RTB Breeding

Activity n°3:

Evaluation of acceptability thresholds of key quality traits for the different RTB food products

Online module n°4:

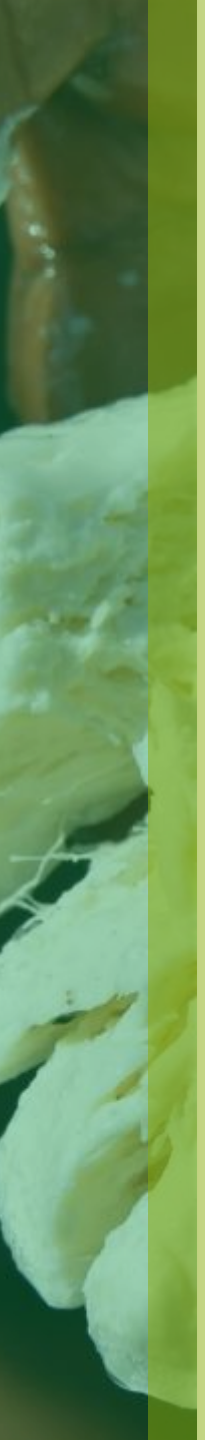
Descriptive analysis: QDA and instrumental measures

Deuscher Zoé

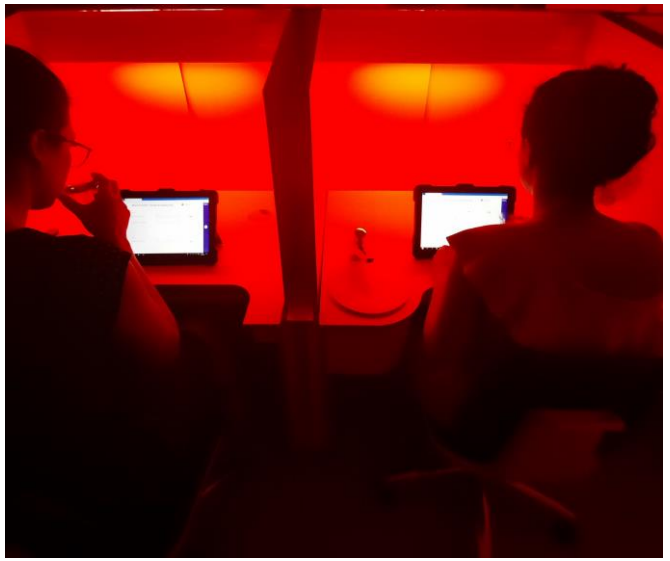
Adinsi Laurent

& Bugaud Christophe

To be cited as:
Deuscher Zoé, **Adinsi Laurent**, **Bugaud Christophe**. 2024. Activity n°3: Evaluation of acceptability thresholds of key quality traits for the different RTB food products. Online module n°4: Descriptive analysis: QDA and instrumental measures. Montpellier: CIRAD-RTB Breeding Project, 23 p. , 1 vidéo (18 min. 04 sec.) https://doi.org/10.18167/agritrop/00825



Quantitative Descriptive Analyses



Reminder: What is sensory evaluation?

RTB Breeding

ISO standard: Science relating to the examination of the organoleptic (or sensory) properties of a product by the sense organs (vision, hearing, touch, smell and taste).

Measuring instrument: panel of human subjects
Standardised methodology: choice of products, choice of tests, panel recruitment and training, etc.

