



# History of the Quinuas in South America

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## Abstract

Quinoa (*Chenopodium quinoa Willd*) is an Andean food grain domesticated mainly in the highlands of the central part of the Andes in South America by the quechua and aimara people since at least 3,000 years. The geographical distribution of the crop covers territories from south of Colombia to north of Argentina and central part of Chile. The actual technological conditions and production areas in each country are discussed and presented a differentiation of five main types of quinoa including, the geographical distribution: the Andean valleys; the high plateau around the lake Titicaca; the salares in Bolivia, the sea level and the yunga or subtropical quinoa types. Suggestions for a future need of research as well as agro industrial process with references to the different traditional uses from the roots, grains, leaves as stems is describe.

## Keywords

Origin • Quinoa distribution • Main types • Research needed

The Andean settlers cultivated, besides potato and corn, the Andean Grains such as quinoa (*Chenopodium quinoa Willd*), kiwicha (*Amaranthus caudatus*) and *Amaranthus mantegazzianus* and later kañiwa (*Chenopodium paliidicaule* Aellen) for thousands of years (Hunsiker 1952; Cardenas 1969; Nuñez 1970; Pulgar Vidal 1954). The Andean Grains are known specially for their high nutritional value in quality proteins to replace the lack of milk.

## 1.1 Origin

The age of the domestication of quinoa and the beginning of its use as a food can be dated at least 2,000 to 3,000 years BC because of its presence in archeological remains. Towle (1961) mentions several archeological findings of quinoa, with fruitful panicles, branches and loose grains, found in different regions of Peru and in the coastal zone of Arica, Chile.

As Nuñez (1970) indicates, it is not well known how quinuas were domesticated. However, findings in northern Chile (Chinchorro complex), suggests that quinoa was used before 3000 BC. In the area of Ayacucho (Peru), Uhle 1919 describes remains of quinoa grains and gives an even earlier date, 5,000 years BC, as the beginning of domestication.

In a Khipu (a traditional accounting system, based on alpaca fiber with different size knots

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and different colors, which allows recording the production of food crops in the Inca Empire) of the sixteenth century, studied by Murra (1975), the importance of quinoa production is noted in the central highlands of Peru. The production of quinoa precedes the potato production in the khipu.

Ulloa Mogollon refers in 1586 to the use of quinoa in the province of Collaguas (Bolivia). As already mentioned, there is evidence that quinoa was widely cultivated in the valleys of northern Chile. In 1558, Cortes Hogeia, first to visit the island of Chiloe (Chile), found quinoa sowings. In the North Argentinian territory, Pedro Sotelo (1583) mentions these crops in the valley of Calchaquies and in the vicinity of Cordoba.

However, it should be noted that there is little information about religious rites with the use of quinoa. Cárdenas (1969) does not believe that quinoa has completely replaced corn in the highlands, and it is not being used for religious ceremonies. It points out the tradition that the natives of the mountain range still have, of traveling to the valleys to exchange quinoa for corn or salt.

It is still not understood when and from which wild species the native domesticated quinoa varieties or land races were obtained and more research is necessary to provide evidence on domestacation; however, there are important hypotheses.

For Andean researchers, the center of origin and domestication is the altiplano, around Lake Titicaca, shared by countries such as Peru and Bolivia (Gandarillas 1968; Mujica 1977). Other scholars consider the existence of different centers of origin in the inter-Andean valleys and that the quinoa has been taken to the altiplano of Lake Titicaca, which is considered the great center of diversification.

Other researchers suggest that cultivated quinoa would have an ancestor in *Chenopodium berlandieri*, a wild species from North America; however, there is little evidence of its use as a crop or food in that region (Maughan 2013).

The Andean origin of quinoa is supported by the existence of the different regional names of quinoa. There are many regions within the native language. Robledo, quoted by Pulgar Vidal

(1954), specifies that the Chibchas (Colombia) called it “pasca” and with great surprise it has been defined that “pasca” etymologically means the pot or food of the father.

