THE POTATO GERMPLASM RESOURCE

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Abstract

The tuber-bearing Solanums are a unique and wonderful collection of interesting cultivated and wild species that span the mountainous regions from the southwestern United States to the southern tip of Chile. They grow from desert areas to cloud forests, from cultivated fields to stony mountain slopes. They have proven to be a useful source of genes for improvement and other investigative studies. The wealth of variability and usefulness they represent is reflected by their use in a variety of disciplines—breeding, biochemistry, cytogenetics, entomology, genetics, nematology, pathology, food science/processing, etc. Genes for resistance to pests such as aphids, leafhopper and flea beetles, golden and knotroot nematodes, late blight, potato viruses X and Y, and characters such as chipping direct from storage, high solids, frost resistance, tuber shape and color, 2n gamete production, endosperm viability, and enhanced yield are just a few of the characteristics contributed by this invaluable resource. To insure availability of this important resource, several national and international collection(s) of tuber-bearing Solanums have been established. Expeditions have been sent to collect in rural markets as well as in remote mountainous regions only accessible by foot or mule. Screening of the accessions is the key needed to expose the genetic treasure hidden within. The potato is a rich resource that we who work with greatly value. Equally unique are the collaborators who so unselfishly share their findings and materials with others. We work with a crop blessed with an overwhelmingly rich variability and a generous, unselfish community of users.

Compendio

Los Solanum tuberizantes son una singular y maravillosa colección de especies cultivadas y silvestres interesantes que se extienden desde las regiones montañosas del suroeste de los Estados Unidos hasta los bosques nublados y desde los campos cultivados hasta las laderas de las montañas pedregosas. Ellos han probado ser una fuente útil de genes para el mejoramiento y otros estudios de investigación. La riqueza en variabilidad y la

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utilidad que representa se refleja en su utilización en una serie de disciplinas — mejoramiento, bioquímica, citogenética, entomología, genética, nematología, pathología, ciencia alimentaria/procesamiento, etc. Genes para resistencia a plagas tales como áfidos, cigarritas y escarabajos-pulga, a los nematodos dorado y del nódulo de la raíz, al tizón tardío, a los virus X y Y de la papa, y características como su transporte directo del almacén, alto contenido de sólidos, resistencia a las heladas, forma y color del tubérculo, producción de gametos 2n, viabilidad del endosperma, e incremento del rendimiento son unas cuantas de las características con las que ha contribuido este invaluable recurso. Para asegurar la disponibilidad de este importante recurso han sido establecidas varias colecciones nacionales y una internacional de Solanum tuberizantes. Se han enviado expediciones para efectuar colecciones en los mercados rurales al igual que en regiones montañosas lejanas accesibles solamente a pie o a mula.

La evaluación y selección de entradas es la clave requerida para exponer la riqueza genética que se esconde dentro de ellas. La papa es un valioso recurso que los que trabajamos con él apreciamos mucho. Igualmente singulares son los colaboradores que tan generosamente comparten con otros sus descubrimientos y materiales. Trabajamos con un cultivo bendito con una abrumadora riqueza en variabilidad y una comunidad de usuarios generosos y desinteresados.

Introduction

The tuber-bearing Solanums and their close relatives provide a rich, unique and diverse source of genetic variation (5, 14, 23). There are more than 200 recognized wild and cultivated species (18), growing primarily through the mountain chains from the southwestern United States through Mexico and Central America to central Chile and across northern Argentina to the Atlantic coast (Figure 1). They are found growing in cloud forests, in cultivated fields, on cliffs, as epiphytes, in desert areas such as coastal Peru, in forests and on Pacific islands. They are found at all altitudes from the high mountains to coastal areas. They are found in diverse types of soils, from those found on forest floors to sandy soils, to volcanic soils, to rich loamy soils. They are found growing under extremely high rainfall associated with tropical areas to coastal desert areas where moisture is entirely restricted to that provided by ocean mists or fogs. They are a sturdy, diverse group that have adapted themselves to a wide variety of habitats and niches.

They are just as diverse in morphology (5, 14, 23). Some are very short, rosette plants while others may exceed a meter in height. Some grow as vines. Their leaf shapes vary from those similar to the commonly cultivated potato, with its dissected leaflets, to those that consist primarily of a large single leaf. Some leaves are strap shaped, while others are very finely dissected. Some have winged stems, while others are not winged. Some bear their flowers on high pedicels, while others tuck them within their foliage.