Combined effect of drying conditions and starch composition on breadmaking ability of sour cassava starch

INTRODUCTION

Cassava starch modified by fermentation and UV irradiation acquires bread making ability. Exhaustive works have been performed to try to better understand sour starch breadmaking ability but due to date are still not fully elucidated. The aim of this work is to contribute to a better understanding of sour cassava properties, and to highlight the effects of varietal, altitude and process parameters on the breadmaking ability.

The Problematic:

What produces breadmaking ability?

A mechanism of starch degradation not fully elucidated

Manufacturing process of sour starch:

Cassava fucula extraction

Interest:

- Empirical processing
- Irregular product quality
- Dependence of climatic conditions
- Good breadmaking ability
- Gluten free

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RESULTS

Good breadmaking ability after fermentation + sun-drying (FSR) and notably in highland varieties

Highland varieties seem to be different to lowland:
- More marked sensitivity to sun-drying
- Different molecular structure, probably
- Hypothesis established from pasting properties, intrinsic viscosity and granule size.

Mechanism of starch damage:

1. At supramolecular level occurring main during fermentation. The site of preferential damage depends of cultivation altitude (differences in particle size, RVA and intrinsic viscosity analyses):
   - 1.1. In Highland varieties granules were damaged throughout their structure
   - 1.2. In lowland varieties granules were attacked only on their surface
2. At molecular level, fermentation and sun-drying treatments may also damage structure, i.e. by molecular weight reduction or depolymerization mechanisms.

CONCLUSION

- Post-harvest treatments were prevailing factors in improving breadmaking ability, while the varietal factor played a secondary role
- Fermentation had a more pronounced effect than sun-drying, but the combination of both treatments improved dough expansion
- Amylose content influenced negatively dough expansion, possible amylose-lipid complex formation
- The mechanism of starch degradation was located at supramolecular and molecular level:
  - At supramolecular level it occurs mainly during fermentation. It depends on cultivation altitude: lowland varieties were attacked on their surface whereas highland throughout their center. In highlands, breadmaking ability was better than lowlands, perhaps due to more extensive granule collapse during gelatinization, consequently better film formation around the bubbles of steam driven dough expansion.

What produces breadmaking ability?

Objectif

Comprehension of determinant factors to predict breadmaking ability of sour cassava starch

Specific objectif

Importance of treatment effect Vs varietal effect

 MATERIALS and METHODS

13 cassava starches (CIAT - Colombia) x 4 treatments

- 3 lowlands (1000 m)
- 10 highlands (1700 m)

1) Non fermented oven-dried (NFO)
2) Non fermented oven-dried with lipid (NFS)
3) Fermented oven-dried (FO)
4) Fermented sun-dried 'Rallanderia' (FSR)

Mechanism of starch degradation:

Located at both: at supramolecular level and at molecular level.

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LITERATURE CITED:

1) Laboratorio de calidad de raíces 2009 (CIAT), “Protocolo de panificación”
2) Sanchez et al. 2009, “Screening of Starch Quality Traits in Cassava”