

Protected food, drink or agricultural product name

Product specification for LOCHE DE LAMBAYEQUE

A protected designation of origin (PDO)

Responsible country: Peru

This document sets out the elements of the product specification for information purposes.

Competent authority

The National Institute for the Defense of Competition and Protection of Intellectual Property (INDECOPI) is the Peruvian authority in charge of running the scheme of the appellations of origin and geographical indications.

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Applicant group

Name: The Loche de Lambayeque's application was submitted by GOBIERNO REGIONAL DE LAMBAYEQUE, from Peru. However, it must be noted that according to the Peruvian legislation, the Peruvian State is the exclusive owner of the Peruvian appellations of origin or geographical indications.

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

Fruit, vegetables and cereals fresh or processed (class 1.6).

1. Product name(s)

Loche de Lambayeque.

2. Description

The product is a fruit called Loche, whose scientific name is Cucurbita moschata Duchesne (pumpkin). It is a fruit with a higher carbohydrate content, this explains why one of the attributes is its particular sweetness. Likewise, it shows a higher content of reducing sugars compared to other fruits; And although some reducing sugars have low sweetening power, this makes LOCHE DE LAMBAYEQUE a product with an appropriate sweetness to combine it in the preparation of the various dishes of Peruvian gastronomy. Likewise, LOCHE DE LAMBAYEQUE has a very low lipid content and a higher fiber content. On the other hand, due to the domestication and selection of the Cucurbita moschata Duchesne species, carried out by the pre-Inca cultures, it was possible to obtain the current variety called "Criolla", which is maintained and used by the descendants of the Mochica settlers, through the crop cultural work (human factor). This variety has been conserved by the asexual propagation mode used by producers for their seedbeds, managing to genetically homogenize the Criolla variety of LOCHE DE LAMBAYEQUE.

The ranges that have been defined for the bromatological variables in the fruit are based on a constant moisture of 82% and with a statistical confidence of 95% and correspond to:

95% CONFIDENCE	MINOR VALUE	GREATER VALUE
PROTEINS (%)	1.13	2.97
FIBRE (%)	0.40	1.62
ASH (%)	0.36	1.22
CARBOHYDRATES (%)	13.23	16.41
REDUCING SUGARS (g/100 g sample)	0.12	1.26
PHENOLIC CONTENT (mg/Gallic Ac./100 g sample)	18.15	23.20
ANTIOXIDANT CAPACITY (ug Trolox Eq/g sample)	41.34	83.15
CAROTENES (mg Eq/100 g sample)	0.76	8.97

a) Sensory profile:

- Pulp Colour: The fruits of the Loche de Lambayeque have medium yellow pulp. This aspect is consistent with the lower content of carotenes in these fruits.
- Smell: The fruits of Loche de Lambayeque have a medium odour.

- Flavour: The fruits of Loche de Lambayeque had a strong sweet flavour. This is also related to its composition. These fruits contain more carbohydrates and a greater amount of reducing sugars.
- Texture: The fruits of Loche de Lambayeque must be of medium to strong consistency. This is related to the fact that in the Loche de Lambayeque fruits there is a greater amount of carbohydrates.

3. Geographical area

The delimited geographical area where the cultivation plots are located is detailed below:

- a) Chiclayo, the plots are located in:

Ciudad Eten, Monsefú and Cosupe, taking as a reference the Villa El Milagro road and the one that leads to the Puerto de Eten and the banks of the Reque River, left bank - downstream.

In Cayanca, the cultivation areas are in the area called Alicán Grande and it extends towards the edge of the Reque River - right bank, downstream.

In Lagunas, it is cultivated up to the height of Mocupe, capital of the Lagunas district, located towards the south.