→ Precautions

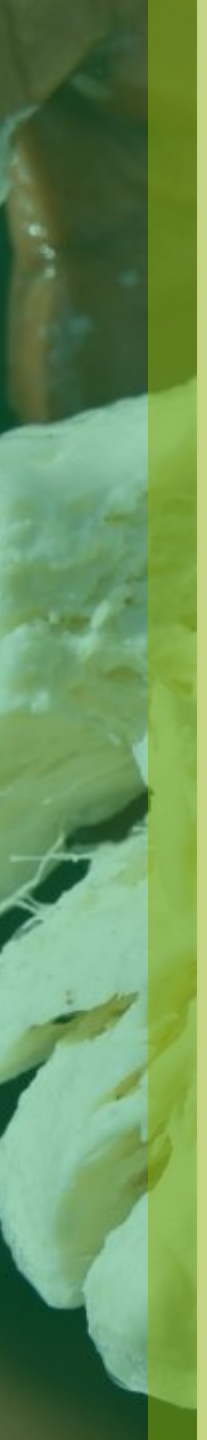
Sensory Evaluation

- Hedonic approach → Consumer appreciation → Consumer test
- Analytical approach → Look for differences → QDA

The different stages of QDA

RTB Breeding

I. Selection of key quality traits
II. The panel
    1. Generality
    2. Pre-selection and recruitment of the panel
    3. General training
    4. Matrix training
    5. How to control the panel performance
III. The working environment
IV. The QDA questionnaire
V. Realization of the QDA
    1. Preparation of the questionnaire
    2. When the panelist arrive
    3. When the panelist has finished analyzing the various products
    4. When the panelist has left
VI. Data treatment



I. Selection of key quality traits

RTB Breeding

- Depends on the product studied
- Sensory attributes defined in RTBfoods product profiles
- 4 or 5 sensory attributes maximum
- Establish a clear definition list for selected attributes

II. The panel

1. Generality

What is required of the panel?

→ To understand the definition of the terms

→ To recognize the sensations in the product

→ To ensure repeatability, reproducibility and discrimination

All the explanation in details:

Isabelle MARAVAL, Nelly FORESTIER-CHIRON, Christophe BUGAUD. (2018). *RTBfoods Manual - Part 1 - Sensory Analysis. Training a panel in sensory analysis and implementing descriptive tests, Tutorial: How to process data in sensory analysis.* Montpellier, France: CIRAD-RTBfoods Project Report, 54 p. DOI: https://doi.org/10.18167/agritrop/00573

II. The panel

2. Pre-selection and recruitment of the panel

How many?

→ More than **20 people**

Why them? Selection criteria:

→ Interest and motivation

→ Behaviour with regard to food products

→ Behaviour : persistent, punctual, reliable and honest

→ Communication skills

→ Health

→ Availability

II. The panel

3. General training

1 → **General introduction** to the laboratory and tasting methodology

2 → **Retro-olfaction demonstration**: Use a short exercise to show the panellists the distinction between smell, flavour and aroma and to clearly define them

3 → **Performing sensory tests to select and train the panel**:

1) *Basic taste and sensation recognition test*

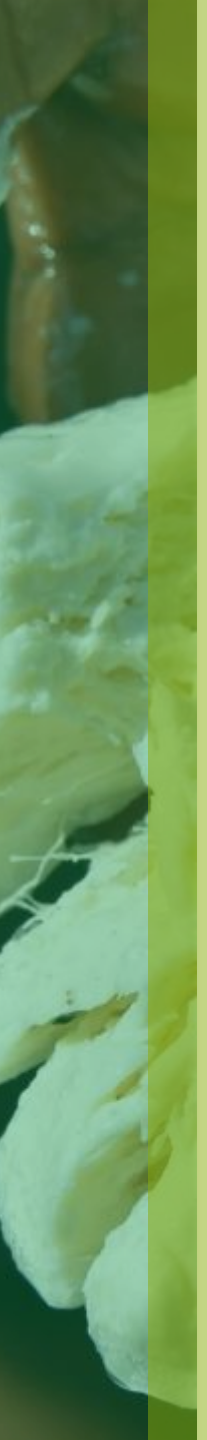
2) Basic taste classification test

3) Threshold test for perception of basic tastes and sensations

4) Triangular test

5) Smell recognition test

6) Describing a fruit puree



II. The panel

4. Matrix training → 4 sessions of training

For all sessions: Use **three or four contrasting products representative** of the food to be evaluated

First two sessions:

→ Learning the definitions of the key quality traits as sensory descriptors

→ Learning how to evaluate descriptors on the full rating scale

After the sessions: joint **discussion** and **correction** is carried out by the moderator to recalibrate panelists who were unable to place themselves on the scale

Next two sessions:

→ Test under real-life conditions: the same test is carried out twice, to assess the panel's performance

→ Use a batch of three contrasting products. Use the same samples for both sessions

II. The panel

5. How to control the panel performance

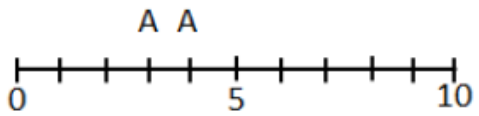
→ The same test is carried out twice, so that the panel's performance can be assessed on the basis of three criteria: **repeatability, panel agreement and discrimination.**

→ The assessment of the panel's performances will be carried out as indicated in this tutorial:

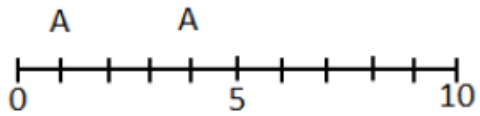
> **Christophe BUGAUD, Isabelle MARAVAL, Nelly FORESTIER-CHIRON**, (2022). *RTBfoods Manual - Part 2 – Tutorial. Monitoring Panel Performance and Cleaning Data from Descriptive Sensory Panels for Statistical Analysis. Biophysical Characterization of Quality Traits, WP2.* Montpellier, France: RTBfoods Methodological Report, 13 p. https://doi.org/10.18167/agritrop/00582

The **repeatability**: the measure of the agreement obtained during evaluations carried out on the same sample under identical conditions.

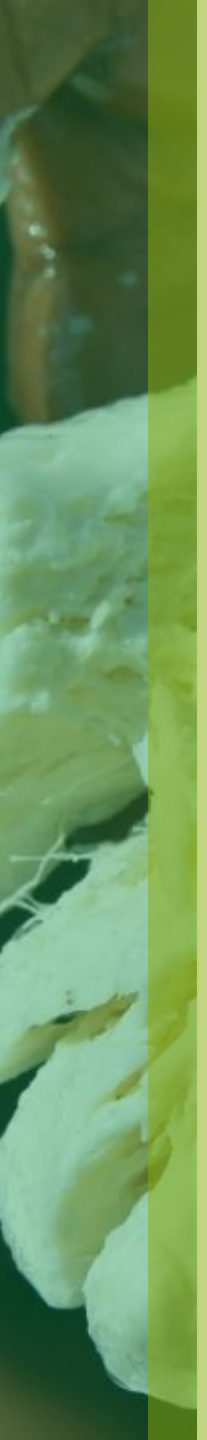
→ the **deviation** between two observations should be **less than or equal to 2**



Effective repeatability



Ineffective repeatability



II. The panel

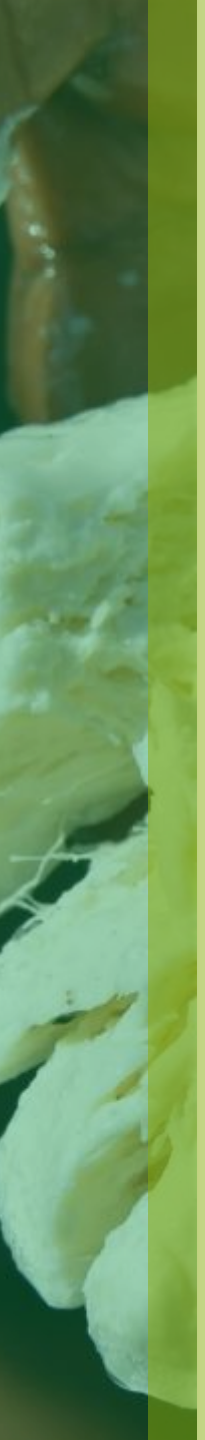
RTB Breeding

5. How to control the panel performance

Agreement between the panelists measures the homogeneity of the responses obtained for the same stimulus by the different tasters.

