# ECUADORIAN CATALOGUE

*of*

# WILD SPECIES RELATED TO SWEETPOTATO, RICE, LIMA BEAN, POTATO AND EGGPLANT

INIAP
INSTITUTO NACIONAL DE INVESTIGACIONES AGROPECUARIAS

crop wild relatives

# Ecuadorian catalogue of wild species related to sweetpotato, rice, lima bean, potato and eggplant

This publication is part of the *Potato, eggplant, bean, rice and sweetpotato wild relatives collection in Ecuador* project managed by the National Institute of Agricultural Research (INIAP) and financed by Global Crop Diversity Trust.



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Our thanks go to the Ministry of the Environment for granting the necessary collection, research and transportation permits for conducting this project, to the park rangers who allowed them to explore in protected areas, and to INABIO for identifying taxa in herbariums.

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For more information see the project website: http://www.cwrdiversity.org/.

# Prologue

Crop wild relatives (CWR) are species of plant that are genetically related to cultivated crops. Over the course of time, CWR genes have provided crops with resistance to pests and diseases, and a greater tolerance of abiotic stresses. There is therefore a need to conserve CWR diversity, with highly limited geographical distributions and others that are broader, especially in places where they can develop important characteristics in terms of biotic and abiotic factors.

Despite their importance, conserving these CWR has not been a priority, either in genebanks or in conservation activities in general.

The "Potato, eggplant, bean, rice and sweetpotato wild relatives collection project in Ecuador" has focused on the fullest coverage of wild relative diversity in *ex situ* collections, and is part of an initiative entitled "Adapting agriculture to climate change: collecting, protecting and preparing related wild species" that Global Crop Diversity Trust and Royal Botanic Gardens, Kew, United Kingdom, are carrying out in conjunction with the National Institute of Agricultural Research - INIAP.

The goal of this project was to collect various wild species of potato, lima bean, eggplant, rice and sweetpotato, and it aims to conserve these phyto-genetic resources in genebanks so that they can be used for crop improvement purposes. The initiative thus safeguards part of the existing CWR genetic diversity and prevents it from becoming extinct in the field.

The purpose of this publication is to make the CWR biodiversity of various crops that are important for food security known to the scientific community and to society in general, thus enabling decision-makers to draw up plans and programs for conserving these CWR and their ecosystems.

I congratulate the authors of this catalogue, which will become a compulsory reference work for biodiversity studies and for genebank administrators. My thanks go to the technical personnel, guides and peasants who helped collect and conserve these CWR. My appreciation also goes to Global Crop Diversity Trust and Royal Botanic Gardens, Kew, United Kingdom, for financing the project, and to the Ministry of the Environment for approving the research permits.

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Interim Director, Santa Catalina Experimental Station

# Introduction

Ecuador has high biodiversity in relation to its relatively small surface area, and this is recognized worldwide. One subgroup of this biodiversity, agrobiodiversity, is particularly important, since it forms the basis of food security and sovereignty for all Ecuadorians. To this agrobiodiversity, which can be found on small farms and cultivated plots throughout the country, can be added crop wild relatives. Crop wild relatives (CWR) are commonly defined in terms of wild species that are closely related to agricultural and horticultural crops (Maxted and Kell, 2009).

Using wild relatives to improve crops is a practice that dates back more than 70 years, albeit with greater emphasis in the last 30, and it has contributed genes for pest and disease resistance, abiotic factor tolerance, increasing quality and yield, etc. Important worldwide crops such as tomato, potato, rice, wheat, corn, barley, cassava, millet, sunflower, lettuce, banana, peanut and chickpea have received characteristics donated by their wild relatives that have contributed to solving problems in cultivated varieties and helped to feed the world's population (Hajjar and Hodkin, 2007).

Despite the importance of CWR, there are still materials that are vulnerable to loss, and many of these are not represented in the world's genebanks. A call went out back in the seventies about the danger of CWR being lost around the world and the need for them to be conserved (Harlan, 1976). Jarvis et al. (2008) have already presented data on the vulnerability of wild peanut *Arachis* spp., potato *Solanum* spp. and cowpea *Vigna* spp. species, due to the effects of climate change.

It is for this reason that a worldwide initiative has been designed to collect, conserve and use crop wild relatives as a climate change adaptation alternative (Dempewolf et al., 2014). The objectives of this global project are as follows.

1. To identify CWR not included in existing genebank collections that are in the greatest danger of extinction and are extremely important if agriculture is to adapt to climate change.
2. To collect CWR in their natural surroundings and conserve them in genebanks.
3. To evaluate these and other CWR materials already in collections for desirable characteristics, so that they can be used to genetically improve crops.
4. To ensure that the resulting products and information are widely available.

These wild species have adapted and are developing at different bioclimatic levels, which are areas at successive altitudes and with the corresponding temperature variations. Each region has a series of levels that are defined on the basis of their temperature and their characteristic vegetable taxa (Rivas-Martinez, 1987). The following bioclimatic levels exist in Ecuador: Montane, High Montane, Upper High Montane, Low Montane, Nival, Piedmontane, Subnival and Lowland (MAE, 2013).

When choosing wild species of worldwide importance, experts drew up an inventory of species and prioritized them on the basis of three parameters: (a) socioeconomic importance of the crop; (b) potential use for improvement (crossability); and (c) threat level. These parameters resulted in an inventory of 1667 taxa, divided into 37 botanic families, 108 genera, 1392 species and 299 subspecies (Vincent et al., 2013).

Ecuador, through the country's National Institute of Agricultural Research (INIAP), was invited to take part in this worldwide project and focused on collecting and subsequently conserving the following 16 wild relative species.

Potato wild relatives: *Solanum albicans* (Ochoa) Ochoa, *Solanum albornozii* Correll, *Solanum andreanum* Baker, *Solanum chilliasense* Ochoa; *Solanum chomatophilum* Bitter; *Solanum colombianum* Dunal; *Solanum minutifoliolum* Correll; and *Solanum olmosense* Ochoa.

Eggplant wild relatives: *Solanum torvum* Sw.; *Solanum grandiflorum* Ruiz & Pav. and *Solanum asperolanatum* Ruiz & Pav.

Sweetpotato wild relatives: *Ipomoea ramosissima* (Poiret) Choisy; *Ipomoea tiliacea* (Willdenow) Choisy in D.C. and *Ipomoea trifida* (H.B.K.) G. Don.

Rice wild relative: *Oryza latifolia* Desv. Bean wild relative: *Phaseolus augusti* Harms.

These wild relatives were found in farmers' fields, beside roads, on remote land and in protected areas, frequently under difficult biotic and abiotic conditions. It is precisely the wide-ranging adaptation that can be seen in how these crop wild relatives have evolved that has equipped them with outstanding genetic characteristics and thus made them valuable sources of desirable characteristics for improving cultivated plants.

The work done by INIAP is in the context of the 2015-2030 National Biodiversity Strategy, Result 14: "Ecuador implements comprehensive measures to prevent the loss of wildlife and cultivated species deemed to be a national priority" (Ecuadorian Ministry of the Environment, 2016). INIAP, as the country's principal agricultural research entity, is accordingly adding wildlife species related to crops of national importance to its genebank, with a view to guaranteeing the food security of future generations. The authors hope that this work will create an awareness in the public of the importance of wild relatives in the country.

# Methodology

## Collection

This catalogue is the product of various collection missions between May 2017 and August 2018 for species selected by Royal Botanic Gardens, Kew (Table 1). The secondary information relating to possible collection sites was supplied by Royal Botanic Gardens, Kew, plus the National Herbarium and the Pontificia Universidad Católica Herbarium in Ecuador.

Before the collections took place, legal aspects were covered by obtaining Scientific Research Authorization Permit No. 007-2016-IC-FLO-DNB/MA from the Ministry of the Environment, which authorized the species listed in Table 1 to be collected.

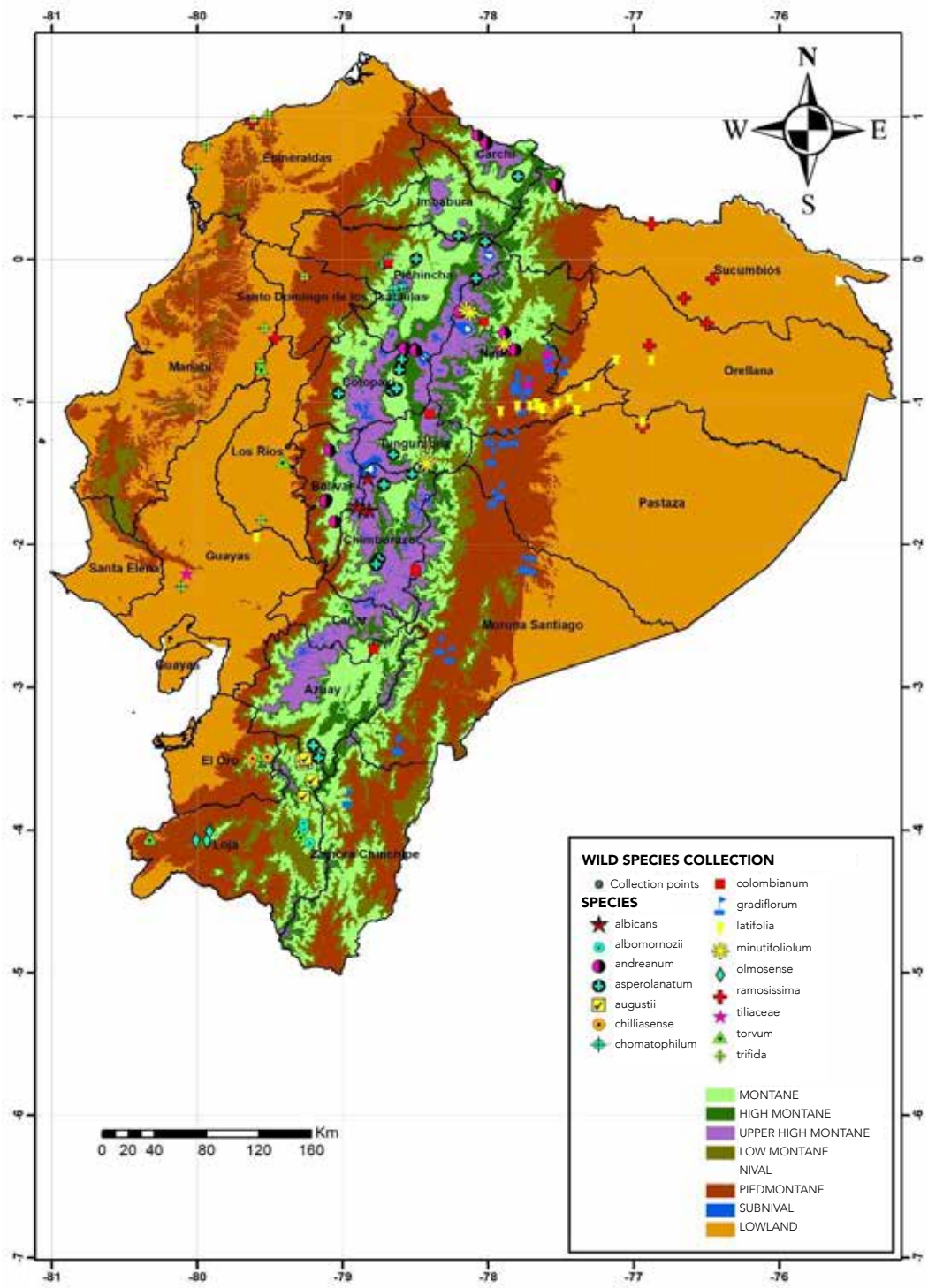
Collections were made in 22 provinces, 10 on the Sierra, 6 on the Coast and 6 in Amazonia, with 164 items collected from 16 species: 3 of *Ipomoea*, 1 of *Oryza*, 1 of *Phaseolus* and 11 of *Solanum* (Table 2 and Map 1).

**Table 1**. Wild species selected for collection in Ecuador. INIAP-DENAREF, 2018

| Gene pool | Family | Scientific name |
|---|---|---|
| Sweetpotato (*Ipomoea batatas* (L) LAM) | Convolvulaceae | *Ipomoea ramosissima* (Poiret) Choisy |
| Sweetpotato (*Ipomoea batatas* (L) LAM) | Convolvulaceae | *Ipomoea tiliacea* (Willdenow) Choisy in D.C. |
| Sweetpotato (*Ipomoea batatas* (L) LAM) | Convolvulaceae | *Ipomoea trifida* (H.B.K.) G.Don. |
| Rice (*Oryza sativa* L.) | Poaceae | *Oryza latifolia* Desv. |
| Lima bean (*Phaseolus lunatus* L.) | Leguminosae | *Phaseolus augusti* Harms |
| Potato (*Solanum tuberosum* L.) | Solanaceae | *Solanum albicans* (Ochoa) Ochoa |
| Potato (*Solanum tuberosum* L.) | Solanaceae | *Solanum albornozii* Correll |
| Potato (*Solanum tuberosum* L.) | Solanaceae | *Solanum andreanum* Baker |
| Potato (*Solanum tuberosum* L.) | Solanaceae | *Solanum chilliasense* Ochoa |
| Potato (*Solanum tuberosum* L.) | Solanaceae | *Solanum chomatophilum* Bitter |
| Potato (*Solanum tuberosum* L.) | Solanaceae | *Solanum colombianum* Dunal |
| Potato (*Solanum tuberosum* L.) | Solanaceae | *Solanum minutifoliolum* Correll |
| Potato (*Solanum tuberosum* L.) | Solanaceae | *Solanum olmosense* Ochoa |
| Eggplant (*Solanum melongena* L.) | Solanaceae | *Solanum asperolanatum* Ruiz & Pav. |
| Eggplant (*Solanum melongena* L.) | Solanaceae | *Solanum grandiflorum* Ruiz & Pav. |
| Eggplant (*Solanum melongena* L.) | Solanaceae | *Solanum torvum* Sw. |

**Table 2**. Number of items collected by province. INIAP-DENAREF, 2018.

| Regions and Provinces | Species | Number of items collected |
|---|---|---|
| Sierra | *Phaseolus augusti* | 7 |
| | *Solanum albicans* | 4 |
| | *Solanum albornozii* | 9 |
| | *Solanum andreanum* | 9 |
| | *Solanum asperolanatum* | 20 |
| | *Solanum colombianum* | 10 |
| | *Solanum chomatophilum* | 7 |
| | *Solanum minutifoliolum* | 7 |
| | *Solanum olmosense* | 3 |
| | *Solanum torvum* | 5 |
| Coast | *Ipomoea ramosissima* | 2 |
| | *Ipomoea tiliacea* | 1 |
| | *Ipomoea trífida* | 10 |
| | *Oryza latifolia* | 1 |
| | *Solanum chilliasense* | 2 |
| | *Solanum torvum* | 3 |
| Amazonia | *Ipomoea ramosissima* | 7 |
| | *Ipomoea tiliacea* | 3 |
| | *Oryza latifolia* | 15 |
| | *Solanum andreanum* | 10 |
| | *Solanum colombianum* | 4 |
| | *Solanum grandiflorum* | 21 |
| | *Solanum minutifoliolum* | 4 |




**Map 1.** Geographical distribution of collections in 2017 and 2018. INIAP–DENAREF, 2018.

A map was produced for each target species, showing collection point distribution in all localities where collections were made, using a GPS Garmin eTrex 10 receiver, and these were superimposed on the map showing bioclimatic levels (MAE, 2013).