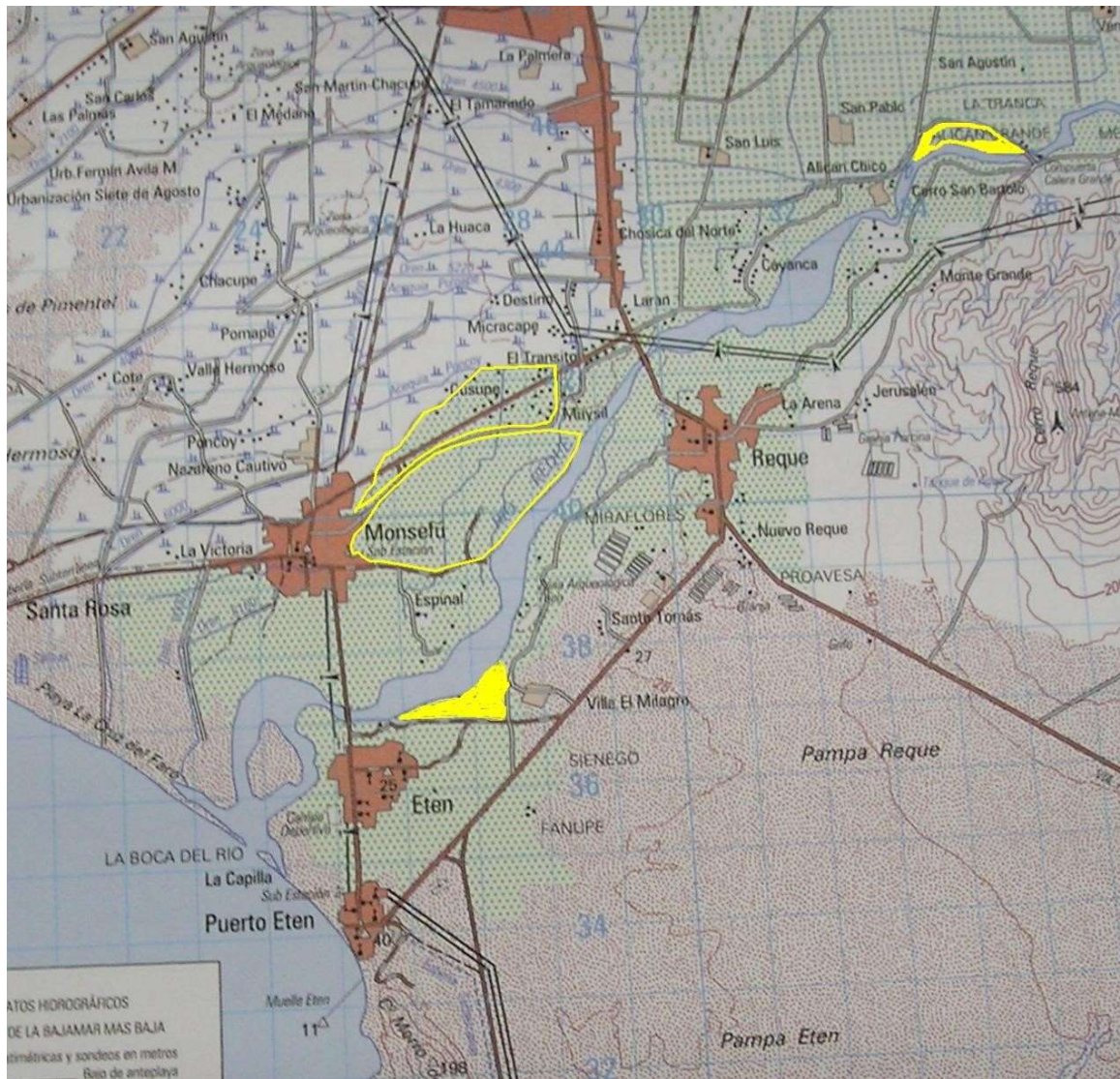
- b) Lambayeque, the cultivation areas of Loche are distributed in:

Illimo, the cultivated fields extend along the Jayanca highway to the south in the area called Culpón Bajo, where the road of the same name and the main highway to Jayanca converge. Towards the south, the loche fields are located in the Sapame area and the boundaries of the archaeological zone. The areas of: Culpón Alto y Bajo, Sapame, Terremotal, Sanjón, Aricoche and Sector Faical are included.

