ETHIOPIAN STANDARD

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Banana crisps - Specification

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Foreword

This Ethiopian Standard has been prepared under the direction of the Technical committee for fruit and vegetable (TC-13) and published by Ethiopian Standard Agency (ESA).

The standard has been developed to address observed needs and to support the local industry in order to make progress through upraising competitiveness and maintain comparative market advantage both domestically and internationally.

In the preparation of this standard reference has been made to the following:

CD-ARS 832, *Banana crisps — Specification, African Organization for Standardization*.

PNS/BFAD 13, *Banana chips – Specification, Philippine National Standard*.

Codex Stan 192, *General standard for food additives.*

Codex Stan 193, *General standard for contaminants and toxins in food and feed.*

Acknowledgment has been made for the use of information from the above publications.

Banana crisps – Specification

1. Scope

This Ethiopian Standard specifies the requirements for crisps made from (sound and mature banana fruit (Musa varieties) preserved exclusively by frying) the cooking bananas of the species (M. balbisiana) and (M. acuminata).

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.

CES 70, Edible Salt- Specification.

CES 73, General standard for prepackaged foods - Labeling.

CES 80, Bananas - Specification.

ES 577, Recommended code of practice - General principle of food hygiene.

ES ISO 712, Cereals and cereal products - Determination of moisture content - Reference method.

ES ISO 763, Fruit and vegetable products - Determination of ash insoluble in hydrochloric acid.

ES 929, Code of practice-food hygiene management.

ES 2834, Sampling plans for prepackaged foods (AQL6.5).

ES ISO 3960, Animal and vegetable fats and oils - Determination of peroxide value - Iodometric (visual) endpoint determination.

ES ISO 4832, Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of Coliforms - Colony-count technique.

ES ISO 4833-1, Microbiology of the food chain - Horizontal method for the enumeration of microorganisms - Part 1: Colony count at 30 ^{0}C by the pour plate technique.

ES ISO 6579-3, Microbiology of the food chain - Horizontal method for the detection, Enumeration and serotyping of Salmonella - Part 3 Guidelines for serotyping of Salmonella spp.

ES ISO 6888-1, Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of coagulase-p-staphylococci (Staphylococcus aureus and other species) - Part 1: Technique using Baird-Parker agar medium.

ES ISO 6888-2, Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of coagulase-p-staphylococci (Staphylococcus aureus and other species) - Part 2: Technique using rabbit plasma fibrinogen agar medium.

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

ES ISO 7558, Guide to the prepacking of fruits and vegetables.

ES ISO 7932, *Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of presumptive Bacillus cereus - Colony-count technique at 30 ^{0}C.*

ES ISO 16050, Foodstuffs - Determination of aflatoxin B1, and the total content of aflatoxins B1, B2, G1 and G2 in cereeals, nuts and derived products - High- performance liquid chromatographic method.

ES ISO 21527-1, Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of yeasts and moulds - Part 1: Colony count technique in products with water activity greater than 0,95.

ES ISO 21527- 2, Microbiology of food and animal feeding stuffs - 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.

ES ISO 22002-1, Prerequisite programmes on food safety - Part 1 Food manufacturing.

3. Terms and definitions

For the purpose of this standard the following definitions apply.

3.1

crisp

thin firm slices of peeled and washed bananas, deep-fried until crunchy.

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

foreign matter

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

3.4

extraneous matter

organic matter of banana origin other than sweet potato crisps.

4. Description of products

Banana chips are prepared by frying the peeled sound and mature banana fruit (Musa varieties) sufficient to attain a crispy texture. It may be in the form of chips, slices, halves, cubes or any other forms with or without the addition of sweetening agent/s, salt/s or other food ingredients and additives packed in any suitable packaging materials.

5. Essential composition

4.1 Raw materials

The following materials shall be used in the processing of banana crisps:

Bananas - Complying with CES 80. They shall be mature, fresh, peeled and clean.

Vegetable oil - Shall comply with the relevant Ethiopian Standards.

4.2 Optional ingredients

Edible salt - Shall comply with CES 70.

Spices and condiments - Shall comply with the relevant Ethiopian Standards.

