

Adapting agriculture to climate change:
collecting, protecting and preparing crop wild relatives

Costa Rica



Seed Collecting Guide



MILLENNIUM
SEED BANK
PARTNERSHIP

Royal Botanic Gardens
Kew



**CROP
TRUST**

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The content of this collecting guide is intended only as a general reference for future collecting missions; the contents and data within are not guaranteed to be complete, correct, timely, current or up-to-date at the time of publishing. For general information and resources on collecting crop wild relatives, visit cwrdiversity.org.

Cover photos

TOP LEFT: *Solanum asperolanatum*, CREDIT: Stan Shebs/Wikimedia Commons;

TOP RIGHT: *Ipomoea involucrata*, CREDIT: RBG Kew;

BOTTOM LEFT: Rice, CREDIT: CIAT/Neil Palmer;

BOTTOM RIGHT: *Phaseolus costaricensis*, CREDIT: Daniel Debouck

This work was undertaken as part of the initiative “Adapting Agriculture to Climate Change” which is supported by the Government of Norway. The project is managed by the Global Crop Diversity Trust with the Millennium Seed Bank of the Royal Botanic Gardens, Kew, in partnership with national and international genebanks and plant breeding institutes around the world. It is implemented in accordance with the International Treaty on Plant Genetic Resources for Food and Agriculture. For further information see the project website: www.cwrdiversity.org/

Many individual scientists, herbaria, genebanks and specialist institutes are contributing advice and information to the Project and these guides. The Project aims to collect the wild relatives of 29 key crops, conserve them in genebanks, and prepare them for use in plant improvement programs to breed new crop varieties adapted to future climates.



The boundaries and names shown on the maps included in this guide do not imply official endorsement or acceptance by the Adapting Agriculture to Climate Change Project. Data source: GADM, Version 1.0 via diva-gis.org

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The Harlan and de Wet Crop Wild Relatives Checklist was developed by Holly Vincent and Nigel Maxted at the University of Birmingham.

UNIVERSITY OF
BIRMINGHAM



International Center for Tropical Agriculture
Since 1967 *Science to cultivate change*

The Gap Analysis work which informed the list of species included in this guide, and all the map files, were produced by the Gap Analysis team at CIAT: Andy Jarvis, Nora Castañeda, Colin Khoury and Julian Ramirez-Villegas.

RBG Kew is involved in the research and collection phases of the project. This collecting guide was developed based on the work of the Millennium Seed Bank Enhancement Project Species Targeting Team.

Royal Botanic Gardens
Kew



The Crop Wild Relatives Project is led by the Global Crop Diversity Trust. This work was undertaken as part of the initiative.

Specimen data was kindly provided to this project by many individuals and organisations who are listed on the website: <http://www.cwrdiversity.org/home/data-sources>

This data set will be made available for download. Please refer to the website for more information on this dataset.

This collecting guide has been compiled by:

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This collecting guide consists of species profiles and information sheets contained within this folder, alongside a CD which contains localities of the taxa in an excel file.

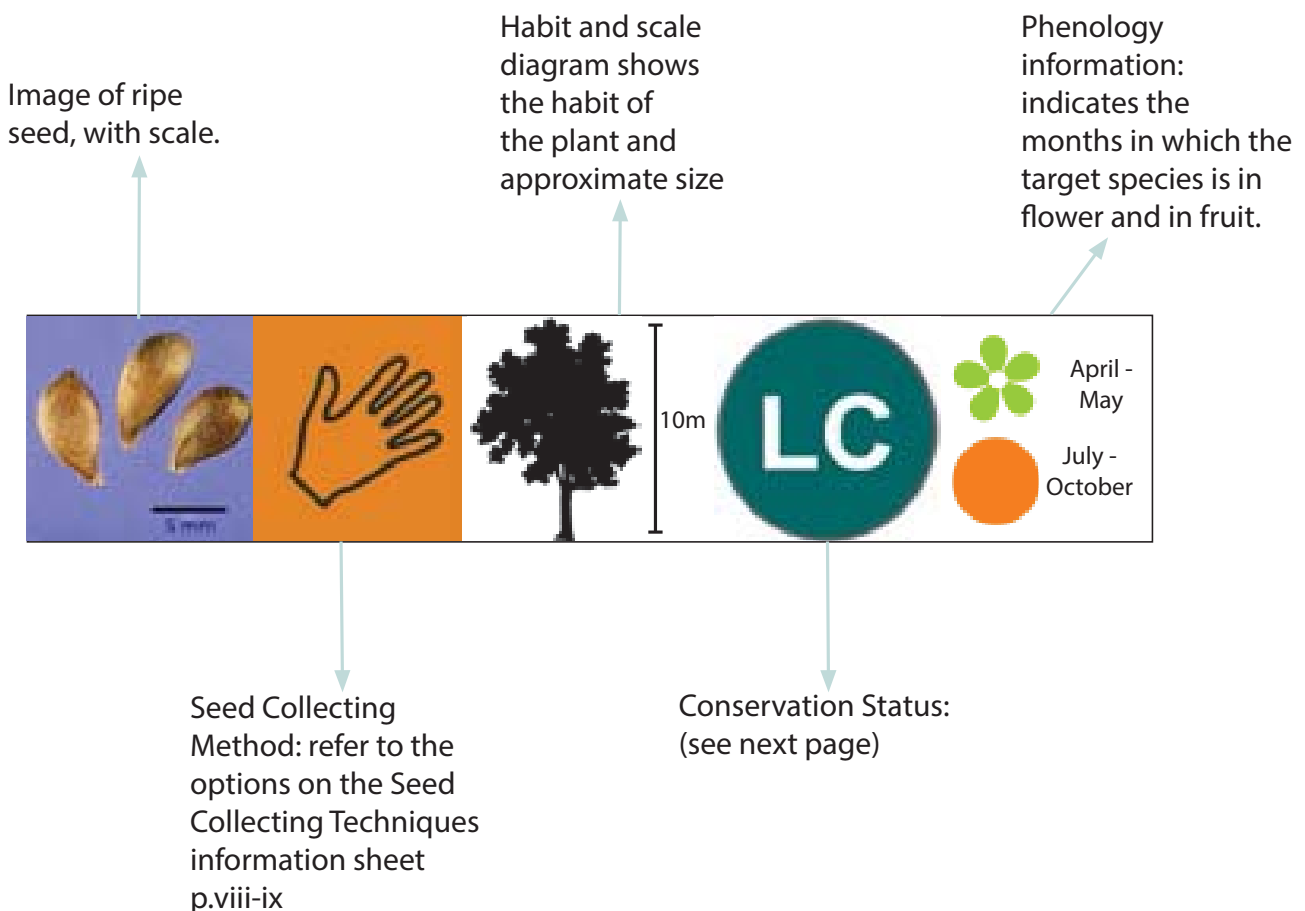
The species included in this guide are a selection of the wild relatives of the 29 key crops which this project covers (African Rice, Alfalfa, Apple, Aubergine, Bambara groundnut, Banana, Barley, Bread Wheat, Butter Bean, Carrot, Chickpea, Common Bean, Cowpea, Faba bean, Finger millet, Grasspea, Lentil, Oat, Pea, Pearl millet, Pigeon pea, Plantain, Potato, Rice, Rye, Sorghum, Sunflower, Sweet potato, Vetch). It is not a definitive guide to the Crop Wild Relatives in this country.

The guides are designed to be used both in the planning of a collecting trip, and also in the field.

At the front of this guide there is a phenology table showing the flowering and fruiting times of all the taxa to indicate which species may be found at a certain time of year, or when to collect target species.

Synonyms for each species are listed in the Appendix at the end of this guide.

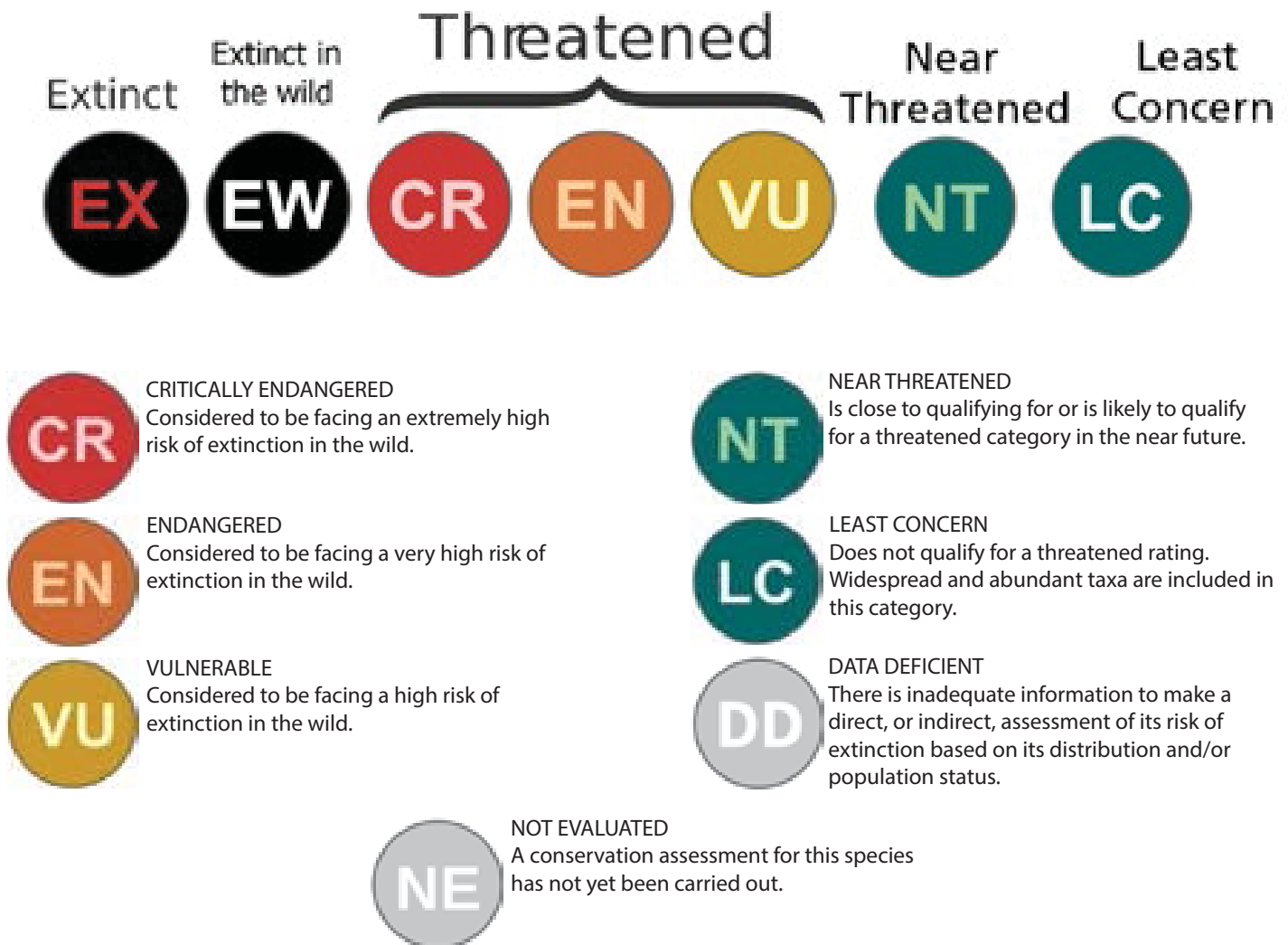
On each species profile, there is a collection of images to help identify the target species, accompanied by a series of symbols :



Conservation Assessments

Conservation Status:

Assessments are completed using 2001 IUCN Red List Categories and Criteria version 3.1 with the following categories:



Where a full conservation assessment has not been completed, a preliminary conservation rating may be indicated. Preliminary assessments are produced using specimen locality data and GIS, which calculates two parameters accepted by IUCN as suitable measures of range: namely extent of occurrence (EOO) and area of occupancy (AOO). These values derived for each species are then compared with thresholds set out by IUCN under Criterion B.

Where a preliminary conservation assessment has been calculated this is indicated by the word PRELIM:



Maps

Two maps are provided for each target species. The first map shows a point distribution of all the known localities of this species based on herbarium specimen records and existing data-sets. The area shaded on this map shows the predicted distribution based on Maxent.



The second map shows the potential gaps in gene bank collections, where seed collections should be targeted.



Useful resources

The following resources are available online.

