Postharvest quality of cassava, markets and consumer preferences

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Agroindustrial Eng.

20-23 November 2023 – Monteria, Colombia

Cassava market for fresh consumption

- **High dry matter content: Value>35%**

Dry matter quantification for Nirs and oven

- **Low Cyanide Content**

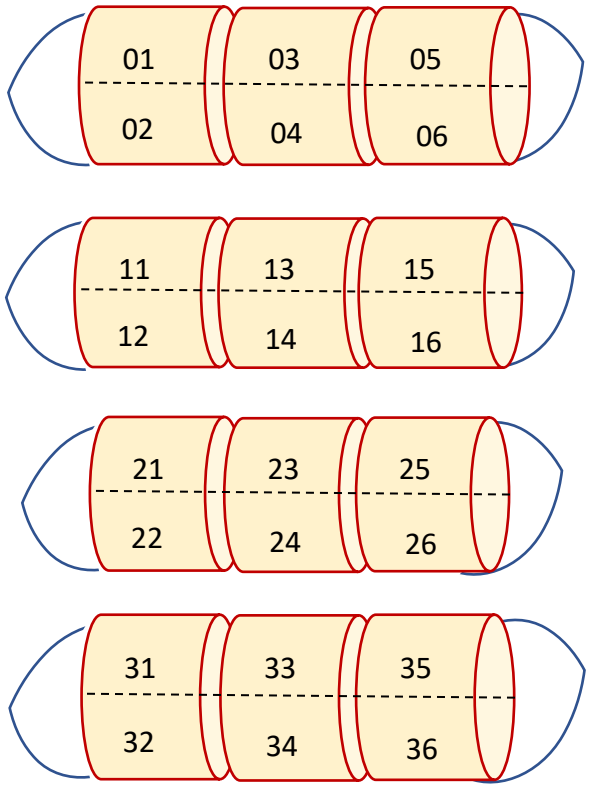
HCN content allowed
< 180 ppm on a dry basis
< 50 ppm on a wet basis

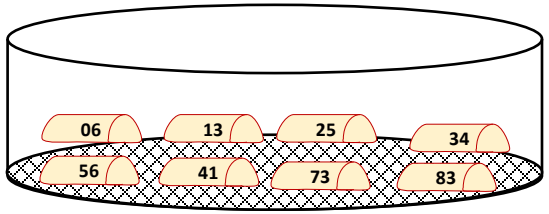
Enzymatic quantification

Low Susceptibility to Postharvest Physiological Deterioration (PPD)

❖ Short Cooking time and Culinary quality

Method: Water absorption and Optimal cooking time





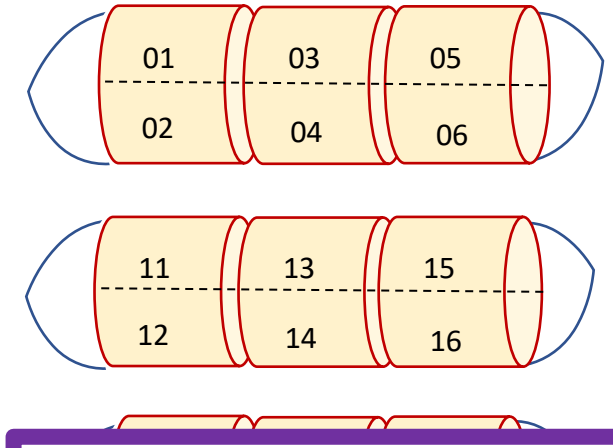
Selection of 9 pieces (proximal, central and distal)