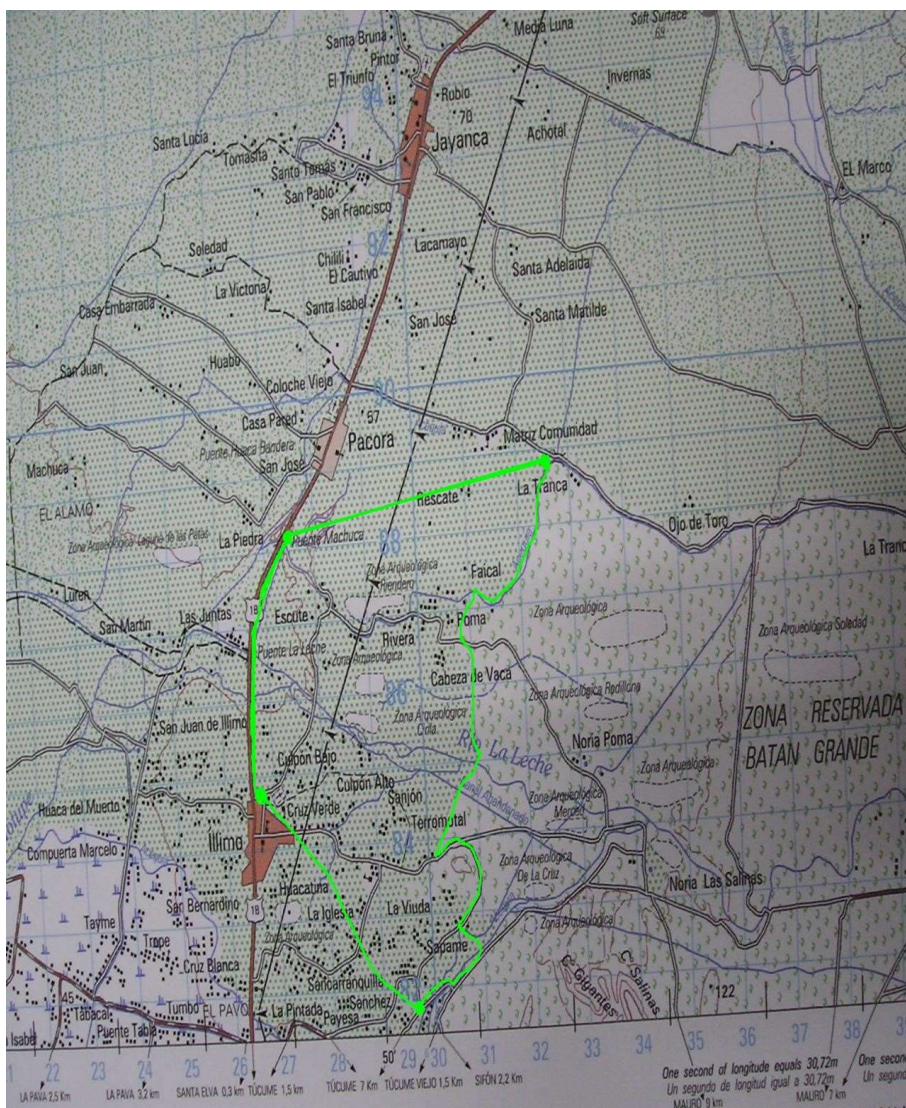
- c) Ferreñafe, the production area is in:

Poma III sector, jurisdiction of the Pítipo district, - entering through the old Panamericana Norte - comprising towards the northwest, at the Machuca Bridge, extending to the northeast at La Tranca, Faical area.

Map No. 1: Production area in the province of Chiclayo, cultivation area of LOCHE DE LAMBAYEQUE highlighted in yellow:



Map No. 2: Production area in the provinces of Lambayeque and Ferreñafe: Illimo and Pítipo, cultivation area of LOCHE DE LAMBAYEQUE highlighted in green.



4. Proof of origin

In order to guarantee proof of origin or traceability of LOCHE DE LAMBAYEQUE, after harvest, farmers usually classify the fruits into 5 types or categories for marketing, depending on the size and weight:

- First-class fruits: Lengths between 35 to 40 cm, elongated shape, uniform dark green colour without discoloration, almost ashy, slightly rough, weight exceeding 2 kg.
- Second-class fruits: Lengths between 30 to 35 cm, clean dark green, may contain slightly pyriform or elongated shapes.
- Third-class fruits: Lengths between 20 to 30 cm, deep green and rough, with elongated, pyriform shapes.
- Fourth-class fruits: Lengths between 10 to 20 cm, light green colour, less uniform in colour and shape.
- Fifth-class fruits: Lengths less than 20 cm of very uneven colours and shapes, with yellowish or damaged spots, these are discarded fruits.