The name “suba or supha” (Chibcha language) is indicated by Pulgar Vidal (1954). As the primitive name of quinoa in the Bogota area, and the author relates it always with the Aymara term “hupha”, which is used in some regions of Bolivia. In the rest of the territory that is now Colombia, the Quechua Quinoa name was generally used, but in Cundinamarca the indigenous name was “pasca”.

In the Aymara language, quinoa has different names, depending on the variety: the wild quinoa is called “cami”, while the cultivated white and most appreciated is called “ppfique”; the red one is called “kana llap”; the yellow one, “cchusllunca”; another yellowish variety is called “ccachu yusi”; and the wild one “isualla”, according to Latchman (1936). However, this author confuses the quinoa with the kañihua (*Chenopodium pallidicaule* Aellen) and includes it within the quinoa varieties, calling it “cinnamon or cañagua”. The same author adds that in the North of Chile quinoa was cultivated and that it is called in atacameño “dahue”. Bertonio (1879) added Aymara names for the varieties, such as “aara”, “callapi” and “vocali”. It also mentions a variety between colorada and negra, la “cami hupa”.

An additional source of information to recognize the origin and distribution of this Andean grain is the tradition that exists in the diverse ways of consuming this grain in Colombia, Ecuador, Peru, Bolivia, Northern Chile and Argentina, both in the preparation of different dishes, and drinks and processed foods. Traditional dishes are known as “lawa”, thick quinoa soup; with fat and katawi as the preparation of white chicha, etc. Quinoa’s tender leaves, known as “liccha”, are used extensively in salads, and to prepare the ashes of the roots and stem for the preparation of the “llipta”, alkali, used to chew coca leaves (Beyerdorf and Blanco 1984); the names of the surplus residue of the leaves and stems and the name of “jipi” to designate the residues of the grains and small seeds.

Samples of *Amaranthus* with erect inflorescence (very similar to those of quinoa) have been found in the area of Tarija, Bolivia. This receives the name of “coimi”; however, indistinctly it is also called quinoa (Tapia 1979).

Quinoa has a close relative cultivated in the highlands of Mexico as *Chenopodium nuttaliae*, called “huauzontle”, which resembles Andean quinoa (Wilson 1976). Apparently, it had high importance in times of the Aztec empire as a food, according to the codex of Antonio Mendoza, first Viceroy of Mexico between the years 1535 and 1550, in which the tributes are indicated in grains like “huauzontle”, from each of the 363 vassal peoples of the Aztec Empire paid annually, to the central government, with this grain (quoted by Hunkizer 1952) (Photo 1.1).

The first Spanish to mention the cultivation of quinoa in the new world was Pedro de Valdivia, who informed the Emperor Carlos I in 1591 about the crops in the surroundings of Concepción (Chile) and indicated that “the region is abundant in all the maintenance that the Indians plant for their sustenance as well as corn, potatoes, quinoa.” (Hunsiker 1952).



**Photo 1.1** Ceremonial vessel of the Wari culture, Ayacucho, Peru, ninth century, with a drawing of the quinoa plant on the right

However, there was a strong confusion in the seventeenth century when quinoa was not identified in all cases. The first Spaniards, for example, always related quinoa to the pigweed that grows as a weed in the Iberian Peninsula. BERNABE Cobo (1653) says “quinoa is a plant very similar to the ‘bledos’”. Bledos were described in Europe as annual plants with creeping stems of the family of the Chenopodiaceae and Amaranthaceae, like *Amaranthus blitum* L. Confusion develops as the eminent botanist Carolus Clusius, in his *Historia Rariorum Plantarum* of 1601, presents the first illustration of a species that he called quinoa, but which is actually a plant of *Amaranthus caudatus* L.

## 1.2 Geographical Distribution

Quinoa nowadays has been widely distributed in the Andean countries. Cieza de León (1560) reports that in the South of Colombia, quinoa was also cultivated in the highlands between the cities of Pasto and Quito, and he writes: “In all these towns, it gives little corn or almost none, because of frost, but other species as quinoa does”.

