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NUTRITIONAL AND BIOACTIVE PROPERTIES OF *SOLANUM QUITOENSE* LAM: NATIVE FRUIT FROM THE SOUTH AMERICAN ANDES

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ABSTRACT

The increasing interest in tropical fruits has been observed worldwide, driven by their desirable sensory and nutritional characteristics. Lulo (*Solanum quitoense* L.), an exotic and native South American fruit, is predominantly used in beverage production and commercially marketed in Colombia and Ecuador. However, the perishable nature presents challenges for their commercialization to market. This has prompted food researchers to be interested in developing new Lulo-based products, that can have an agro-industrial impact in the countries of origin. Lately, a growing number of studies have aimed to uncover the nutritional and bioactive properties of Lulo. These studies have revealed that the fruit is rich in vitamin C, chlorogenic acids, phenolic compounds, and bioactive amines, making it an attractive raw material for the agri-food and pharmaceutical industries. This review summarizes the current understanding of the properties of *Solanum quitoense* L., including its physicochemical, nutritional, and bioactive properties. The fruit's high concentration of beneficial compounds has increased interest from industries and presents new opportunities for economic growth in the countries where it is grown. The growing demand for natural products underscores the need for further research on Lulo's potential applications and benefits, which could result in the development of new and economically viable products.

Keywords: Lulo, antioxidant capacity, native fruits, Solanaceae, bioactive compounds

INTRODUCTION

Lulo (*Solanum quitoense* L.) is an exotic, tropical fruit native to South America, belonging to the Solanaceae family (**Majcher *et al*., 2020**), distributed in some countries throughout the region (**Alvarez-Herrera *et al*., 2021; Ramírez, 2021**). It is also known by several names including "lulo"," quito quito" or "naranjilla", and is widely marketed in Peru, Colombia, and Ecuador (**Gómez-merino *et al*., 2014**). The lulo a member of the Solanum genus is a transitory crop that forms an essential part of the diet of the Andean population (**Andrade-Cuvi *et al*., 2015; Fischer *et al*., 2021; Silva *et al*., 2016**).
The cultivation of lulo has gained international recognition due to its important nutritional and organoleptic properties. This fruit is used to prepare various products such as jams, jellies, juices, nectars, and fermented drinks because of its excellent aroma and characteristic citrus flavor (**Acosta *et al*., 2009; Hinestroza-Córdoba *et al*., 2020, 2021**). Lulo is the main ingredient used to make a national drink called "lulada" in Colombia and drinks called "canelazo" and "colada morada" in Ecuador (**Forero *et al*., 2015; Hinestroza-Córdoba *et al*., 2020, 2021**).
Many researchers point out that lulo fruit is an essential source of nutrients such as fiber, vitamins, and minerals that make this fruit a significant food source. In addition, it contains bioactive compounds such as carotenoids, which are precursors to vitamins A, C, and total polyphenols, making this fruit a valuable resource for public health (**Acosta *et al*., 2009; Forero *et al*., 2016; Gancel *et al*., 2008; Hinestroza-Córdoba *et al*., 2020; Vasco *et al*., 2008**). It should be noted that carotenoids are responsible for the color of a large number of plants and animals, such as carrots, orange juice, tomatoes, salmon, and yolk (**Chang *et al*., 2019; Maoka, 2020**). In addition to the role of carotenoids in the production of the attractive colors of fruits and vegetables, due to their physiological and dietary importance, the properties of some of them that represent the activity of provitamin A are highlighted (**Simpson, 1983**). Recent research has shown that the fruit *Solanum quitoense*, also presents other bioactive compounds, such as chlorogenic acids, phenolic compounds, and bioactive amines, which make this fruit represent an interest in the field of health (**Forero *et al*., 2016; Gancel *et al*., 2008; Hinestroza-Córdoba *et al*., 2020**).
The purpose of this review is to provide up-to-date information on the physicochemical, nutritional, and bioactive properties of the fruit *Solanum quitoense* L.