Kew technical information sheets

- Assessing a potential seed collection:
<http://brahmsonline.kew.org/Content/Projects/msbp/resources/Training/02-Assessing-population.pdf>
- Post-harvest handling of seed collections:
<http://brahmsonline.kew.org/Content/Projects/msbp/resources/Training/04-Post-harvest-handling.pdf>

Other sheets covering the following topics are available from

<http://brahmsonline.kew.org/msbp/Training/Resources>

- Protocol for comparative seed longevity testing
- Measuring seed moisture status using a hygrometer
- Selecting containers for long-term seed storage
- Low-cost monitors of seed moisture status
- Small-scale seed drying methods
- Equilibrating seeds to specific moisture levels
- Identifying desiccation-sensitive seeds
- Seed bank design: seed drying rooms
- Seed bank design: cold rooms for seed storage
- Cleaning seed collections for long-term conservation

ENSCONET seed collecting manual for wild species

http://ensconet.maich.gr/PDF/Collecting_protocol_English.pdf

Seed conservation: turning science into practice

<https://academic.oup.com/aob/article/95/5/888/201951>

Collecting plant genetic diversity: Technical guidelines (Bioversity)

http://cropgenebank.sgrp.cgiar.org/index.php?option=com_content&view=article&id=390&Itemid=557

FAO – Commission on Genetic Resources for Food and Agriculture

<http://www.fao.org/nr/cgrfa/en/>

IUCN Red List Categories and Criteria (Version 3.1)

<https://iucn-csg.org/red-list-categories/>

Plants of the World Online

<http://plantsoftheworldonline.org/>

For more information about the Crop Wild Relatives Project and to access the Harlan and de Wet Crop Wild Relatives checklist, please visit the website:

www.cwrdiversity.org

Identification Keys

Interactive identification keys can be accessed using the links below.

[Kew Grassbase interactive identification key](http://www.kew.org/data/grasses-db/ident.htm)

<http://www.kew.org/data/grasses-db/ident.htm>

Clayton, W.D., Vorontsova, M.S., Harman, K.T. and Williamson, H. (2006 onwards). GrassBase - The Online World Grass Flora. <http://www.kew.org/data/grasses-db.html>. [accessed 15 March 2012; 14:30 GMT]

Seed Collecting Techniques

Michael Way and Kate Gold, Seed Conservation Department

Seed collecting from wild plants requires care, resourcefulness and determination. There are many different collecting techniques. The most appropriate technique will depend on the species, particularly the type of dispersal unit (fleshy fruit, dry fruit, individual seeds etc). This information sheet outlines the manual techniques most commonly used to make seed collections of adequate quality and quantity, for long term conservation.

Hand picking of whole fruits

The most basic and flexible of techniques, hand picking or plucking, has many benefits. Consider though, if you can use a more efficient technique.

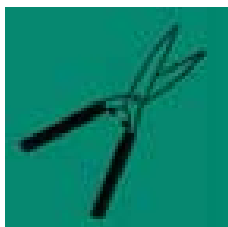


Plucking is particularly suitable when:

- target fruits can easily be selected by eye (e.g. due to colour or texture change of fruit coat, or swelling of fruit);
- non-target (e.g. immature or damaged) fruit cannot be excluded from the collection by more efficient techniques;
- fruits are easily accessible and collectors can tie buckets or similar containers around the waist, releasing both hands for collecting;
- collecting many-seeded fleshy or dry indehiscent fruits; and
- making small seed collections.

Pruning clusters of fruit

This technique is typically used to collect tree seeds. Cut groups or clusters of fruits using secateurs or tree pruners. Assess for ripeness and damage before adding seeds to the collection.

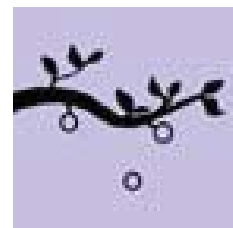


This is a very effective technique when:

- seed is clustered at the distal (terminal) parts of branches;
- the species is abundant and a small associated loss of branch and foliage is acceptable;
- seed is beyond reach of the collectors and has to be obtained using tree pruners.

Shaking branches

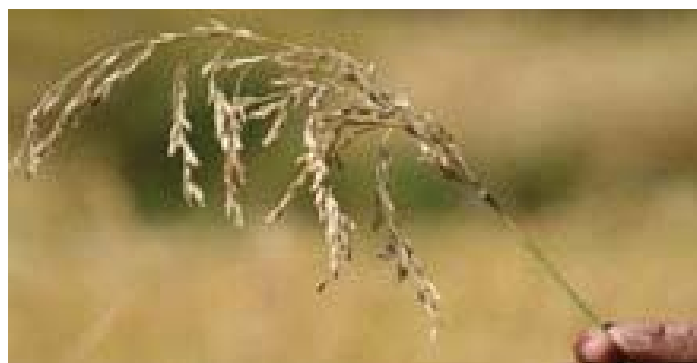
Careful shaking of branches will sometimes dislodge the best available seed, which can be collected in buckets or on a tarpaulin held or spread out beneath the plant. Start with gentle taps, and carefully check each sample of seed dislodged. Light shaking will often dislodge fully ripe fruits and seeds, leaving immature, poorly developed and damaged seeds to be retained on the parent plant. Too-heavy beating of branches may cause damage to the tree, and may also dislodge other plant material and associated insects, necessitating additional cleaning of the collection.



Shaking branches may be useful when collecting:

- dehiscent fruits with medium large seeds;
- seeds with irritant plumes (e.g. *Cercocarpus* of the Rosaceae);
- spiny trees such as *Prosopis* (Fabaceae);
- on level, open terrain suitable for tarpaulin use.

This technique may not be suitable for light, plumed seed from *Bombacaceae* and *Asclepiadaceae*, which may be carried away by air currents.



ABOVE: Stripping seed heads may be appropriate for grasses
Credit: Global Crop Diversity Trust/Britta Skagerfält

Stripping entire seed-heads

This is a popular technique for collecting seed from grasses and may be suitable for other species with erect infructescences (seedheads). Grasp the seedheads at the base with a gloved hand and slide the hand upwards, dislodging many or all of the seeds. This technique may introduce a proportion of immature seeds into the collection. Such seeds might need further postharvest ripening which can be time consuming and is best avoided.

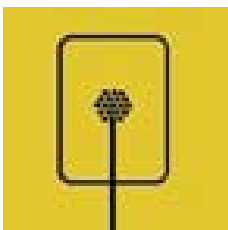


The stripping technique is most suitable for:

- dense, mono-specific stands of target species with no weed or other species present; and
- infructescences which are completely and consistently at the natural dispersal stage.

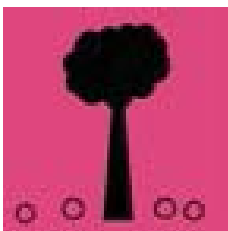
Bagging seed-heads

If there is frequent access to the collecting site, and if seeds would otherwise be lost, fix a well-tied mesh bag loosely over pre-dispersal seed heads. Seeds are captured as soon as they are shed, and can be periodically removed. This has been successfully used on a small scale, e.g. for collecting *Fouquieria* spp.



Collecting from the ground

You will frequently find seeds on the ground below trees or shrubs, but they will often be damaged by pests or pathogens. The seeds may have been on the ground for several months, and could even date from the previous year. Such seed will have aged and life-span in storage will be reduced. Inspect the seed carefully, noting any variation in the fruit, seed coat and internal tissues.



In general, only collect from the ground when:

- the parent tree(s) can be determined without doubt;
- you are certain that you are collecting recently dispersed seeds;
- seeds have not suffered significant damage from pests or pathogens; and
- other techniques or collecting options are unsuitable.

Collecting fleshy fruits

- Collect fleshy fruits directly into strong plastic bags or tubs with as much air as possible.
- Pack the bags in a rigid plastic container to ensure that the fruits are not squashed and help prevent them getting too hot and fermenting during transit.
- You may need to remove the seeds from fleshy fruits either during or immediately after the field trip.



ABOVE Collecting small seeds into paper bags
Credit: Ruth Harker/ RBG Kew

Containers

Collect into buckets, cloth or paper bags, and check each person's sample carefully before combining into a single population collection.

Using buckets has the advantage of allowing you to monitor the quality of the collection whilst associated insects disperse freely.

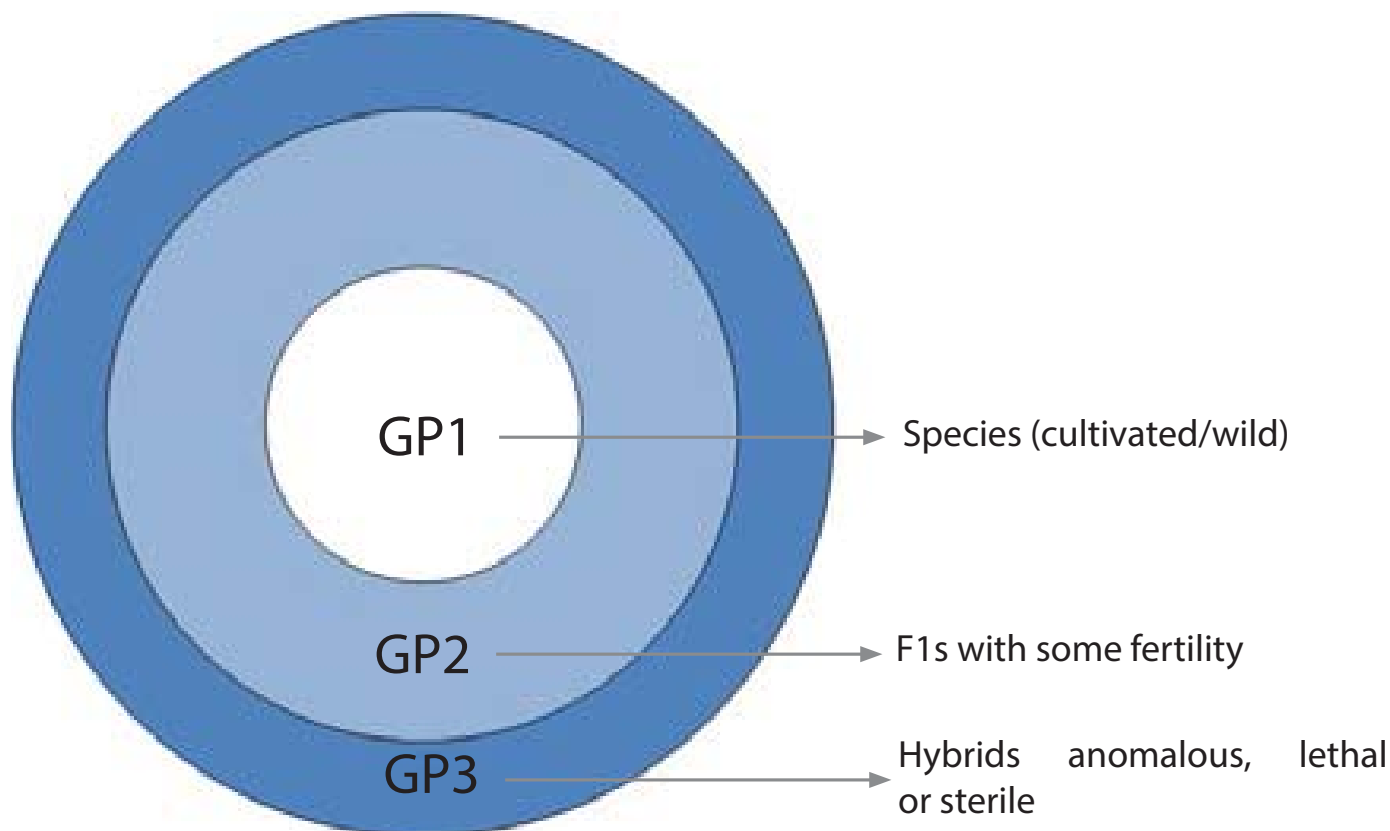
Place collections of dry, ripe seed into cloth or paper bags for transit. Store any awned seed or hooked fruit, that would damage or get stuck in cotton bags, in cardboard boxes or strong paper bags. Never collect or store seeds in plastic bags.

Label all seed containers inside and out with a unique collection number, and seal them securely. It is best to prepare sufficient labels before filling the containers.

Each target species in this guide is a wild relative of a crop. On each species profile it is indicated how closely related the target species is to the crop using either the Gene Pool concept or the Taxon Group concept. Species more closely related to the crop are higher priorities for collecting.

