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Wild Tuber Bearing Solanum Species screening for Late Blight Resistance under natural conditions

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Introduction

The INRA *Solanum* wild relative species collection maintained in Ploudaniel (West Brittany—France) is composed of 26 species represented by 863 clones. Those accessions introduced since the seventies has never been tested for the Late Blight resistance. In 2004 we started to screen for foliage resistance under semi-natural conditions. The idea is to detect new unexploited sources of resistance to *Phytophthora infestans* which could be then introduced in the cultivated *S. tuberosum* germplasm. At this moment, about half of our collection has been tested.



Solanum polytrichon



Solanum berthaultii

Material and Methods

- Plants grown in 5 liters containers (50% peat, 35 % sand and 15% pine bark) on a concrete area. Planting date was in the mid-May.
- 2 years of testing :
 - Year 1 : 2 replicates for each clone ;
 - Year 2 : a randomised block design with 4 blocks and one replicate per clone in each block. In the second year, were experimented only the clones that were detected resistant during the first year.
- Natural infection by local strains of *P. infestans* (Virulence characterised by Black's differentials R1 to R11 included in the experimental design (Table 1)).
- Spreader plants of cv « Bintje » include to ensure a reliable source of inoculum during the epidemic.
- Six additional controls to ensure the reliability of the evaluation method (Arka, Alpha, Eerstelling, Robijn and Gloria).
- Plants watered by dripping water and sprinklers as often as necessary.
- Disease scored weekly as soon as the first late blight attack was observed according to B.M.S. scale (James, 1971) during 6 to 10 weeks according to year conditions.
- For each plot calculation of :
 - the Area Under Disease Progress Curve (AUDPC) ;
 - the delay between the first visible symptoms on the tested genotype and the susceptible control cultivar « Bintje » ;
 - the slope of the logarithmic transformation of the DPC.

Results

Table 1 : Observed virulences of the local strains of *P. infestans* in the experimental design from 2004 to 2008.

Year	Black's Differentials											
	r	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11
2004	NT	+	+	+	-	-	-	-	-	-	NT	+
2005	+	+	+	+	-	-	+	+	+	-	+	+
2006	+	+	+	+	-	-	-	-	-	-	+	+
2007	+	+	+	+	-	-	-	-	+	+	+	+
2008	+	+	+	+	+	+	+	+	+	+	+	+

NT = not tested - = uninfected
 + = infected +? = uncertain symptoms

Among the 362 screened clones belonging to 19 species, 71 clones (20%) representing 13 species proved to have high or intermediate level of *P. infestans* resistance (Table 2). Both R-genes and quantitative resistance have been described in these sources, according to DPC shape.

Table 2 : Number of tested clones for each species, number of resistance sources detected, with indication of probable type of resistance.

Plant Species	Number of clones tested for resistance	Number of resistant clones	Major R gene	Quantitative resistance
<i>S. acule</i>	1	0		
<i>S. andigna</i>	115	3	Unlikely	Probably
<i>S. berthaultii</i>	11	7	Yes	Probably
<i>S. brachistotrichum</i>	4	2	Yes	Probably
<i>S. bulbocastanum</i>	7	4	Yes	Probably
<i>S. cardiophyllum</i>	3	0		
<i>S. chacoense</i>	88	5	No	Probably
<i>S. fendleri</i>	1	0		
<i>S. gourlayi</i>	8	0		
<i>S. hougasii</i>	5	5		
<i>S. kurtzianum</i>	1	0	Yes	probably
<i>S. phureja</i>	34	11	No	yes
<i>S. polytrichon</i>	11	10	Unlikely	yes
<i>S. sparsipilum</i>	12	1	No	yes
<i>S. spegazzinii</i>	2	0		
<i>S. stenotomum</i>	26	2	Probably	probably
<i>S. stoloniferum</i>	17	17	Yes	probably
<i>S. tarjense</i>	13	2	Unlikely	yes
<i>S. trifidum</i>	3	2	Yes	probably
Total	362	71		

Discussion—Perspectives

Some crosses between detected resistant clones and *S. tuberosum* at the diploid level produced a sufficient number of seeds to progress in introduction of resistance to late blight in cultivated potato ; it is the case for *S. berthaultii*, *S. bulbocastanum*, *S. chacoense*, *S. hougasii*, *S. polytrichon*, *S. stenotomum* and *S. tarjense*. Unfortunately, for *S. trifidum*, *S. brachistotrichum* and *S. stoloniferum* there was no success with the attempted crosses. However, one solution could be to use bridge species to be able to exploit these new resistant sources.

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