Exceptionally, there are extra types, which are of lengths and weights that can reach or exceed 40 cm. The LOCHE DE LAMBAYEQUE must cover the categories from First to Fourth; therefore, any product that is classified within the fifth-class category cannot be considered protected by the appellation of origin. This classification does not represent sub types of loche that have different genetic or flavour characteristics. It is a classification for fruit marketing purposes, mainly according

to size and shape. Also, it is important to highlight that, in the production area it is customary to use cuttings called guides, as a source of seeds. These are stem portions of 30 to 40 cm, obtained from young plants that must be approximately 4 months old and must be collected in the same cultivation field or in neighboring plots and will be used for the sowing of the following campaign. Each cutting should have buds so that they can root quickly after being sown. Moreover, regarding the crop development, before harvesting the producers tend to carry out pest control tasks, controlled watering to prevent rotting of the fruits and the proliferation of pests such as the fall armyworm, which severely damages the fruit and the buds of the stems, causing death by wilting of the plant. Additionally, during the harvest, producers issue reports that measure the amount of fruit obtained per hectare, where it can be seen that, at the best times, some farmers have obtained between 4,000 and 6,000 fruits per hectare.

5. Method of production

The cultivation practices and techniques currently used by producers are the following: A) Seedbeds In the area it is customary to use cuttings called guides, as a source of seeds. These are stem portions of 30 to 40 cm, obtained from young plants that must be approximately 4 months old and must be collected in the same cultivation field or in neighboring plots and will be used for the sowing of the following campaign. Each cutting should have buds so that they can root quickly after being sown. B) Establishment of the loche. Cultivation Stages Each of the stages for cultivation is described below:

B.1. Production sites and areas The cultivation areas have the appearance of arid, flat fields, with a slope close to zero, with altitudes less than 70 meters above sea level, little distanced from the populated places, varying between 0.2, 1, 5, 10 km. The native crops in the area are loche, corn, cabbage, and other vegetables. On the occurrence, the loche turns out to be the main one, constituting an annual crop in almost all the places of production.

B.2. Characteristics of the cultivation plots The farmers that exist in the area have relatively small plots ranging from 0.25, 0.5, 1, 1.5, 2, 3, 6 ha. The orientation of the plots with respect to the sun is in Pomac III from south to north; in Illimo and Cayanca from east to west. The associated flora that coexists with loche crops, consists of (i) mangoes and plums in the Pomac III zone; (ii) carob, mango and plum trees in Illimo; (iii) cabbage, lettuce, and corn in Ciudad Eten; and (iv) corn with vegetables in Cayanca. This characteristic corresponds to a prairie-type vegetation, according to the descriptors of the International Institute of Plant Genetic Resources - IPGRI.

B.3. Sowing times It has been observed that in Pomac III and Illimo it is customary to rotate the crop and sometimes monocropping is practiced, mainly in the latter area; however, in Ciudad Eten, they have the custom of rotating the crop with other vegetables. In Cayanca, they sow the crop in rotation, and also mix the loche in the same field with other crops such as peas, radishes, carrots, cabbage, onions, among others. Sowing takes place in Pomac III in January and July; in some plots they do so in January and August or sometimes in October, depending on whether the year presents a regularity in the characters of the seasons. In Illimo between February to May or in August. In Ciudad

Eten, sowing occurs in February; and in Cayanca they do it in September. This ensures that LOCHE DE LAMBAYEQUE can be produced all year round.