→ Effective if **70% of the deviation** (absolute value) between the **average of the panel and the average of the panelist** (for an identical product assessed twice) is lower than the standard deviation of the panel.

Discrimination is the ability to detect sensory differences between products. It is closely linked to repeatability, since the lower the level of repeatability, the more difficult it is to be discriminating.



III. The working environment

RTB Breeding

Choice of room:

- ❑ Physical separation of participants (individual booths)
- ❑ Floor and wall easy to clean
- ❑ Neutral decoration
- ❑ Uniform, controllable light
- ❑ Temperature
- ❑ Hygrometry
- ❑ Smell
- ❑ Silence

IV. The QDA questionnaire

RTB Breeding

Create the questionnaire:

- Choosing the number samples
- Choosing the number of repetitions (depending on the number of samples and panelist and the quantity of samples)
- Choosing the order of sample presentation (Distribution in random order)
- Make the samples anonymous
- Choosing sensory descriptors
- Choosing scoring scale

Sample n° :

In the order of descriptors, circle the number corresponding to the intensity of the descriptor you perceive in the sample.

Firmness:

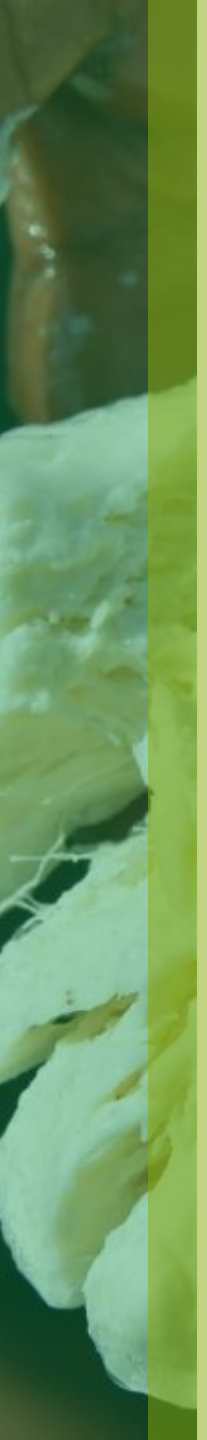
0 1 2 3 4 5 6 7 8 9 10

Humidity

0 1 2 3 4 5 6 7 8 9 10

Sweetness

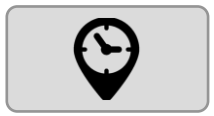
0 1 2 3 4 5 6 7 8 9 10



V. Realization of the QDA

RTB Breeding

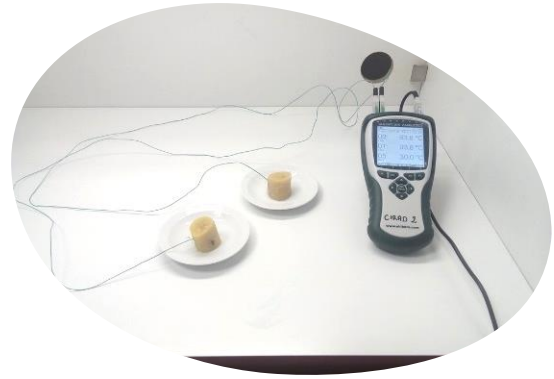