6. Requirements

5.1 General requirements of the finished product

a) The banana crisps shall be well cooked, firm, free from sogginess and excessive oil.

b) Banana crisps shall be golden to yellow in colour.

c) The banana crisps shall be uniform in symmetry.

d) Banana crisps, when packed, shall not contain more than 10 per cent by mass of irregular and broken pieces.

e) Banana crisps shall be of good flavour, free from rancidity, bitterness, foreign matter and any other adulterant.

f) The banana crisps shall be free from artificial colouring matter.

g) When packed, not more than 1 per cent of the product shall have the following defects:

i. Surface or internal pigmentation.

ii. Black, dark brown or reddish discolouration.

iii. Peels.

5.2 Specific requirements

Banana crisps shall conform to the chemical requirements specified in Table 1 below.

Table 1 — Chemical requirements for banana crisps

S/N	Parameter	Requirements	Test Methods
1	Moisture content, %, by mass, Max.	4.7	ES ISO 712
2	Fat content on dry weight basis, %, Max.	35	Annex A
3	Free fatty acids on dry weight basis, %, Max.	0.5	Annex B
4	Sodium chloride (NaCl) on dry weight basis, Max.%,	2.0	Annex C
5	Acid insoluble ash, %, by mass, Max.	0.05	ES ISO 763
6	Peroxide value, meq oxygen per gram, Max.	0.5	ES ISO 3960

7. Food additives

The products covered by this Standard shall be in accordance to the *General Standard for Food Additives* (Codex Stan 192).

8. Contaminants

7.1 Pesticide residues

Banana crisps shall conform to those maximum residue limits established by the Codex Alimentarius Commission for this commodity.

7.2 Other contaminants

Banana crisps shall comply with the maximum levels of the Codex General Standard for Contaminants and Toxins in Food and Feed (Codex Stan 193).

The dried banana chips shall contain no more than 10 micrograms per kilogram aflatoxin of which not more than 5 micrograms per kilogram may be aflatoxin B1 when tested in accordance with ES ISO 16050.

9. Hygiene

8.1 Banana crisps shall be manufactured and handled in a hygienic manner in accordance with ES 577, ES 929 and ES ISO 22002-1.

8.2 Banana crisps shall be free of pathogenic microorganisms to the extent that does not have health effect and shall conform to the microbiological requirements in Table 2.

Table 2 - Microbiological requirements for Banana crisps

S/N	Microorganisms	Requirements	Test Methods
1	Total plate count, cfu/g, Max.	10^3	ES ISO 4833-1
2	*Staphylococcus aureus,* cfu/g, Max.	10^2	ES ISO 6888-1, ES ISO 6888-2
3	*Escherichia coli,* cfu/g.	absent	ES ISO 7251
4	*Salmonella*, cfu/25g.	absent	ES ISO 6579-3
5	*Coliforms,* cfu/g.	absent	ES ISO 4832
6	Bacillus cereus, cfu/25g.	absent	ES ISO 7932
7	Yeasts and moulds, cfu/g, Max.	10^3	ES ISO 21527-1, ES ISO 21527- 2

10. Packaging and Labeling

10.1 Packaging

The packaging shall comply with the requirements of ES ISO 7558 and shall consider the following:

10.1.1 Banana crisps shall be clean, sound, free from insects and fungi infection and the packing material shall be of food grade quality.

10.1.2 The containers, including packaging material, shall be made of substances which are safe and suitable for their intended use. They shall not impart any toxic substance or undesirable odor or flavor to the product.

NOTE 1 Packaging materials may be required to meet different regulations in Ethiopia.

10.2 Labelling

The labeling shall comply with the requirements of CES 73, and shall be legibly and indelibly marked with the following:

a) common name of the product ‘Banana Crisps’;

b) name, and physical address of the manufacturer/ distributor and /or trade name/ brand name;

c) if spiced they shall be labelled ‘Spiced Banana Crisps’;

d) date of manufacture;

e) list of ingredients;

f) lot identification;

g) expiry date;

h) country of origin;

i) the net weight in metric units;

j) storage instructions;

k) declaration stating “salted” or “unsalted”;

l) declaration of flavouring agent or spice used; and

m) instructions on disposal of used package.

