Research article

Technical Sheet of Some Cassava Roots Starch Granules Morphology

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Abstract

Cassava (Manihot esculenta Crantz) is a plant whose tuberous roots are used as a staple food for many people in the tropics. And improved varieties have been developed at CNRA for their extension and studies have been conducted for this purpose. Morphological analysis of the improved cassava varieties tuberous root starch granules showed granules of heterogeneous forms which do not differ regardless of the variety. The size of the starch granules varies significantly from one variety to another and from one group of varieties to another, with values between 1.94 microns and 32.81 microns. **Copyright © www.acascipub.com, all rights reserved.**

Keywords: Cassava, roots, starch, granules, forms, size, morphological analysis.

Introduction

The edible roots and tubers found in tropical and subtropical areas namely yam, taro, sweet potato and cassava are food products used in the diet of the peoples of these regions (**Amani and Kamenan 2003; Sahoré *et al.,* 2007**). Among these food products, cassava (*Manihot esculenta* Crantz) is one of the most important of these regions by the volume of its production and consumption (**FAO, 2001**). Indeed, Cassava is an important source of starch (**Meuser and Smolnik, 1980**). Works carried out on starch by **Cecil (1993), Buléon *et al*. (1990)**, have shown that it has many applications in food and non-food. In food industry, it acts as a texture agent (thickener, stabilizer, gelling) of various products and non-food industry, it is used for the production of textiles, glues and adhesives, paper and cardboard as incipient or binder in pharmaceutical industry (**Ansart, 1990**). World cassava production was estimated at 224 million tons in 2007 with a volume of 114 million tons from Africa (FAO, 2007).

This data sheet presents the morphological characteristics of starch from some improved cassava varieties developed at the Agronomy Research Center.

2. Material and Methods

2.1. Vegetable Material

The tuberous roots of cassava (*Manihot esculenta* Crantz) varieties studied come from part of the varietal collection of the National Agricultural Research Centre (NARC). They include: Anango agba, Attiéké M'bossi2, Ay15, IM89, TMS4 (2) 1425, CM (2), 9612A, I88/00159 (Photo 2).

The tuberous roots of the cassava varieties were harvested at different stages of the growth cycle (11, 13, 15 and 17 months after planting) in the experimental plots of the CNRA at Km 17 (Adiopodoumé). They were then transported the same day of harvest to Abidjan within jute bags for the study. Starch is extracted from these cassava roots according to the method of Delpeuch *et al*. (1979) (Figure 1).

