

Protected food, drink or agricultural product name

# **Product specification for PITAHAYA AMAZONICA DE PALORA**

**A protected designation of origin (PDO)**

**Responsible country:** Ecuador

**GB number:** F0093

## **Competent authority**

Name: Ministerio de Producción, Comercio Exterior, Inversiones y Pesca

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## **Applicant group**

Name: Asociación de Productores y Comercializadores de Pitahaya y Otros Productos de Palora

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Composition: Producers

## **Type of product (as in Annex XI Implementing Regulation 668/2014)**

Class 1.6. Fruit, vegetables and cereals fresh or processed.

# 1. Product name(s)

Pitahaya Amazónica de Palora

## 2. Description

Pitahaya is a fleshy perennial plant with decumbent and angular leaves, armed with thorns, green color and white flowers, funnel-shaped, 32 to 28 cm long. The fruit is ovoid tuberous, thorny yellow.

Pitahaya produced in Palora is large in size, has a firm rind, a sweet flavour with a taste of white fruits (pear, naranjilla), higher acidity, with a very pleasant aroma, the pulp is consistent, and its flavor is prolonged in the mouth, unlike the other types of pitahaya that are smaller, elastic, light flavor, not very sweet, which disappears quickly in the mouth. Its flesh is juicy and fleshy, composed of small shiny seeds that are evenly distributed in large quantities throughout the fruit and have a diameter of about 3 mm, a dark black colour and an obovate shape.

### Physical characteristics

**Family:** pitahaya yellow *cereus triangularis*.

**Color:** from bright green (degree of maturity) to yellow-orange.

**Length:** between 10 to 15 cm.

**Diameter:** from 7 to 8 cm.

**Shape:** oval, round, elongated, free of formations.

**Appearance:** free of stains, scars and bruises caused by slugs, bugs, birds, mites, fungi, ants, agrochemical residues, punctures, cuts from pruning shears, evidence of bruises, free of thorns with their entire nipples.

**Weight:** greater than or equal to 200 grams depending on size of fruit.

### Organoleptic characteristics

**Texture:** On the surface of the peel there are protruding formations called bractéolos that are like ears or bracts of firm consistency, which in the case of pitahaya are called mamilas and have groups of thorns 1.5 cm long that stand out to the eye around the entire fruit. The flesh is juicy and fleshy.

**Smell:** slightly sweet with a subtle aroma that does not cloy or saturate the sense of smell.

**Flavour:** with edible pulp of pleasant taste, its flavour is prolonged in the mouth. Quite sweet with slight acidity.

## **Fruit classification**

### **CATEGORY (A)**

It is fruit with a weight  $\geq 290$  gr, to be considered for export the percentage of stain on the fruit must be  $\leq 10\%$  and for the national market it must have a percentage of stain on the fruit up to 50%. If the fruit has a spot percentage  $>50\%$ , it will be considered category B fruit even if it exceeds the normal grade weight for that category.

### **CATEGORY (B)**

It is fruit with a weight between 260 gr to 289 gr, to be considered for export the percentage of stain must be  $\leq 10\%$  and domestic market must have a percentage of stain up to 50%. In case of having a percentage of stain  $>50\%$  will be considered as category C fruit even though more than the normal grade weight for that category.

### **CATEGORY (C)**

It is fruit with a weight between 200 gr to 259 gr, to be considered for export the percentage of stain must be  $\leq 10\%$  and domestic market must have a percentage of stain up to 50%. In case of having a percentage of stain  $>50\%$  will be considered as category D fruit even though more than the normal grade weight for that category.

### **CATEGORY (D)**

Category D refers to fruit that does not meet the criteria of the previous categories (A, B and C) and are discarded. This category includes:

Damaged fruit: significant damage to the peel, such as bruises, dents, deep cuts or bruises.

Fruits that are green or overripe, which may affect flavor and texture.

Fruit with slight marks or blemishes on the peel, but which do not affect the quality or flavor of the fruit.

