Training / Support mission on Instrumental Textural Characterization of Boiled yam by Ottawa Extrusion and Pounded Yam by Kieffer Dough Extensibility, at IITA & Bowen University, Nigeria

18/12/2023 – 19/01/2024, Ibadan, Nigeria,

Oluwatoyin AYETIGBO, CIRAD, Montpellier, France

06/08/2024

This report has been written in the framework of the RTB Breeding project, Quality-component (under CIRAD coordination), as a continuation of work initiated under the RTBfoods project.

Ethics: The activities, which led to the production of this document, 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.

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Final validation by		
Dominique DUFOUR (CIRAD)		21/01/2025

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ABSTRACT

The training/support mission was carried out to review and improve the standard operating procedure (SOP) for the textural characterization of boiled yam in IITA by the Ottawa extrusion method. Previous methods to characterize texture of boiled yam under standard protocols by penetration method have been shown to be discriminant but not always repeatable due to the variation in locale-specific texture and the physiological parts of yam, vis-à-vis proximal, central and distal parts. Texture profile analysis (TPA) have also yielded repeatable measurements between replicates but not always discriminant texture among genotypes. Extrusion was performed using 5-blade grid on an Ottawa cell on a texture analyser to measure textural properties of 9 yam genotypes, such as maximum force, end force, linear distance and area under curve.

The second objective of the mission was to train the IITA and BOWEN University partners on conducting a new SOP for the measurement of extensibility of pounded yam by the Kieffer dough extensibility (KDGE) procedure. Previous procedures by lubricated squeeze flow (LSF) and uniaxial extensibility (UAE) have not been consistently representative of extensibility of pounded yam, and have not been usable for some alata genotypes especially those with sticky or friable texture, respectively. Also, the pounded yam preparation procedure was revised by considering the adjustment of dry matter during pounding.

The partners were trained on how to prepare the samples for evaluation, carry out the textural procedures, analysis of the data, and precautionary measures needed to ensure accurate conduct of the procedures.

Key Words: Boiled yam, Pounded yam, Ottawa cell, Kieffer dough extensibility, Yam, Extrusion

1 GENERAL OVERVIEW

1.1 Interest of this training/support mission in RTB Breeding-Quality framework

- The mission was to equip the partners with skills for conducting the revised standard operating procedure for determining extrusion texture of boiled yam using the Ottawa cell. The SOP will ensure that partners use the same procedure across their various labs for evaluating the texture of boiled yam.
- The second mission was to equip the partners with the skills to conduct the new procedures to prepare pounded yam by adjusting the dry matter during pounding, how to determine extensibility of the pounded yam using the Kieffer dough extensibility SOP, and data analysis. This will ensure that partners are able to produce pounded yam under standard conditions and measure extensibility of the pounded yam across the various labs.

1.2 Specific objectives

1. To train the IITA partner in the setting up of the texture analyser for the measurement of texture of boiled yam by extrusion procedure.
2. To train the IITA and BOWEN University partners in the setting up of the texture analyser for the measurement of extensibility of pounded yam by Kieffer dough extensibility procedure.

1.3 Organizing committee

- Michael ADESOKAN, Food and Nutrition laboratory manager, International Institute of Tropical Agriculture, (IITA), Ibadan, Nigeria
- Professor Bolanle OTEGBAYO, Bowen University, (BOWEN), Iwo, Nigeria

1.4 List of participants or trained/supported staff

Workshop/Training Title: Training / Support mission on Instrumental Textural Characterization of Boiled yam by Ottawa Extrusion, and pounded Yam by Kieffer Dough Extensibility

Place: IITA, Ibadan, NIGERIA   **Dates:** 18/12/2023 – 19/01/2024

Workshop/Training Responsible Person: Ayetigbo OLUWATOYIN, Texture Focal Point, RTB Breeding Project, CIRAD, oluwatoyin.ayetigbo@cirad.fr

Research Project Supervised by: Dominique DUFOUR, Food Technologist, CIRAD, dominique.dufour@cirad.fr

You have been invited to take part in this training/workshop and accepted to join with full knowledge of its objectives, agenda and content. The potential risks related to this training have been openly communicated by trainers.

For reporting purposes, you will be asked to provide contact information. Sessions and discussions could be recorded; some pictures will be taken by the organizers. Data storage and management of information will be secured according to the specific rules of RTB Breeding project, to limit traceability and prevent use of personal data by external entities.