Gene Pool Concept

Harlan and de Wet, 1971



Taxon Group Concept

Maxted et al. 2006

Taxon Group 1 – cultivated/wild form of the crop

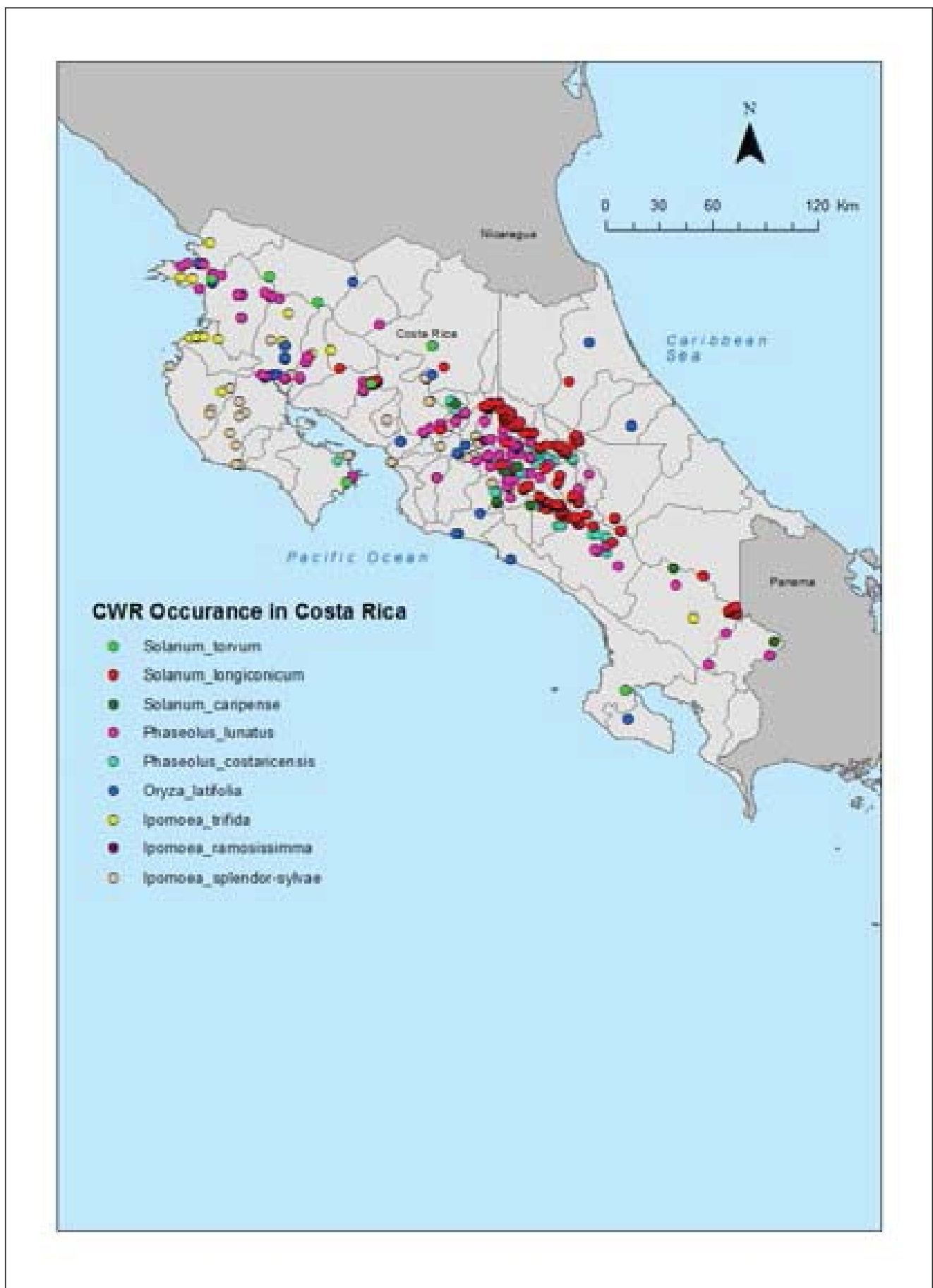
Taxon Group 2 – species in same series/section as crop

Taxon Group 3 – species in same subgenus as crop

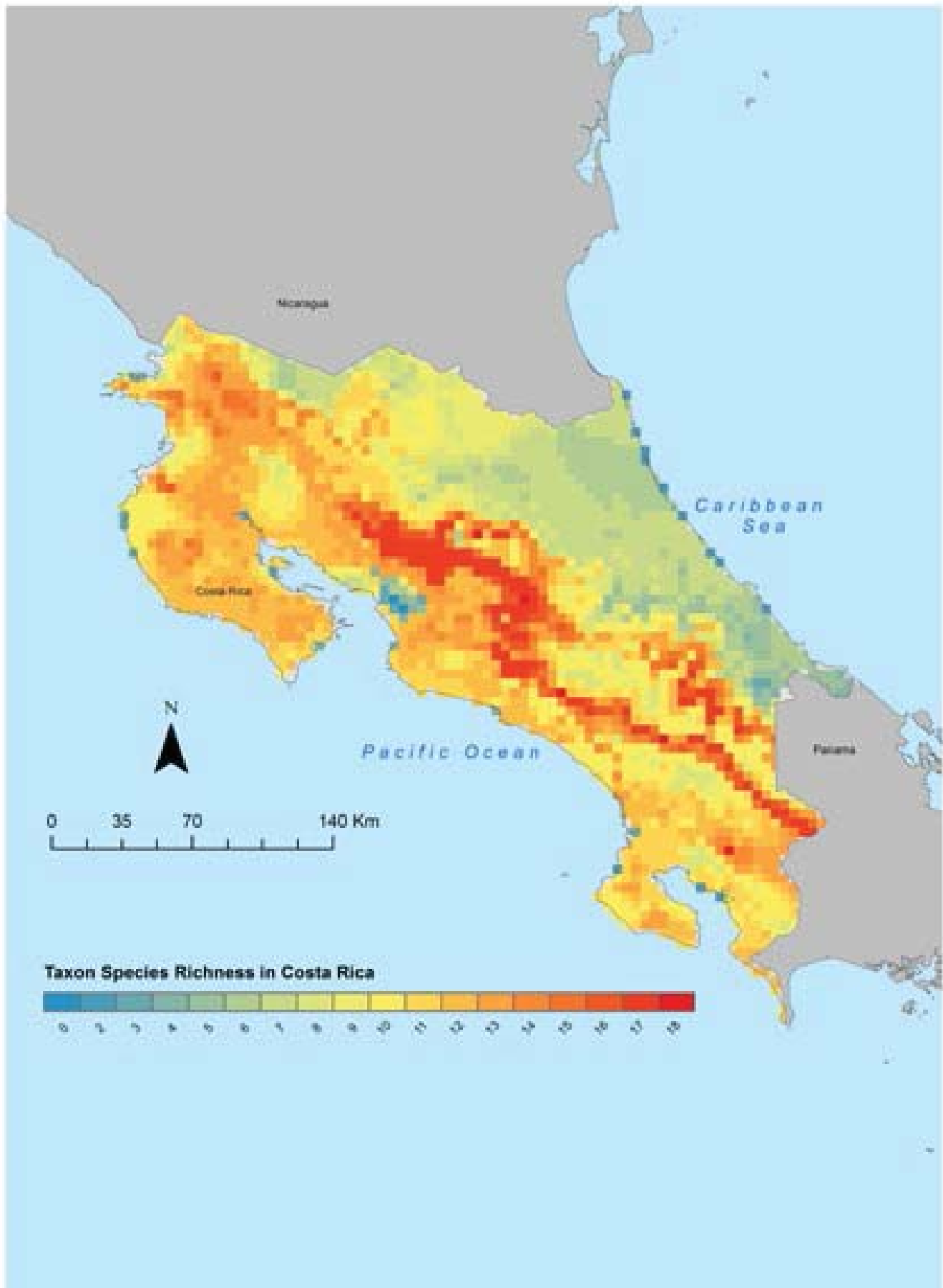
Harlan, J. and J. de Wet (1971). Towards a rational classification of cultivated plants. *Taxon* 20: 509-517.

Maxted, N., B.V. Ford-Lloyd, S.L. Jury, S.P. Kell and M.A. Scholten (2006). Towards a definition of a crop wild relative. *Biodiversity and Conservation* 14: 1-13.

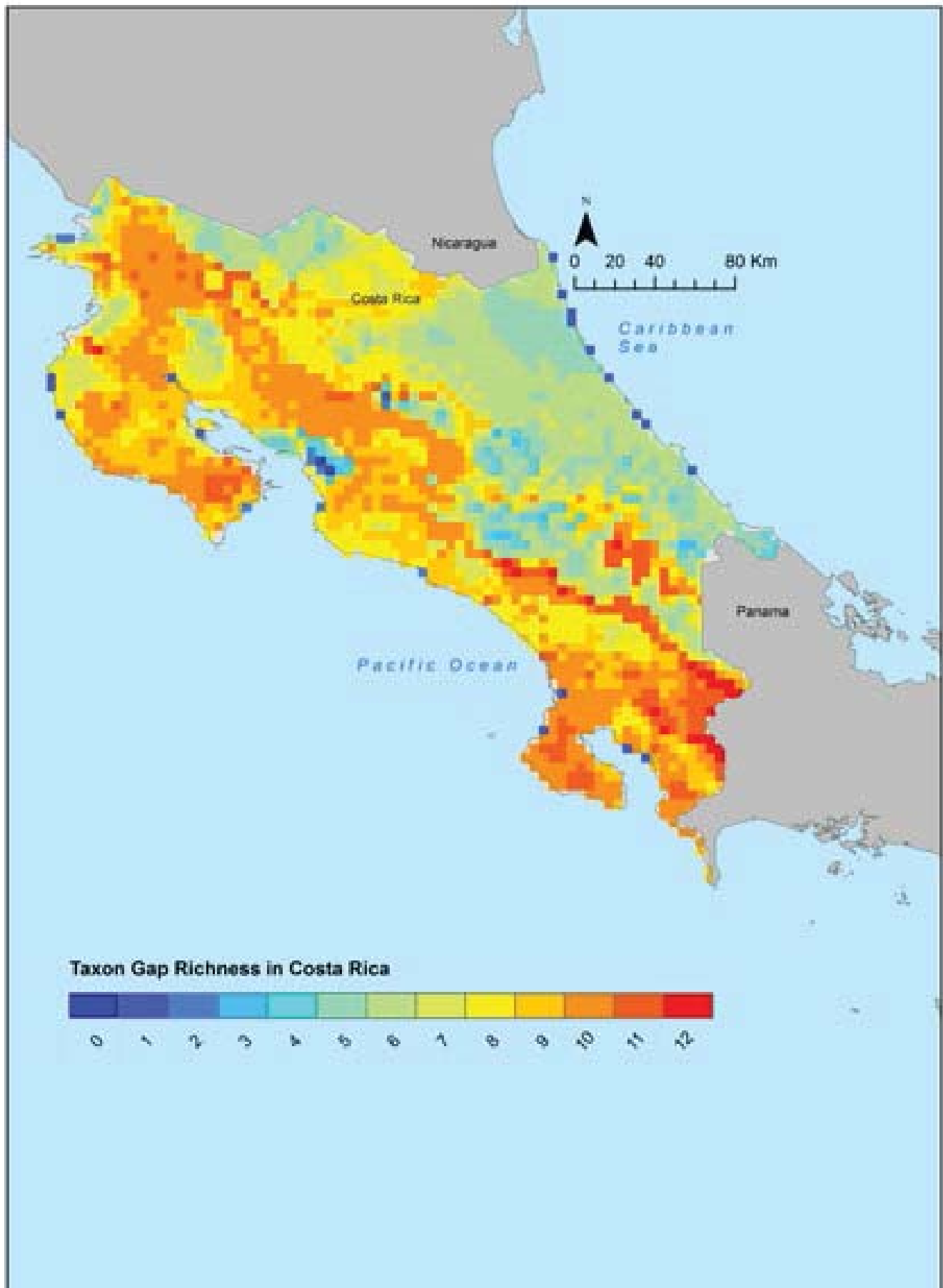
Occurences of all taxa in this guide, as a point distribution



Species richness



Gap richness



Species in this guide

Species profiles are arranged alphabetically by family and taxon.

Family	Taxon	Genepool	Collection Priority	Sheet
Leguminosae	<i>Ipomoea ramosissima</i>	Sweet Potato	High	1
Leguminosae	<i>Ipomoea splendor-sylvae</i>	Sweet Potato	High	2
Leguminosae	<i>Ipomoea tiliacea</i>	Sweet Potato	High	3
Leguminosae	<i>Ipomoea trifida</i>	Sweet Potato	Low	4
Leguminosae	<i>Phaseolus coccineus</i> subsp. <i>coccineus</i>	Common Bean	Low	5
Leguminosae	<i>Phaseolus costaricensis</i>	Common Bean	Low	6
Leguminosae	<i>Phaseolus lunatus</i>	Common Bean	Low	7
Leguminosae	<i>Phaseolus vulgaris</i> var. <i>aborigineus</i>	Common Bean	Low	8
Poaceae	<i>Oryza grandiglumis</i>	Rice	High	9
Poaceae	<i>Oryza latifolia</i>	Rice	High	10
Solanum	<i>Solanum caripense</i>	Potato	Low	11
Solanum	<i>Solanum longiconicum</i>	Potato	Low	12
Solanum	<i>Solanum torvum</i>	Eggplant	Low	13

Phenology table

Taxon	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
<i>Ipomoea ramosissima</i>	Species in flower	Species in flower	Species in flower	Species in fruit							Species in flower	Species in flower
<i>Ipomoea splendor-salvae</i>	Species in flower	Species in fruit							Species in flower	Species in fruit		
<i>Ipomoea tiliaceae</i>												
<i>Ipomoea trifida</i>												
<i>Oryza grandiglumis</i>			Species in flower	Species in fruit			Species in flower	Species in fruit				
<i>Oryza latifolia</i>	Species in flower	Species in fruit	Species in flower	Species in fruit			Species in flower	Species in fruit				
<i>Phaseolus coccineus</i> subsp. <i>coccineus</i>												
<i>Phaseolus costaricensis</i>	Species in flower	Species in fruit										Species in flower
<i>Phaseolus lunatus</i>												
<i>Phaseolus vulgaris</i> var. <i>aborigineus</i>					Species in flower						Species in fruit	
<i>Solanum caripense</i>	Species in flower	Species in fruit	Species in flower	Species in fruit			Species in flower	Species in fruit			Species in flower	Species in fruit
<i>Solanum longiconicum</i>	Species in flower	Species in fruit	Species in flower	Species in fruit			Species in flower	Species in fruit			Species in flower	Species in fruit
<i>Solanum torvum</i>	Species in flower	Species in fruit	Species in flower	Species in fruit			Species in flower	Species in fruit			Species in flower	Species in fruit

KEY

Species in flower



Species in fruit



Data gathered from literature and herbarium specimens

Gene Pool Tertiary relative of *Ipomoea batatas* (L.) Poir



See above
for seed
image



4-5 m



Nov-Mar

Nov-Apr

Gene Pool Tertiary relative of *Ipomoea batatas* (L.) Poir

HABIT: Perennial, slender, high twining.