# piece	6	13	25	34	41	56	73	83	94
Time (min)	30	15	20	15	35	60	20	20	60

Optimal Cooking time: 30 min

❖ Short Cooking time and Culinary quality

Method: Water absorption and Optimal cooking time



International Journal of Food Science +Technology

International Journal of Food Science and Technology 2021, **56**, 1193–1205

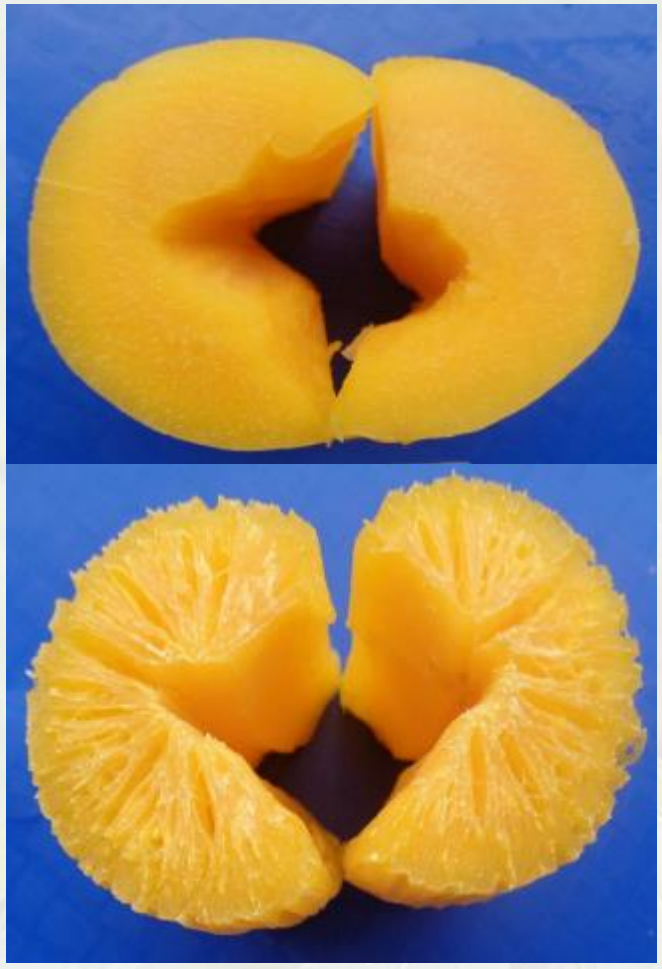
Original article

Correlation of cooking time with water absorption and changes in relative density during boiling of cassava roots

Thierry Tran,[1,2,3] Xiaofei Zhang,[1] Hernan Ceballos,[1]* Jhon L. Moreno,[1] Jorge Luna,[1] Andrés Escobar,[1] Nelson Morante,[1] John Belalcazar,[1] Luis A. Becerra[1] & Dominique Dufour[1,3,4]

Descriptors in the sensory evaluation of boiled cassava

- Color
- Hardness
- Friability
- Fibrousness
- Stickiness
- Bitterness
- Glassiness



Market: Flour and starch production

1. High dry matter content

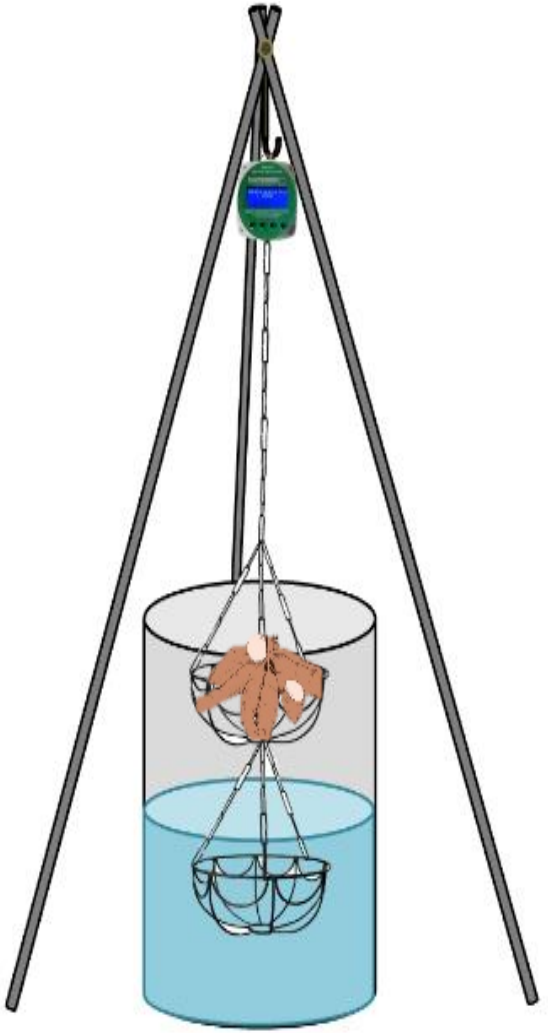
2. Cyanide content (Levels >200 ppm HCN are acceptable)

3. Cooking time and PPD are not a discriminating factor

Tool to measure the percentage of dry matter of cassava

Tutorial: Manejo de la balanza digital para medir materia seca de yuca

https://youtu.be/r8DhdVWY0Jg



-Para más información visité la página: https://n9.cl/herramienta_web_m_seca_yuca

-Disponible aplicación en Play Store como: “Calculadora Materia seca de yuca”

Alianza

Bioversity International

CIAT
Centro Internacional de Agricultura Tropical
Desde 1967 Ciencia para cultivar el cambio

