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Production and handling of sweet potato root — Code of practice

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

WD xxx was prepared by Technical Committee RSB/TC 30, *Roots and Tubers.*

In the preparation of this standard, reference was made to the following standard (s):

Committee membership

The following organizations were represented on the Technical Committee on *Title of TC* (RSB/TC 30) in the preparation of this standard.

Africa Food Supply Ltd

Electromax/Amazi ya Huye

Innovation in Production Ltd (INNOPRO Ltd)

National Industrial Research and Development Agency (NIRDA)

Norbert Business Group Ltd (NGB Ltd)

Rwanda Agriculture Board (RAB)

Rwanda Inspectorate, Consumer Protection and Competition Authority (RICA)

SAKAZA Fruits Processing ltd

Rwanda Standards Board (RSB) – Secretariat

Introduction

This code of practice focuses upon issues that are specific to the primary production, storage, and packaging of sweet potato roots in order to produce a quality, safe and wholesome products. This code of practice addresses Good Agricultural Practices (GAPs), Good Hygiene Practices (GHPs) and Good Manufacturing Practices (GMPs) that will help control microbial, chemical and physical hazards associated with all stages of the production from primary production to packaging. Particular attention is given to minimizing damage and deterioration of sweet potato roots before marketing.

This code of practice does not provide detailed information which is considered to be generally applicable to all fruits and vegetables or food products in general. Such provisions are available in other codes. As such, this code should be used in conjunction with CAC/RCP 53.

Production and handling of sweet potatoes roots — Code of practice

1 Scope

This Draft Rwanda Standard provides recommended practices for the production, storage, packaging and transportation of sweet potato roots intended for human consumption.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

CAC/RCP 53, *Code of hygienic practice for fresh fruits and vegetables*

EAS 38, *Labelling of pre-packaged foods — General requirements*

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply.

3.1

agricultural inputs

any incoming material including water, agricultural chemicals and fertilizers, and planting material used for the primary production of sweet potato roots

3.2

biological control

use of competing biological agents (such as insects, micro-organisms and/or microbial metabolites) for the control of pests, plant pathogens and spoilage organisms

3.3

primary deterioration

deterioration as a result of physiological changes characterised by vascular streaking or vascular discoloration

3.4

secondary deterioration

deterioration induced by micro-organisms that cause rotting under aerobic and anaerobic conditions

3.5

curing

operation of self-healing of wounds, cuts and bruises of freshly harvested crops

Note 1 to entry: post-harvest (process) treatment where freshly harvested roots are held under warm temperatures and high humidity for several days to heal wounds, toughen the outer skin which makes it thicken, and improve the storage and eating quality.

3.6

clamp

rectangular depression in the field where sweet potato roots is stacked and covered with straw/hay and soil to act as temporary storage

3.7

latex

natural plant sap found more in young roots.

Note 1 to entry: when cut and exposed to air, the latex reacts with oxygen, and this causes oxidation, turning it brown or black.

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4 Primary production and handling

4.1 General

4.1.1 Sweet potato roots are grown and harvested under a wide range of climatic and diverse geographical conditions, using various agricultural inputs and technologies. Biological, chemical and physical hazards may vary significantly from one type of production to another.

4.1.2 In each primary production area, it is necessary to consider the particular agricultural practices for particular sweet potato type that promote the production of safe of sweet potato roots, taking into account the conditions specific to the primary production area, varieties and methods used.

4.1.3 During production, primary and secondary deterioration should be prevented so as to maintain the quality of sweet potato roots. Procedures associated with primary production should be conducted under good hygienic conditions to minimize potential hazards to health due to the contamination of the specific sweet potato root in accordance with CAC/RCP 53.

4.2 Agricultural input requirements

4.2.1 Inputs used for the production of sweet potato roots should comply with the relevant Standards.

4.2.2 Agricultural inputs shall not contain microbial or chemical contaminants at levels that may adversely affect the safety and quality of the sweet potato roots.

4.2.3 Growers shall use only agricultural inputs which are approved by the competent authority for the cultivation of the particular sweet potato and shall use them according to the product label for the intended purpose.

4.2.4 The disposal of surplus chemicals and used containers shall be in accordance with guidelines provided by the national environment regulatory agency.

4.2.5 The residues shall comply with those maximum residue limits established by the Codex Alimentarius Commission.

4.2.6 Agricultural workers who apply agricultural chemicals should be trained on proper application procedures.

4.2.7 Growers should keep records of agricultural chemical applications. Records should include information on the date of application, the chemical used, the crop sprayed, the pest or disease against which it was used, the concentration, method and frequency of application, and records of harvesting to verify that the time between applications and harvesting is appropriate.