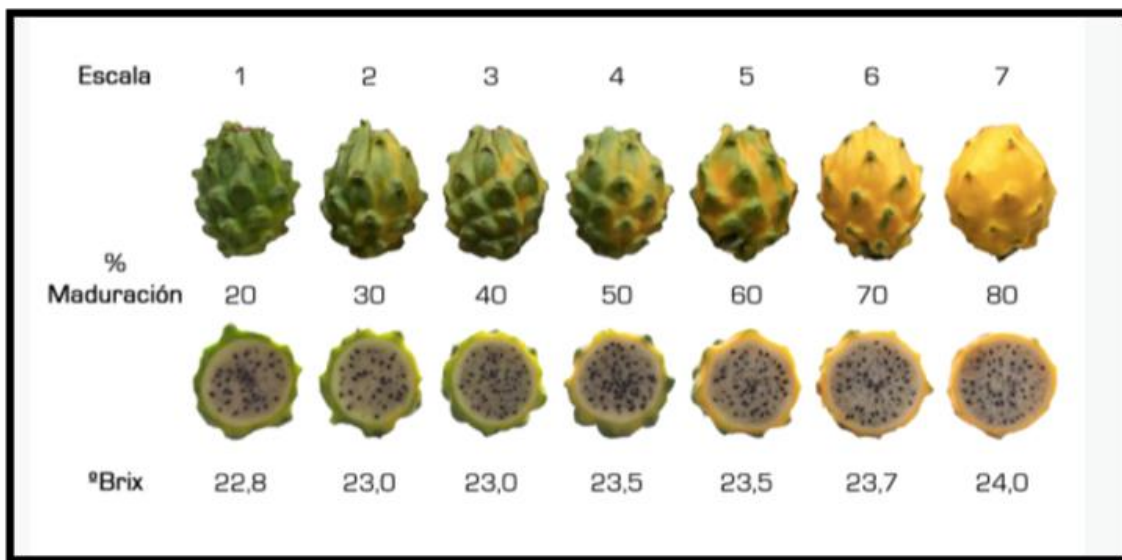
Deformed fruits: Fruits that do not have a typical shape or size but can still be consumed.

## **Requirements**

The fruit must be marketed when it has reached physiological maturity (from grade 2 to grade 6 maturity).

In none of the cases the pulp of the fruit must be affected or exposed.

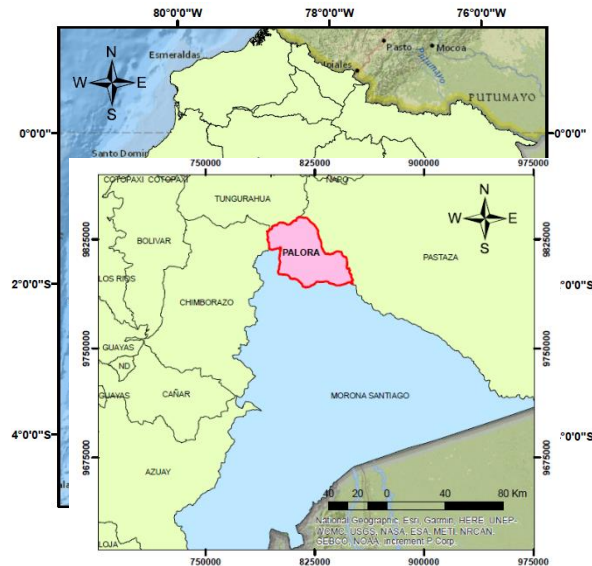
### Pitahaya Ripening, maturity and Brix (sweetness) Scale



- Pitahayas must be packed within 24 hours of harvest at an approved collection center registered with AGROCALIDAD that guarantees pest suppression.

### 3. Geographical area

Ecuador, Provincia de Morona Santiago, Cantón Palora.



#### 4. Proof of origin

The traceability system used on the farm consists of the following:

Once the seeds or plants have been acquired, it is essential to keep a detailed record of everything related to their management, including planting dates, irrigation, fertilization, pest and disease control, among others. It is also important to document any phytosanitary treatment performed.

During the plant growth process, environmental conditions such as temperature, humidity and light are monitored, as these factors can influence the final quality of the product.

Once harvesting time has arrived, traceability must be guaranteed in terms of dates, harvesting methods and transportation. This data is relevant to ensure product quality and to identify any eventualities that may have occurred during the process.