CGIAR

Visits to cassava processing companies

INALMA COMPANY - Honduras

Limitations:

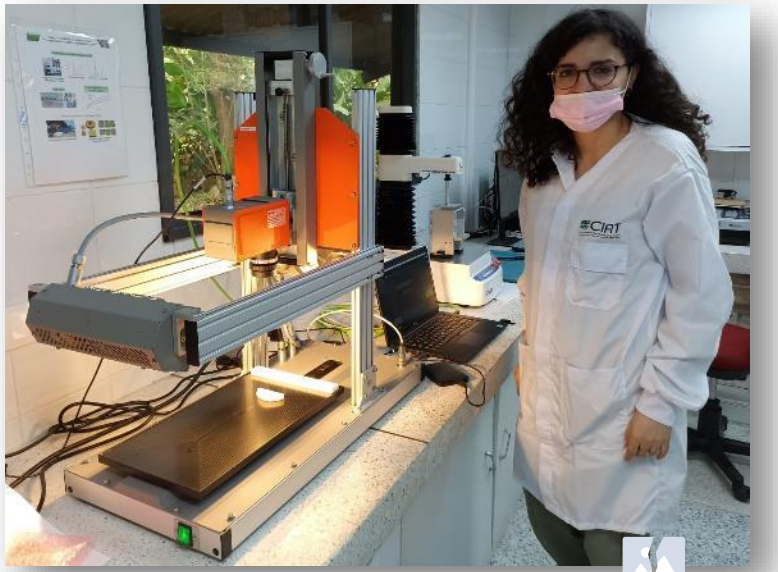
Roots do not cook homogeneously
High crystallization percentage (glassiness)
Fibrosity
Not easy peeling

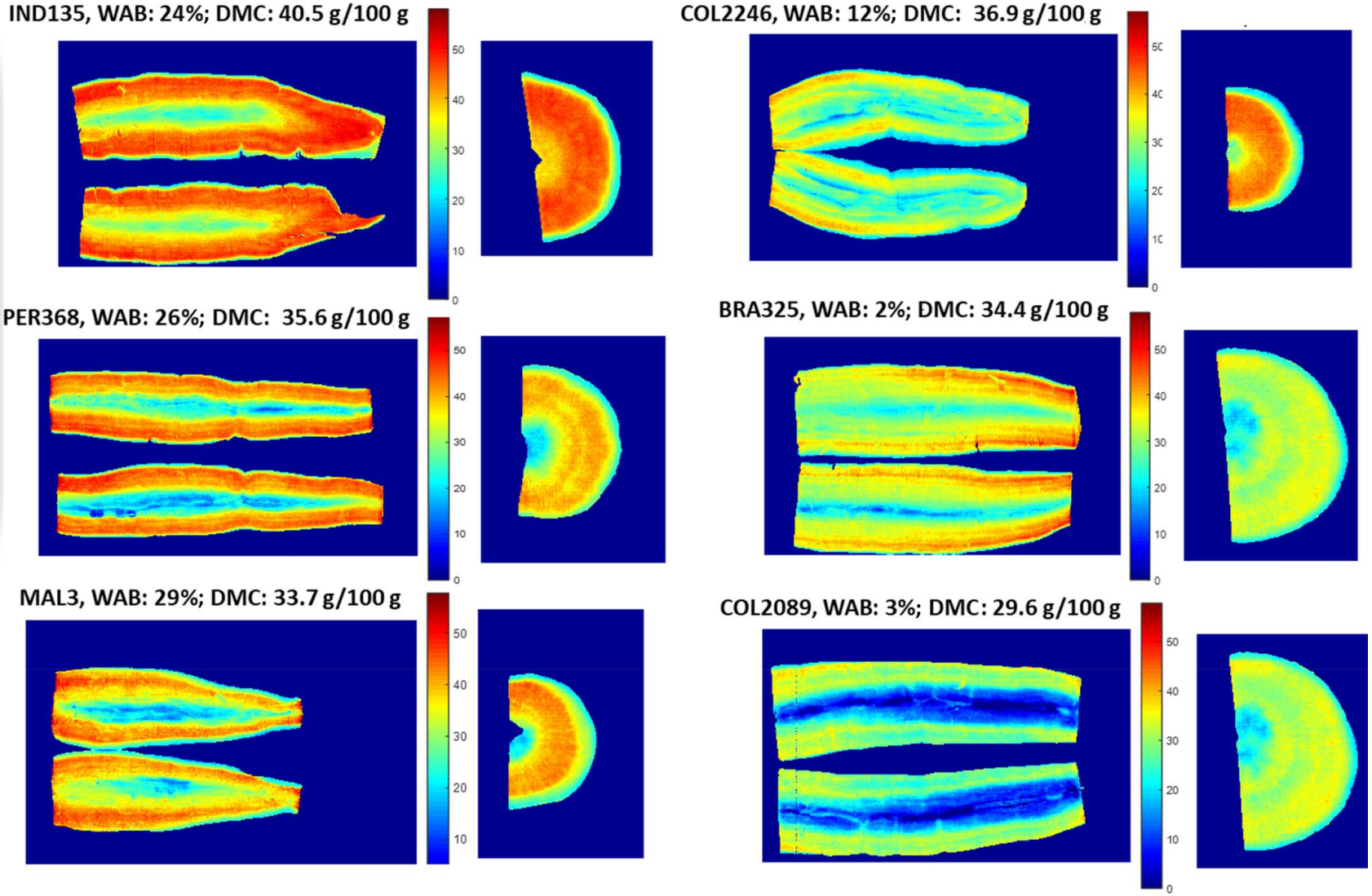
Opportunity:

Genotypes of short and homogeneous cooking
Stable mealiness for staggered harvests
Type CR63 and IND135

% Crystallization Percentage

Hyperspectral imaging analysis





J Sci Food Agric, First published: 22 April 2023, DOI: (10.1002/jsfa.12654)

FRUTICOL COMPANY - Colombia

Limitations:

They cannot find the same variety of cassava to buy
The roots arrive with PPD to the processing plant
Roots that are not easy to peel

Opportunity:

They are interested in yellow genotypes for chips and flour production.
Genotypes like Belloti that have low susceptibility to PPD, high dry matter, and low cyanide would be ideal for your process.

poltec® - Colombia

Uses of modified cassava starch

Meat products

Stability

Sauces and dressings

Sauces that are thicker and more stable over time

Milk Products

Improve the stability and viscosity of your dairy drinks

Breadmaking Products

Greater volume, softness and strength in your product

Thickening agent in sauces

Jam stabilizer

Emulsifier in cheeses, prevents the separation of water and fat

poltec®

Consistometer

ZAHN Cup

Research Project: Developing combined interventions to address the Double Burden of Malnutrition

Products made from fresh cassava

Croquettes

Cassava Flan

Chips

Ice cream and cone

Products made with cassava flour

GLUTEN FREE

Cookies

Pancakes

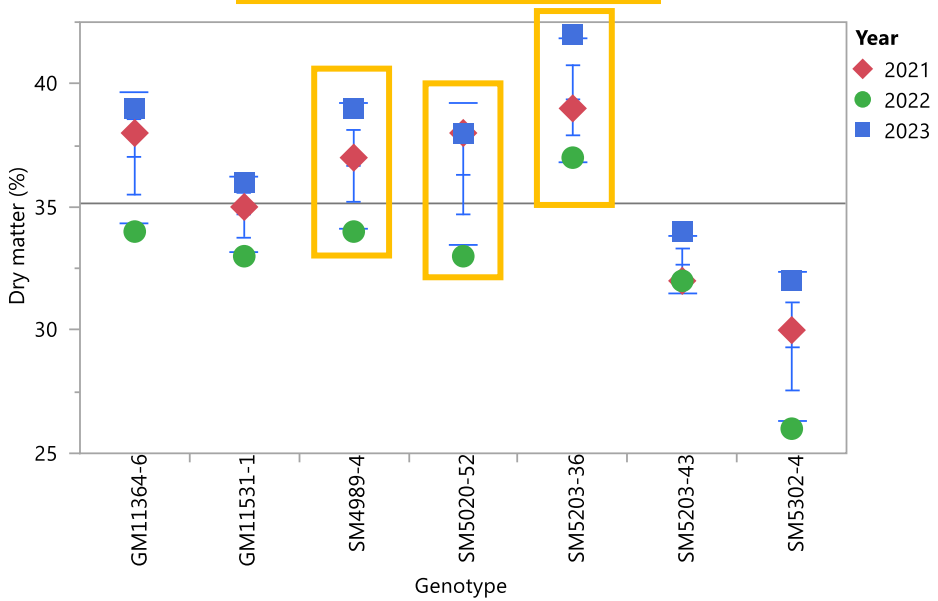
Crepes

Waffles

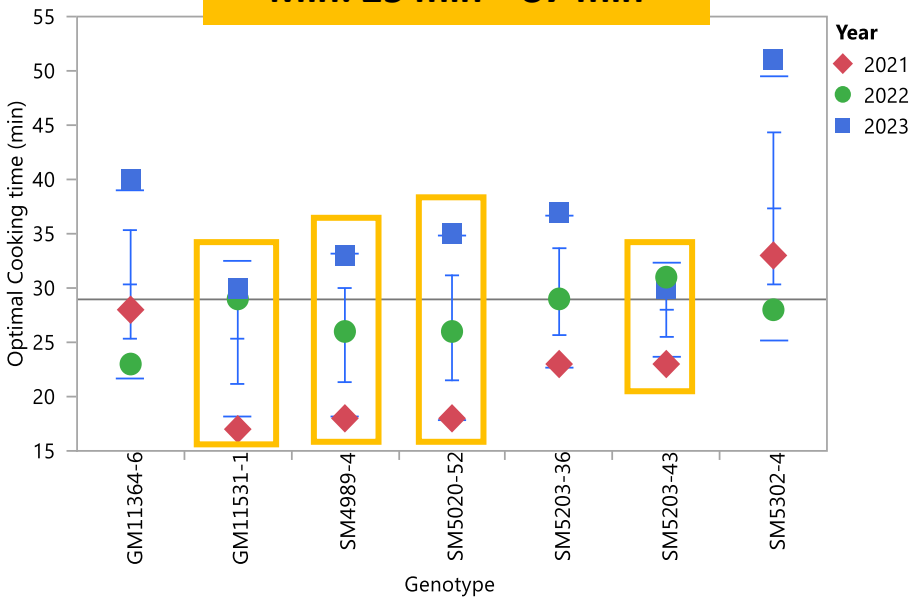
Pasta

Obleas

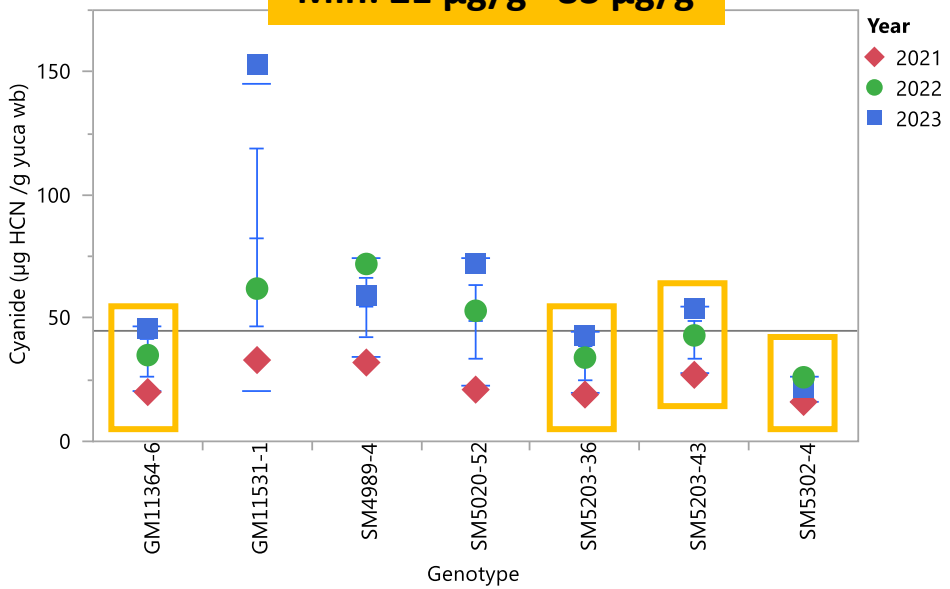
Dry Matter
Min:29% Max:39%



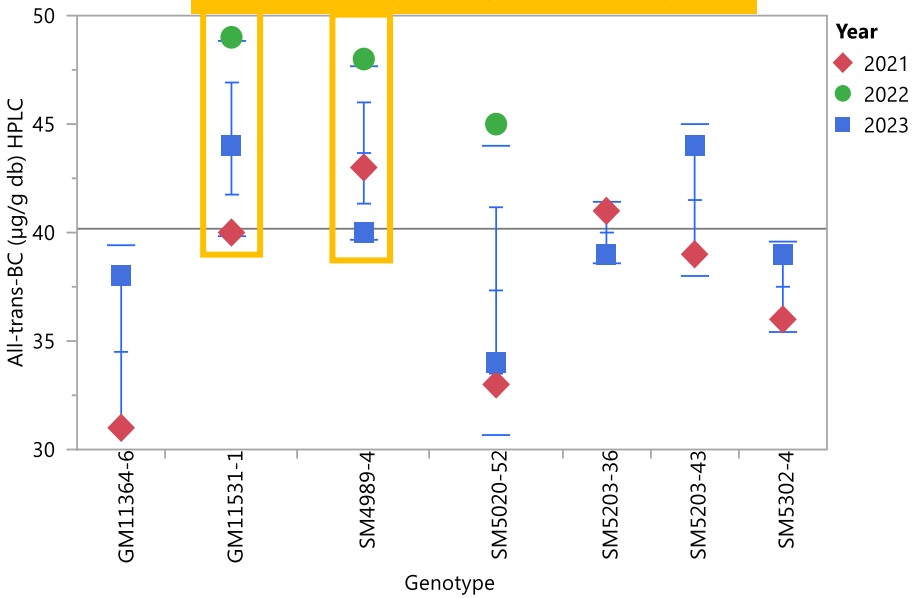
Optimal Cooking time
Min: 25 min – 37 min



