

FEASIBILITY AND ACCEPTABILITY FOR SWEETPOTATO BAKERY PRODUCTS.

A. BREAD

Description of the product

Materials

Sweetpotato roots

Fresh sweetpotato storage roots used in this study were from two popular clones found in Kampala: "Tanzania"¹ and "New Kawogo". They were purchased from the Kalerwe market. Tanzania is characterized by a white skin and yellowish fresh color whereas New Kawogo has a red skin and whitish flesh colour.

Sweetpotato dry matter determination

Dry matter content was determined as follows: triplicate 100-g samples of fresh roots were weighed to 0.1 mg, dried at 70°C in a forced-air oven until the weight became constant (about 48 hours), removed, allowed to cool for 5 min in a desiccator, and again weighed. It was $31.7 \pm 0.4\%$ for variety Tanzania and $31.5 \pm 0.9\%$ for New Kawogo.

Sweetpotato flour

Sweetpotato flour used in this study was processed out of dried sweetpotato slices purchased from a farmer at Soroti, Uganda. They were from variety Tanzania and processed according to the general schema described in Figure 1. After harvesting, sweetpotato storage roots are usually kept in the sun for 2-3 days, hand-peeled, sliced, and sun-dried. After peeling, they are often crushed instead of slicing² and dried. Sun-dried sweetpotato slices are reportedly very sensitive to attack by storage weevils. To prevent such damage, some farmers in Tanzania parboil or blanch the slices at the boiling temperature of water for 3-5 min and then dry them for 2-3 days before storage (Dr. Kapinga, personal communication). After parboiling, a hard protective layer forms during the sun-drying period because of gelatinized starch at the surface of the slices. This hard layer seems to prevent storage weevils

¹Tanzania is occasionally referred to as "Mbale".

²Farmers report that slicing is labour-intensive and even dangerous (sharpened knife used in that process could be perilous).

from penetrating into the slices. The blanching technique has not yet been reported in Uganda, but it is a common practice in some parts of Tanzania (Ewell, 1993).

Sweetpotato slices used in our study were redried before use in forced-air cabinet drying at the KARI-Postharvest Program in Kawanda to a moisture of 8% dry weight and then ground into flour in a "Posho" mill at the Nakawa market.

Wheat flour

The wheat flour used was that generally used for bread-making in Uganda. It was milled in Uganda Grain Millers Ltd. at Jinja (Unga Millers Limited, P.O. Box 895, Jinja, Uganda).

Baking trials

Baking trials were conducted under commercial baking conditions at FADCA Quality Foods, P.O. Box 2997, Kampala, Uganda, using a mixture containing various proportions of wheat flour, sweetpotato flour or fresh-grated or boiled and mashed sweetpotato storage roots. Table 1 gives the recipe for commercial baking using composite flour with sweetpotato.

Baking procedure

Sweetpotato (flour, raw and grated³, or boiled and mashed⁴), wheat flour, baking yeast (Fermipan, Gist-brocades, P.O. Box 1, 2600 MA Delft, Holland), dough improver (preparatory mix of dough improvers and raising agents), and sugar were mixed together and a quarter of total water added. Figure 2 shows the technological process schema.

The dough was kneaded using a mixer for 2 minutes at the first speed, and fat slowly added. The mixer continued at this speed for two more minutes. The remaining water⁵ was slowly added to the mixture and mixing continued for 8-10 min at n° 2 speed until an elastic dough was formed. The dough was cut into pieces of 560 g (which should give a normal bread loaf weight of 500 g after baking), moulded, and then put in a fermentation cabinet kept at about 30°C and 80% relative humidity for 2 hours. The dough was then baked at 240°C for 25-30 min. Eight

³Grating is usually hard and time-consuming work because of the latex content in sweetpotato storage roots. In this study, it was done manually using a small kitchen grater. In Figure 2, the peeling operation could be omitted when white-skinned variety Tanzania is used.

⁴Refers to peeled roots maintained in boiling water for about 25-30 min and then hand-mashed into puree.

⁵In bread-making, water used in the recipe is usually not measured. It will depend on the protein content of flour and the protein capacity of water retention. Experienced bread-makers normally know how to check whether water is sufficient by feeling the dough elasticity in their hands.

samples of baked bread loaves were weighed 20 hours after baking. The day after baking, loaves were sliced, packed and then taken to the Middle East or Kalerwe markets for consumer acceptability testing⁶.