Convening panelists: Minimum 12 people

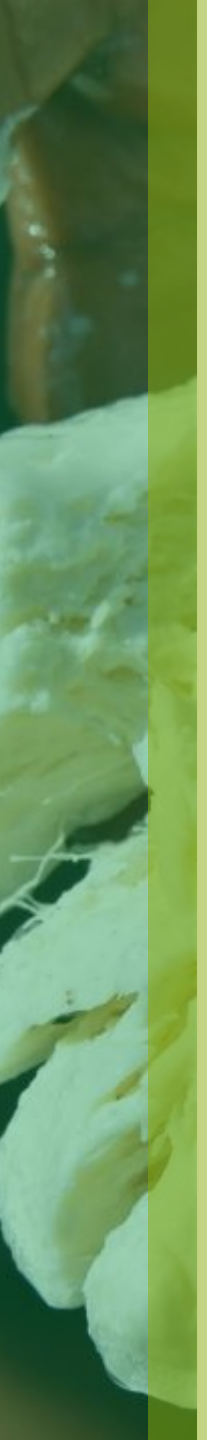
	Be in good health, report any sickness
	Avoid body odors and cosmetics
	Do not smoke, eat or drink within at least one hour before the tests
	Be punctual under all circumstances
	Remain silent
	Rinse out the mouth as often as possible during the test
	Read the questionnaires attentively

V. Realization of the QDA

Prepare the samples:

- ✓ Product quality control
- ✓ Quantity
- ✓ Sample homogeneity
- ✓ As close as natural consumption
- ✓ Storage and transport
- ✓ ⚠ Temperature → Importance of controlling the temperature during the tasting session





V. Realization of the QDA

RTB Breeding

On the day of analysis:

- ✓ Set up the boxes (plates, cutlery, napkins, glass of water, pen, questionnaire to be completed, consent questionnaire, list of definition)
- ✓ Welcome the panelists and explain the study in general terms, without giving any details
- ✓ Explain the task to be performed
- ✓ Distribute the samples in the defined order, according to the order of presentation you have previously chosen
- ✓ Each sample is brought to the panelist one after the other
- ✓ Distribute water to panelists as needed
- ✓ When the panelist has finished: check that the questionnaires are complete

VI. Data treatment

Example of results for QDA:

All the panelists and the repetitions for one sample

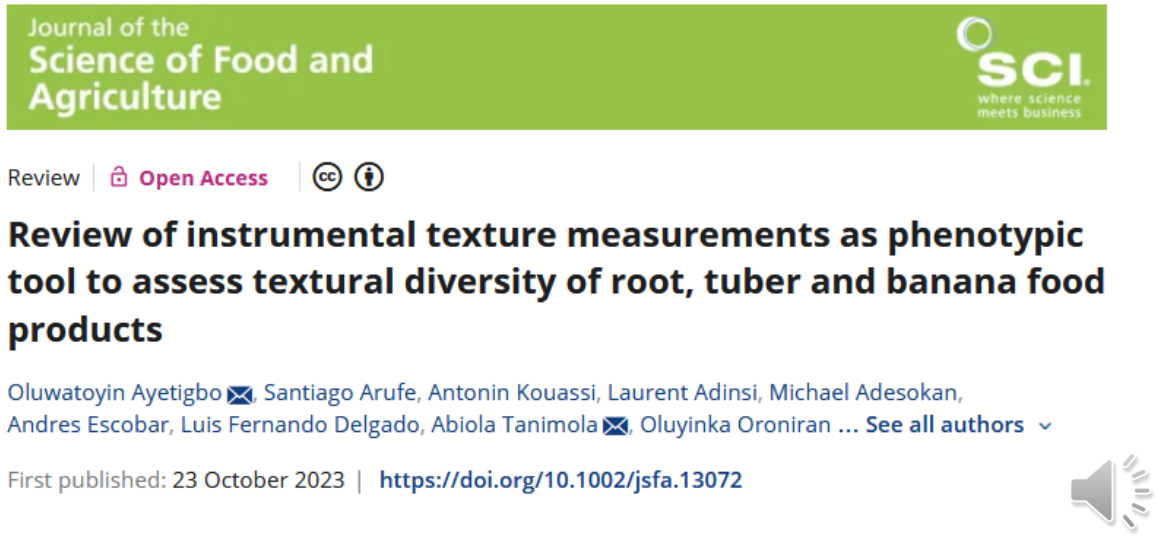
Calculate the mean score for each attribute in one sample