Cyanide
Min: 21 µg/g - 83 µg/g



All trans–βetacarotene
Min: 34 µg/g – 44 µg/g



SM4989-4

Dry Matter (%):	36
HCN content (ppm wb):	54
All trans β carotene (µg/g db):	44
Total carotenes (µg/g db):	62
Cooking time(min):	26

GM11531-1

Dry Matter (%):	35
HCN content (ppm wb):	83
All trans β carotene (µg/g db):	44
Total carotenes (µg/g db):	53
Cooking time(min):	25

***SM4989-4 and GM11531-1 had the best behavior to make products from cassava flour**

SM5203-43

Dry Matter (%):	32
HCN content (ppm wb):	27
All trans β carotene (µg/g db):	39
Total carotenes (µg/g db):	57
Cooking time(min):	22

SM5020-52

Dry Matter (%):	**37**
HCN content (ppm wb):	**21**
All trans β carotene (µg/g db):	**33**
Total carotenes (µg/g db):	**43**
Cooking time(min):	**18**

***SM5203-43 and SM5020-52 can be used for fresh consumption**

Journal of the
Science of Food and
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where science
meets business

Research Article | Open Access

Kinetics of thermal degradation of carotenoids related to potential of mixture of wheat, cassava and sweet potato flours in baking products

Maria A Ospina, Jhon Larry Moreno, Thierry Tran, Angélica M. Jaramillo, Sonia Gallego-Castillo, Bernardo Ospina, Dominique Dufour

First published: 05 July 2023 | https://doi.org/10.1002/jsfa.12831

Diversity of post-harvest phenotypic traits among the world cassava germplasm held at CIAT

(Becerra López-Lavalle *et al.*, 2015)

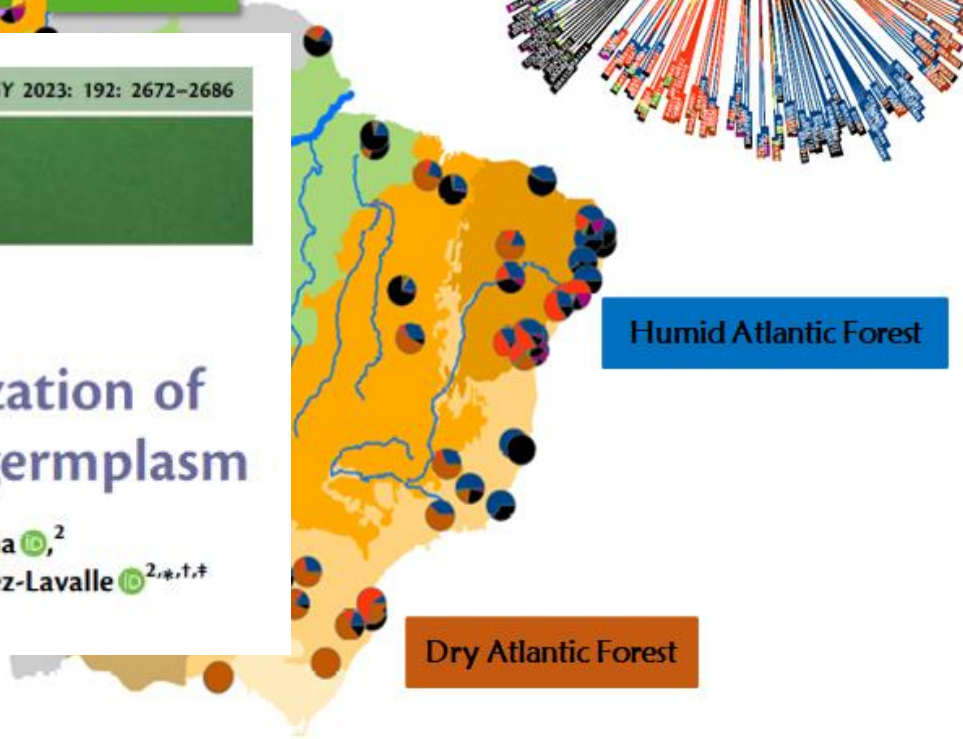
World cassava Germplasm held at CIAT 6.600 accessions

