

A close-up photograph of several white flowers with bright yellow centers, likely from the Solanum genus. The petals are covered in numerous small, clear water droplets, giving them a glistening appearance. The background is dark, making the white and yellow colors stand out. The text is overlaid in the center of the image.

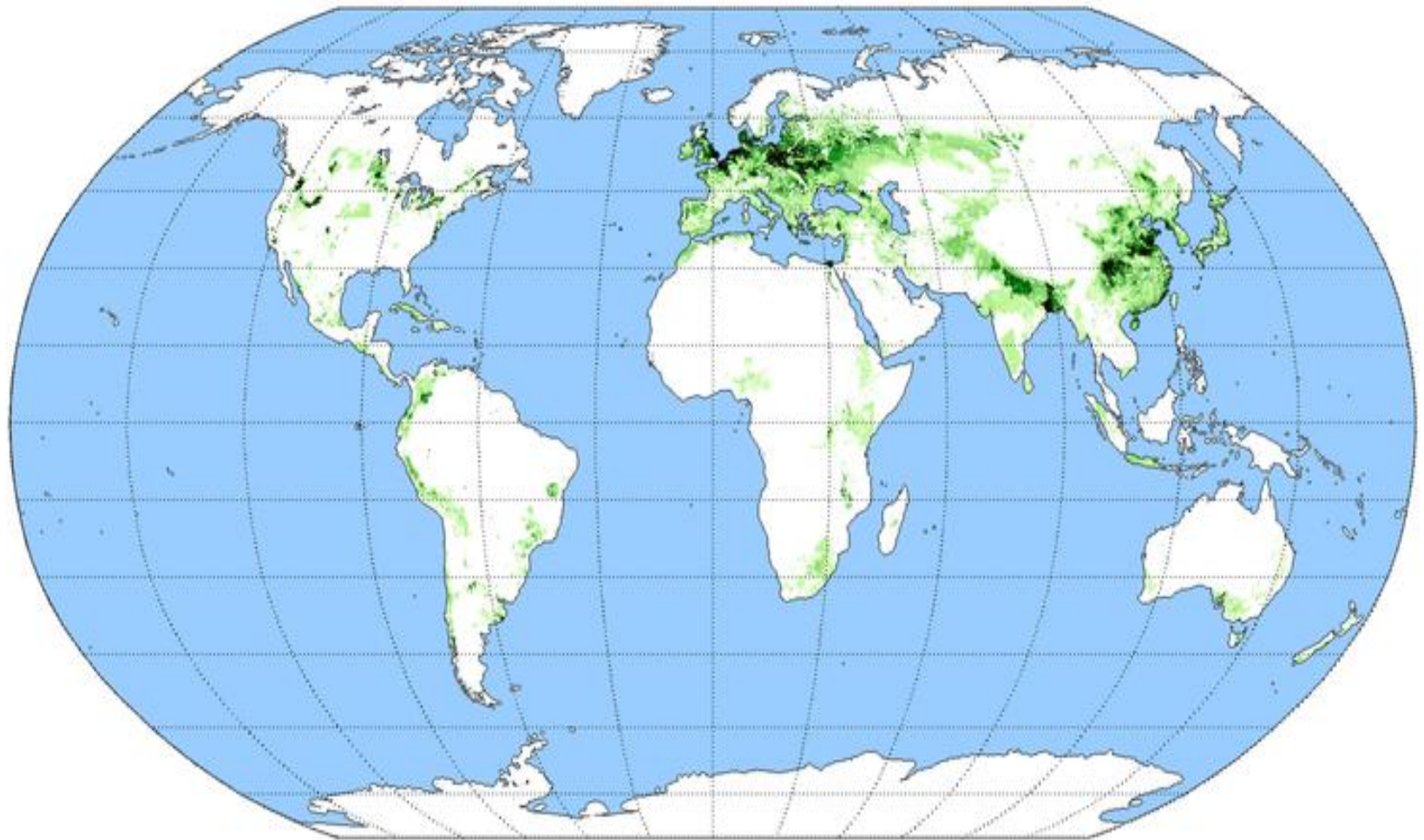
***Solanum* L. species: taxonomy, distribution,  
valuable traits**

The cultivated potato *Solanum tuberosum* L. originated from the Andean Region of South America.

