5	0:47	0.07	0.33	2	3		
NR17C2aF7P043	cylindrical	big	3.9	106	29	3:41	0.68	3.22	3	4		
		medium	1	47	20	1:17	0.24	0.76	2	3	4	4
		small	0.2	33	9	0:34	0.06	0.14	2	2		
IITA-TMS-IBA00070	irregular	big	2	141	30.5	1:56	0.25	1.75	2	3		
		medium	1	31	25	1:58	0.14	0.86	2	3	3	3
		small	0.4	28	14	1:02	0.07	0.33	2	3		

KEY

Peel thickness	Smoothness of skin	ease- to-peel
1 – extremely thin	1 – extremely rough	1 – extremely difficult
2 – thin	2 – rough	2 - difficult
3 – neither thick nor thin	3 – neither rough nor smooth	3 - neither difficult nor easy
4 – thick	4 – smooth	4 - easy
5 – extremely thick	5 – extremely smooth	5 – extremely easy

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