## Seed collection methods

Various seed collection methods were used, depending on the type of fruit in each family: manual harvesting was used for berries in the *Solanaceae* family, pruning of the panicle for the *Poaceae* family, manual harvesting of capsules for the *Convolvulaceae* family, and manual harvesting of the pod for the *Leguminosae* family.

In the case of berries in the *Solanaceae* family, when these were collected they were deposited directly into cloth bags, in an effort to ensure that the fruits did not get squashed and then overheat and ferment during the collection period. The seeds were extracted from the fleshy fruit immediately after the field trip, following the Monteros-Altamirano et al. (2018) protocols. The containers used with the other families were correctly labelled paper bags.

The germplasm collected is conserved in a cold chamber in the INIAP Genebank at a temperature of -15°C (Monteros-Altamirano et al., 2018). Herbarium duplicates are also kept on the premises of the INIAP National Plant Genetic Resources Department – ENAREF, the National Herbarium, and Royal Botanic Gardens, Kew.

**Table 3**. Source and characteristics of the thematic layers used in the ecogeographical characterization. INIAP-DENAREF, 2018.

| Layers | Source | Format | Resolution or scale |
|---|---|---|---|
| Climatic | WorldClim (1996) | Raster | 30 arc-seconds |
| Geophysical | Shuttle Radar Mission (NASA, 2015) | Raster | 30 arc-seconds |
| Edaphic | MAGAP-IICA-CLIRSEN (2000) | Vector | 1: 50.000 |

### Conservation status

The categories and criteria stated on the IUCN Red List (2012) were used for determining the conservation status of the different species. Given that the full information needed for categorization has not yet been completed, a "preliminary" categorization is made in this document, as follows.


CRITICALLY ENDANGERED. A taxon is Critically Endangered when the best evidence available indicates that it meets any of criteria A to E (see Section V of IUCN, 2012) and is therefore considered to have an extremely high risk of becoming extinct in nature.


ENDANGERED. A taxon is Endangered when the best evidence available indicates that it meets any of criteria A to E (see Section V of IUCN, 2012) and is therefore considered to have a very high risk of becoming extinct in nature.


VULNERABLE. A taxon is Vulnerable when it has a high risk of becoming extinct in nature.


NEAR THREATENED. A taxon is Near Threatened when it is currently not Critically Endangered, Endangered or Vulnerable but is close to classifying or likely to classify in a threatened category in the near future.


LEAST CONCERN. A taxon is classified under Least Concern when it is not classified as being Critically Endangered, Endangered, Vulnerable or Near Threatened.

### Ecogeographic characterization

Ecosystems where species were collected were given an ecogeographic categorization based on 10 variables: three climatic (annual mean temperature, annual precipitation), two geophysical (altitude and gradient), and five edaphic (principal soil texture, rock depth, pH, organic carbon content, and stone content).

The ecogeographic characterization of sampling sites was based on geographic coordinates. The source, format and resolution or scale of the different thematic layers are shown in Table 3.

Slope gradient was classified in the following manner: 0%-2%, flat; 2%-5% slightly inclined; 5%-10%, inclined; >10%: steeply inclined.

Texture was defined using the USDA Texture Diagram, which is a tool for obtaining classes of texture as a function of sand, silt and clay percentages (USDA, 2014). Other soil variables were obtained from the "Generation of georeferenced information for sustainable development of the agricultural sector" project, which was carried out in the context of the Cooperation Agreement between the Ministry of Agriculture and Cattle, the Centre for Integrated Surveying of Natural Resources by Remote Sensors, and the Inter-American Institute for Cooperation on Agriculture (MAGAP - IICA - CLIRSEN, 2000).

Once collection sites had been characterized using the CAPFITOGEN tool (Parra-Quijano et al., 2015), each sample collected was assigned the corresponding environmental information, based on its origin. Given that various samples of a species were collected, the habitat description indicated the ranges of the different ecogeographical variables where these collections were made.

## How to use this catalogue

This catalogue contains profiles of each species, and information sheets. The species included are a selection of the wild relatives of five key crops covered by the project (sweetpotato, rice, lima bean, potato and eggplant).

The catalogue is designed to be used both when planning conservation strategies in the field and for *ex situ* conservation.

The profile of each species includes a series of photos and maps relating to the herbarium samples, plant morphology and bioclimatic levels.

# *Ipomoea ramosissima* (Poiret) Choisy

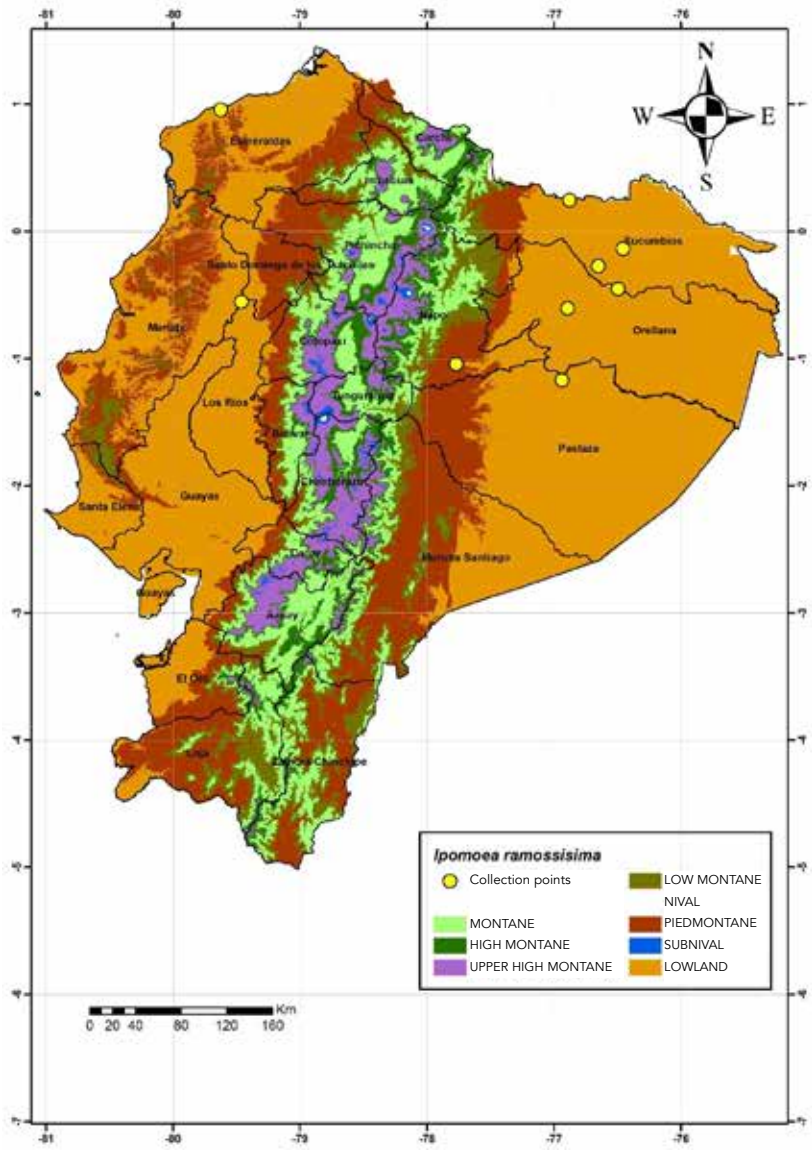
**Botanic description**
Perennial climbing plant, stems 4m-5m, herbaceous, simple or compound inflorescence of 2-12 pink or purple flowers (RBG Kew, 2016) (Figure 1).

**Conservation status**
Near Threatened (NT)

NT
PRELIM

**Geographical distribution**
This species is found in the Amazonian provinces of Napo, Orellana and Sucumbíos, and in Los Ríos province (Coast), at Lowland and Piedmontane bioclimatic levels (see Table 2, Map 2).

**Habitat**
Found in ecosystems with an annual mean temperature of between 23.5°C and 25.4°C and annual precipitation of between 796mm and 4078mm, at altitudes ranging from 52m to 455m and with flat slopes. This species grows in moderately deep, non-stony clay soils with low organic carbon and an acid pH. It grows easily along riverbanks, beside roads, and together with crops in the area.




**Map 2.** Geographical distribution of *Ipomoea ramosissima*. INIAP-DENAREF, 2018.


**Figure 1.** *Ipomoea ramosissima*. A. Close-up of plant. B. Close-up of flower. C. Close-up of leaves. D. Herbarium.

# WILD SWEETPOTATO SPECIES

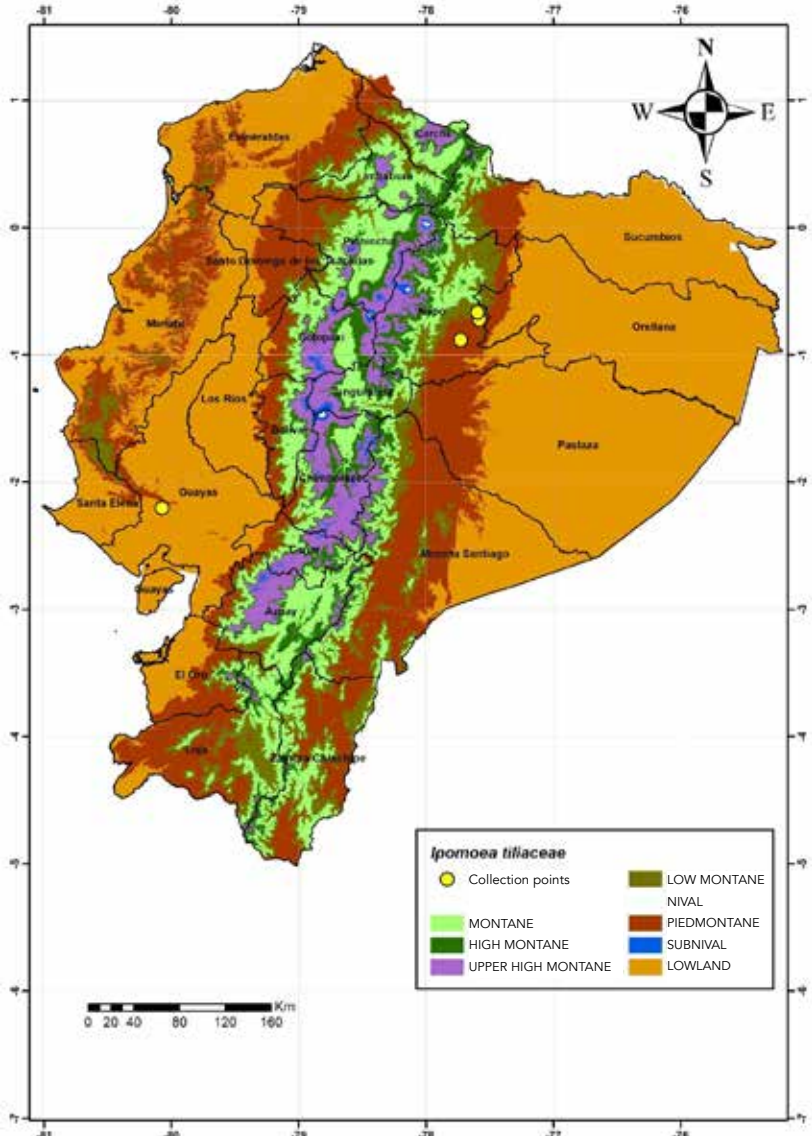
## *Ipomoea tiliaceae* (Willdenow) Choisy in D.C.

**Botanic description**
Thin, interwoven stems various meters long with oval leaves 3cm-10cm long at the base, inflorescences in the form of axillary peduncles occurring singly or in pairs. The pink or purple flower often has a darker center (RBG Kew, 2016) (Figure 2).

**Conservation status**
Near Threatened (NT)


**Geographical distribution**
Found in Napo province (Amazonia) and in Guayas province (Coast), at Lowland and Piedmontane bioclimatic levels (see Table 2, Map 3).

**Habitat**
Found in ecosystems with an annual mean temperature of between 19.1°C and 25.3°C and annual precipitation of between 744mm and 4320mm, at altitudes ranging from 41m to 1500m and with flat slopes. This species grows in moderately deep, non-stony clay-loam soils with medium organic carbon and an acid pH. It can easily be found beside roads and rivers, and on uncultivated land.




