Effect of slicing of cassava roots on growth rate of moulds during solid state fermentation

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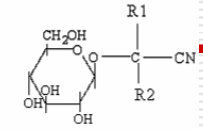
INTRODUCTION

Cassava in Mozambique

- ✓ 6.15 million tons of cassava in 2005
  ranks 5th (Nigeria, D R Congo, Ghana and Tanzania)
  Average yield 6.5 ton/ha (Exp St. 44 ton/ha)
- ✓ 320 kg per capita (fresh weight)
  112 kg per capita (dry weight)
  450 kcal/day/capita (offer about 30-40% of energy intake)

CYANOGENIC GLUCOSIDES



Cyanogenic glucoside

97% Linamarin (R1 = R2 = CH3)
3% Lotaustralin (R1 = C2H5, R2 = CH3)

Cassava varieties are often described as being **bitter** or **sweet** by reference to the taste of fresh roots and this partly correlates with cyanogen concentrations

Range: 0 - > 1000 mg CN/Kg dry weight
> 100 mg CN/Kg dry weight are considered toxic varieties

CASSAVA PROCESSING

- **Boiling**
- Applicable for sweet varieties (less CNp)

Moisture 65%
Dry matter 35%

Peeling

Sun drying

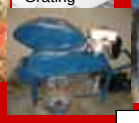
Moisture 11%
Dry matter 89%

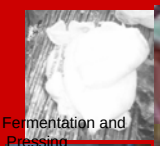
Lactic acid fermentation

Moisture 65%
Dry matter 35%

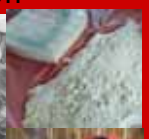
USD 3/100Kg

Grating



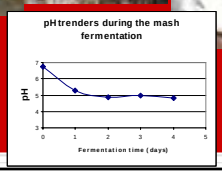


Fermentation and Pressing



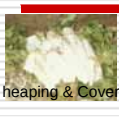
Rale

USD 0.4/kg



Moisture 11%
Dry matter 89%

Heap fermentation



heaping & Covering

Sun dried

Unfermented *karakata*

Fermented *karakata*

Rhizopus stolonifer,
Rhizopus oryzae
Neurospora sitophila,
Geotrichum candidum

The fermentation takes 4 to 7 days

Heap fermentation plays an important role in reducing the total cyanogens in cassava roots. It also improves flavour and reduce the rubbery characteristic

Objective of Study

To reduce fermentation time by slicing the cassava roots in heaps.

MATERIAL AND METHODS

- Cassava roots were washed with water, left for 20 min to dry,
- Cleaned with alcohol (70% v/v)
- Peeled to remove the periderm and cortex .

The sizes of cassava root slices were:

- Cassava roots, 8 cm long
- Cassava roots, 8 cm long, sliced longitudinally once
- Cassava roots, 4 cm long
- Cassava roots, 4 cm long, sliced longitudinally once

- **Preparation of mould spores**

Spore suspensions of *Neurospora sitophila* (CNF7) and *Rhizopus stolonifer* (CNF6), isolated in Nampula Province- Mozambique

Neurospora sitophila (CNF7)

Rhizopus stolonifer (CNF6),

Fermentation of cassava slices

incubation (triplicate) at 30o C for 0, 24, 48 and 72 hours.

Description of mould growth

The description of mould growth was carried out by **visual observation** of the cassava samples at each defined time of fermentation and score numbers were attributed as follows:

0- **No growth** (no mycelia), **1**- **Slight growth** (less than 1/4 of the roots covered with mycelia), **2**- Moderate growth (more than 1/4 and less than 1/2 of the roots covered with mycelia),

3-**Growth** (more than 1/2 of the roots covered with mycelia), **4**- **Good growth** (all roots covered with mycelia).

Texture analysis of cassava roots during fermentation

Stable Micro Systems Texture Analyser (SMS England) was used to determine the **softness/hardness** of the cassava roots

Determination of pH

Cassava flour samples (5 g) were suspended in distilled water (20 ml)

RESULTS DISCUSSION

Mould growth

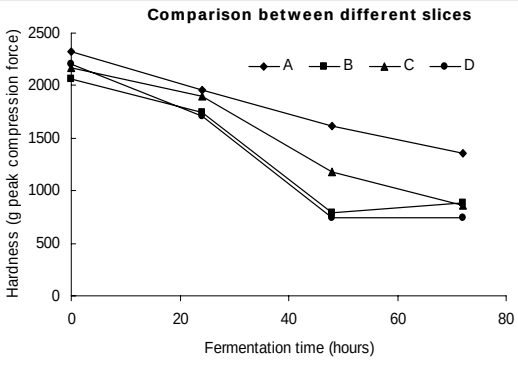
Table 1 Mould growth on different slices of cassava roots during fermentation at 30º C

Treatment	Fermentation time (hours)			
	0	**24**	**48**	**72**
Uninoculated cassava roots (control)	0	0	0	0
Inoculated with *Rhizopus stolonifer*:				
Cassava roots, 8 cm long	0	1	1	2
Cassava roots, 8 cm long, sliced longitudinally once	0	2	3	3
Cassava roots, 4 cm long	0	2	2	3
Cassava roots, 4 cm long, sliced longitudinally once	0	2	3	4
Inoculated with *Neurospora sitophila*:				
Cassava roots, 8 cm long	0	1	2	3
Cassava roots, 8 cm long, sliced longitudinally once	0	2	3	4
Cassava roots, 4 cm long	0	1	3	4
Cassava roots, 4 cm long, sliced longitudinally once	0	2	**4**	4

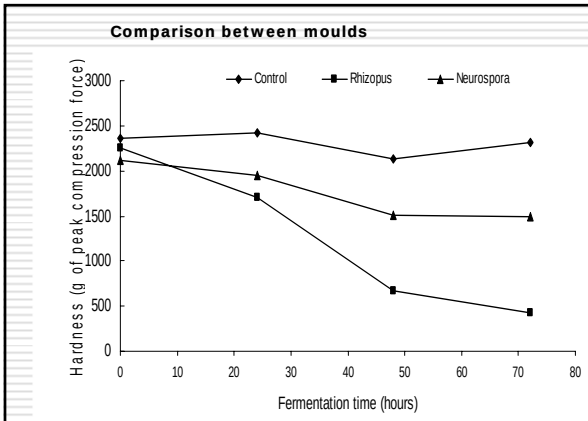
Neurospora sitophila

Rhizopus stolonifer

Texture



B and D are longitudinally sliced roots



pH changes

The average pH of all the fermented cassava samples decreased from 6.5 ± 0 to 5.8 ± 0.1 after 72 hours of incubation.

CONCLUSION AND RECOMMENDATIONS

- **Inoculation of cassava roots with isolated moulds resulted in a shorter fermentation time compared to the natural fermentation under uncontrolled conditions.**
- ***Neurospora sitophila* grew faster than *Rhizopus stolonifer* on cassava roots under controlled conditions.**
- ***Rhizopus stolonifer* softened the cassava roots more than the *Neurospora sitophila*.**
- **A combination of the moulds would reduce the fermentation time.**
- **Slicing the cassava roots is recommended as it increased the rate of mould growth and softness of the roots during the fermentation. However, a quick method of slicing needs to be investigated as slicing the cassava roots manually would be labour intensive.**