B.4. Land preparation For the sowing of LOCHE DE LAMBAYEQUE, farmers have managed to obtain a variety, which is called "Criolla". This is the product of domestication carried out by our ancestors for more than 1 500 years BC, as revealed by archaeological studies. This crop had to be intensively selected to achieve the genotype that is currently used as a source of cultivation and that farmers preserve, since they maintain the use of the asexual propagation system, which guarantees varietal purity. The soils where the loche is sown are of the type that varies from loam to sandy clay loam. Among the characteristics of the soils, the following stands out: Regarding stoniness, this was insufficient to affect tillage in all the soils where the studies were carried out. Soil drainage was moderate in Pomac III and well-drained elsewhere. The color of the soil matrix varied depending on the place, (i) reddish yellow in Pomac III and Ciudad Eten, (ii) yellow in Illimo, (iii) brownish in Cayanca. Tillage texture was not very smooth in Pomac III, smooth in Illimo and Cayanca and very smooth in Ciudad Eten. In these soils, farmers carry out tasks prior to sowing, consisting of stirring and turning the soil to promote aeration, which helps to maintain the microbial flora. When the weather conditions are appropriate, both in terms of temperatures and the availability of light and water, they proceed to prepare the beds along the land. In Pomac III and Illimo the beds have widths between 5 to 7 m, approximately; in Cayanca and Ciudad Eten from 4 to 6 m wide approximately, flanked by furrows. In preparing the soil, they usually use 4 bags of urea, 1 bag of diammonium phosphate, 1 bag of potassium sulfate, and 1 bag of ammonium nitrate for planting. The foliar fertilizer is optional depending on the requirements of the plant.

B.5. Sowing and density The cuttings, called guides, are stem portions of 30 to 40 cm, obtained from its young plants that should be approximately 4 months old and should be collected in the same field or in neighbouring plots and that will be used for sowing. Each cutting should have buds so that they can root quickly after sowing. For sowing, holes are prepared in each of the furrows that flank the bed and sowing is done wet, to prevent the cuttings from being damaged and dying. The holes with the cuttings are placed at a distance between 5 and 7 meters between grooves and 4 to 5 meters between plants, which represents an approximate density between 400 to 600 plants per hectare.

B.6. Crop development During the development of the cuttings, they tend to spread across the width and length of the beds, with two stems approximately facing each other, of the two furrows that flank each bed. To ensure that the cuttings reach their development, flowering, and fruiting, frequent and light waterings are applied, in order to avoid root rot and damage to flower buds. The time that the vegetative period takes is approximately 4.5 to 5 months. Irrigation in Pomac III and Illimo is the product of the combination of well water and canal water, which brings water from tributaries such as the La Leche rivers (when it is loaded with water, the longest time of the year is totally dry) and from the Olmos - Tinajones reserve. In Ciudad Eten and Cayanca, the water used comes exclusively from the irrigation canals, which carry water from the Reque and Zaña rivers. During the flowering phase, it is appreciated that all plants have male and female flowers, which is ideal to promote pollination, which is the process that will allow the formation of the fruit and its development. At this stage, farmers usually apply complementary foliar fertilizers

that will strengthen the photosynthetic capacity of the plant and ensure that the fruit of the LOCHE DE LAMBAYEQUE accumulates a sufficient quantity and quality of components responsible for the particular quality of this fruit. Before harvesting, they tend to carry out pest control tasks, controlled watering to prevent rotting of the fruits and the proliferation of pests such as the fall armyworm, which severely damages the fruit and the buds of the stems, causing death by wilting of the plant.

B.7. Harvest The harvests are carried out after approximately 4.5 months of cultivation of the loche, and it is considered when the plantation has between a 40 to 50% of plants with ripe fruits. The time that the harvest can be extended is 3 to 4 months in the different production areas. In Pomac III the harvest takes place between May and November. In Illimo from August to October. In Ciudad Eten, the harvest is in July and in Cayanca between December and January. The entire crop is developed exposed to the sun, that is, it does not require shading. For the harvest, the farmers simply pick the fruits they consider suitable, being guided mainly by the dark green colour and depending on the use, they determine if it is for consumption or if it is for commercialization. For each plant they get between 10 to 30 fruits, which equates to between 600 to 2 000 fruits per hectare. There are reports that indicate that some farmers have obtained between 4,000 and 6,000 fruits per hectare at the best times. This is based on the management and control of plant pests.

B.8. Commercialization After the harvest, farmers usually classify the fruits into 5 types or categories for commercialization, depending on the size and weight.

6. Link with the geographical area

The sign is made up of the name of a geographical place - "Lambayeque" - and identifies a product with special characteristics due to the geographical environment to which the name refers.

