

# Tuber genetic stocks and gene function validation tools

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GCP Project Number: SP2-4



Generation Challenge Program and CIP

*The International Potato Center CIP*



# Immediate objectives

- To estimate homozygosity of suitable potato genetic stock available at CIP and SCRI using AFLP markers;
- To assess phenotypic homogeneity of near-homozygous accessions by field trials;
- To evaluate suitable EMS dose for mutation generation;
- To generate a potato mutant population useful for forward and reverse genetics;
- To perform preliminary characterization of the mutant stock.

# Background

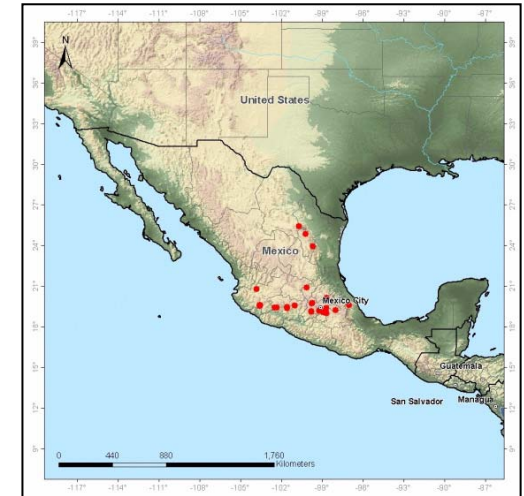
The potato has one of the richest genetic resources of any cultivated plant with about 230 wild and primitives species and highly heterozygous modern varieties.

The crop is rarely self-compatible, one notorious exception is *S. verrucosum*, a diploid self-compatible tuber bearing wild species.



# *Solanum verrucosum*

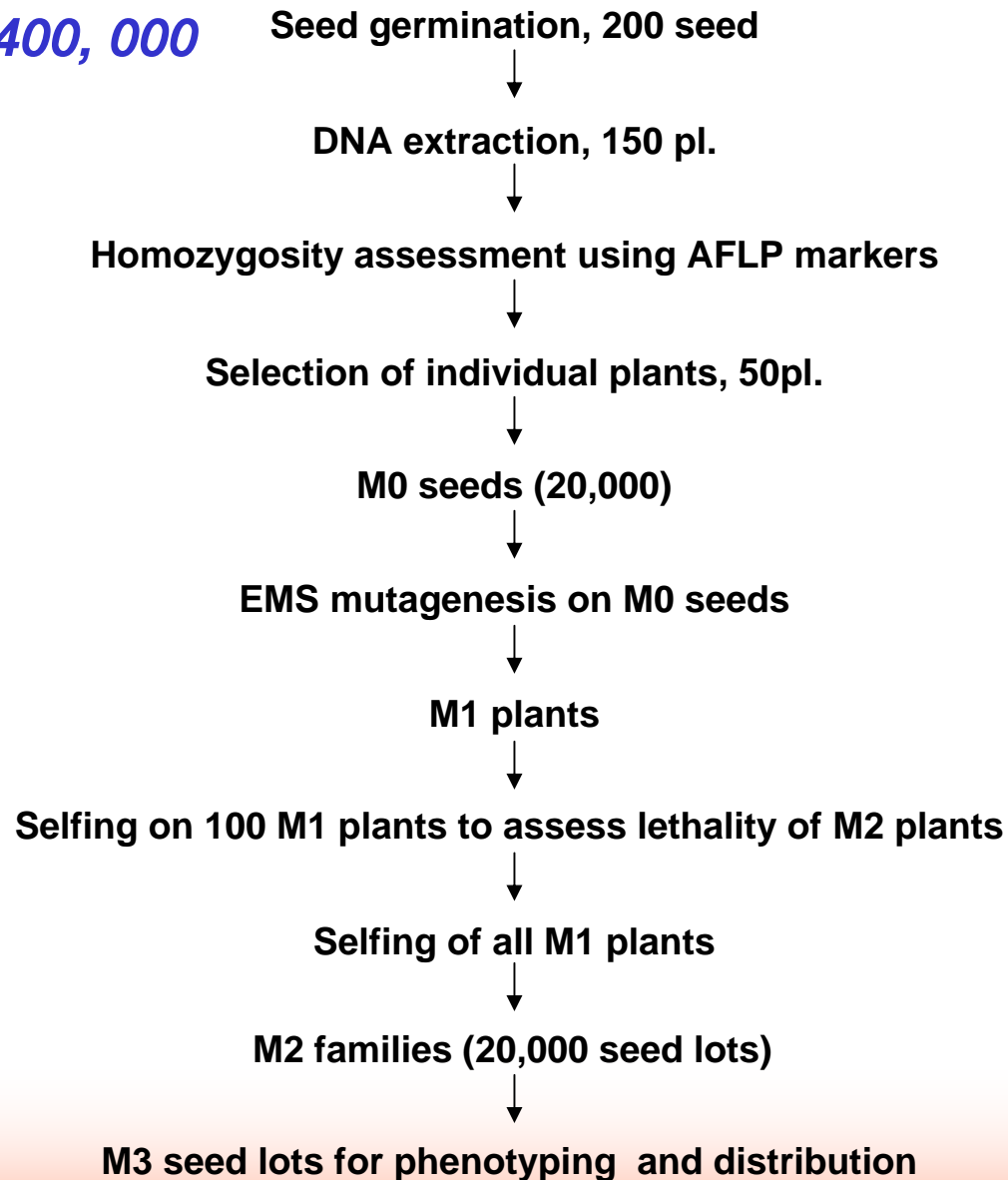
- Tuber bearing plant, usually erect and slender;
- Tubers: oval, compressed, white or purple-tinged, 3-6 cm. long.;
- Flowers: deep purple to light purple or lavender purple;
- Corolla: rotate-pentagonal
- Habitat: in coniferous and hardwood forests, 2400-3200m alt.;
- Chromosomes:  $2n = 24$
- *S. verrucosum* is frequent in the high mountains of Central México



