KENYA STANDARD

DKS2861:2018
ICS 67.080.20

Production and handling of sweetpotato- code of practice

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TECHNICAL COMMITTEE REPRESENTATION

The following organizations were represented on the Technical Committee:

University of Nairobi-Department of Food Science, Nutrition and Technology
Agriculture and Food Authority- Food Cop directorate
Kenya Agricultural & Livestock Research Organization
Kenya Industrial Research & Development Institute
National Potato Council of Kenya
Propack Ltd.
Graduate Africa Ltd
Food Science and Technology platform of Kenya
International Potato Council
Kenya Bureau of Standards — Secretariat

REVISION OF KENYA STANDARDS

In order to keep abreast of progress in industry, Kenya Standards shall be regularly reviewed. Suggestions for improvements to published standards, addressed to the Managing Director, Kenya Bureau of Standards, are welcome.

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Foreword

This Kenya Standard has been developed by the Tubers and Tuber Products Technical Committee under the guidance of the Standards Projects Committee and it is in accordance with the procedures of the Kenya Bureau of Standards.

The development of this standard was in response to the need to accommodate the emerging quality, technological and environmental issues in the sector. The implementation of the standard is aimed at creating sector harmony, quality uniformity and fair trade in the sector, thereby creating value for the stakeholders. In the development of this standard it was envisaged that the current paradigm of sustainable development shall be ensured in the context of social, economic and environmental concerns. The standard thus intends to safeguard the interests of the stakeholders in the entire value chain, guarantee product quality and enhanced safety of the consumers.

In the development of this standard, reference was made to the following documents:

Recommended International Code of Practice General Principles of Food Hygiene.

EuroGap Protocol for Fresh Fruit and Vegetables _Sept_2001_Rev.02.

Global Good Agricultural Practices

Acknowledgement is hereby made for the assistance derived from these sources.

Production and handling of sweetpotato — Code of practice

1 Scope

This Kenya Code of practice provides recommended Good Agricultural Practices for the production, post-harvest handling, storage, packaging and transportation of fresh sweetpotatoes (*Ipomea batatas*), 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:

EAS 38, *General standard for the labelling of pre-packaged foods*

EAS 39, *Hygiene in the food and drink manufacturing industry — Code of practice*

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

CAC/RCP 44, Code *of Practice for Packaging and Transport of Fresh Fruits and Vegetables*

KS 2783 *Warehousing and storage of roots and tubers- Code of practice*

3 Terms and definitions

For the purposes of this Code of practice, the following terms and definitions shall apply:

3.1

fresh sweetpotato

produce of species *Ipomea batatas* grown for its roots primarily used for human consumption

3.2

agricultural inputs

any incoming material (e.g. water, agricultural chemicals and planting material) used for the primary production of fresh sweetpotato.

3.3

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

3.4

primary deterioration

reduction in quality as a result of physiological changes characterized by vascular streaking or vascular discoloration

3.5

secondary deterioration

reduction in quality induced by micro-organisms that cause rotting under aerobic and anaerobic conditions

3.6

curing

operation of self-healing of wounds, cuts and bruises

3.7

clamp

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

4 Primary production and handling of fresh sweetpotato

4.1 General requirements

Fresh sweetpotato is 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.

In each primary production area, it is necessary to consider particular agricultural practices that promote production of safe fresh sweetpotatoes, taking into account the conditions specific to the primary production area, varieties of fresh sweetpotato and methods used.

During production, primary and secondary deterioration should be avoided so as to maintain the quality of fresh sweetpotato. Procedures associated with primary production shall be conducted under good hygienic conditions to minimize potential hazards to health due to the contamination of fresh sweetpotato in accordance with EAS 39 and CAC/RCP 53.

4.2 Agricultural input requirements

4.2.1 Inputs used for the production of fresh sweetpotato shall conform to 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 fresh sweetpotatoes.

4.2.3 Growers shall use only agricultural inputs which are approved by the Competent Authority for the cultivation of sweetpotato 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 to the national environment regulatory agency guidelines.