The end product

Table 2 presents the calculated yield and changes in weight for a bread loaf of 500 g by adding sweetpotato as an ingredient. The yield in bread is about three loaves from 1 kg of wheat flour or sweetpotato flour. From about 1 kg of raw and grated sweetpotato roots, you can obtain one bread loaf of 500 g, whereas this ratio is about 800 g from boiled and mashed sweetpotato roots (Table 2). It is interesting to note the heaviness of the loaves from raw and grated, and from cooked and mashed, sweetpotato roots. In fact, they are about 10 g heavier than the loaves processed from wheat flour or wheat flour plus sweetpotato flour.

Much more work is needed to determine the effect of that heaviness on the storability of the bread loaves in which raw and grated or boiled and mashed sweetpotato have been incorporated. Many consumers have raised questions about how long such loaves could be kept without deteriorating and becoming unfit for human consumption⁷.

Sweetpotato flour in bread-making

From discussions we had with commercial bakers, we learned that sweetpotato flour would be easy to handle and use as a potential substitute for wheat flour in bread-making.

Various test loaves using increasing amounts of sweetpotato flour in lieu of wheat flour were made to see how much wheat flour could be replaced and still provide an acceptable bread. We undertook to process 500-g bread loaves using 16.6%, 23.3%, 30%, and 50% sweetpotato flour to replace wheat flour with FADCA's equipment. The 0% loaf was the bread type "salty" usually processed at the FADCA bakery.

Sweetpotato flour bread

Table 3 lists some properties of bread baked at FADCA's bakery from composite flours containing different proportions of sweetpotato flour. We observed the characteristics indicated or FADCA's workers noticed them after

⁶During our first-day test made on loaves with FADCA's workers, we decided to remove from the survey the bread containing the boiled and mashed sweetpotato because it was too heavy, the crust was very rough, and the loaves were not commercially acceptable. We believe the mixing was not adequate. More mixing tests are required to establish the correct mixing time.

⁷Increased moisture in the baked product produces a softer crumb and increased shelf life.

seeing and tasting the bread made from the composite flour. Our results corroborate and generally agree with those reported by Sammy (1970).

Use of 16.6 % sweetpotato flour produced a loaf almost identical to the standard wheat loaf, except for the light grey colour with yellowish particles because of the sweetpotato flour (yellowish fresh variety, Tanzania) of the crumb⁸. A 23.3% introduction produced a smaller and less attractive loaf. It had a very slight sweetpotato off-odour and taste when hot, but this seemed to disappear on cooling. This loaf was acceptable, but less so than the 16.6% loaf. The 30% loaf was unacceptable as a formal bread because of its distinct sweetpotato off-flavour, taste, and insufficient rising. There was no rising with the introduction of 50% sweetpotato flour. Figure 3 shows the loaves with 16.6%, 23.3%, and 30% sweetpotato.

This experiment indicated to us that sweetpotato flour could replace wheat flour up to 20% if it is well processed and of high quality⁹. Studies in terms of particle size, colour and drying conditions are still needed in order to improve sweetpotato flour and its end products.

Consumer acceptability

Acceptability was evaluated by comparing sweetpotato bread (using raw, grated sweetpotato or sweetpotato flour to substitute for wheat flour¹⁰) with the bread the consumer has just bought from the market. Attributes such as sugary taste, colour, apparent freshness, heaviness, appearance (grain, texture, symmetry, crust and crumb colour), and general acceptability were judged subjectively by bread consumers. Bread consumers were asked to compare sweetpotato bread with the one they had just bought and had in their hands or were used to buying. In the Middle East market, consumers compared sweetpotato bread with raw, grated sweetpotato roots (var. Tanzania) (#1) and raw and grated roots (var. New Kahogo) (#2). In the Kalerwe market, consumers were asked to compare sweetpotato bread with raw, grated sweetpotato roots (var. Tanzania) (#3) and to bread with flour processed from sweetpotato roots (var. Tanzania) (#4). We did not inform consumers whether our product contained sweetpotato as an ingredient.

Consumer acceptability characteristics

Figure 4 summarizes bread characteristic acceptability at the Middle East and Kalerwe markets and shows consumers' choice between two types of sweetpotato bread and the type they have just bought at the respective

⁸The bread produced using the recipes indicated in Table 1 was like a standard European-type bread. It contained 2-3% sugar whereas the popular bread in Kampala usually contained about 10% sugar in the total ingredients. The standard European-type bread is labeled "salty".

