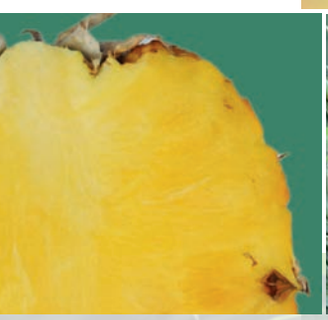
UNECE Standard on the marketing and commercial quality control of



Pineapples

Explanatory Brochure

UNITED NATIONS

New York and Geneva, 2013

Note

Commercial quality standards for agricultural produce are developed and approved by the United Nations Economic Commission for Europe through its Working Party on Agricultural Quality Standards. These international standards facilitate trade, encourage high-quality production, improve profitability and protect consumer interests. They are used by governments, producers, traders, importers and exporters, as well as international organizations. They cover a wide range of agricultural products, including fresh fruit and vegetables, dry and dried produce, seed potatoes, meat, cut flowers, eggs and egg products.

The Explanatory Brochure on the Standard for Pineapples has been developed to harmonize the interpretation of the standard, thereby facilitating international as well as national trade. It addresses producers and traders, as well as inspection authorities. It corresponds to the latest edition of the UNECE Standard for Pineapples (FFV- 49), which was officially adopted in November 2012. Subsequent revisions to the standard will be placed on the website at: www.unece.org/trade/agr/standard/fresh/ffv-standardse.html

All members of the United Nations can participate on an equal footing in the activities of the Working Party on Agricultural Quality Standards.

For more information, please visit our website: www.unece.org/trade/agr/welcome.html

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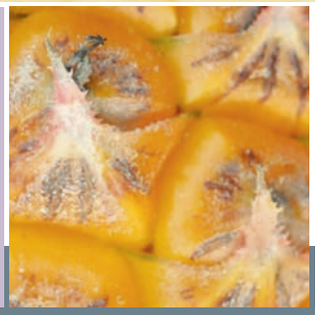
The official text of the standard is indicated in blue bold type; the interpretative text of the standard is indicated in black. References to photos representing the visual interpretation are printed in black bold. The entire text of the standard without the interpretative text appears in annex II.



Definition of Produce

I. Definition of Produce

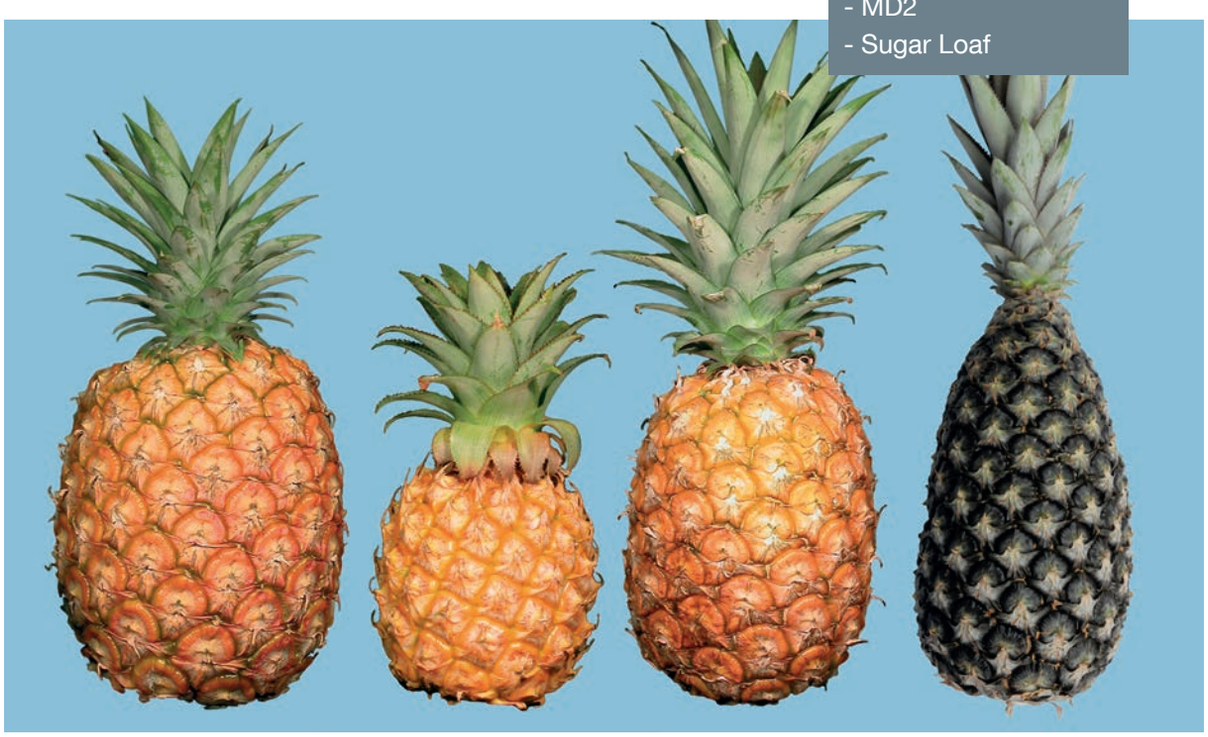
This standard applies to pineapples of varieties (cultivars) grown from *Ananas comosus* (L.) Merr. to be supplied fresh to the consumer, pineapples for ornamental use or industrial processing being excluded.

Interpretation: Pineapple varieties are characterized by:

- Size of the fruit, when fully developed: small, medium or large-sized fruit
- Shape of the fruit: cylindrical, barrel-shaped, trapezoid, ovoid or conical
- Shape of the eyes: flat or bulging
- Leaves of the crown: with smooth or spiny edges
- Flesh colour, when ripe: deep-yellow, pale-yellow or white
- Flesh maturity: more or less distinct
- Skin colour, when mature and depending on climatic conditions in the growing region: orange-red, orange-yellow, yellow or green.

Examples of commercially grown varieties are shown in **Photo 1**.

Photo 1
Definition of produce – examples of commercially grown varieties (from left to right)
- Smooth Cayenne
- Queen Victoria
- MD2
- Sugar Loaf



Provisions concerning Quality

II. Provisions concerning Quality

The purpose of the standard is to define the quality requirements for pineapples at the export-control stage after preparation and packaging.

However, if applied at stages following export, products may show in relation to the requirements of the standard:

- **a slight lack of freshness and turgidity**
- **for products graded in classes other than the "Extra" Class, a slight deterioration due to their development and their tendency to perish.**

The holder/seller of products may not display such products or offer them for sale, or deliver or market them in any manner other than in conformity with this standard. The holder/seller shall be responsible for observing such conformity.

Advice: At the packing stage, special attention should be paid to ensuring that the minimum requirements have been met. Produce with any progressive defects will deteriorate during transportation and distribution.

A. Minimum requirements

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

- **intact, with or without crown; if present, the crown may be reduced or trimmed**

Interpretation: Pineapples must not have any damage or injury affecting the integrity of the produce. Pineapples with mechanical damage, unhealed injuries or cracks exposing the interior of the produce are not allowed.

Split bracts are not considered a defect as the flesh is not damaged.

Examples related to the minimum requirement "intact" are shown in **Photos 2-4.**

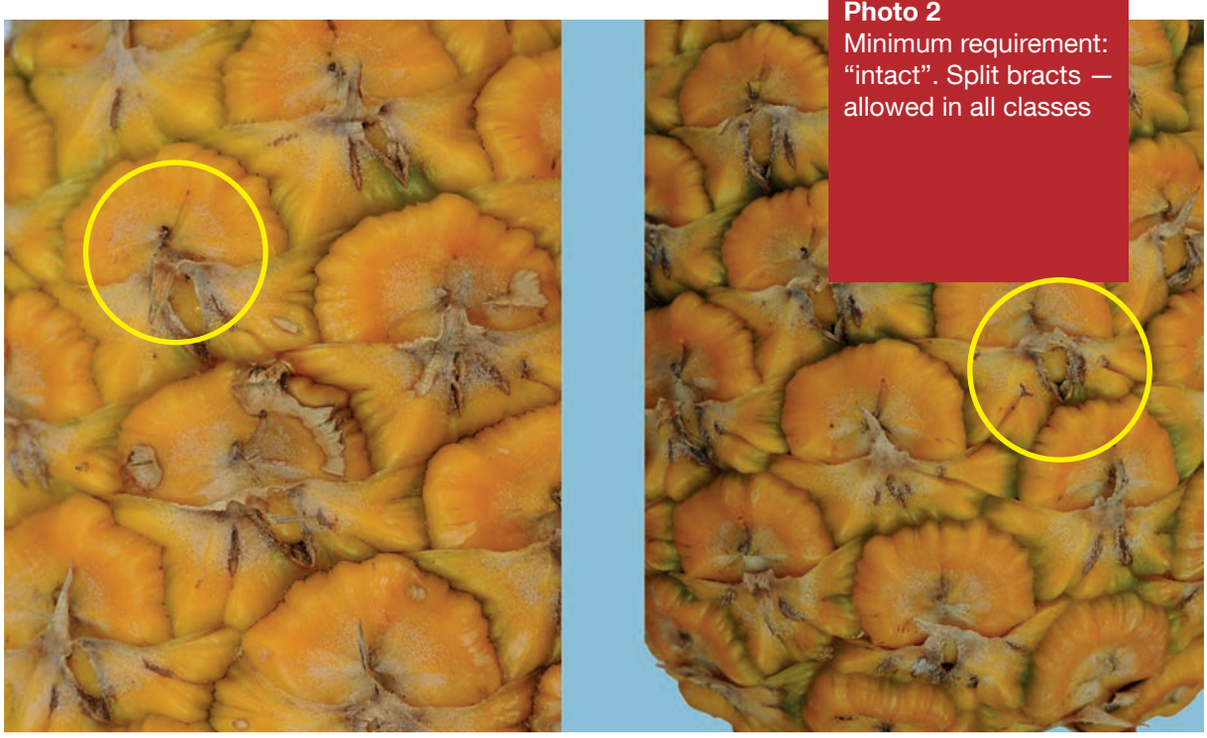


Photo 2
Minimum requirement: "intact". Split bracts — allowed in all classes

Photo 3
Minimum requirement: “intact”. Cracks affecting the flesh — not allowed

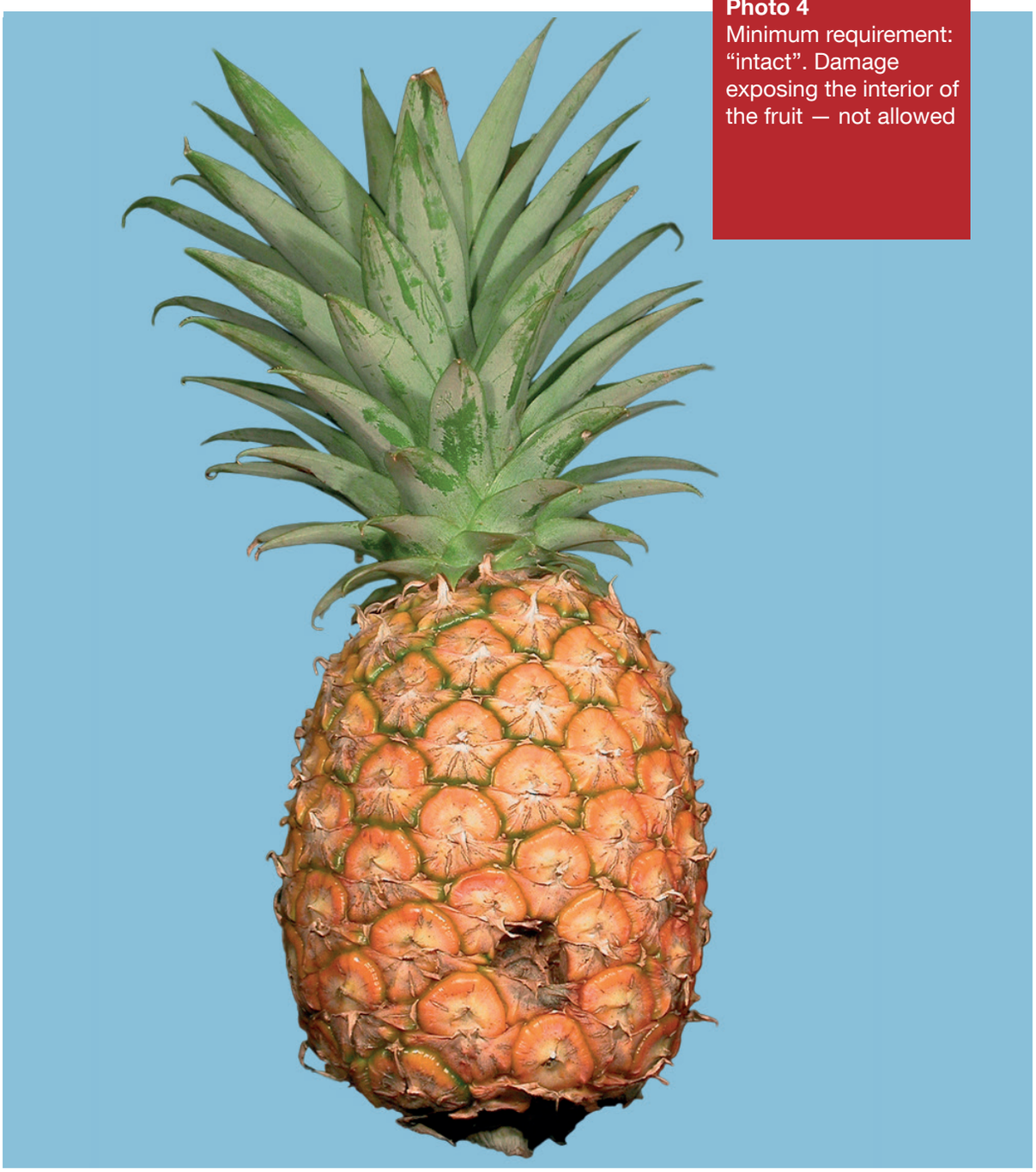


Photo 4
Minimum requirement: “intact”. Damage exposing the interior of the fruit — not allowed

The crown, if present, must be intact. It may be reduced or trimmed.