4.2.8 Agricultural implements and equipment shall be calibrated, as necessary, to ensure accuracy of application.

4.2.9 Agricultural chemicals should be kept in their original containers, labelled with the name of the chemical, storage conditions, expiry date and the instructions for application and use.

4.3 Handling during production

4.3.1 During the primary production and post-harvest activities, effective measures should be taken to prevent contamination of sweet potato roots from agricultural inputs or personnel who come directly or indirectly into contact with the sweet potato roots.

4.3.2 To prevent contamination, sweet potato growers, harvesters and handlers should adhere to the following:

a) sweet potato unfit for human consumption should be segregated during harvesting. Those, which cannot be made safe by further processing should be disposed off properly;

b) agricultural workers should not use harvesting containers for other purposes (for example, lunches, tools and fuel, among others). Where such containers have to be used for other purposes, they should be cleaned and sanitized; and

c) care should be taken when packing the sweet potato root in the field to avoid exposure to filth.

4.4 Handling during harvesting

4.4.1 Sweet potato root should be harvested when fully mature depending on the cultivar and the method of planting. Maturity may be assessed by the following stages:

a) cut the all cuttings (except one main cutting) and leaves seven days to fourteen days before harvesting to harden the skin of the root to minimise loss and transmission of late blight during post-harvest handling;

b) cut the sweet potato root in the field and observe the colour of the latex exuded. The latex from immature sweet potato root turns black, and has high latex content while from mature root turns yellow; they release a lot of white latex and the latex turns brown/black.

c) Almost all the leaves have naturally turned yellow and the skin is fully set. Fully mature ideal harvest time sweet potato root has very little or almost no latex, or only a few drops that stop almost immediately, very abundant, watery, white latex flows quickly and continuously for several seconds.

d) Flesh may look pale and watery, the skin is thin and easily peeled; rub the skin of the root, immature roots skin easily peels off.

4.4.2 Careful harvesting and proper handling of the sweet potato root should be considered as an important step towards successful storage.

4.4.3 Harvesting may be done manually or mechanically. Care should be taken during the harvesting process to minimize post-harvest losses such as damage caused by bruising, scrapping or breaking of the sweet potato roots, as this greatly reduces the shelf life. The root should not be thrown or dropped down as this may accelerate deterioration.

4.4.4 Whether harvested manually or mechanically, the produce should be carefully handled and transported to the packing facility immediately. Avoid injuring the root at harvest by the digging tools, which may be wooden sticks, machetes, hoes or forks.

5 Storage and preservation

5.1 General

5.1.1 The sweet potato root generally does not store well, except under ideal conditions and bruised ones rapidly deteriorate. The storage duration varies with the variety.

5.1.2 The sweet potato root is still a living organism after harvest and losses that occur during storage arise mainly from its physical and physiological conditions. The main causes of loss are associated with mechanical damage, physiological conditions such as maturity, respiration, water loss, as well as pests and diseases.

5.1.3 To ensure effective storage of roots crops, these major causative factors need to be properly understood and, where appropriate, be properly controlled, taking into account the socio-economic factors which prevail in the areas of production and marketing.

5.2 Preparation for storage

5.2.1 The sweet potato root should be harvested and handled with care to minimize deterioration during storage and the following conditions should be adhered to:

a) retain only those roots that do not show signs of injury. Roots that are to be kept for more than one week should be carefully selected since curing will not be effective on roots with extensive damage;

b) establish curing of the roots after harvest as a routine operation with a possibility of minimum handling;

c) establish sorting as a routine operation before storage. The sorting should aim at eliminating damaged, rotten, greening and diseased roots.

5.2.2 Severely damaged roots should not be stored because of the following reasons:

a) lower quality;

b) increased risk of subsequent pathogenic losses; and

c) risk of introducing disease organisms into sound produce.

5.3 Control of damage

5.3.1 Mechanically damaged roots will normally deteriorate rapidly and should not be stored and exported. Mechanical damage can occur during handling operations, particularly harvesting and washing. Damaged regions are more susceptible to microbial infection.

5.3.2 Careful handling should be done during all handling operations. Adequate drying and curing should be ensured prior to packing and storage.

5.4 Temperature control

5.4.1 Temperature has a great influence on many factors that cause loss during storage; it influences the rate of sprout growth, development of rotting micro-organisms and insect infestation. [Storage at temperatures below 10 °C will result in sweetening, while storage temperatures above 25 °C will result in increased decay, water loss and sprouting.]

5.4.2 **[** The sweet potato root meant for fries, crisps, boiled and flour may be stored at 10 °C - 25 °C for four months while those for other products may be stored in cold storage for four months.]