**Map 3.** Geographical distribution of *Ipomoea tiliaceae*. INIAP-DENAREF, 2018.


**Figure 2.** *Ipomoea tiliaceae*. A. Close-up of plant. B. Close-up of flowers. C. Close-up of leaves. D. Herbarium.

# WILD SWEETPOTATO SPECIES

## *Ipomoea trífida* (H.B.K.) G.Don.

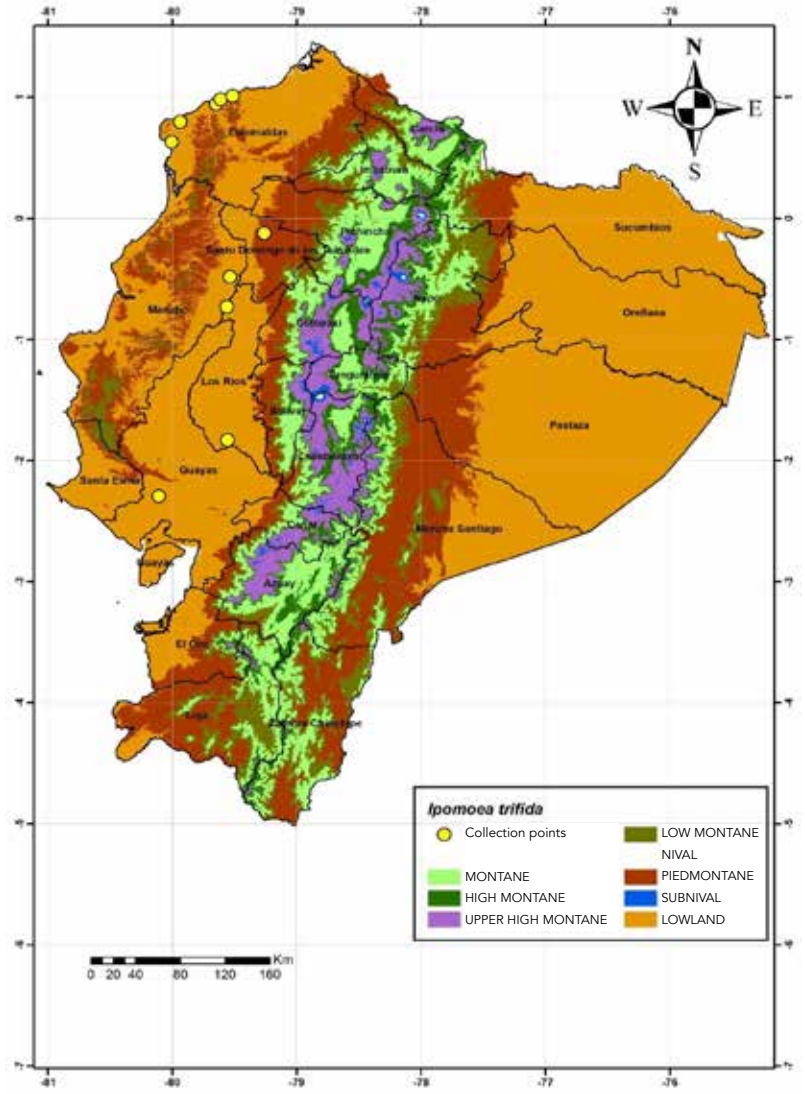
**Botanic description**
Creeping growth with oval leaves, round or angular basal lobules. Inflorescences with peduncles of variable length and funnel-shaped flowers 3cm-4cm long, dark pink or lavender in color, and small, dark brown seeds (RBG Kew, 2016) (Figure 3).

**Conservation status**
Near Threatened (NT)

NT
PRELIM

**Geographical distribution**
This species is found on the Coast of Ecuador, in Esmeraldas, Guayas, Los Ríos and Manabí provinces, at Lowland and Piedmontane bioclimatic levels (see Table 2, Map 4).

**Habitat**
Found in ecosystems with an annual mean temperature of between 24.0°C and 25.6°C and annual precipitation of between 667mm and 3070mm, at altitudes ranging from 7m to 351m and with flat slopes. This species grows in moderately deep, non-stony clay-loam soils with low organic carbon and an acid to moderately alkaline pH. It can be found easily beside roads and alongside local crops.




**Map 4.** Geographical distribution of *Ipomoea trífida*. INIAP-DENAREF, 2018.

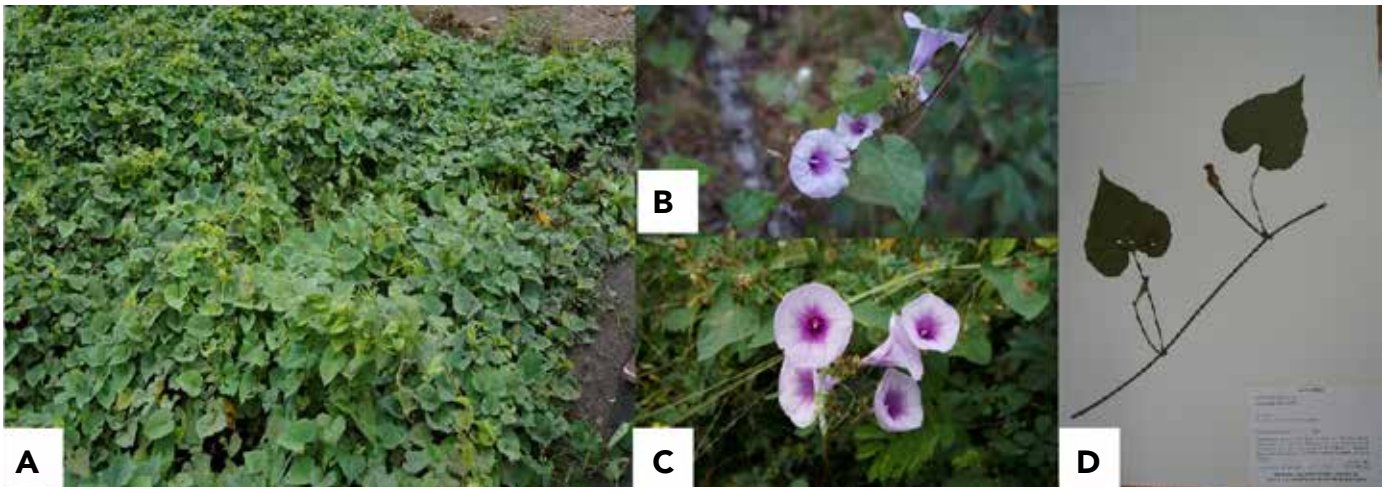



**Figure 3.** *Ipomoea trífida*. A. Close-up of plant. B. Close-up of leaves and flowers. C. Close-up of flowers. D. Herbarium.

# WILD RICE SPECIES

## *Oryza latifolia* Desv.

### Botanic description

Herbaceous growth with stems 1m-3m high. Lanceolate leaves 0.25m-0.72m with ligule. The flower is a panicle with dark brown glumes, there is a well-developed lemma with thorns, and pubescent palea. The fruit is an oblong caryopsis 6.0mm-6.5mm long (RBG Kew, 2016) (Figure 4).

### Conservation status

Least Concern (LC)

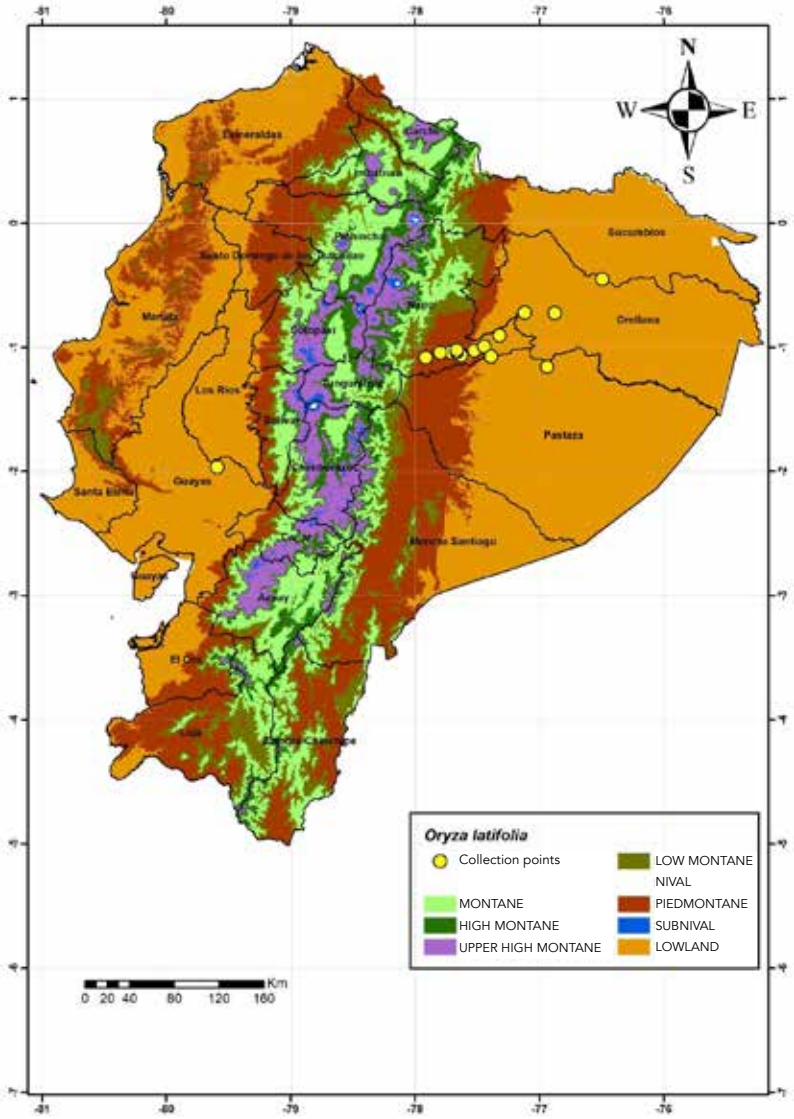
LC
PRELIM

### Geographical distribution

*Oryza latifolia* grows mainly in Ecuador's Amazonia region, in Napo, Orellana, Pastaza and Sucumbíos provinces, and on the Coast (Guayas province) at Lowland and Piedmontane bioclimatic levels (see Table 2, Map 5).

### Habitat

Found in ecosystems with an annual mean temperature of between 23.0°C and 25.3°C and annual precipitation of between 1344mm and 4242mm, at altitudes ranging from 8m to 570m and with flat to slightly inclined slopes. This species grows in moderately deep, non-stony clay-loam soils with low organic carbon and an acid pH. It grows easily in moist soils with little drainage along riverbanks or beside trails.




**Map 5.** Geographical distribution of *Oryza latifolia*. INIAP-DENAREF, 2018.

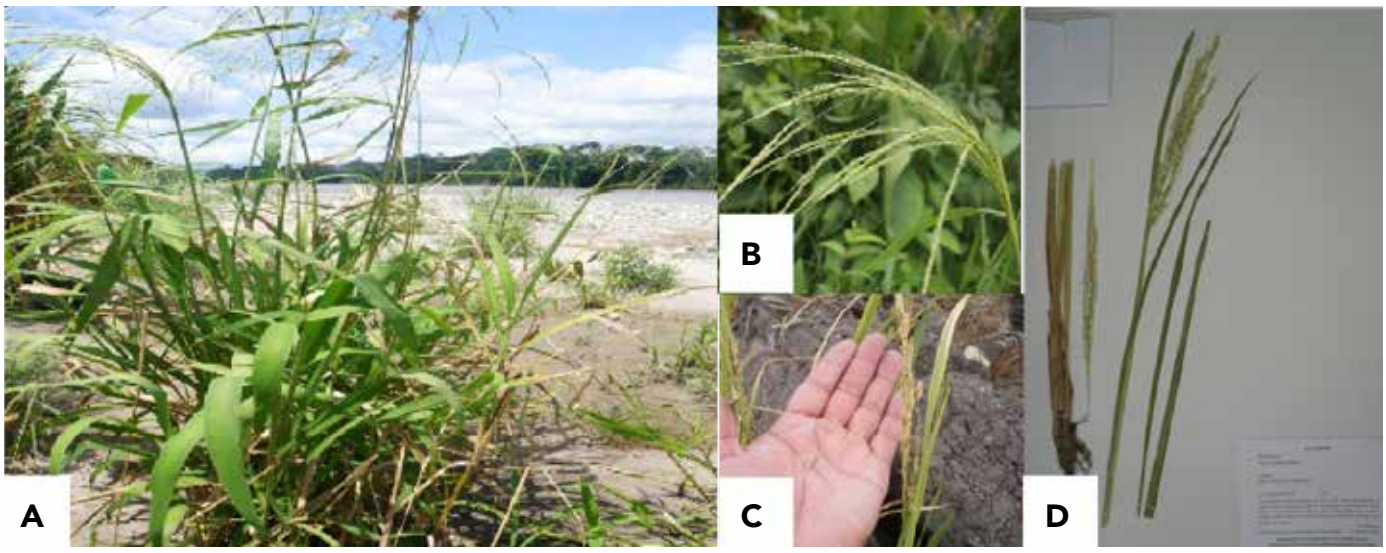



**Figure 4.** *Oryza latifolia*. A. Close-up of plant. B. Close-up of flowers. C. Close-up of seeds. D. Herbarium.

# WILD LIMA BEAN SPECIES

## *Phaseolus augusti* Harms

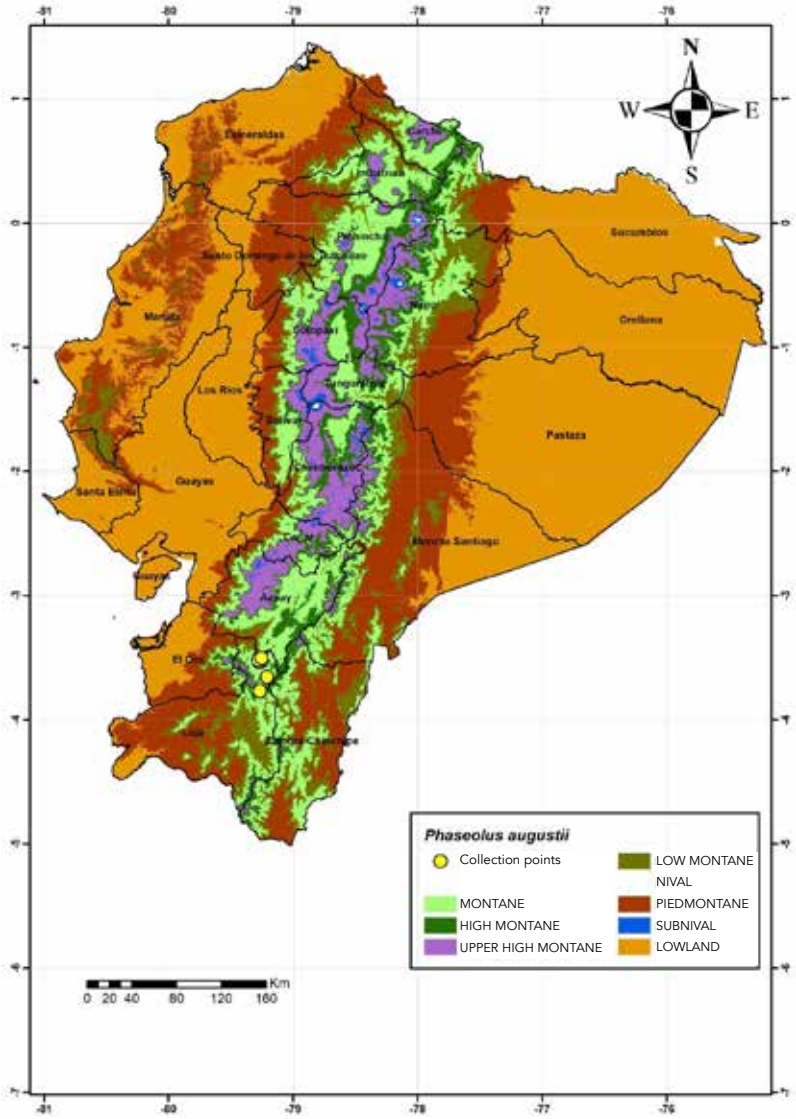
**Botanic description**
Volatile growth habit, 2m long or more, pubescent except on leaves and flowers. Petioles 7mm long, leaves 5cm to 7cm long, broad oval folioles, and truncated oblique side. Flowers in bunches, calyx 4.0mm to 4.5mm, violet except for wings, which are yellowy-brown. Downy pods 5cm long and 8mm-9mm wide (RBG Kew, 2016) (Figure 5).