⁹The dried sweetpotato slices used to produce flour were not highly cleaned and the fineness of the flour was poor.

¹⁰We used 16.6% sweetpotato flour loaves.

market. At the Middle East market 73 bread consumers (purchasers) were interviewed, and 68 at the Kalerwe market.

Sweetness

Most consumers from both markets indicated for their first choice that the bread loaf usually bought was much more sugary. The bread loaf containing raw and grated sweetpotato was their second choice at both markets. At the Middle East market, where we used two varieties but the same process of grating, there was no difference in choice of consumer acceptability between varieties Tanzania and New Kawogo (Figure 5, second choice at Middle East). Sweetpotato flour introduction in bread-processing seemed to reduce the sugary taste as a characteristic in bread acceptability. The popular bread in Kampala is very sweet, and sugar usually represents about 10% of the total ingredients.

In Uganda, bread is not a staple food like it is in other many countries around the world where the sugar content in bread rarely exceeds 2-3%. In Kampala, bread is often consumed by a certain group of people (usually with a high income) for breakfast and in the evening with tea. It is preferred very sweet perhaps as a substitute cake, or as a cheap cake.

This fact is confirmed by the popularity and high preference of sweet yellow bread loaves in which artificial yellow food colorants¹¹ have been used to give to loaves the yellowish cake aspect or impression that eggs have been added.

Colour

The colour of the bread loaf usually bought was the first choice at Middle East market and almost tied with one containing raw and grated sweetpotato (variety Tanzania) at the Kalerwe market (Figure 4). The yellowish aspect of variety Tanzania had a good record in colour acceptability as well at the Middle East market, where bread containing raw and grated Tanzania was the second choice. Definitely, yellowish colour is an important characteristic in acceptability of bread colour in Kampala.

Filling

For the filling aspect among consumers, bread containing raw and grated Tanzania tied with the one usually bought at the Middle East market, as the first choice. The same figures for the first choice were observed at the Kalerwe market, but this time between the loaf usually bought and the one containing sweetpotato flour. As the second

¹¹Food grade colour used is orange or yellow obtained by a blend of tartrazine, sunset yellow, ponceau 4R and NaCl.

choice, bread with raw and grated New Kawogo was preferred at the Middle East market whereas the one with raw and grated Tanzania was preferred at the Kalerwe market.

Appearance

As the first choice, the bread loaf usually bought looked better at the Middle East Market, followed by a tie between the bread with raw and grated Tanzania and New Kawogo (Figure 4). At the Kalerwe market, the loaf usually bought tied with the one containing raw and grated Tanzania for the first choice. The second choice was the bread with raw and grated Tanzania that was preferred at both markets.

Freshness

At the Middle East market, consumers found that the three different bread types were highly fresh whereas at the Kalerwe market their first choice was the bread with raw and grated Tanzania. As the second choice for consumers, bread with raw and grated Tanzania tied with the one with raw and grated New Kawogo at the Middle East market whereas the loaf usually bought led at the Kalerwe market, followed by the one with raw and grated Tanzania (Figure 4).

Taste

The loaf usually bought was the first choice at the Middle East and Kalerwe markets. Bread with raw and grated Tanzania was the first second choice at both markets.

Conclusion on the bread characteristic acceptability

The acceptability characteristics recorded among bread consumers at the Middle East and Kalerwe markets for loaves made from ingredients including raw and grated sweetpotato were similar to those for bread usually bought except for the sweetness characteristic for which the preference was very clearly favored the bread usually bought. The bread made from ingredients including sweetpotato flour had acceptability characteristics in general poorer than those of the one usually bought.

Price

Some 60% of consumers interviewed at the Kalerwe market said they would pay the same price for the bread loaf made from ingredients including raw and grated sweetpotato (variety Tanzania) as for bread loaf just or usually bought (Figure 5), 2% would pay more and 38% would pay less. The same figures have been recorded at the Middle East market for the loaves containing raw and grated Tanzania. Those willing to pay the same price as for bread loaf just bought reached 98% among consumers for the bread containing raw and grated New Kawogo. Only 40% of the consumers interviewed at the Kalerwe market would pay the same price for the bread loaf made from

ingredients containing sweetpotato flour as for bread loaf just or usually bought. Of the consumers interviewed, 60% said they would pay less for the bread with sweetpotato flour.