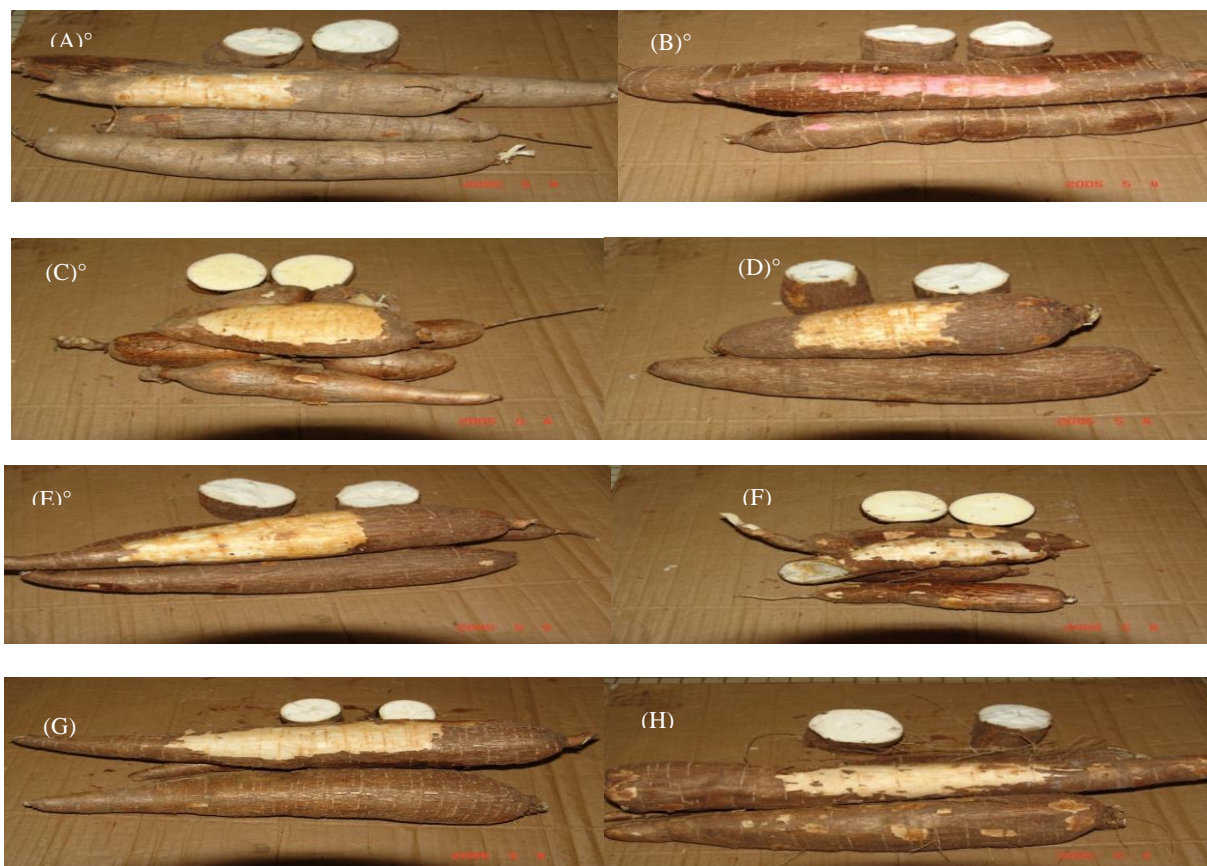**Photo 1**: Cassava field (**B. C. Ebah-Djedji**)

Photo 2: Cassava root varieties studied TMS4 (2)1425 (A), IM89 (B), I88/00159 (C), CM (2) (D), Attiéké M'bossi 2 (E), AY15 (F), Anangbo agba (G) et 9612A (H) (Photos **B. C. Ebah-Djedji**)
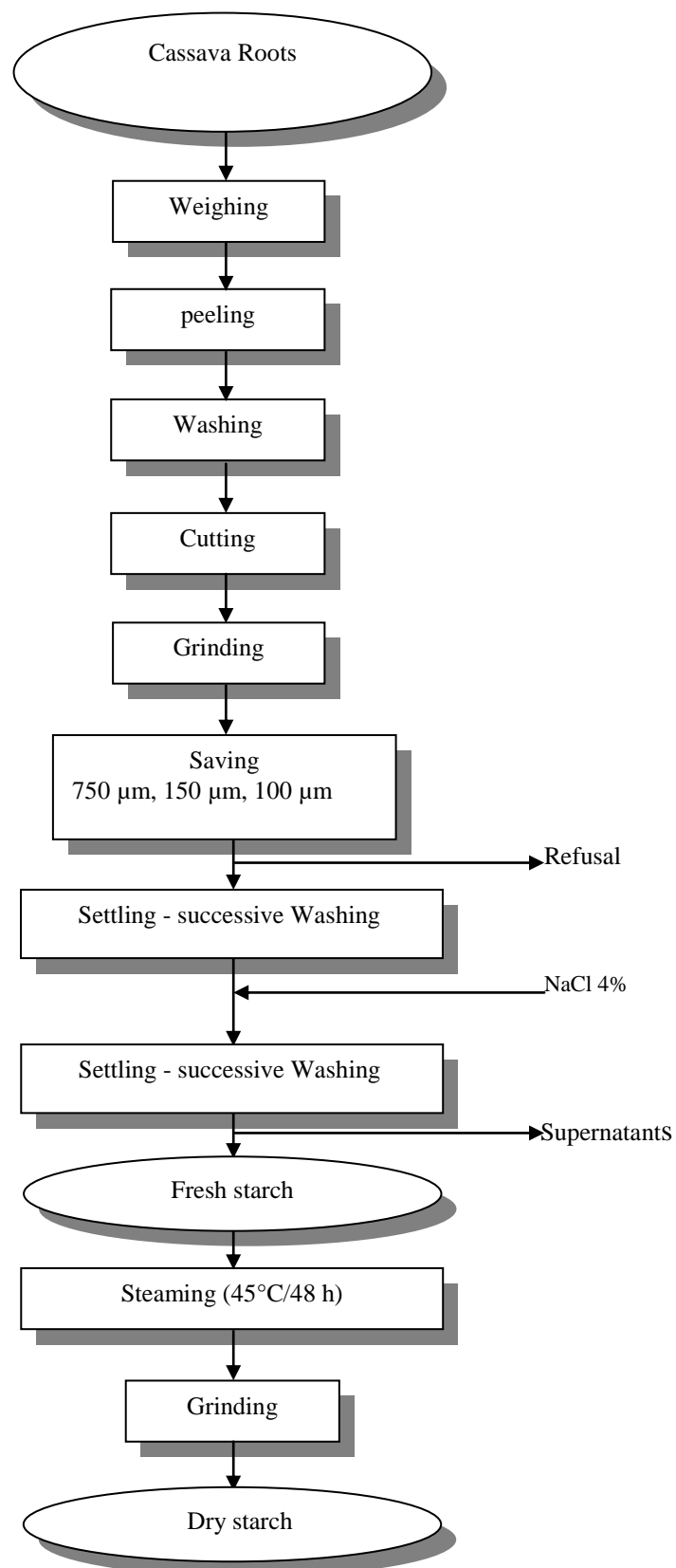
2.2 Starch extraction