**Conservation status**
Vulnerable (VU)

VU
PRELIM

**Geographical distribution**
Found specifically in Loja province, in Ecuador's southern Sierra, at Montane, Low Montane Nival and High Montane bioclimatic levels (see Table 2, Map 6).

**Habitat**
*Phaseolus augusti* is found in ecosystems with an annual mean temperature of between 13.3°C and 19.9°C and annual precipitation of between 677mm and 919mm, at altitudes ranging from 1621m to 2637m and with slightly to steeply inclined slopes. This species grows in moderately deep, non-stony loam soils with low organic carbon and an acid pH. It grows with difficulty in dry soils in a temperate climate, alongside thickets in streams and beside trails.




**Map 6.** Geographical distribution of *Phaseolus augusti*. INIAP-DENAREF, 2018.


**Figure 5.** *Phaseolus augusti*. A. Close-up of plant. B. Close-up of leaves. C. Close-up of pod. D. Herbarium.

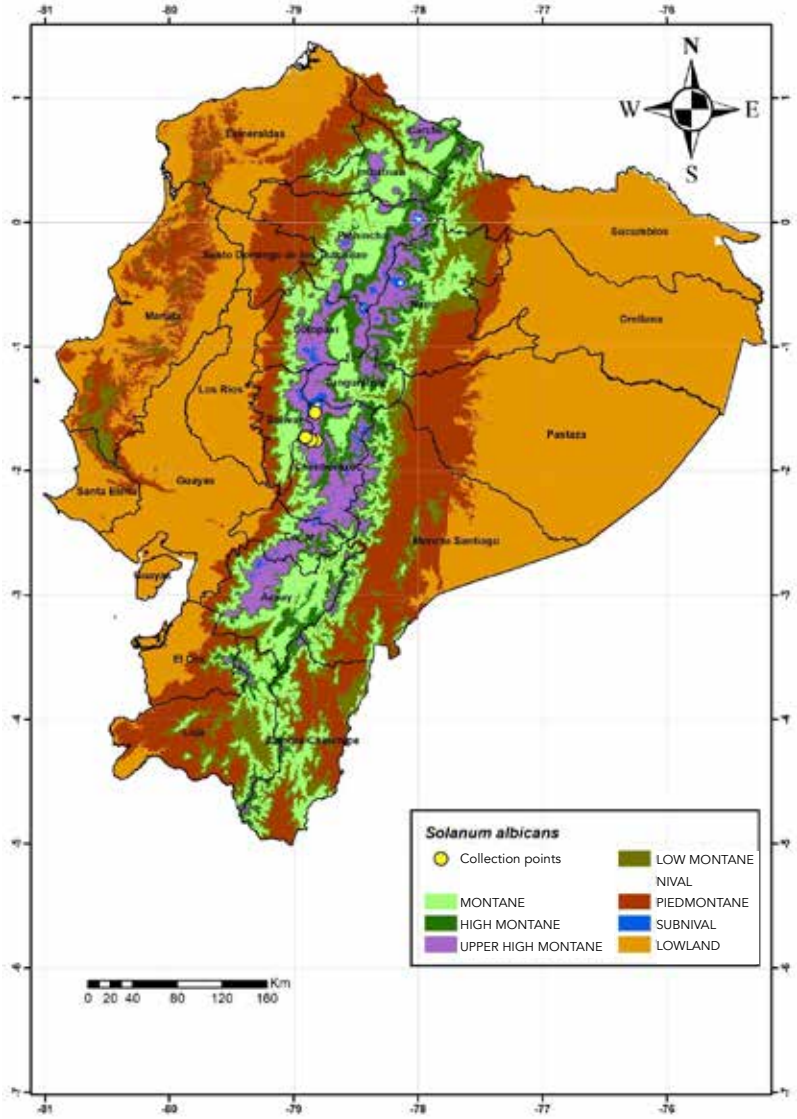
# *Solanum albicans* (Ochoa) Ochoa

**Botanic description**
Membranous, densely pubescent green leaves with off-white hairs. The flowers are white to light blue, occasionally darker, fruits are round and fleshy (RBG Kew, 2016) (Figure 6).

**Conservation status**
Endangered (EN)


**Geographical distribution**
Found in Chimborazo province (Sierra), at the Upper High Montane bioclimatic level (see Table 2, Map 7).

**Habitat**
Found in ecosystems with an annual mean temperature of between 4.9°C and 6.8°C and annual precipitation of between 672mm and 803mm, at altitudes ranging from 3816m to 4101m and with inclined slopes. This species grows in moderately deep, non-stony loam soils with high organic carbon and an acid pH. It grows in a *páramo* (moorland) environment where it withstands frost, in black soils with earth movement alongside streams or beside roads.




**Map 7.** Geographical distribution of *Solanum albicans*. INIAP-DENAREF, 2018.

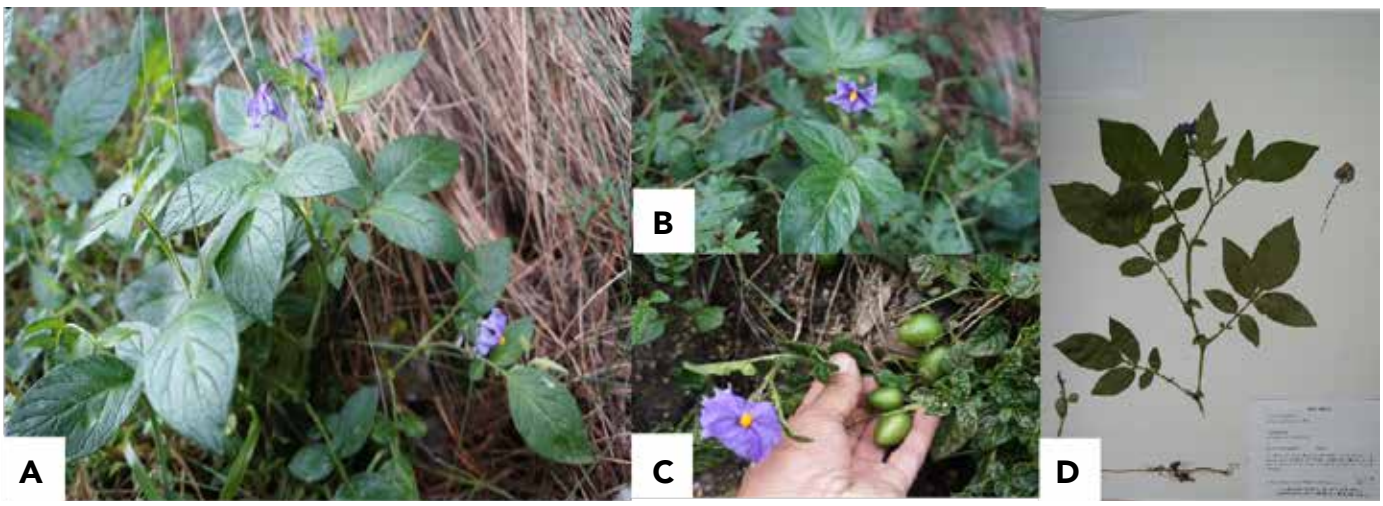



**Figure 6.** *Solanum albicans*. A. Close-up of plant. B. Close-up of flower. C. Close-up of fruits. D. Herbarium.

# WILD POTATO SPECIES

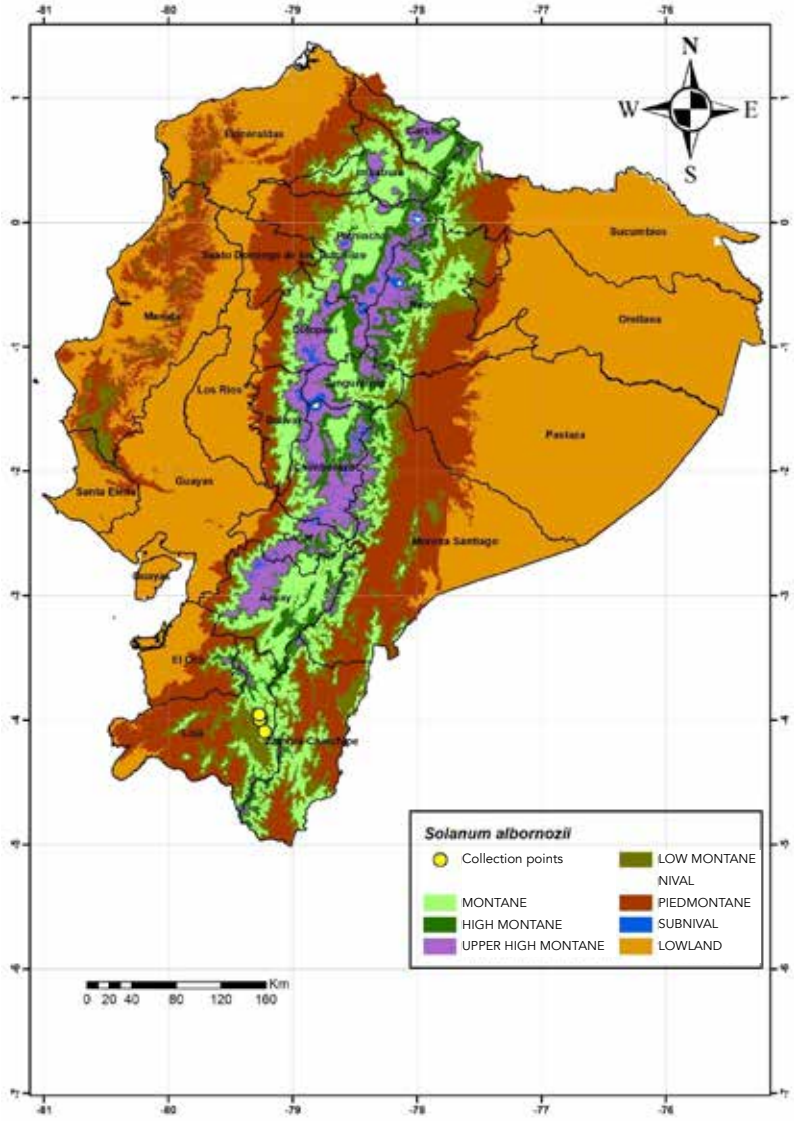
## *Solanum albornozii* Correll

**Botanic description**
Plant 0.4m-1.0m high, erect, light green to dark green pinnate leaves, inflorescence with apparently perfect flowers, white flowers with a lilac vein on the back, fruit with light green oval berry (RBG Kew, 2016) (Figure 7).

**Conservation status**
Endangered (EN)


**Geographical distribution**
Found in Loja province (Sierra), at the Montane and Low Montane Nival bioclimatic levels (see Table 2, Map 8).

**Habitat**
Found in ecosystems with an annual mean temperature of between 14.0°C and 14.7°C and annual precipitation of between 1024mm and 1056mm, at altitudes ranging from 2445m to 2628m and with inclined slopes. This species grows in moderately deep, frequently stony sandy-loam soils with very low organic carbon and a moderately alkaline pH. It is a species that is hard to find and exists near streams, alongside crops, and under the surface of trails. Its phenological development coincides with the rainy season, when plants, flowers and fruits are found, and plant senescence occurs as the dry season progresses.