MATERIAL AND METHODS

This review aimed to identify relevant and up-to-date information on the nutritional, functional, pharmaceutical, and bioactive properties of *Solanum quitoense* L., a fruit of significant public health interest, by searching databases of high-quality indexed journals. To conduct a thorough search, the recommendations of the PRISMA statement (**Moher *et al*., 2009; Urrútia & Bonfilll, 2013**) were followed, and the following MeSH terms were used as keywords in the English language: "Solanum quitoense," lulo, "quito quito," naranjilla, Solanaceae, "bioactive compounds," "nutritional compounds," "chemical composition," antioxidants, phytochemicals, "functional foods," "pharmaceutical properties," and polyphenols.
A comprehensive search of high-quality indexed journals in the Scopus, PudMed, and Web of Science databases was conducted to identify publications on *Solanum quitoense* L. fruit from the past ten years. To ensure a thorough search, the researchers used the following search query: (TITLE-ABS-KEY ("bioactive compounds" OR "nutritional compounds" OR "chemical composition" OR antioxidants OR phytochemicals OR "functional foods" OR "pharmaceutical properties" OR polyphenols) AND TITLE-ABS-KEY ("Solanum quitoense" OR lulo OR "quito quito" OR naranjilla OR Solanaceae)). The search yielded 32 documents in Scopus, 67 in PubMed, and 70 in Web of Science, where the following inclusion and exclusion criteria were applied to select relevant articles:
- Studies that focused primarily on *Solanum quitoense* Lam. fruit.
- Studies that addressed issues related to the nutritional and physicochemical properties of the fruit.
- Studies that focused on bioactive compounds and their antioxidant components.
- Studies that described the results of functional food, pharmaceutical, or health effect studies.

RESULTS AND DISCUSSION

Proximal composition

Table 1 shows the proximal characterization of the fruit from various genotypes, as determined by several authors. Regarding moisture content, this fruit has moisture values ranging from 86.52 to 92.20 g/100 g fresh weight (FW).
As for the protein and carbohydrate content, they are relatively low. Proteins are molecules composed of amino acids, needed for the growth and repair of body

tissues, and are an essential component of the cells. The low protein levels presented by these fruits are compared with those reported by **Berto *et al*. (2015)** of 0.18-0.99%, who studied the proximal composition of 10 native fruits from the South American Amazon.

Regarding carbohydrate content, it is evident that the values reported by **Obregón & Lozano (2021)** for lulo fruits from Peru were higher than those reported by **Acosta *et al*. (2009)** from Costa Rica. This difference is due to several factors such as the genetic and origin of the fruit, as well as its state of maturity at the time of analysis and the technique used.

The fiber content of this fruit stands out, with values greater than 1%, which vary according to the genotype or origin of the fruit. In this regard, **De Carvalho *et al*. (2019)** and **Ajila *et al*. (2008)** pointed out that the consumption of dietary fiber favors better control of glycemia, diabetes, high cholesterol, colon cancer, and gastrointestinal and cholesterol disorders, so regular consumption of lulo fruit could help in some way to prevent these types of diseases.

Table 1 Proximal composition of *Solanum quitoense* L. fruit of different genotypes.

Genotypes	**Peru**	**Costa Rica**	**Ecuador**	**Colombia**
References	**Obregón & Lozano, 2021**	**Acosta et al., 2009**	**Gancel *et al*., 2008**	**Arango *et al*., 1999**
Humidity (g)	86.52	90.60	91.50	92.20
Protein (g)	0.29	0.70	0.69	0.60
Lipids (g)	0.34	N.D*	1.08	0.0001
Total carbohydrates (g)	10.28	3.80	------	------
Fiber (g)	1.87	1.40	1.42	------
Ash (g)	0.70	0.92	------	0.70
Energy (Kcal / 100 g)	45.35	18.00	------	24.00

Notes: *Not Detectable

The energy content is directly related to the content of lipids, protein, and total carbohydrates. Energy values are less than 100 Kcal/ 100 g FW, therefore, lulo fruits can be used in elaborating low-calorie diets **(Berto *et al*., 2015**).

Physical-chemical analysis

Table 2 shows the results on the physicochemical properties of different *S.quitoense* genotypes from different Latin American countries. The dissolved solids content is relatively low compared to other fruits in the region, ranging from 4.20 to 10.30 ºBrix.

Almanza-Merchán *et al*. (2016) studied the changes in the physicochemical composition of two varieties of lulo during their growth and development and found that in the case of soluble solids, they grow to yield 6.7° Brix for chunky cherry and 7.6° Brix for criollo. In the case of total acidity, a similar trend was observed, increasing before harvest, reaching values of 3.61% for the cherry variety and 3.84 % for the criollo variety. The increase in acidity during ripening is associated with the high respiratory activity of this fruit.

