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SWEET POTATO FLOUR – SPECIFICATION

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Sweet potato flour — Specification



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Introduction

Sweet potato flour is obtained from the tubers of *Ipomoea batata*. Sweet potatoes of both white and yellow fleshed varieties are available. Sweet potato flour is used as a raw material for processing into other products. A variety of products such as doughnuts, biscuits, muffin, cakes, cookies, extruded products, fried chips, ice cream, porridge, brownies, pies, breakfast foods, and weaning foods have been made from sweet potato flour. It can also be used in soups, as a thickener for sauces and gravies, and in breading for fish. Mixed flour from sweet potato and wheat can be the good materials for many food item such as biscuits, bread, noodles, snacks, cakes and so on. Substituting 38% of wheat flour (by weight) with boiled and smashed orange flesh sweet potato in bread buns has been shown to be acceptable to consumers and bakers because of heavier texture and its attractive golden appearance [1]. The flour can add natural sweetness, colour, and flavour to processed food products. It can also serve as a source of energy and nutrients and minerals, and contributes to the daily nutrient needs for β -carotene, thiamin, iron, vitamin C, and protein. The wastes after making flour can also be used for anthocyanin and carotenoid extraction.

For prolonged storage of sweet potato flour, the packaging material must be impermeable to vapor and gas, resist tearing, protect against contamination from the environment, and be easy to handle. Studies have demonstrated the advantage of double packaging (polyethylene/muslin cloth) to prevent lumpiness and loss of colour of flour stored in polyethylene and polypropylene bags for 5 - 7 months. Auto-oxidation of carotenoids may take place during storage, leading to loss of colour and nutritional value. The stability of β -carotene proved to be strongly and adversely affected by storage temperature and light [2]. The microbial count of flour stored in different packaging materials did not change over time and was below the tolerable limit [3].

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Sweet potato flour — Specification

1 Scope

This African Standard specifies the requirements and methods of sampling and test for flour which is obtained from the processing of sweet potato [*Ipomoea batatas* (L.) Lam.] intended for human consumption.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ARS 53, *General principles of food hygiene — Code of practice*

ARS 56, *Prepackaged foods — Labelling*

CODEX STAN 192, *General standard for food additives*

CODEX STAN 193, *Codex general standard for contaminants and toxins in food and feed*

ISO 712, *Cereals and cereal products — Determination of moisture content — Reference method*

ISO 941, *Spices and condiments — Determination of cold water-soluble extract*

ISO 1842, *Fruit and vegetable products — Determination of pH*

ISO 2171, *Cereals, pulses and by-products — Determination of ash yield by incineration*

ISO 2173, *Fruit and vegetable products — Determination of soluble solids — Refractometric method*

ISO 3588, *Spices and condiments — Determination of degree of fineness of grinding — Hand sieving method (Reference method)*

ISO 5498, *Agricultural food products — Determination of crude fibre content — General method*

ISO 6579, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection of *Salmonella* spp.*

ISO 7251, *Microbiology of food and animal feeding stuffs — Horizontal method for the detection and enumeration of presumptive *Escherichia coli* — Most probable number technique*

ISO 15914, *Animal feeding stuffs — Enzymatic determination of total starch content*

ISO 21527-2, *Microbiology of food and animal feedstuffs — Horizontal method for the enumeration of yeasts and moulds — Part 2: Colony count technique in products with water activity less than or equal to 0.95*

ISO 24333, *Cereals and cereal products — Sampling*

3 Definitions

For the purpose of this standard the following definitions apply.

ARS 827:2017(E)

3.1

sweet potato flour

product prepared from dried sweet potato chips or paste by a pounding, grinding or milling process, followed by sifting to separate the fibre from the flour

3.2

food grade material

material that is free from substances that are hazardous to human health and may be permitted to come in contact with food

3.3

extraneous matter

organic matter of sweet potato origin other than sweet potato flour

3.4

foreign matter

organic and inorganic materials (such as sand, soil, glass) other than extraneous matter in the flour

3.5

practically free

without defects in excess of those that can be expected to result from, and be consistent with good cultural and handling practices employed in the production and marketing of the fresh sweet potato

4 Essential quality and compositional requirements

4.1 Raw materials

The raw materials shall be fresh sweet potatoes, dried sweet potato chips, paste or crumbs made from fresh sweet potatoes conforming to the relevant African Standards.