Potato was first domesticated and eaten by man in South America particularly in the region of the Andes about 8000 years ago.

Potato is one of the most important food crops in the world and is ranked at the fourth place in world food production after wheat, corn and rice.





0 100 200 300 400 500 600



Average regional potato output (kg/ha)

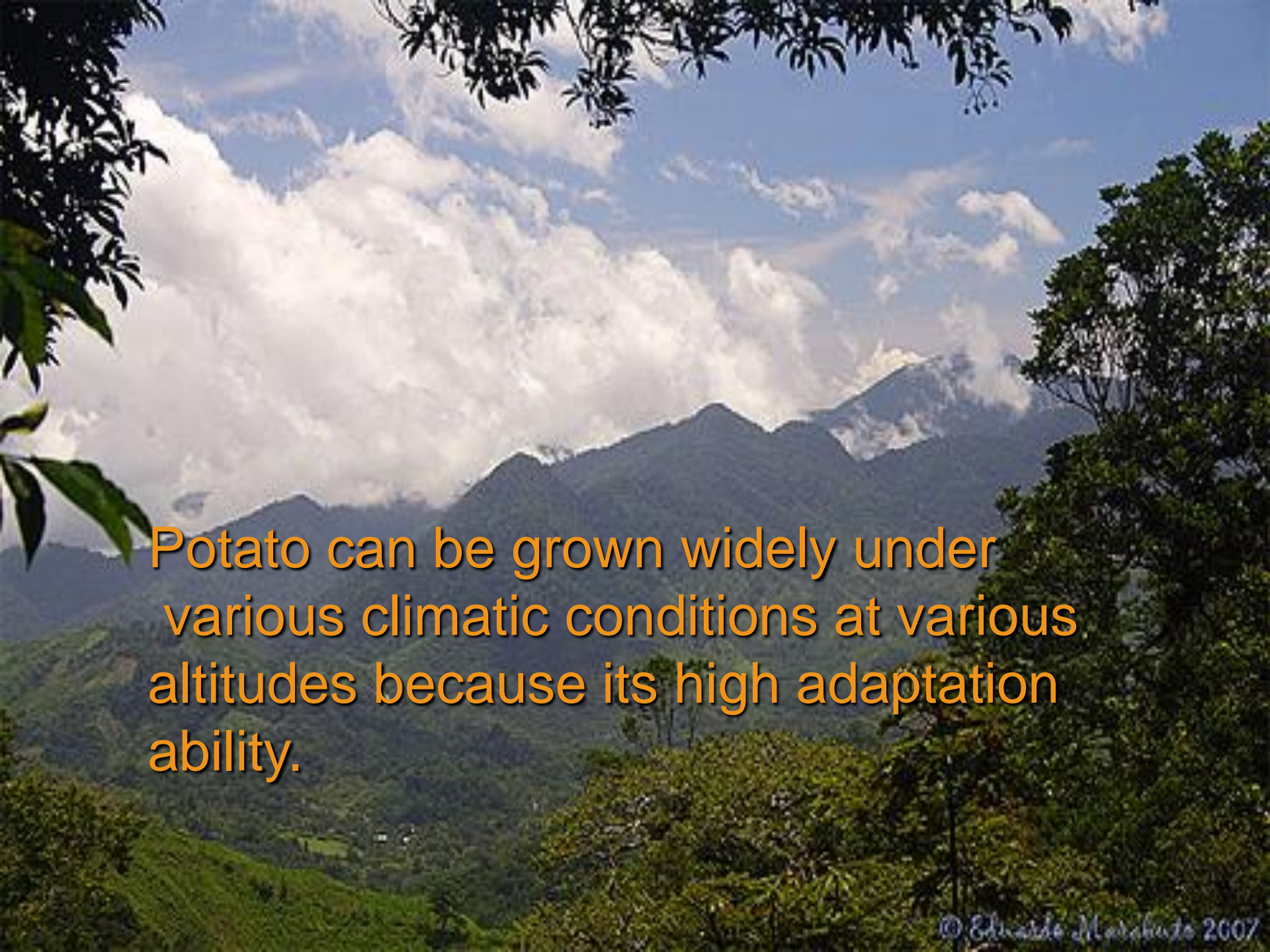
## Nutritional value per 100 g (row with peel)