The Inca Garcilaso de la Vega, in his famous *Royal Comments*, says about quinoa “in the second place of the crops that are raised on the face of the earth give what they call quinoa and, in Spanish, ‘millet’, or small rice, because in the grain and the taste it resembles something”. This historian refers to his trip to Spain in the seventeenth century with the first export of quinoa grains to the old world, which fatally failed to spread because “the seeds arrived dead” (Photo 1.2).

The Spanish chroniclers did not always treat these Andean Grains with the just evaluation. The fact that quinoa resembled the “Spanish bledo”, evoked that quinoa was considered a plant without value (“worth a damn”). It is also true that there were numerous confusions between quinuas, cañihua and amaranth, because of the similar architecture, morphology of the plant and the shape of the grain, and it was called, for example, cinchona quinoa or cañihua.

In the North of Peru the cultivation of quinoa was common, but in most fields quinoa was

**Photo 1.2** Inca Gracilazo de la Vega, the first to introduce quinoa in Europe



grown together with corn. Further to the South, quinoa gained importance both in the “Callejon de Huaylas” and in the Mantaro Valley, where it was widely cultivated by the Huancas tribe. Numerous sources report that the Spanish were surprised finding in each region, the “ccolcas” or food deposits with large amounts of quinoa grain.

Relatives of quinoa are very common, especially in the agricultural area around lake Titicaca and neighboring areas, as a group of *Chenopodium* species called “ayaras or ajaras”. In the Arequipa countryside, several species from the *Chenopodium* genus can be found, known locally as “llichas”, which is the same name given to the tender quinoa leaves in the Puno highlands. These species are considered as weeds, although their tender leaves are consumed

in green rolls called “loritos” (Tapia et al. 2014) (Photo 1.3).

Quinoa was initially studied by archeologists, Towle, 19. Uhle (1919) botanics as Hunsiker (1952), Cardenas (1969), Leon (1964) followed by nutricionists, White (1955), geographers, Pulgar Vidal (1954) finally researched by agronomists Gandarillas (1967), Rea (1944), Mujica (1977), Canahua (2012), Rojas (2013), Gomez (2013) and ultimately specialists in molecular studies. Maughan (2013), Jiménez (2014).

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### 1.3 Current Production Centers

From the North to South of the South American continent, the following current centers of increased production of quinoa can be identified.





**Photo 1.3** Cultivars of quinoa from the high plateau of Puno, Peru

### 1.3.1 Colombia

According to Acosta (1948), the cultivation of quinoa was abundant in the past, but now almost abandoned in the Colombian savannas, because most of the agricultural areas of the cold lands of Cundinamarca and Boyaca became pastures for grazing.

Pulgar Vidal (1954) believes that quinoa can and should be sown in the Cundinamarca area, a name that etymologically means “the country of frost”, and that this plant could have a safe production.

At present, the region with the greatest cultivation is the province of Nariño, with the towns of Ipiales, Pueres, Contadero, Cordova, San Juan, Mocandino and Pasto (Pulgar Vidal 1954).

Since 1947 Professor Braulio Montenegro of the University of Nariño has dedicated his effort to the promotion of the cultivation of quinoa in

Colombia. In 1958, he obtained an improved variety, the Dulce de Quitopamba that gives yields of 1500 to 2000 kg/ha, with fertilizations of 30 at 50 kg of nitrogen per hectare.

Romero (1976) made experimental plantings at the Marengo Agricultural Center of the National University in Bogota to test the production of new varieties. He found yields of 400 to 500 g per plant with the Bolivian Sajama variety.

### 1.3.2 Ecuador

In Ecuador, quinoa has persisted among peasants in the area of Carchi, Imbabura, Pichincha, Cotopaxi, Chimborazo and Loja (Cardozo 1976; Tapia 1976; Romero 1976; Peralta et al. 2012).

Morales (1975) compared some 18 ecotypes from the areas of Imbabura, Cayambe, Cotopaxi

and Chimborazo with material from Bolivia, and highlighted the Ecuadorian ecotypes Chaucha, Punin, Grande and Staquinua with very good yields.