LEAVES: Leaf blades ovate, deeply cordate, acuminate, the basal lobes rounded, sinuate-dentate on the outer margin with a few prominent teeth, entire toward the apex, 5-9 cm long; petioles about equaling the blades or shorter.

INFLORESCENS: Peduncles exceeding the subtending petioles and blades, slender, 10-18 cm long, 1-3 flowered; pedicels 10-15 mm long; sepals unequal, membranaceous, the inner longer, oblong or elliptical-oblong, 8-10 mm long, obtuse or rounded; corolla 5-9 cm. long, lilac to purple on inside of the throat, the tube slender within the calyx, expanding above the calyx into a tube 1 cm thick, the limb subentire, about 4 cm broad.

FRUITS: Ovate, obtuse, 7-8 mm long and 7-9 mm wide.

SEEDS: Ovoid, 4 - 5 mm long, with long trichomes on the margins, black.


Habitat:

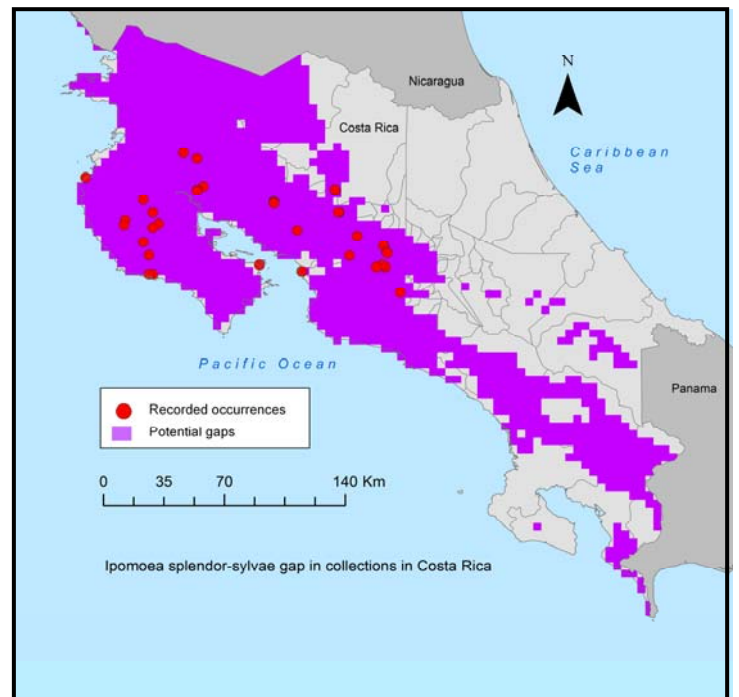
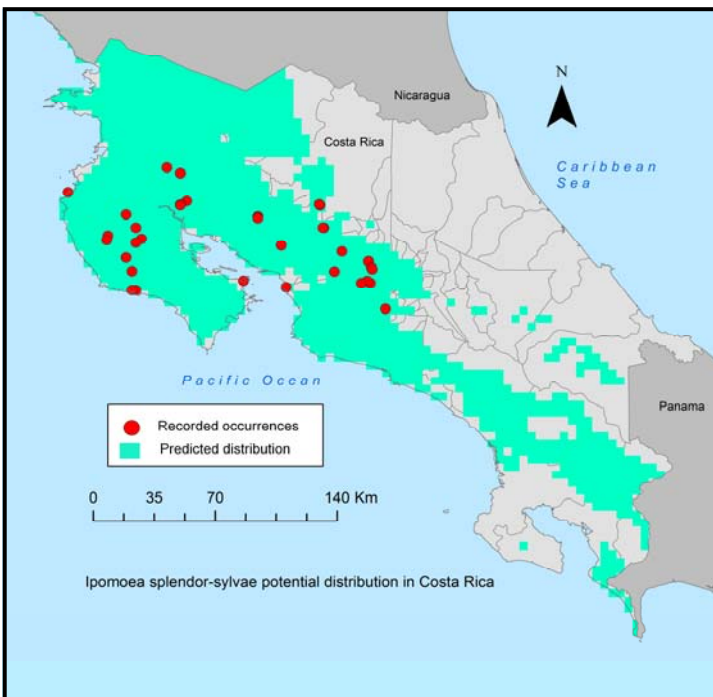
Dry forest, wet and very wet, scrub and forest edges.

Distribution:

Costa Rica, Honduras, Mexico, Nicaragua.

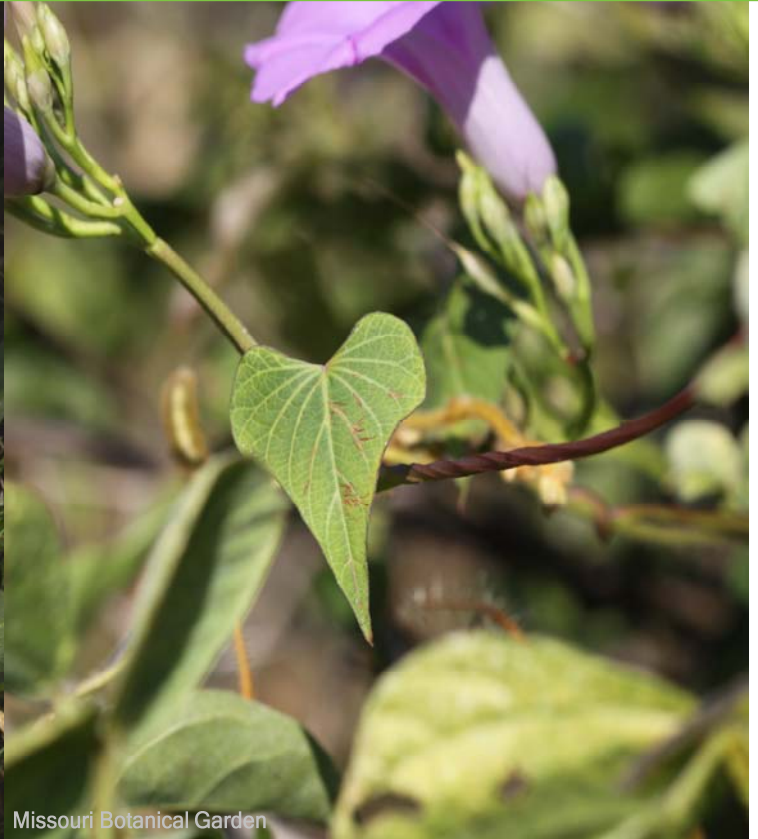
Altitude: 0 - 1500 m

<p><i>Ipomoea splendor-sylvae</i></p>	<p>May be confused with: <i>Other Ipomoea species</i></p>
<p>Leaves toothed near the base, peduncles elongated exceeding the leaves.</p> 	<p>Many species of <i>Ipomoea</i> have similar morphological characteristics. Refer to the left box for defining characteristics of <i>Ipomoea splendor-sylvae</i>.</p>



References: Muhlenbergia. Volume: v.3-4 1(907-1908) page 43

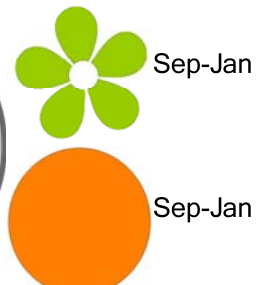
Gene Pool Tertiary relative of *Ipomoea batatas* (L.) Poir



No seed image available



Up to 6 m



Provisional Secondary Gene Pool relative of *Ipomoea batatas* (L.) Poir**HABIT:** Stems twining, slender, several metres long, glabrous or hirsute, lignescent.**LEAVES:** Ovate, 5- 15 by 3-10 cm, cordate at the base, acuminate, with an acute or obtusish mucronulate acumen, mostly entire, glabrous or appressed-pilose; petiole slender, 3-7 cm.**INFLORESCENCES:** Axillary; peduncles solitary or in pairs, as long as, or often longer than the petiole, 4-15 cm, cymosely few- to several-flowered. Pedicels 5-12 mm. Bracts minute, narrow-lanceolate.**FLOWERS:** Sepals glabrous or sparsely fimbriate at the margins, nearly equal in length or the outer ones shorter; outer sepals oblong or ovate-lanceolate, acute, mucronulate, 5-10 mm long, inner ones elliptic, acute or obtuse, often with a less distinct mucronate, to 10 mm long. Corolla funnel-shaped, ca 4-6 cm long, glabrous, pink or purple, often with a darker centre, or rarely white. Stamens and style included; filaments sparsely pubescent nearly to the apex. Ovary glabrous.**FRUITS:** Capsule globular, 2-celled, 4-valved.**SEEDS:** 4, glabrous or pilose along the edges.**Habitat:**

River banks, clearings in secondary forests.

Distribution:

Native to Australia and New Zealand, the Caribbean, South and Central America, and South Eastern Asia. Also known from Cameroon.

Altitude: 0 - 100 m

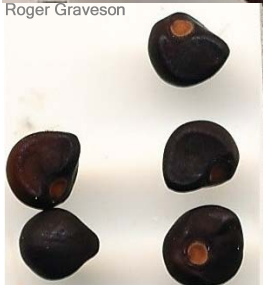
<i>Ipomoea tiliacea</i>	May be confused with: <i>Ipomoea littoralis</i>
Corolla funnel shaped 4-6 cm. Capsule globular.	Corolla funnel shaped 3-4.5 cm. Capsule depressed globose.

Reported from
Costa Rica but no
localities known

All populations
priority for collection

References:

Provisional Secondary Gene Pool relative of *Ipomoea batatas* (L.) Poir



several
m long

LC
PRELIM



No data

No data

Gene Pool Secondary relative of *Ipomoea batatas* (L.) Poir

HABIT: Vines, twining or prostrate stems mostly over 1 m long, glabrous or commonly with short-pilose indumenta.
LEAVES: Broadly ovate to suborbicular, entire, coarsely dentate to deeply 3-5 lobed, occasionally 7-lobed, 3-10 cm long and wide, basally cordate, the basal lobes rounded or angular to lobed, the apex acute, obtuse or sometimes acuminate, both surfaces glabrous or short-pilose.
INFLORESCENCES: Axillary, the peduncle variable in length and either shorter or longer than the petiole, short-pilose, angular, minutely verruculose toward the apex, more slender than most of the other species, mostly few-flowered cymes.
FLOWERS: Funnelform, 3-4 cm long, rarely shorter, glabrous, dark pink to lavender, the centre purple, the limb obtuse, lobes mucronulate; sepals usually markedly unequal, the outer 4-10 mm long, ovate, acute, with a short mucronate tip, densely pilose with small, appressed trichomes, the margins with similar indument, the inner sepals broader, 5-12 mm long, glabrous or with an indument similar to the outer, calyces are straw-yellow, at least the inner sepals cochleate; stamens with white anthers and filaments; ovary pubescent; nectary yellow to yellow-orange.
CAPSULES: Subglobose, 5-7 mm in diameter, short-bristly pubescent, 2-celled, 4-valved.
SEEDS: 4 or less, 3-3.5 mm long, subglobose, glabrous, brown.

Habitat:

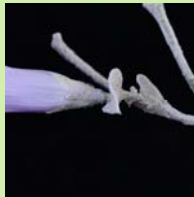
In thickets and hedges.