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

“Trimming” is the removal after harvest of excess crown or dead, wilted or damaged leaves. The cut must be neat.

“Removing” the crown in its entirety is allowed provided the cut is clean, dry and sound.

Examples related to the minimum requirement “with or without crown” are shown in **Photos 5-6**.

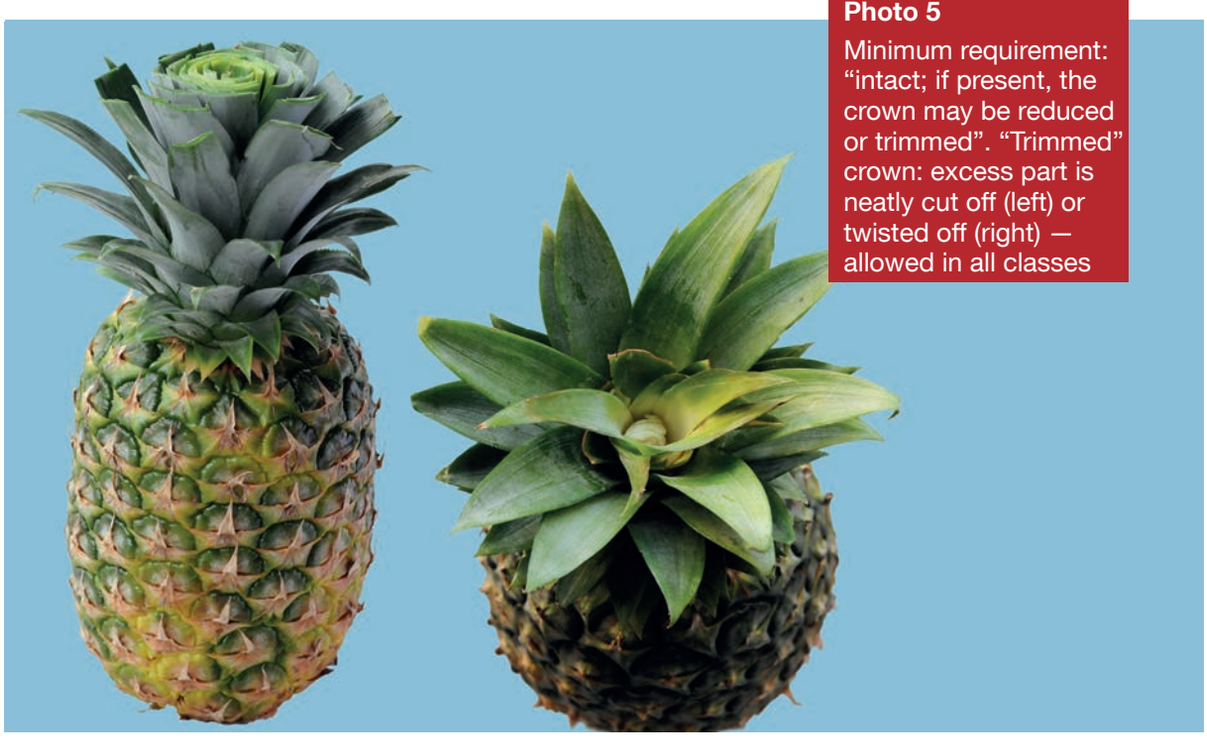


Photo 5

Minimum requirement: “intact; if present, the crown may be reduced or trimmed”. “Trimmed” crown: excess part is neatly cut off (left) or twisted off (right) — allowed in all classes

Photo 6
Minimum requirement: "intact; if present, the crown may be reduced or trimmed". "Removed" crown: neatly twisted off (left) or cut off (right) — allowed in all classes

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

Interpretation: Pineapples must be free from disease (caused by fungi, bacteria or viruses), physiological disorders or serious deterioration, which appreciably affect their appearance, edibility or keeping quality. Pineapples affected by rotting or those having only their crowns affected by rot, even if the signs are very slight but liable to make the fruit unfit for consumption upon arrival at destination, should be excluded.

Pineapples with the following defects are therefore excluded:

- rotting
- mould
- severe bruising
- sun-scorch

Note: Sun-scorch is caused by overexposure to sunlight, especially when the fruit bends over during growth. This commonly occurs during the last month before harvest, leading to translucence of the underlying flesh. After storage sun-scorch may lead to pronounced withering of the skin and deterioration of the flesh. Pineapples with sun-scorch that has caused softening of the flesh are not allowed.

- water soaking
- chilling injury

Note: Chilling injury (damage caused by low temperature) appears as glassiness developing directly under the skin and progressing towards the core. The peel is a dull brownish colour.

Advice: Pineapples should be stored between 8° C and 10° C.

- internal breakdown
- physiological disorders, caused by mineral deficiencies or environmental stress.

Examples related to the minimum requirement "sound" are shown in **Photos 7–14**.

Photo 7
Minimum requirement: “sound”. Fruitlet core rot — not allowed

Photo 8
Minimum requirement: “sound”. *Phytophtora* infection — not allowed

Photo 9
Minimum requirement: “sound”. Mould on cut stem — not allowed

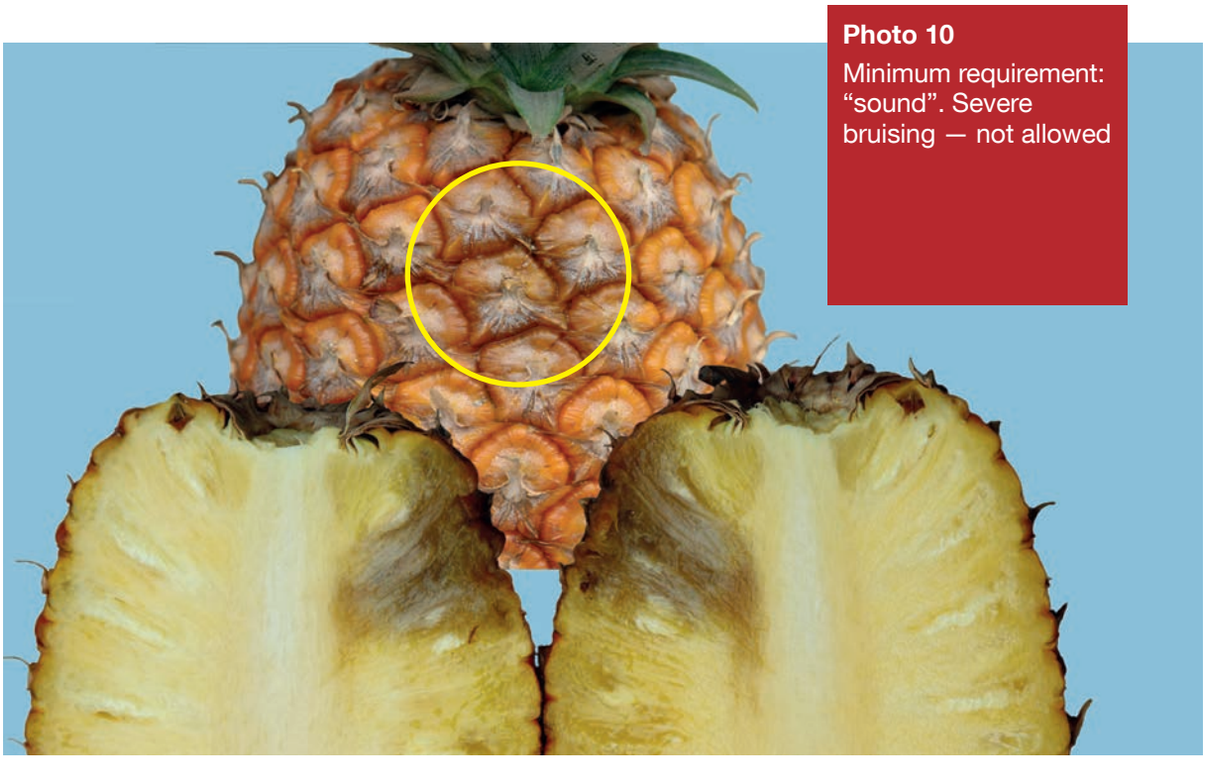


Photo 10
Minimum requirement: “sound”. Severe bruising — not allowed

Photo 11
Minimum requirement: “sound”. Internal water soaking — not allowed

Photo 12
Minimum requirement: “sound”. Chilling injury — not allowed

Photo 13
Minimum requirement: “sound”. Chilling injury — not allowed

Photo 14
Minimum requirement: “sound”. Internal breakdown — not allowed

- clean, practically free of any visible foreign matter

Interpretation: Pineapples must be practically free of visible soil, dust, chemical residue or other foreign matter.

The acceptable limit for “practically free” would be slight traces of foreign matter. Extensive soiling or deposits are not allowed.

An example related to the minimum requirement “clean” is shown in **Photo 15**.

Photo 15
Minimum requirement: “clean”. Excessive soiling (left), pest residue (right) — not allowed

- practically free from pests

Interpretation: The presence of pests can detract from the commercial presentation and acceptance of the pineapples. Therefore, the acceptable limit would be the odd insect, mite or other pests in the package or sample; any colonies would lead to rejection of the produce.

An example related to the minimum requirement “practically free from pests” is shown in **Photo 16**.

Photo 16
Minimum requirement: “practically free from pests”. Colony of mealy bugs — not allowed

- free from damage caused by pests affecting the flesh

Interpretation: Pest damage affecting the flesh makes the produce unfit for consumption and is not allowed. Pest damage affecting the skin only is covered by the allowances for skin defects in each class.

Examples related to the minimum requirement “free from damage caused by pests affecting the flesh” are shown in **Photos 17-19**.