The quinoas of Latacunga, Ambato, Carchi, Riobamba and Cuenca are of small grain, in general of high size and quite bitter grain. It is estimated that the total cultivated area is about 1,200 ha in all the country (Freere et al. 1975). However, this area has increased remarkably in the last ten years.

### 1.3.3 Peru

At present, Peru is the country where most farmers cultivate and consume quinoa and where a large number of varieties have been selected (Tapia 1979; Mujica 1977).

In the region of the inter-Andean valleys, quinoa is cultivated within the fields of corn and beans, or as the border of potato crops. But it is in the highlands, where corn does not grow, where quinoa's cultivation becomes more important.

In Cajamarca it is customary to plant 6 to 10 rows of corn followed by one of quinoa, in a system known as Chaihua. Only in the highlands near the jalca you can see small quinoa fields in monoculture.

Other important areas are the Callejon de Huaylas in Ancash, the Mantaro valley and the Jauja highlands in Junin, Andahuaylas in Ayacucho, as well as the highlands of the department of Cusco.

In the Mantaro valley and the upper part of Jauja, the varieties Blanca and Rosada de Junin are planted, with very uniform grains and low saponin content.

In the Vilcanota valley between Cusco and Sicuani, at altitudes of 3000 and 3600 m with precipitation of more than 500 mm, the Yellow of Marangani variety is cultivated, whose yields can exceed 2000 kg/ha.

The Quinua White, variety of Junin has been fully adapted to the conditions of Anta in Cusco at 3700 m, there you can find the most extensive cash crops, up to 150 ha, with yields above

2000 kg/ha. As in the Marangani area, in Cusco, it is recognized as the Marangani variety.

Quinoa is really important in the Altiplano del Collao, department of Puno, above 3800 m, where corn cannot be produced. The quinoa cultivation plots appear in the small ravines or lands near lagoons or Lake Titicaca. The Cheweca variety has been selected around the Orurillo lagoon, which produces a small, almost sweet, very soft and special grain to make flours. Lescano from the region of Cabanillas comes the variety Kanccolla (del Collao), of almost sweet grains that has high yields. The variety called "jiura" rice of small grains, called Blanca de Ayaviri, has white and semi sweet grains.

Finally, on the Peruvian side of the lake quinoa ecotype "Blanca de Juli" is grown. Other local ecotypes include "Chullpi", with transparent grains.

According to the General Directorate of Statistics of Peru, the cultivation of quinoa covered more than 42,000 ha per year in 1951. This area initially decreased, but in the last decades it has been recovered to more than 65,000 ha. Of this area, more than 55% is concentrated in the department of Puno, in the South-west of the country, in the highlands bordering Bolivia.

### 1.3.4 Bolivia

In the Altiplano, salty plains, and in the inter-Andean valleys, quinoa has been maintained above all as a self-consumption crop for the thousands of farmers who appreciate its nutritional value (Gonzales 1917; Gandarillas 1986 Rea).

Here we must also distinguish between the quinoa of the Altiplano with a plant of smaller size (up to 1.60 m) and the quinoas of the valleys that can reach 2 m or more. Around Lake Titicaca, the crops are concentrated in the peninsula of Copacabana and, with higher density, between the area of Desaguadero and Guaqui. Quinoa cultivation decreases in frequency and extension from the South until Oruro.

The main quinoa producing areas with some 3000–4000 ha are the provinces of Quijarro, Nor

Lipez and Daniel Campos, of the department of Potosí, and Ladislao Cabrera, of the department of Oruro, where the “quinua real” produced. It has a bigger seed size and a high content of saponins (Bautista 1976).

The region of the salt plains of Coipasa and Uyuni is characterized by the more xerophytic conditions in which quinoa is cultivated. This environment determined an adaptation of the methods of cultivation for about two centuries. This is the region from where quinoa is mostly exported to Europe and the United States.