Lulo fruit has a high acidity (2.51-3.78 g citric acid/ 100 g FW). This value is higher compared to orange (0.6-1.3 %) **(Shaaban *et al*., 2006**) and lower compared to lemon (5.84-6.52%) (**Al-Jaleel *et al*., 2005**).

Gancel *et al*.(2008) determined the organic acid content of *Solanum quitoense* and found that citric acid represents more than 30% of the dry weight of the fruit and about 97% of the total organic acids. The pH of S. *quitoense* is relatively low (2.89-3.90).

Table 2 Physicochemical characteristics of *Solanum quitoense* L. of different genotypes

Genotypes	**Peru**	**Colombia**	**Colombia**	**Costa Rica**	**Ecuador**	**Colombia**
References	**Obregón & Lozano, 2021**	**Gonzalez-Loaiza *et al*., 2014**	**Mejía *et al*., 2012**	**Acosta *et al*., 2009**	**Gancel *et al*., 2008**	**Arango *et al*., 1999**
Sugars (g)	9.70	-----	-----	3.0	3.58	2.91
Total Acidiy*	2.51	3.21-3.78	2.63-3.00	2.63	2.86	3.65
Soluble solids (°Brix)	10.00	6.57-9.03	4.20-10.30	9.10	7.30	9.50
pH	3.23	2.89-2.94	3.67-3.90	3.20	3.24	3.10

Notes: *g citric acid/ 100 g FW

Mineral Content

Petkova *et al*. (2021) state that the supply of minerals in the human diet is a vital aspect of human nutrition; their consumption is related to metabolic processes and the body's normal functioning. Fruits and vegetables have long been considered the most valuable sources of minerals, and their consumption is promoted as a preventive factor against diseases and dysfunctions (**Hegazy *et al*., 2019**).

Most of the macro and micronutrients necessary for human health are found in *Solanum quitoense* L. species (Table 3).

Table 3 The mineral content of *Solanum quitoense* L. fruits of different genotypes.

References	**Peru**	**Ecuador**	**Colombia**
	Obregón & Lozano, 2021	**Gancel *et al*., 2008**	**Leterme *et al*., 2006**
Phosphorus (mg/ 100 g)	40.6	22.29	22.0
Calcium (mg/ 100 g)	15.70	10.00	22.0
Potassium (mg/ 100 g)	354.90	293.36	264.0
Magnesium (mg/ 100 g)	25.10	15.89	31.0
Zinc (mg/ Kg)	1.70	1.51	2.50
Iron (mg/ Kg)	34.60	1.79	6.30
Copper (mg/ kg)	1.20	0.73	1.90

Leterme *et al*. (2006) studied the mineral content of fruits from the Colombian Andes and found that potassium was the mineral with the highest proportion in most cases, representing an average of 32% of the total mineral content. They also reported that sodium and chlorine were the minerals in lower proportion.

It should be noted that **Obregón & Lozano (2021)** and **Gancel *et al*. (2008)** had similar results to those reported by **Leterme *et al*. (2006)** regarding mineral content for this fruit, despite being of different genotypes.

Obregón *et al*. (2021) found high levels of phosphorus, potassium, calcium, and magnesium as macronutrients. The mineral with the hights percentage was potassium and it was similar to that found by other authors described in table 3. Among the mineral trace elements, iron, copper, boron, and zinc turned out to be necessary.

Regarding iron content, the values reported by **Obregón & Lozano (2021)** were higher than those reported by **Gancel *et al*. (2008)** and **Leterme *et al*. (2006)** for lulo fruits of genotypes from Peru, Ecuador and Colombia, respectively. In this regard, this difference is mainly due, among other factors, to the methodology used, genotype, origin, maturity stage, etc.

Iron functions as a component of several proteins, including enzymes and hemoglobin, the latter being crucial for transporting oxygen to tissues throughout the body for metabolism. The Recommended Daily Intake (RDI) of iron for all ages in men and postmenopausal women is 8 mg/day and in premenopausal women of 18 mg/day.

Zinc acts as a component of several enzymes, maintaining the structural integrity of proteins and regulating gene expression. The RDI of zinc for adults is 8 mg/day for women and 11 mg/day for men **(Trumbo *et al*., 2001)**.