<u>Energy</u>	321 kJ (77 kcal)	<u>Iron</u>	1.8 mg (14%)
<u>Carbohydrates</u>	19 g	<u>Magnesium</u>	23 mg (6%)
<u>Starch</u>	15 g	<u>Phosphorus</u>	57 mg (8%)
<u>Dietary fiber</u>	2.2 g	<u>Potassium</u>	421 mg (9%)
<u>Fat</u>	0.1 g	<u>Sodium</u>	6 mg (0%)
<u>Protein</u>	2 g	<u>Calcium</u>	12 mg (1%)
<u>Water</u>	75 g		

## Vitamins (per 100 g):

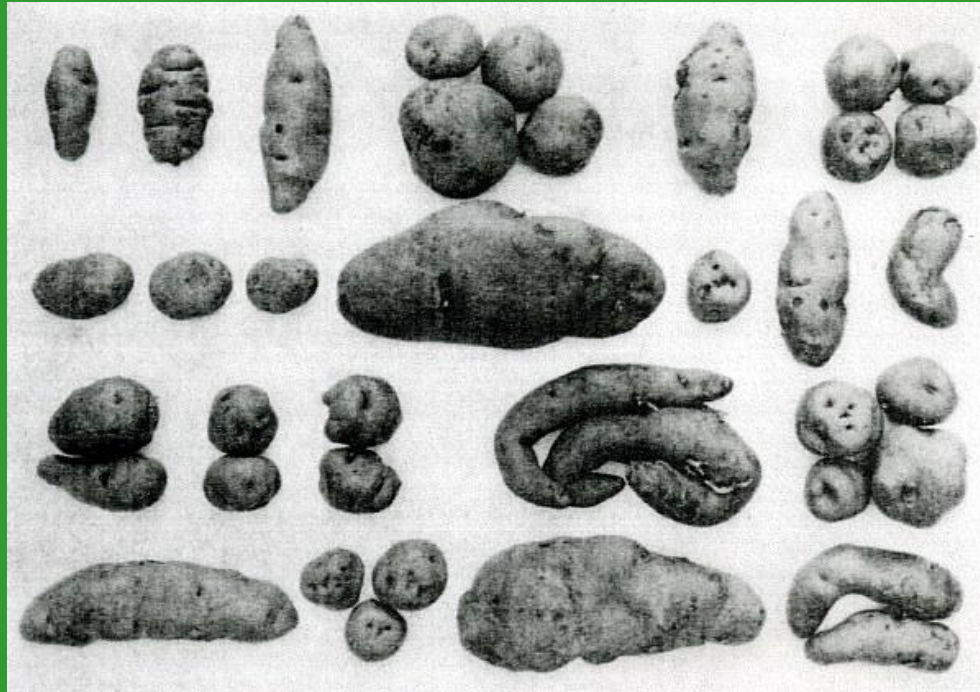
<u>Thiamine (Vit. B<sub>1</sub>)</u>	0.08 mg (6%)
<u>Riboflavin (Vit. B<sub>2</sub>)</u>	0.03 mg (2%)
<u>Niacin (Vit. B<sub>3</sub>)</u>	1.1 mg (7%)
<u>Vitamin B<sub>6</sub></u>	0.25 mg (19%)
<u>Vitamin C</u>	20 mg (33%)





Potato can be grown widely under various climatic conditions at various altitudes because its high adaptation ability.

Wild potatoes occur between 38° N and 41° S, with more species in the southern hemisphere.



Species richness is highest between 8° and 20° S and around 20° N. Wild potatoes typically occur between 2000 and 4000 m altitude.

- Wild potatoes occur in 16 countries., but 88% of the observations are from Argentina, Bolivia, Mexico, and Peru. High species richness occurs in northern Argentina, central Bolivia, central Ecuador, central Mexico, and south and north-central Peru. Peru has the highest number of species (93), followed by Bolivia (39).