### 1.3.5 Chile

In this country, quinoa is grown in two very different ecological and geographical zones. On the one hand, in the Chilean highlands (for example, Isluga, Iquique) in the North of the country, the conditions and varieties are very similar to the Bolivian altiplano (Lanino 1076). On the other hand, in the fields of the Concepción area, in the South, at sea level, with longer photoperiod, very different ecotypes of small, flattened, somewhat transparent (as cooked) grain are found. As an example, we mentioned the Catentoa variety (Junge et al. 1973).

Bazile Didier article

### 1.3.6 Argentina

Quinoa is grown mostly in the North-western region of Argentina, in small areas of about 100 m in the highlands of Jujuy and Salta in the North. Vorano and Garcia (1977) believe that quinoa, despite having a series of difficulties in its use (mainly self-consumption), is an irreplaceable species for the conditions of the Argentine highlands (Arraguez 2017).

The cultivation of quinoa is spread throughout the Andes, however, in the case of Peru, it can be mentioned that there are at least 6 assembly centers in Cajamarca, the Callejon de Huaylas, in Junin, Ayacucho, Cusco and mostly in the highlands of Puno.

## 1.4 Main Types of Quinuas

The quinuas, according to their agro ecological adaptation, can be grouped into five major types (Tapia 1997):

- Quinuas including dry valleys (Junín, Ayacucho, Cochabamba) and humid valleys (Cajamarca in Peru and valleys of Ecuador and Colombia).
- Quinuas from the altiplano (around Lake Titicaca). White and colored are more frost resistant from the Suni agro-ecological zone.
- Quinuas from salt plains “salares” (South plains of Bolivia).
- Sea level from South latitude quinoa (Chile, Concepcion,).
- Quinuas from the Yunga agroecological zone (Bolivia at 1,500 m).

In the book Razas de Quinuas del Peru (Quinoa Races in Peru), 24 major different groups are distinguished according to their morphology, grain characteristics, agroecological zones of cultivation and different ways of consumption (Tapia 2013). With the same approach of classification, Quinoa races of Bolivia have been published by Gandarillas (1968) and of Ecuador by Gandarillas et al. (1989).

Quinuas from the valley environments could be differentiated between cultivars from dry areas grown on irrigated land, or under rainfed environments as in Cajamarca, Cusco, Huaraz, valley Mantaro, Ayacucho, Abancay and Cochabamba (Bolivia). There is also the influence of increased precipitation North of Peru, which extends into Ecuador, and into Southern Colombia. In the area of Nariño, Colombia and Northern Ecuador there is a tall ecotype, highly branched, light green leaves and very white and sweet grain that gave rise to the variety Nariño, cultivated in Peru (Tapia 1982).

Quinoa from the altiplano is also produced under variable conditions: low rainfall and favorable weather conditions such as around Lake Titicaca; in lands close to lagoons or ravines near rivers like Kancolla cultivar is grown,



Blanca de Juli, and Tahuaco are native of South of Puno. Some cultivars are adapted to the high plains, at 3 900 m.a.s.l., for instance, Cheweca, Ccoitu, Wariponcho, Chullpi and Witulla, with colored panicles and that also withstand lower temperatures.

Cultivars in the region of Puno, Canahua (2012)

1. Janko or yurac. White
2. Chullpi or hyalines. White/transparent Good Clado, pure.
3. witullas. Colored Red/red, purple. High. Kispño Flours, torrijas.
4. Wariponcho. Yellow/yellow for soups, flours.
5. Kcoito. White or lead/Good Turrets Flours. Plumb, brown.
6. Pasancallas. Red, white/red. High. Manna. Flours
7. Cuchi wila. Red/black High. Chicha Kispño

The quinas of the salares group in the south of Bolivia support extreme xerophytic conditions and their initial development is possible because they take advantage of the humidity of the holes dug at the time of sowing. The cultivation of quinoa in this area follows a very special production system: after the harvest, the soil takes a

rest for 4 to 8 years, in recent times this period is shortened, producing negative effects due to depletion of the fertility of the soils.

Quinoa at sea level is adapted to humid conditions and with more moderate temperatures; they are located mostly in the latitudes South of 30° S (Concepción and Valdivia, Chile). Didier (2014).

