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Fresh pineapples — Specification

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Foreword

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This African Standard was prepared by the ARSO Technical Harmonization Committee on *Agriculture and Food Products* (ARSO/THC 02).

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Introduction

Pineapple, after banana and citrus, is the third most important tropical fruit in international trade with production occurring mainly in the developing countries of the tropics [1–3]. The world production of pineapple was reported as 23.3 million metric tons by FAO in 2012 [1]. Seventy per cent of the pineapple produced in the world is consumed as fresh fruit in the country of origin, whereas 30% is exported [2,3]. The market for fresh pineapples is one of the fastest growing in the world, fruit is shipped mainly to the European and North America markets where the imports of this fruit and its processed products has more than tripled since 2000. Moreover, there has been a marked increase in North American imports since 2005, especially for fresh and frozen pineapple. Part of this significant growth in fresh products has been the shift to varieties more suited to the fresh fruit market, having lower acids than the typical canning varieties. Pineapple fresh fruit or fresh-cut products have shown a greater increase in volumes traded than that for processed products (canned, dried, juice and concentrate).

Pineapple is consumed fresh, dehydrated, canned, in juice and jams and contains fibre, bromelain, manganese, copper, vitamin C, vitamin B complex, calcium, zinc and β-carotene. The flesh is free of cholesterol and fat, and low in sodium and calories. Pineapple is the only source of bromelain, a proteolytic enzyme complex used in the pharmaceutical market, beer making and as a meat-tenderizing agent. The consumption of this fruit offers great benefits as it supports the immune system, aids digestion of proteins, alleviates symptoms of the common cold, and strengthens bones [1]. Because of its nutritional properties, texture, and juiciness its use is appropriate at all stages of life.

The stems and leaves of pineapple plants are also a source of fibre which can be processed into paper and cloth with remarkable qualities of thinness, smoothness and pliability. Parts of the plant are used for silage and hay for cattle feed. Processing wastes (shell or core material) and centrifuged solids from juice production are also used as animal feed. Alcoholic beverages can also be made from the juice or nutrient-rich fruit core.

Fresh pineapples — Specification

1 Scope

This African Standard applies to commercial varieties of pineapples grown from *Ananas comosus* (L.) Merr., of the *Bromeliaceae* family, to be supplied fresh to the consumer, after preparation and packaging.

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 56:2016, *Pre-packaged foods — Labelling*

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

CAC/GL 21, *Principles for the Establishment and Application of Microbiological Criteria for Foods*

ISO 6561-1, *Fruits, vegetables and derived products — Determination of cadmium content — Part 1: Method using graphite furnace atomic absorption spectrometry*

ISO 6561-2, *Fruits, vegetables and derived products — Determination of cadmium content — Part 2: Method using flame atomic absorption spectrometry*

3 Terms and definitions

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

3.1
foreign matter
any foreign substance which affects the appearance and typical smell of the pineapple

3.2
diseased
any unhealthy condition caused by any fungus, bacterium, virus or pest

3.3
similar varietal characteristics
the pineapples in any lot are similar in type and character of growth

3.4
mature
the pineapple has reached the stage of development where ripening has progressed to a degree where the fruit is usable and edible

3.5
overripe
the fruit is soft and past commercial utility

3.6
stems removed
the stem at the base of the fruit has been removed so that it does not extend more than 2.5 cm beyond the outermost bottom portion of the butt of the fruit

3.7
well formed
the fruit shows good shaller development and is not lopsided or distinctly pointed, and that the sides are not noticeably flattened

3.8
fairly well formed
the fruit is not excessively lopsided, or excessively flattened at the shallers or sides

3.9
fairly uniform in size
the weight of the fruit within individual containers does not vary more than 0.7 kg from smallest to largest

3.10
freezing injury or frozen (fruit)
the edible flesh is glassy, watersoaked, and/or discoloured characteristic of having been frozen or the fruit is affected by freezing so that some portion is in a hardened state with ice crystals present

