

Development and promotion of sweetpotato products in Western Kenya

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Abstract. Sweetpotato utilization in western Kenya has for along time been limited to boiling, roasting and chewing raw. In order to add value to the crop, attempts have been made to process sweetpotato into different products. Several products were prepared among them 'crackies', 'mushenye' Amaranthus relish with sweetpotato flavour and sweet potato juice. These products were evaluated by extension agents for acceptability. The most highly ranked products were 'crackies' made from sweetpotato and cassava flour, 'mushenye' made from sweetpotato variety *Mugande* and juice from the orange-fleshed sweetpotato variety SPK004. Amaranthus relish with sweetpotato flavour was more preferred to amaranthus with Roiko or soya flour flavour. The study also showed that products with a combination of sweetpotato and cassava flour were more preferred to pure wheat products. Currently the selected products are promoted through field days, shows as well as individual and group training involving different technology transfer agents such as NGOs and community based organizations. The study showed there is high potential for sweetpotato products utilization in home consumption.

Introduction

Sweetpotato (s/p) is the world's seventh most important food crop after, wheat, rice, maize, potato, barley, and cassava (CIP 1996). Domestic supply through production of sweet potatoes indicates that it is third besides

maize and cassava in calorie output (FAO 1992-94). It is an important staple food in Kenya, utilized by most households and as described by Hagenimana *et al* it is a woman's crop and available all year round (Hagenimana *et al.*,1999). Therefore sweetpotato has the potential of bridging the food gap due to diversified processing and utilization technologies that have been produced but not yet fully exploited. The color intensity of the sweetpotato root flesh differs from one cultivar to another and varies from white to deep orange. The intensity of the color is attributed to carotenoid content (Ameny and Wilson 1997). A study on carotenoid content in fresh, dried and processed sweetpotato showed that increased consumption of orange flesh sweetpotato in either fresh or processed form can contribute in alleviating dietary deficiency of vitamin A (Hagenimana *et al.*,1998) Consumption of sweetpotato in Western Kenya is mainly in raw, boiled or roasted. Storage practiced is in-ground and only harvested when need for consumption or sale arises. The International Potato Center (CIP) and Kenya Agricultural Research Institute (KARI) developed technologies using sweetpotato in three forms, (boiled and mashed), (grated) and (flour, mixed with 30% to 50 % wheat flour) these were acceptable to consumers. However recent survey indicates that the products were expensive due to inclusion of wheat flour. This paper describes development and promotion of cheaper products by replacing wheat flour with cassava flour. Consumers also requested skills in juice and spicy food additives.

Products were made, tested and evaluated for general acceptability. The best options were selected, improved, tested and evaluated again and then replicated on-farm. Data was collected and analyzed and most acceptable products transferred to farmer groups and extension agents through demonstrations. Groups and individuals interested in micro enterprise were given skills in simple product making, packaging and promotion.

Materials and Methods

Ideas concerning improvement of old products and new products were generated and tried out at KARI laboratory. Participatory interactive methods were used to transfer skills in product production and promotion to extension, farmer groups and , Non Governmental Organizations (NGOs)/ Community Based Organizations (CBOs) agents. This study was done on the following products: juice, mshenye, crisps, crackies, chapatti, mandazi, onion bites and sweetpotato flavour.

Fresh sweetpotato juice made from three sp varieties (SPK 004 orange flesh and high in Vitamin A, Mugande white flesh and liked for marketability and Bungoma cream flesh and popular with farmers). The roots 600g of each variety were peeled, washed, boiled and mashed. For each variety, 500g of mash and 2000ml of water were mixed and sieved. The result content for each variety was 1800ml and divided in three for the following treatments:

SPK004 plain
SPK004 + sugar
SPK004 + sugar + lemon juice
Bungoma plain
Bungoma + sugar
Bungoma + sugar + lemon juice
Mugande plain
Mugande + sugar
Mugande + sugar + lemon juice

Test panel at KARI lab evaluated and eliminated the first two treatments for each variety and recommended the last treatment

for each variety for on-farm test. Farmer groups and extension staff carried out on-farm tests.