LOCHE DE LAMBAYEQUE belongs to the species *Cucurbita Moschata Duchense*. This species is distributed throughout several regions of the American continent; however, the way in which it was domesticated and selected by our ancestors have allowed it to become a product of great importance in the gastronomy of northern Peru. Currently, it is being recognized for its particular flavour characteristics. The special characteristics of the product identified by the name LOCHE DE LAMBAYEQUE, are a consequence of:

Geographical factors:

The location of the cultivation plots, the latitudinal, longitudinal position, an altitude close to sea level, with an almost flat relief throughout the entire area involved.

The interaction of environmental factors:

Meteorological variables, climatic conditions, determined by the convergence of different biomes (coastal desert, equatorial dry forest, Pacific Ocean current), which modulate and regulate the conditions of temperature, humidity, hours of sunshine, etc.

All this determines the appropriate conditions for the development of loche with its particular characteristics. The aforementioned factors are combined in the geographical area of Lambayeque and allow the product identified with the name LOCHE DE

LAMBAYEQUE to express its organoleptic potential and, in particular, to exhibit the flavour that characterizes it in the gastronomic field.

In the genetic and morphological component of LOCHE DE LAMBAYEQUE a very high homogeneity is exhibited, showing that the medium where the product is developed is very important for the fruit to produce and accumulate the necessary metabolites that guarantee that this product presents the properties of particular flavour that characterize it. For example, regarding the analysis of the waters within the environmental component, it is important to determine its electrical conductivity (EC) since it is associated with the degree of salinity of the water; however, the results does not tell us if the high conductivity values are due to the presence of salts with toxic or beneficial elements for the plant and the soil. According to the permissible standards of EC values, in Pomac III, the values were in the range of 0.321 to 1.428, which means medium to high salinity hazards. For sensitive plants that can be stressed by salt concentrations, moderate leaching is required to avoid accumulation of salts in the soil, as well as in certain areas it can affect some plants and good leaching drainage is required. Illimo, Ciudad Eten and Cayanca, are characterized by having waters with EC between 0.32-0.651, 0.56-0.57 and 0.366, respectively, which means medium danger of salinization. However, LOCHE DE LAMBAYEQUE does not seem to be affected by those characteristics of irrigation water and probably the characteristics of the soil favour that salts do not accumulate significantly. The soils of Ica do show greater dangers of salinization, perhaps because irrigation is mainly by well water. LOCHE DE LAMBAYEQUE has the advantage that the crop is irrigated with both types of water. This can be an important factor in determining the particular characteristics of the fruit. In conclusion, in relation to the waters, differences have been found in this component that could be related to that particularity that LOCHE DE LAMBAYEQUE possesses in relation to the flavour of the fruit. Therefore, it can be concluded that the waters used in the irrigation of the LOCHE DE LAMBAYEQUE are appropriate in their characteristics, resulting from a combination of subsoil water (well) and channels that transport water from the rivers that cross the areas of production. The waters must be slightly acidic to slightly alkaline in tendency, with an appropriate CE without danger of salinization affecting the soil. It must also be balanced in its content of anions and cations, with a ratio of absorption of sodium, magnesium and calcium in the form of carbonates, with values that make it suitable for irrigation, without the danger of sodium accumulation.

Another component of the physical environment that is worth highlighting is the type of soil, since it is the one that carries the mineral nutrients that the plant requires in the form of salts and that are mostly solubilized in the water. In this regard, the suitable soils for the cultivation of LOCHE DE LAMBAYEQUE must be slightly alkaline (pH: 7-8), of EC that make the soil from very slightly saline to saline; they are not demanding in fertility. However, those of the cultivation area vary from high to low fertility, with good availability of organic substance, from medium to good moisture retention and of the types according to granulometry, which vary from loam, sandy loam, and sandy clay loam. Therefore, in the results analyzed as individual variables, it is noted that the soils of the LOCHE DE LAMBAYEQUE production area are more similar to each other than those analyzed as a comparison contrast. In addition, the multivariate analysis has made it possible to better define that when analyzing all the variables together, those of the study area were grouped

together, corroborating the individual analyzes of the variables. These results indicate that in the Loche cultivation area, the soil component is important as a contributor in determining the quality and particularity of the fruit.