**Map 8.** Geographical distribution of *Solanum albornozii*. INIAP-DENAREF, 2018.

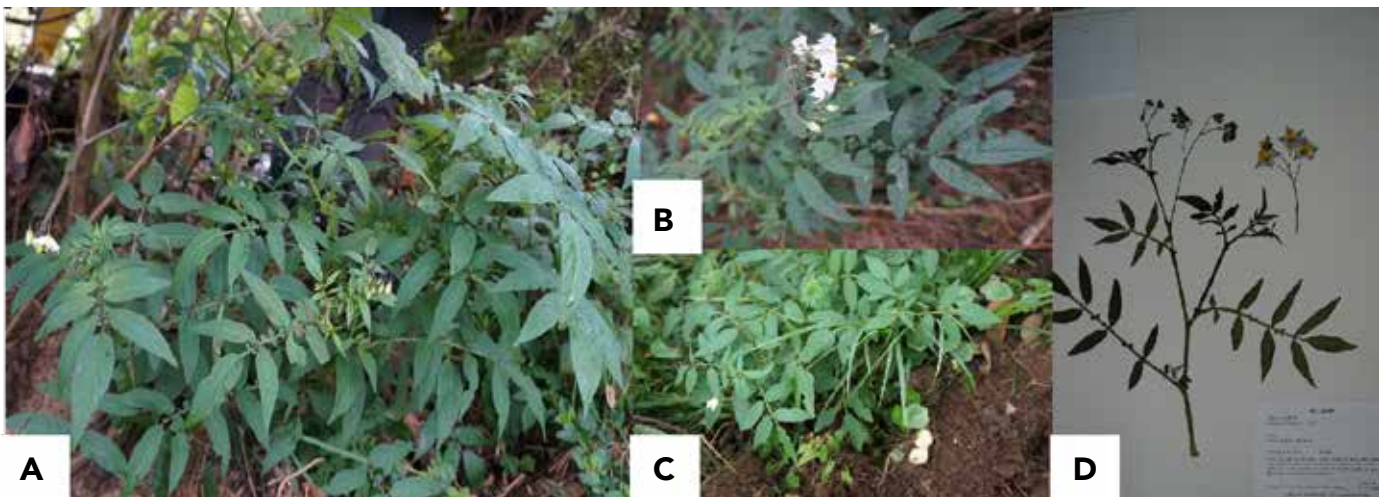



**Figure 7.** *Solanum albornozii*. A. Close-up of plant. B. Close-up of flower. C. Close-up of leaves. D. Herbarium.

# WILD POTATO SPECIES

## *Solanum andreanum* Baker

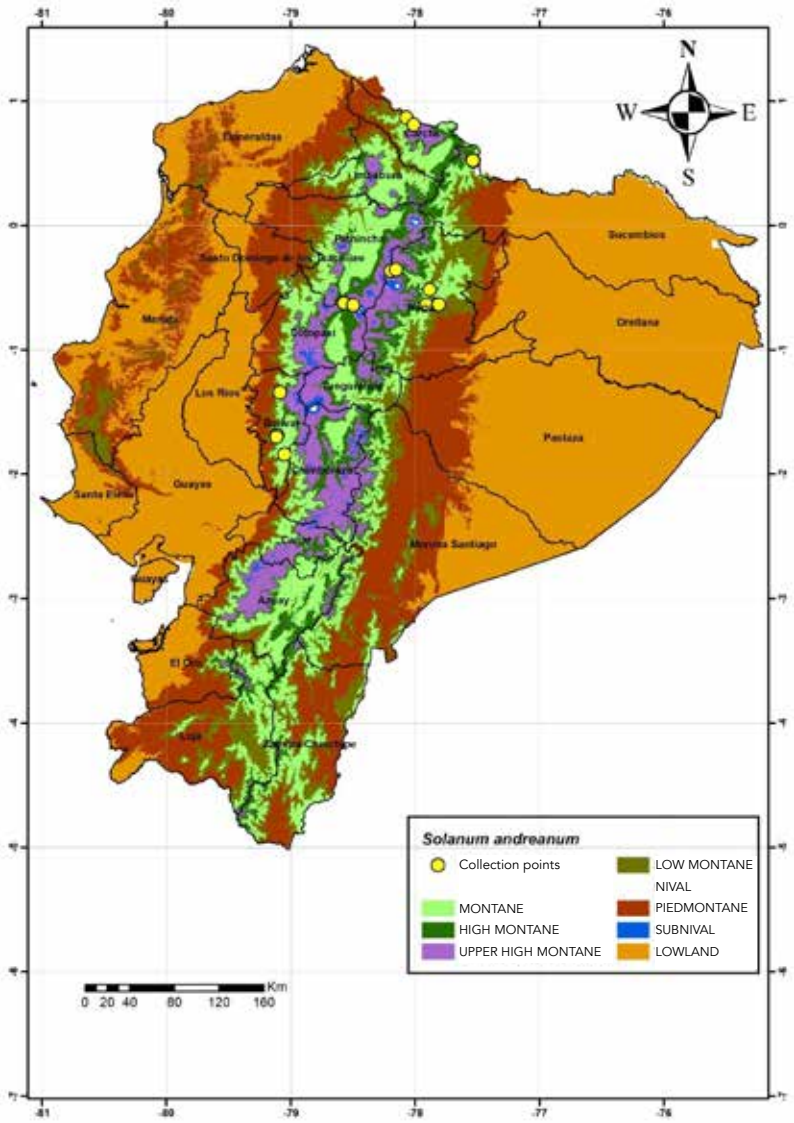
**Botanic description**
Plant 0.06m-0.86m high, straight stems, leaves dark green on the front and light green on the back, flowers lilac or bluish (RBG Kew, 2016) (Figure 8).

**Conservation status**
Vulnerable (VU)

VU
PRELIM

**Geographical distribution**
Found on the western slopes of Carchi, Cotopaxi and Bolívar provinces and on the eastern slopes of Sucumbíos and Napo provinces, at the Montane, Low Montane Nival, High Montane, Upper High Montane and Subnival bioclimatic levels (see Table 2, Map 9).

**Habitat**
Found in ecosystems with an annual mean temperature of between 6.1°C and 17.5°C and annual precipitation of between 947mm and 3277mm, at altitudes ranging from 1891m to 3794m and with inclined slopes. This species grows in moderately deep, slightly stony loam soils with high organic carbon and an acid pH. It grows in moist environments, in primary cloud forest and secondary intervened forest next to shallow water sources such as rivers and waterfalls. It is easy to find beside paths and trails.




**Map 9.** Geographical distribution of *Solanum andreanum*. INIAP-DENAREF, 2018.

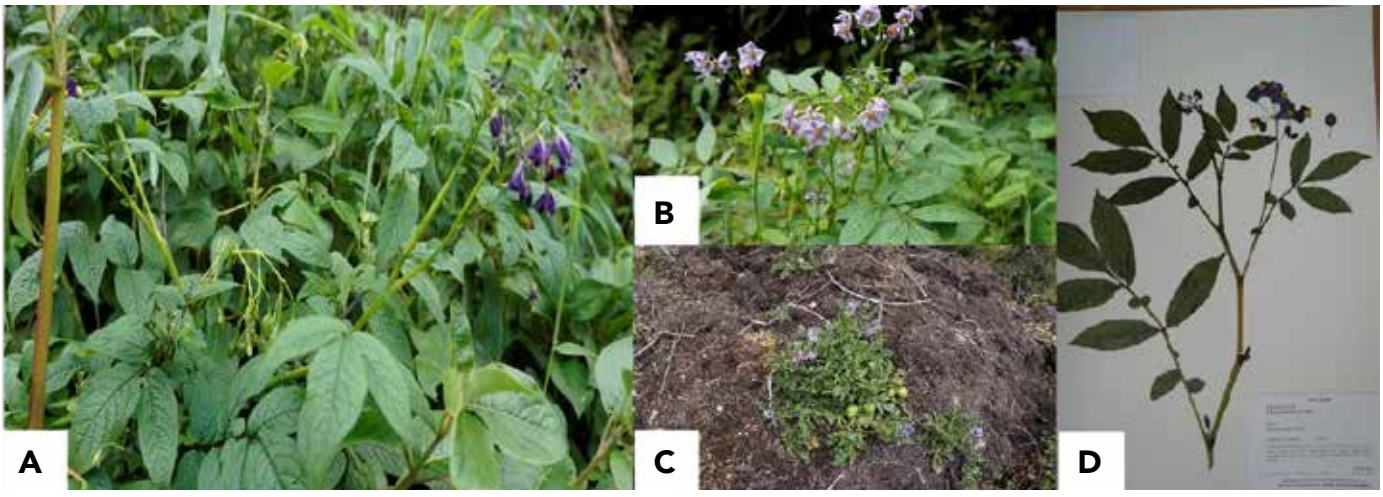



**Figure 8.** *Solanum andreanum*. A. Close-up of plant. B. Close-up of flower. C. Close-up of fruits. D. Herbarium.

# WILD POTATO SPECIES

## *Solanum chilliasense* Ochoa

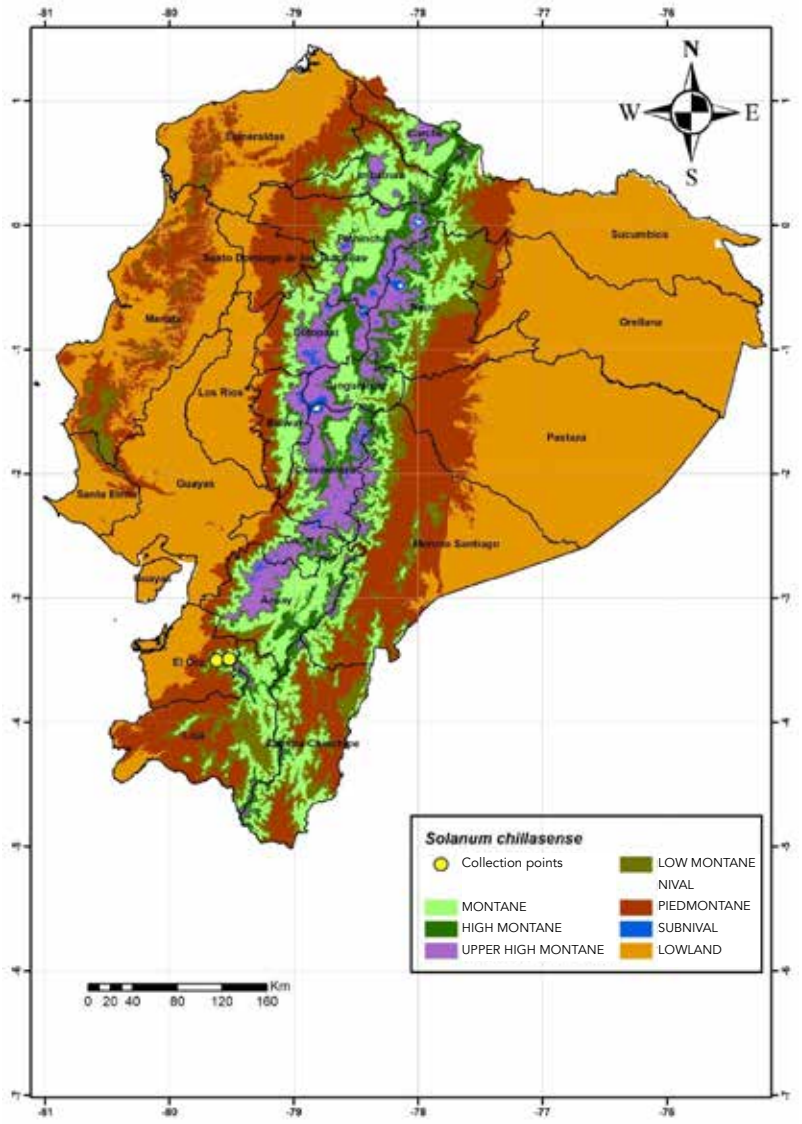
**Botanic description**
Plant 0.6m-1.0m high, erect, color green to purple-white, dark green leaves, pentagonal lilac-blue flowers with flat corolla edges, and round, green fruits (RBG Kew, 2016) (Figure 9).

**Conservation status**
Critically Endangered (CR)

CR
PRELIM

**Geographical distribution**
Found on the western slopes of El Oro province, at the Montane and Low Montane Nival bioclimatic levels (see Table 2, Map 10).

**Habitat**
Found in ecosystems with an annual mean temperature of between 10.2°C and 11.2°C and annual precipitation of between 866mm and 925mm, at altitudes ranging from 3049m to 3215m and with steeply inclined slopes. This species grows in moderately deep, non-stony loam soils with high organic carbon and an acid pH. Its development cycle coincides with the rainy season on the Sierra in the south of the country. Scarce, found next to streams and alongside trails.




**Map 10.** Geographical distribution of *Solanum chilliasense*. INIAP-DENAREF, 2018.

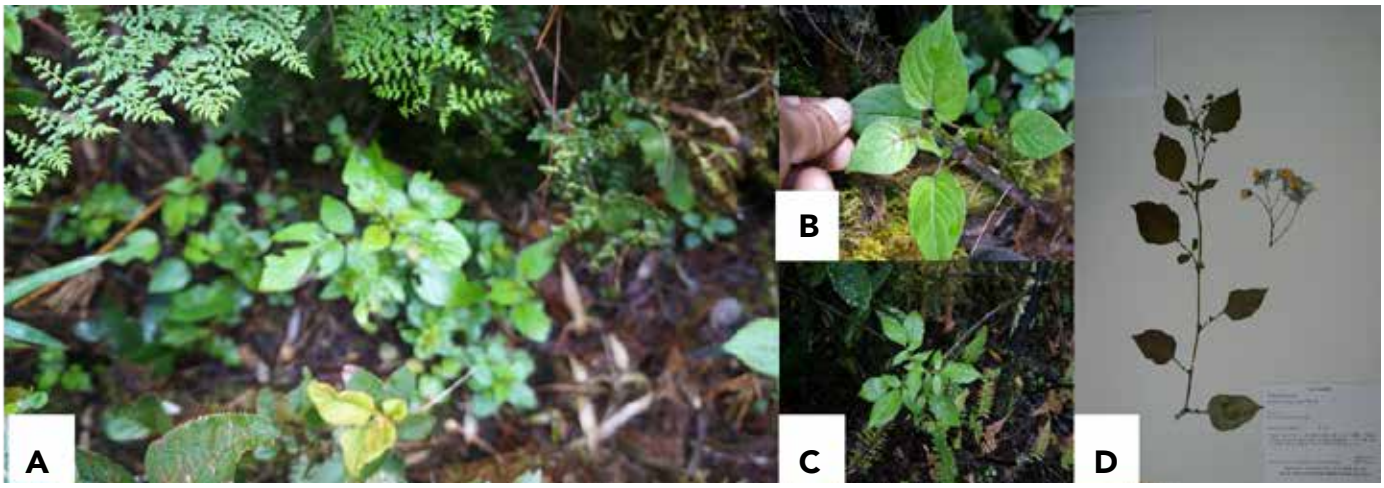



**Figure 9.** *Solanum chilliasense*. A. Close-up of plant. B. Close-up of flower. C. Close-up of fruits. D. Herbarium.

## *Solanum chomatophilum* Bitter

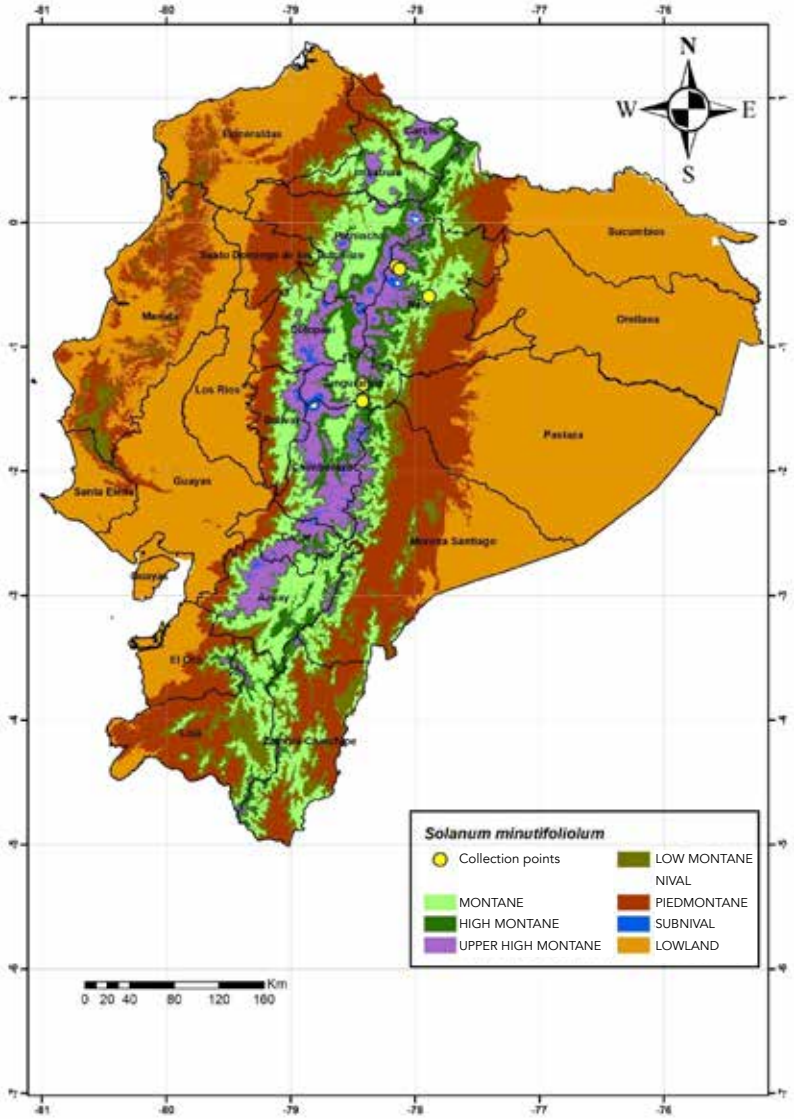
**Botanic description**
Plant 0.1m-0.9m high, stems that grow straight, asymmetrical leaves dark green on the front and light green on the back. Flowers lilac to lilac-bluish (RBG Kew, 2016) (Figure 10).