# Corolla shapes





# Variation in *Solanum andigenum* tuber morphology



# Botanical series of Central American species

- Series *Morelliformia* Hawkes
- Series *Bulbocastana* Rydb.
- Series *Conicibaccata* Bitter
- Series *Longipedicellata* Bukasov
- Series *Demissa* Bukasov
- Series *Pinnatisecta* (Rydb.) Hawkes
- Series *Tuberosa* (Rydb.) Hawkes

- Hawkes (1990) and Gorbatenko (1989) recognize 15 and 20 series, respectively, for the South American species,  
and
- Hawkes (1990) and Bukasov (1978) recognize 21 and 36 series, respectively.

# Botanical series of South American species

- Series *Commersoniana* Buk.
- Series *Circaeifolia* Hawkes
- Series *Conicibaccata* Bitter
- Series *Cuneoalata* Hawkes
- Series *Acaulia* Juz.
- Series *Megitstacroloba* Cardenas & Hawke
- Series *Tuberosa* (Rydb .) Hawkes

In a nature there are several ploidy levels, varying from diploid ( $2n = x = 24$ ) to hexaploid ( $2n = 6x = 72$ ).



Commonly cultivated potato varieties are being a tetraploids ( $2n=4x=48$ ).

Differences in ploidy lead to difficulties to use wild species in cross with *S. tuberosum*. There are the barriers in cross ability in species with different ploidy levels.





# Crosses





Ktz x and

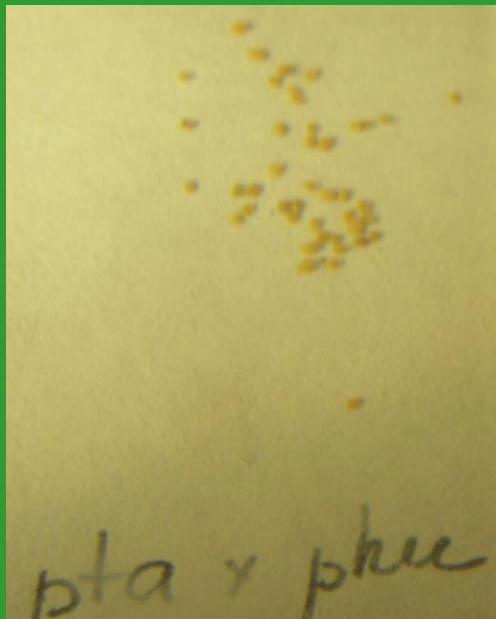
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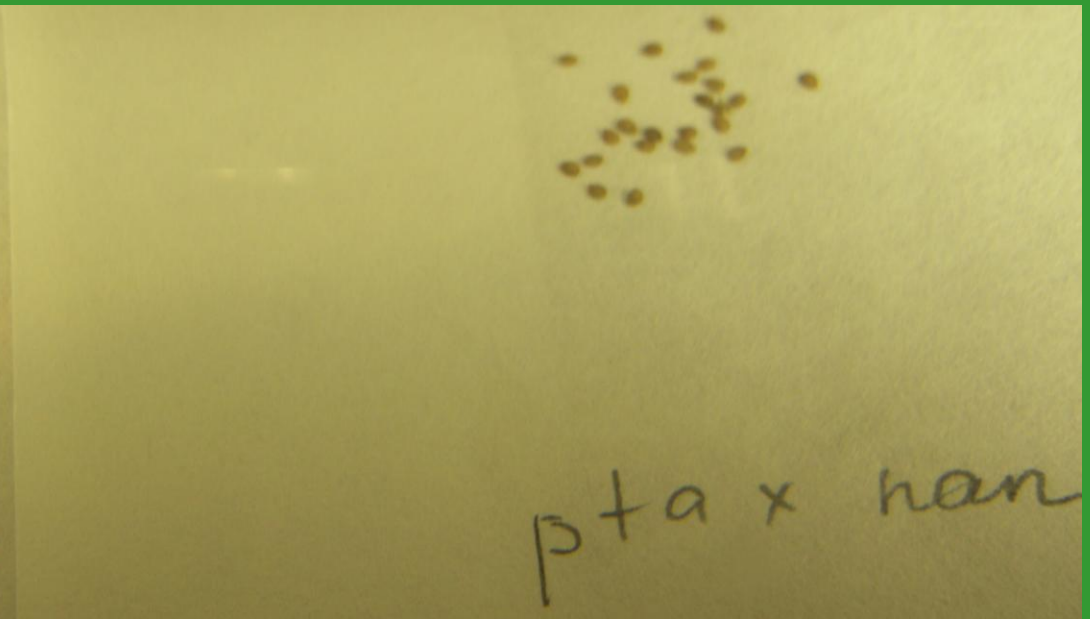
04-2081  
x  
Ora 10.07  
3 ft.