Photo 17
Minimum requirement: “free from damage caused by pests affecting the flesh”. Damage caused by the *Augosoma* beetle — not allowed

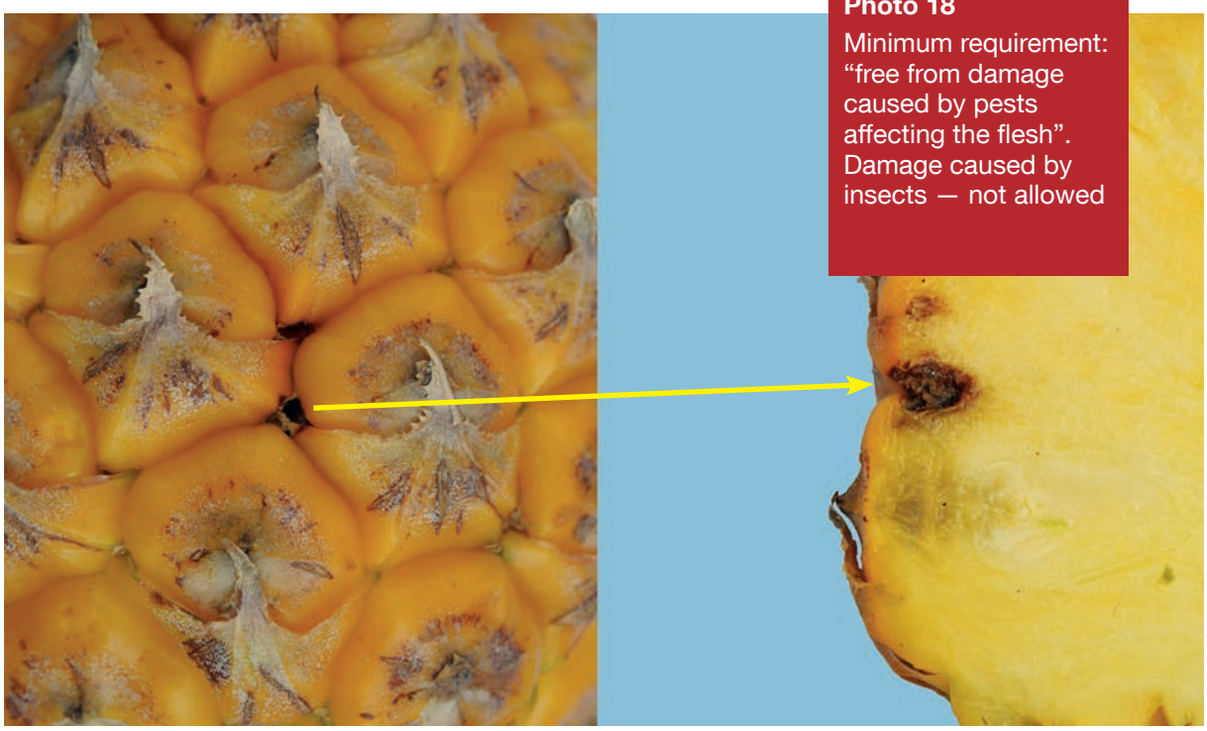


Photo 18
Minimum requirement: “free from damage caused by pests affecting the flesh”. Damage caused by insects — not allowed

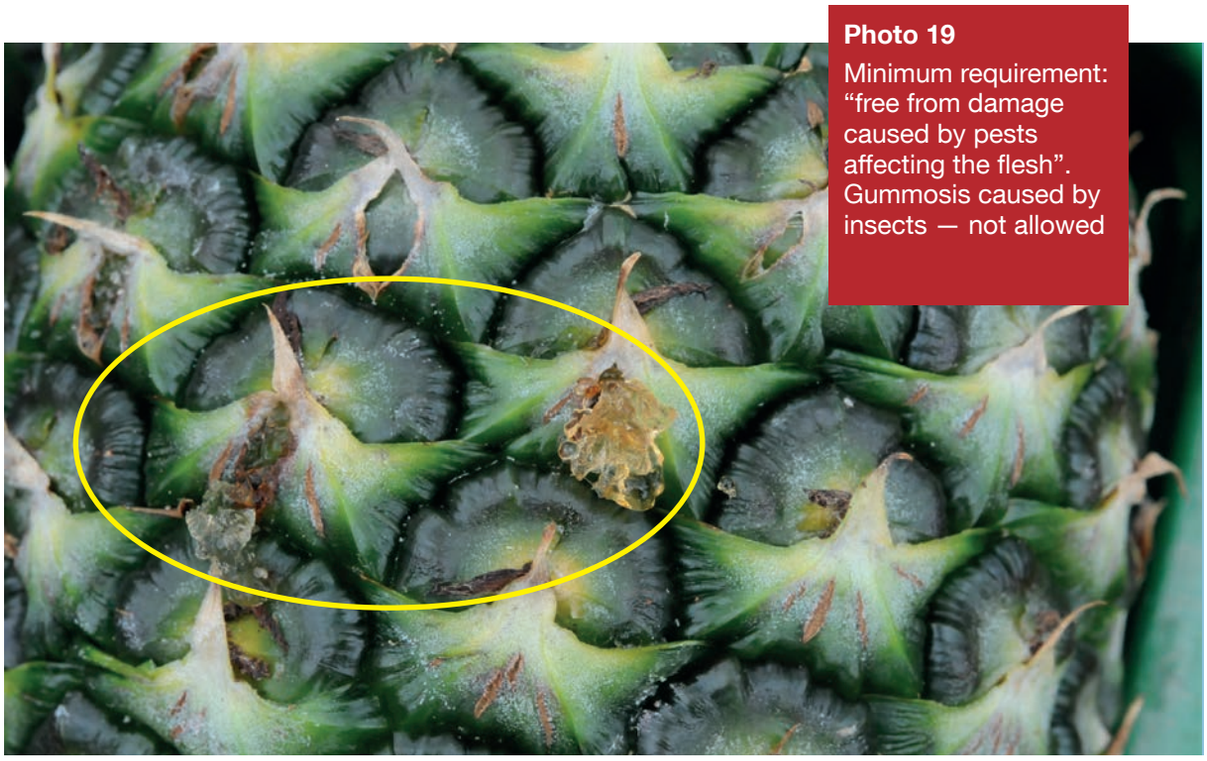


Photo 19
Minimum requirement: “free from damage caused by pests affecting the flesh”. Gummosis caused by insects — not allowed

- fresh in appearance, including the crown

Interpretation: Pineapples should be firm and turgid. The crown, if present, should be fresh and not discoloured. Slight lack of freshness is allowed at stages following export or dispatch. Pineapples showing signs of shrivelling or dehydration or having crowns with wilted or dry leaves are excluded.

Note: Shrivelling and dehydration are usually caused either by fruit remaining too long on the plant or by suboptimal growing conditions leading to insufficient water reaching the fruit.

Examples related to the minimum requirement “fresh in appearance, including the crown” are shown in **Photos 20-21**.

Photo 20
Minimum requirement: “fresh in appearance, including the crown”. Normal fruit (left) — allowed, dehydrated fruit (right) — not allowed

Photo 21
Minimum requirement: “fresh in appearance, including the crown”. Wilted crown — not allowed

- free of abnormal external moisture

Interpretation: This provision applies to excessive moisture — for example, free water lying inside the package — but does not include condensation on produce following release from cool storage or refrigerated vehicle.

- free of any foreign smell and/or taste.

Interpretation: This provision applies to pineapples stored or transported under poor conditions, which has consequently resulted in their absorbing abnormal smells and/or tastes, in particular through the proximity of other products that give off volatile odours.

When a stalk is present, it shall not be longer than 2.5 cm measured from the shoulder of the fruit and the cut must be transversal, straight and clean. However, during transportation pineapples with a longer stem are excluded from these requirements.

Interpretation: The stalk must not be longer than 2.5 cm and must be cut transversally, be straight and clean. Pineapples may be transported with a stalk longer than 2.5 cm. The stalk must then be cut to length at destination.

An example related to the minimum requirement "stalk should not be longer than 2.5 cm" is shown in **Photo 22**.

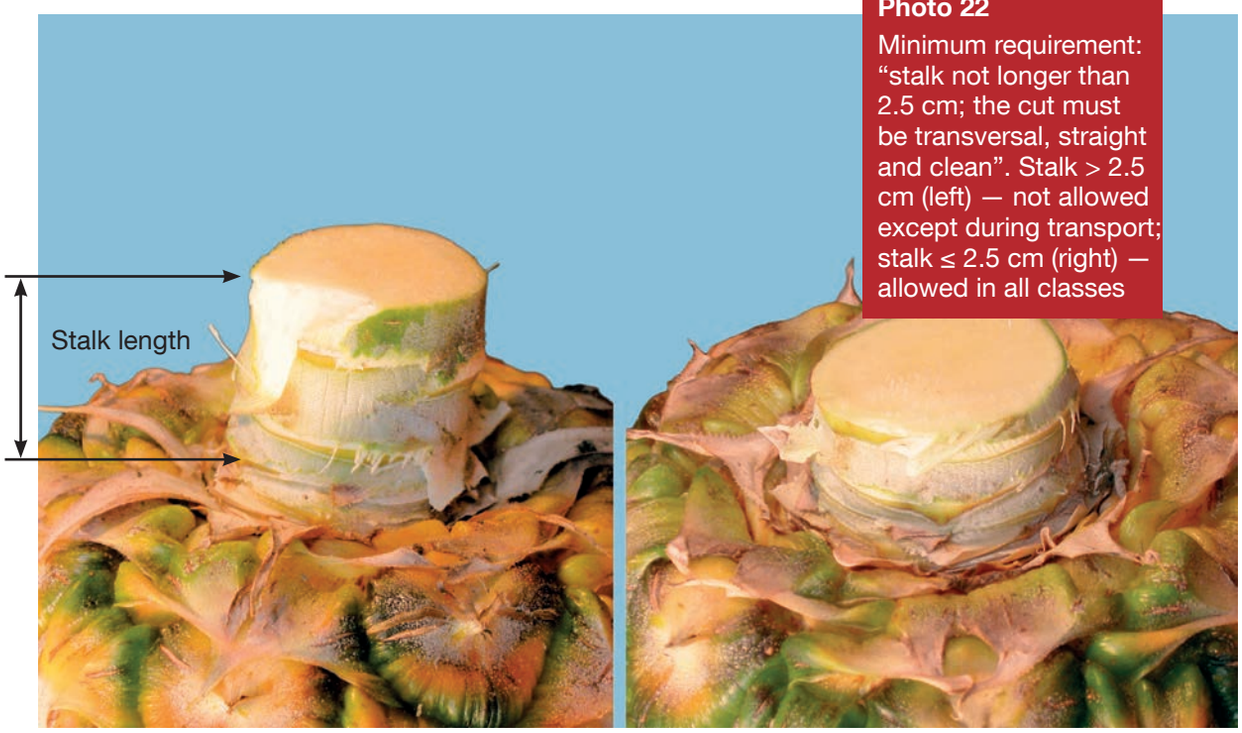


Photo 22
Minimum requirement: "stalk not longer than 2.5 cm; the cut must be transversal, straight and clean". Stalk > 2.5 cm (left) — not allowed except during transport; stalk ≤ 2.5 cm (right) — allowed in all classes

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

- **to withstand transportation and handling**
- **to arrive in satisfactory condition at the place of destination.**

B. Maturity requirements

The pineapples must have reached an appropriate degree of maturity and ripeness in accordance with criteria proper to the variety and to the area in which they are grown.

Interpretation: Once picked, pineapples do not ripen further and the sugar level does not increase. The flesh of the harvested pineapples must not be unripe (opaque, flavourless, exceedingly porous) or over-ripe (exceedingly translucent or fermented).

Examples related to the maturity requirement "appropriate degree of maturity and ripeness" are shown in **Photos 23-24**.

Photo 23
Maturity requirement: "appropriate degree of maturity and ripeness". Unripe fruit — not allowed

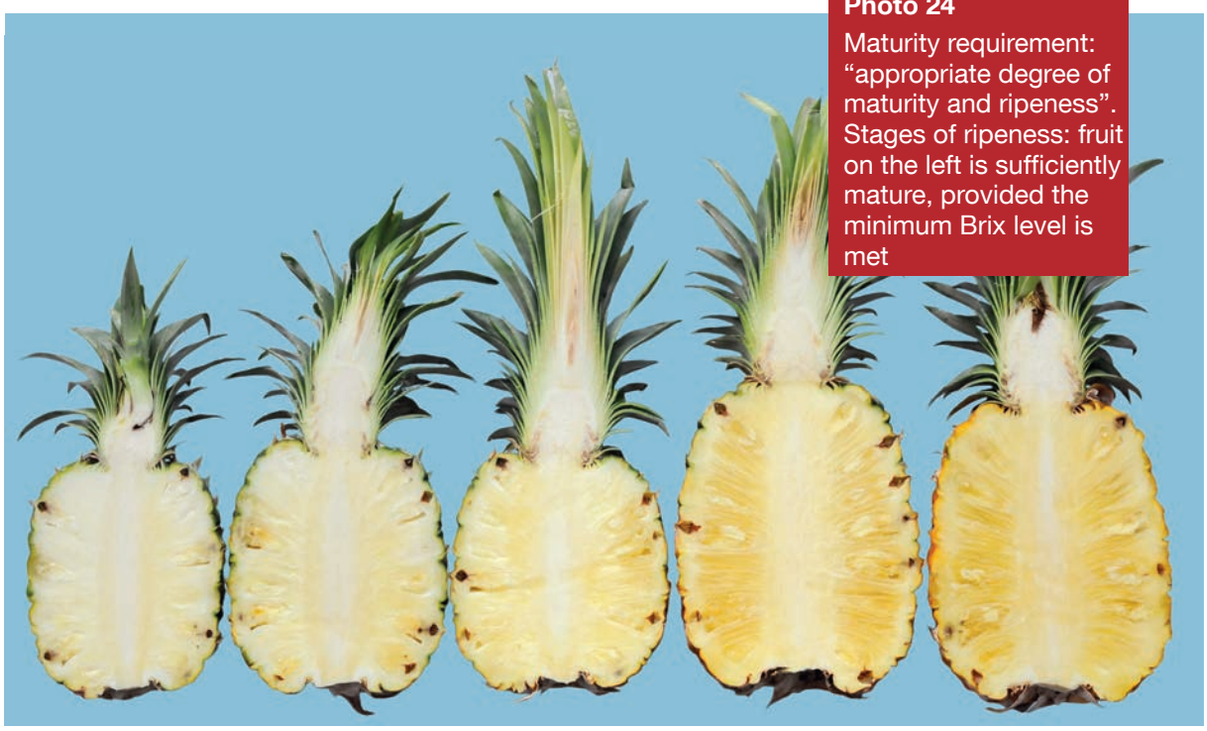


Photo 24
Maturity requirement: “appropriate degree of maturity and ripeness”. Stages of ripeness: fruit on the left is sufficiently mature, provided the minimum Brix level is met

The total soluble solids content of the fruit flesh should be at least 12° Brix.