Distribution:

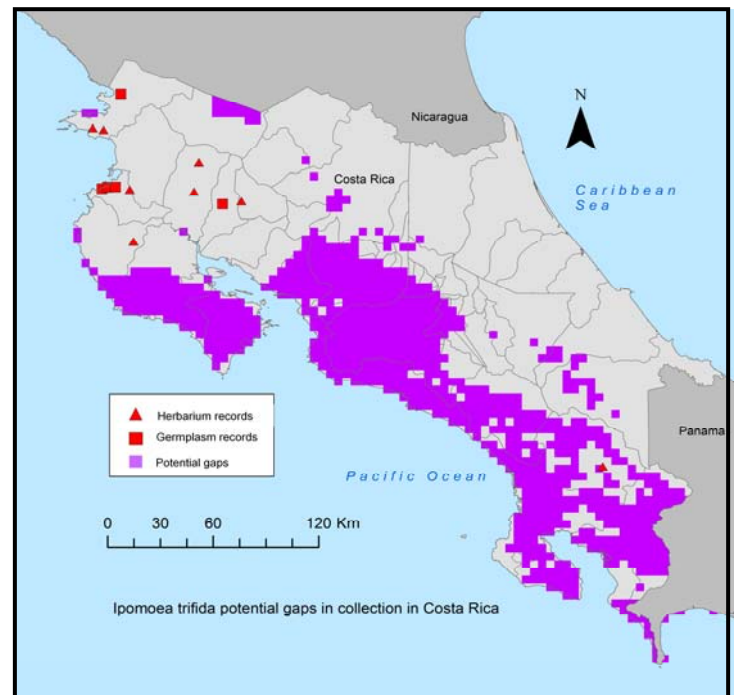
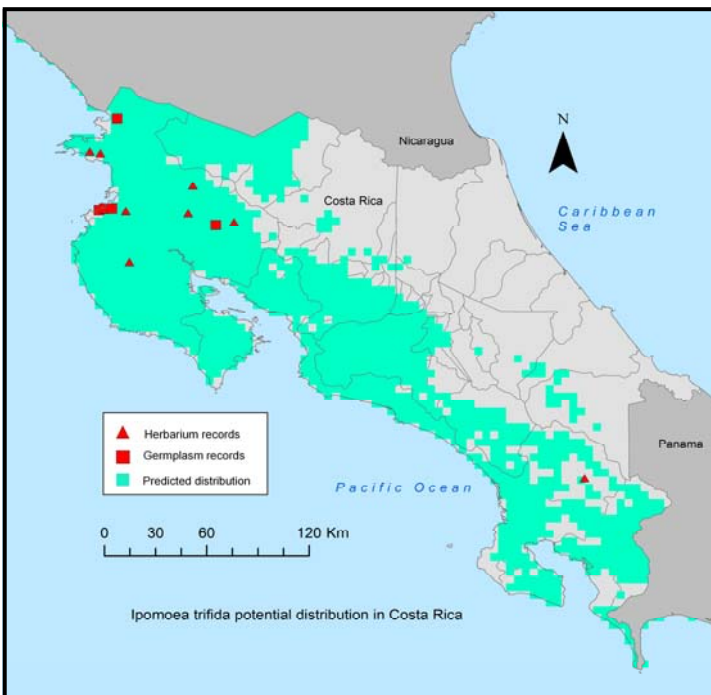
Native of Tropical America.

Altitude: 0 - 300 m*Ipomoea trifida*May be confused with:
Ipomoea trichocarpa

Sepals straw yellow with small trichomes.



Sepals brown-green to red, glabrous.

**References:** Austin, D.F., (1978), Bulletin of the Torrey Botanical Club., The Ipomoea batatas complex,

Gene Pool Secondary relative of *Ipomoea batatas* (L.) Poir



This image has been redacted due to copyright restrictions. To request access to an unabridged version of this guide, please contact the Seed Bank Librarian at msbplib@kew.org



See above
for seed
image



Over 1
m long



No data

No data

Gene Pool Primary relative of *Phaseolus coccineus* L.

HABIT: Vigorous climber over 5 m long, branches often pendent.

LEAVES: 6.5-16 cm long; petiole 23-75 mm long; petiolule 0.9-2 cm long; pulvini 2.5-4 mm long, heavily pubescent; terminal leaflet broadly ovate to rhomboid to lanceolate, 3-6 cm long, 2.5-5 cm wide at about 1/4 of length from base, acuminate, apiculate.

INFLORESCENCE: Short erect raceme to 20 cm long, the peduncle 7-14 cm long, the rachis 1-8 cm long, of mostly 2-6- (14) flowering nodes, nearly glabrous to heavily hooked pubescent primary bracts ovate to lanceolate, 4.5-10 mm long, 2-2.5 mm wide, nearly glabrous to heavily pubescent.

FLOWER: Scarlet, mostly 2 per node but often 3, calyx 5 mm long, acute, glabrous to sparsely covered by strigose hairs mostly on the lower central tooth; standard light to dark red, very large, thickened, nearly round, 14-18 mm long, 14-19 mm wide.

POD: Small nearly straight, 6 cm long, 1 cm wide, 0.5-0.8 cm deep, inflated, the valves fibrous, with somewhat thickened sutures, pubescent, green or tan with purple strips, early dehiscent by one complete twist.

SEED: Oblong squarish, flattened, 7 mm long, 6 mm wide, 3 mm thick.

Habitat:

Growing in and around mixed forests, often on steep slopes.

Distribution:

Costa Rica, Honduras, Mexico, Guatemala, El Salvador.

Altitude: 15200 - 2500 m

<i>Phaseolus coccineus</i> subsp. <i>coccineus</i>	May be confused with: <i>Other Phaseolus species</i>
Bracteoles usually more than half the length of the calyx tube, 2 mm or longer.	Many species of <i>Phaseolus</i> have similar morphological characteristics. Refer to the left box for defining characteristics of <i>Phaseolus coccineus</i> subsp. <i>coccineus</i> .

Reported from
Costa Rica but no
localities known

All populations
priority for collection

References:

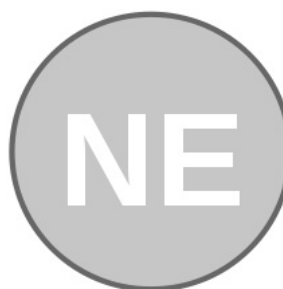
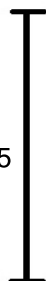
NO IMAGE AVAILABLE

If you know of an image or link to an image of this species please let us know cropwildrelatives@kew.org

No seed
image
available



over 5
m



No data

No Data

Gene Pool Tertiary relative of *Phaseolus acutifolius* A. Gray

HABIT: Aerial shoot huge perennial, woody, shrubby indeterminate vine, 4-8 m long; stem corky and knobby; internodes 12-16 cm long, covered by reflexed, short and fine, strigose, hispid and uncinated, whitish hairs; stipules triangular-lanceolate, 6 mm long, 3 mm wide.

LEAVES: 13-34 cm long terminal leaflets broadly ovate to oblong-ovate, 4-7-11 cm long, 4.5-12 cm wide at about 1/3 from base.

INFLORESCENCE: Very long raceme, 10-38-87 cm long; rachis stout 3-15-46 cm long, with hirtellous, tawny hairs, glabrate below, with many flowering nodes to 30 or more spaced 2-5-30 mm apart on axis.

FLOWER: Dark pink or lilac to purple 23 mm long, 14-15 mm wide; calyx campanulate, 5-6 mm long, with a small knob at base; wings lilac to purple, broadly rounded, cupped and clasping, unequal, spreading laterally, 23 mm long

POD: When young, straight, flat, broad, about 3 times longer than broad, covered with yellowish brown tomentose hairs to sparsely covered by strigose hairs, mature pods straight, 10 cm long, 13 mm wide, 7-10 mm thick; the beak strong, 7 mm long, recurved.

SEED: Squarish ovate, rounded and flattened, 10-11.6 mm long, 8.3-9.4 mm wide, 3.8-5.1 mm thick, brown and black speckled and streaked on brown and tan.

Habitat:

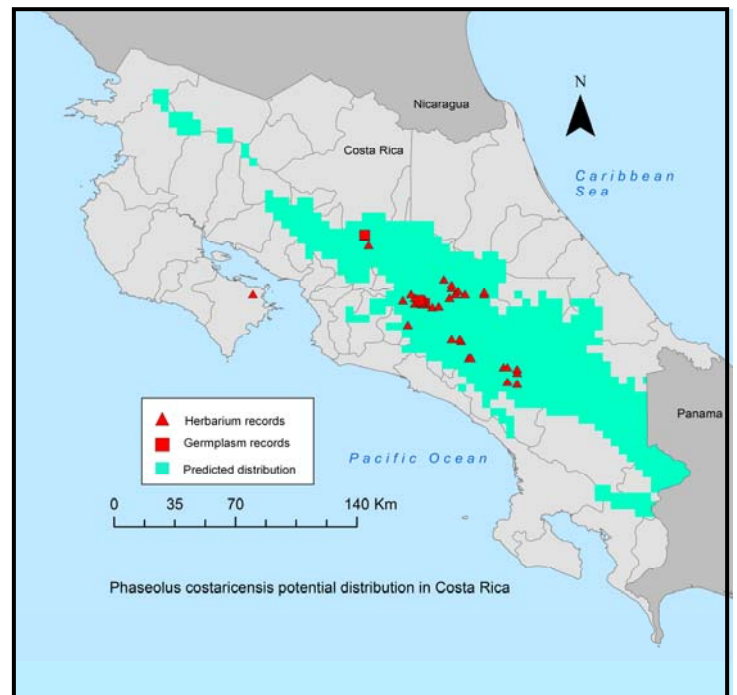
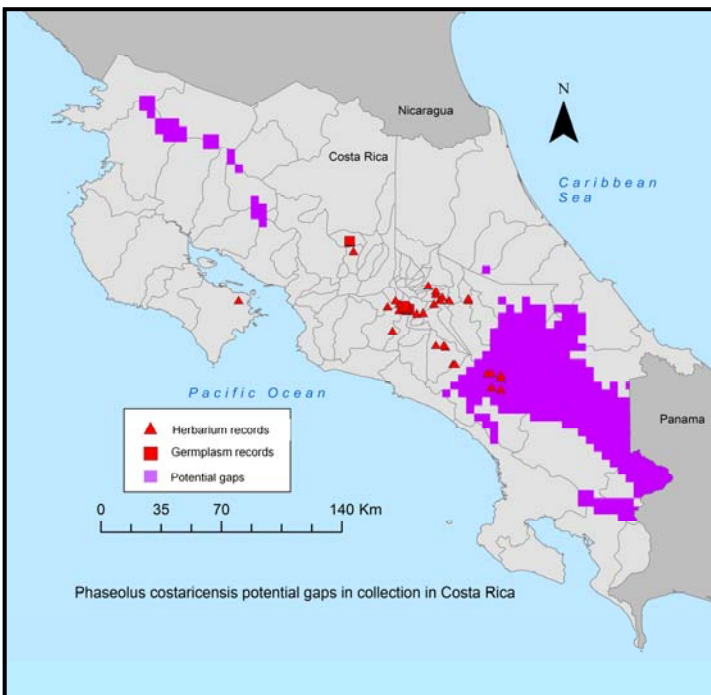
Sprawling over shrubs and trees, open areas, steep slopes.

Distribution:

Costa Rica, Panama.

Altitude: 1400 - 2100 m

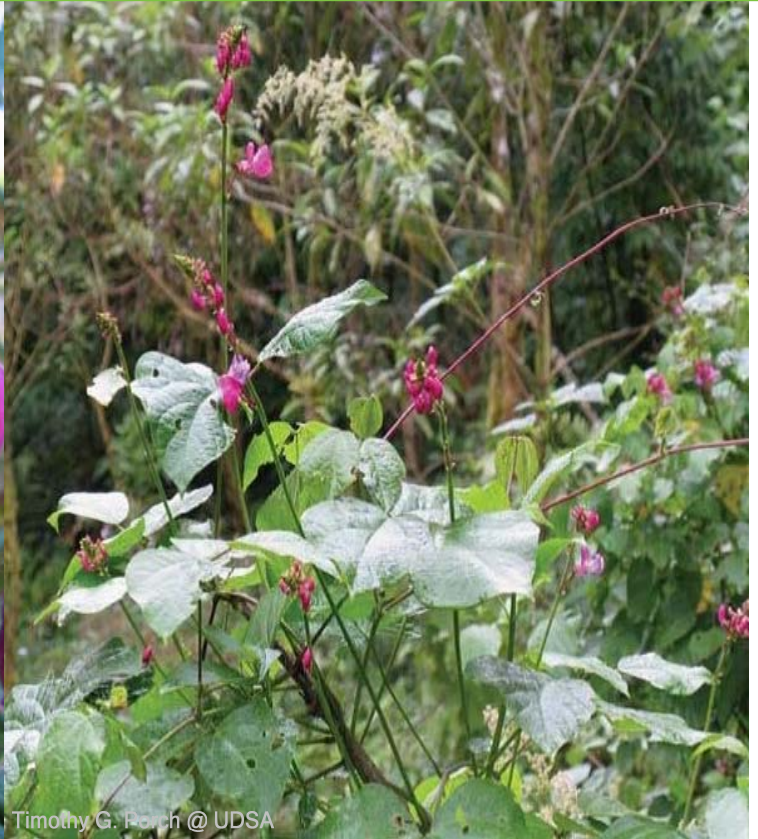
<i>Phaseolus costaricensis</i>	May be confused with: <i>Phaseolus coccineus</i>
Dark pink or lilac to purple flowers. Large, long primary bracts and bracteoles, 5-8-9 mm long.	Scarlet flowers. Bracteoles 2mm or more.