Do the same for each sample and compel the data in one new table

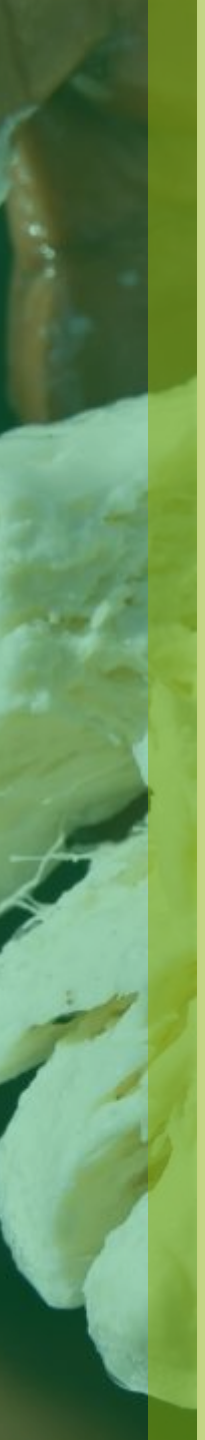
Panellist	Samples	Repetition	Sweetness	Firmness	Wetness
1	**1**	**1**	7	2	4
2	**1**	**1**	8	2	5
…	**…**	**…**	…	…	…
3	**1**	**2**	7	1	6
4	**1**	**2**	6	3	6
…	**…**	**…**	…	…	…
12	**1**	**3**	8	1	5
Mean	**1**		**7,5**	**2,9**	**4,6**

Samples	Sweetness	Firmness	Wetness
1	7,5	2,9	4,6
2	8,3	5,3	7,5
3	2,2	8,1	1,3
4	4,4	6,1	3,8

Instrumental Analyses



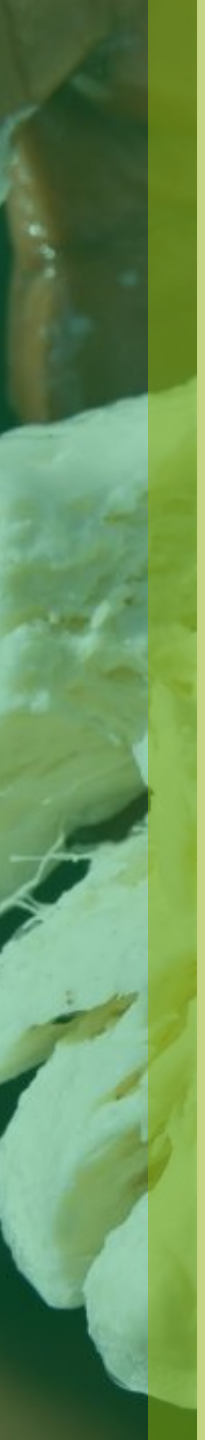
Ayetigbo O, Arufe S, Kouassi A, Adinsi L, Adesokan M, Escobar A, Delgado LF, Tanimola A, Oroniran O, Kendine Vepowo C, Nakitto M, Khakasa E, Chijioke U, Nowakunda K, Ngoh Newilah G, Otegbayo B, Akissoe N, Lechaudel M, Tran T, Alamu EO, Maziya-Dixon B, Mestres C, Dufour D. **Review of instrumental texture measurements as phenotypic tool to assess textural diversity of root, tuber and banana food products**. J Sci Food Agric. 2024 Jun;104(8):4527-4539. doi: 10.1002/jsfa.13072. Epub 2023 Nov 29. PMID: 37872724.



Instrumental analyses

RTB Breeding

- **Color**: Chromameter LAB
- **Sweetness**: sugar content and organic acids
- **Texture**: Different method of analysis to evaluate:
  - TPA: Texture Profile Analysis
  - Penetration
  - Extrusion
  - Puncture
  - Craft Knife
  - Uniaxial Compression
  - Craft knife…



