



Effect of different genotypes of *Phytophthora infestans* and temperature on tuber disease development of advanced breeding line



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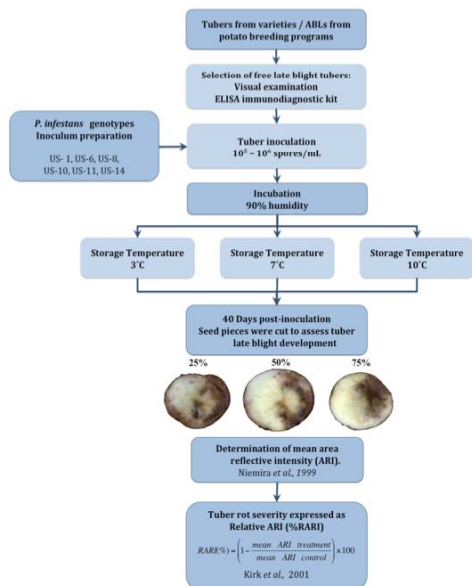
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Introduction

Phytophthora infestans causes potato late blight in foliage and tubers and is a severe constraint on potato production. Late blight is readily transmitted by seed-borne inoculum and consequently, immature stems and leaves may be exposed to late blight from infected seed pieces (Kirk et al 2009). The transmission dynamics of late blight inoculum from seed to sprout and ultimately to the stem are still largely unknown and have been tested with only a limited number of varieties of potato and isolates of *P. infestans*. Direct loss of tuber yield occurs in the growing crop following reduction in photosynthetic capacity and tuber infection and also in the stored crop.

The appearance of more aggressive *P. infestans* genotypes represents a threat for potato production because of the increased capacity to infect and survive on tubers during storage. The objective of this study was to use tubers from advanced breeding lines (ABL) and challenge them with different genotypes of *P. infestans* at three different temperatures used in storage (3, 7 and 10°C) in four production seasons. These results showed the importance of different components involved in the disease development and inoculum source, including the pathogens variability. This study is an important approach to overcome aggressive *P. infestans* genotypes such as the US-8 genotype.

Materials and Methods



The study was developed on years 2003, 2004, 2005, 2006 and 2007. For each year different varieties / ABL's were different.

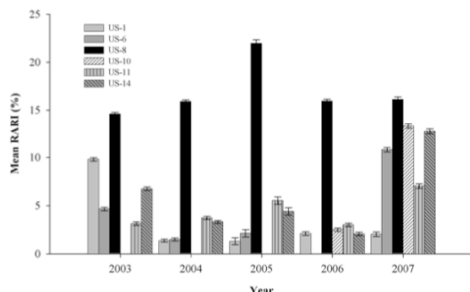


Figure 1. Tuber late blight measured as mean RARI (%) for the different *P. infestans* genotypes across evaluated years.

Results and Discussion

Different varieties/ABLs of potatoes showed a broad range of responses to the infection with different *P. infestans* genotypes for each year. Interaction between storage temperature, genotype aggressiveness and cultivar/ABL resistance were the different factors of interest in this experiment.

Tuber late blight development measured as mean RARI (% Relative Average Reflective Intensity) over the range of factors (variety and temperature). Effect of different temperatures and genotypes of *Phytophthora infestans* on tuber disease development was evaluated by repeating the experiment for 5 consequent years.

In most of the years, *P. infestans* genotype US - 8 caused most tuber rotting genotypes followed by US - 11 and US - 14 (Figure 1). Also, the storage conditions had a great effect on the disease development, affecting the tuber late blight development because of the survival of the inoculum at lower temperatures.

Different storage temperatures (3, 7 and 10°C) were used to evaluate tuber infection and late blight development. The disease rate was high at 10°C for every year (Figure 2), consequently the response is affected by the other two factors: cultivar/ABL resistance and the aggressiveness of the *P. infestans* genotype. Late blight symptoms were also observed in 3°C and 7°C in different isolates and varieties.