https://doi.org/10.1093/plphys/kiad269 PLANT PHYSIOLOGY 2023: 192: 2672–2686

Plant Physiology®

Integrated genetic and metabolic characterization of Latin American cassava (*Manihot esculenta*) germplasm

Laura Perez-Fons,[1] Tatiana Maria Ovalle,[2] Margit Drapal,[1] Maria Alejandra Ospina,[2] Anestis Gkanogiannis,[2,†,‡] Adriana Bohorquez-Chaux,[2] Luis Augusto Becerra Lopez-Lavalle[2,*,†,‡] and Paul David Fraser[1,*]



Evaluation of postharvest quality traits in Genetic diversity collection

- **2016** — 300 Genotypes
- **2017** — 400 Genotypes
- **2018** — 388 Genotypes
- **2019** — 350 Genotypes
- **2020** — 368 Genotypes, 2 repetitions
- **2021** — 150 Genotypes, 2 repetitions
- **2022** — 204 Genotypes, 2 repetitions
- **2023** — 187 Genotypes, 2 repetitions

Roots

- ✓ Cyanide
- ✓ Postharvest Physiological Deterioration (PPD)
- ✓ Cooking time
- ✓ Dry matter
- ✓ Water absorption

Starch

- ✓ Amylose Content
- ✓ Pasting properties (viscosity)
- ✓ Gel clarity

Leaves

- ✓ Cyanide
- ✓ Protein and aminoacids
- ✓ Carotenoids Content

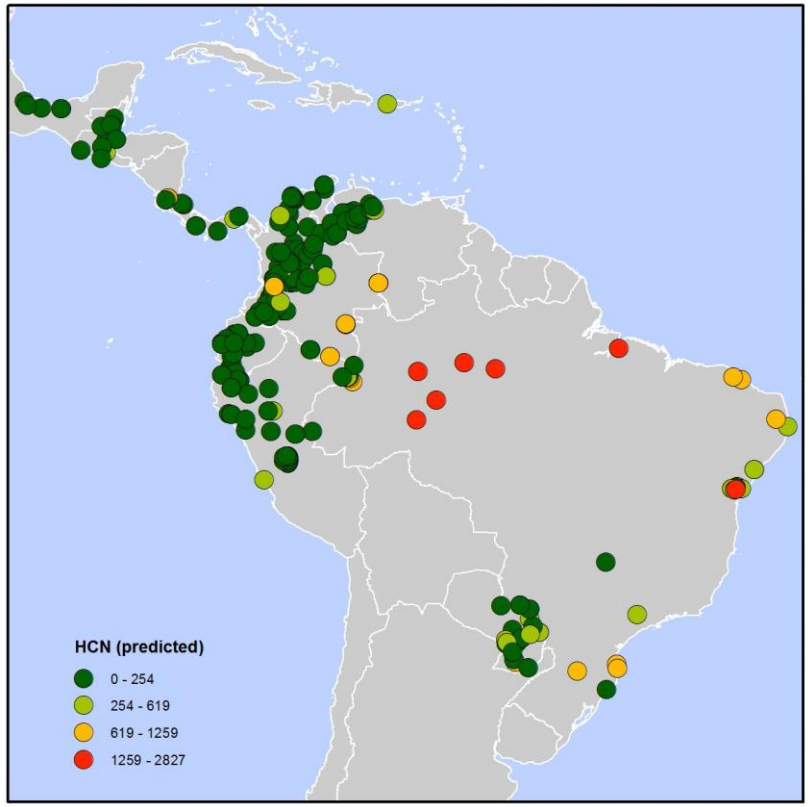
International Journal of Food Science +Technology

International Journal of Food Science and Technology 2021, **56**, 1343–1353

Original article

Cyanogenic, carotenoids and protein composition in leaves and roots across seven diverse population found in the world cassava germplasm collection at CIAT, Colombia

Maria A. Ospina,[1,2] Monica Pizarro,[1] Thierry Tran,[1,3] Julien Ricci,[3] John Belalcazar,[1] Jorge L. Luna,[1] Luis F. Londoño,[1] Sandra Salazar,[1] Hernan Ceballos,[1] Dominique Dufour[2] & Luis A. Becerra Lopez-Lavalle[1*]



Journal of the Science of Food and Agriculture

SCI where science meets business

Research Article

Content and distribution of cyanogenic compounds in cassava roots and leaves in association with physiological age

María A. Ospina, Thierry Tran, Monica Pizarro, Jorge Luna, Sandra Salazar, Luis Londoño, Hernan Ceballos, Luis A. Becerra Lopez-Lavalle, Dominique Dufour

First published: 14 November 2023 | https://doi.org/10.1002/jsfa.13123

GRACIAS!