B. CHAPATI

Description of the product

Materials

Sweetpotato roots

The same common sweetpotato varieties Tanzania and New Kawogo were used for chapati trials.

Wheat flour

Wheat flour used was that generally used for chapati-making in the Nakawa and Wandegeya markets. It was milled by UNGA Limited, Commercial Street P.O. Box 30386, Nairobi, Kenya.

Processing

Chapatis were made from the following recipe : 1.0 kg of wheat flour, 1.0 kg of sweetpotato (boiled and mashed or raw and grated), 1 teaspoon (about 1.7 g) of salt (Salt Manufacturers Kenya Ltd., P.O. Box 81665, Mombasa, Kenya), 3 teaspoons (about 5 mL) of baking powder¹² (Kapa Oil Refineries Ltd., P.O. Box 18492, Nairobi, Kenya), 1/4 cup (about 100 mL) of vegetable oil (Mukwano Industries Ltd., P.O. Box 2671, Kampala, Uganda) and 2 cups of water.

The chapatis for our trials were processed by one of the chapati makers from the respective market following the appropriate commercial chapati procedure. Figures 6 and 7 indicate the process schemas of chapati-making using boiled and mashed sweetpotato and raw and grated sweetpotato roots.

Sweetpotato and dry ingredients were mixed together. Water was added and the mixture hand-kneaded to make a soft, smooth dough. The resulting dough was divided into approximately equal portions and formed into balls. These were rolled¹³ into circular shapes of about 12 cm in diameter and about 3 mm thick using a floured pastry board, and grilled on a hot and oily griddle iron for about 1 minute each (about 30 sec for each side) (Figures 6 and 7).

¹²Some processors in Kenya and Uganda do not use the baking powder.

¹³Chapati processors told us that the mixing and rolling of dough containing raw and grated sweetpotato was harder than usual, whereas the one with boiled and mashed sweetpotato was easier.

The end product

Chapati in Kampala is a kind of simple, flat, salty bread (Figure 8) generally characterized by the size, oiliness, and heaviness. The main quality components of chapati are discussed later in this report.

Consumer acceptability

Acceptability was evaluated by comparing sweetpotato chapatis (substituting raw and grated or cooked and mashed sweetpotato for wheat flour) with the chapatis the consumer has just bought from the market. Attributes such as taste, colour, apparent freshness, filling, heaviness, oiliness, appearance (texture, symmetry, crust), and general acceptability were judged subjectively by chapati consumers. Chapati consumers were asked to compare sweetpotato chapati with the one they had just bought and had in their hands or were used to buying. In the Nakawa and Wandegeya markets, consumers were asked to compare chapati with raw and grated sweetpotato roots (var. Tanzania) with chapati of boiled and mashed sweetpotato roots (var. New Kawogo).

Consumer acceptability characteristics

Figure 8 summarizes chapati acceptability characteristics at the Nakawa and Wandegeya markets as indicated by consumers. They compared sweetpotato chapati with the one they have just bought at the respective market, and ranked them as their first or second choice. At the Nakawa market, 29 chapati consumers (purchasers) were interviewed, and 51 at the Wandegeya market.

Sweetness

Most consumers from the Nakawa and Wandegeya markets indicated the chapati with the boiled and mashed New Kawogo sweetpotato ingredient as their first choice for sugar content and sweetness (Figure 9). As their second choice, chapati containing raw and grated Tanzania was indicated at the Nakawa market whereas the chapati usually bought is as sweet as the one containing raw and grated Tanzania for consumers (purchasers) of the Wandegeya market¹⁴.

Oiliness

Chapati with boiled and mashed New Kawogo as an ingredient was chosen first by consumers from the Nakawa and Wandegeya markets for its well-measured oil content. Chapati usually bought and the one with raw and grated Tanzania followed at the same level as the first choice for oil content (Figure 9). As for the second choice,

¹⁴Although consumers have classified the chapati according to its sweetness, the chapati sweetness component is not a quality usually desired in the product. Consumers indicated that the sweet chapati adds a new choice on the market.

consumers did not show a clear difference for the three types of chapati although the one with raw and grated Tanzania was the second choice by a slight margin.

