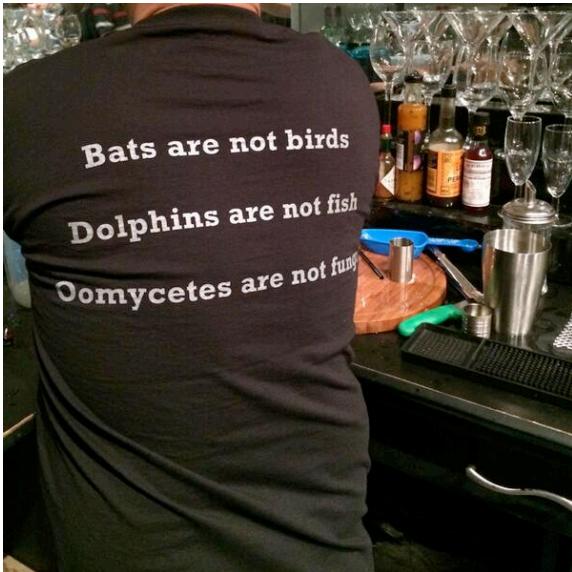


Phytophthora infestans



Phytophthora infestans is the causal agent of late blight



- Oomycete (group Stramenopiles, super group Chromalveolata)
- Hemibiotrophic pathogen
- Sexual and asexual reproduction

- Primary host: **potato**
- Also infects other solanaceous plants
(tomatoes, petunias, hairy nightshades, etc.)