Interpretation: Setting minimum limits ensures that pineapples are harvested at a maturity stage that enables them to enter the distribution chain in satisfactory condition and to be of acceptable quality when they reach the consumer.

Depending on the variety, pineapples mature from the bottom up with a more or less distinct gradient.

Method to measure total soluble solids of pineapples

To measure total soluble solids (TSS), juice should be taken from the whole fruit. The method explained below follows the OECD Guidance on Objective Tests to Determine Quality of Fruit and Vegetables and Dry and Dried Produce (www.oecd.org/tad/fv).

Sampling: To evaluate the lot selected for inspection, take a sample of at least 10 fruits of each size at random from the reduced sample. Fruits should be free from defects such as sun-scorch and pest or disease damage, which may have affected the normal ripening process.

Sample preparation and measurement includes six steps:

Step 1: Cut each fruit in half lengthways with a knife. Both halves of each fruit should be tested.

Step 2: Cut diagonal lines into the flesh of each half in two directions.

Step 3: Cut the core out.

Step 4: Squeeze the fruit and collect the juice.

Step 5: Place 1-2 drops of juice on the prism plate of the refractometer.

Step 6: Take a reading to one decimal point.

An equal number of drops should be taken for each measurement.

Clean the glass prism with distilled water after taking each reading.

Calculation of the results: Note the readings for both halves of each fruit and average them. To obtain the average value for the sample, sum up these averages and divide them by the number of sampled fruits, rounding the result to one decimal point. If the average value is equal to or greater than the limit specified in the standard (12° Brix), the lot has met the required minimum maturity level. If the average readings for at least 3 of the 10 sampled fruits are 10 per cent (or more) lower than the limit specified in the standard, a second sample needs to be taken and analysed with other fruits from the reduced sample or from a new sample. If the average of the two samples is 10 per cent (or more) lower than the limit specified in the standard, the lot fails to meet the minimum maturity level requirement and should be rejected. No tolerance is applied.

Examples related to the maturity requirement “Total soluble solids content (TSS)” are shown in **Photos 25-31**.

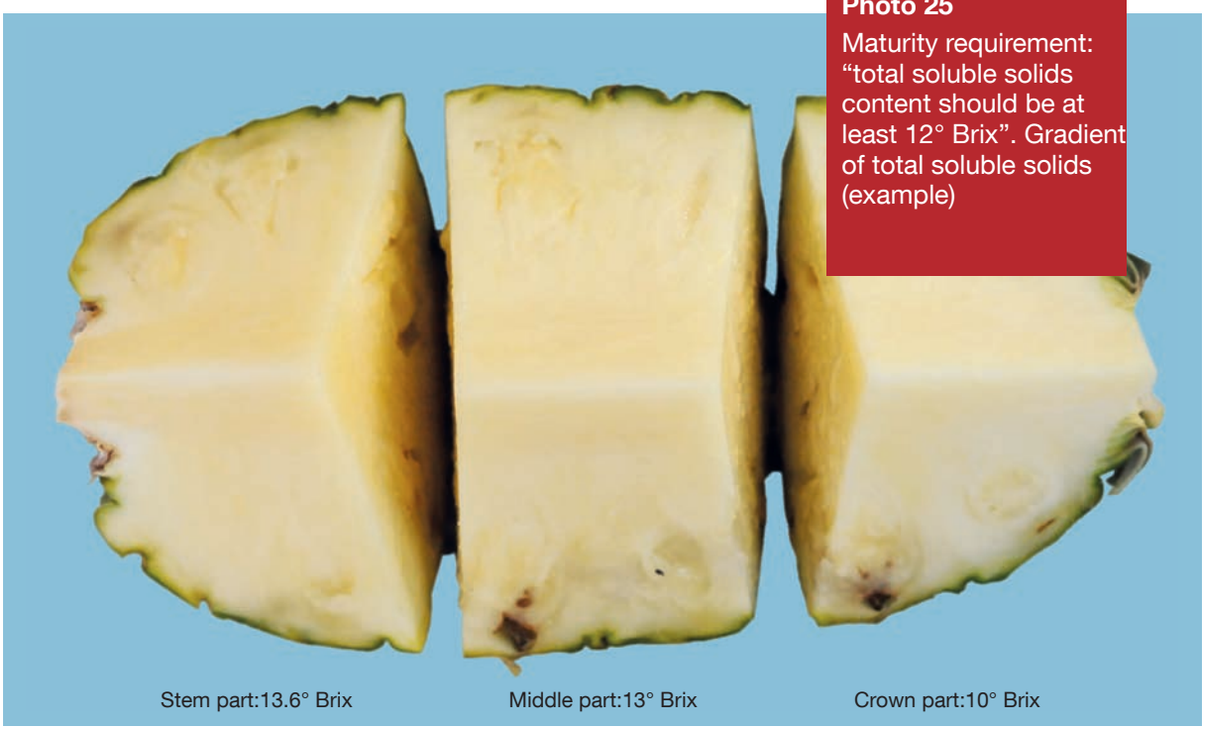


Photo 25
Maturity requirement: "total soluble solids content should be at least 12° Brix". Gradient of total soluble solids (example)

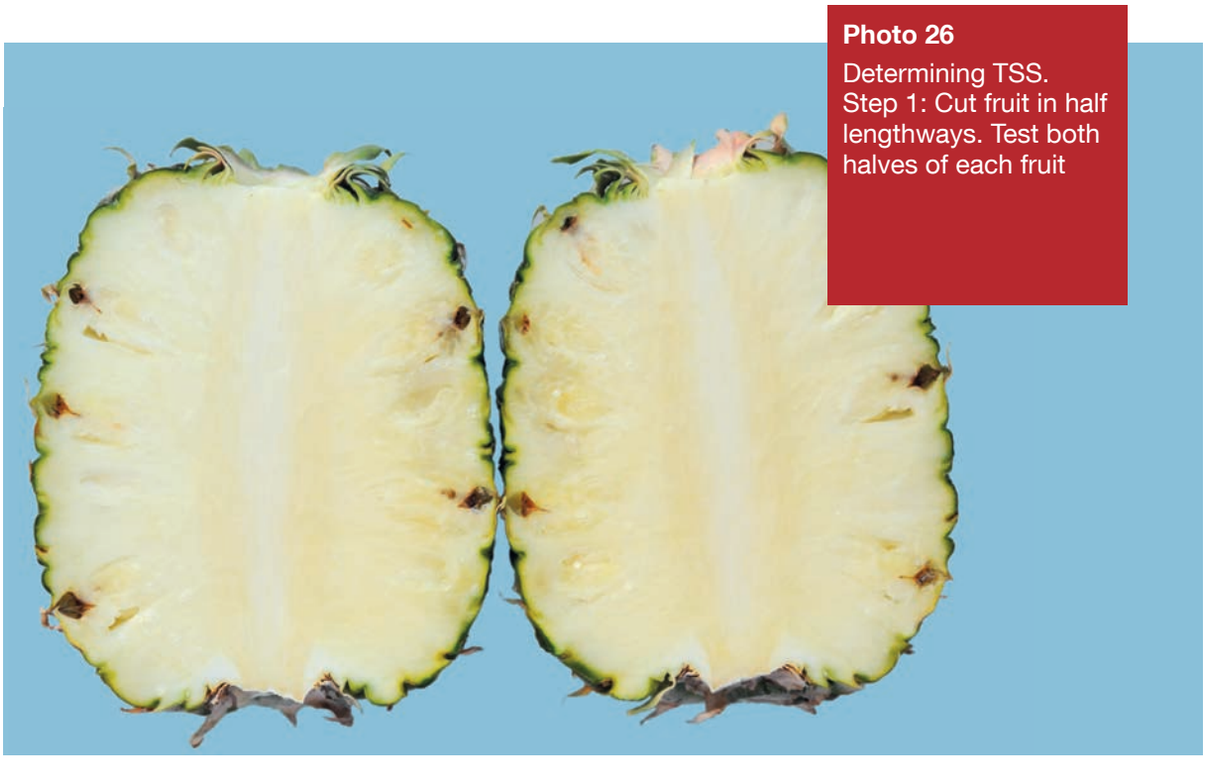


Photo 26
Determining TSS. Step 1: Cut fruit in half lengthways. Test both halves of each fruit

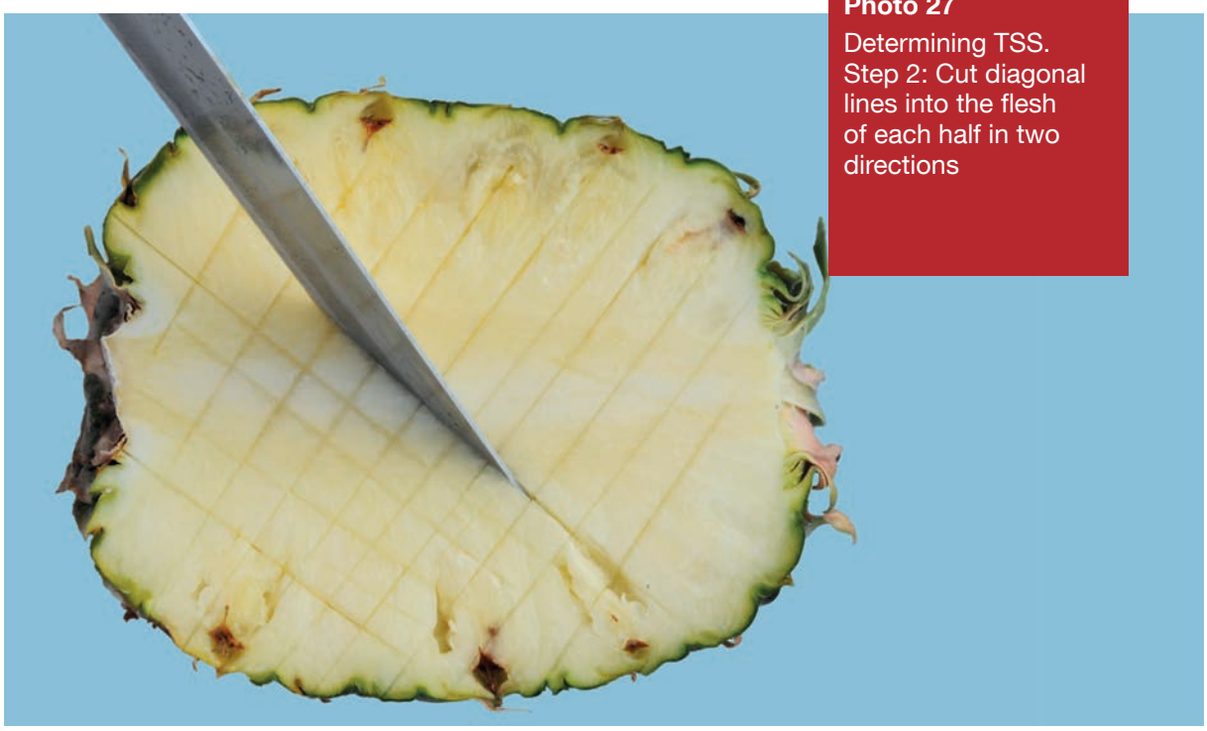


Photo 27
Determining TSS.
Step 2: Cut diagonal lines into the flesh of each half in two directions

Photo 28
Determining TSS.
Step 3: Cut the core out

Photo 29
Determining TSS. Step 4: Squeeze the fruit and collect the juice

Photo 30
Determining TSS. Step 5: Place 1-2 drops of juice on the prism plate of the refractometer

Photo 31
Determining TSS.
Step 6: Take a reading to one decimal point

Fruit showing over-ripeness affecting edibility is excluded.

