

Iberian-American Fruits Rich in Bioactive Phytochemicals for Nutrition and Health



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ANDEAN RASPBERRY

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Scientific name: *Rubus glaucus* Benth

(genus *Rubus*, family Rosaceae)

Common names: mora, mora blanca, mora de Castilla, zarzamora azul. It is known as Andean blackberry, Andes-berry, Andean raspberry (English), amora-preta (Portuguese), mûre des Andes (French), andenhimbeere (Germany).



Origin

This plant grows wild. There are around 400 species in the whole planet, all of them pertain to blackberry and raspberry genus (*Rubus sp*), and most of them are native from temperate and cold zones from North America and Euro Asia. Despite many species are still gathered from the wild in Central America it is not possible to assure that they are native to that region, probably they were introduced and were not completely domesticated. According to the German botanist W.O. Focke who studied systematic the blackberries, most species are native to the temperate zones from Northern hemisphere. Most of European and American species might be separated by glacier movements (Bejarano, 1992).

Production

Although common in the wild plants of genus *Rubus sp*, in special Mora de Castilla has been found in Ecuadorian Andes growing individually, disperse or in groups with other varieties. In 1921 they were already found as small plantations in Ecuadorian towns Ibarra, Otavalo, Ambato, and in Quito (Popenoe, 1921). Mora de Castilla (*Rubus glaucus*) discovered by Hartw and described by Benth is native to high tropical zones from America; it is cultivated mainly in Ecuador,

Colombia, Panama, El Salvador, Honduras, Guatemala, Mexico and the United States (Franco and Giraldo, 1999).

Varieties

Since 1840 it started the works to obtain *Rubus* varieties with better characteristics, and they managed for temperate zones. At the end of 19th century the first crops were introduced in the United States. The first known varieties are Dorchester, Snyder, Evergreen and Himalaya (OIRSA, 2003; Bejarano, 1992). In Ecuador the most important commercial varieties are mora de Castilla, Brazos from Texas for exportation due to its high productivity and Olallie from California that was introduced in 1987 (Martínez *et al.*, 2007).

There is a variety of berry without thorns (*Rubus glaucus* Benth) named INIAP ANDIMORA 2013, that comes from a natural somatic mutation of mora de Castilla plants with thorns, used for vegetative multiplication by terminal layer, that was presented in Pillaro-San Miguelito, Tungurahua Province in 2007. These plants without thorns were multiplied and distributed to several locations of the province in order to observe their agronomic behavior and the permanent absence of thorns. In 2008 INIAP started a series of experiments in farm and laboratory related to characterization agronomic, molecular, physico-chemical and quality of the fruit from a collection of moras, where mora without thorns corresponded to accession MA-0100, collected in San Luis-Tisaleo-Tungurahua and after five years of research it was selected in 2012 due to its high productivity and quality having also the property of thorns absence which is important for farmers since it facilitates trimming and harvest that are periodic in this crop. Finally sensory and agroindustrial tests led to conclude that this variety has properties demanded by the market for fresh and industrial consumption.

Nutrition

The fruit is a berry formed by 110 to 120 drupes with their seeds inside, representing 10% of the weigh. Mora without thorns, variety INIAP ANDIMORA 2013 has a comparative advantage since it compensates the 2.62% of acidity with 12.60 °Brix which corresponds to a high content of soluble solids.

The variety shows a interesting source for human diet, according the values for the Total Polyphenols 6,08 mg/ g fresh basis and 57,25 μ mol Equivalent Trolox/g fresh basis of Antioxidant Activity, is related to the compounds capable of protecting a biological system against the potentiall harmful effect of processes or reaction involving reactive oxygen and nitrogen species (ROS and RNS).

INIAP ANDIMORA 2013 is also rich in minerals as Potassium (264 mg/100 g fresh weight).

Mora variety INIAP ANDIMORA 2013	
Moisture (%)	87.43
pH	2.93
Titration Acidity (% citric acid)	2.62
Soluble solids (Brix)	12.60
Ash (%)	0.61
Protein (%)	1.40
Fiber (%)	0.44
Total Carbohydrates (%)	9.73
Total Sugars (%)	5.35
Reducing Sugars (%)	5.11
Vitamin C (mg)	16.59
Total Polyphenols (mg)	608
Total Carotenoids (μg)	660
Calcium (mg)	20.1
Magnesium (mg)	27.7
Phosphorus (mg)	30.2
Potassium (mg)	264
Sodium (mg)	6.3
Iron (mg)	0.2
Zinc (mg)	0.6
Manganese (mg)	0.4
<i>Food values on 100 g on fresh basis.</i>	
<i>Source: Department of Nutrition and Quality, INIAP, 2011</i>	

Culinary uses

The Andean blackberries are native from Mexico to Ecuador and are widely cultivated in South America for their edible fruits, which are eaten fresh or processed products (Mertz, 2007). At present there is a growing trend of consumption.

Mora de Castilla is not only found as fresh fruit but it is also widely commercialized as frozen and processed products (jelly, juice, pulp among others).

The main processed product is the juice, in addition to pulp and frozen concentrates which are treated by IQF (Individual Quick Freezing). Halves and pieces are frozen by IQF and also used in different kind of preserves, ice creams, desserts, candies when dehydrated and osmodehydrated. It is considered an exotic ingredient for gourmet dishes also used with all kind of meats, fruit and vegetable salads and for decoration.

Phytochemistry and health

Blackberries are currently promoted as being a rich source of polyphenols, which are compounds of interest because of their antioxidant activity as radical scavengers and possible beneficial roles in human health, such as reducing the risk of cancer, cardiovascular disease, and other pathologies (Mertz,2007).

Phenolic compounds include several classes such as hydrobenzoic acids, hydroxycinnamic acids and flavonoids. The mayor phenolic compounds in berries are hydrolysable tannins (gallo and ellagitannins) and anthocyanins, hydroxycinnamic acids, flavonols, flavan-3-ols, including proanthocyaninidins being present in lower amount (Mertz, 2007).

Ellagitannins and ellagic acid derivates were detected in *Rubus* species, but amounts reported were closely dependent in the analytical conditions (Lei 2011). Ellagitannis were the mayor compounds with sanguin H-6 and lambertianin C being the predominant one. The anthocyanin composition as well as the presence or absence of kaempferol glycosides can be used to distinguish the *Rubus* species studied. Flavonol hexoside-malonates is identified in *Rubus glaucus* and *Rubus adenotrichus*. Hydroxycinnamic acids were the minor compound found as ferulic, caffeic, and p-coumaric acid esters (Mertz 2007)

Currently, the compounds formed from hydrolysis of elagic tannins have received much attention due to their biological active properties such as antimutagenic, antiviral, anticarcinogenic, antitumoral, quimioprotective and antioxidant.

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On-line additional sources

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- <http://www.plantnames.unimelb.edu.au>
- <http://www.biodiversityinternational.org>
- <http://www.tropicos.org>
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