Fry W (2008) Mol Plant Pathol

Life cycle of *Phytophthora infestans*

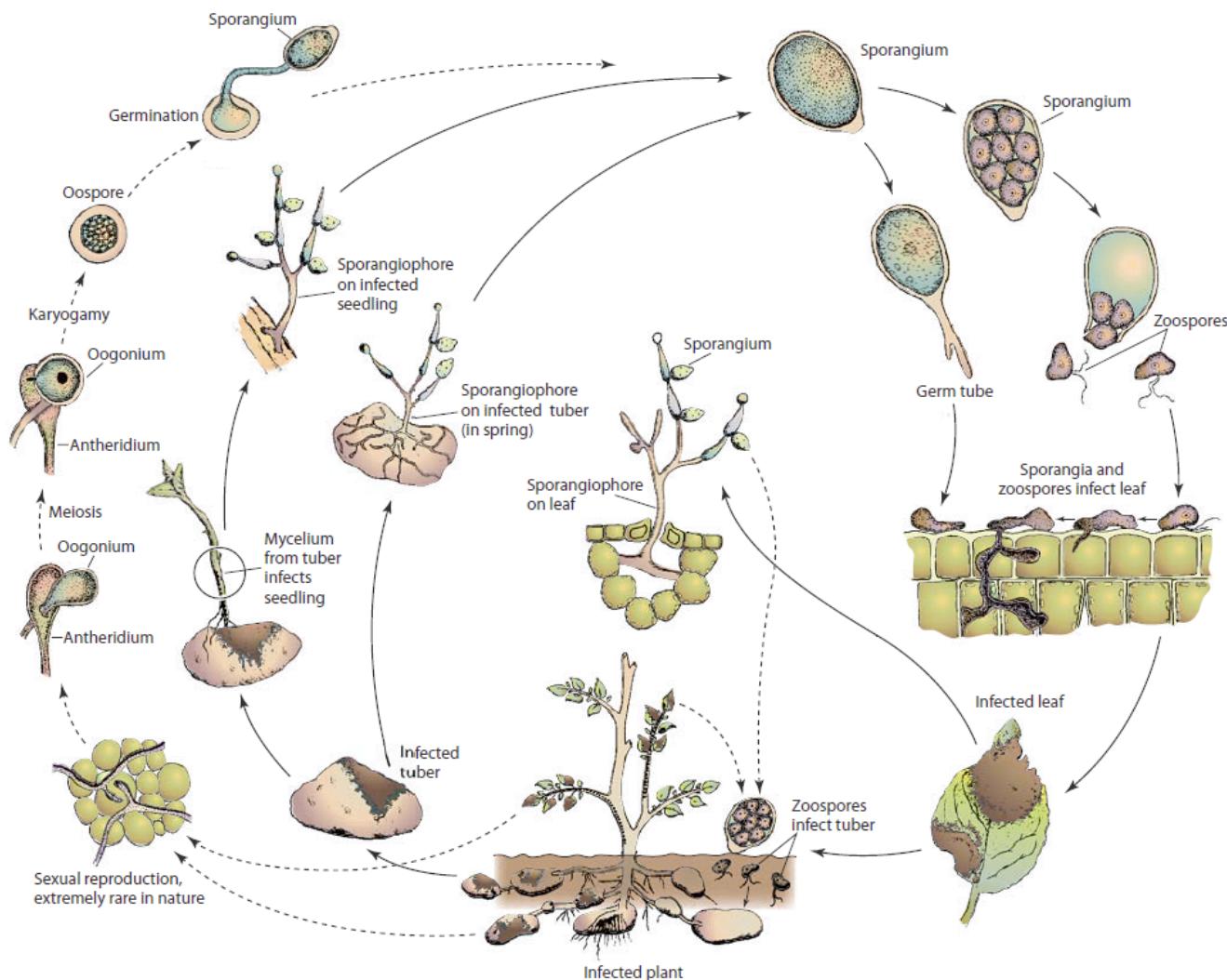


FIGURE 11-29 Disease cycle of late blight of potato and tomato caused by *Phytophthora infestans*.

Late blight is the most economically important disease of potato worldwide

Fry W (2008) Mol Plant Pathol



Great Famine, by James Mahony
The Illustrated London News, 1847

Worldwide economic losses exceed \$5 billion annually (potato production alone)

Average production loss of 15% in developing countries (\$2.75 billion in total)

Armed and Dangerous

These fungi, weeds, and viruses are among the more serious biological threats to food security—so researchers are working hard on countermeasures



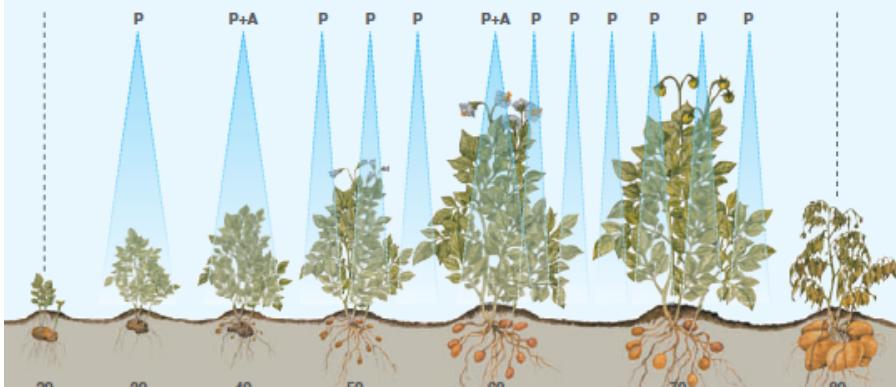
POTATO BLIGHT

Pest: *Phytophthora infestans*

Crops: Potatoes; also tomatoes and other solanaceous crops



Current management methods



P - Phytophthora treatment, A - Alternaria treatment

Source: BASF

Extensive use of chemicals and multiple sprayings

- On average, 10-12 sprays / summer in the UK
- In Northern Europe up to 25 sprays in wet years (Belgium, 2007-2008)