If you do not wish your picture or email address to be used by RTB Breeding project, it has to be mentioned in the table below. Participants who wish to express any particular or personal issue or concern are free to ask the responsible person whose contact is written above or the organizers, and to withdraw at any time.

Date: 06/08/2024

IITA TEAM

#	NAME First name	Gender (F/M)	Position	Education - Background (ex: Biochemistry)	Institute + COUNTRY	WP	Email Contact	Consent to Picture use (YES/NO)
1	ADESOKAN Michael	M	Laboratory manager	Chemistry	IITA, Ibadan, NIGERIA	2	M.Adesokan@cgiar.org	YES
2	Adedapo Adeyemi	M	Dry lab & sample preparation room technician	Biochemistry	IITA, Ibadan, NIGERIA	2	F.adedapo@cgiar.org	NO
3	Raheem Qoyyum	M	Industrial Trainee	Food science	LAUTECH, Ogun	-	-	YES
4	Iyiola Karimah	F	Industrial Trainee	Food science	LAUTECH, Ogun	-	karimahiyiola@gmail.com	YES

BOWEN UNIVERSITY TEAM

#	NAME First name	Gender (F/M)	Position	Education - Background (ex: Biochemistry)	Institute + COUNTRY	WP	Email Contact	Consent to Picture use (YES/NO)
1	Prof. Otegbayo Bolanle	F	Professor, Product champion	Food Science and Technology	BOWEN UNIVERSITY, Iwo, NIGERIA	2	bolanle.otegbayo@bowen.edu.ng	YES
2	Ayomide Alamu	F	Texture analyst	Food Science and Technology	BOWEN UNIVERSITY, Iwo, NIGERIA	2	ayomidedorcas811@gmail.com	YES

1.5 Preliminary experience / level of staff trained

ADESOKAN Michael is the manager of the Food and nutrition laboratory at IITA, Ibadan where he manages the coordination of laboratory activities. He is competent in Biochemistry and food related disciplines. He is well familiar with the principles of texture analysis and has been instrumental in the collection of texture and biophysical data in IITA.

Prof. OTEGBAYO Bolanle is a product champion for the pounded yam food product profile. She heads and manages the Food Science and Technology department at BOWEN University. She is competent in food related disciplines, as well as texture analyses.

Mr ADEDAPO Adeyemi is the technician who runs the dry laboratory and sample preparation room at IITA, Ibadan. He is partly trained in the use of the texture analyser.

ALAMU Ayomide is a food technologist and works in the Food science laboratory in BOWEN University, Iwo, Nigeria. She is familiar with the use of the texture analyzer, and is instrumental to the collection of textural data in BOWEN University.

RAHEEM Qoyyum is a student studying Food science at Ladoke Akintola University, Nigeria. He is undergoing industrial training at IITA, Ibadan. He is not familiar with the use of texture analyzer, and requires training.

IYIOLA Karimah is a student studying Food science at Ladoke Akintola University, Nigeria. She is undergoing industrial training at IITA, Ibadan. She is not familiar with the use of texture analyzer, and requires training.

2 TRAINING/SUPPORT MISSION IMPLEMENTATION

2.1 Agenda

Training on Ottawa extrusion texture of boiled yam (IITA team)

18 December 2023 (Day 1)	19 December 2023 (Day 2)	20 December 2023 (Day 3)	21 December 2023 (Day 4)	22 December 2023 (Day 5)
- Arrival and introduction to the dry lab and sample preparation team and facility. - Setting up and calibration of the texture analyzer in the lab. - Presentation of the theoretical aspects of the new SOP for the preparation of boiled yam and the texture analysis of boiled yam by extrusion method. - Collection and documentation of nine yam genotypes from the yam storage barn at IITA. - Discussion with team and work plan breakdown. - Dry matter analysis of the fresh and boiled yam. - First set of data collected (genotype *Oju Iyawo*) for extrusion texture of boiled yam.	- Calibration of texture analyzer. - Measurements of extrusion texture of genotypes *TDr1500100*, *TDr1439027*, and *TDr1437005*.	- Calibration of texture analyzer. - Measurements of extrusion texture of genotypes *Oweigbo*, *TDa1511008*, and *TDa1520050*.	- Calibration of texture analyzer. - Measurements of extrusion texture of genotypes *TDr1500042* and *TDa1510119*.	- Collection of final mass of Dry matter - Collation of data

Training on Kieffer dough extensibility (KDGE) texture of pounded yam (IITA and BOWEN University teams)