Bioactive compounds

Table 4 shows the different results reported by various authors regarding the content of bioactive compounds present in the lulo, among which we can observe vitamin C, polyphenols and carotenoids. Fruits and vegetable consumption are associated with a low risk of cancer incidence and mortality, and lower rates of mortality from coronary disease, according to various epidemiological studies. Bioactive compounds, such as phenols, show a great capacity to capture free radicals that cause oxidative stress, attributing to them, in turn, a beneficial effect in the prevention of cancer, and cardiovascular diseases **(Kurek *et al*., 2022**).
Vitamin C represents the most important bioactive compound found in lulo, which varies in a range of 11-47.20 mg/100 g PF (Table 4). According to **Gómez-merino *et al*. (2014)**, lulo fruits have a high content of vitamin C (29.4-30.8 mg/ kg FW) and iron 0.87-1.19 mg/ 100 g FW), which gives it diuretic and toning properties.
The RDI of vitamin C in adult men is 90 mg/day; in adult women, it is 75 mg/day. In this sense, 100 grams of this fruit would provide up to 52% of the RDI of this nutrient in adult men. In women, the contribution would be 62.93%, according to **Monsen (2000)**, of the Institute of Medicine of the United States, so this fruit represents an important source of vitamin C.

Table 4 Bioactive compounds of *Solanum quitoense* L. fruits of different genotypes

Genotypes	Peru	Ecuador	Colombia	Colombia	Ecuador	Ecuador	Ecuador
References	**Obregón & Lozano, 2021**	**Andrade-Cuvi *et al*., 2017**	**Contreras-Calderón et al., 2011**	**Moreno *et al*., 2014**	**Mertz *et al*., 2009**	**Gancel *et al*., 2008**	**Vasco *et al*., 2008**
Vitamin C (mg/Kg)	30.10	47.2	13.00	-----	11-13	-----	11-13
Total polyphenols (mg GAE)	67.24	-----	58.3	330	91.00		91.00
β-Carotene (mg)	0.74	1.67	-----	-----	-----	0.79	-----

Notes: GAE, Gallic acid equivalent

Regarding the content of phenolic compounds, most methodologies use the Folin-Ciocalteu method, which measures the reduction of Folin's reagent by phenolic compounds with the formation of a colored blue complex, which can be measured at 750 nm, taking gallic acid as a reference standard **(Imeh & Khokhar, 2002**).
The content of phenolic compounds varies in the range of 58.3 to 330 mg GAE/ 100 g FW (Table 4). According to **Vasco *et al*. (2008)**, those fruits that present a content of less than 100 mg GAE/ 100 g FW of phenolic compounds are classified as low content; however, other researchers such as **Moreno *et al*. (2014)** and **Gancel *et al*. (2008)**, reported higher values.
According to the literature, close values of phenolic compounds are reported for strawberry (264- 368 mg GAE/100 g FW), passion fruit (72 mg GAE/ 100 g FW), mango (68 mg GAE /100 g FW), tomato (10-26 mg GAE/100 g FW), guava (170-345 mg GAE/ 100 g FW), and plum (366-478 mg GAE /100 g FW (**Brat *et al*., 2006; Thaipong *et al*., 2006; Wu *et al*., 2004**).
On the other hand, when comparing the content of phenolic compounds in the pulp of S. quitoense with other tropical fruits such as guava, pitahaya, mango, or papaya, seems to have intermediate amounts of phenolic compounds (**Mahattanatawee *et al*., 2006**).
Loizzo *et al*. (2019), studied the phenolic profile of Colombian fruits of the Solanaceae and Passifloraceaes family, where a total of 16 phenolic compounds were found. The skin of these fruits presented the highest amount of phenolic compounds, with respect to the pulp and seed. Chlorogenic acid was the most abundant in all extracts. An appreciable amount of rutin hydrate was found in the skin of S. quitoense (**Loizzo *et al*., 2019**).
Gancel *et al*. (2008) found the following phenolic compounds in *S. quitoense*: chlorogenic acids and their hexoses in the edible part and flavonol glycosides in the skin; also, dihydro caffeoyl spermidine compounds (Polyamines) were found throughout the fruit. Chlorogenic acid (5-O-caffeoyl quinic acid), which belongs to the group of phenolic compounds and is found mainly in coffee and in a wide variety of fruits, is potentially beneficial to humans, due to its antioxidant, hypoglycemic, antiviral, hepaprotective, nutraceutical and other properties **(Monteiro & Farah, 2012; Somporn *et al*., 2012; Tfouni *et al*., 2014).**
Polyamines are naturally occurring compounds that are found in a wide range of food sources, including breast milk and meat, as well as plants, where they can exist in either a free form or bound to other compounds, such as hydroxycinnamic acids (**Edreva, 1996**). Polyamines have been extensively researched for their properties due to their significant role in various biological activities including cell proliferation, genes expression, and cell signaling. These compounds are acknowledged for their biological effects, particularly in cell differentiation and the regulation of inflammatory reactions (**Bachrach, 2004**). Therefore, lulo can provide a good source of spermidine, since all the polyamines present in this fruit are spermidine derivatives **(Gancel *et al*., 2008**).
Other bioactive compounds, found in the fruit of *S. quitoense*, are carotenoids, which present diverse biological activities, such as antioxidants, provitamin A, anticarcinogenic, antidegenerative, immunomodulatory, and others **(Olivares-Tenorio *et al*., 2016; Saini *et al*., 2015**).
Carotenoids are a class of natural pigments widely distributed in vegetables and fruits, being responsible for the reddish-yellow color of many foods **(Fraser *et al*., 2005; van den Berg *et al*., 2000**). **De Rosso & Mercadante (2007)** points out that the is a positive correlation has been observed between the intaken of vegetables and fruits containing carotenoids and the prevention of several chronic degenerative diseases, such as cancer, inflammation, and cardiovascular diseases, among others **(De Rosso & Mercadante, 2007; Fraser *et al*., 2005; van den Berg *et al*., 2000**).
The β-carotene values reported by several authors vary from 0.74-1.67 mg/ 100g FW. The carotenoids found in greater proportion are all-trans-β-carotene, 13-cis-β-carotene, 9-cis- β-carotene, and lutein (**Gancel *et al*., 2008**).
De Rosso *et al*. (2007), identified the types of carotenoids present in fruits native to the Brazilian Amazon, also finding all-trans-β-carotene as the main compound. Compared to other edible fruits, the β-carotene contents of the edible part of S. quitoense are higher than those of other traditional fruits, such as mango (0.444 mg β-carotene/ 100 g FW) and papaya (0.275 mg β-carotene/ 100 g FW).