3.11
freezing injury or frozen (tops)
the leaf tissue is glassy, watersoaked, and/or discoloured as is characteristic of having been frozen or the tops are to some degree, hardened by freezing with ice crystals present

3.12
single top
the fruit has only one prominent main stem at the crown of the fruit

3.13
crown slips
the small secondary top growths at the crown of the fruit

3.14
shell
the external surface or rind of the fruit

3.15
flesh
the internal edible portion of the fruit

3.16
similar varietal characteristic colour for tops
the tops in a lot may vary from a characteristic green to reddish-green colour

3.17
decay
breakdown or disintegration of the tops or breakdown, disintegration or fermentation of the pineapple caused by bacteria or fungi

3.18
internal breakdown
a physiological deterioration which results in a watersoaked or brown or blackish discoloration

3.19
injury
any defect listed in the classification of defects or any other defect or combination of defects which more than slightly detracts from the appearance, edible, or shipping quality of the fruit

3.20
damage
any defect listed in the classification of defects or any other defect or combination of defects which materially detracts from the appearance, edible, or shipping quality of the fruit

3.21
serious damage
any defect listed in the classification of defects or any other defect or combination of defects which seriously detracts from the appearance, edible, or shipping quality of the fruit

3.22
reducing (of the crown)
the mechanical destruction of the apical growing point in the heart of the crown during the growth period at about two months to harvest by means of a gouge or similar instrument. Done correctly, this leaves no visible scar at harvest and requires no special subsequent treatment.

3.23
trimming
the removal after harvest of dead, wilted or damaged leaves, either by hand or with a sharp blade. Only when explicitly so specified by a particular market outlet shall the crowns be removed in their entirety.

4 Provisions concerning quality

4.1 General

This standard is applicable to fresh pineapples with or without tops provided that pineapples with tops attached or with tops removed may not be commingled in the same container.

4.2 Minimum requirements

In all classes, subject to the special provisions for each class and the tolerances allowed, the pineapples shall be:

— intact, complete with the crown, which may be reduced and/or trimmed;

— fresh in appearance, including the crown, which shall be free of wilted, dry, loose or damaged leaves;

— sound, produce affected by rotting or deterioration such as to make it unfit for consumption is excluded;

— clean, practically free of any visible foreign matter;

— free of internal browning;

— practically free of pests;

— practically free of damage caused by pests;

— free of pronounced blemishes, in particular unhealed cuts, bruising, scorching, holes, cracks (healed or not);

— free of damage caused by chilling or by high temperature;

— free of abnormal external moisture;

— free of any foreign smell and/or taste.

When a peduncle (stem) is present, it shall be no longer than 2.0 cm long and the cut shall be transversal, straight and clean.

The development and condition of the pineapples shall be such as to enable them:

— to withstand transport and handling, and

— to arrive in satisfactory condition at the place of destination.

4.3 Maturity requirements

The fruit shall be physiologically ripe, i.e. without evidence of unripeness (opaque, flavourless, exceedingly porous[1] flesh) or over-ripeness (exceedingly translucent or fermented flesh).

A transverse section of the fruit shall not reveal flesh that is excessively fibrous or lacking in aroma.

The “eyes” shall be well-filled, according to the characteristics of the variety.

The pineapples shall have been carefully picked and have reached an appropriate degree of maturity and ripeness in accordance with criteria proper to the variety and/or commercial type and to the area in which they are grown.

The total soluble solids content of the fruit flesh shall be at least 12° Brix. For the determination of Brix degrees, a sample of the juice representative of all the fruit shall be taken.

4.4 Classification

Pineapples are classified in three classes defined below:

4.4.1 “Extra” Class

Pineapples in this class shall be of superior quality. They shall be characteristic of the variety and/or commercial type.

They shall be free from defects, with the exception of very slight superficial defects, provided that these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package.