On the other hand, in relation to the climate, it should be noted that the area where Loche is grown (Lambayeque, Reque, Ferreñafe) is characterized by average minimum temperatures ranging from 17.85°C to 18.16°C, with an annual range of all spaces ranging from 15.38°C to 21.83°C. The average maximum temperature ranges from 24.94°C to 28.04°C, with an annual range between 22.22°C to 31.83°C. Humidity ranges from 76.40% to 81.70% and an annual range between 73.39% and 83.23%. Precipitation levels do not seem to be significant, with the exception of the occurrence of “El Niño” Phenomenon; however, the monthly average values in the production area are between 3.42 millimeters to 7.07 millimeters and an annual range between 0.00 millimeters and 32.68 millimeters. Another important variable that has to do with the amount of light to which the Loche plantations are exposed is the hours of sunshine, which for the production area was between 143.93 to 195.55 hours per month.

Regarding the morphological characterization of LOCHE DE LAMBAYEQUE, Loche fruits have few to moderate warts, they vary from pear-shaped to elongated, with variable length (L) between 14.71 cm and 34.42 cm (sometimes being able to exceed these limits) and diameters (W) between 8.86 cm and 13.05 cm. The fruit index (L/W) is between 1.12 to 3.427. Regarding the bromatological components of LOCHE DE LAMBAYEQUE, significant differences were found in the content of metabolites and their composition in the LOCHE DE LAMBAYEQUE samples compared to the Loche fruit grown in the Virú Valley. The LOCHE DE LAMBAYEQUE has a very low lipid content, higher carbohydrate content, reducing sugars and fiber. In relation to the organoleptic characteristics, the study carried out has made it possible to differentiate the fruits of LOCHE DE LAMBAYEQUE from those produced in the Virú Valley (La Libertad). The main differences are the LOCHE DE LAMBAYEQUE has a medium yellow pulp, while the one from Virú has a very strong yellow. This aspect is consistent with the content of carotenoids, which was very high in the samples from Virú and lower in those from Lambayeque. Regarding the smell, the fruits of Virú presented a strong smell, while those of Lambayeque had a medium smell. This can be explained by the higher content of phenols and carotenoids in those from Virú. In flavor, the LOCHE DE LAMBAYEQUE presents a strong sweet flavor, while those of Virú had a medium sweet flavor. This is also related to its composition. LAMBAYEQUE LOCHEs contain more carbohydrates and a higher quantity of reducing sugars. In texture, again the LOCHE DE LAMBAYEQUE had a medium to strong consistency, while those from Virú had a weaker consistency. This may be related to the fact that there are more carbohydrates in Lambayeque fruits.

In conclusion, the product in question is intrinsically linked to the designated production area, since were it not for its natural factors, it would not have the characteristics that make it the appellation of origin LOCHE DE LAMBAYEQUE.

Additionally, the human factor is present with the agronomic management of the cultivation areas of Loche de Lambayeque by current farmers who, to date, conserve loche as an ethnobotanical product, whose planting and harvesting technology maintains traditions and

cultural practices, such as those that refer to the management of the crop, inherited from their ancestors, who managed to domesticate the loche and select it to achieve the current variety, as well as adapt it to the environment in which the crop has prospered. Such cultural contributions have been made through various moments of the historical and cultural development of the first settlers of the Lambayeque area to their current descendants, which are: Cupisnique (2200-400 BC; Salinar (400 –100 BC); Moche also known as Mochica (100 -750 AD); Sicán or Lambayeque (800-1350 AD); Chimú (1300-1470 AD) to the Lambayecan mestizo world of the present day, where the predominant ethnic and cultural matrix is Muchik or Mochica. Evidence of said cultural manifestations are found in the archaeological zones of the National Sanctuary of Pomac, represented in ceramic samples that represent the fruit of the loche (which are preserved in the site museum), as well as in botanical remains (seeds) found in graves and excavations.

7. Inspection body

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8. Labelling

Peruvian Metrological Standard NMP 001: 2019 "Requirements for the labelling of pre-packages" - 5th edition, as applicable.