

Standard Operating Protocol for Textural Characterization of Boiled Sweetpotato – Version A

Biophysical Characterization of Quality Traits, WP2

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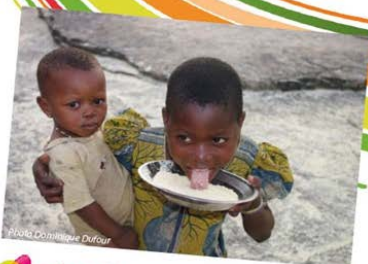
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Ethics: The activities, which led to the production of this manual, were assessed and approved by the CIRAD Ethics Committee (H2020 ethics self-assessment procedure). When relevant, samples were prepared according to good hygiene and manufacturing 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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ABSTRACT

Texture characteristics of sweetpotato such as firmness and mealiness are important for consumer liking. It is therefore important to consider consumer preferences in sweetpotato breeding programs. Instrumental methods of texture analysis complement descriptive sensory analysis in breeding programs where many samples are evaluated. To develop this SOP several experiments were conducted. In the first experiment, roots of NASPOT 11 and NASPOT 8 were prepared following 3 methods: boiling cubes for 15 minutes, steaming 7cm portion for 1 hour (kitchen method) and steaming pieces of similar dimension for 20 minutes (strict method). Texture analysis was conducted using TPA (40%, double compression) by a 60cm plate probe. In the second experiment, roots of Ejumula and NASPOT 8 were prepared using the kitchen and strict methods, and their texture was analysed using plate probe (TPA 25% compression) and cylindrical probe (penetration). The best method was selected then compared to descriptive sensory analysis using roots 12 genotypes which were evaluated by both the panel and selected instrumental texture method. In each experiment, different set ups were statistically compared using F-test to determine whether results were reliable and discriminative. Pearson correlation were conducted to compare results of instrumental texture to sensory panel. The selected sample preparation method was strict preparation method and double compression TPA (25%) was the best instrumental analysis procedure. The kitchen method can be an alternative when both descriptive sensory analysis and instrumental texture analysis are conducted. The developed SOP facilitate genotype screening by texture and further demand led breeding.

Key Words: texture analysis, sweetpotato, penetration, TPA

SOP: Protocol for samples preparation and cooking time for texture analysis of Boiled yam

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1 SCOPE AND APPLICATION

This SOP describes the preparation of steamed sweetpotato samples for texture analysis (double compression TPA using a plate probe) using a kitchen and a strict method. The sweetpotato is cooked by steaming following the common practice of consumers. The kitchen method is the same method used for preparing samples for sensory analysis in which big 7cm length portions of the sweetpotato are cooked. In the strict method smaller pieces of sweetpotato, of controlled dimension (3X3X2.5 cm) and shape (cuboid) are cooked.

2 GENERALITIES AND DEFINITIONS

Kitchen method: The sweetpotato roots are cut into 7 cm portions weighing 160 to 240 g, peeled and steamed between two layers of banana leaves for 1 hour (of which 50 minutes is actual steaming time).

Strict method: In this method, small pieces are cut out of the sample in a cuboid shape with dimensions of 3X3X2.5. The pieces are steamed between two layers of banana leaves for 25 minutes. These dimensions and cooking times were the result of a series of experiments conducted prior.

3 PREREQUISITES

Setting up and managing a texture analyser.

4 APPARATUS

- Texture analyser (the model used for the development of this SOP is a TA-XTPplus by Stable Microsystems).
- Plate probe - Aluminium
- Steam cooker
- Sharp knives
- Meter/rule
- Food grade thermometer