Colour

For consumers from the Nakawa market, chapati made from ingredients containing boiled and mashed New Kawogo was definitely their first choice. At the Wandegeya market, the first choice was not clear. The colour of the three types of chapati was good, but chapatis with raw and grated Tanzania and the ones just and usually bought had the best first colour. As for the second choice, chapati usually bought and the one with raw and grated Tanzania were indicated at the Nakawa market. The three types of chapati tied at the Wandegeya market as the second choice for consumers.

Filling

For consumers from the Nakawa market, chapati with boiled and mashed New Kawogo was their first choice, followed by the one with raw and grated Tanzania (Figure 9). At Wandegeya, the first choice was not distinctively clear for consumers because the three types were highly accepted. As the second choice, chapati with raw and grated Tanzania was preferred at both markets. Consumers indicated chapati usually bought and the one with boiled and mashed New Kawogo as their first second choice.

Appearance

As the first choice, chapati with boiled and mashed New Kawogo looked nice at the Nakawa market (Figure 8). At the Wandegeya market, chapati with raw and grated Tanzania led as the first choice of consumers, followed by a tie between the one with boiled and mashed New Kawogo and the one usually bought. As the second choice, chapati with raw and grated Tanzania was preferred by consumers at the Nakawa market. At the Wandegeya market, consumers did not find any difference in appearance and shape between the chapati just bought and the one with raw and grated Tanzania (Figure 9).

Freshness

At the Nakawa and Wandegeya markets, consumers found that the chapati with boiled and mashed New Kawogo was their first choice in freshness. The figures for the second choice were similar at both markets and the chapati with raw and grated Tanzania was their first second choice. The ones just and usually bought followed with an equally record of acceptability.

Taste

The taste of chapati with boiled and mashed New Kawogo was the first choice for consumers from the Nakawa market. Consumers from the Wandegeya market indicated that the taste of the three types of chapati was very good and all could be considered as the first choice. As the second choice, chapatis just and usually bought with the one containing raw and grated Tanzania were preferred at both markets.

Conclusion on chapati acceptability characteristics

Acceptability characteristics recorded for chapatis made from ingredients including boiled and mashed sweetpotato were superior to those for chapati usually bought. Chapatis made from raw and grated Tanzania were similarly acceptable as the one usually bought.

Price

Some 78% of consumers interviewed at the Nakawa market said they would pay the same price for chapati made from ingredients containing raw and grated Tanzania (Figure 10) as for chapati usually bought, 10% would pay more and 12% would pay less. The same figures were recorded at the Wandegeya market for chapati with raw and grated Tanzania. For chapati with boiled and mashed New Kawogo, 80% of consumers at the Nakawa market would pay the same price as for the chapati usually bought, 18% would pay more and 2% would pay less. At the Wandegeya market, 78% of consumers would pay the same price, 20% would pay less and 2% would pay more.

C. MANDAZI

Description of the product

Sweetpotato roots

The same common sweetpotato varieties Tanzania and New Kawogo were used for mandazi trials.

Wheat flour

Wheat flour used was that generally used for mandazi-making at the Wandegeya market. It was milled by UNGA Limited, Commercial Street P.O. Box 30386, Nairobi, Kenya.

Processing

Mandazis were made from the following recipe : 1.5 kg of wheat flour, 1.5 kg of sweetpotato (cooked and mashed or raw and grated), 250 g of sugar, 2 tablespoons (about 10 mL) of baking powder, 5 tablespoons (about 25 mL) of vegetable oil and 2 1/4 cups (about 500-600 mL) of water. The mandazis were processed by one of the mandazi makers from the Wandegeya market following the appropriate commercial mandazi procedure. Figures 11 and 12

indicate the process schemas of mandazi-making using boiled and mashed sweetpotato and raw and grated sweetpotato roots.

Sweetpotato and dry ingredients were mixed together and a well was made in the centre where the oil was put and mixed. Sweetpotato was added and then water was slowly and added gradually and hand-kneaded until a soft dough formed. The dough was left to relax for 10-15 min and was then rolled on a floured pastry board to the thickness of 1.25 cm (Oyunga, 1994). It was then cut into approximately equal pieces that were deep-fried until browning.

The end product

Mandazi is a kind of doughnut (Figure 13) characterized by its round size, sweetness, brownish colour, and heaviness. The main quality components of mandazi are discussed later in this report.