Instrumental analyses

RTB Breeding

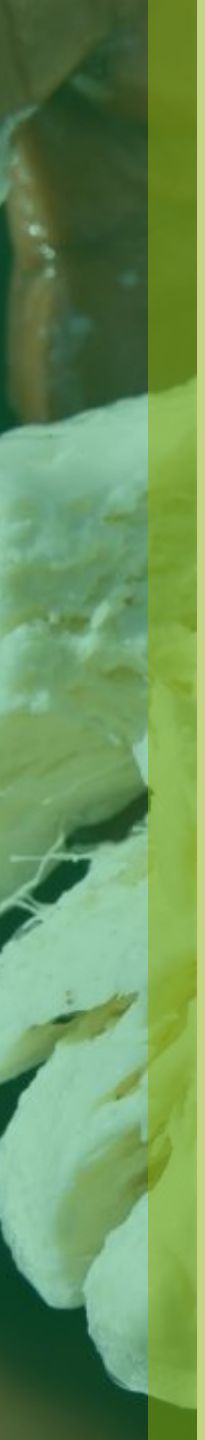
Different method of analysis:

TPA	• Boiled cassava	→ Ease of chew
	• Boiled plantain and dessert banana	→ Friability, Chewiness
	• Boiled yam	→ Friability, Chewiness
	• Boiled sweet potato	→ Firmness
	• Eba	→ Hardness, Stretchability, Mouldability, Smoothness
	• Fufu	→ Hardness, Stretchability, Mouldability, Smoothness
	• Pounded yam	→ Hardness, Stretchability, Mouldability, Smoothness
	• Matooke	→ Firmness, Smoothness
Extrusion	• Boiled cassava	→ Hardness, Mealiness, Stickiness
	• Boiled yam	→ Hardness, Chewiness
Puncture	• Boiled cassava	→ Friability

Instrumental analyses

RTB Breeding

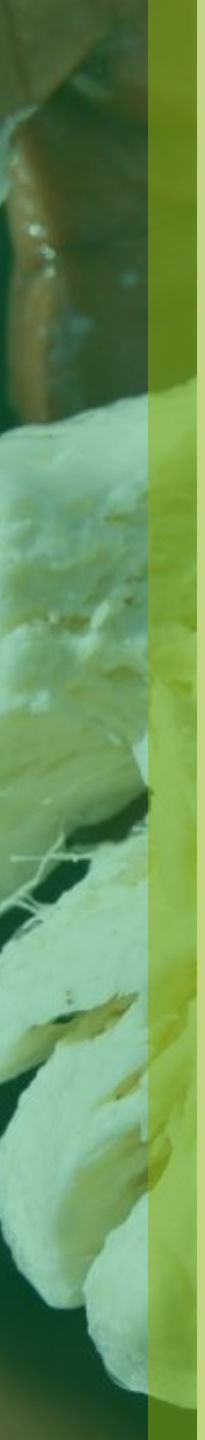
Penetration	• Boiled cassava	→ Ease of chew, mealiness
	• Boiled plantain and dessert banana	→ Friability, Chewiness
	• Boiled yam	→ Friability, Chewiness
	• Boiled potato	→ Firmness, Mealiness
	• Boiled sweet potato	→ Firmness, Mealiness
	• Fried sweet potato	→ Crispiness, Crunchiness, Mealiness
	• Matooke	→ Firmness, Smoothness
Craft Knife	• Boiled plantain and dessert banana	→ Firmness
Uniaxial compression	• Boiled potato	→ Mealiness
Kieffer dough extensibility	• Pounded yam	→ Stretchability
	• Fufu	→ Stretchability



Take home message:

RTB Breeding

- QDA is a sensory analysis done in **laboratory**
- Use the **same raw material** than those used for the hedonic test
- Analyses to be carried out **only on key quality traits** (the same as those used for the JAR test)
- Need a **good trained panel of minimum 12 judges** which is **repeatable**, **discriminating** and in **agreement**
- Each panelist is asked to **rate the intensity** of the descriptors from 0 (absent) to 10 (very strong)
- In parallel, you need to carry out **instrumental measurements** to measure the **same key quality traits** as those evaluated in sensory analysis



See you soon for the next module

Thank you!