**Conservation status**
Endangered (EN)

EN
PRELIM

**Geographical distribution**
Found in Pichincha province (Sierra), at the Montane, Low Montane Nival and Upper High Montane bioclimatic levels (see Table 2, Map 11).

**Habitat**
Found in ecosystems with an annual mean temperature of between 5.4°C and 16.4°C and annual precipitation of between 1277mm and 1720mm, at altitudes ranging from 2039m to 3968m and with steeply inclined slopes. This species grows in moderately deep, non-stony loam soils with high organic carbon and an acid pH. It grows in *páramo* (moorland) and primary tropical rainforest environments with little vegetation cover. It prefers to be in streams and beside trails with earth movement.




**Map 11.** Geographical distribution of *Solanum chomatophilum*. INIAP-DENAREF, 2018.

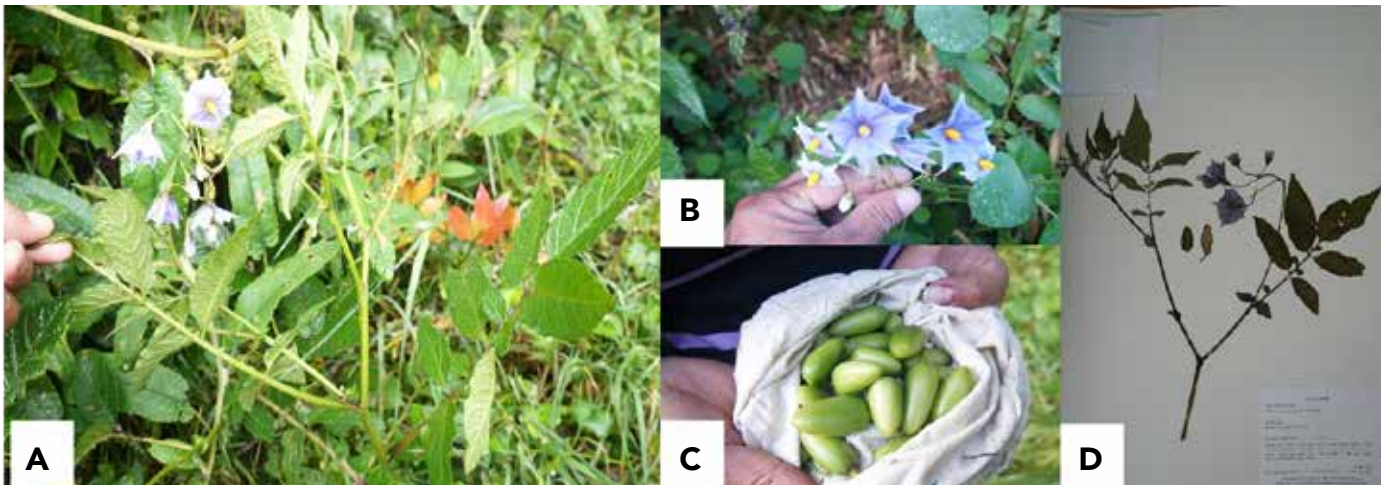



**Figure 10.** *Solanum chomatophilum*. A. Close-up of plant. B. Close-up of flowers. C. Close-up of fruits. D. Herbarium.

# *Solanum colombianum* Dunal

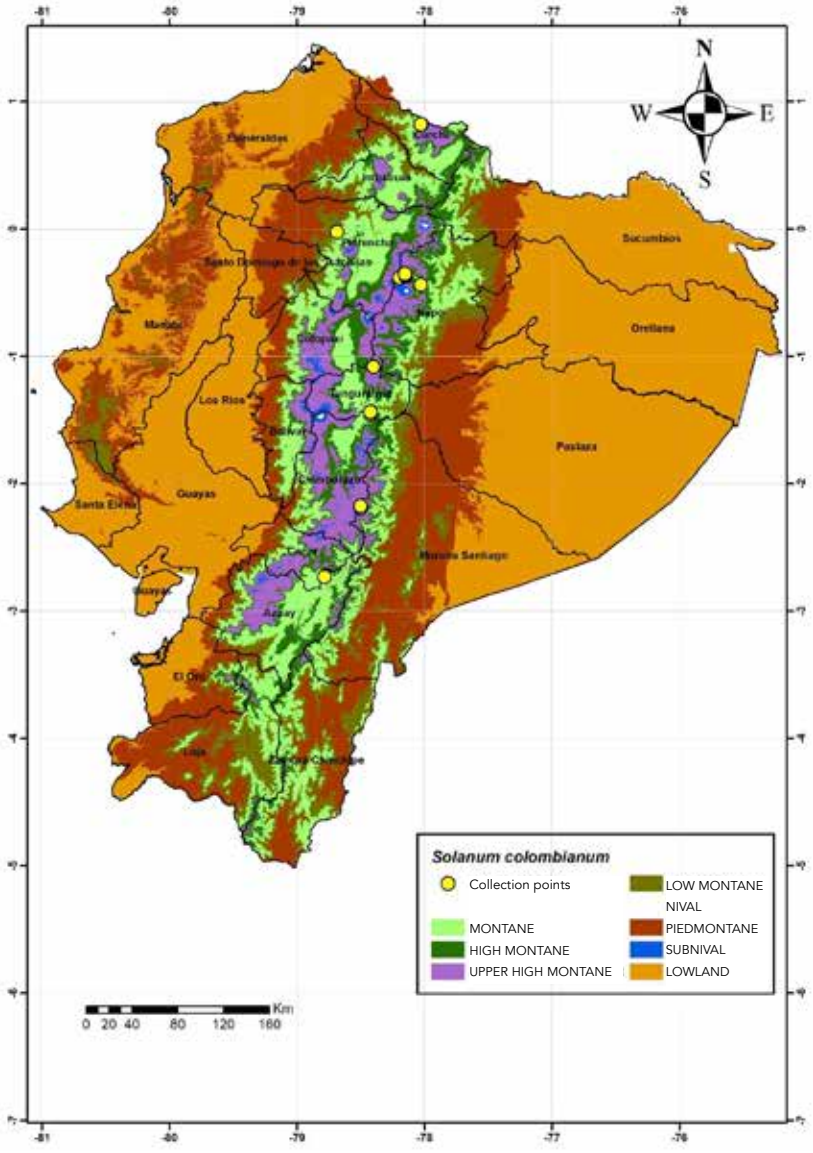
**Botanic description**
Plant 0.3m-2.2m high, semi-erect or erect, white flower, fruit in the form of an oval green berry, oval tubers 1cm-1.5cm in diameter (RBG Kew, 2016) (Figure 11).

**Conservation status**
Near Threatened (NT)

NT
PRELIM

**Geographical distribution**
Found in Carchi, Pichincha, Tungurahua, Chimborazo and Azuay provinces (Sierra) and in the Amazonian province of Napo, at the Montane, Low Montane Nival, High Montane, Upper High Montane and Subnival bioclimatic levels (see Table 2, Map 12).

**Habitat**
Found in ecosystems with an annual mean temperature of between 6.4°C and 15.9°C and annual precipitation of between 867mm and 1584mm, at altitudes ranging from 2254m to 3753m and with inclined slopes. This species grows in moderately deep, non-stony loam soils with medium organic carbon and an acid pH. It grows in primary cloud forest, in places where earth is removed such as runoffs, beside trails and near streams.




**Map 12.** Geographical distribution of *Solanum colombianum*. INIAP-DENAREF, 2018.

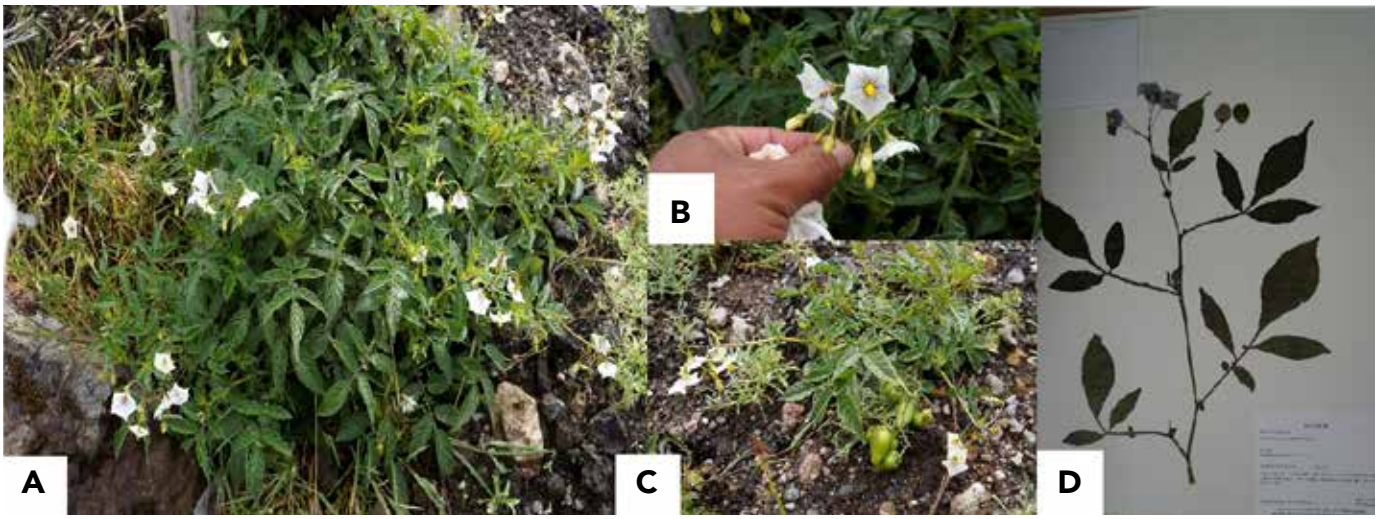



**Figure 11.** *Solanum colombianum*. A. Close-up of plant. B. Close-up of flowers. C. Close-up of fruits. D. Herbarium.

# WILD POTATO SPECIES

## *Solanum minutifoliolum* Correll

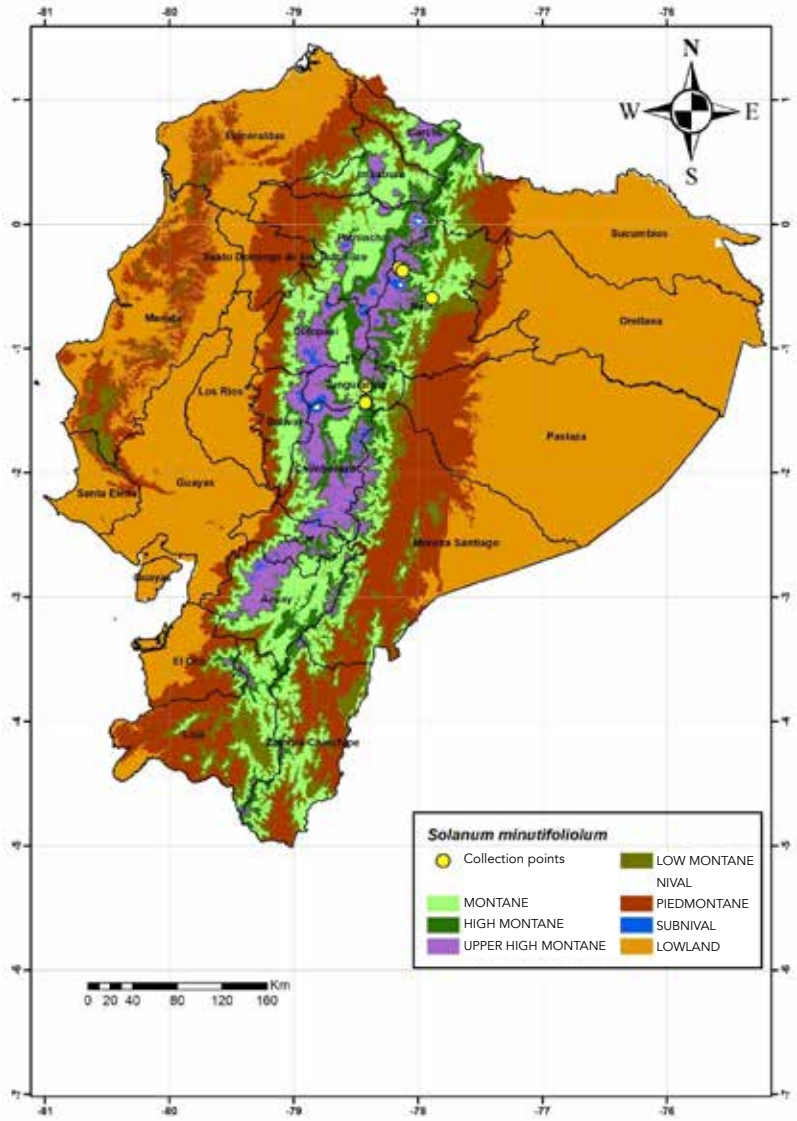
**Botanic description**
Green semi-erect plant 1m high with pubescences on leaves, stems and peduncle; pale green leaves with micro-folioles on the rachis, blue to purple flower and dark purple to green-colored round fruits (RBG Kew, 2016) (Figure 12).