Interpretation: Overripe pineapples showing exceedingly translucent flesh and/or having a fermented or off taste are excluded.

Excessive application of ethylene may lead to red/pink skin colouration that might be associated with translucent flesh and over-ripeness.

Advice: Fruit with red/pink skin colouration caused by excessive application of ethylene must be cut to check for over-ripeness.

Examples related to the maturity requirement "over-ripeness affecting edibility" are shown in **Photos 32-33**.

Photo 32
Maturity requirement: "over-ripeness affecting edibility". Overripe fruit (exceedingly translucent flesh) — not allowed

Photo 33
Maturity requirement: "over-ripeness affecting edibility". Red/pink skin colouration due to excessive application of ethylene — not allowed if associated with over-ripeness

The skin colour can be green, provided the minimum maturity requirements are met.

Interpretation: Due to climatic conditions in the tropical and subtropical areas of production, the skin may remain green while the fruit has reached full maturity and ripeness. Pineapples may be degreened. All skin colours are allowed as long as the Brix level has met the minimum requirement.

The following colour classification, or peel-colour index, may be used in trade:

C0 – Totally green exterior

C1 – Beginning to turn yellow/orange on one quarter of the fruit surface

C2 – Yellow/orange on one half of the fruit surface

C3 – Yellow/orange on two thirds of the fruit surface

C4 – Totally orange/yellow fruit.

Examples related to the maturity requirement "skin colour" are shown in **Photos 34-36**.

Photo 34
Maturity requirement: “skin colour”. Green but mature fruit of MD2 variety — allowed in all classes

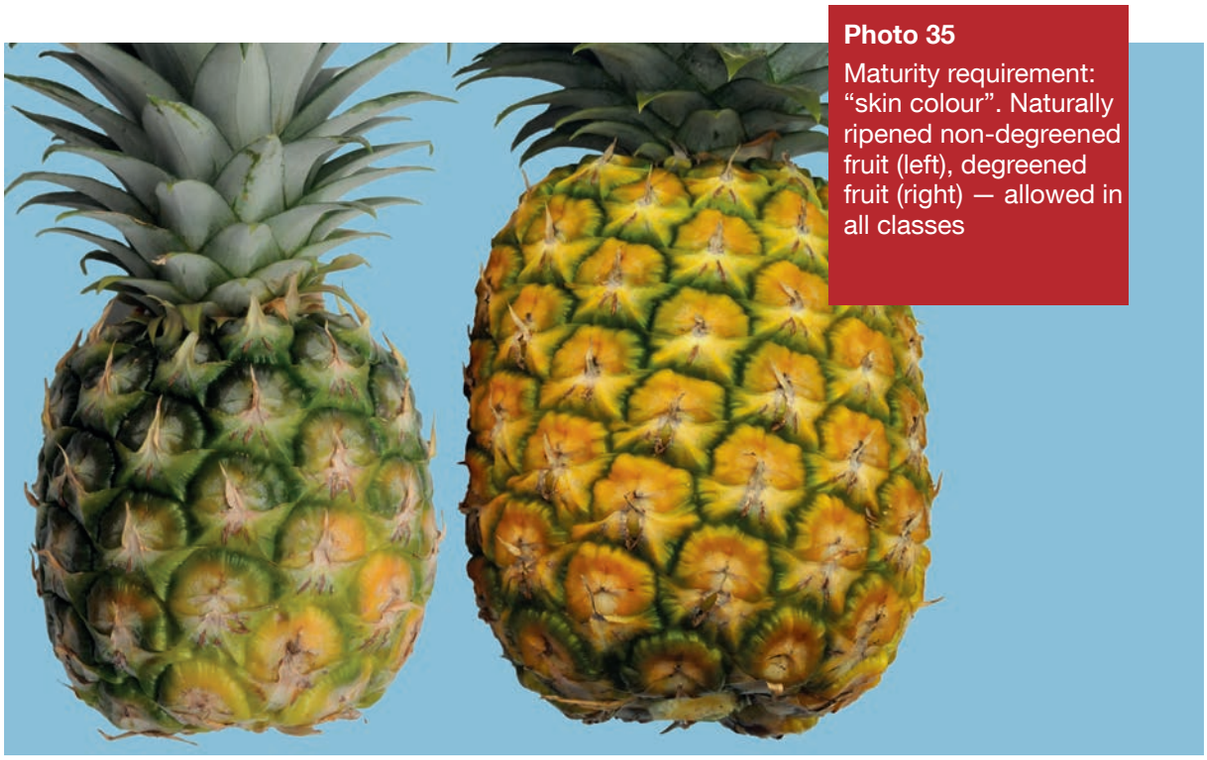


Photo 35
Maturity requirement: “skin colour”. Naturally ripened non-degreened fruit (left), degreened fruit (right) — allowed in all classes

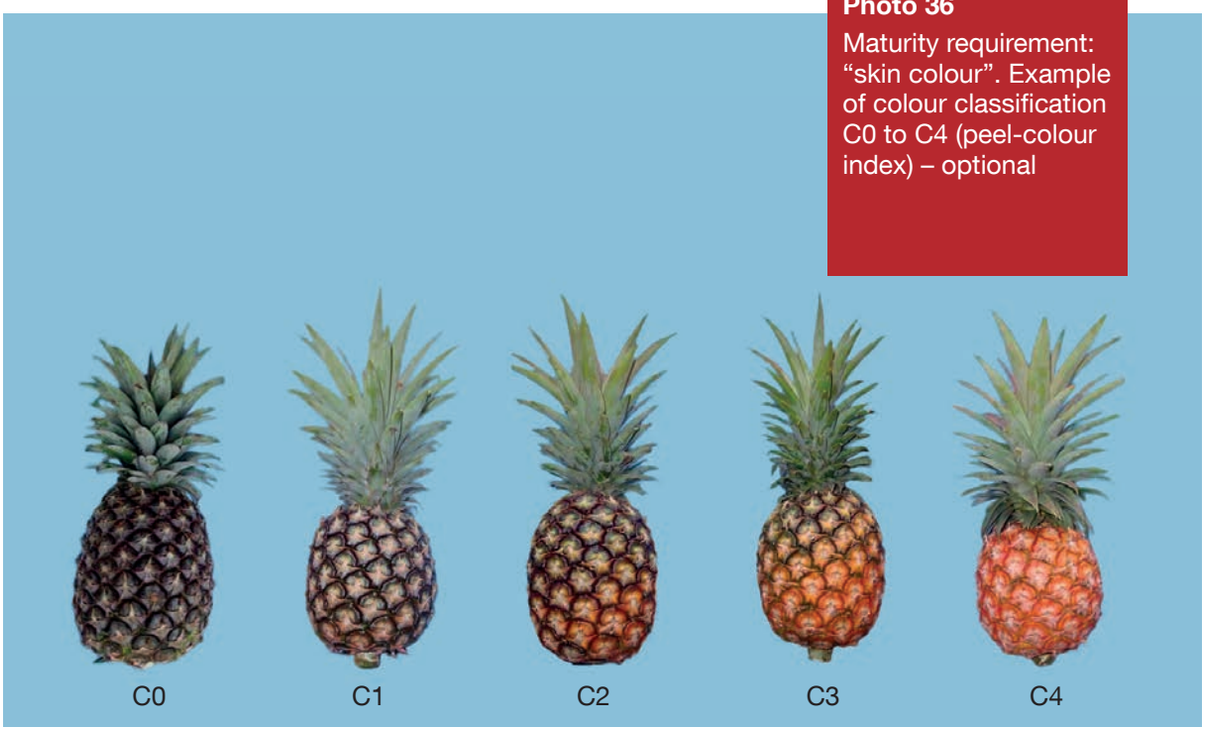


Photo 36
Maturity requirement: "skin colour". Example of colour classification C0 to C4 (peel-colour index) – optional

C. Classification

Pineapples are classified in three classes, as defined below:

(i) *"Extra" Class*

Pineapples in this class must be of superior quality. They must be characteristic of the variety.

The crown, if present, must be single and straight with no side-shoots and should not exceed 150 per cent of the length of the fruit. It must be fresh and not discoloured.

The flesh must be perfectly sound.

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

Interpretation: Superior quality fruit fall within "Extra" Class.

Changes in colouration as pineapples ripen are not considered defects in colouring. However, fruit in packages must be uniform in colouring.

The crown, if present, must be well developed, not damaged and not trimmed. The length of the crown should be between 50 and 150 per cent of the length of the fruit.

Examples related to "Extra" Class are shown in **Photos 37-39**.

Photo 37
Classification: “Extra” Class. Characteristic of the respective varieties – no defects

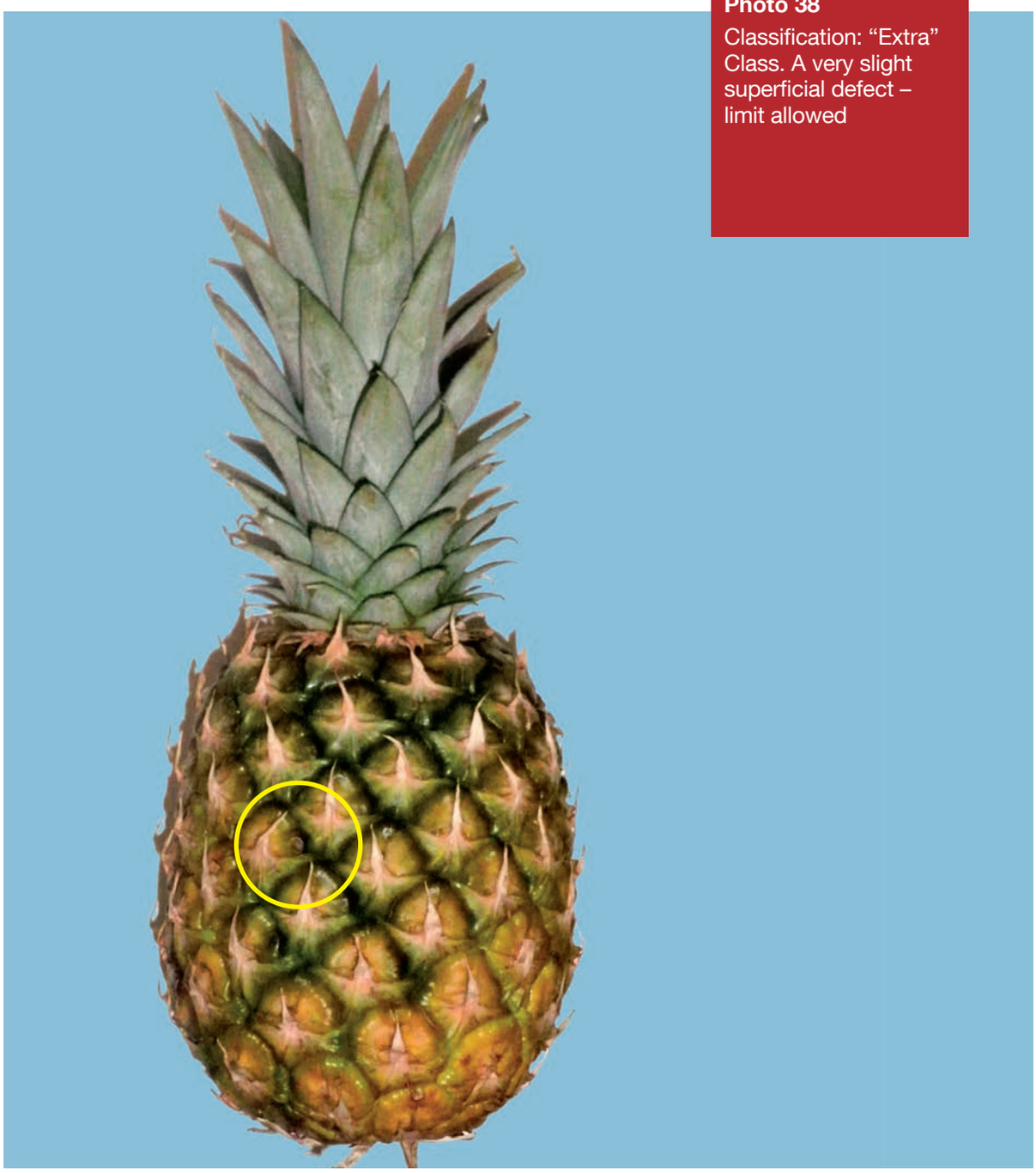


Photo 38
Classification: “Extra” Class. A very slight superficial defect – limit allowed

Photo 39
Classification: Crown length exceeding 150 per cent (right) and crown under 50 per cent (left) of the length of the fruit — not allowed in "Extra" Class

(ii) *Class I*

Pineapples in this class must be of good quality. They must be characteristic of the variety.