11. Methods of sampling

Sampling of banana crisps shall be done in accordance with ES 2834.

Annex A
(normative)

Determination of fat content

A.1 Principle of the method

This is achieved by the Soxhlet method with ether or petroleum ether. When reporting the results, the method and solvents used for extraction shall be stated. All substances which can be extracted from the materials to be tested by the above-mentioned solvents, and which are not volatile when dried for one hour at 105 ^{0}C, are reported.

A.2 Soxhlet method

The fatty substance is extracted completely with dry peroxide, free diethyl ether or with dry petroleum ether (boiling point below 60 ^{0}C) in a Soxhlet apparatus.

The material to be tested has previously been dried, possibly with addition of Na_2SO_4.

A.3 Reagents

A.3.1 Dry peroxide, free ethyl ether or petroleum ether (B.p. below 60 ^{0}C).

A.3.2 Na_2SO_4

A.4 Apparatus

A.4.1 Extraction thimble

A.4.2 Fat-free cotton pad

A.4.3 Soxhlet apparatus

A.4.4 Metal spiral or glass bulb

A.4.5 Oven, 103 ^{0}C – 105 ^{0}C

A.4.6 Desiccator

A.5 Procedure

About 5 g – 10 g of the finely ground substance is placed in the extraction thimble and latter closed with a fat-free cotton pad. If the material is very rich in fat, it is recommended to mix it intimately with an equal amount of dried sand.

If necessary, the thimble with contents is dried at 100 ^{0}C. The extraction is performed in the Soxhlet apparatus. In order to drain off the solvent from the extraction thimble as completely as possible at the end of each siphonage, a metal spiral of a glass bulb is placed under it.

The extraction shall be continued for at least 4 h, during which time the thimble will have been emptied about 30 times. The apparatus is then taken apart and the petroleum ether distilled off. The last traces of ether and moisture are removed by drying for one hour either in vacuum at 70 ^{0}C, or in a drying oven at 103 ^{0}C – 105 ^{0}C. By passing an air current through the flask before and after drying, all traces of petroleum ether vapour are removed.

Allow to cool for 20 min in a desiccator and weigh. As a control, the drying shall be repeated for 30 min, followed by blowing through, cooling and weighing.

The difference between two weighings shall not exceed 0.05 % of the fat values obtained; otherwise the drying has to be repeated.

Annex B
(normative)

Determination of free fatty acids

B.1 Apparatus - Soxhlet fat extraction apparatus.

B.2 Reagents

B.2.1 Petroleum ether, distilling below 65 ^{0}C, or ethyl ether.

B.2.2 Alcohol potassium hydroxide, 0.1 N (use absolute or alcohol denatured with methanol

B.2.3 Alcohol-ether mixture, equal volumes of 96 % alcohol and ethyl ether

B.2.4 Phenolphthalein solution, 1 % in alcohol or alcohol denatured with methanol. Add 0.3 mL per 100 mL mixture of alcohol-ether and add alcoholic KOH solution to a faint pink.

B.3 Procedure

B.3.1 Extract 10.00 g ± 0.01 g of the sample taken in a thimble with petroleum ether for about 4 h in a Soxhlet extraction apparatus. Completely evaporate the solvent from the extraction flask (weighed previously) on a steam bath, cool and weigh the extraction flask with the residue. Dissolve the residue in the extraction flask with the 50 mL of the alcohol-ether phenolphthalein solution. Titrate the dissolved extract, with standard potassium hydroxide solution, to a faint pink colour, which persists for 10 s. If emulsion is formed during titration, dispel by adding a second 50 mL portion of the alcohol- ether phenolphthalein solution.

B.3.2 Make a blank titration on 50 mL of the alcohol-ether phenolphthalein solution and subtract this value from the titration value of the sample. If the additional 50 mL portion of the alcohol-ether phenolphthalein solution is added, double the blank titration.