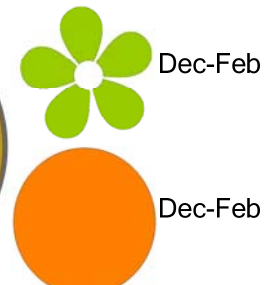
References: Freytag, G.F. & Debouck, D.G. (2002) Taxonomy, Distribution and Ecology of the Genus *Phaseolus* (Leguminosae-Papilionoideae) in North America, Mexico and Central America.

Phaseolus costaricensis Freytag & Debouck

Gene Pool Tertiary relative of *Phaseolus acutifolius* A. Gray



4-8 m



Primary Gene Pool relative relative of *Phaseolus lunatus* L.

HABIT: Usually perennial, woody, climbing vines with fibrous to somewhat fleshy rootstock. Stems pubescent or glabrous, 1-4.5 m long. Stipules triangular, persistent, 2-3.5 mm long.

LEAVES: Leaflets 3, variable in shape, but usually somewhat triangular-ovate, 5-12 cm long by 3-9 cm wide, base rounded or cuneate, apex acute or acuminate. Petiole 1.5-2 cm long, rachis 0.7-5 cm long, petiolules 3-5 mm long.

INFLORESCENCES: Axillary lax racemes, few-flowered, peduncle 1.5-30 cm long, rachis 1-7 cm long, bracts persistent, 1.5 mm long, bracteoles persistent, 1.5-2 mm long. Calyx campanulate, 2-3 mm, pubescent. Corolla white, yellowish, or pink; standard 5-10 mm long, apex emarginate; wings obovate; keel apex twisted for 1-2 turns. Ovary pubescent.

FRUIT: Pods oblong-falcate, 2-4-seeded, flattened, apex beaked.

SEEDS: Variable in colour, usually white or purple, reniform to rhomboid, longest dimension 1-1.5 cm, hilum whitish, 2.5-4 mm long.

Habitat:

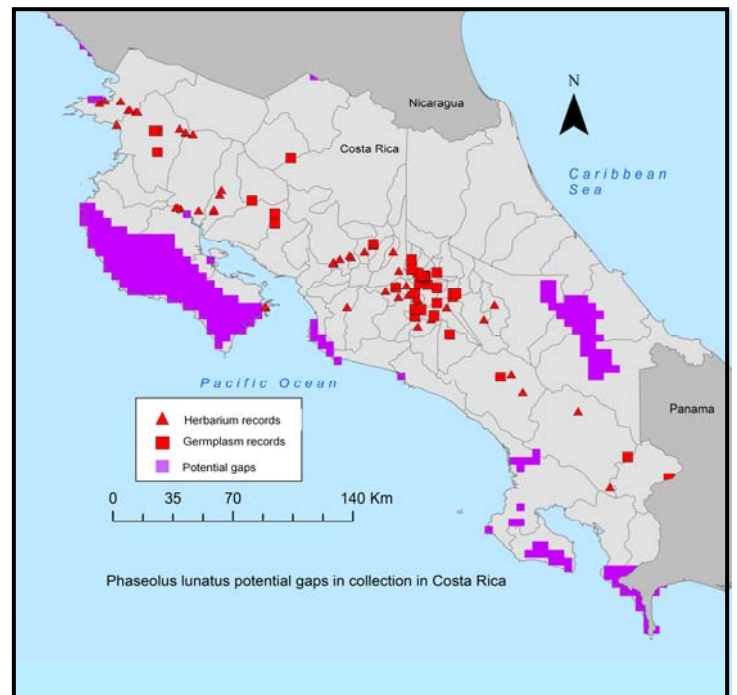
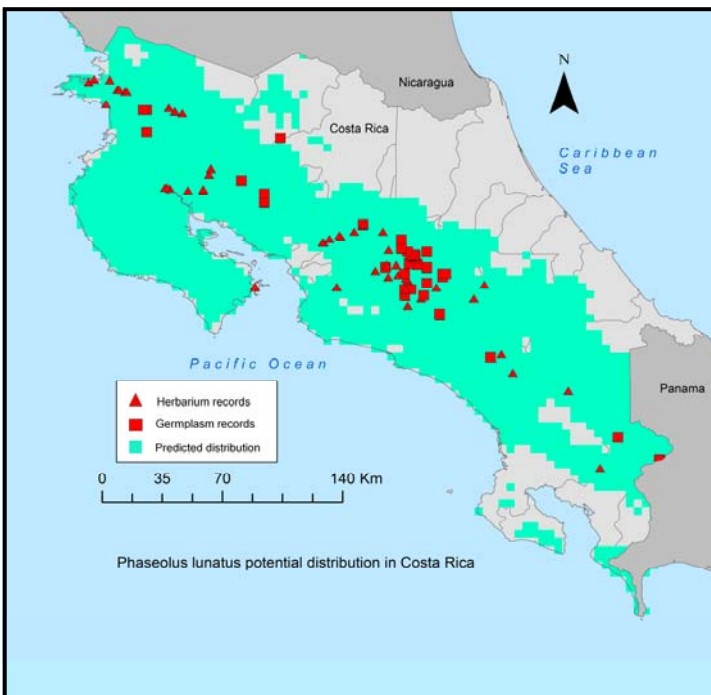
Grasslands, forests, cultivated areas.

Distribution:

Native to tropical America, widely cultivated and naturalized throughout the rest of the tropics and subtropics.

Altitude: 0 - 2250 m

<i>Phaseolus lunatus</i>	May be confused with: <i>Other Phaseolus species</i>
Woody vines with fibrous rootstock; bracteoles very small, c.1.5 mm long; leaflets usually somewhat triangular-ovate, nearly glabrous; pod oblong-falcate.	Many species of <i>Phaseolus</i> have similar morphological characteristics. Refer to the left box for defining characteristics of <i>Phaseolus lunatus</i> .



References: Freytag, G.F. & Debouck, D.G. (2002) Taxonomy, Distribution and Ecology of the Genus *Phaseolus* (Leguminosae-Papilionoideae) in North America, Mexico and Central America.

Primary Gene Pool relative relative of *Phaseolus lunatus* L.



No seed image available



1-4.5 m

LC
PRELIM

Jan-Dec
Jan-Dec

Phaseolus vulgaris var. *aborigineus* (Burk.) C.Baudet

Gene Pool Tertiary relative of *Phaseolus acutifolius* A. Gray

HABIT: Perennial climbing indeterminate vine, tending to be annual, 1-6 m long, at ground level to 2-3 cm thick, strongly twining erect, often branching.

LEAVES: 8-16 cm long; petiole 3-5 cm long; petiolule 1.5-2.5 cm long, moderately covered with strigose and shorter uncinata hairs; pulvini 3-5 mm long, moderately covered with strigose hairs; terminal leaflet ovate to broadly ovate, 4-8 cm long, 3-7 cm wide at just below midpoint.

INFLORESCENCE: Pseudoraceme, often 2-4 flowers, sometimes many flowered, vertical to extending horizontally; peduncle 5-8 cm long, rachis 3-9 cm long, usually 4-6 flowering nodes but may have as many as 8 or more, with 2 flowers per node, heavily to moderately covered with short uncinata hairs; primary bracts broadly ovate, 4 mm long, 3.5 mm wide, heavily 8- to 12- nerved, glabrous to pubescent, minutely ciliate near tip.

FLOWER: Purple, white, or bicolour, infrequently veined purple; calyx bilabiate, 4 mm long, the upper two teeth united, scarcely elongated, emarginated.

POD: Nearly linear to slightly curved, 5-6.5 cm long, 5-7 mm wide, 3-5 mm thick, inflated but compressed, the beak curved, 3-6 mm long.

SEED: Oblong-rhomboid to spherical, 5-10 mm long, 4-7 mm wide, 3-4.5 mm deep.

Habitat:

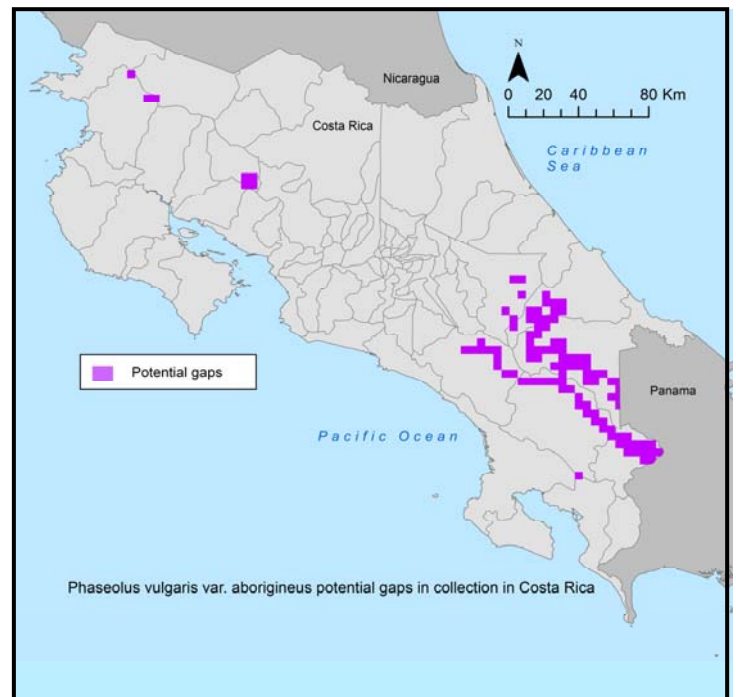
Dryer localities of desert to thorny scrub, on hill sides or steep slopes in open Pine-Oak forest.

Distribution:

Argentina, Guatemala, Peru, Venezuela.

Altitude: 1000 - 2800 m

<i>Phaseolus vulgaris</i> var. <i>aborigineus</i>	May be confused with: <i>Other Phaseolus species</i>
Large seed 5-10 mm long, 4-7 mm wide, 3-4.5 mm deep.	Normal <i>Phaseolus</i> seed ca. 6 mm long, 4.6 mm wide, 2.8 mm deep.



References: Freytag, G.F. & Debouck, D.G. (2002) Taxonomy, Distribution and Ecology of the Genus *Phaseolus* (Leguminosae-Papilionoideae) in North America, Mexico and Central America; Berglung-Brucher, O., Brucher, H., (1976). The South American Wild Bean (*Phaseolus aborigineus* Burk.) as Ancestor of the Common Bean.

Phaseolus vulgaris var. *aborigineus* (Burk.) C. Baudet

Gene Pool Tertiary relative of *Phaseolus acutifolius* A. Gray



No seed image available



1-6 m

LC
PRELIM

May-Jul
Aug-Nov

Gene Pool Secondary relative of *Oryza glaberrima* Steud.

HABIT: Annual; caespitose. Rhizomes short. Culms erect; 200 cm long; 4 - 9 mm diam. Culm-nodes constricted; pallid, or brown. Leaf-sheaths narrower than blade at the collar; glabrous on surface. Ligule 4-6 mm long; entire (often split). Leaf-blades linear to lanceolate; 15-36 cm long; 1.5-4.5 mm wide.

INFLORESCENCE: Peduncle antrorsely scabrous above. Panicle open; lanceolate, or elliptic; 15-40 cm long. Primary panicle branches ascending. Panicle branches angular; scabrous; hispid.

FERTILE SPIKELETS: Spikelets comprising 2 basal sterile florets; 1 fertile florets; without rhachilla extension. Spikelets ovate; laterally compressed; compressed strongly; rostrate; 7-9 mm long; 4-6 mm wide.

GLUMES: Glumes both absent or obscure.

FLORETS: Basal sterile florets similar; barren; without significant palea. Lemma of lower sterile floret lanceolate; 7-8 mm long; 1 length of spikelet; 1 -veined; without lateral veins. Lemma of upper sterile floret lanceolate; 7-8 mm long; 1 length of lower sterile floret. Fertile lemma elliptic; laterally compressed; 6-8 mm long; coriaceous; keeled; 5 -veined. Lemma surface reticulate, margins involute, apex rostrate; 1 -awned. Principal lemma awn 1-18 mm long overall.

FLOWER: Lodicules 2; lanceolate; membranous. Anthers 6. Stigmas 2.

FRUIT: Disseminule comprising a floret.

Habitat:

BogIn Savanna or woodland. In water at river's edge or wet places. Found in open and shaded habitats.

Distribution:

Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Paraguay, Peru.