The crown, if present, shall be simple and straight with no sprouts, and shall be between 50 and 150% of the length of the fruit for pineapples with untrimmed crowns.

Pineapples in this class shall meet the following specific requirements:

(1) Basic requirements for fruit:

(i) Similar varietal characteristics;

(ii) Mature and fresh in appearance;

(iii) Well formed, firm and well-developed eyes; and,

(iv) Stems removed.

(2) Basic requirements for tops:

[1] Except in certain varieties such as those of the Queen Victoria which may have more porous flesh.

(i) Similar varietal characteristic colour;

(ii) Single stem;

(iii) Moderately straight;

(iv) Well attached to fruit; and,

(v) Not more than 1.5 times the length of the fruit.

(3) Fruit free from:

(i) Fresh cracks;

(ii) Evidence of rodent feeding;

(iii) Freezing injury or frozen;

(iv) Overripe; and,

(v) Decay.

(4) Tops free from:

(i) Crown slips;

(ii) Freezing injury or frozen; and,

(iii) Decay.

(5) Fruit free from injury by:

(i) Bruising;

(ii) Sunburn;

(iii) Gummosis;

(iv) Internal breakdown;

(v) Insects;

(vi) Healed cracks; and,

(vii) Mechanical or other means.

(6) Tops free from injury by:

(i) Discoloration; and,

(ii) Insects.

(7) Tolerances

4.4.2 Class I

Pineapples in this class shall be of good quality. They shall be characteristic of the variety and/or commercial type.

The following slight defects may be allowed, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package:

— slight defects in shape;

— slight defects in colouring, including sun-scorch/sun-spots/sun-burns;

— slight skin defects (i.e. scratches, scars, scrapes and blemishes) not exceeding 4 per cent of the total surface area.

The defects shall not, in any case, affect the pulp of the fruit.

The crown may be simple or double and straight or slightly curved, with no side-shoots and shall not exceed 150 per cent of the length of the fruit. The maximum inclination of the crown shall not exceed 30° from the longitudinal axis of the fruit.

The pineapples in this class shall meet the following specific requirements:

(1) Basic requirements for fruit:

(i) Similar varietal characteristics;

(ii) Mature and fresh in appearance;

(iii) Well formed, firm and well-developed eyes; and,

(iv) Stems removed.

(2) Basic requirements for tops:

(i) Similar varietal characteristic colour;

(ii) Single stem;

(iii) Not more than moderately curved;

(iv) Well attached to fruit; and,

(v) Not more than twice the length of the fruit.

(3) Fruit free from:

(i) Fresh cracks;

(ii) Evidence of rodent feeding;

(iii) Freezing injury or frozen;

(iv) Overripe; and,

(v) Decay.

(4) Tops free from:

(i) Freezing injury or frozen; and,

(ii) Decay.

(5) Fruit free from damage by:

(i) Bruising;

(ii) Sunburn;

(iii) Gummosis;

(iv) Internal breakdown;

(v) Insects;

(vi) Healed cracks; and,

(vii) Mechanical or other means.

(6) Tops free from damage by:

(i) Discoloration;

(ii) Crown slips; and,

(iii) Insects.

(7) Tolerances

4.4.3 Class II

This class includes pineapples that do not qualify for inclusion in the higher classes, but satisfy the minimum requirements specified above.

The following defects may be allowed, provided the pineapples retain their essential characteristics as regards the quality, the keeping quality and presentation:

— defects in shape;

— defects in colouring, including sun-scorch;

— skin defects (i.e. scratches, scars, scrapes, bruises and blemishes) not exceeding 8 per cent of the total surface area.

The defects shall not, in any case, affect the pulp of the fruit.

The crown may be simple or double and straight or curved, with no side-shoots.

The pineapples in this class shall meet the following specific requirements:

(1) Basic requirements for fruit:

(i) Similar varietal characteristics;

(ii) Mature; and,

(iii) Fairly well formed.