15 January 2024 (Day 1)	16 January 2024 (Day 2)	17 January 2024 (Day 3)	18 January 2024 (Day 4)	19 January 2024 (Day 5)
• Arrival and discussion with teams and work plan breakdown. • Setting up and calibration of the texture analyzer in the lab. • Presentation of the theoretical aspects of the new SOP for the preparation of pounded yam including dry matter adjustment; and the texture analysis of pounded yam by Kieffer dough extensibility method. • Collection and documentation of nine yam genotypes from the yam storage barn at IITA. • Dry matter analysis of the fresh, boiled, and pounded yam. • First set of data collected (genotypes *Oju Iyawo, TDr1437005, TDr1439027*) for first replicate measurements of KDGE texture of pounded yam.	• Setting up and calibration of the texture analyzer in the lab. • Dry matter analysis of the fresh, boiled, and pounded yam. • First set of data collected (genotypes *TDr1500100, TDr1500042, Oweigbo, TDa1511008, TDa1520050, and TDa1510119*) for first replicate measurements of for KDGE texture of pounded yam.	• Setting up and calibration of the texture analyzer in the lab. • Second set of data collected (genotypes Oju iyawo, TDr1437005, TDr1439027, TDr1500100, TDr1500042) for second replicate measurements of for KDGE texture of pounded yam.	• Setting up and calibration of the texture analyzer in the lab. • Second set of data collected (genotypes Oweigbo, TDa1511008, TDa1520050 and TDa1510119) for second replicate measurements of for KDGE texture of pounded yam.	• The final masses for dry matter calculation for the second replicate. • Calculation of texture data using macros after smoothening (using macro factor 50) texture profile curves.

Training on Ottawa extrusion texture of boiled yam (IITA team)

18-22 December 2023

DAY 1- 18 December 2023

Who: Adesokan Michael, Adedapo Adeyemi, Raheem Qoyyum, Iyiola Karimah.

Where: IITA dry lab and sample preparation lab.

What:

- Arrival at IITA and introduction to the dry lab and sample preparation team (led by Mr Adedapo Adeyemi). The equipment in the facility were introduced and familiarized with.
- The texture analyzer in the lab was set up and calibrated for texture measurement after fitting with the Ottawa cell.
- A presentation of the theoretical aspects of the new SOP for the preparation of boiled yam and the texture analysis of boiled yam by Ottawa extrusion method was conducted with the team. IITA was already preparing a SOP earlier, but this was reviewed by changing parameters such as sample size and geometry, and steaming time to 23 minutes. Measurement of texture was to be taken at approximately 45 °C.
- Nine yam genotypes consisting of five *D. rotundata* and four *D. alata* yams were collected from the yam storage barn at IITA.
- Discussion with team and work plan breakdown. A member of the team handled dry matter determination, another handled the steaming of boiled yams and another handled the texture measurement.
- The first replicate data for extrusion texture of boiled yam was collected for the genotype *Oju Iyawo.*

Specific Methods & Tools Used:

- Discussions and demonstration of procedures.
- Review skills of of trainees with the Texture analyzer (TA-XT Plus, Stable Micro Systems Ltd., Surrey, UK) and with Exponent Software Interface.

Challenges Faced:

- Some of the trainees were not very familiar with the use of the texture analyzer.
- There was need to change the steaming time, geometry of the boiled yam samples and texture analyzer settings.

Output(s) -Result(s):

- Trainees understood the new sample preparation procedures
- Trainees understood the procedures to set-up, calibrate, and use the texture analyzer and conduct the extrusion textural procedure with minimal supervision.
- The first set of data for texture of genotype *Oju iyawo* was obtained, as well as dry matter data of fresh and boiled yam.

DAY 2- 19 December 2023

Who: Adesokan Michael, Adedapo Adeyemi, Raheem Qoyyum, Iyiola Karimah.

Where: IITA dry lab and sample preparation lab.

What:

- The texture analyzer in the lab was calibrated.

- The first replicate data for extrusion texture of boiled yam was collected for the genotypes *TDr1500100*, *TDr1439027*, and *TDr1437005*.
- Dry matter was determined.

Specific Methods & Tools Used:

- Discussions and demonstration of procedures.

Challenges Faced:

- There was a problem of calibration of the texture analyzer during measurement of texture data for genotype *TDr1439027*. A recalibration was performed, but the yam tubers were finished.