4.2 General quality requirements for sweet potato flour

Sweet potato flour shall be:

- a) in the form of a fine powder and shall be white in colour;
- b) free from rancidity;
- c) practically free from extraneous matter, adulterants and rodent contamination;
- d) free from fermented, musty or any other objectionable odours;
- e) practically free from any living insect or fungus infestation and foreign matter;
- f) safe and suitable for human consumption; and
- g) of colour characteristic of the variety.

It shall not contain any other added sweetening, flavouring, colouring agent or any other foreign matter.

4.3 Compositional requirements

Sweet potato flour shall conform to the requirements in Table 1 below.

Table 1 — Compositional requirements

S/N	Parameter	Requirement	Method of test
1	Total ash content, % by mass on dry matter basis, max.	3.0	ISO 2171
2	Moisture content, % by mass, max.	12.0	ISO 712
3	Crude fibre content, % by mass on a dry matter basis, max.	5.0	ISO 5498
4	Acid insoluble ash, % by mass on dry matter basis max.	0.15	Annex A
5	Total sugar content (as sucrose) % by mass, Min	6.0	ISO 2173
6	Starch (on dry basis), % by mass, Min	60.0	ISO 15914
7	pH of aqueous extract	4.5 – 7.0	ISO 1842
8	Cold water solubles (on dry basis), % by mass	12.0	ISO 941

4.4 Specific quality factors

4.4.1 Particle size

Not less than 90 % shall pass through a 600 µm sieve for fine flour and not less than 90 % shall pass through a 1200 µm sieve for coarse flour. Testing for particle size shall be done in accordance with ISO 3588.

Sweet potato flour intended for baking purposes shall have particle size of which not less than 90 % shall pass through a 250 µm sieve

5 Food additives

Food additives may be used in the preparation of sweet potato flour in accordance with CODEX STAN 192.

6 Contaminants

6.1 Pesticide residues

Sweet potato flour shall conform to maximum residue limits for pesticide residues established by the Codex Alimentarius Commission for this commodity.

6.2 Heavy metals

Sweet potatoes shall comply with those maximum levels for heavy metal contaminants established by the Codex Alimentarius Commission for this commodity.

6.3 Mycotoxin and chemical limits

Sweet potato flour shall comply with those maximum mycotoxin limits established by the Codex Alimentarius Commission for this commodity.

6.4 Other contaminants

Sweet potato flour shall comply with the maximum levels of the Codex General Standard for Contaminants and Toxins in Food and Feed (CODEX STAN 193).

7 Hygiene

Sweet potato flour shall be prepared and handled in a hygienic manner in accordance with ARS 53 and shall conform to microbiological limits specified in Table 2.

Table 2 — Microbiological limits for sweet potato flour

S/N	Micro-organism(s)	Requirement	Method of test
1	<i>Escherichia coli</i> , cfu/g, max.	<1	ISO 7251
2	Salmonella, 25g, max.	absent	ISO 6579
3	Yeasts and moulds, cfu/g, max.	10 ⁴	ISO 21527-1

8 Packaging

8.1 Sweet potato flour shall be packaged in food grade material which will safeguard the hygienic, nutritional, technological and organoleptic qualities of the product.

8.2 The net weight of the packages for sweet potato flour may be required to meet the relevant regulations of the destination country.

9 Labelling

9.1 In addition to the requirements of ARS 56, the following specific labelling requirements shall apply and shall be legibly and indelibly marked:

- common name of the product 'sweet potato flour';
- name, and physical address of the manufacturer/ distributor and /or trade name/ brand name;
- date of manufacture;
- lot identification;
- expiry date;
- country of origin;
- the net weight in metric units;
- the statement 'Human Food' shall appear on the package;
- storage instructions; and
- instructions on disposal of used package.

9.2 When labelling non-retail packages, information for non-retail packages shall either be given on the packages or in accompanying documents, except that the name of the product, lot identification and the name and address of the manufacturer or packer shall appear on the packages.

10 Sampling

Sampling of sweet potato flour shall be done in accordance with ISO 24333.

11 Criteria for conformity

A lot shall be declared as conforming to this standard if samples inspected or analysed for quality requirements conform to the provisions of this standard.

Annex A (informative)

Process of producing sweet potato flour

A.1 Raw material

Sweet potato roots can be a raw material for processing flour. The processing schema is shown in the Figure A.1.