Figure 1: Starch extraction Diagram (**Delpeuch** *et al*, **1979**)

- Morphology study of starch granules

The Scanning Electron Microscope (SEM) (Zeiss Supra 40-VP, Germany) with varying voltages (0.1 KV to 30 kV). The morphology of samples of grain starch cassava varieties is then observed with a voltage of 1 KV.

- Grain Size

The distribution of average grain diameter was determined on a total of 500 grains (Rasper, 1971). From the data obtained, the mean and standard deviation were determined.

- Frequency distributions of the average grain diameter of native starch.

It was translated by histograms and performed according to the rule of Sturge (Scherrer, 1984). A rule which helped define the expected number of classes and therefore the associated amplitude. The formulas used are:

NC=1+ (3, 33 log10 N);   a = Dmax-Dmin / NC

NC: number of classes; **a**: amplitude of class; **D**: maximum mean diameter of the granules.

- Analysis of variance (ANOVA) was used to study the factors and product parameter

& Variability .The homogeneity of the parameters studied was determined by comparing the averages by Duncan test at 5%

3. Results &Discussion
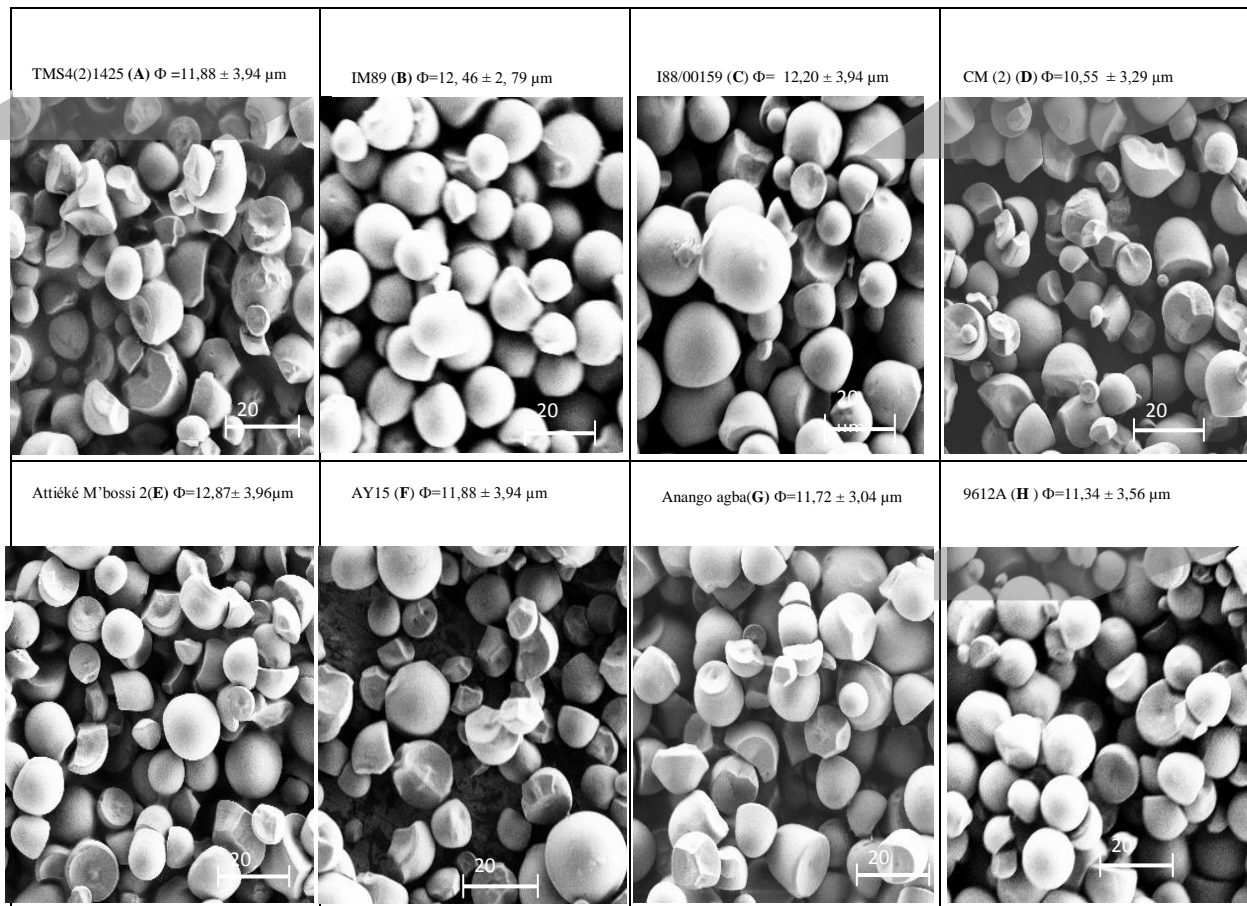## 3.1. Morphology of starch granules

Photo 3: Observation by scanning electron microscopy (SEM) of improved cassava varieties (Photo 2) native starch granules (TMS4 (2) 1425 (**A**) - IM89 (**B**) - I88/00159 (**C**) - CM (2) (**D**) - Attiéké M'bossi 2 (**E**) - AY15 (**F**) - Anango agba (**G**) - 9612A (**H**)

The improved cassava varieties root starch granules shapes are identical. They are predominantly spherical and ovoid. They are identical to those reported by **Szylit et al. (1977**) on the tuberous roots of cassava. It also complies with those recorded by **Zoumenou (1994)** on the tuberous roots of cassava varieties Bonoua ouaga and akaman. These authors reported form spherical starch granules and ovoid.

3.2. Granules size distribution

The frequency distribution of the starch granules average diameters is unimodal. The Interval and mode distribution of these cassava starch granules differ from one variety to another.