Altitude: 1 - 230 m

<i>Oryza grandiglumis</i>	May be confused with: <i>Oryza sativa</i>
Empty glumes, Longer and wider leaves 15-35 cm long x 1.5-4.5 mm wide. Short ligule 4-6 mm long.	Leaf-blades 12-65 cm long; 4-18 mm wide. Ligule 15-45 mm long.

Reported from
Costa Rica but no
localities known

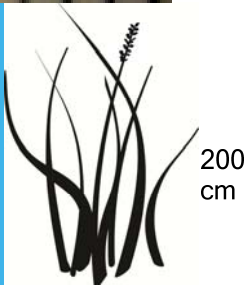
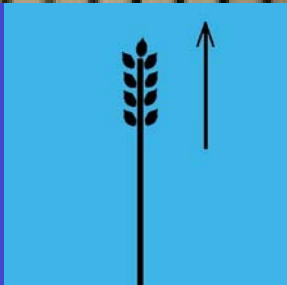
All populations
priority for collection

References: <http://www.kew.org/data/grasses-db/www/imp06790.htm>; Vaughan, D. A., (1994). The Wild Relatives of Rice, A Genetic Resources Handbook.

Gene Pool Secondary relative of *Oryza glaberrima* Steud.



No seed image available



LC PRELIM

Mar-Jul

Mar-Jul

Gene Pool Secondary relative of *Oryza glaberrima* Steud. & *Oryza sativa* L.

HABIT: Perennial. Rhizomes short. Culms erect; 100-300 cm long. Culm-nodes glabrous. Leaf-sheaths 22-42 cm long, smooth. Ligule lacking membrane, 1-7 mm long; obtuse. Leaf-blades lanceolate; 25-72 cm long; 10-40 mm wide.

FERTILE SPIKELETS: Spikelets comprising 2 basal sterile florets; 1 fertile florets; without rhachilla extension. Spikelets oblong; laterally compressed; 5-9 mm long; 2.5-2.8 mm wide; falling entire. Spikelet callus glabrous; base truncate.

GLUMES: Both absent or obscure.

FLORETS: Basal sterile florets similar; barren; without significant palea. Lemma of lower sterile floret linear; 2.5-4.5 mm long; 0.5 length of spikelet; 1 -veined; without lateral veins. Lemma of upper sterile floret linear; 2.5-4.5 mm long; 1 length of lower sterile floret. Fertile lemma oblong; laterally compressed; 5-9 mm long; coriaceous; keeled; 5 -veined. Lemma midvein spinulose. Lemma surface granulate. Lemma margins interlocking with palea margins. Lemma apex rostrate; 1 -awned. Principal lemma awn 8-10 mm long overall; limb scabrous. Palea elliptic; coriaceous; 3 -veined; 1-keeled. Palea keels spinulose. Palea surface granular. Palea apex acute.

FLOWER: Lodicules 2; membranous. Anthers 6, 3.5-4 mm long.

FRUIT: Caryopsis with adherent pericarp; oblong; 6-6.5 mm long. Disseminule comprising a floret.

Habitat:

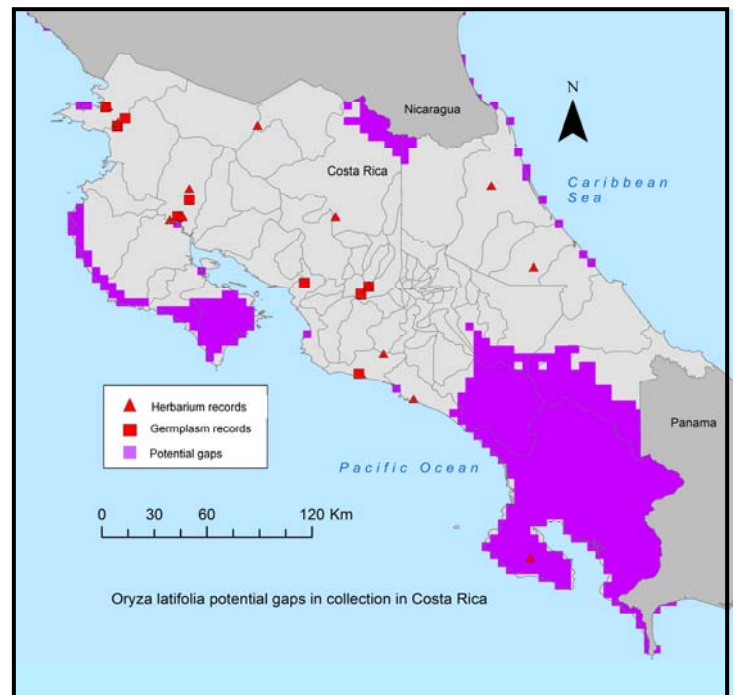
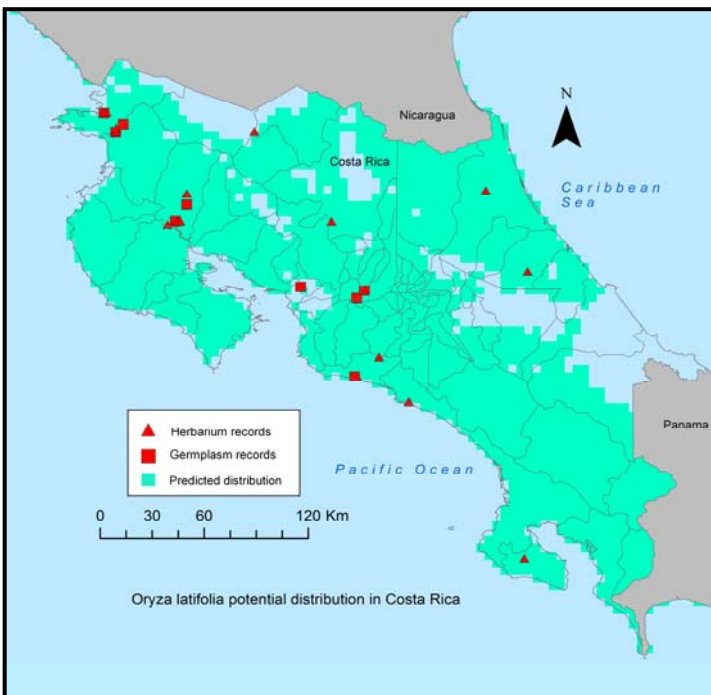
Low forest, rainforest, secondary growth forest, open woodland, undulating savanna, pasture, cultivated fields, open swamp. In or near water.

Distribution:

North America: Mexico. South America: Mesoamericana, Caribbean, northern South America, western South America, Brazil, and southern South America.

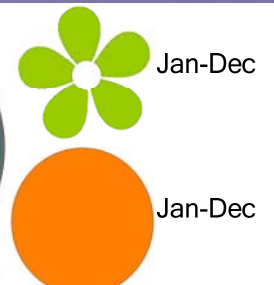
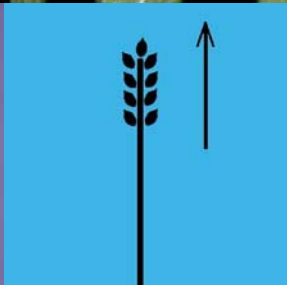
Altitude: 0 - 700 m

<i>Oryza latifolia</i>	May be confused with: <i>Oryza sativa</i>
Coarse growth, wide sharply-scabrous leaves, 10-40 mm wide, short ligule, form of branching and narrower spikelets, 5-9 mm long; 2.5-2.8 mm wide.	Leaf-blades 12-65 cm long; 4-18 mm wide. Spikelets 8-11 mm long; 2.5-3.5 mm wide.



References: GrassBase - The Online World Grass Flora; Nanda, J.S., Sharma, S.D., (2003) Monograph on Genus Oryza; Vaughan, D.A., (1994) The Wild Relatives of Rice.

Gene Pool Secondary relative of *Oryza glaberrima* Steud. & *Oryza sativa* L.



Gene Pool Primary relative of *Solanum muricatum* Aiton

HABIT: A viny bush, climbing or sprawling, up to 2 m or more; more or less densely pilose throughout with dull tawny or shiny silvery hairs; stem woody or thick-herbaceous, hirsute.

LEAVES: Entire to trilobed or with a second pair of greatly reduced lateral leaflets, rarely more than 12 cm long, with a petiole up to 5.5 cm long; leaf or leaflets ovate to ovate-elliptic or elliptic-lanceolate to lanceolate, cuneate to broadly rounded or cordate at base, broadly obtuse to shortly acuminate at apex, densely hirsute; lateral leaflets sessile to very shortly petiolulate; terminal leaflet usually noticeably larger than the lateral ones, up to 10 cm long, 5 cm wide.

INFLORESCENCE: Pseudoterminal and/or lateral, up to 10-flowered simple raceme or very rarely paniculate; peduncle naked or subtended by a pair of bracts at or near the base, up to 8 cm long.

FLOWERS: Purple to lavender, occasionally white or whitish and marked with purple or lavender; calyx dark green, usually densely pilose, 4 - 6 mm long; corolla 1.3 - 2.3 cm diameter.

FRUIT: Globose to ovoid or ovoid-ellipsoid, green with darker green stripes.

Habitat:

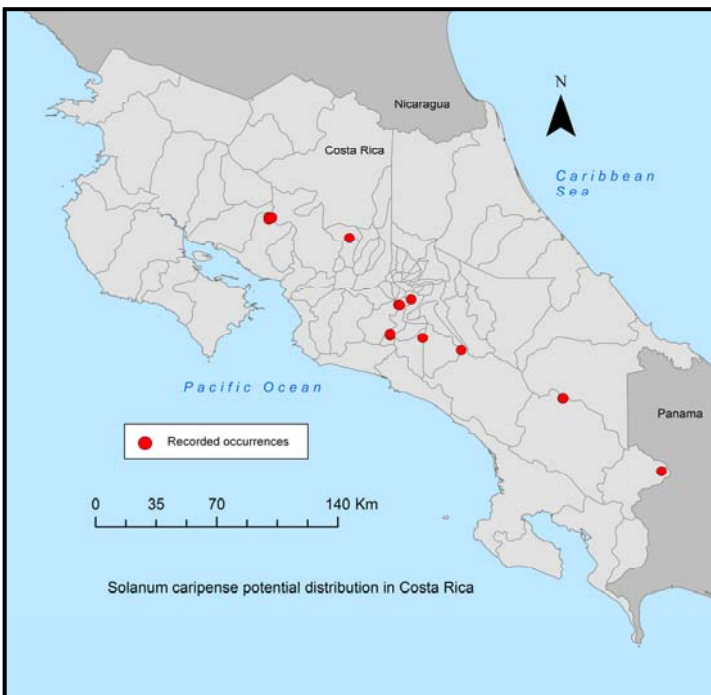
In and on the edges of thickets, on wooded slopes and along streams, about the base of cliffs or sometimes on open slopes.

Distribution:

Costa Rica, Venezuela, Colombia, Ecuador and Peru.

Altitude: 80 - 3800 m

<i>Solanum caripense</i>	May be confused with: <i>Solanum filiforme</i>
Leaves usually with odd-pinnate. Calyx lobes not ligulate.	Leaves simple. Calyx lobes ligulate.



All populations
priority for collection

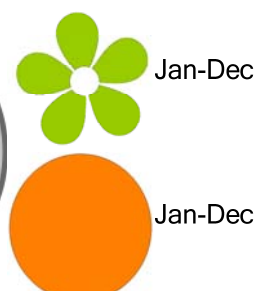
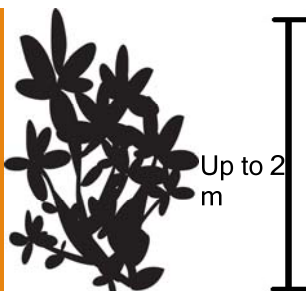
References: Correll, D. S., (1962), The Potato and its Wild Relatives

Gene Pool Primary relative of *Solanum muricatum* Aiton



RBG Kew

No seed image available



Gene Pool Secondary relative of *Solanum tuberosum* L.**HABIT:** Herbaceous tuber-bearing perennials 0.2-2 m tall. Stems 2-13 mm in diameter at base of plant.**LEAVES:** Pseudostipules to 2-10 mm long, lunate. Leaves odd-pinnate, 9-33 cm long, 5-20 cm wide, glabrous; petioles 1-5 cm long; lateral leaflet pairs (2-) 3-5 (-6), subequal or the size of the lateral leaflets diminishing gradually towards the base of the leaf most distal lateral leaflets 3.6-9 cm long, 1.2-3.3 cm wide, narrowly ovate to elliptical, apex acuminate, base oblique, rounded to cuneate, sessile or with petiolules up to 10 mm long; terminal leaflet 4.5-10.0 cm long, 1.2-2.5 cm wide, ovate to elliptical, apex acute to acuminate, base attenuate.**INFLORESCENCE:** Dichasially branched, ebracteate, monochasial or dichasial cyme, 8-16 flowers, all flowers perfect, peduncle 3.8-11 cm long; pedicels 15-30 mm long, articulate between the proximal 1/4 and the distal 1/4.**FLOWERS:** With the calyx 4-10 mm long, lobes acute to short-attenuate; corollas 2-3 cm in diameter, rotate, edges flat, not folded dorsally, blue to purple or white adaxially and abaxially.**FRUITS:** 1.1-3.9 cm long, conical, obtuse to acute at tip, medium green to deep green throughout.**SEEDS:** Green-white throughout, ovoid, ca. 2 mm long.**Habitat:**

In wet habitats, in organic soils, in full sun or partial shade, in openings of cloud forests, marshy grasslands, including disturbed habitats such as landslides, streamsides, road cuts, moist garbage heaps.