The crown, if present, must be single and with no side-shoots and should not exceed 150 per cent of the length of the fruit. It may be:

- **slightly damaged**
- **slightly discoloured**
- **slightly curved with a maximum inclination not exceeding 30° from the longitudinal axis of the fruit.**

Interpretation: The crown, if present, may have up to 6 slightly damaged, discoloured or dehydrated leaves.

Examples of Class I crown defects are shown in **Photos 40-41**.

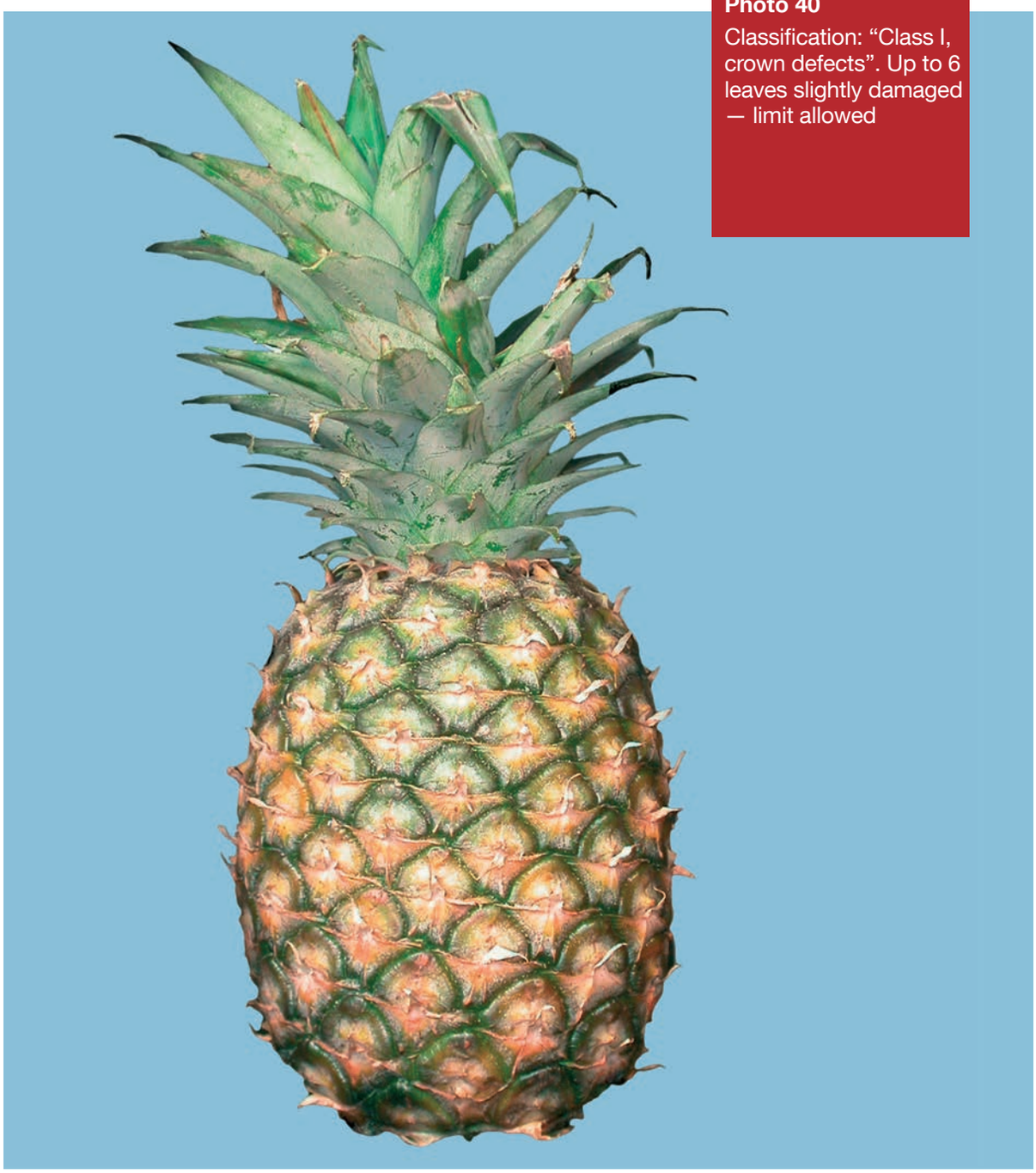


Photo 40
Classification: “Class I, crown defects”. Up to 6 leaves slightly damaged — limit allowed

Photo 41
Classification: “Class I, crown defects”. Inclination at 30° from the longitudinal axis of the fruit — limit allowed

The flesh must be perfectly sound.

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

- a slight defect in shape

Interpretation: An example of Class I shape defects is shown in **Photo 42**.

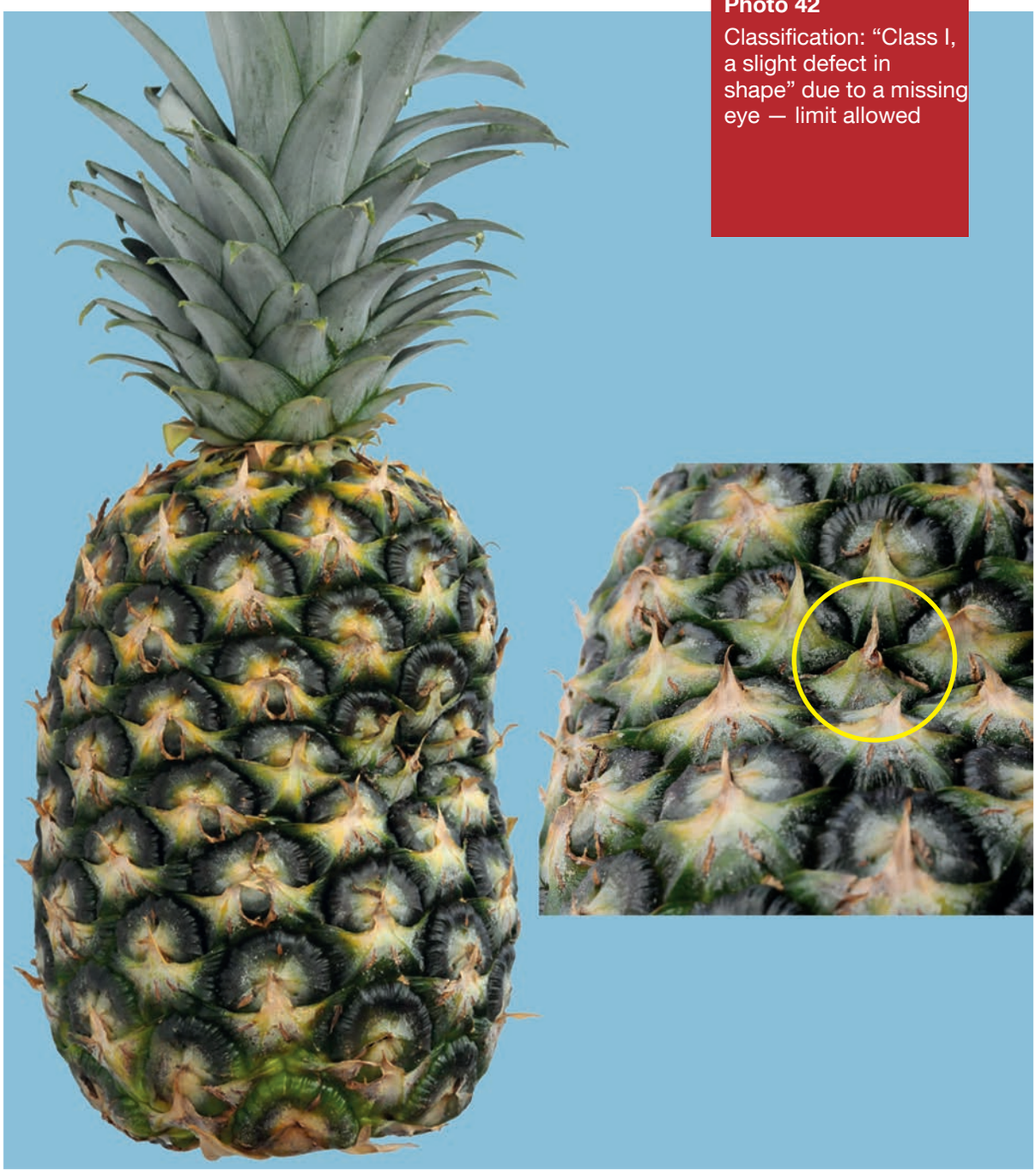


Photo 42
Classification: “Class I, a slight defect in shape” due to a missing eye — limit allowed

- slight defects in colouring, including discolouration caused by the sun

Interpretation: Changes in colouration as pineapples ripen are not considered colour defects. However, fruit in packages must be uniform in colouring. Colour defects caused by the sun should not affect the flesh.

An example of Class I defects in colouring is shown in **Photo 43**.

Photo 43
Classification: "Class I, slight defects in colouring, including discolouration caused by the sun" — limit allowed

- slight skin defects not exceeding 5 per cent of the total surface area

Interpretation: Slight skin defects can be eliminated by normal peeling. Skin defects not affecting the flesh appear for example as:

- sunken lesions
- corkiness around or within the eye
- winter speckles (mainly on the Queen Victoria variety) or blemishes.

Guidance: How to assess 5 per cent or 1/20 of the surface area

***Either** for fruit with distinct areas of skin defects:*

Pineapples have a varying number of "eyes" depending on size:

- *For small fruit with 40 – 80 eyes, 1/20 is 2 up to 4 eyes*
- *For medium fruit with 80 – 140 eyes, 1/20 is 4 up to 7 eyes*
- *For large fruit with 140 –180 eyes, 1/20 is 7 up to 9 eyes.*

***Or** for fruit with similar-sized skin defects on each eye:*

An assessment of the area covered on one eye can be extended to reflect a similar area defect on the whole fruit.

Examples of Class I skin defects are shown in **Photos 44-46**.

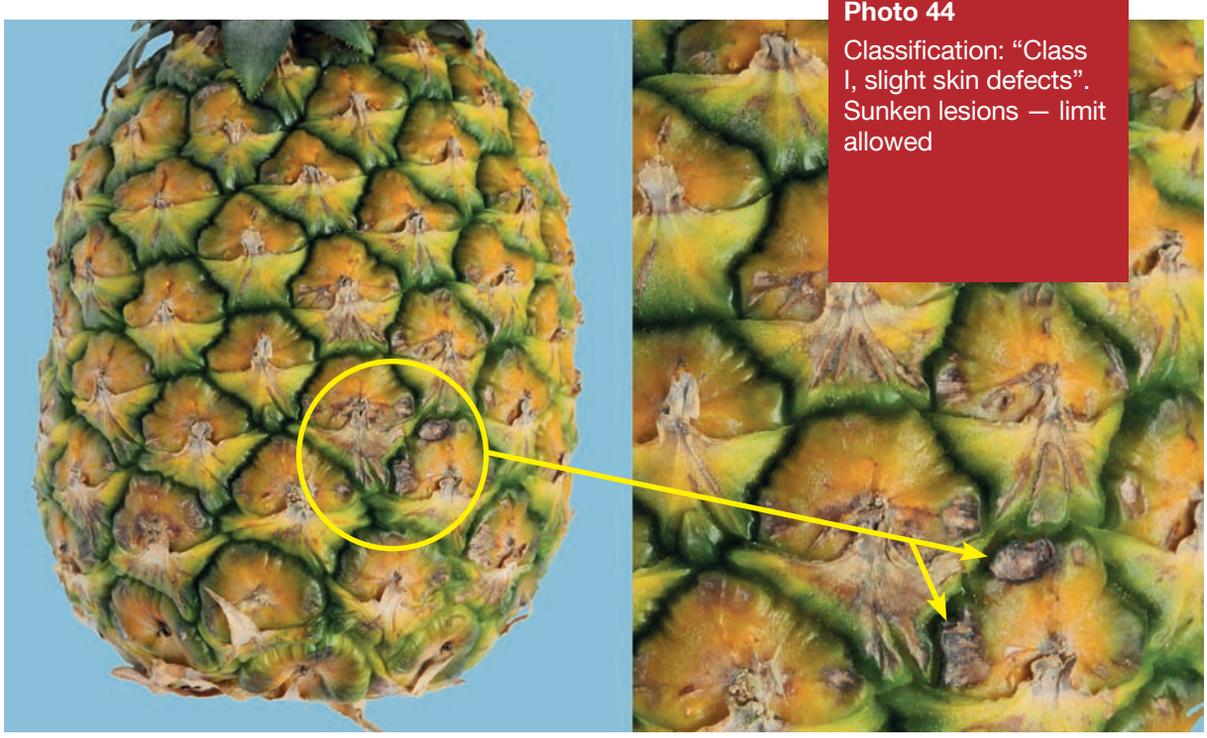


Photo 44
Classification: "Class I, slight skin defects". Sunken lesions — limit allowed