**Conservation status**
Vulnerable (VU)

VU
PRELIM

**Geographical distribution**
Found in Tungurahua province (Sierra) and in the Amazonian province of Napo, at the Montane, High Montane and Upper High Montane bioclimatic levels (see Table 2, Map 13).

**Habitat**
Found in ecosystems with an annual mean temperature of between 6.8°C and 16.7°C and annual precipitation of between 796mm and 2420mm, at altitudes ranging from 2103m to 3676m and with steeply inclined slopes. This species grows in moderately deep, non-stony loam soils with high organic carbon and an acid pH. It grows specifically in moist environments with full vegetation cover. It is frequently found beside roads, in streams and mountain limits.




**Map 13.** Geographical distribution of *Solanum minutifoliolum*. INIAP-DENAREF, 2018.

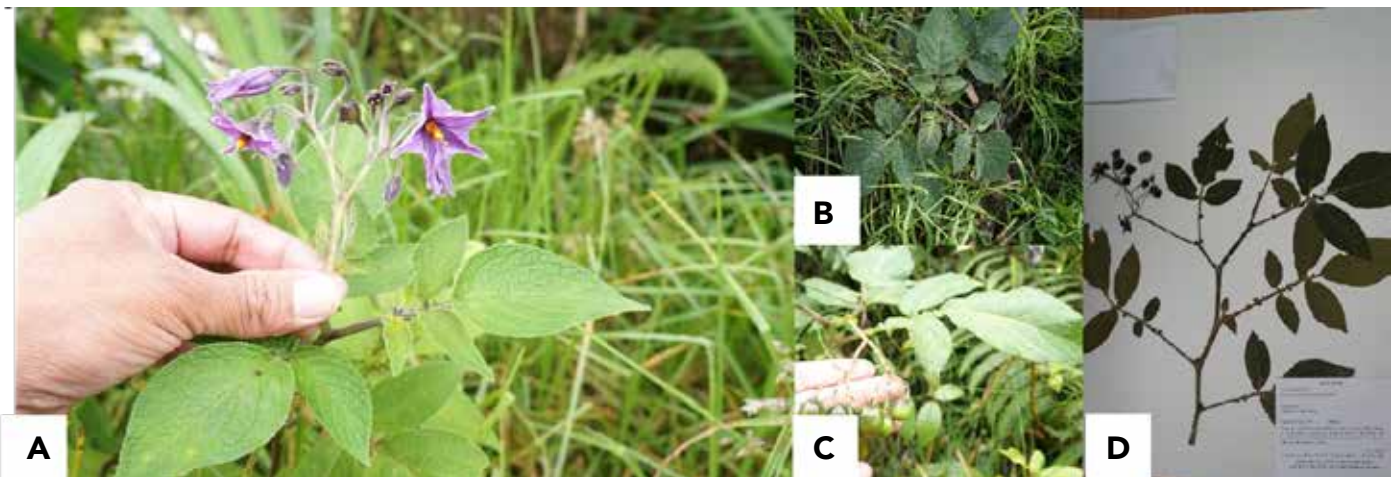



**Figure 12.** *Solanum minutifoliolum*. A. Close-up of plant. B. Close-up of leaves. C. Close-up of fruits. D. Herbarium.

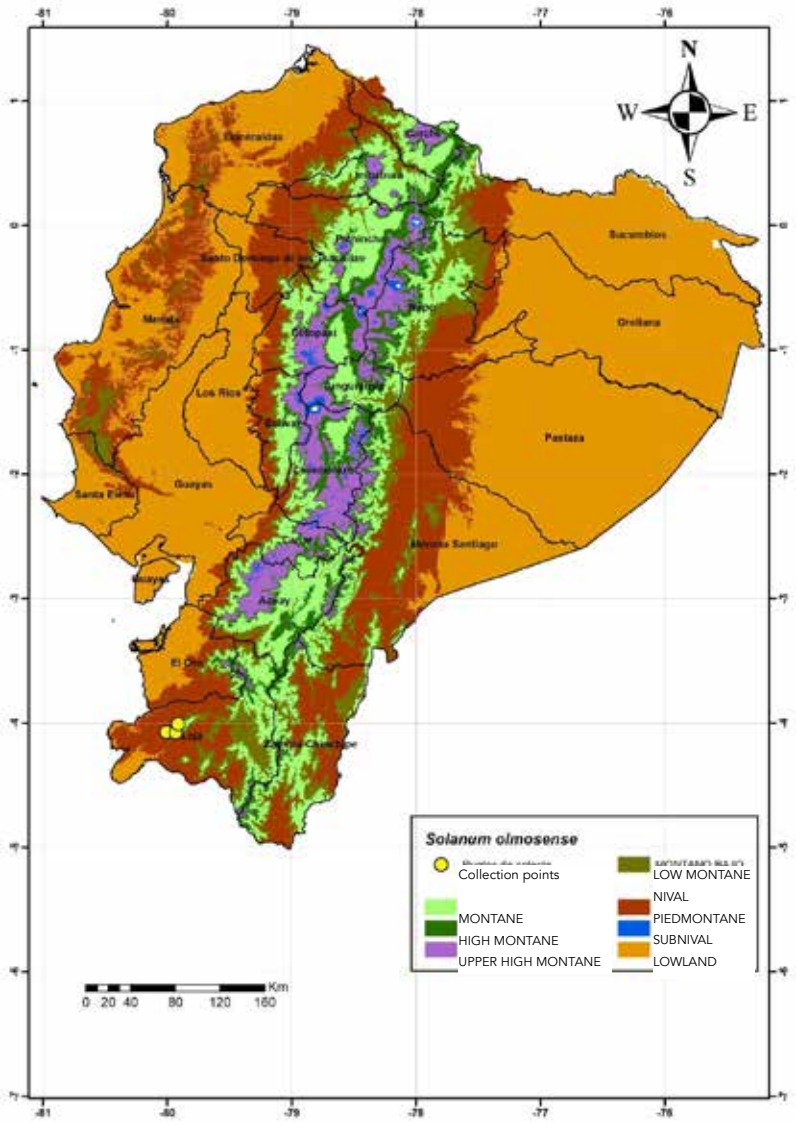
# *Solanum olmosense* Ochoa

**Botanic description**
Erect plant 0.4m-1.5m high, stems 0.3cm-7.0cm at the base of the plant, dark green wing-shaped leaves 9.9cm-33.0cm x 6.5cm-18.6cm, white flowers, perfect in appearance, glabrous axes with hairs, flat edges to the corolla (RBG Kew, 2016) (Figure 13).

**Conservation status**
Critically Endangered (CR)


**Geographical distribution**
Found in Loja province (Sierra) at the Low Montane Nival and Piedmontane bioclimatic levels (see Table 2, Map 14).

**Habitat**
Found in ecosystems with an annual mean temperature of between 16.2°C and 20.3°C and annual precipitation of between 1328mm and 1452mm, at altitudes ranging from 1467m to 2309m and with steeply inclined slopes. This species grows in moderately deep, non-stony loam soils with low organic carbon and an acid pH. Its phenological development coincides with the rainy season in the province where it is reported. It grows beside trails and paths.




**Map 14.** Geographical distribution of *Solanum olmosense*. INIAP-DENAREF, 2018.

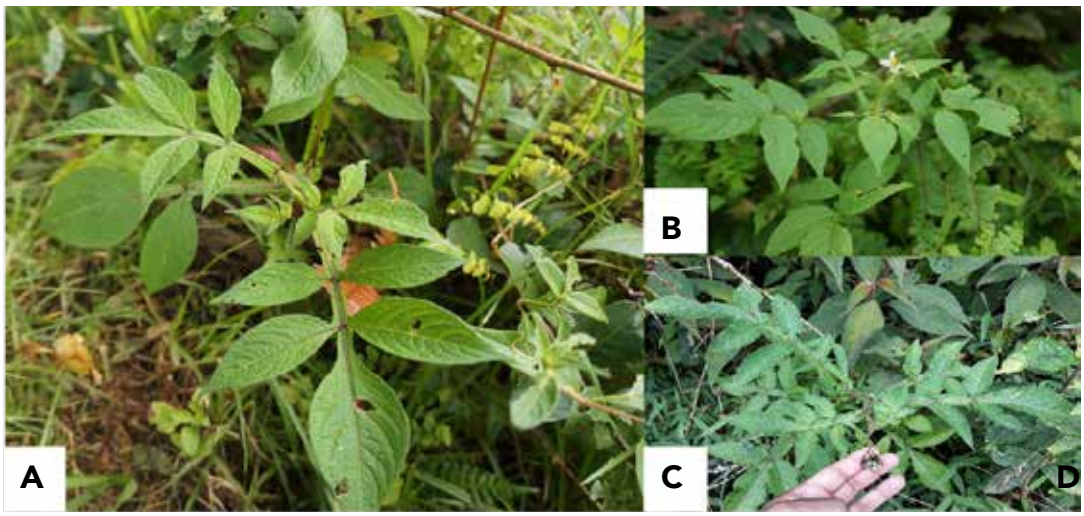



**Figure 13.** *Solanum olmosense*. A. Close-up of plant. B. Close-up of leaves. C. Size of flowers.

# WILD EGGPLANT SPECIES

## *Solanum asperolanatum* Ruiz & Pav.

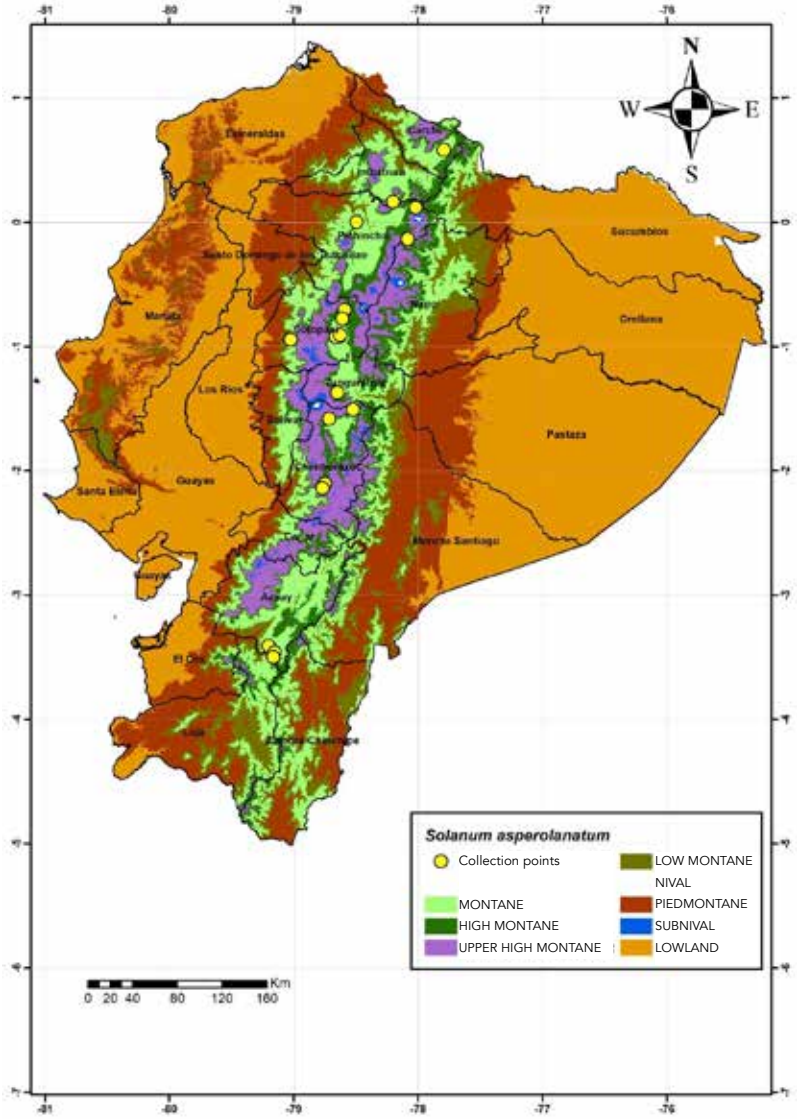
**Botanic description**
Bush up to 10m high with thorns on young stems, oval or elliptical-oval pubescent leaves. Purple inflorescence on sub-dichotomic corymb. Yellow fruits in bunches (RBG Kew, 2016) (Figure 14).

**Conservation status**
Least Concern (LC)

NT
PRELIM

**Geographical distribution**
Found in Carchi, Imbabura, Pichincha, Cotopaxi, Tungurahua, Chimborazo, Azuay and Loja provinces (Sierra) at the Montane, Low Montane Nival, High Montane and Upper High Montane bioclimatic levels (see Table 2, Map 15).

**Habitat**
Found in ecosystems with an annual mean temperature of between 6.7°C and 15.5°C and annual precipitation of between 515mm and 1703mm, at altitudes ranging from 2148m to 3705m and with inclined slopes. This species grows in moderately deep, non-stony loam soils with low organic carbon and a slightly acid pH. It grows in various environments and is easy to locate beside roads, at the edge of fields and on uncultivated land.