(2) Basic requirements for tops:

(i) Similar varietal characteristic colour;

(ii) Well attached to fruit;

(iii) Not completely curved over; and,

(iv) Not more than two fairly well-developed stems.

(3) Fruit free from:

(i) Fresh cracks;

(ii) Evidence of rodent feeding;

(iii) Freezing injury or frozen;

(iv) Overripe; and,

(v) Decay.

(4) Tops free from:

(i) Freezing injury or frozen; and,

(ii) Decay.

(5) Fruit free from serious damage by:

(i) Bruising;

(ii) Sunburn;

(iii) Gummosis;

(iv) Internal breakdown;

(v) Insects;

(vi) Healed cracks; and,

(vii) Mechanical or other means.

(6) Tops free from serious damage by:

(i) Discoloration; and,

(ii) Insects.

(7) Tolerances

4.4.4 Classification by exterior colouring

Colour criteria of the fruit are as follows:

C0: totally green exterior,

C1: beginning to turn yellow/orange on ¼ of the fruit surface,

C2: yellow/orange on ½ of the fruit surface,

C3: yellow/orange on $^{2}/_{3}$ of the fruit surface,

C4: totally yellow/orange fruit.

5 Provisions concerning sizing

Size is determined by the average weight of the fruit with a minimum weight of 700 g, except for small size varieties[2], which can have a minimum weight of 250 g, in accordance with Table 1:

For all classes, not more than 10 per cent by number or weight of pineapples not satisfying the requirements as regards sizing shall meet the size immediately above and/or below that indicated on the package.

The pineapples in each container shall be fairly uniform in size and the count shall be plainly stamped, stencilled, or otherwise marked on the container.

In order to allow for variations incident to proper packing, not more than 5 percent of the packages in any lot may fail to meet the requirements pertaining to size and marking.

Table 1 — Size codes and designations

Size Code	Average Weight (+/-12%) (in grams)	
	with crown	without crown
AAA	3800 and above	—
AA	3250	—
A	2750	2280
B	2300	1910
C	1900	1580
D	1600	1330
E	1400	1160
F	1200	1000
G	1000	830
H	800	660

Significant volumes of pineapples in international trade are packaged and sold by count per box. Boxes are packed to minimum weight expectations e.g. 10 kg, 9 kg, 18 kg, appropriate for the various markets. Fruit are segregated for packaging by weights which approximate the above size codes, but may not consistently fall within a single size code, but would retain the uniformity required by the code.

6 Provisions concerning tolerances

Tolerances in respect of quality and size shall be allowed in each package for produce not satisfying the requirements for the class indicated.

6.1 Quality tolerances

6.1.1 “Extra” Class

5 per cent by number or weight of pineapples not satisfying the requirements of the class, but meeting those of Class I or, exceptionally, coming within the tolerances of that class: **Provided**, that included in this amount not more than the following percentages shall be allowed for the defects listed: 3 percent for defects causing serious damage, including in the latter amount not more than 1 percent for decay.

[2] Such as Queen Victoria variety.

6.1.2 Class I

10 % by number or weight of pineapples not satisfying the requirements of the class, but meeting those of Class II or, exceptionally, coming within the tolerances of that class: **Provided**, that included in this amount not more than the following percentages shall be allowed for the defects listed: 6 % for defects causing serious damage, including in the latter amount not more than 2 % for decay.

6.1.3 Class II

10 per cent by number or weight of pineapples satisfying neither the requirements of the class nor the minimum requirements, with the exception that not more than 1 percent of the produce is affected by rotting or any other deterioration rendering it unfit for consumption.

6.2 Application of tolerances

The contents of individual samples in the lot, are subject to the following limitations: Individual samples shall have not more than double a specified tolerance except that at least two defective specimens may be permitted in any sample: **Provided**, That no more than one specimen affected by decay be permitted in any sample, and provided further, that the averages for the entire lot are within the tolerances specified for the classes.