Antioxidant capacity

Antioxidant capacity can be considered a factor to be considered in the analysis of the nutritional value of fruits and vegetables and in the identification of changes in the postharvest process (**Jideani *et al*., 2021**). Since the overall antioxidant capacity of a sample is determined by the synergistic interactions between different antioxidant compounds as well as the specific mechanism of action of each, appropriate procedures should be used when antioxidant extraction and capacity measurement. Antioxidants **(Kurek *et al*., 2022; Moreno *et al*., 2014**).
Kurek *et al*. (2022) points out that antioxidant activity refers to its capacity to neutralize free radicals, and its mechanism of action is due to two types of reactions: transfer of electrons and hydrogen atoms.
Various studies performed showed that lulo represents important values for antioxidant capacity as shown in Table 5, where the results determine the antioxidant capacity of *S. Quitoense* presents the results of different South American genotypes.
Several researchers have concluded that the antioxidant capacity of fruits is mainly due to the presence of phenolic compounds and to a lesser extent to the vitamin C content **(Miller & Rice-Evans, 1997; Rapisarda *et al*., 1999**). The presence of a high content of polyphenols in *S. quitoense* fruit could be responsible for the high antioxidant capacity of this fruit.

Table 5 Antioxidant capacity of *Solanum quitoense* L. fruits from different genotypes (µM TE/100 g FW)

Genotypes	Peru	Colombia	Colombia	Ecuador	Ecuador	Ecuador
References	**Obregón *et al*., 2021**	**Contreras-Calderón *et al*., 2011**	**Moreno *et al*., 2014**	**Gancel *et al*., 2008**	**Vasco *et al*., 2008**	**Mertz *et al*., 2009**
DDPH	280	-----	60.00	-----	320	---
ABTS	888	1220	-----	-----	400*	---
FRAP	197	677	6300	-----	350*	----
ORAC	-----	-----	-----	1070	-----	1160

Notes: TE, Trolox Equivalent; DPPH, diphenyl-1-picrylhydrazy; ABTS, Folin-Ciocalteu's phenol reagent reducing ability 2,2-Azinobis 3-ethylbenzthiazoline-6-sulfonic acid radical scavenging assay; FRAP, ferric ion reducing antioxidant parameter; ORAC, oxygen radical absorbance capacity, *Approximate value

Saura-Calixto & Goñi (2006) state that the antioxidant capabilities of fruits vary depending on their content of vitamin C, vitamin E, carotenoids, flavonoids, and other polyphenol.