**Map 15.** Geographical distribution of *Solanum asperolanatum*. INIAP-DENAREF, 2018.

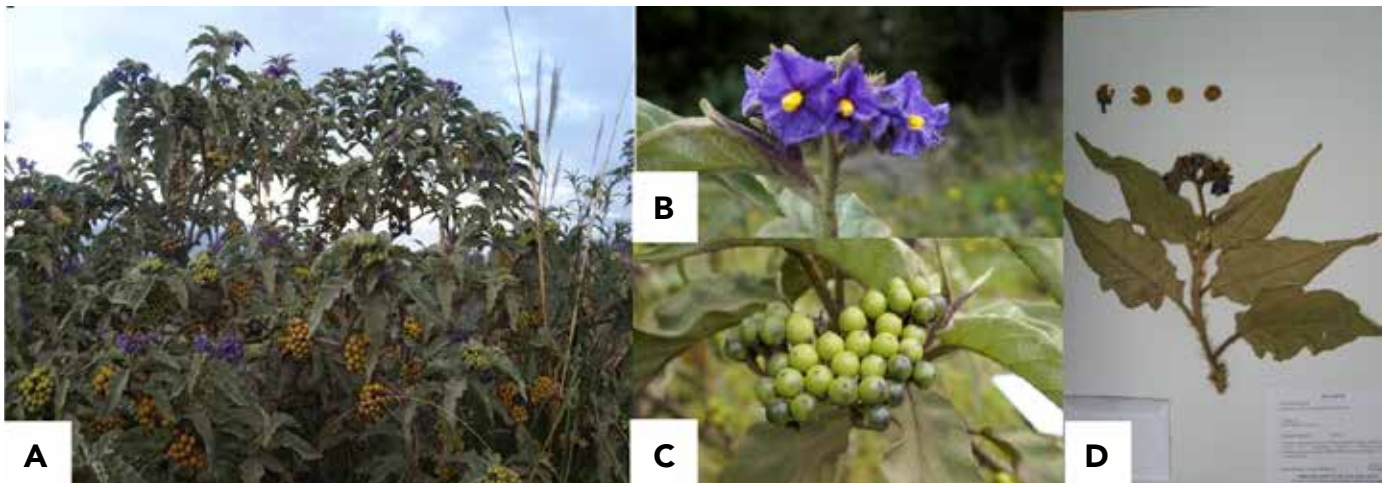



**Figure 14.** *Solanum asperolanatum*. A. Close-up of plant. B. Close-up of flower. C. Close-up of fruits. D. Herbarium.

# *Solanum grandiflorum* Ruiz & Pav.

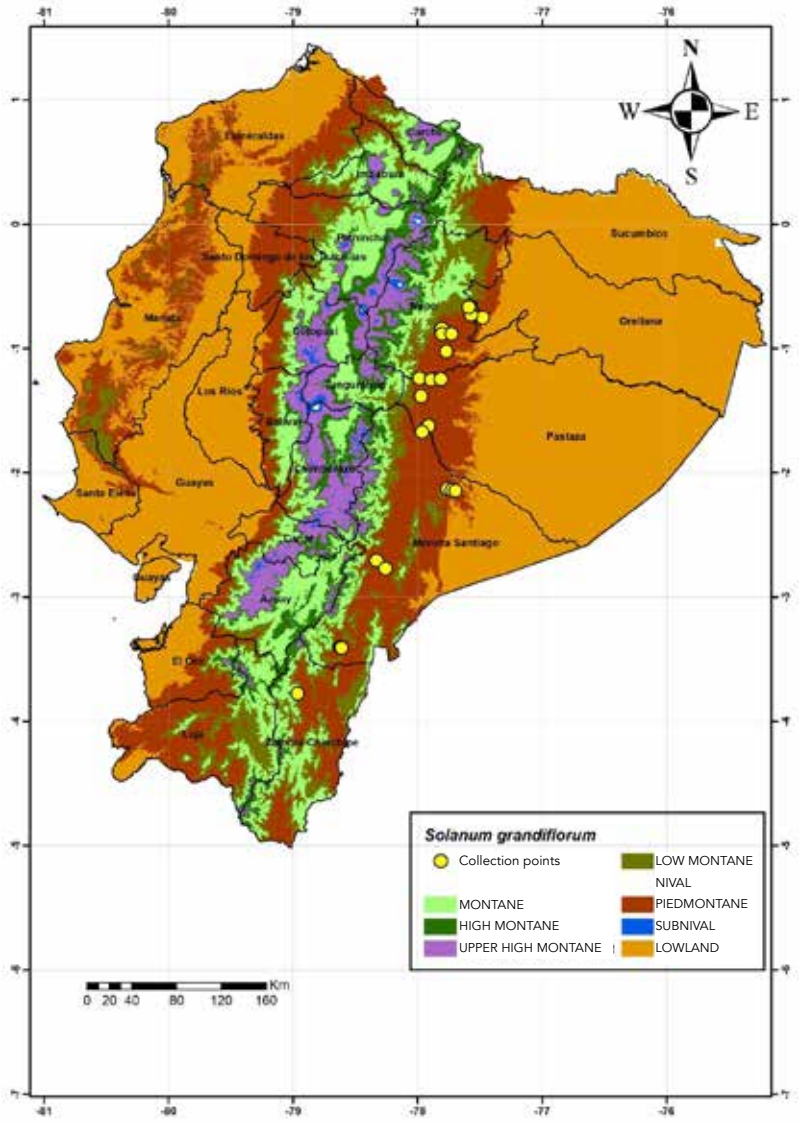
**Botanic description**
Tree up to 15m tall, occasionally with thorns on the main stem and secondary stems, oval to elliptical leaves with the entire border deeply denticulated, flowers that are violet-blue on the inside and whitish on the outside, large green to grey fruits 4cm-6cm in diameter (RBG Kew, 2016) (Figure 15).

**Conservation status**
Least Concern (LC)

NT
PRELIM

**Geographical distribution**
Found in the Amazonian provinces of Napo, Orellana, Pastaza, Morona Santiago and Zamora Chinchipe at the Low Montane Nival and Piedmontane bioclimatic levels (see Table 2, Map 16).

**Habitat**
Found in ecosystems with an annual mean temperature of between 16.5°C and 23.4°C and annual precipitation of between 1428mm and 4387mm, at altitudes ranging from 568m to 2138m and with slightly inclined slopes. This species grows in moderately deep, non-stony loam soils with medium organic carbon and an acid pH. It grows frequently in primary and secondary forest. It grows easily in streams, on riverbanks and beside roads.




**Map 16.** Geographical distribution of *Solanum grandiflorum*. INIAP-DENAREF, 2018.

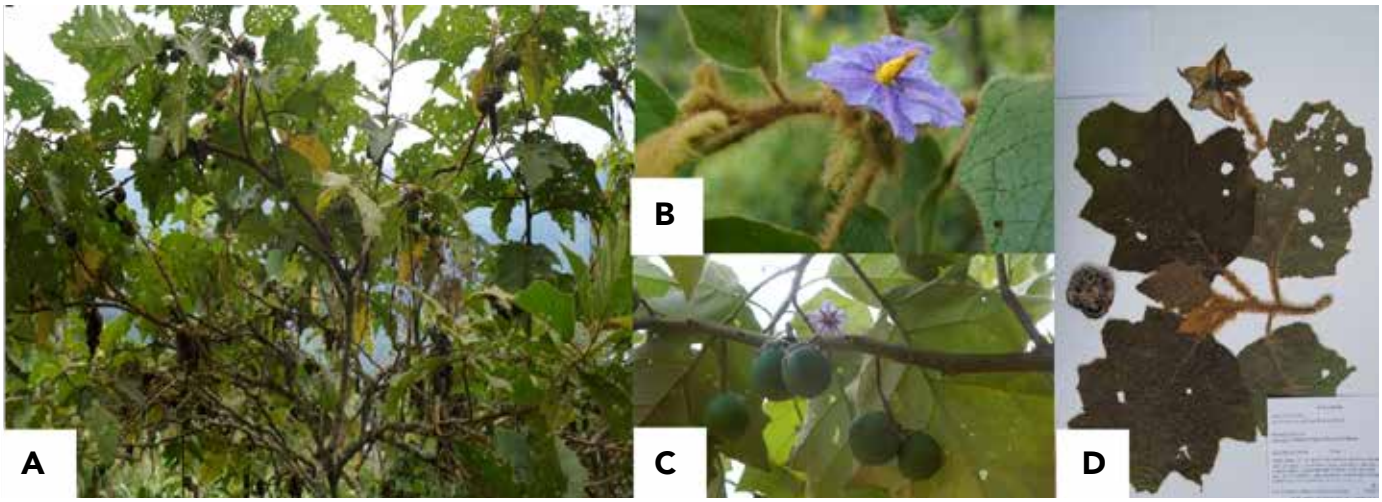



**Figure 15.** *Solanum grandiflorum* A. Close-up of plant. B. Close-up of flower. C. Close-up of fruits. D. Herbarium.

# WILD EGGPLANT SPECIES

## *Solanum torvum* Sw.

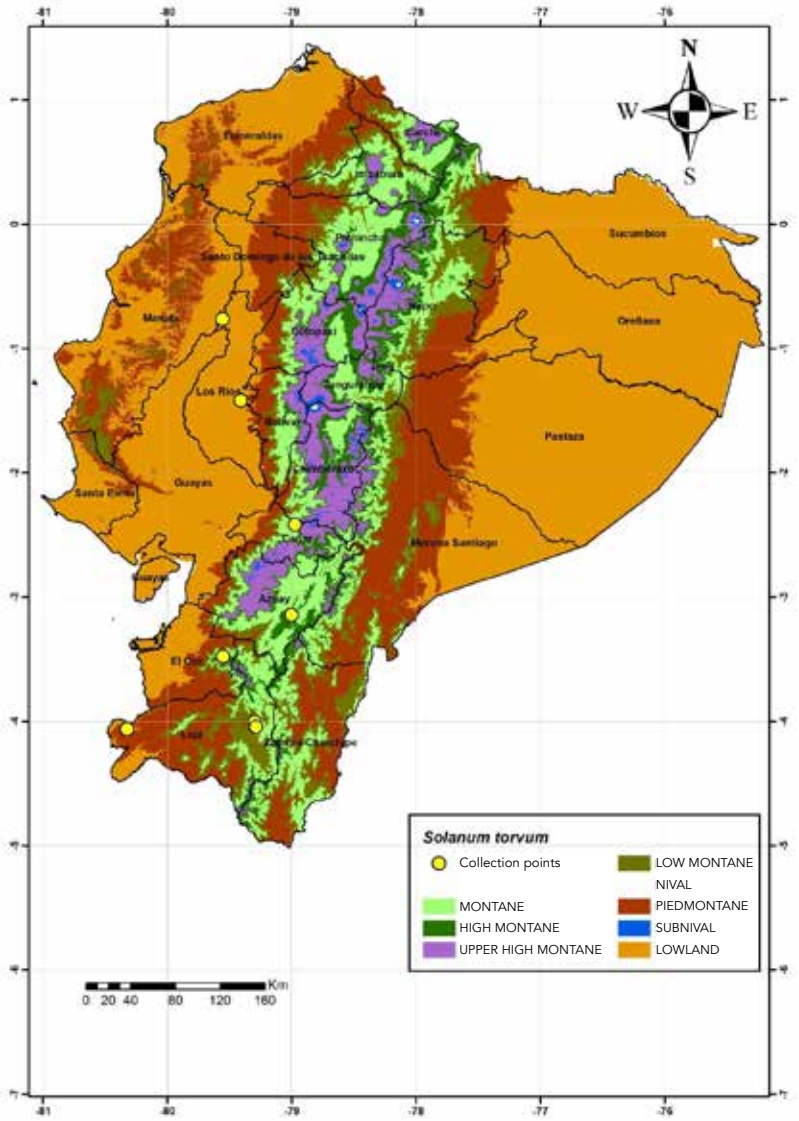
**Botanic description**
Bushes up to 3m high, significant branching from the base, simple elliptical to oval leaves, sharp or tapering tip, pubescent petioles. Pubescent, star-shaped white flowers; the fruit is a globoid, pale green to grey berry (RBG Kew, 2016) (Figure 16).

**Conservation status**
Vulnerable (VU)

VU
PRELIM

**Geographical distribution**
Found in Cañar and Azuay provinces (Sierra) and in Los Ríos and El Oro provinces (Coast) at the Montane, Low Montane Nival, High Montane, Piedmontane and Lowland bioclimatic levels (see Table 2, Map 17).

**Habitat**
Found in ecosystems with an annual mean temperature of between 10.6°C and 25.2°C and annual precipitation of between 679mm and 2262mm, at altitudes ranging from 38m to 3172m and with inclined slopes. This species grows in moderately deep, slightly-stony loam soils with low organic carbon and a slightly acid pH. It grows frequently in thickets, streams, and on riverbanks and beside roads.




**Map 17.** Geographical distribution of *Solanum torvum*. INIAP-DENAREF, 2018.

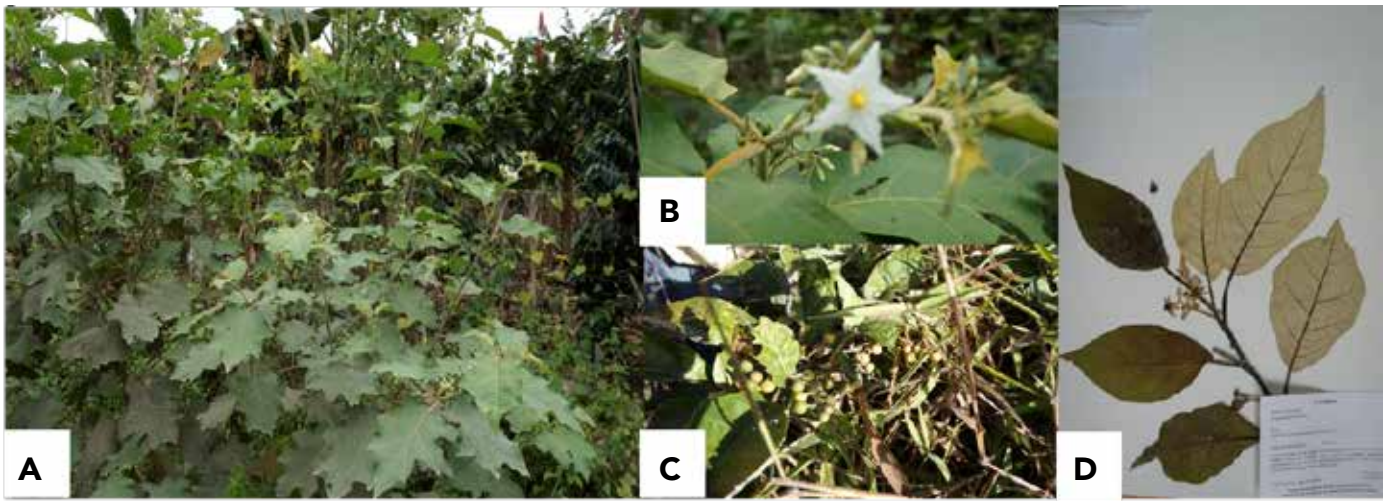



**Figure 16.** *Solanum torvum*. A. Close-up of plant. B. Close-up of flower. C. Close-up of fruits. D. Herbarium.

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