4.2.5 Agricultural workers who apply agricultural chemicals shall be trained on proper application procedures.

4.2.6 Untreated Sewage and industrial waste shall not be used in sweetpotato production.

4.2.7 Growers shall 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 on 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 control the accuracy of application.

4.2.9 Agricultural chemicals shall be kept in their original containers, labelled with the name of the chemical and the instructions for application and use

.**4.3 Handling during production**

During the primary production and post-harvest activities, effective measures shall be taken to prevent contamination of fresh sweetpotato from agricultural inputs or personnel who come directly or indirectly into contact with fresh sweetpotato.

4.4 Handling during harvesting

4.4.1 sweetpotatoes should be harvested when fully mature. Maturity can be assessed by:

a) cutting fresh sweetpotato in the field and observing the colour of the latex exuded; latex from immature sweetpotato turns black, while from mature roots remains creamy-white;

b) rubbing the skin of the roots; immature roots skin easily peel off.

4.4.2 Careful harvesting and proper handling of sweetpotato is an important step towards successful storage.

4.4.3 Sweetpotato can be harvested manually or mechanically. Care should be taken during the harvesting process to minimize damage such as bruising, scrapping or breaking of the sweetpotato, to minimize postharvest losses.

4.4.3 Care should be taken to prevent excessive damage and injuries during cleaning of harvested roots .

4.4.4 Whether harvested manually or mechanically, the produce shall be carefully handled and transported to the packing facility immediately.

To prevent contamination, fresh sweetpotato growers, harvesters and handlers shall adhere to the following:

a) fresh sweetpotato unfit for human consumption shall be segregated during harvesting. Those which cannot be made safe by further processing should be disposed of properly;

b) agricultural workers should not use harvesting containers for other purposes. Where such containers have to be used for other purposes they shall be cleaned and sanitized;

c) care shall be taken when harvesting fresh sweetpotato in the field to avoid exposure to contamination with animal/human filth.

d) only potable shall be used water for cleaning of the sweetpotato roots

5 Storage and preservation

5.1 General

5.1.1 Fresh sweetpotato roots are perishable and under normal conditions, they store for 3 to 4 weeks while bruised ones deteriorate more rapidly.

5.1.2 The main causes of post-harvest losses in sweetpotato are associated with mechanical damage, physiological condition (maturity, respiration, water loss), diseases and pests. To ensure effective storage of root 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.

5.1.2 General storage requirements

5.1.2.1 For proper storage of sweetpotato roots ensure that roots with excessive mechanical injury and those damaged by insects or fungus are isolated

5.1.2.2 Ensure the Storage structure provides adequate ventilation to avoid dampness and control temperature. Higher temperatures reduce the duration of storage by encouraging development of sprouts more so at high humidity and internal cork where viral disease is present.

5.1.2.3 The recommended range of storage temperature and relative humidity for sweetpotato is 12-15 ^{o}C/80-95% rh. These conditions will guarantee storage up to 4-6 months.

5.1.2.4 At a temperature of 4^{o}C-chilling injury and other deleterious effects such as:

- increased susceptibility to infection by rot-causing organisms
- internal discoloration and root break down and
- reduction of 'seed' value of roots due to failure to produce any sprouts when bedded are likely to occur

5.1.2.4 Where warehouse is used for storage of sweetpotato the structure shall comply with the requirements of KS 2783.

5.2 Preparing fresh sweetpotato for storage

Fresh sweetpotatoes should be harvested and handled with care to minimize deterioration during storage and the following 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 or more 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, as far as possible, minimum handling

c) 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 causing organisms into sound produce.

5.3 Control of damage

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

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

5.4 Temperature control

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

Fresh sweetpotato may be stored at 12 °C — 15°C

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

5.5 Curing of fresh sweetpotato

5.5.1 Fresh sweetpotato shall be properly cured as soon as possible after harvest to promote the formation of a hard cork layer. Curing should be carried out near the place where the roots will be stored to minimize handling after curing.