B.4 Calculation

Calculate the acid value from the following formula:

$$\text{Acid value (as oleic acid)} = \frac{56.1VN}{M}$$

Where:

V is the volume, in mL, of standard potassium hydroxide solution used;

N is the normality of standard potassium hydroxide solution; and

M is the mass, in g, of the material taken for the test.

Annex C
(normative)

Determination of the sodium chloride content

C.1 Scope

This method determines the content of chlorides.

C.2 Definition

The chloride content corresponds to the sum of all anions (halides) calculated as sodium chloride precipitable with silver ions in a nitric acid solution.

C.3 Principle

Quantitative precipitation of the halides extracted from the ash in a nitric acid solution with $AgNO_3$ in excess. Back titration of the surplus $AgNO_3$ with ammonium thiocyanate, using ferric alum (ferric ammonium sulphate) as the indicator.

C.4 Reagents

C.4.1 Distilled or demineralized water

C.4.2 $AgNO_3$ solution, 0.1 N (16.9888 g $AgNO_3$)

C.4.3 NH_4SCN solution, 0.1 N (7.6113 g NH_4SCN). In practice a slightly higher weight is taken and the solution is adjusted by dilution against a 0.1 N $AgNO_3$ solution.

C.4.4 Cold saturated $NH_4Fe(SO_4)_2.12H_2O$ solution (approximately 40 %). The ensuing brown colouring is eliminated by adding pure nitric acid dropwise.

C.4.5 HNO_3 (approximately 30 %)

C.4.6 Diethyl ether of nitrobenzene

C.5 Apparatus

C.5.1 Measuring flask, 100 mL

C.5.2 Burette, 50 mL

C.5.3 Erlenmeyer flask, 200 mL

C.5.4 Pipettes

C.5.5 Funnel, filtering paper

C.6 Procedure

The ash (residue after carbonisation and incineration of the potato crisp at a maximum temperature of 550 °C in a muffle furnace) obtained from 1 g – 2 g dry matter is extracted by means of 80 mL – 90 mL hot distilled water acidified with a few drops of nitric acid. The washings are filtered off into a 100 mL measuring flask; after cooling distilled water is added until the mark is reached (stock solution).

In proportion to the expected chloride content aliquot part of this solution, which should preferably contain 50 mg – 100 mg NaCl, taken off, distilled water being added to obtain a quantity of approximately 100 mL.

Subsequently 5 mL ferric alum solution (see C.4.4), 20 mL 0.1 N $AgNO_3$ solution (see C.4.2) and 5 mL – 10 mL ether or 1 mL nitrobenzene are added; titration is carried out by means of an ammonium thiocyanate solution

0.1 N (see C.4.3), until the red colouring remains after stirring.

C.7 Expression of results

Report in percentage by weight to one decimal place.

$$\text{Chloride content} = \frac{5.65\,(V_2 - V_3)\ \mathbf{X}\ V\ \mathbf{X}\ 100}{V_1\ \mathbf{X}\ P}$$

Where:

- P is the test portion, in mg, incinerated;
- V is the mL of the stock solution derived from the ash;
- V_1 is the volume, in mL, stock solution used from titration;
- V_2 is the volume, in mL, $AgNO_3$ added;
- V_3 is the volume, in mL, NH_4SCN necessary for back titration.

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Ethiopian Standards Agency

Organization and Objectives

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010.ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1998.

ESA's objectives are:-

- ❖ Develop Ethiopian standards and establish a system that enable to check whether goods and services are incompliance with the required standards,
- ❖ Facilitate the country's technology transfer through the use of standards,
- ❖ Develop national standards for local products and services so as to make them competitive in the international market.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational Institutions, research institutes, government or ganizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/ or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes.
Orders For all Ethiopian Standards, International Standard and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices. A catalogue of Ethiopian Standards is also a vailable freely and can be accessed in from our website.

International Involvement

ESA, representing Ethiopia, is a member of the International Organization for Standardization (ISO), and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the in ternational Electro-technical Commission (IEC) and American Society for Testing and Materials (ASTM).It is a founding member of the African Regional Organization for standardization (ARSO).

<u>More Information</u>?
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