5.4.3 Temperature control methods should aim at slowing down rates of physiological and biological deterioration.

5.5 Relative humidity treatment

The sweet potato root should be properly treated as soon as possible after harvesting to promote preservation of the skin as well as formation of a hard cork layer. Treatment should be carried out near the place of storage

to facilitate handling operation. [The process is carried out for four days to fifteen days at temperature of 15 °C to 22 °C and a relative humidity of 85 % to 95 %.]

5.6 Storage methods

5.6.1 General

[The general storage area should be dark and well ventilated to avoid greening and accumulation of solanine.]

5.6.2 Storage in the soil before harvest

The sweet potato roots may be stored by leaving them un-harvested for short periods before the optimum harvest age. Roots should not be left in the ground as a method of storage beyond the optimum harvest period because of the danger of roots being infested by pathogens and any other physiological deterioration.

5.6.3 Storage pits/heaps

Storage in outdoor pits/heaps may be used, after curing sweet potato by digging the hole, put dry grasses into the hole, and store the sweet potato root in the hole making a heap and cover the heap of sweet potato roots. Broken and rotten sweet potato roots should not be stored as it can lead to the deterioration and contamination of the sound sweet potato roots. Prior to store the sweet potato, moisture content reduction should be done reason that high moisture content encourages decay and deterioration

5.6.4 Storage in crates/baskets/boxes

5.6.4.1 Harvested sweet potato roots can be stored in wooden crates, boxes or baskets. These shall be lined with a layer of sawdust, wood shavings, peat or any other suitable adsorbent materials. The spaces between the roots should be filled with sawdust and the roots covered with the sawdust.

5.6.4.2 The sawdust should neither be damp nor wet. If the sawdust is too dry the roots will deteriorate quickly. Sawdust which is too moist promotes the formation of mould and rot. To prevent the roots from drying out too early, the crate, box or basket should be lined with plastic foil.

5.6.4.3 The crates, boxes or baskets can simultaneously be used as containers during transport (also several times) which saves on handling costs and reduces injury to the roots.

5.6.5 The field clamps

The sweet potato root may be kept in a clamp (preferably under shade) for up to eight weeks. The clamp should be in a well-drained location. Temperatures inside a ventilated clamp will be approximately those of the ambient temperatures.

5.6.6 Other methods

Other methods of storage and preservation include refrigeration, waxing and chemical treatment of the root:

a) refrigeration: reduced temperatures extend the storage ability of the sweet potato root by delaying the rot processes which occur rapidly at normal storage temperatures. [The most favorable temperature for the storage

of the sweet potato is 2 °C - 4 °C except for the sweet potato root meant for processing which should be stored between 10 °C - 15 °C]; and

b) waxing and chemical treatment: the sweet potato root may be preserved by coating in wax supported by a fungicide.

6 Sorting and packing for export

6.1 With suitable handling and storage, the sweet potato root can be successfully transported for long distances including export by sea-shipment. The sweet potato root may be graded in terms of size and shape, with only one type being packed in one package including small rounded, small elongated, medium round, among others.

6.2 The optimum handling conditions for the sweet potato roots are as follows:

a) [the sweet potato root should be carefully cleaned and dipped in a solution of 0.05 % Thiabendazole for 15 s to 30 s];

b) after washing and fungicide treatment, the sweet potato root should be left overnight in a well-ventilated area to dry, before packing for departure; and during shipment, the required storage temperature is 10 °C to 15 °C for five days. For longer shipment durations, a chilling temperature of 3 °C may be recommended for some type of sweet potato roots.

7 Packaging

7.1 The sweet potato root should be packaged in food grade packaging material that will safeguard the hygienic, nutritional, technological and organoleptic qualities of the product.

7.2 Packaging materials should protect the produce against mechanical damage, ease handling and

transportation including accounting for quantity in the lot.

7.3 The selection of packaging materials for commercial scale marketing requires careful consideration. The following factors should be considered in choosing suitable packaging materials:

a) level of losses occurring during marketing;

b) comparative cost of the present and improved packaging;

c) regularity of supply of the packaging material; and

d) acceptance of the packaging method by the market.

7.4 Among the various types of packaging material that are available, the following may also be used;

a) natural and synthetic fibre sacks;

b) molded plastic boxes;

c) wooden boxes;

d) cardboard boxes; and

e) paper or plastic film sacks.

7.5 The net weight should be:

a) in metric units; and

b) not more than 50 kg in accordance with International Labour Organization (ILO) guidelines.

7.6 For sea-shipment, an additional 5 % packing weight may be required due to weight loss which will occur during storage and shipment.

8 Labelling

The labelling of packaged sweet potato roots shall be in accordance with EAS 38.

Bibliography

[1] EAS 775: 2023, *Production and handling of ware potato tuber— Code of practice*

[2] EAS 776: 2023, *Production and handling of fresh cassava root — Code of practice*

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