Distribution:

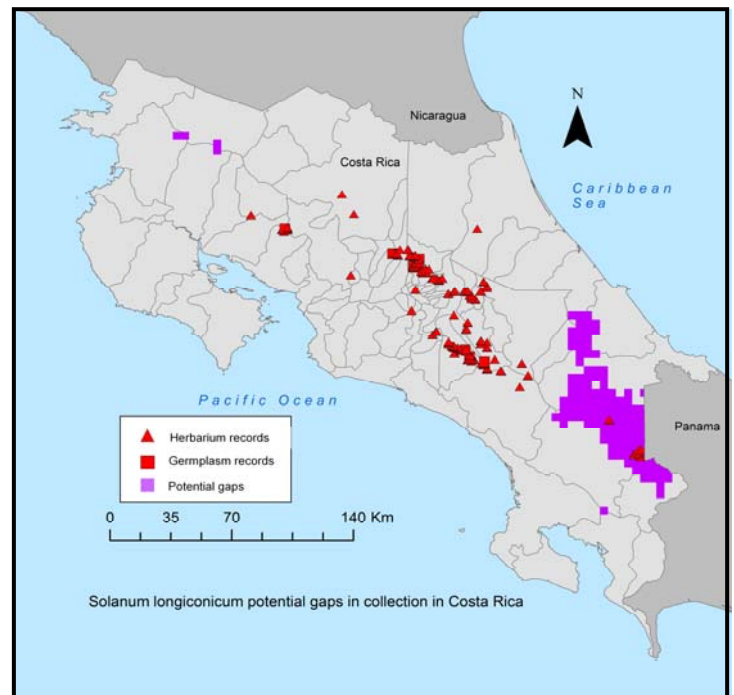
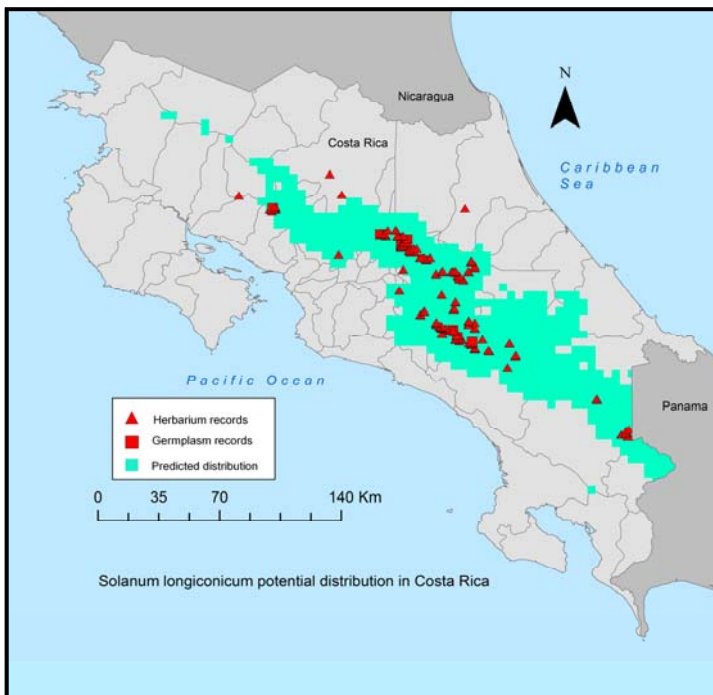
Central Costa Rica to western Panama.

Altitude: 1400 - 3300 m*Solanum longiconicum*

Most distal lateral leaflets sessile or with petiolules up to 10 mm long. Interjected leaflets commonly 0 to rarely 6.

May be confused with:
Solanum agrimonifolium

Most distal lateral leaflets, sessile to subsessile with petiolules up to 2m long. Interjected leaflets 4-31.



References: <http://solanaceaesource.org/taxonomy/term/107911/descriptions>

Gene Pool Secondary relative of *Solanum tuberosum* L.



Credit: Alex Monro



Credit: Alex Monro



Credit: Franz Xaver



Credit: Heike Betz/Field Museum

No seed image available



0.2-2 m



Jan-Dec

Jan-Dec

Gene Pool Tertiary relative of *Solanum melongena* L.

HABIT: Shrubs to 3 m, many-branched from the base, armed or unarmed. Young stems terete, pubescent with a mixture of short and long stalked porrect trichomes to 0.5 mm.

LEAVES: Simple, (5.5-) 9-17 cm long, (4-)5-12 cm wide, ca. 1.5 times as long as wide, elliptic to ovate; adaxial surfaces evenly and sparsely to densely pubescent with sessile porrect stellate trichomes, abaxial surfaces densely pubescent with short to long-stalked stellate trichomes to 0.5 mm long, the stalks multiseriate; apex acute to acuminate; petioles 1.5-4 cm long, densely stellate-pubescent.

INFLORESCENCES: 2-6 cm long, 15-20 mm diam., 1-4 times branched, with more than 50 flowers, peduncle 0.5-2 cm long; pedicels 1-1.2 cm long.

FLOWERS: White, 5-numerous, all perfect. Calyx 4-6 mm long, sparsely to densely stellate-pubescent and glandular, the lobes 3-4 mm long, the caudate tip ca. 1 mm long. Corolla 1.5-2 cm in diameter, stellate, lobed 1/2 to 2/3 of the way to the base, the lobes 7-9 mm long, 4-5 mm wide.

FRUIT: A globose berry, 5-40+ per infructescence, 1-1.3 cm in diameter, pale grayish green.

SEEDS: Up to 100 per berry, 2.5-3 mm long, 2-2.5 mm wide, flattened reniform, pale yellowish tan, the surfaces minutely pitted to smooth.

Habitat:

Among grasses, cacti, tropical deciduous forests, scrub and oak forests, pine forests, often in shallow or dry rocky soil, steep rocky slopes, among piles of stones or along fencerows, railroad tracks, sometimes in cultivated fields.

Distribution:

Widespread throughout central Mexico (southern Jalisco to Querétaro and Veracruz), south to southeastern and south-central Guatemala, to southern Honduras.

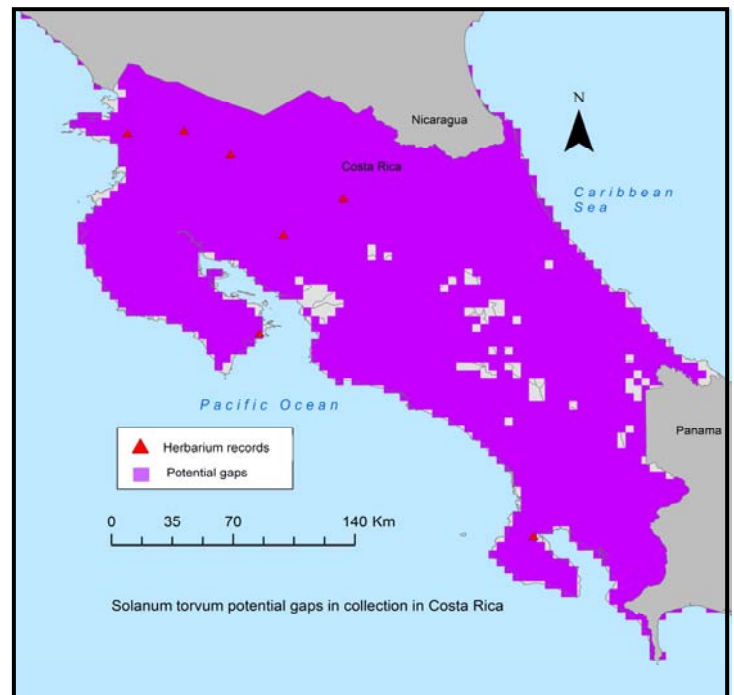
Altitude: 1870 - 3050 m*Solanum torvum*

May be confused with:
Solanum anguivi

Fruit green at maturity, inflorescences with small simple, gland-tipped trichomes. Flowers 15-20mm



Red fruit and smaller flowers, 8-15mm diam.



References: <http://solanaceaesource.org/taxonomy/term/105995/descriptions>

Gene Pool Tertiary relative of *Solanum melongena* L.



Up to 3 m

LC
PRELIM



Jan-Dec

Jan-Dec

Appendix – Synonyms

Taxon		Synonyms
<i>Ipomoea ramosissima</i> (Poiret) Choisy	1	<i>Convolvulus ramosissimus</i> Poir.; <i>Ipomoea dichotoma</i> var. <i>trilobata</i> Meisn.; <i>Ipomoea ebracteata</i> (Poir.) Choisy; <i>Ipomoea perplexa</i> L.O. Williams; <i>Ipomoea quesadana</i> Standl.; <i>Ipomoea ramosissima</i> f. <i>rosea</i> (Hallier) O'Donell; <i>Ipomoea ramosissima</i> var. <i>rosea</i> Hallier
<i>Ipomoea splendor-sylvae</i> House	2	<i>Ipomoea umbraticola</i> House
<i>Ipomoea tiliacea</i> (Willdenow) Choisy in D.C.	3	<i>Convolvulus fastigiatus</i> Roxb.; <i>Ipomoea fastigiata</i> (Roxb.) Sweet; <i>Convolvulus tiliaceus</i> Willd.
<i>Ipomoea trifida</i> (H.B.K.) G.Don.	4	<i>Convolvulus trifidus</i> Kunth; <i>Ipomoea confertiflora</i> Standl.; <i>Ipomoea radicans</i> Blume; <i>Ipomoea ramonii</i> Choisy; <i>Ipomoea roseana</i> House
<i>Phaseolus coccineus</i> subsp <i>coccineus</i> L.	5	<i>Phaseolus coccineus</i> L.
<i>Phaseolus costaricensis</i> Freytag & Debouck	6	No Synonyms
<i>Phaseolus lunatus</i> L.	7	<i>Dolichos tonkinensis</i> Bui-Quang-Chieu; <i>Phaseolus bipunctatus</i> Jacq.; <i>Phaseolus ilocanus</i> Blanco; <i>Phaseolus inamoenus</i> L.; <i>Phaseolus limensis</i> Macfad.; <i>Phaseolus lunatus</i> var. <i>lunatus</i> <i>Phaseolus lunatus</i> var. <i>macrocarpus</i> (Moench) Benth.; <i>Phaseolus macrocarpus</i> Moench; <i>Phaseolus portoricensis</i> Spreng.; <i>Phaseolus puberulus</i> Kunth; <i>Phaseolus rosei</i> Piper; <i>Phaseolus saccharatus</i> Macfad.; <i>Phaseolus tunkinensis</i> Lour.; <i>Phaseolus vexillatus</i> "sensu Blanco, non L."; <i>Phaseolus viridis</i> Piper; <i>Phaseolus vulgaris</i> "sensu Blanco, non L."; <i>Phaseolus xuaresii</i> Zuccagni
<i>Phaseolus vulgaris</i> var. <i>aborigineus</i> (Burk.) C.Baudet	8	<i>Phaseolus vulgaris</i> subsp. <i>aborigineus</i> (Burkart) Burkart & Brucher
<i>Oryza grandiglumis</i> (Döll) Prodoehl	9	<i>Oryza latifolia</i> var. <i>grandiglumis</i> (Döll) A.Chev.; <i>Oryza sativa</i> var. <i>grandiglumis</i> Döll
<i>Oryza latifolia</i> Desv.	10	<i>Oryza latifolia</i> var. <i>grandispiculis</i> A.Chev.; <i>Oryza alta</i> Swallen; <i>Oryza platyphylla</i> Schult. & Schult.f.; <i>Oryza sativa</i> var. <i>latifolia</i> (Desv.) Döll
<i>Solanum caripense</i> Dunal	11	<i>Solanum caripense</i> var. <i>caripense</i> ; <i>Solanum caripense</i> subsp. <i>jamesonianum</i> Bitter; <i>Solanum caripense</i> var. <i>piloso-hirsutum</i> Dunal; <i>Solanum chiliadenium</i> Bitter; <i>Solanum grossularia</i> Wercklé ex Bitter
<i>Solanum longiconicum</i> Bitter	12	<i>Solanum manoteranthum</i> Bitter
<i>Solanum torvum</i> Sw.	13	<i>Solanum ficifolium</i> Ortega; <i>Solanum mayanum</i> Lundell