med x tyx  
x Ber  
15.07  
2 ft.



pta x phue



pta x nan

# Triple diploid interspecific potato hybrid



Potato breeding is aimed at improving resistance to many potato diseases. Wild species of the genus *Solanum* are widely distributed from Central America to South America. Utilization of wild *Solanum* germplasm could broaden the genetic resistance base of the cultivated potato.



# Evaluation of potato breeding lines for resistance to Early Blight caused by *Alternaria solani*



Wild potato species are being to be the valuable source of genes for resistance to harmful organisms. To obtain late blight resistance, breeders are focused on the introgression of dominant resistance genes from wild potato species originated from Mexico.



A potato tuber ruined by late blight



Late Blight Caused by *Phytophthora infestans* is the causal agent of late blight, which is the most devastating disease in potato worldwide. It caused the great Irish famine in the 1840s resulting in famine-related diseases, which caused the death of over 1 million people and lead to the emigration of over 1.5 million people.

The economic value of loss caused by late blight costs of crop protection have been estimated at 5 billion US\$ annually.

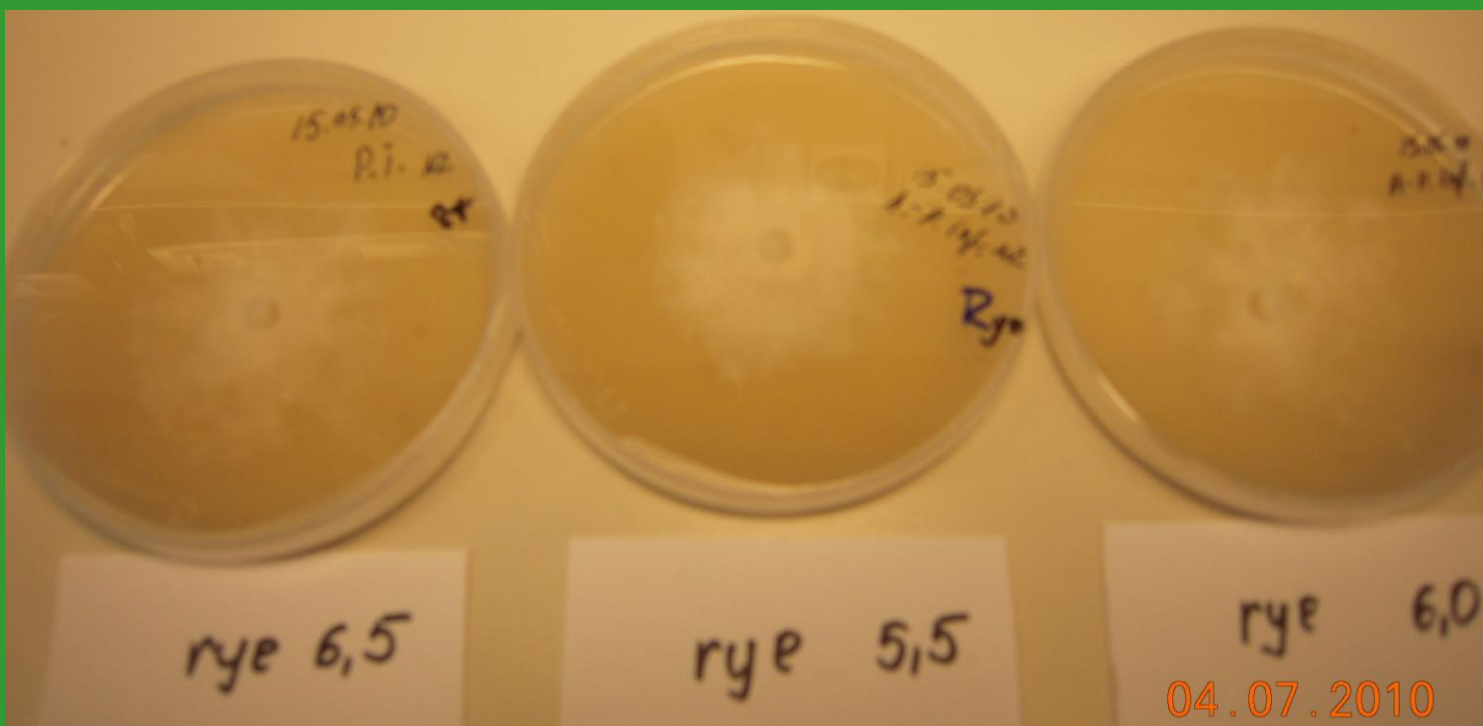




The pathogen *P. infestans* belongs taxonomically to the oomycetes.

The necessity of developing varieties with durable resistance increases because sexual reproduction of pathogen leads to more virulent and fungicide-resistant strains of *P. infestans* occurrence. A1 x and A2 mating types







15.06.2010

**Black 's differential set  
(r, R1-R11)**

During the first half of the 20th century, eleven dominant R genes (R1-R11) from the wild species *S. demissum* were discovered

The genetic spectrum of resistance genes in *S. guerreroense* was not yet studied. It is very probably that *S. guerreroense* is also reach with major genes for resistance to *P. infestans* because it is phylogenetically close to *S. demissum*.

Both species are hexaploid ( $2n = 6x = 72$ ) .