A.2 Cleaning and trimming

This operations aims to remove soil and other foreign material from the sweet potato root surface, portion damaged by weevils or other pests, and any other unwanted portions of the roots. Damaged portions tend to brown during the course of flour processing. Cleaning and trimming is manually done using knives. In the processing of flour using sweet potato, experiments have shown there is no need of peeling since the root skin is extremely thin and has a very minor influence on the colour and final composition of the product.

A.3 Washing and brushing

The washing and brushing steps are the most critical in the production of sweet potato flour. The washing of the roots should be exhaustive. The quality of the end product flour depends on how the washing has been conducted. The brushing is also a relevant step because it reinforces the removal of the soil and an important portion of the skin, especially when red skin coloured sweet potato roots are being processed into flour. It has been noted that the skin has a protective effect on the water diffusion from the roots towards the surface, and consequently slices having a portion of the skin take a long time to dry and their structure becomes harder and not breakable. During the brushing, the protective role of the peel against capillary water diffusion to the surface is slowed down.

At least, three batches of water are required: the first for pre-washing when soil and other impurities are removed. Roots should be submerged in water so that impurities which adhere to the skin can be freed. The second washing is for cleaning and brushing concomitantly with removal of possible damaged portions of the roots escaped from the previous step. The third washing is for fine cleaning with A very clean water.

The sun pre-drying of clean and washed roots is desirable. It reduces the moisture at the surface of the roots and improves the cleanliness of the end product.

A.4 Slicing

The sweet potato slicing separates roots into small physical sizes and increases their drying surface. It is currently done manually and stainless knives are recommended to avoid undesirable browning reactions. The slicing sweet potato roots is a tedious exercise, but it has been observed that the slicing or chipping gives a sweet potato flour of high quality colour. The sweet potato grating induces a lot of enzymatic browning reactions and the fresh grated product is quickly subjected to an undesirable spontaneous fermentation. Sweet potato balanced chemical composition makes fresh sweet potato a suitable medium for the growth of a wide range of micro-organisms and other agents involved in the deterioration of the fresh roots.

A.5 Drying

Many different techniques exist to carry out the drying of food products such as: traditional solar drying, technical solar drying or drying using sophisticated industrial equipment. Our context is of traditional solar drying. The traditional drying is the exposition of sweet potato chips directly to the rays of the sun on a drying surface, and water is capillary transported to the slice surface where it vaporises. So, thin slices will dry very fast.

The sun drying presents certain difficulties such as: there is too much dependence on climatic conditions (it is sometimes necessary to gather up the product in case of rain), there is a need for manual labour to move the product during the drying time, there is difficulty in maintaining hygienic conditions.

The dry season is a must to avoid moving of the product, especially for the first drying day. The second drying day, chips could be moved at least twice a day until they are completely dried.

The approximate drying time of sweet potato chips is from two to four days and the residual humidity should be between 10 and 12%. The water activity should be around 0.4.

It is recommended to pack the sweet potato dried chips immediately after the drying to avoid any risk of rehydration.