On the other hand, the maturity stage of the fruit is important, as it affects the content of bioactive compounds and their antioxidant capacity. **Andrade-Cuvi *et al*. (2015)**, studied the antioxidant capacity content of lulo fruits at three stages of maturity (ripe, immature, and overripe), and found that overripe fruits have a hydrophilic antioxidant capacity 50% higher than ripe and immature fruits, measured by ABTS and DPPH methods. According to him, this could be since in overripe fruits, a concentration phenomenon occurs due to the dehydration of the tissues, being the *S. quitoense* fruit an alternative for use as raw material for the elaboration of processed products with a high antioxidant capacity if they are discarded.

Among the various methods that exist to determine antioxidant capacity, the ORAC method is one of the most accurate, since it includes the hydrophilic and lipophilic components of the bioactive components of the fruit (**Prior *et al.*, 2005**).

Mertz *et al*. (2009), determined the antioxidant capacity of three types of tropical fruits from Ecuador, using the ORAC method, reporting higher values (ORAC value = 1160 µM TE/100 g FW) for *Solanum quitoense*, when compared to apple (ORAC value = 190 µM TE/100 g FW), tomato (ORAC value = 160 µM TE/100 g FW), red grape (ORAC value = 400 µM TE/100 g FW), or orange (ORAC value =680 µM TE/ 100 g FW)(**Wang *et al*., 1996**).

On the other hand, **Loizzo *et al*. (2019)**, evaluated the content of phenolic compounds and antioxidant capacity of fruits of the *Solanaceae* family *(Solanum quitoense, Physalis peruviana, and Cyphomandra betacae (synonyms Solanum betaceum Cav) adn Passifloracea (Passiflora pinnatistipula, Paasiflora tripartita and Passiflora lingularis),* finding that the skin of *Solanum quitoense* presented the highest DPPH value, with a EC_{50} (value corresponding to the concentration of extract that scavenged 50% of the free radicals) of 38.8 µg/mL, the highest antioxidant capacity.

Other compounds

One of the significant applications of the lulo fruit is in the formulation and development of functional beverages, due to its pleasant and strong flavor; however, with time and processing conditions, the pulp of this fruit has a slightly bitter taste that sometimes limits its acceptance by consumers (**Forero *et al.*, 2016; Igual *et al.*, 2014**). This bitter taste could be induced by the thermal reactions of food processing **(Dawid & Hofmann, 2014; Forero *et al*., 2016**).

Forero *et al*. (2016), studied the active components of *S. quitoense* pulp bitterness, in order to study their effect on the components of fresh and dehydrated S. *quitoense* fruit. Two spermidine derivatives, N^1 ,N^4 ,N^8 -tris(dihydrocacaphoyl) spermidine and N^1 ,N^8 bis(dihydrocacaphoyl) spermidine, were isolated and their structures were confirmed by HPLC-ESI/MS and NMR analysis. The spermidine derivatives identified in lulo pulp exhibited strong ACE-I (angiotensin I converting enzyme) inhibitory activity. These results confirmed the potential use of lulo pulp as an ingredient in functional foods related to the prevention of arterial hypertension.

Hypertension is associated with risk factors for the development of cardiovascular disease. Studies have shown angiotensin I-converting enzyme (ACE) is associated with blood pressure regulation of the renin-angiotensin system (RAS); specifically, it catalyzes both the production of the vasoconstrictor peptide angiotensin II (AngII) and the inactivation of the vasodilator bradykinin **(Dong *et al*., 2022; Liu *et al*., 2013**). Thus, ACE inhibition can exert an antihypertensive effect and potent synthetic ACE inhibitor are used in the treatment of hypertension **(Pripp & Ardö, 2007; Wyvratt, 1988; Wyvratt & Patchett, 1985**). In that sense, the spermidine components found in the lulo fruit after processing could help people with high blood pressure problems (**Betoret *et al*., 2020**).

CONCLUSION

The fruit *Solanum quitoense* L. is an exceptional reservoir of a variety of essential nutrients and bioactive compounds, such as fiber, minerals, vitamin C, phenolic compounds, carotenoids, and spermidines, among others. It should be noted that the nutritional profile of these fruits is susceptible to changes based on the region and the edaphoclimatic conditions in which they are grown. Additionally, the high antioxidant capacity exhibited by these fruits makes them beneficial effect in the prevention of cancer and cardiovascular diseases. Therefore, it can be inferred that the fruits of *Solanum quitoense* L. hold great potential in the agri-food and pharmaceutical industry for the development of functional foods and ingredients.

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