#### Export Fruit

Fruit from the moment it is harvested is assigned a code that has the following nomenclature:

FARM INITIALS	AGROCALIDAD CODE	INVOCE NUMBER
		00_ _ _

Farm initials: \_\_\_\_\_

Production site code: \_\_\_\_\_

1. The fruit is delivered to the collection centre along with a code. This code is assigned to identify and track the fruit during its distribution process. The code generally remains with the fruit until it reaches its final destination in order to be easily identified and ensure product traceability.
2. Coding is kept at the collection center and labels with the coding are affixed to the packed product.
3. All harvests must be documented in the Fruit Harvest Register.

### **Procedures in the collection centers**

Among the first procedures would be to ask each producer for GAP certificates as a rule to meet one of the mandatory requirements of the countries where the fruit will be received.

From reception through to packing of the fruit should be done independently by each producer in order to avoid contamination with other fruits and thus be able to specifically identify any anomaly for the respective corrective actions. At this stage, products are labeled with barcodes or unique identification labels containing detailed information about the product, such as date of packaging, production batch, ingredient supplier, among other data.

Reception of the fruit: must be received in their respective drawers with the name of the producer, the number of drawers and the quantity in kilos.

### Export inspections in Ecuador prior to export.

- Inspection records including traceability information associated with each lot, number of fruits selected and inspection results (type and number of pests detected, if any) must be maintained in at least two locations.
- Only lots that pass inspection may be combined in one shipment.
- Only lots that pass inspection should be eligible for export and issuance of the phytosanitary certificate by AGROCALIDAD.

## **5. Method of production**

### **5.1 Agronomic part**

#### **Propagation:**

Although pitahaya can be propagated both sexually and asexually, Asexual propagation is most often used because although sexual propagation from seed is permitted is not generally used as it takes a long time for the plant to reach maturity. Asexual propagation is done by taking cuttings from pitahaya plants of 3 years old or older.

#### **Planting:**

Seedlings or cuttings must measure between 0.5m to 1.2m in length. Several planting densities can be used but the most common is to plant 1000 plants per hectare with 2.5 m between plants and 4m between rows.

#### **Weed control:**

- To be performed only with scythe at a minimum frequency of 45 days.
- Herbicide use is allowed only once a year.
- Final spraying must be done no later than 3 weeks before harvest.

#### **Pest and disease control**

For the phytosanitary control of the pitahaya crop it is important to carry out an integrated control to prevent the presence of major pests and diseases some preventive activities and treatments such as:

- The waste material from phytosanitary pruning should be placed in an appropriate place for final disposal, this place can be a municipal landfill or a place that is at least 100m away from the crop, a place in which the material will be disinfected in a permanent way for its decomposition.
- Disinfection of tools used in the handling of the crop with solutions of iodine, alcohol, hydrogen peroxide or quaternary ammonium, and chlorine every time they are to be used and at the end of their use.
- Preventive phytosanitary control in the pitahaya crop with the use of authorized insecticides, fungicides and acaricides.
- The plant should be constantly sprayed every 21 days with a complete fumigation of the entire plant, respecting the appropriate doses and the periods of deficiency indicated by the manufacturer of the products.
- For the control of pests and diseases at the fruit level (treatment to obtain export quality fruit), agrochemical applications are used as described on the

individual products. For the control of the different pests and diseases, the following treatments can be used:

- Bacteriosis: Kasugamicide, petanhydrated copper sulfate, gentamicin sulfate + oxytetracycline hydrochloride,
- Nematodes: Benfuracarf 20%, cadudafos
- Mites: Pyridaben, abamectin, hexythiazox, propargite.
- Insects: Lamba cyhalothrin, chlorpyrifos ethyl, cypermethrin, luferon, profenofos.
- Fungicides: Penconazole, difenoconazole, Propanocarb + Metalaxyl, Hymexazole, copper sulfate pentahydrate, chlorothalonil, mancozeb.

Residuality: The farmer performs residuality analysis of the fruit to ensure that the fruit is not contaminated which is recorded on the fruit harvest register.

In case of residuality, the farmer has an Action Plan that establishes the measures to be taken in case of exceeding the Maximum Residual Limits (MRL) which is the maximum concentration of a pesticide residue in food that is legally tolerated. To take immediate, medium and long term actions to prevent and correct the presence of chemical residues in the fruit.

the farmer or the entity in charge of agricultural production to keep records of harvests, including data such as the quantity of fruit harvested, the quality of the fruit, the dates of harvest and any other relevant data. This record can be useful to keep track of production, perform analysis and make decisions on future harvests.

