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Effect of Milling Machines and Sieve Sizes on Cooked Cassava Flour Quality

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ABSTRACT

Cassava flour has a wide range of uses and its product stability is a major advantage in exploiting its potentials for opening into new markets beyond the normal use of fresh roots and traditional food products. This study therefore examined appropriate processing methods to meet consumer needs. Dry cassava chips were obtained from the cassava breeding unit of the International Institute of Tropical Agriculture (IITA) Ibadan, Nigeria. 1 kg sample of chips was milled in each of pin, hammer, attrition and mortar mills. The flour recovered from each mill was weighed and sieved with 0.55 mm and 0.05 mm sieve apertures to compare the level of losses and final recovery percentage for each mill. The flour obtained, using the sieves for the different mills, was cooked for 5 min by mixing 200 ml of cassava flour with 400 ml of water. Sensory evaluation was conducted to assess the taste, texture, colour, plasticity and general acceptability of the cooked flours. The percentage flour recoveries were 96, 87, 75 and 62 respectively for pin, hammer, attrition and mortar mills. The results from sensory evaluation showed preference for the quality of cooked cassava flour from pin mill followed by those from hammer, attrition and mortar mills. There were significant differences ($p < 0.05$) in the quality of the cassava flour from the various milling machines. These results therefore suggest that products from the pin mill may be a better alternative to the popular hammer mill.

Keywords: Chips, fineness, flour, lafun and milling machines.

Introduction

Cassava *(manihot escutenta crantz)* is a major food crop grown in Nigeria, supplying about 70% of the daily calorie of over 50 million people in Nigeria (Oluwole *et al.*, 2004). According to Abu *et al.* (2006), it has been estimated that cassava provides food for over 500 million people in the world. It is essentially a carbohydrate food with low protein and fat. Ihekoronye and Ngoddy (1985) and Oluwole *et al.* (2004), reported that edible part of fresh cassava root contains 32 – 35% carbohydrate, 2 – 3% protein, 75 – 80% moisture, 0.1% fat, 2.0% fibre and 0.70 – 2.50% ash. The consumption of cassava has currently been on the increase, and the growing of cassava is expanding to semi-arid areas where cassava was not cultivated some thirty years ago (Omodamiro *et al.*, 2007).

In Nigeria, the fresh starchy cassava roots are highly perishable and a lot of post-harvest losses occur also as a result of the inherent high moisture content of fresh roots, which promotes both microbial deterioration and unfavourable biochemical changes in the commodity (Wenham, 1995). This limits its availability as a raw material to the industries that need it, but are largely processed and used as human food and animal feed.

Cassava processing for industrial use by small scale processors can be a relatively high income earning enterprise. This necessitates the need for the introduction of improved processing technologies, methods and expanded markets. This has become

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necessary for the country to retain her present global position in cassava production. In recent years, cassava research objectives at the International Institute of Tropical Agriculture (IITA), Ibadan, has been the development of alternative methods for cassava utilization and the use of the excess production for income generation and poverty alleviation (Sanni *et al.*, 2005).

Cassava root tuber contains about 60 to 70% water which makes it extremely perishable, and cannot be stored for long periods of time. Deterioration of cassava, which begins within 40 – 48 hours after harvest, has adverse effect on the processed products (Linus, 1999). As a result of this, cassava is usually processed shortly after harvest. Cassava roots are usually processed to lengthen their shelf life, have their water content reduced to facilitate transportation and to reduce the cyanogenic potential to a safe level. Processing also enhances taste and improves palatability (Bencini, 1991).

Cassava flour is produced from cassava root tubers with either low or high cyanogenic potential (CNP). Cassava flour has continued to find wider applications in the food, feed and chemical industries (Balagopian, 2002). Unfermented cassava flour can be used in the preparation of bakery products such as cakes, biscuit, cookies, and so on, and in the production of noodles and macaroni (Oladunmoye *et al.*, 2001). Cassava products can either be wet or dry. The dry milled products from cassava are normally referred to as flour. In order to achieve floury products, freshly peeled cassava root tubers are subjected to milling operation among others, either manually or mechanically. After this operation, the products obtained are sieved to obtain the floury product. The fineness of the product from the mechanical mill is controlled by the holes in the screen according to Ravidran and Ravidran (1998).

This study was carried out to investigate the effects of different milling machines on the fineness of sieved cassava flour which determines the colour, texture and plasticity of the cooked flour

Materials and Methods

Some quantity of dry cassava chips were obtained from the cassava breeding unit of the International Institute of Tropical Agriculture (IITA), Ibadan. One kilogram (1 kg) of the cassava chips was each weighed for the different milling machines using an electronic weighing machine. The milling commenced with mortar mill. The weighed cassava chips were fed into the mortar and the milling was done with the use of pestle. Other mills used are Attrition, Hammer, and the Pin mills. The weights after milling for each of the mills were recorded.

Sieve analysis was carried out by passing the milled products through sieves with sizes ranging from 0.5 mm to 0.55 mm. The percentage recoveries, based on the weight obtained, were also determined for each of the milling machine.

Sensory evaluation was carried out by mixing 200 ml of the flour recovered from each mill after sieving in 400 ml of water and cooked for 5 min to form cassava paste known as *lafun*. Ten-member panel was used to evaluate the cassava paste. The panel were semi-trained but consisted of lafun consumers who were familiar with lafun quality. Selection was based on interest and availability. It was served hot on randomly coded plates.

The panel members were seated in an open well-illuminated laboratory. Method reported by Iyang and Idoko (2006) was used in rating the *lafun's* colour, taste, plasticity and texture on a 9-point scale, where 9 represented like extremely and 1 dislike extremely. Overall acceptability of the samples was also rated on same scale with 9 highly acceptable and 1 = highly unacceptable. Data for all parameters were reported as means of 10 judgments. Analysis of variance was computed for each sensory attribute.

Results and Discussion

Weights of cassava flour recovered after milling and the corresponding percentage losses, weights of flour recovered using 0.5 mm sieve aperture and the corresponding percentage recovery, and weights of flour recovered using 0.05 mm sieve aperture and