7 Provisions concerning presentation

7.1 Uniformity

The contents of each package shall be uniform and contain only pineapples of the same origin, variety or commercial type, quality and size.

In addition, for the “Extra” Class, uniformity in colouring and maturity is required.

The visible part of the contents of the package shall be representative of the entire contents.

7.2 Packaging

Pineapples shall be packed in such a way as to protect the produce properly.

The material used inside the package shall be new[3], clean and of a quality such as to avoid causing any external or internal damage to the produce. The use of materials, particularly of paper or stamps bearing trade specifications is allowed, provided the printing or labelling has been done with non-toxic ink or glue.

Stickers individually affixed on the produce shall be such that, when removed, neither leave visible traces of glue, nor lead to skin defects.

Pineapples shall be packed in each container in compliance with the CAC/RCP 44. The containers shall meet the quality, hygiene, ventilation and resistance characteristics to ensure suitable handling, shipping and preserving of the pineapples. Packages shall be free of all foreign matter and smell.

7.3 Presentation

The pineapples may be presented:

— laid down horizontally in the package,

— stood up vertically in the package with the crowns uppermost.

[3] For the purposes of this Standard, this includes recycled material of food-grade quality.

8 Marking or labelling

8.1 Consumer packages

In addition to the requirements of ARS 56, the following specific provisions apply:

8.1.1 Nature of produce

If the produce is not visible from the outside, each package shall be labelled as to the name of the produce and may be labelled as to name of the variety and/or commercial type. The absence of the crown shall be indicated.

8.2 Non-retail containers

Each package shall bear the following particulars, in letters grouped on the same side, legibly and indelibly marked, and visible from the outside, or in the documents accompanying the shipment.

8.2.1 Identification

The exporter, packer and/or dispatcher shall be identified by name and physical address (e.g. street/city/region/postal code and, if different from the country of origin, the country) or a code mark officially recognized by the national authority.

NOTE The national legislation of a number of countries requires the explicit declaration of the name and address. However, in the case where a code mark is used, the reference "packer and/or dispatcher (or equivalent abbreviations)" has to be indicated in close connection with the code mark, and the code mark shall be preceded by the ISO 3166 (alpha) country/area code of the recognizing country, if not the country of origin.

8.2.2 Nature of produce

Name of the produce if the contents are not visible from the outside. Name of the variety or commercial type (optional). The absence of the crown shall be indicated.

8.2.3 Origin of produce

Country of origin and, optionally, district where grown or national, regional or local place name.

8.2.4 Commercial identification

- Class;
- Size (recognised size code or average weight in grams);
- Number of fruits;
- Net weight (optional).
- Coloration code (optional);
- Tare weight (optional);
- The indication “To be stored at 8 °C” (optional)

NOTE The following is an example of a “recognized size code” that is in current commercial use.

A5:	fruit of 2,101 – 2,400 grams
A6:	fruit of 1,801 – 2,100 grams
A8:	fruit of 1,502 – 1,800 grams
B9:	fruit of 1,301 – 1,500 grams
B10:	fruit of 1,101 – 1,300 grams
C12:	fruit of 901 – 1,100 grams
D14:	fruit of 701 - 900 grams

8.2.5 Official inspection mark (optional)

9 Contaminants

9.1 Heavy metals

Pineapples shall comply with those maximum levels for heavy metals established by the Codex Alimentarius Commission for this commodity. The current levels are as indicated below:

Metal	Unit of measurement	Maximum limit	Test method
Lead (Pb)	mg/kg	0.10	ISO 6633 (AAS)
Cadmium (Cd)	mg/kg	0.050	ISO 6561

9.2 Pesticide residues

Pineapples shall comply with those maximum pesticide residue limits established by the Codex Alimentarius Commission for this commodity.

10 Hygiene

10.1 It is recommended that the produce covered by the provisions of this Standard be prepared and handled in accordance with the appropriate sections of ARS 53.

