Effect of Processing Methods on the Chemical Composition and Rheological Properties of Cassava Flour from four new varieties.

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by

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ABSTRACT

Cassava (*Manihot esculenta*) features prominently in the diets of most West Africans. Traditionally, cassava roots are processed by a variety of methods into many different food products. One of the more recent uses of cassava is to produce flour for baking. There is therefore the need to study the effects of varying processing methods on the chemical composition of cassava have been reported, there is still the need for more studies on cassava flour production. This study investigated the effects of different flour processing methods on the chemical composition and rheological properties of new cassava varieties in order to determine their suitability for various food uses. Three processing methods (grating, slicing and reconstitution of the starch and fiber) were used to obtain the cassava flours from four cassava varieties. The flour samples were analyzed for proximate composition, starch, reducing and non-reducing sugars, free cyanide as HCN, non-glucosidic cyanogens and total cyanogens. Pasting characteristics of the flours were determined using the Brabender viscoamylograph. Both the variety and the method of flour production significantly affected flour chemical composition. The protein, ash, sugar and fibre contents were lowest in reconstituted flours (RCF) though the starch content of RCF was highest. Cyanogen levels in the flours were also significantly affected by processing methods. Reconstituted flours had lowest cyanogenic potential. The total cyanogens ranged from 0.083 for RCF to 1.838 mg CN equiv/Kg. for flours produced by slicing. Slicing produced flours with the lowest peak paste viscosities (298BU to 456BU) whilst that for RCF were highest (714BU to 914BU). All other rheological indices were also lowest for flours from the method of slicing. The reconstitution method significantly reduced the total cyanogens of the flours but resulted in flours with higher viscosities. The viscosities of grated cassava flours were however more suitable for baking.

INTRODUCTION

The rate of increase of cassava production has been higher than any other crop in Africa over the past 15years due to the release of improved varieties by the International Institute of Tropical Agriculture (IITA) in Nigeria (Nweke *et al.*, 1994).

Cassava, like most root crops is a major source of carbohydrate and traditionally, cassava roots are processed by a variety of methods into many different food products. Flours are the most widely used cassava products and are processed in a variety of ways. The different cassava flour processing methods applied to cassava processing are expected to influence the characteristics of the resulting flour .

OBJECTIVE: To investigated the effects of different flour processing methods on the chemical composition and rheological properties of flours from the different cassava varieties.

MATERIALS AND METHODS

❖ **Raw Materials**

Four new cassava varieties; *Yebeshie, Abasafitaa, 175* (VI) and 045 (V2) were used for the study. They were used immediately after harvest.

❖ **Cassava Flour Preparation**

After peeling and washing, three different processing methods were used for the cassava flour preparation

❖ **Slicing:** Tubers were sliced to 2-3cm thicknesses. and spread thinly on trays to dry @ 50°C for 8h. The dried chips were milled into flour .

❖ **Grating:** Tubers were grated and dewatered. The mass and oven-dried immediately at 50°C for about 8h. The dried grated cassava was then milled into fine powder

❖ **Reconstitution:** Fresh cassava tubers were peeled, washed, chopped and blended with water into a paste. This was then sieved to separate the starch from the fibre using lots of water to wash the starch from the fibre. The starch was made to settle for 10h before the supernatant was decanted and the starch dried at 50°C for 8h. The fibre/residue that was obtained was dried immediately at a temperature of 50°C for 8h. The dried starch and fibre were then milled and mixed thoroughly using a Y cone mixer to obtain the flour

❖ **Analytical methods**

- Proximate composition (AOAC, 1990),
- Starch, reducing and non-reducing sugars (Egan *et al.*, 1981)
- Free cyanide as HCN, non-glucosidic cyanogens , total cyanogens (Essers *et al.*, (1993)
- Pasting characteristics of the flours

RESULTS AND DISCUSSION

❖ **Chemical composition**

The chemical composition of the different cassava samples are shown in Table 1.