Pilot plant of production of flour and extraction of starch

- What need the consumers? To know what is the applications for starch and flour. Because we have different kind of starches from diversity and special starches (small granule and waxy)

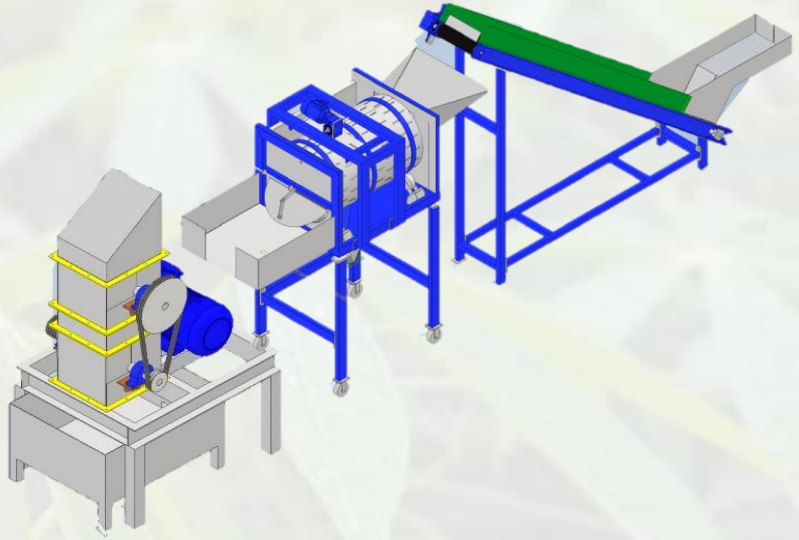
- Machine capacity 3 tons cassava fresh per hour

- Energy consumption 20 kilowatt hours

- Invested US 25.000

- Previous results: For 3870 kg fresh cassava (65% humidity), this yields 1000 kg of cassava flour (12% humidity)

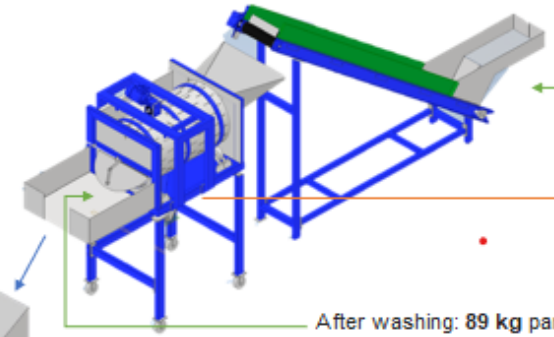
- For flour production uses minimal water consumption.



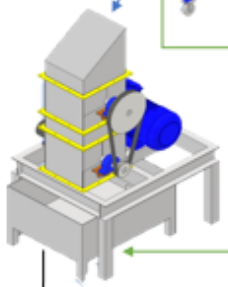
Test 1: Fresh roots sample- 100 kg

Mass balance

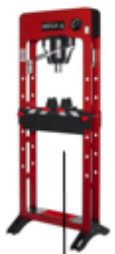
Before washing: roots 93.20 kg / residues 6.80 kg



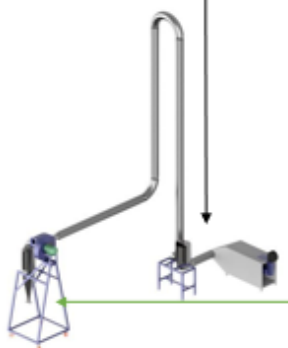
After washing: **89 kg** partially peeled and cleaned roots / residues: **4.2 kg** cassava peel



After grating: **78,5 kg** of grated dough / residues **3.7kg** of losses of the grated mass adhering to the equipment and in the mobilization to to the pressing.



After pressing: **34 kg** flour cake with 40% moisture content/ **44,5 kg of water**



After flash dryer: **24.5 kg** flour with 12% moisture content/ **9,5 kg of water**