10.2 The produce shall comply with any microbiological criteria established in accordance with CAC/GL 21.

11 Classification of defects

Defects	Injury	Damage	Serious damage
Tops:			
Discoloration	When more than 10 percent of the crown leaves are discolored.	When more than 25 percent of the crown leaves are discolored.	When more than 50 percent of the crown leaves are discolored.
Crown slips	Free from.	When more than 5 crown slips or when more than 2 are over 69.85 mm in length.	
Mechanical or other means	When physical injury (cleanliness, mechanical damage) more than slightly affects the appearance of the pineapple.	When physical injury (cleanliness, mechanical damage) materially affects the appearance of the pineapple.	When physical injury (cleanliness, mechanical damage) seriously affects the appearance of the pineapple.
Fruit:			
Bruising	When any bruise extends into flesh more than 6.35 mm and when a bruise or combination of bruises affects an aggregate area of a circle more than 38.1 mm in diameter.	When any bruise extends into flesh more than 12.7 mm and when a bruise or combination of bruises affects an aggregate area of a circle more than 57.15 mm in diameter.	When any bruise extends into flesh more than 19.05 mm and when a bruise or combination of bruises affects an aggregate area of a circle more than 76.2 mm in diameter.
Sunburn	When there is bleaching and a slight softening of the shell affecting an aggregate area more than 38.1 mm in diameter.	When there is bleaching and a moderate softening of the shell affecting an aggregate area more than 57.15 mm in diameter.	When there is bleaching and severe softening of the shell affecting an aggregate area more than 76.2 mm in diameter.
Gummosis	When gum deposits penetrate into the flesh or causes discoloration of the shell affecting an aggregate area more than 6.35 mm in diameter.	When gum deposits slightly penetrate into the flesh or causes discoloration of the shell affecting an aggregate area more than 12.7 mm in diameter.	When gum deposits readily penetrate into the flesh or causes discoloration of the shell affecting an aggregate area more than 25.4 mm in diameter.
Fruit:			
Internal breakdown	When more than 5 percent of the edible flesh has a distinct	When more than 10 percent of the edible flesh has a light	When more than 20 percent of the edible flesh has a

Defects	Injury	Damage	Serious damage
	light brown to medium brown discoloration which more than slightly detracts from the appearance or edible quality of the fruit.	to medium brown discoloration which materially detracts from the appearance or edible quality of the fruit.	distinct medium to dark brown or brown-black discoloration which seriously detracts from the appearance or edible quality of the fruit.
Insects and insect feeding	When an aggregate area more than 12.7 mm in diameter has any insects attached to the surface (e.g. scale) or any injury from insect feeding, which more than slightly detracts from the appearance, edible, or shipping quality of the fruit.	When an aggregate area more than 19.05 mm in diameter has any insects attached to the surface (e.g. scale) or any injury from insect feeding, which materially detracts from the appearance, edible, or shipping quality of the fruit.	When an aggregate area more than 25.4 mm in diameter has any insects attached to the surface (e.g. scale) or any injury from insect feeding, which seriously detracts from the appearance, edible, or shipping quality of the fruit.
Healed cracks	When healed cracks more than slightly detract from the appearance, edible, or shipping quality of the fruit.	When healed cracks on the eyes are more than 12.7 mm in width and not more than 12.7 mm in depth or which materially detract from the appearance, edible, or shipping quality of the fruit. When healed cracks between the eyes materially affect the appearance of the fruit shell.	When healed cracks on the eyes are more than 19.05 mm in width and not more than 19.05 mm in depth or which seriously detract from the appearance, edible, or shipping quality of the fruit. When healed cracks between the eyes seriously affect the appearance of the fruit shell
Mechanical or other means	When physical injury (cleanliness, mechanical damage) more than slightly affects the appearance or edible quality of the pineapple.	When physical injury (cleanliness, mechanical damage) materially affects the appearance or edible quality of the pineapple.	When physical injury (cleanliness, mechanical damage) seriously affects the appearance or edible quality of the pineapple.

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