Consumer acceptability

Acceptability was evaluated by comparing sweetpotato mandazis (substituting raw, fresh grated or fresh cooked and mashed sweetpotato for wheat flour) with mandazis the consumer has just bought from the market. The attributes such as sugary taste, colour, apparent freshness, filling, heaviness, appearance (grain, texture, symmetry, crust and crumb colour), and general acceptability were judged subjectively by mandazi consumers. Mandazi consumers were asked to compare sweetpotato mandazis to the ones they had just bought and had in their hands or they were used to buying. Sweetpotato mandazis had raw and grated sweetpotato roots (var. Tanzania) and boiled and mashed sweetpotato roots (var. New Kawogo).

Consumer acceptability characteristics

Figure 14 summarizes mandazi acceptability characteristics at the Wandegeya market as the first or second choice for sweetpotato mandazi compared with the ones the consumer just bought at the market. Some 43 mandazi consumers (purchasers) were interviewed.

Sugar

Consumers from the Wandegeya market found that mandazis made from ingredients containing boiled and mashed New Kawogo were their first choice, followed by a tie between the mandazis with raw and grated Tanzania and the ones just or usually bought. As the second choice, mandazis with raw and grated Tanzania were the first second choice for those consumers.

Oiliness

Mandazis with boiled and mashed New Kawogo were indicated as the first choice for oil content, followed by the ones just or usually bought. As the first second choice, boiled and mashed New Kawogo was again preferred by consumers.

Colour

Mandazis with boiled and mashed New Kawogo were indicated as the first choice for having the best color, followed by the ones with raw and grated Tanzania. As the second choice, the colour of mandazis with raw and grated Tanzania was the first second choice, followed by the ones just or usually bought.

Filling

As the first choice, the difference was not distinctively clear between mandazis containing raw and grated Tanzania and the ones with boiled and mashed New Kawogo. The filling aspect was high for both. Consumers indicated mandazis with raw and grated Tanzania as their first second choice, followed by a tie between mandazis usually bought and the ones with boiled and mashed New Kawogo.

Appearance

Mandazi with boiled and mashed New Kawogo were indicated by consumers to have a highly pleasing appearance. As the second choice, mandazis with raw and grated Tanzania were preferred, followed by the ones just or usually bought.

Freshness

Consumers indicated mandazis with boiled and mashed New Kawogo as their first choice (Figure 14). The ones with raw and grated Tanzania were indicated as the first second choice, followed by the ones just or usually bought.

Taste

The taste of mandazis with boiled and mashed New Kawogo was the first choice for consumers from the Wandegeya market (Figure 14). The ones with raw and grated Tanzania were the first second choice, followed by mandazis just or usually bought.

Conclusion on mandazi acceptability characteristics

According to consumers interviewed, the acceptability characteristics recorded for mandazis made from ingredients including boiled and mashed sweetpotato New Kawogo were superior to those for mandazis usually bought, whereas those made from raw and grated Tanzania were similar to mandazis usually bought.

Price

Some 80% of consumers interviewed at the Wandegeya market said they would pay the same price for mandazis made from ingredients including raw and grated Tanzania or boiled and mashed New Kawogo (Figure 15), about 19% would pay less and 1% would pay more.

D. CONSUMER SUGGESTIONS TO IMPROVE PROCESSED SWEETPOTATO PRODUCTS

Quality product components

Quality is defined by Kader (1985) as *any of the features that make something what it is or the degree of excellence or superiority*. The word *quality* could be used in various ways. For sweetpotato roots and end products, it can refer to *market quality, edible quality, shipping quality, table quality, nutritional quality, internal quality, and appearance quality*. Fresh sweetpotato quality is a combination of characteristics, attributes, and properties that give the valuable to humans as food. Farmers worry whether their commodity has a good appearance and few visual defects, so for them a useful cultivar must score high for yield, disease resistance, ease of harvest, and should have good shipping quality. People receiving roots and market distributors, appearance quality is the most important (in many different Kampala markets, sweetpotato sellers put the best roots on the top of the heap or the basket, whereas the smallest roots with an often bad look go to the bottom). Distributors are also keenly interested in firmness and long storage life. Table 4 lists quality components for fresh sweetpotato and many of them are similar for processed products from sweetpotato roots.

Although quality components are known, well documented, and almost standardized for bread, for chapati and mandazi they are perhaps known by consumers and processors, but have not yet been standardized, or well documented. Consumers and processors of such products usually refer to appearance, texture, and flavour. Nutritive value and safety factors are not often highlighted. Consumers consider good-quality chapati or mandazi to be those that look good, are soft, and offer good flavour and nutritive value. Although chapati or mandazi consumers generally buy on the basis of appearance and feel, their satisfaction and repeat purchases depend upon good edible quality and low price.