Finally, there is a very small group of quinas that have adapted to the conditions of yunga agro ecological zone of Bolivia, at altitudes between 1,500 to 2,000 m, with the characteristic of having the stem and perigonium orange to mature state (Tapia 1979). Their adaptation to subtropical climates allows them to tolerate higher levels of precipitation and heat. There is only one collection made in Bolivia and the samples of this group grew adequately in K'ayra, Cusco at 3,300 m above sea level, presenting a long vegetative period of more than 200 days.

Quinoa is also cultivated in different production systems depending on the agroecological zones. Sometimes it is grown in pure or single crop fields, and sometimes it is grown together with maize or potatoes, or sometimes it is grown as a border of different crops like maize or potatoes (Photos 1.4 and 1.5).



**Photo 1.4** Quinoa grown in suka collos or elevated land, Puno, Peru





**Photo 1.5** Cultivation of quinoa in the aynokas system, Puno, Peru

## 1.5 Research Advances

The initial technical meeting related to quinoa was held in Puno, Peru 1968, called the First International Quinoa and Kañiwa Convention with the assistance of researchers from Peru and Bolivia. The second Convention was held in Potosi, Bolivia 1976.

From there, 12 International Andean crops Congress have been held in the six Andean countries (1977–2012). Also, six international congresses dedicated specifically to Andean grains have been organized (2001–2017). All the proceedings of these meetings have been published in Spanish.

Specific research done on this crop includes the floral biology (Rea 1944), nutritional evaluation (White 1944), botanical studies (Cardenes 1969 Leon), agricultural and plant breeding (Gandarillas 1986; Mujica 2013; Gomez 2013; Lescano 1994; Tapia 2012; Canahua 2012; Rojas 2013; Bonifacio et al. 2012).

The future development of this crop requires to propose an integrated plan for a greater diffusion, consumption and cultivation of quinoa, coordinated by the Andean countries, as to know in greater detail the agronomic and climatic

adaptation characteristics of the different varieties of this species, that is, the agroecological zoning of the quinoa in south America and the potential for adaptation that has the varied genetic material, in the germplasm banks of this crop for other agro ecosystems.

In the altiplano conditions, the yields can be affected by frequent frosts, especially at the beginning of flowering. The valley varieties are adapted to temperatures that fluctuate between 10 and 18 °C and are not tolerant to frost. The varieties in the salt flats in Bolivia support temperatures of −8 °C, alkaline soils up to pH 8.0 and salinity up to 52 mS/cm (Mujica et al. 2001).

Quinoa had been grown from 2012 in the Peruvian coast, yields obtained are over 4,000 kg/ha under conditions of conventional agriculture with high level of fertilization and irrigation systems (Tapia and Lozada 2017).

## 1.6 Traditional Quinoa Utilization

Quinoa has been used for centuries by the Andean peasants who have used it in their usual diet, even considering it as an appropriate food for food security, that is, to keep it for the years

of low harvests that occur periodically in the plateau.

In recent years, quinoa, especially quinas of colors, have received special attention by the most renowned chefs and with this, its value and acceptance is spreading in urban areas.

In addition, the farmers keep the tradition of the integral use of the plant with different purposes that it has tried to recover in different events and field visits during the last 30 years.

Special mention should be given to the work of the NGO Pratec, which in its work of recovery of traditional knowledge has produced more than 1,500 primers, several of them dedicated to cultural traditions in the cultivation of quinoa.

Currently, quinoa is used in the preparation of soups, stews, grains, pures, desserts and drinks; transformation into flour: in baking biscuits, desserts, sweets, beverages, making noodles mixed with other flours, ingredient of sausages and meatballs, flakes; drinks, soups, sweets; (popeadas) or Pipocas: for direct use alone or with yogurt, ice cream, desserts and chocolate.

Quinoa, kañihua and all edible amaranthus species together, constituted an important component of the diet of prehispanic people in the highlands of the Andes. Its use was common in the Andean regions of Peru and Bolivia until the first third of the last century (1940), when it began its decline, when the reception of food aid from the United States began and the massive importation of subsidized wheat increased.