5 PRODUCT PREPARATION

5.1 Using the kitchen method

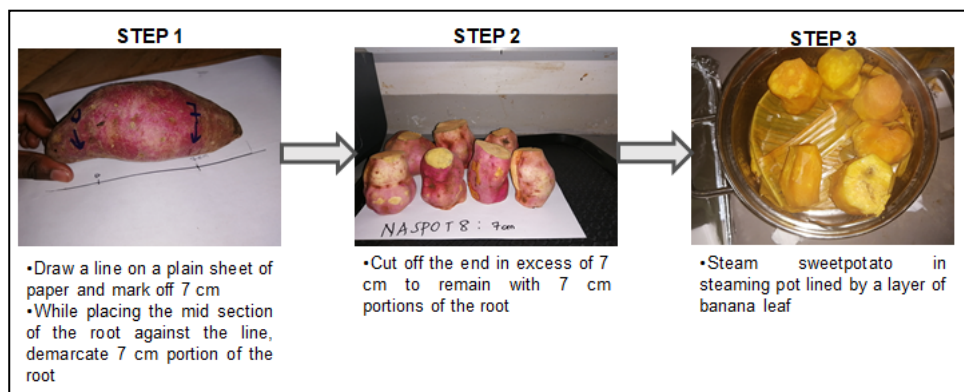
- Select five moderately sized roots per genotype. These roots should weigh 160 – 240g when 7 cm portions are cut from their mid-section (Picture 1). This method should not be used with varieties or roots that are too big or too small given this criteria.
- Pour 2 l of water in a steaming pot. Lay a banana leaf on the separation. Place the sweetpotato portions on the leaf and cover with another layer of banana leaf followed by the pan lid.

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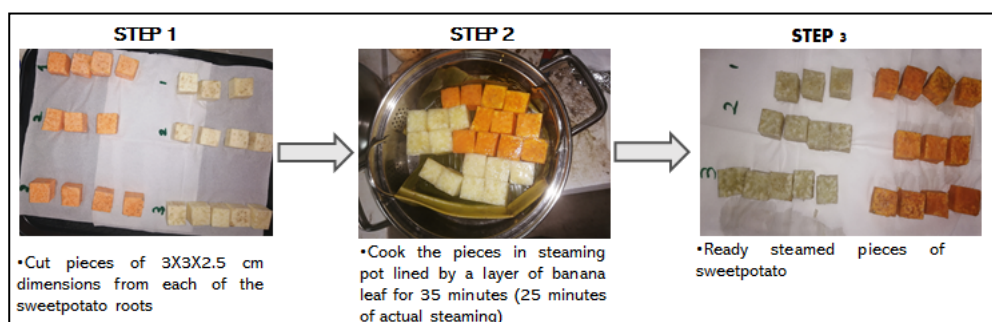
- Place the steaming pot on a lit stove set at high heat and cook for 1 hour. This cooking time includes 50 minutes of actual steaming.



Picture 1 : Steps in sample preparation using the kitchen method

5.2 Using strict method

- Select three roots per genotype. Cut out three or more 3X3X2.5 cm dimension cuboids from each root (Picture 2).
Note: This method is quite robust and root size is not expected to affect the results very much. Nonetheless, it is recommended to use roots that are big/long enough to make at least three cubes
- Pour 2 l of water in a steaming pot. Lay a banana leaf on the separation. Place the sweetpotato pieces on the leaf and cover with another layer of banana leaf followed by the pan lid.
- Place the steaming pot on a lit stove set at high heat and cook for 35 minutes. This cooking time includes 25 minutes of actual steaming.



Picture 2 : Steps in sample preparation using the strict method

5.3 Texture analysis of boiled sweetpotato

5.3.1 Preparing samples for texture analysis

The texture analysis method is intended for use with samples of 3X3X2 cm dimension. Therefore, samples prepared using each of the methods have to be adjusted accordingly.

Modifying samples prepared using the kitchen method

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Handle the cooked 7 cm portions carefully and make pieces of the 3X3X2 cm dimension using a knife by measuring against marks on a plain sheet of paper. It is expected that 3 pieces can be obtained from each 7 cm portion. Wipe the knife clean whenever necessary to maintain a clean cut.