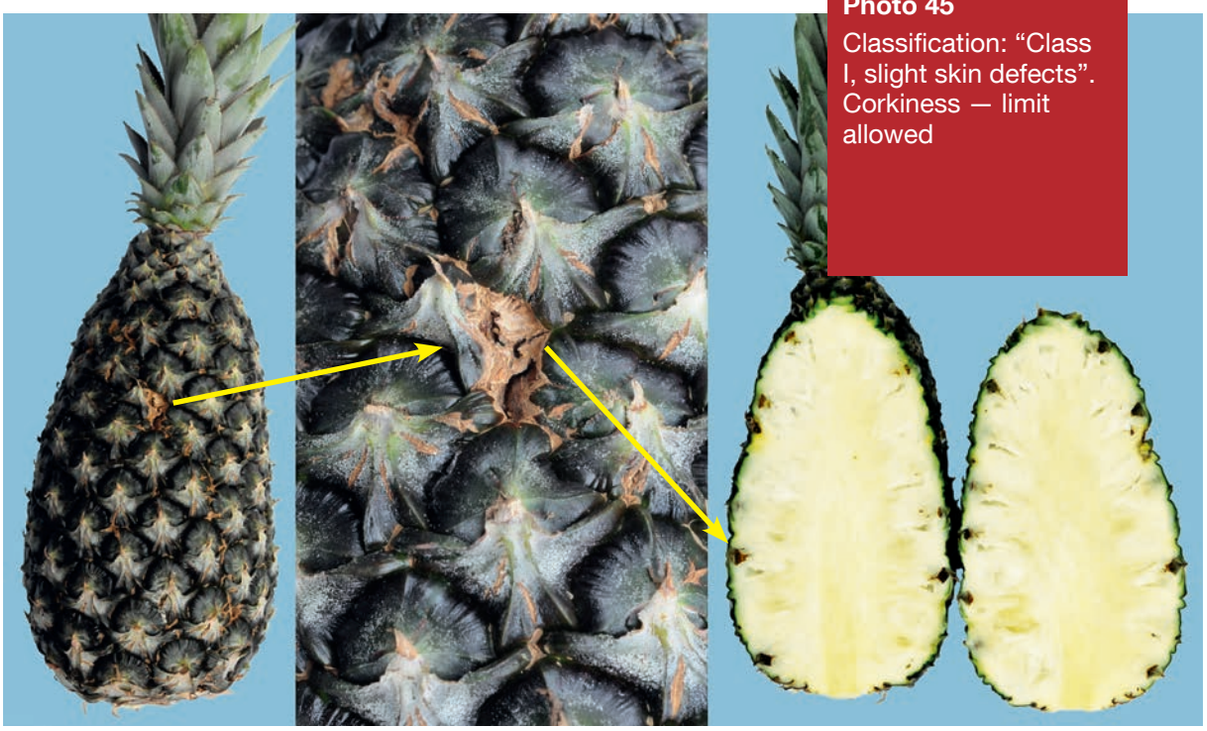


Photo 45
Classification: “Class I, slight skin defects”. Corkiness — limit allowed

Photo 46
Classification: “Class I, slight skin defects”. Winter speckles — limit allowed

- slight bruises.

Interpretation: Slight bruises should not affect the flesh and can be removed by normal peeling.

(iii) *Class II*

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

Interpretation: Pineapples in this class must be of reasonable quality and suitable for human consumption and meet the minumum requirements (explained from page 6 onwards).

The flesh must be free from major defects.

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, including a double crown

Interpretation: Pineapples may have shape defects in Class II. To determine the limit, the “one-third/two-thirds” rule is applied. The fruit is acceptable if the longitudinal axis starting at the stem end cuts it into two parts, one of which constitutes 1/3 or more and the other 2/3 or less of the fruit.

A bottle neck is a shape defect for non-elongated varieties. This may be caused by environmental factors, in particular when high-temperature weather conditions are aggravated by the use of ethylene.

Double crowns are allowed as long as the core is not too large and the edibility is only slightly affected. Multiple and undeveloped crowns are allowed within the 10 per cent tolerance of Class II.

Undeveloped crowns are allowed, provided the edibility of the fruit is not affected. The crowns may be longer than 150 per cent of the fruit length. The development of long crowns may be caused by a combination of environmental factors including the application of ethylene for degreening. The inclination of the crown may exceed 30° from the longitudinal axis of the fruit. The crown may be damaged or show up to 6 leaves affected by yellow/brown discolouration, dehydration, wilting or damage. Side shoots may be removed.

Examples of shape and crown defects for Class II pineapples are shown in **Photos 47-55**.

Photo 47
Classification: “Class II, defects in shape”. Shape defect — limit allowed

Photo 48
Classification: “Class II, defects in shape”. Fruit with a bottle neck — limit allowed for non-elongated varieties

Photo 49
Classification: “Class II, defects in shape, including a double crown” — limit allowed

Photo 50
Classification: “Class II, defects in shape, including a double crown”. Multiple crowns — not allowed

Photo 51
Classification: “Class II, defects in shape, including a double crown”. Undeveloped crown — allowed

Photo 52
Classification: “Class II, defects in shape, including a double crown”. Crown exceeding 150 per cent of the fruit length — allowed

Photo 53
Classification: “Class II, defects in shape, including a double crown”. Crown inclination exceeding 30° — allowed

Photo 54
Classification: “Class II, defects in shape, including a double crown”. Side shoots removed – limit allowed

Photo 55
Classification: “Class II, defects in shape, including a double crown”. Damaged crown – limit allowed

- defects in colouring, including sun-scorch

Interpretation: Any colour defect caused by the sun is allowed as long as the flesh remains free from major defects, i.e. the affected area should be restricted to the flesh directly under the peel. As the fruit colour turns, sun-scorch becomes difficult to distinguish.

Examples of colour defects for Class II pineapples are shown in **Photos 56-57**

Photo 56
Classification: “Class II, defects in colouring”
— limit allowed

Photo 57
Classification: “Class II, defects in colouring, including sun-scorch”. Sun-scorch — limit allowed

- skin defects not exceeding 10 per cent of the total surface area

Interpretation: Skin defects appear in a variety of ways:

- sunken lesions
- corkiness around or within the eye
- winter speckles (mainly on the Queen Victoria variety) or blemishes.

Guidance: How to assess 10 per cent or 1/10 of the surface area

Pineapples have a varying number of “eyes” depending on size:

- *Small fruit: 40 – 80 eyes. 1/10 is 4 up to 8 eyes*
- *Medium fruit: 80 – 140 eyes. 1/10 is 8 up to 14 eyes*
- *Large fruit: 140 – 180 eyes. 1/10 is 14 up to 18 eyes.*

If a defect is of a fairly similar size on every eye it is straightforward to make an assessment of the area covered on one eye and then it can be said that the same area of defect is on the whole fruit.

Examples of skin defects for Class II pineapples are shown in **Photos 58-59**.

Photo 58
Classification: “Class II, skin defects” – limit allowed

Photo 59
Classification: “Class II, skin defects”. Winter speckles — allowed within 10 per cent tolerance

- bruises

Interpretation: Bruising is allowed as long as the flesh remains free of major defects.
An example of bruises for Class II pineapples is shown in **Photo 60**.

Photo 60
Classification: “Class II, bruises” — limit allowed

Provisions concerning Sizing

III. Provisions concerning Sizing

Size is determined by weight.

To ensure uniformity in size, the range in size between produce in the same package shall not exceed:

- **300 grams for fruit weighing 1 300g or less**
- **680 grams for fruit weighing more than 1 300g.**

Interpretation: Examples of ranges of weights within a package (weight measured in grams):

Package 1: 520g 540g 550g 560g 600g 610g 620g (complies with size range)

Package 2: 550g 570g 580g 610g 650g 670g 870g 890g (does not comply with size range)

Provisions concerning Tolerances

IV. Provisions concerning Tolerances

At all marketing stages, tolerances in respect of quality and size shall be allowed in each lot for produce not satisfying the requirements of the class indicated.

Interpretation: Tolerances are provided to allow for deviation in handling due to natural deterioration of fresh produce over time.

To determine conformity with the tolerances, samples are taken according to Annex II of the OECD Council Decision [(C(2006)95] (www.oecd.org/dataoecd/33/0/19517729.PDF). The decision on the conformity of the lot is taken depending on the percentage of non-conforming produce in the total sample.

A. Quality tolerances

(i) *"Extra" Class*

A total tolerance of 5 per cent, by number or weight, of pineapples not satisfying the requirements of the class but meeting those of Class I is allowed. Within this tolerance not more than 0.5 per cent in total may consist of produce satisfying the requirements of Class II quality.

Interpretation: The 5 per cent tolerance covers all shape, skin and colour defects allowed in Class I. The 0.5 per cent tolerance covers all shape, skin and colour defects, as well as bruises, allowed in Class II.

(ii) *Class I*

A total tolerance of 10 per cent, by number or weight, of pineapples not satisfying the requirements of the class but meeting those of Class II is allowed. Within this tolerance not more than 1 per cent in total may consist of produce satisfying neither the requirements of Class II quality nor the minimum requirements, or of produce affected by decay.

Interpretation: The 10 per cent tolerance covers all shape, skin and colour defects, as well as bruising, allowed in Class II. The 1 per cent tolerance covers all defects not meeting the minimum requirements, including those rendering the produce unfit for consumption.

(iii) *Class II*

A total tolerance of 10 per cent, by number or weight, of pineapples satisfying neither the requirements of the class nor the minimum requirements is allowed. Within this tolerance not more than 2 per cent in total may consist of produce affected by decay.

Interpretation: The 10 per cent tolerance covers all malformations, serious skin and colour defects, as well as defects not meeting the minimum requirements but not affecting edibility, such as slight damage, soiling, lack of freshness. The 2 per cent tolerance covers all defects not meeting the minimum requirements, rendering the produce unfit for consumption.

B. Size tolerances

For all classes: a total tolerance of 20 per cent, by number or weight, of pineapples not satisfying the requirements as regards sizing is allowed.

Provisions concerning Presentation

V. Provisions concerning Presentation

A. Uniformity

The contents of each package must be uniform and contain only pineapples, with or without crowns, of the same origin, variety, quality and size.

In addition, for the "Extra" Class and Class I, uniformity in colouring and length of crowns is required.

Interpretation: In "Extra" Class and Class I, pineapples in one package must be within one colour group only (see colour classification in Photo 36). Class II pineapples within one package may be within two or more colour groups.

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

Interpretation: Concealing in the lower layers produce inferior in quality and size to what is marked on the package and placed in the top layer is not allowed.

Examples of uniform presentation are shown in **Photos 61-64**.

Photo 61
Presentation: "Uniformity". "Extra" Class presentation of Smooth Cayenne variety

Photo 62
Presentation: "Uniformity". Class I presentation of Queen Victoria variety

Photo 63
Presentation: "Uniformity". Class II presentation of Queen Victoria variety

Photo 64
Presentation: "Uniformity". Crownless fruit — allowed in all classes

B. Packaging

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

Interpretation: Packages must be of such quality and strength as to protect the pineapples during transportation and handling.

The materials used inside the package must be 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.

Interpretation: Clean materials should be used to protect the produce from foreign matter such as leaves, sand or soil, which could cause a negative impact on the produce and its presentation.

Stickers or labels individually attached to the produce shall be such that, when removed, they neither leave visible traces of glue nor lead to skin defects.