S/p crisps. 18 medium roots from three varieties of sweetpotato (SPK 004, Mugande and Bungoma) were washed, peeled, washed again and sliced into very thin pieces using a kitchen grater. The contents were separately put in salted water, drained and deep fried till starting to brown. The crisps were removed from oil, salted and let to cool. The crisps were tested, evaluated and recommended for on-farm tests, which were done.

S/p “mshenye”. 9 medium roots from three varieties (SPK 004, Mugande and Bungoma) were washed, peeled, washed again, sliced and boiled. 600g of pre-boiled maize and beans was divided in three portions of 200g and added to each variety of sweetpotatoes and mashed. Salt was added to taste and the product tested and evaluated for variety and recommended for on-farm tests.

S/p Crackies. Wheat flour (Unga Millers Ltd. Nairobi) 400g and soya flour 50g for crackie1, S/P flour 200g, wheat flour 200g and soyafLOUR 50g for crackie2, S/P flour 150g, cassava flour250g and soya flour 50g for crackie3 was weighed and put in three mixing bowls. Baking powder (Kapa Oil Refineries) 10g and cayenne pepper 10g (Ruby Industries - Nakuru) were sieved into the flour, iodized salt 3g (Kensalt Nairobi) was sprinkled on each mixture. Bahari oil 20g (Bidco Oil Refineries Ltd. Thika) were added. Rub-in method was used to mix the ingredients. An egg was broken, poured in a cup, checked, and then added to the mix. A cooking stick was used for a while to turn in the egg then rub-in method resumed. A little warm water was added to soften the dough. Kneading was done by hand till the required texture of elastic smooth dough was formed. The dough was left to relax while cooking oil was poured into a pan and put on the Kenya Ceramic Jiko (KCJ) to heat. The dough was packed into the noodle machine and the handle of the machine turned clockwise to

extrude the contents. The dough contents were dropped into the hot oil and let to brown while turning with a perforated flat long spoon. After attaining golden brown color, the contents were removed and drained put in plastic buckets and left to cool, tested, evaluated and recommended for on-farm.

S/p chapati Wheat flour 400g and soya flour 50g for chapatti 1, S/P flour 200g, wheat flour 200g and Soya flour 50g for chapatti 2,. S/P flour 150g, cassava flour 250g and soya flour 50g for chapatti 3 was weighed and put in three mixing bowls. 50g of oil and 5g of salt were added to the flour and mixed well. Lukewarm water was added to the mixture in the bowls and kneaded till stiff smooth paste was formed. The dough was divided into 8 equal balls and rolled on a floured surface. Each ball was folded to form a strip and coiled to form a circle and put aside for 20 minutes. Each coil was rolled out into a thin circular sheet and shallow fried on both sides till golden brown. The product chapatti, was tested, evaluated and recommended for on-farm.

S/p mandazi. Wheat flour 400g and soya flour 50g for mandazi 1, S/P flour 200g, wheat flour 200g and soyafLOUR 50g for mandazi 2,, S/P flour 150g, cassava flour 250g and soya flour 50g for mandazi 3 was weighed and put in three mixing bowls. 20g of oil, 40g sugar and 10g of baking powder were added to the flour and mixed well. Lukewarm water was added to the mixture in the bowls and kneaded till smooth paste was formed. The dough was rolled on a floured surface to 1cm thickness. A knife was used to cut uniform square pieces, which were deep fried till golden brown. The mandazi products, were removed from oil, drained, cooled, tested, evaluated and recommended for on-farm.