5.5.2 Curing of sweetpotato roots involves holding roots at specific temperature and relative humidity in order to

i. Facilitate healing of injuries (cuts and bruises) incurred during harvesting and handling
ii. Guarantee successful storage.
iii. Prevent attack on the roots by rot-causing organisms and other pests.
iv. Prevent excessive shrinkage while starches are being converted to sugars and other flavor compounds during storage

5.5.3 For proper curing:

a) Do not wash roots since it interferes with wound healing process.
b) Dry freshly harvested roots (if wet) in the sun for few hours before moving to curing room.
c) Allow sufficient exchange of air to avoid accumulation of Carbon dioxide.

5.5.4 The recommended curing conditions are as shown in table 1:

Table 1: The recommended curing conditions for sweetpotatoes

Relative humidity	Temperature	Number of days
85% - 95%.	29 °C -32°C	2- 7
85% - 95%.	27 °C	8-10
85% - 95%.	24 °C	15-20

85% - 95%.	21 °C	25-30

- NOTE 1: Higher temp >32°C will facilitate sprouting while lower temp-increase days of curing. At 2°C and below, there will be no more wound healing.
- NOTE 2: Slow wound healing increases rate of infection by decay-producing organisms.

5.6 Storage methods

5.6.1 Storage in the soil before harvest

Fresh sweetpotato 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.

5.6.2 Storage pits/heaps

Storage in outdoor pits/heaps is not recommended. Where used care should be taken to reduce dampness in order to prevent decay.

5.6.3 Storing fresh sweetpotato in crates/ baskets/boxes

Freshly harvested sweetpotato roots can be stored in wooden crates or baskets. The crates should be lined with a layer of sawdust, wood shavings, peat or any other suitable adsorbent materials. The spaces between the roots should also be filled with sawdust. Finally, the roots are then covered with sawdust.

To prevent the roots drying out too early, the crates should be lined with plastic foil. 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.

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

5.6.4 The field clamp

Fresh sweetpotato 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- should be approximately those of the ambient temperatures.

5.6.5 Other methods

Other methods of storage and preservation include refrigeration, waxing of the roots , modified atmosphere and chemical treatment.

5.6.5.1 Refrigeration

Reduced temperatures extend the storage ability of sweetpotato roots by delaying the rot processes which occur rapidly at normal storage temperatures. The most favourable temperature for the storage of fresh sweet potato is 12 °C — 15 °C

5.6.5.2 Waxing

Sweetpotato roots may be preserved during storage by coating them with food grade wax. The wax may or may not be supported with a fungicide.

6 Sorting and packing for export

With suitable handling and storage, fresh sweetpotato can be successfully transported for long distances including export by sea-shipment. Fresh sweetpotato may be graded in terms of size and shape, with only one type being packed in one carton e.g. small rounded, small elongated, medium round etc.

The optimum handling system is as follows:

a) fresh sweetpotato shall be carefully cleaned and dipped in a solution of 0.05% Thiabendazole for 15 - 30 s.

b) after washing and fungicide treatment, the fresh sweetpotato should be left overnight in a well ventilated area to dry before packing for dispatch .

c) during shipment, the required storage temperature is 12 °C –15 °C.

7 Packaging and labelling

7.1 packaging shall be done in accordance to the requirements of CAC/RCP 44

7.2 Sweetpotato roots shall be packaged in food grade materials that will safeguard the hygienic, nutritional and organoleptic qualities of the product. The packaging materials shall also comply with other national regulations.

7.3 Packaging materials shall protect the produce and ease handling including accounting for quantity in the lot.

7.4 The selection of suitable containers for commercial scale marketing requires very careful

consideration. The following factors should be considered in choosing packaging materials:

a) the level of losses occurring during marketing;

b) the comparative cost of the present and improved packaging;

c) the regularity of supply of the packaging material; and

d) the acceptance of the packaging method to the market.

7.5 Among the various types of packaging material that are available, the following are used;

a) natural and synthetic fibre sacks;

b) moulded plastic boxes;

c) sawn wooden boxes;

d) cardboard boxes; and

e) paper or plastic film sacks.

7.6 The net weight shall be:

a) in metric units; and

b) not more than 50 kg in line with ILO guidelines.

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

7.7 The labelling of packaged fresh sweetpotato shall be in accordance with EAS 38**.**

8 Criteria for conformity

A lot shall be declared as acceptable if the production and handling processes conform to the provisions of this Code of practice.