Packages must be free of all foreign matter.

Interpretation: A visible lack of cleanliness in several packages may result in the lot being rejected.

Provisions concerning Marking

VI. Provisions concerning Marking

Each package[1] must bear the following particulars, in letters grouped on the same side, legibly and indelibly marked, and visible from the outside.

Interpretation: In the case of packed produce, all particulars must be grouped on the same side of the package, either on a label attached to or printed on the package with water-insoluble ink.

In the case of re-used packages, all previous labels must be carefully removed and/or previous indications deleted.

An example of marking is shown in **Photo 65**.

[1] **These marking provisions do not apply to sales packages presented in packages.**

Photo 65
Marking - required particulars printed on a package

A. Identification

Packer and/or dispatcher/shipper:

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[2].

Interpretation: For inspection purposes, the "packer" is the person or firm responsible for the packaging of the produce (this does not mean the staff that actually carry out the work, who are responsible only to their employer). The code mark is not a trademark but an official control system enabling the person or firm responsible for packaging to be readily identified. The dispatcher (shipper or exporter) may, however, assume sole responsibility, in which case identification of the "packer" as defined above is optional.

B. Nature of produce

- **"Pineapples" if the contents are not visible from the outside**
- **Name of variety for "Extra" Class and Class I. The name of the variety can be replaced by a synonym. A trade name[3] can only be given in addition to the variety or the synonym**
- **"Without crown" or equivalent denomination, where appropriate.**

C. Origin of produce

- **Country of origin[4] and, optionally, district where grown, or national, regional or local place name.**

Interpretation: Marking must include the country of origin, i.e. the country in which the pineapples were grown (e.g. "Produce of Ghana" or "Produce of Thailand"). Optionally, district of origin in national, regional or local terms may also be shown.

D. Commercial specifications

- **Class**

Interpretation: Stating the class is compulsory.

- **Size expressed as:**
  - **minimum and maximum weight; or**
  - **number of fruits**
- **Colour code (optional)**
- **The indication "Should not be stored below 8° C" (optional).**

E. Official control mark (optional)

Adopted 2003
Last revised 2012

[2] **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 should be preceded by the ISO 3166 (alpha) country/area code of the recognizing country, if not the country of origin.**

[3] **A trade name can be a trade mark for which protection has been sought or obtained or any other commercial denomination.**

[4] **The full or a commonly used name should be indicated.**

Annex I

Brief summary of pineapple production

History

The most likely origin of the pineapple (*Ananas* spp.) is thought to be the Paraná-Paraguay River basin in Southern Brazil and Paraguay, where the original seed species survives in the wild today. An alternative centre of origin may be along the river banks of southern Guyana.

It is believed that the Tupi-Guaraní Indians were the first people to select and cultivate pineapples. Pineapples were spread throughout South America be native people and eventually reached the Caribbean. Columbus "discovered" pineapples in 1493 and from then on early European explorers distributed pineapples throughout the world.

Preparation

The soil is usually prepared into a fine tilth and polythene is laid down in rows ready for the suckers to be planted through the polythene. Polythene helps reduce weed competition and water loss. **Photo A1**

Photo A1
Preparation of the soil for planting

Pineapples grow best on fertile well-drained alluvial or volcanic soils, with a pH of 5.5 to 6.5, and at an elevation of less than 600 metres. The best temperature range for successful production is a daytime temperature of 25° C - 30° C with a night-time temperature of 15° C - 17° C.

Pineapples produce suckers that are suitable planting material from a number of parts of the mature plant. These suckers arise at soil level around the base of the plant, at leaf axils and below the mature fruit. **Photo A2**

Photo A2
Selection of basal suckers for planting

All these suckers can be used, but it depends on each variety which is most effective. For MD2 the basal suckers are the most productive and will produce fruit within 12 to 14 months from planting. The other suckers generally take longer to produce fruit. However, even among basal suckers careful selection is required, as sucker weight has a large influence on final fruit size. For the Sugar Loaf variety, suckers from below the fruit are most commonly used. **Photo A3**

Photo A3
Sugar Loaf variety showing suckers below fruit used for planting

Contaminated soil, poor agricultural practices and vegetative reproduction requiring a large number of suckers (60 000 per hectare) can lead to falling yields, increased unevenness of fruit size, poorer colour and keeping qualities, as well as a build-up of viral infection. To obtain good quality source material, tissue culture methods are used to multiply healthy progeny plants, which are planted to grow "cleaned" suckers for fruit production.

Planting

Suckers are usually planted through the polythene sheet in rows of two or four, but are also planted directly into the ground in some areas. Depending on growing conditions, up to 4 rows will increase yield. **Photo A4**

Photo A4
Planting of suckers through polythene in a four-row system

Plants develop roots during the first month only, after which no new roots grow. The formed roots continue to grow. They are fragile and the slightest disturbance to the soil will affect their growth.

To achieve a satisfactory yield, pests and diseases should be controlled during the growth period. A wide range of pests, fungal and bacterial diseases can affect pineapple production, such as mealy bug and the *Thecla* butterfly, as well as *Anthracnose*, *Phytophthora*, Gummosis, *Pythium*, etc.

Sugar content and acidity are the essential indicators of the fruit quality and can vary considerably depending on fertilization and weather conditions. Applying optimal amounts of nitrogen and potassium increases fruit size and improves fruit quality. Pineapples develop and ripen from the base upwards. Pineapples are non-climacteric, once harvested there can only be a gradual loss of fruit quality.

Flower induction

Natural flowering is erratic. To induce regular flowering, plants are sprayed with an ethylene solution (Ethephon is widely used) after approximately 6 months of vegetative growth. This technique forces the plants to produce marketable fruit within a short period of time, which in turn reduces the cost of harvesting and packaging. **Photos A5-A6**

Photo A5
Pineapple flower

Photo A6
Pineapple field at flowering stage

De-greening

To shorten the time period during which the fruits mature in the field, they are sprayed with an ethylene solution when most of them are close to maturity. **Photo A7**

Photo A7
Green fruit

Maturity

In some production areas, leaves may be tied over maturing fruit to protect the fruit from damage caused by the sun. **Photo A8**

Photo A8
Leaves tied up to protect the fruit

Harvesting

The fruit is harvested, usually manually, when it has reached the required colour and sugar level. After harvesting, the fruit should be transported to the packhouse, graded and packed as soon as possible. **Photos A9-A11**

Photo A9
Pineapple harvesting

Photo A10
Loading pineapples for transport from field to packhouse

Photo A11
Grading and packaging pineapples at packhouse

Fruit for export should be stored at 8° C - 10° C after being graded and packed and during transportation to the market of destination.

Annex II

UNECE STANDARD FFV-49

concerning the marketing and commercial quality control of

PINEAPPLES

I. Definition of Produce

This standard applies to pineapples of varieties (cultivars) grown from *Ananas comosus* (L.) Merr. to be supplied fresh to the consumer, pineapples for ornamental use or industrial processing being excluded.

II. Provisions concerning Quality

The purpose of the standard is to define the quality requirements for pineapples at the export-control stage after preparation and packaging.

However, if applied at stages following export, products may show in relation to the requirements of the standard:

- a slight lack of freshness and turgidity
- for products graded in classes other than the “Extra” Class, a slight deterioration due to their development and their tendency to perish.

The holder/seller of products may not display such products or offer them for sale, or deliver or market them in any manner other than in conformity with this standard. The holder/seller shall be responsible for observing such conformity.

A. Minimum requirements

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

- intact, with or without crown; if present, the crown may be reduced or trimmed
- 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
- practically free from pests
- free from damage caused by pests affecting the flesh
- fresh in appearance, including the crown
- free of abnormal external moisture
- free of any foreign smell and/or taste.

When a stalk is present, it shall not be longer than 2.5 cm measured from the shoulder of the fruit and the cut must be transversal, straight and clean. However, during transportation pineapples with a longer stem are excluded from these requirements.

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

- to withstand transportation and handling
- to arrive in satisfactory condition at the place of destination.

B. Maturity requirements

The pineapples must have reached an appropriate degree of maturity and ripeness in accordance with criteria proper to the variety and to the area in which they are grown.

The total soluble solids content of the fruit flesh should be at least 12° Brix.

Fruit showing over-ripeness affecting edibility is excluded.

The skin colour can be green, provided the minimum maturity requirements are met.

C. Classification

Pineapples are classified in three classes, as defined below:

(i) *"Extra" Class*

Pineapples in this class must be of superior quality. They must be characteristic of the variety.

The crown, if present, must be single and straight with no side-shoots and should not exceed 150 per cent of the length of the fruit. It must be fresh and not discoloured.

The flesh must be perfectly sound.

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

(ii) *Class I*

Pineapples in this class must be of good quality. They must be characteristic of the variety.

The crown, if present, must be single and with no side-shoots and should not exceed 150 per cent of the length of the fruit. It may be:

- slightly damaged
- slightly discoloured
- slightly curved with a maximum inclination not exceeding 30° from the longitudinal axis of the fruit.

The flesh must be perfectly sound.

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

- a slight defect in shape
- slight defects in colouring, including discolouration caused by the sun
- slight skin defects not exceeding 5 per cent of the total surface area
- slight bruises.

(iii) *Class II*

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

The flesh must be free from major defects.

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, including a double crown
- defects in colouring, including sun-scorch
- skin defects not exceeding 10 per cent of the total surface area
- bruises.

III. Provisions concerning Sizing

Size is determined by weight.

To ensure uniformity in size, the range in size between produce in the same package shall not exceed:

- 300 grams for fruit weighing 1 300g or less
- 680 grams for fruit weighing more than 1 300g.

IV. Provisions concerning Tolerances

At all marketing stages, tolerances in respect of quality and size shall be allowed in each lot for produce not satisfying the requirements of the class indicated.

A. Quality tolerances

(i) *"Extra" Class*

A total tolerance of 5 per cent, by number or weight, of pineapples not satisfying the requirements of the class but meeting those of Class I is allowed. Within this tolerance not more than 0.5 per cent in total may consist of produce satisfying the requirements of Class II quality.

(ii) *Class I*

A total tolerance of 10 per cent, by number or weight, of pineapples not satisfying the requirements of the class but meeting those of Class II is allowed. Within this tolerance not more than 1 per cent in total may consist of produce satisfying neither the requirements of Class II quality nor the minimum requirements, or of produce affected by decay.

(iii) *Class II*

A total tolerance of 10 per cent, by number or weight, of pineapples satisfying neither the requirements of the class nor the minimum requirements is allowed. Within this tolerance not more than 2 per cent in total may consist of produce affected by decay.

B. Size tolerances

For all classes: a total tolerance of 20 per cent, by number or weight, of pineapples not satisfying the requirements as regards sizing is allowed.

V. Provisions concerning Presentation

A. Uniformity

The contents of each package must be uniform and contain only pineapples, with or without crowns, of the same origin, variety, quality and size.

In addition, for the "Extra" Class and Class I, uniformity in colouring and length of crowns is required.

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

B. Packaging

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

The materials used inside the package must be 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 or labels individually attached to the produce shall be such that, when removed, they neither leave visible traces of glue nor lead to skin defects.

Packages must be free of all foreign matter.

VI. Provisions concerning Marking

Each package[1] must bear the following particulars, in letters grouped on the same side, legibly and indelibly marked, and visible from the outside.

A. Identification

Packer and/or dispatcher/shipper:

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[2].

B. Nature of produce

- "Pineapples", if the contents are not visible from the outside
- Name of variety for "Extra" Class and Class I. The name of the variety can be replaced by a synonym. A trade[3] name can only be given in addition to the variety or the synonym
- "Without crown" or equivalent denomination, where appropriate.

C. Origin of produce

- Country of origin[4] and, optionally, district where grown, or national, regional or local place name.

D. Commercial specifications

- Class
- Size expressed as:
  - minimum and maximum weight; or
  - number of fruits
- Colour code (optional)
- The indication "Should not be stored below 8^0 C" (optional).

E. Official control mark (optional)

Adopted 2003

Last revised 2012

UNECE has published an explanatory illustrated brochure on the application of this standard.

The publication may be obtained from the UNECE at:

www.unece.org/trade/agr/welcome.htm

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[1] These marking provisions do not apply to sales packages presented in packages.

[2] 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 should be preceded by the ISO 3166 (alpha) country/area code of the recognizing country, if not the country of origin.

[3] A trade name can be a trade mark for which protection has been sought or obtained or any other commercial denomination.

[4] The full or a commonly used name should be indicated.

■ NOTES