The appearance of sweetpotato processed products can be influenced by many defects related to mechanical damage during processing, such as splitting and crushing (mandazi). Colour is important for such products, but not always essential for chapati or mandazi consumers. The texture of fried processed products is also very important. Soft

chapati and mandazi are required by consumers while oiliness in these products does not constitute a problem of acceptability.

Flavour quality that involves perception of tastes and aromas of many compounds is perhaps the most important quality component for fried processed sweetpotato products. Sweetness is required in mandazi as is saltiness for chapati. All quality components are usually interrelated.

Quality components to be improved in processed sweetpotato products

Bread

The main criticism for the bread loaf made from ingredients containing sweetpotato is related to flavour (taste) and especially to the lack of sweetness in the product (Table 5). This issue was discussed earlier in this report.

The appearance and texture of the product are hardly pointed out, except for the bread loaf made from ingredients containing sweetpotato flour, in which quality related to appearance, such as coarseness, stickiness, compactness, and shape were indicated by consumers as poor for the product. Some consumers suggested that we put yellow colour in our product. In fact, this suggestion is because the popular bread and buns are often coloured yellow with food colorants in Kampala. Some bakers effectively add eggs in the dough together with food colorants, but most of them only add food colorants. The main quality components are generally met for the bread with ingredients containing raw and grated sweetpotato.

Chapati

The quality problem in chapati made from ingredients containing sweetpotato is related to texture. The product is reportedly oily and brittle (mainly for chapati made from ingredients containing raw and grated sweetpotato), and lacks homogeneity in hand-mixing. It is also not as soft as the one usually bought.

Consumers indicated that components related to taste (increase saltiness and reduce sweetness), and appearance (increase the size, thickness, and whiteness caused by non-enzymatic browning) should be improved.

Nutritive value for chapati refers to the lack of heaviness of the product whereas safety aspects refer to cleanliness during the frying process and to the quality and change of used oil (Table 5).

Mandazi

Quality components to be improved in mandazis are size (which should be increased) and the sweetness (which should be reduced). For texture, oiliness should be reduced in mandazis with raw and grated Tanzania, and softness increased. Products made from boiled and mashed New Kawogo were found to be of high quality.

Reasons given for not paying the same price as for the product usually bought

Consumers were usually ready to pay the same price for products containing sweetpotato as for products they usually bought except for bread made from ingredients containing sweetpotato flour¹⁵ (Table 6). We have already discussed these reasons, which are related to quality factors.

Flavour is a key quality factor for all of the products, followed by appearance and then texture. Nutritive value and safety aspects are not important for consumers interviewed in Kampala.

It is interesting to note quality factors for bread compared with ones for chapati or mandazi. According to the figures reported in Table 6, bread consumers require product quality (flavour, appearance, texture, and even nutritive value) before buying, whereas chapati and mandazi consumers pay little attention to quality factors before purchasing the product. Consumer income and level of education could explain this observation.

¹⁵We believe the sweetpotato flour was badly processed.

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Table 1: Recipes for making bread using flour composite with sweetpotato.

Ingredients	Quantity (kg)		
Sweetpotato	2.10 (flour)	4.20 (raw & grated)	4.20 (boiled & mashed)
Wheat flour	10.50	10.50	10.50
Yeast	0.12	0.10	0.10
Improver	0.20	0.20	0.20
Sugar	0.40	0.40	0.40
Fat	0.25	0.25	0.25
Water	About 6.50	About 4.50	About 5.00
500-g bread loaves obtained			
	38	36	38

Table 2: Yield and changes in weight for bread loaf of 500 g by adding sweetpotato as an ingredient.

Wheat flour (parts)	Sweetpotato (parts)	Weight of baked bread loaf ^b (g)	Yield of baked bread loaves (pieces of 500 g)
100 ^a	0.0	501±3	300
100	13.3 (flour)	501±5	342
100	16.6 (flour)	501±2	353
100	23.3 (flour)	500±1	365
100	30.0 (flour)	500±5	400
100	41.2 (raw and grated)	510±5	342
100	41.2 (boiled and mashed)	511±4	353

^a Estimation from the manager of the FADCA bakery.

^b Weight of dough before fermentation and baking was 560 g.