### 1.6.1 Preparation of the Llipt'a O (Llujt'a)

The stems of quinoa and, sometimes, the main root have an important traditional use, which is maintained until today: they are used in llipt'a (alcali) together with "chachado", chewing of the coca leaf.

To obtain the llipt'a the stems and roots of quinoa are burnt, the ash is collected and mixed with water. Optionally milk or anise is added, which gives a more pleasant taste. With this, a type of circular muffin is formed, "biscuits", about 6 cm in diameter that are put to dry in the sun.

The ashes, which are alkaline, facilitate the extraction of cocaine, which is an alkaloid contained in coca leaves, during the chewing process and, thereby, has a stimulating effect.

In the different parts of the Sierra del Peru, there are several ways to prepare the llipt'a according to the available ingredients. For example, it can be made with banana peel ash. But in the Southern Sierra it is considered that the llipt'a of quinoa and kañiwa (*Chenopodium pallidicaule* Aellen) is the most pleasant and smooth.

The stems of quinoa have a high cellulose content, and have therefore been used in the production of cartons or used as firewood.

In the Aymara area of Puno "ch'iwa" soup is prepared with dry meat "chalona", potato, peeled barley, chuño, green beans and processed quinoa. After boiling these ingredients, quinoa leaves are added and boiled for a few minutes, with fresh oregano and aji to taste (Pratec 2001).

Quinoa leaves also used for children, boiled and milled, they are mixed with potato pap. Quinoa is used preferentially to spinach as it contains less oxalates.

The rural population recommends black quinoa seeds to convalescent people, because of its high protein content (19%).

An important aspect is the digestion and absorption of the quinoa protein by the human body. It has been found that the digestion of whole grains is very difficult for children under two years of age, even when quinoa has been cooked. The utilization improves notably when quinoa is consumed as flour. Therefore, it is recommended to prepare quinoa and other Andean grains for young children in porridges, cream soups or beverages based on flours.

Quinoa is the most versatile of the Andean foods in terms of preparation possibilities. You can prepare all kinds of foods, such as soups, breads, savory dishes, cakes, drinks, cookies and much more.

The taste of quinoa can be bitter, if the saponin has not been properly washed away. This fact is often taken as a reason for not wanting to consume quinoa. However, it is not about washing or scarifying the seeds until they

are mutilated in their structure, without nutritional value due to loss of the germ and without flavor. It is desirable to find the ideal point of undamaged grain, where valuable nutrients are preserved, and the bitterness is not unpleasant or a nuisance, but allows to appreciate the own flavor of freshly cooked quinoa.

In the traditional kitchen, the type of food that is going to be prepared according to the ingredients available at the time and place is decided. Quinoa is a dry food, which can be kept for a long time if the conditions are adequate, therefore, it is ideal for periods of scarcity and, consequently, it is always necessary to have a sufficient reserve.

- Steam cooking is used to prepare the kispño; also for tamales and humitas made from quinoa or quinoa flour.
- To make toasted flours the grain is roasted fat-free in a clay pot.
- Fried tortillas are much appreciated, they require fat or oil. Until about thirty years ago, it was a sporadic form of food, nowadays it is becoming more frequent.
- Finally, drinks are prepared such as soft drinks and white quinoa chicha. For beverages, fermented or not, small varieties of colored quinoa are used as the quinoa variety witulla.

### 1.6.2 Traditional Use of Leaves

Quinoa leaves are called “llipcha” or lliqch’a in Quechua and “ch’iwa” in Aymara. “Ch’iwa jauch’a” refers to the tender leaves of quinoa, which are cooked and used to prepare stews and salads. Quinoa is a close relative to spinach.

The consumption of tender leaves is frequent, especially in the month of December until Carnival, (February) and is part of the traditional Christmas dishes. When the plants have reached about 30 cm in size, they proceed to thinning in the field. The plants removed are consumed fresh, preferably on the same day. The most frequent preparations with soups, scrambled eggs, cheese

and spices. They can also be an ingredient of the Quinoa Kispño or an accompaniment of the p’esqe (Quinoa type mazamorra).

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