# Hybrid progeny from *S. guerreroense* Corr.





## Evaluation in glasshouse and in field experiments





# Inoculation of yang seedlings with *Phytophthora infestans*



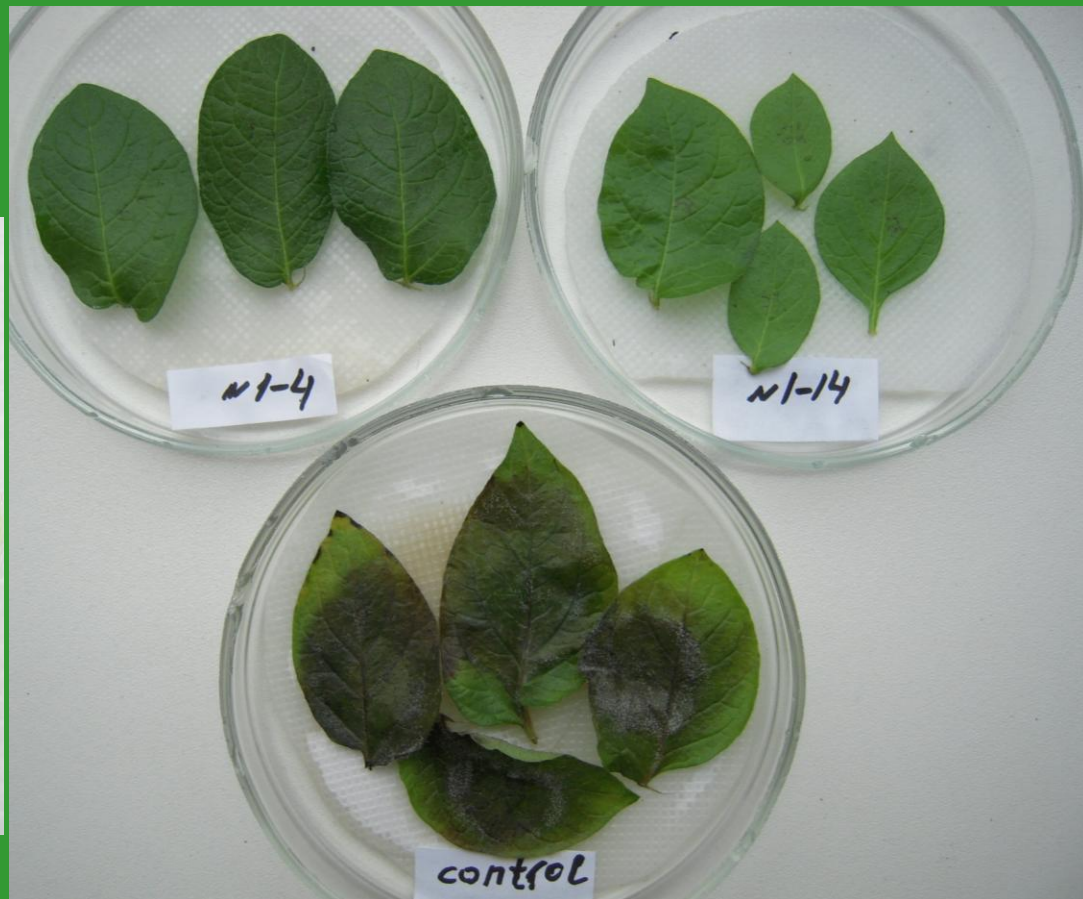
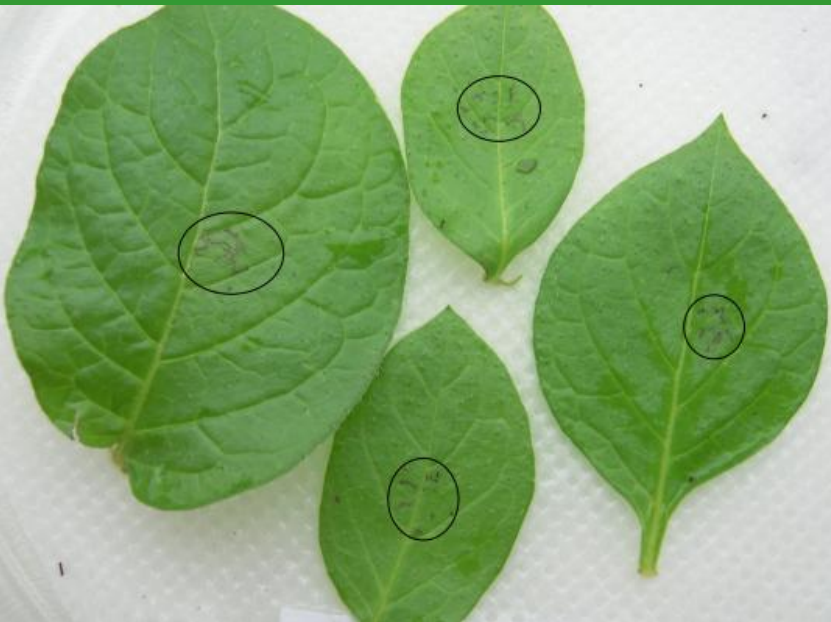
# Inoculation with *P. infestans* detached leaflets



# Leaflet tests



# Reaction of hypersensitivity on leaves of plants possessing *R*-genes after inoculation with *P. infestans*



# Tuber testing



***S. tuberosum***



- interspecific hybrids

Tubers of *S. guerreroense* hybrid progenies  
with necrotic reaction to inoculation with  
*P. infestans*





Hybrid cv. Aurora x (*S. tuberosum* x *S. phureja*).

Source of gene for resistance to *P. infestans* R3a.





Hybrid *S. guerreroense* x Black differential line R5.  
Source of genes for resistance to *P. infestas* R1 and R3a



Hybrid *S. guerreroense* x *S. andigenum*. Source of gene for resistance to nematod *Ro1*.

Genes for resistance to *Globodera rostochiensis* and *Phytophthora infestans* detected in five interspecific potato hybrids

No. In 2011	Number of tested plants	Number of plants with detected resistance genes			
		<i>Globodera rostochiensis</i>		<i>Phytophthora infestans</i>	
		<i>Ro1</i>	<i>Gro1</i>	<i>R1</i>	<i>R3a</i>
1	24	24	0	1	0
2	28	28	-	12	18
5	20	20	-	0	11
6	6	6	-	0	0
7	7	7	-	0	0

The weight of tubers at a third part of *S. guerreroense* hybrid progenies exceeded those formed in plants of *S. guerreroense* in 3- 7 times.



Tubers of parental wild accession (to left) and its hybrid progeny from cross with cultivated *Solanum phureja*



## ■ Acknowledgements

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