## **Fertilization**

After a soil analysis the technician responsible can make the necessary corrections according to the phenological stage of the crop. It is important that a minimum of 5 chemical fertilizations of edaphic per year are made, at a rate of 100 grams per plant per application and organic matter at a rate of 2 kg per plant per application. The organic matter adds nutrients and improves the soil texture.

## **5.2. Harvest and post-harvest:**

### **Harvesting**

- a. The operator must remove with the brush the thorns of each of the fruits within the parameter of 60% of maturity.



- b. Then another operator cuts the fruits taking care that they don't suffer any kind of laceration either from the scissors or thorns and immediately removes with a brush any remaining thorns. Finally, the fruit is placed in a plastic drawer of polyethylene and covered with a protective sponge.
- c. The drawers with the harvested fruit are taken to the primary collection centers to continue with the post-harvest processes.

**Post-harvest**

- a. During the post-harvest process, all the fruit is washed in stainless steel tubs, taking care not to mistreat or lacerate any part, ensuring that no dirt or foreign agents such as insects or agrochemical residues are left behind.

Once the tubs have been used, they are washed with alkaline detergents and rinsed with abundant water.

- b. Subsequently, the fruit that has already been washed is classified according to the following table:

Size fruit	Weight ranges (gr)
5	>500
6	401 – 500
7	351 – 400
8	301 – 350
9	261 – 300
10	241 - 260
11	221 - 240
12	200 - 220

**Packing:**

It is packed in boxes of 2.5 KG, each fruit has its respective white mesh (nun's neck) for protection. Each box is packed verifying its weight with weighing scales, to the 2.5 kg is added 10 to 15 grams to compensate for the dehydration of the fruit.

**Collection centre:**

The collection centre must:

- Be structures that guarantee pest suppression.

- All openings to the outside of the facility must, at a minimum, be covered with a non-grooved insect-proof mesh or Carrera that prevents pests from entering the facility: Maintain sealed packing lines in good working order.
- Keep processing and storage areas free of debris, trash and plant debris.
- Maintain a general pest control program and remove the waste garbage can daily.
- Pitahayas should be packed in new containers and in a manner that avoids possible pest infestation.
- Insect-proof packaging may include cartons, boxes or containers that can be sealed at the collection center, or wooden crates and/or pallets that can be covered with insect-proof netting, plastic wrap or Iona, for movement to any destination.
- Packaged pitahayas can be stored together with their respective labeling for their different destinations with a minimum of 1 meter between each pallet.
- The labeling must appear in a size that clearly shows traceability information.

### **Shipment and Shipping**

- All containers must be inspected prior to loading to ensure that they are free of contaminating pests or other contaminants.
- All wood packaging material, including wood pallets, if used, should be treated or marked according to ISPM 15.
- Care should be taken to reduce the possibility of container infestation during loading, for example:
- The Loading Area should be clean and free of weeds.
- The container should be properly sealed against the loading dock of the collection center during shipment; and if possible, loading should not take place at night under lights that may attract flying insects.
- Loaded containers should be sealed under the supervision of AGROCALIDAD with a seal prior to export.
- Phytosanitary protections, including insect-proof packaging and sealed containers, should be kept intact until arrival and verification at the port of entry.

## **Environmental protection**

- Warehouses: for storing tools, agrochemicals, fuel, fertilizers, and harvest materials. Agrochemical storage is carried out taking into account the main technical recommendations of INEN 1927. There is an anti-spill kit consisting of a container with sand, a shovel, and a broom, so that if there is a spill of fuel or agrochemicals, it can be collected and avoid contaminating the environment.
- Mixture preparation area: There is an area for preparing chemical mixtures, which has a filter to capture the chemical load of possible spills. This area also has signs indicating the mixing area, mixing tank, triple washing area and prohibiting eating, drinking, smoking and pregnant women from entering.
- Triple washing: There is a triple washing area with a sign indicating the procedure for this practice.
- Handling of empty containers: Empty containers are stored in a specific area, then delivered to the warehouse where they were acquired, and documented in the Empty Container Disposal Record.
- Live fences: Live fences were established along the borders with other crops to prevent cross-contamination between farms.