Modifying samples prepared using the strict method

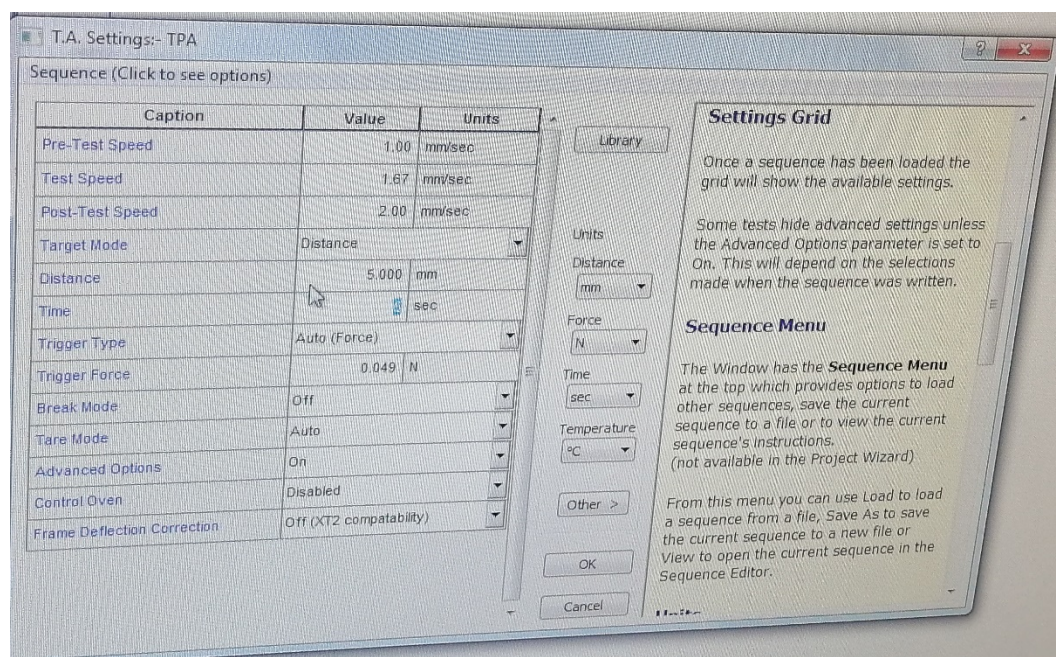
During steaming there is amylose leaching and the pieces tend to have a sticky mucilage coating covering the surface. For this reason, the pieces are made with a height of 2.5 cm rather than 2 cm before cooking. The 0.5cm allowance allows for the mucilage coating to be removed from the cooked samples before texture analysis. Before texture analysis, carefully cut off the mucilage coating from both ends of the piece of sweetpotato with a knife to remain with a sample of 3X3X2 cm in dimension.

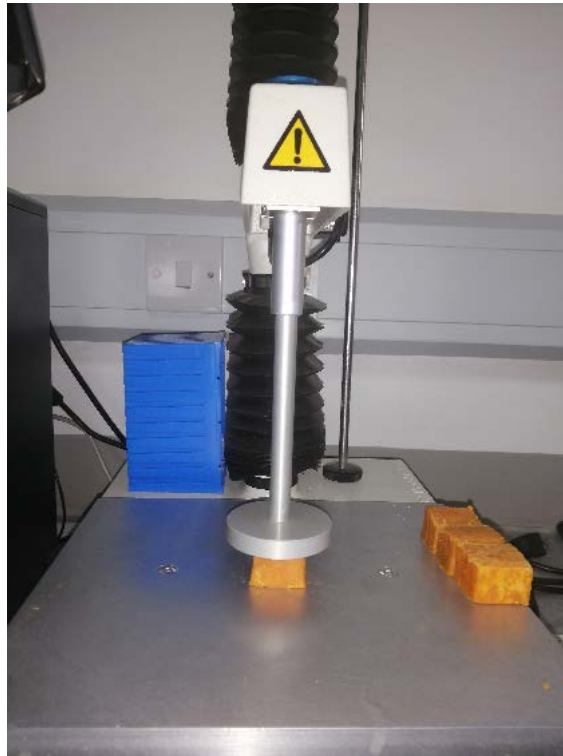
6 TEXTURE MEASUREMENT

6.1 TPA Analysis

The compression test is performed with plate probe and the settings are shown below:

Pre-Test Speed	1.0 mm/s
Test speed	1.5 mm/s
Post-test speed	2.0 mm/s
Target distance	5 mm
Compression (strain)	25 %
Temperature of test	45°C





Picture 3. Double compression TPA using plate probe on sweetpotato samples

7 EXPRESSION OF RESULTS

The main texture parameters recorded include: peak positive force (g), positive area under the first curve (g*s) and positive area under the second curve.

8 CRITICAL POINTS AND NOTES ON THE PROCEDURE

Sample temperature and size /shape sample should be controlled.

9 TEST REPORT

The test report should include full information about the samples; harvest location, clone/genotype name, size (weight, length, circumference) of the roots.



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