The results showed that US-8 genotype was the most aggressive, regardless of the variety or temperature (Figure 1, 2 and 3).

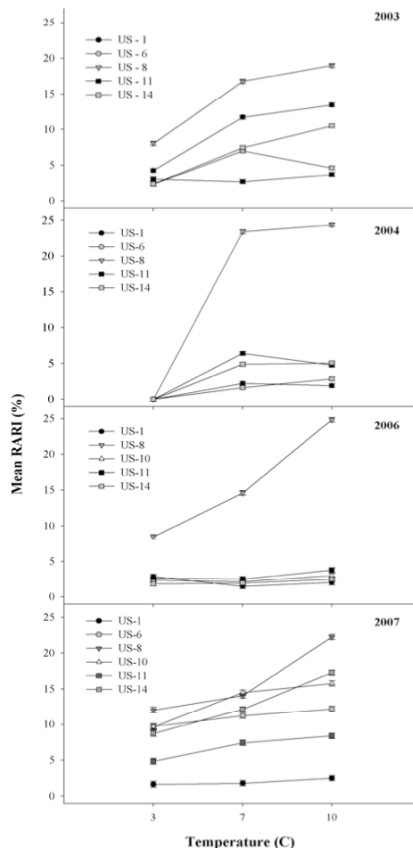


Figure 2. Aggressiveness of *P. infestans* genotypes evaluated at three different storage temperatures (3, 7 and 10°C) in tubers across cultivars and advanced breeding lines.

Among the different varieties and ABL's, Jacqueline - Lee and Stirling were one of the most resistant varieties with mean RARI ranged from 2% to 4%. On the other hand, the most susceptible varieties were White Pearl and MSN 105-1, which had mean RARI values from 10% to 17%.

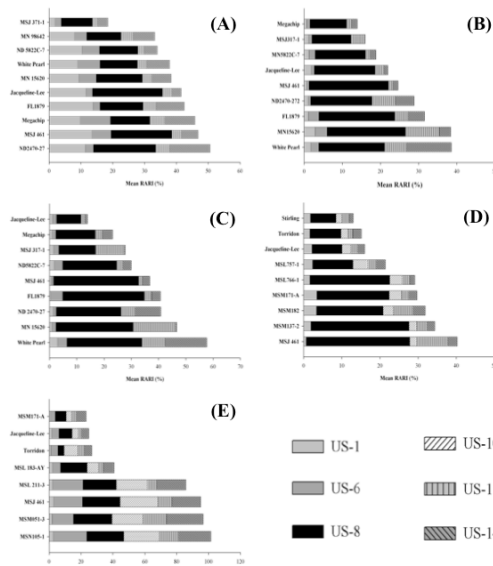


Figure 3. Tuber late blight, as mean RARI (%), evaluated across cultivars and advanced breeding lines inoculated with different *P. infestans* genotypes. The analysis was developed on (a) 2003, (b) 2004, (c) 2005, (d) 2006 and (e) 2007.

Conclusions

The mean RARI (%) is an excellent measure of tuber late blight disease and the range of RARI responses show that different *P. infestans* genotypes respond differently to host resistance and storage conditions. The most recently appeared genotypes of *P. infestans* produce severe symptoms in most cultivars/ABL to the different storage temperature conditions.

The US - 8 genotype was consistently the most aggressive isolate causing high tuber discoloration and rotting. In addition, the aggressiveness of US-8 genotype increased with temperature, and the mean RARI (%) values were greater than in any other *P. infestans* genotypes. US-11 and US-14 genotypes caused less disease in tubers, and US-1 genotype being the least.

References

Kirk WW, Niemira BA and Stein JM (2001) Influence of storage temperature on rate of potato tuber tissue infection caused by *Phytophthora infestans* (Mont.) de Bary estimated by digital image analysis. *Potato Res* 44: 86-96

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Acknowledgements
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