## **6. Link with the geographical area**

### **Environmental impact**

Pitahaya is an exotic fruit. Its natural state is found on top of trees and branches in the rainforest. The plant climbs trees to feed on sunlight and benefits from the humidity of the tree canopy and nutrients in the air.

Palora has a varied climate ranging from the humid tropical climate of the Amazon to the cold climate of the Andean zones of the Sangay volcano, with an average temperature: 22.5 degrees Celsius and annual rainfall: 3000 - 4000 mm. High rainfall ranges from July to December and reaches up to 5,000 mm; and in summer with low rainfall up to 200 mm is located in the months of January, February and March, its relative humidity is 85%.

Pitahaya plants depend on pollinators, such as bees and bats, for successful fruiting. The presence of these pollinators and the availability of nectar-rich flowers in Palora are crucial for proper pollination.

Ecological Classification: According to Holdrigger (Life Zone Classification System), Palora has the following zones: tropical rainforest (bhT), montane rainforest (bhMB), and sub-Andean rainforest (bpSA). The soils predominant in this region belong to the inceptisol order, rather young and poorly developed soils that are just beginning to show the development of horizons; processes of translocation and accumulation can occur, they constitute a subsequent stage of evolution with the entisols, however, they are considered immature in their evolution.

Inceptisols occur in any type of climate and have originated from different parent materials (resistant materials or volcanic ashes), in positions of extreme relief, steep slopes or young geomorphological depressions, encompassing soils that are very poorly drained or well drained soils. The use of these soils is diverse, the slope areas are suitable for reforestation, while the soils of artificially drained depressions can be cultivated. The well-drained soils with good organic matter content in these depressions are ideal for the development of the Pitahaya crop which along with a generally temperate climate and good agricultural practice produces a product of excellent quality. These factors contribute to the larger size, higher acidity and the sweeter longer lasting taste of the fruit in contrast with other pitahaya varieties. The plantation can live more than 30 years. Production begins in the first year after the crop is established, with an average of 5 to 8 fruits per plant and increases continuously until the fifth or sixth year when it reaches an average production of 7 kg. per plant. Several planting densities are used the most common being 1000 plants per hectare, however using a planting density of 2200 plants per hectare would result in 20 tons of fruit per hectare.

For a recommended planting density of 2,200 plants per hectare, it represents an approximate productivity of 20 tons per hectare of which 70% are of a quality for exportation.

## **Skills**

Pitahaya growers have developed a variety of skills related to cultivation, land preparation, mentoring, plant management and problem solving. These skills have evolved over time through hands-on experience, knowledge sharing and continuous learning, enabling them to produce high quality pitahaya crops.

At the beginning of the production of pitahaya in Palora farmers found difficulties in the reproduction of the plant since it deteriorated quickly and did not have an adequate adhesion to the soil. For this reason, the first farmers try placing a cutting in a cement ring with ash, chicken manure, bagasse manure and tea manure, in this way they managed to replicate the reproductive process. For the production of pitahaya, it is necessary to prepare the soil mainly with the excavation of drains to adapt the plant to the topography and natural conditions of the land. Once the area of land is selected and prepared for planting, the plants and alleys are delineated

and laid out to locate them in a distance between plants of 2.5 cm apart and between rows (alley) 4m, giving a density of 1000 plants per hectare. Due to the fact that the pitahaya plant corresponds to a botanical species of cactus for its growth and adequate adhesion to the soil it is important to place temporary stakes or tutors, which can be made of wood, to which the plant will be tied for proper growth. These tutors should be replaced after the first six months by cement poles up to 2 meters high, resistant to the elements, which will remain permanently supporting the plant. This tutorship system has been replicated among all growers, in order to carry out an adequate plantation.

Pitahaya growers consider environmental factors and take appropriate measures to mitigate any adverse effects. This may include providing shade during hot periods, implementing proper irrigation techniques, protecting plants from high winds, and maintaining a suitable soil environment. By managing these factors, growers can optimize fruit quality and yield.

## **7. Inspection body**

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The inspection body conforms to the principles of ISO 17065 standard.

## **8. Labelling**

N.A.

ENDS