The levels of all three types of cyanogens (cyanogenic glucosides, cyanohydrins, and hydrogen cyanide (HCN) varied significantly ($P \leq 0.05$) with the processing methods. Reconstitution gave the lowest cyanogens for all varieties in the finished product whilst slicing gave the highest. Abasafitaa had the highest cyanogen levels whilst Yebeshie had the lowest in all the flours.

The reconstitution method which involved addition of starch to the fiber gave flours with the highest starch content, but lowest amounts of sugar. Grating method produced flours with highest levels of sugars.

Table 1: Chemical Composition of Cassava Flour Samples

Cassava Variety	Samples	Total Cyanogen levels mg CNequiv/kg	[1]Protein (%)	[1]Ash (%)	Crude Fibre (%)	Starch (%)	Sugars (g/100g)
Yebeshie	Unprocessed	-	0.59±0.01	1.17±0.01	-	14.8	-
	Flour from Slices	1.33	1.07±0.00	1.93±0.07	5.40	48.95	8.3
	Flour from Grates	0.34	0.88±0.00	0.82±0.02	4.25	59.27	14.1
	*RCF	0.29	0.71±0.00	0.79±0.02	3.57	65.20	5.0
Abasafitaa	Unprocessed	-	0.40±0.04	0.85±0.01	-	21.0	-
	Flour from Slices	1.67	1.24±0.00	3.66±0.08	3.59	35.85	15.2
	Flour from Grates	0.38	1.07±0.00	3.23±0.01	3.26	35.09	19.8
	*RCF	0.24	0.35±0.00	0.97±0.01	2.87	63.40	14.7
VI- 175	Unprocessed	-	0.62±0.02	1.03 ±0.00	-	23.8	-
	Flour from Slices	0.50	1.25±0.01	3.04±0.09	1.2	37.68	19.7
	*RCF	0..09	0.18±0.00	0.76±0.04	1.1	62.45	16.4
V2-045	Unprocessed	-	1.29±0.06	1.00±0.01	-	19.6	-
	Flour from Slices	1.61	0.89±0.00	2.28±0.02	1.2	58.11	3.6
	*RCF	0.14	0.35±0.00	0.86±0.02	1.0	74.32	5.2

[1]: *Average of two determinations *RCF – Reconstituted Cassava Flour*

❖ **Rheological characteristics**

The rheological characteristics of the different cassava samples are shown in Table 2. Though pasting temperature did not vary significantly, the viscosities varied with processing method. and variety used.

Table 2: Pasting Characteristics of Cassava Flour from Different Processing Methods (Measuring Range - 1000cmg)

Cassava Variety	Method of flour production	Pasting Temp / 0C	Peak Viscosity / BU	Viscosity at 950C / BU	Viscosity at 950C hold / BU	Viscosity at 500C / BU	Viscosity at 500C hold / BU	Set Back
Yebeshie	Slicing	62.7	404	239	149	274	253	125
	RCF	65.0	808	429	301	570	544	269
	Grated	66.9	619	375	245	435	408	190
Abasafitaa	Slicing	*61.2	*576	*5	*-8	*15	*19	23
	RCF	61.5	524	112	74	137	140	63
	Slicing	*67.5	*979	*75	*37	*99	*110	62
VI - 175	Chips	69.1	456	259	150	275	256	125
	RCF	58.1	837	384	265	514	494	249
V2 - 045	Chips	62.7	437	228	130	247	230	117
	RCF	66.0	714	352	250	474	447	224

***Measuring Range - 350cmg**

CONCLUSIONS

The method of flour production has a significant effect on chemical as well rheological properties of the flour. Depending on the end-use of the flour, different processing methods can be used to obtain the flour with the desired functionality. Although reconstitution significantly reduced the total cyanogens of the flours the resulting flours had the highest viscosities. The viscosities of grated cassava flours were however found to be more suitable for baking

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