Output(s) -Result(s):

- The first set of data for extrusion texture of genotypes *TDr1500100*, *TDr1439027*, and *TDr1437005* was obtained, as well as dry matter data of fresh and boiled yam.

DAY 3- 20 December 2023

Who: Adesokan Michael, Adedapo Adeyemi, Raheem Qoyyum, Iyiola Karimah.

Where: IITA dry lab and sample preparation lab.

What:

- The texture analyzer in the lab was calibrated.
- The first replicate data for extrusion texture of boiled yam was collected for the genotypes *Oweigbo*, *TDa1511008*, and *TDa1520050*.
- Dry matter was determined.

Specific Methods & Tools Used:

- Discussions and demonstration of procedures.

Challenges Faced:

- None

Output(s) -Result(s):

- The first set of data for extrusion texture of genotypes *Oweigbo*, *TDa1511008*, and *TDa1520050* was obtained, as well as dry matter data of fresh and boiled yam.

DAY 4- 21 December 2023

Who: Adesokan Michael, Adedapo Adeyemi, Raheem Qoyyum, Iyiola Karimah.

Where: IITA dry lab and sample preparation lab.

What:

- The texture analyzer in the lab was calibrated.
- The first replicate data for extrusion texture of boiled yam was collected for the genotypes *TDr1500042* and *TDa1510119*.
- Dry matter was determined.

Specific Methods & Tools Used:

- Discussions and demonstration of procedures.

Challenges Faced:

- None

Output(s) -Result(s):

- The first set of data for extrusion texture of genotypes *TDr1500042* and *TDa1510119* was obtained, as well as dry matter data of fresh and boiled yam.

DAY 5- 22 December 2023

Who: Adesokan Michael, Adedapo Adeyemi.

Where: IITA dry lab and sample preparation lab.

What:

- The texture data was collated.
- The macro for extrusion texture parameters calculation was shared with the partner and an example of calculation was demonstrated.
- The final mass of samples for dry matter calculation was collected.

Specific Methods & Tools Used:

- Macro for calculation of extrusion texture data

Challenges Faced:

- None

Output(s) -Result(s):

- All extrusion textural data of all genotypes.
- Partner understood how to use macro for texture parameter calculation.
- Dry matter and mass of all genotype samples.

Training on Kieffer dough extensibility (KDGE) texture of pounded yam (IITA and BOWEN University teams)

15-19 January 2024

DAY 1- 15 January 2024

Who: Adesokan Michael, Prof Otegbayo Bolanle, Adedapo Adeyemi, Raheem Qoyyum, Iyiola Karimah. Ayomide Alamu,

Where: IITA dry lab and sample preparation lab.

What:

- Arrival at IITA and introduction of BOWEN team to the dry lab and sample preparation team (led by Mr Adedapo Adeyemi). The equipment in the facility were introduced and familiarized with.

- The texture analyzer in the lab was set up and calibrated for texture measurement after fitting with the Kieffer dough extensibility rig.
- Presentation of the theoretical aspects of the new SOP for the preparation of pounded yam including dry matter adjustment; and the texture analysis of pounded yam by Kieffer dough extensibility method. In the new SOP, the preparation of pounded yam reflects the consumer perception of pounded yam quality where water is often added during pounding to adjust the dry matter of pounded yam to satisfactory levels.
- Discussion with the IITA and BOWEN teams on work plan breakdown. A team handled the sample preparation of yams and steaming; the other team handled pounding, dry matter adjustment and texture analysis.
- Collection and documentation of nine diverse yam genotypes from the yam storage barn at IITA.
- Dry matter analysis of the fresh, boiled, and pounded yam.
- First set of data collected (genotypes *Oju Iyawo, TDr1437005, TDr1439027*) for replicate measurements of KDGE texture of pounded yam.

Specific Methods & Tools Used:

- Discussions and demonstration of the new SOP (awaiting validation and publication).

Challenges Faced:

- Preparation of pounded yam with adjustment of dry matter by addition of warm water during pounding was only necessary when dry matter of fresh yam exceeded 30% after steaming. Therefore, the water addition needed to be made quickly to avoid cooling of pounded yam which could result in retrogradation of the paste and consequent formation of lumps.
- The unavailability of the 5kg standard weight for calibration of force meant that we had to use a 10kg standard weight for calibration.
- The unavailability of 5kg load cell resulted in the use of the only available load cell (a 50kg load cell) which caused the texture profile graphs to include noise. This made it necessary to apply a macro on the profiles to eliminate the noise by smoothening the curves by a factor of 50 on the Exponent software.