Unlike the form, the average granule sizes of starches differ significantly at the 5% of one variety to another and from one group of varieties to another. The values of the mean diameters of the starch granules native tuberous roots of different varieties are in agreement with those recorded on granules starch cassava varieties Bonoua ouaga and akaman by **Zoumenou (1994)** range from 2.6 microns -39 microns. They are close to those reported on cassava starch grains by **Duprat et al. (1980**) which vary between 1µm and 35 microns
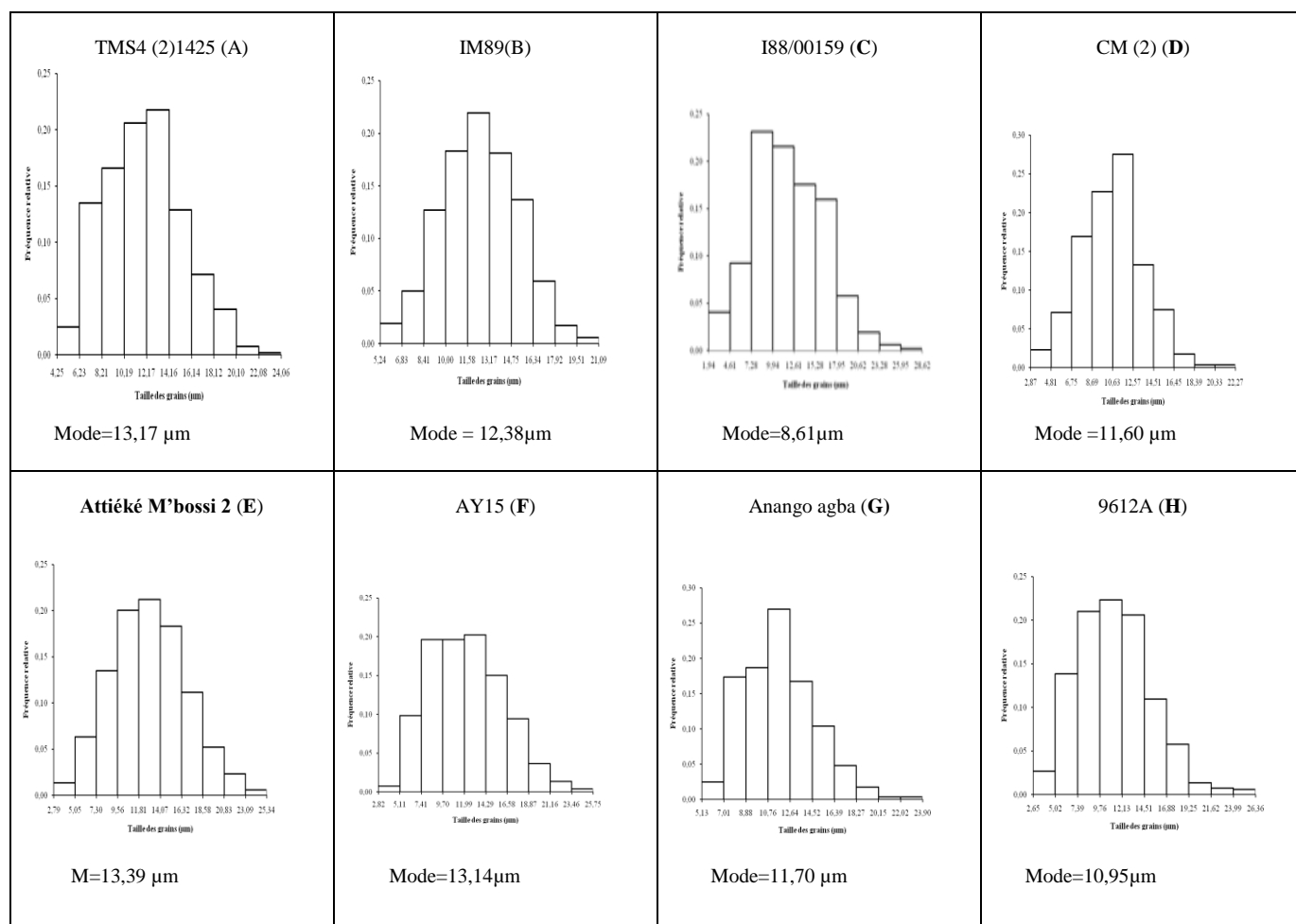

Figure 2: Starch granules diameter average distribution frequency

4. Conclusion

Starch extracted from the tuberous roots of improved cassava varieties has granules of heterogeneous forms which do not differ from one variety to another.

The size of these starch granules varies significantly at the 5% one variety to another and a lot of variety to another. Average diameters frequency distribution of the starch granules is unimodal. The mode of the distribution of starch granules differs from one variety to another.

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