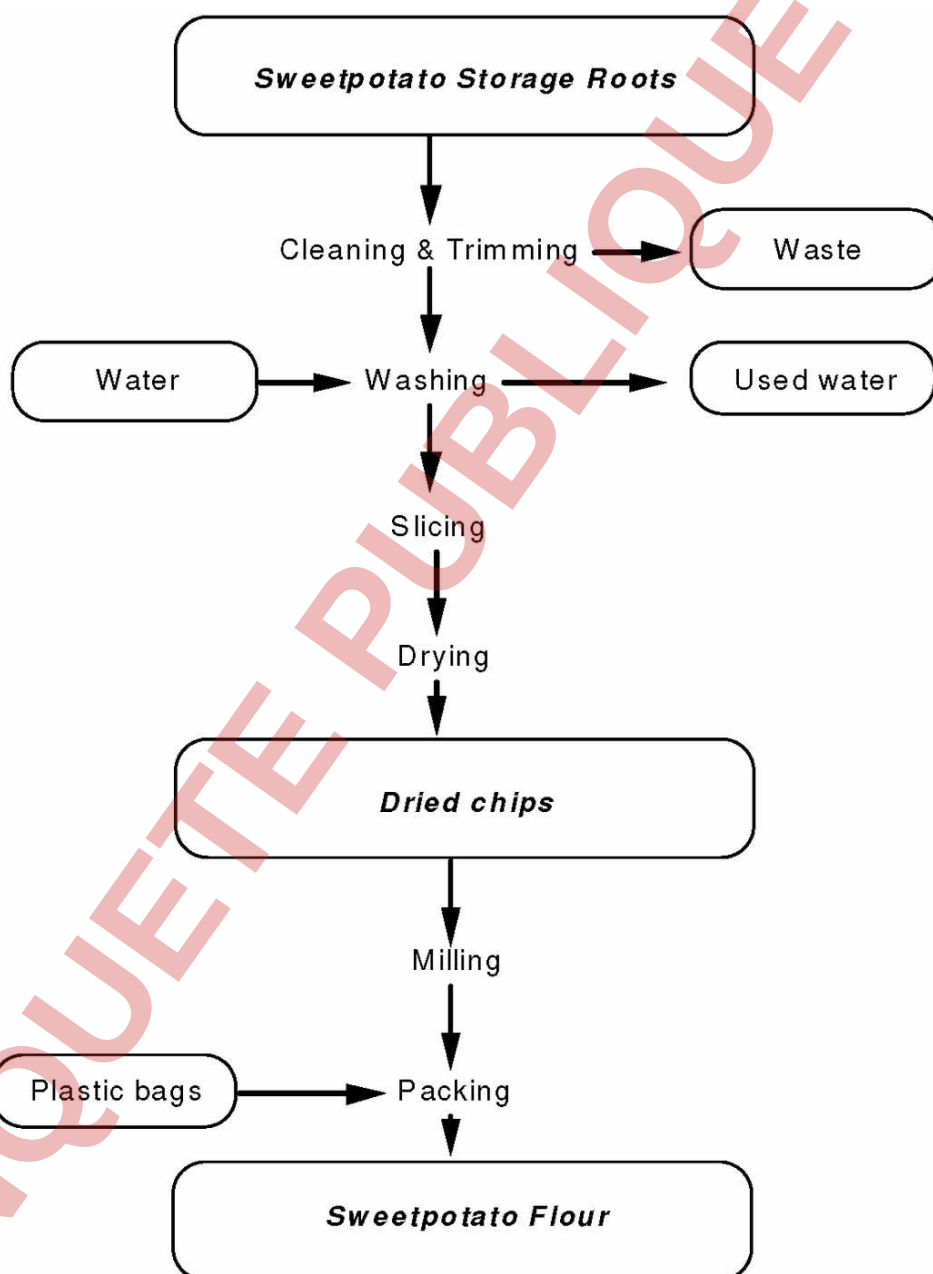


Figure A.1 — Process of producing dried sweet potato slices and flour [1,4]

A.6 Milling

For grinding, any hammer mill can be used. It is desirable to pass twice the dried material in the mill should a finer flour is desired. The residual humidity in the dried slices should be between 10 and 12%. Over drying of slices produces a lot of dust and loss of material during the milling. It is recommended to grind sweet potato dried chips immediately after drying to avoid any risk of rehydration.

A.7 Packing and storage

After the grinding, pack and seal immediately to avoid rehydration and insect infestation. Materials with little permeability to water vapour, such as cellophane, polyethylene or polypropylene should be used. The decision on packaging material is based on transportation requirements and storage time. As soon as the product is placed in its package it should be sealed immediately, removing as much air as possible from inside the package. This is to avoid direct exposition of the product to the surrounding air and to minimise any insect attack. The packed products should be stored in a fresh, dry, and preferably dark place until it is shipped to the consumer.

Annex B (normative)

Determination of acid insoluble ash

B.1 Reagent

B.1.1 Dilute Hydrochloric Acid — 1:1, prepared from concentrated hydrochloric acid.

B.2 Procedure

B.2.1 Weigh accurately about 2 g of the dried material in a tared porcelain, silica or platinum dish. Ignite with a meker burner for about 1 hour. Complete the Ignition by keeping in a muffle furnace at 500 °C to 570 °C until grey ash results.

Cool and filter through whatman filter paper No. 42 or its equivalent. Wash the residue with hot water until the washings are free from chlorides as tested with silver nitrate solution and return the filter paper and residue to the dish. Keep it in an electric air oven maintained at 135 ± 2 °C for about 3 hrs. Ignite the dish again for about 30 minutes, cool and weigh. Repeat this process till the difference between two successive weighings is less than 1 mg. Note the lowest weight.

B.3 Calculation

B.3.1 Acid insoluble ash, per cent by weight

$$= \frac{100(M_2 - M)}{M_1 - M}$$

where,

M_2 = the lowest weight, in g, of the dish with the acid insoluble ash;

M = weight, in g, of the empty dish; and

M_1 = weight, in g, of the dish with the dried product taken for the test.

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