Output(s) -Result(s):

- Trainees understood the new sample preparation procedures
- Trainees understood the procedures to set-up, calibrate, and use the texture analyzer and conduct the Kieffer dough extensibility textural procedure with minimal supervision.
- The first set of replicate one data for extensibility texture of genotypes *Oju Iyawo, TDr1437005, TDr1439027* was obtained, as well as dry matter data of fresh, boiled, and pounded yam.

DAY 2- 16 January 2024

Who: Adesokan Michael, Adedapo Adeyemi, Raheem Qoyyum, Iyiola Karimah. Ayomide Alamu,

Where: IITA dry lab and sample preparation lab.

What:

- The texture analyzer in the lab was set up and calibrated for texture measurement.
- Dry matter analysis of the fresh, boiled, and pounded yam.
- Set of data collected (genotypes *TDr1500100, TDr1500042, Oweigbo, TDa1511008, TDa1520050, TDa1510119*) for replicate measurements of KDGE texture of pounded yam.

Specific Methods & Tools Used:

- Discussions and demonstration of the new SOP (awaiting validation and publication).

Challenges Faced:

- Preparation of pounded yam with adjustment of dry matter by addition of warm water during pounding was only necessary when dry matter of fresh yam exceeded 30% after steaming. Therefore, the water addition needed to be made quickly to avoid cooling of pounded yam which could result in retrogradation of the paste and consequent formation of lumps.
- The unavailability of the 5kg standard weight for calibration of force meant that we had to use a 10kg standard weight for calibration.
- The unavailability of 5kg load cell resulted in the use of the only available load cell (a 50kg load cell) which caused the texture profile graphs to include noise. This made it necessary to apply a macro on the profiles to eliminate the noise by smoothening the curves by a factor of 50 on the Exponent software.

Output(s) -Result(s):

- The next set of replicate one data for extensibility texture of genotypes *TDr1500100, TDr1500042, Oweigbo, TDa1511008, TDa1520050, TDa1510119* was obtained, as well as dry matter data of fresh, boiled, and pounded yam.

DAY 3- 17 January 2024

Who: Adedapo Adeyemi, Raheem Qoyyum, Iyiola Karimah. Ayomide Alamu,

Where: IITA dry lab and sample preparation lab.

What:

- The texture analyzer in the lab was set up and calibrated for texture measurement.
- Dry matter analysis of the fresh, boiled, and pounded yam.
- Set of data collected (genotypes *Oju iyawo, TDr1437005, TDr1439027, TDr1500100, TDr1500042*) for replicate two measurements of KDGE texture of pounded yam.

Specific Methods & Tools Used:

- Discussions and demonstration of the new SOP (awaiting validation and publication).

Challenges Faced:

- Preparation of pounded yam with adjustment of dry matter by addition of warm water during pounding was only necessary when dry matter of fresh yam exceeded 30% after steaming. Therefore, the water addition needed to be made quickly to avoid cooling of pounded yam which could result in retrogradation of the paste and consequent formation of lumps.
- The unavailability of the 5kg standard weight for calibration of force meant that we had to use a 10kg standard weight for calibration.
- The unavailability of 5kg load cell resulted in the use of the only available load cell (a 50kg load cell) which caused the texture profile graphs to include noise. This made it necessary to apply a macro on the profiles to eliminate the noise by smoothening the curves by a factor of 50 on the Exponent software.

Output(s) -Result(s):

- The next set of replicate two data for extensibility texture of genotypes *Oju iyawo, TDr1437005, TDr1439027, TDr1500100, TDr1500042* was obtained, as well as dry matter data of fresh, boiled, and pounded yam.

DAY 4- 18 January 2024

Who: Adedapo Adeyemi, Raheem Qoyyum, Iyiola Karimah. Ayomide Alamu,

Where: IITA dry lab and sample preparation lab.

What:

- The texture analyzer in the lab was set up and calibrated for texture measurement.
- Dry matter analysis of the fresh, boiled, and pounded yam.
- Set of data collected (genotypes *Oweigbo, TDa1511008, TDa1520050, TDa1510119*) for replicate two measurements of KDGE texture of pounded yam.

Specific Methods & Tools Used:

- Discussions and demonstration of the new SOP (awaiting validation and publication).