S/p onion bites. Wheat flour 400g and soya flour 50g for onion bites1, S/P flour 200g, wheat flour 200g and soyafLOUR 50g for onion bites 2,, S/P flour 150g, cassava flour 250g and soya flour 50g for onion bites 3 was

weighed and put in three mixing bowls. 20g of oil, 10g salt, 5g of chilli powder, 10g chopped spring onion and 10g of baking powder were added to the flour and mixed well. Lukewarm water was added to the mixture in the bowls and kneaded till a soft smooth paste was formed. The dough was cut into small balls that were deep fried till golden brown. The products were removed from oil drained, cooled, tested, evaluated and recommended for on-farm.

Sweetpotato flavour was made by extracting 300g starch from white sweetpotato roots. The starch was divided into three portions of 100g and given three treatments as follows: **1.** Spices 70g, Sugar 20g, salt 10g, **2.** Spices 40g, Sugar 40g, salt 10g, **3.** Spices 20g, Sugar 60g, Salt 10g. The spices were added to amaranthus relish, tested and evaluated. The first and third were eliminated and recommendation given to use the second lot. The selected lot was taken on-farm and compared with soya flour and roiko mix which is a commercial flavour

Promotions. Product testing and promotion was done through several channels as follows: On-farm demonstrations and trainings to farmer groups, NGOs/CBOs, displays, tasting/lectures at agricultural shows, schools, farmer field days and on- site training to Ministry of Agriculture extension.

Results and Discussions

The sugar and lemon juice addition in the sweetpotato juice made the product highly acceptable as compared to when the product was plain or only sugar was added (Table 1). The evaluators compared juices with three commercial varieties of 'Fanta' soft drink. The test of SPK004 was likened to 'Fanta' orange, Bungoma to 'Fanta' passion and Mugande to 'Fanta' citrus.

Overall SPK 004 variety was more preferred in the products than the Mugande and Bungoma variety (Table 2). The colour of SPK004 made the juice more appealing than

Mugande and Bungoma. The high dry matter content in the Bungoma variety and its yellow colour made it more popular for crisps. The Bungoma crisps were firm while the SPK004 were brittle. Mugande had highest sugar content which made it ideal for the *mshenye*. The second treatment of sweetpotato, wheat and soya is generally more preferred than the other two (Table 3). Chapati, mandazi and

onion bites required wheat flour this is due to their soft texture. Crackies have entered the snack market in all districts involved in s/p activities due to the long shelf life of four months as compared to the other three that have shorter shelf life of three to four days. Sweetpotato flavour was comparably well accepted like the commercial roiko.

Conclusion and way forward

Products produced and promoted were well accepted showing that sweetpotato has a potential for substituting wheat in high percentages. Diversified sweetpotato utilization has an indication for improving food security and local household incomes of the region.

Markets and machines are identified and farmers informed. Collaborators like NGOs are involved with farmer mobilization and machines acquisition and this is intended to help expand production and utilization of sweetpotato products.

Table 1: KARI panel fresh sweetpotato juice acceptability evaluation (N=20).

SPK004 plain	-
SPK004 + sugar	1
SPK004 + sugar + lemon juice	19
Bungoma plain	-
Bungoma + sugar	1
Bungoma + sugar + lemon juice	19
Mugande plain	-
Mugande + sugar	1
Mugande + sugar + lemon juice	19

Table 2: On-farm acceptability of products made from three varieties of roots (N=30).

Products	SPK 004	Mugande	Bungoma
Juice	20	5	5
Mshenye	10	15	5
Crisps	2	5	18

Table 3: On-farm acceptability of products made from combinations of flour (N=30).

Products	Wheat+ soya	S/P+wheat+soya	S/P+cassava +soya
Crackies	1	10	19
Chapati	8	18	4
Mandazi	10	14	6
Onion bites	4	16	10

Table 4. On-farm acceptability of sweetpotato flavour (N=30).

S/p flavour	12
Roiko	13
Soya flour	5

Acknowledgments

CIP for financial support, KARI for implementation. CBOS and NGOS for backstopping Ministry of Agriculture, for technology dissemination.

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