# Attributes of *S. verrucosum*

- Is a self-compatible species;
- Old studies indicate *S. verrucosum* to be heterozygous for genes controlling quantitative and qualitative characters;
- Male and female fertility ;
- Crossable with many species (phu, sto, sou, chc, tbr);
- Major genes and polygenes for resistance to *Phytophthora infestans* ;
- Resistant to virus X and Y, and good resistance to Colorado beetle, flea beetle, green peach aphid, potato aphid and leaf hopper.

**General scheme for the  
production of 400, 000  
mutant  
chromosomes  
in 20,000  
M2 families**



# *S. verrucosum* accessions

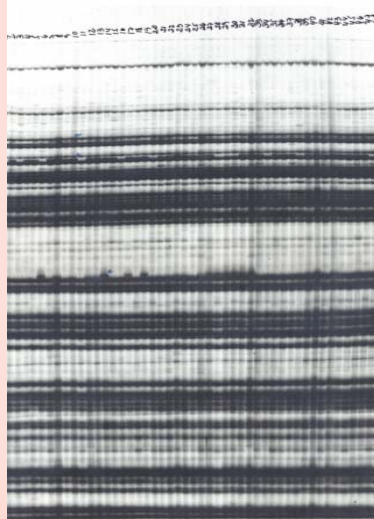
CIP number	PI number	Collector number	Species	FAO	In vitro/seeds
CPC54	-	BLS 5628	ver	not known	seeds
763029	275256	HAW 1528	ver	y	seeds
-	116163	-	ver	not known	In vitro & seeds
763779	558482	SHGRF 4019	ver	y	seeds
763855	498010	TRHRG 23	ver	y	seeds
763857	498061	TRHRG 161	ver	y	seeds
763858	545747	TRHRG 197	ver	y	seeds
763863	310966	UGN 1289	ver	y	seeds
-	-	TAR 91F	ver	y	seeds

**Table 1: Accessions of *S. verrucosum* available to the project for developing potato mutant collection ('CPC' accession is available from SCRI and '763\_\_\_'-series from CIP**

**Seeds were germinated of the 8 *verrucosum* accessions available at CIP and DNA extracted from 50 plants.**

# Homozygosity assessment of CIP's materials

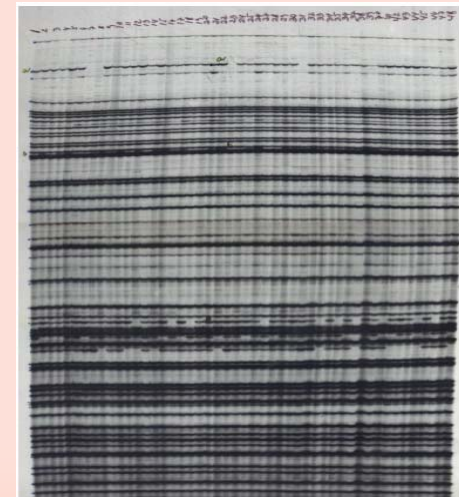
Seven AFLP primer combinations (*EcoRI* / *MseI* - chosen based on polymorphism in previous mapping work) revealed that plants from the accession TRHRG 161 resulted from selfing and displayed a residual heterozygosity estimated at 7.5% based on polymorphic AFLP markers.



E44M60



E44M50



E34M60

TRHRG 161

# Homozygosity assessment of SCRI 'CPC54' *S. verrucosum* accession

Seeds of the 'CPC54' *S. verrucosum* accession were sent from SCRI to CIP.

Two hundred seeds have been germinated to characterize residual heterozygosity using AFLP markers. Samples will also be evaluated for agronomic characteristics in the field.



# Next steps toward the 'Genes that makes Potato'

- Analyze the CPC 54 homozygosity;
- Self the TRHRG 161 accession;
- Test EMS toxicity for lethality of *S. verrucosum* seeds;
- Bulk seeds from more homozygous material;
- Mutagenize the seeds
- Assess lethality on 100 M1 plants
- Self M1 plants to produce 20,000 M2 families