Challenges Faced:

- Preparation of pounded yam with adjustment of dry matter by addition of warm water during pounding was only necessary when dry matter of fresh yam exceeded 30% after steaming. Therefore, the water addition needed to be made quickly to avoid cooling of pounded yam which could result in retrogradation of the paste and consequent formation of lumps.
- The unavailability of the 5kg standard weight for calibration of force meant that we had to use a 10kg standard weight for calibration.
- The unavailability of 5kg load cell resulted in the use of the only available load cell (a 50kg load cell) which caused the texture profile graphs to include noise. This made it necessary to apply a macro on the profiles to eliminate the noise by smoothening the curves by a factor of 50 on the Exponent software.

Output(s) -Result(s):

- The next set of replicate two data for extensibility texture of genotypes *Oweigbo, TDa1511008, TDa1520050, TDa1510119* was obtained, as well as dry matter data of fresh, boiled, and pounded yam.

DAY 5- 19 January 2024

Who: Adedapo Adeyemi, Raheem Qoyyum, Iyiola Karimah. Ayomide Alamu,

Where: IITA dry lab and sample preparation lab.

What:

- Final data collected for calculation of the final dry matter of pounded yam.

Specific Methods & Tools Used:

- Discussions and demonstration of the new SOP (awaiting validation and publication).

Challenges Faced:

- The unavailability of 5kg load cell resulted in the use of the only available load cell (a 50kg load cell) which caused the texture profile graphs to include noise. This made it necessary to apply a macro on the profiles to eliminate the noise by smoothening the curves by a factor of 50 on the Exponent software.

Output(s) -Result(s):

The final data of the dry matter was collected for pounded yam. The macros were used to smoothen and calculate the textural parameters such as extensogram peak force, extensibility, and extensograph area.

List of material/documents shared with trainees
(to be attached to this Report)

- A copy of the current SOP recently developed was used. We could not share the document until it is validated and fully published.

3 TRAINING / SUPPORT MISSION OUTPUTS & FEEDBACKS

3.1 Specific outputs of the training/support mission

- Trainees understood the new SOPs for sample preparation and textural evaluation of boiled yam by Ottawa extrusion and pounded yam by KDGE procedures.
- Trainees understood the procedures to set-up, calibrate, and use the texture analyzer to conduct extrusion and extensibility tests by Ottawa cell and KDGE rig, respectively with minimal supervision.
- Two sets of replicate texture data of nine genotypes were obtained for boiled yam by Ottawa extrusion and pounded yam by KDGE. Also, dry matter data of fresh, boiled, and pounded yam were collected.

- Partners understood how to use macro for removing noise on texture graph profiles and texture parameters calculation.

3.2 Challenges faced & paths for improvement (if relevant)

- The removal of noise background on texture profiles, particularly for the KDGE extensibility od pounded yam was necessary due to unavailability of the appropriate load cell (5kg) for the texture analyzer. A macro was developed to resolve this issue. However, it is recommended that the partners should purchase an appropriate load cell for more accurate evaluations of extensibility of pounded yam by KDGE procedure.
- Adjustment of pounded yam dry matter by addition of water during pounding may sometimes result in sticky doughs been produced. Therefore, the calculation of water added must be correctly performed, taking care to avoid cooling of the pounded yam during pounding. Warm water addition was found to enhance dough consistency and avoid rapid cooling.
- The SOPs used for the training purposes have been finalised but remains to be published, and this is being done at the moment, and are likely to be ready for validation and publication shortly.

3.3 Feedbacks from trainees / General remarks from support team

- Trainees were satisfied with the training on above average scale.
- Request for occasional support in cleaning textural data, statistics and macro development.
- Request for support in purchase of Kieffer dough extensibility units.
- Request for copies of final SOPs after publication.

3.4 Next steps

- Finalizing the pending SOPs for publication.

- Sensory evaluation for key texture parameters of boiled yam (such as mealiness, firmness, crumbliness), and for pounded yam (such as mouldability, stretchability, and smoothness) should be performed.
- Statistical evaluation of textural data.

4 APPENDICES

List of documents attached to the report

1. Data sheets for Ottawa extrusion and KDGE texture of boiled and pounded yam	**Yes**
2. SOP (pending copies)	**Yes**
3. Pictures consent	**Yes**

4.1 Annex 1: Group picture(s)

Participating Trainees at IITA, Ibadan, Nigeria

Yam storage unit at IITA, Ibadan, Nigeria

(This page needs to show this text for every final report)

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