S. demissum
www.inaturalist.org

Introgression of (single) R genes from wild *Solanum* sp. into potato cultivars

...but *Phytophthora infestans* has

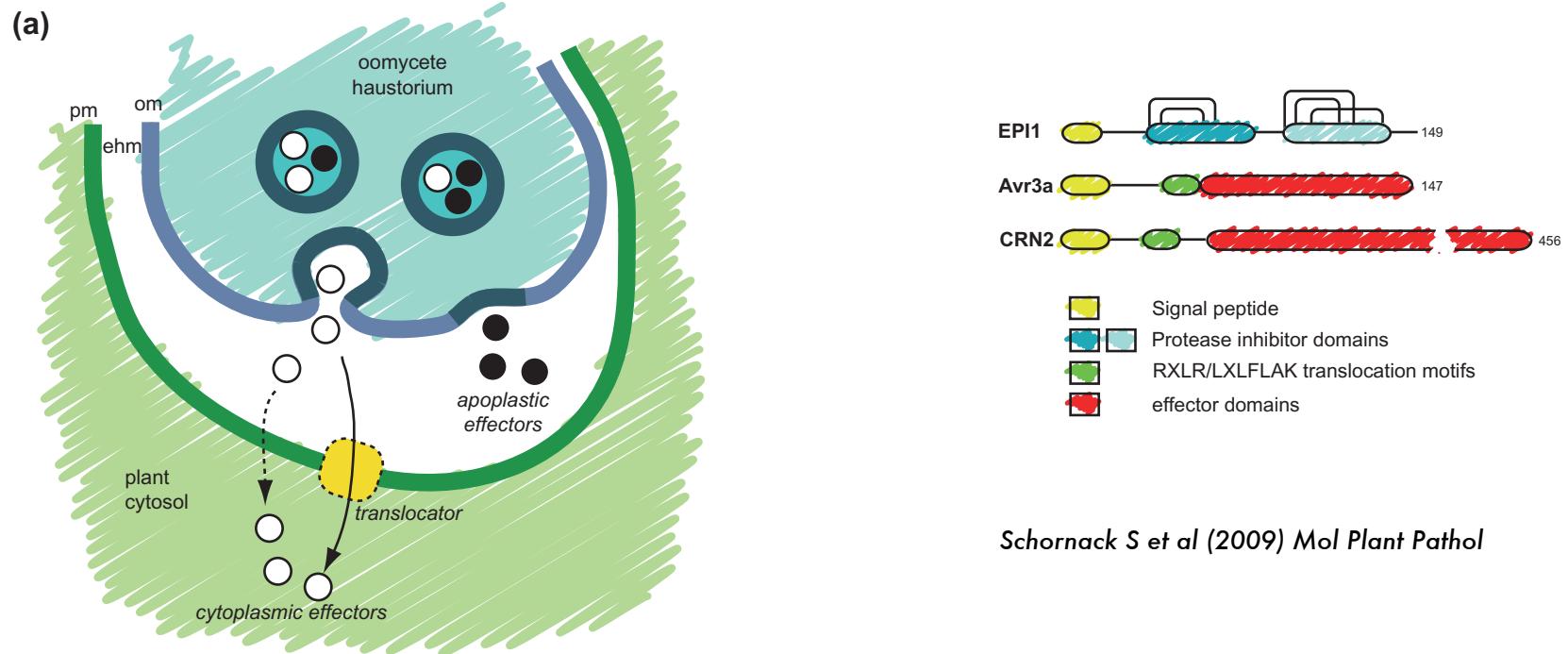
- high evolutionary potential and
- rapidly adapts to overcome resistant plants

Plant diseases that changed the world

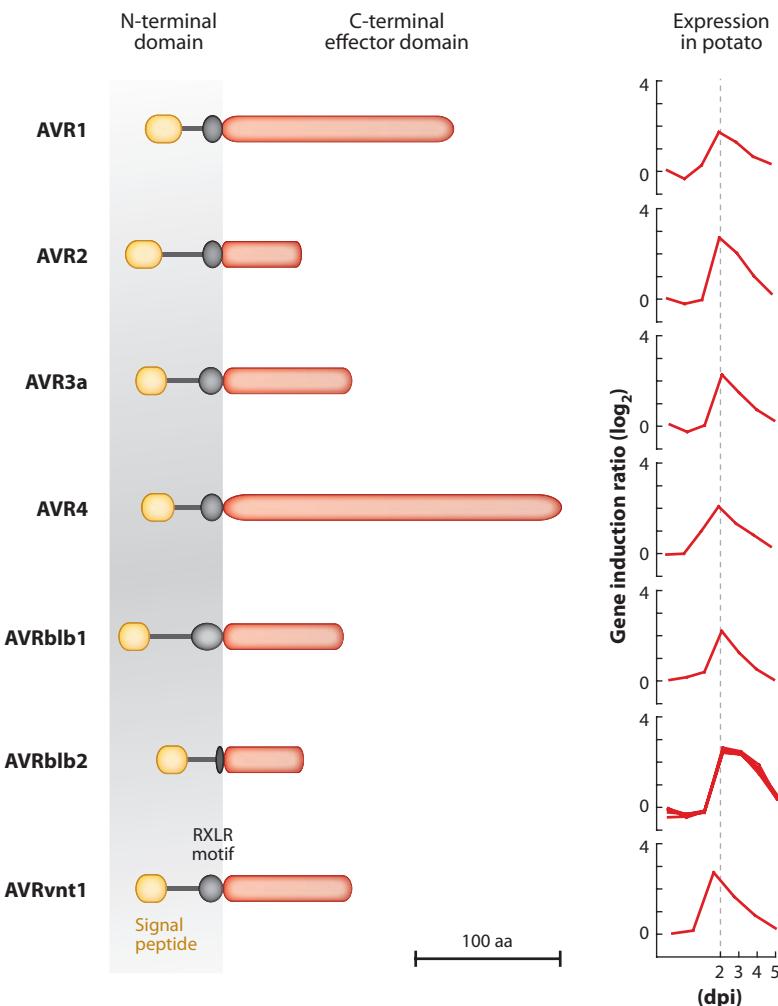
Phytophthora infestans: the plant (and R gene) destroyer

Fry W (2008) Mol Plant Pathol

Phytophthora infestans has different kinds of effectors



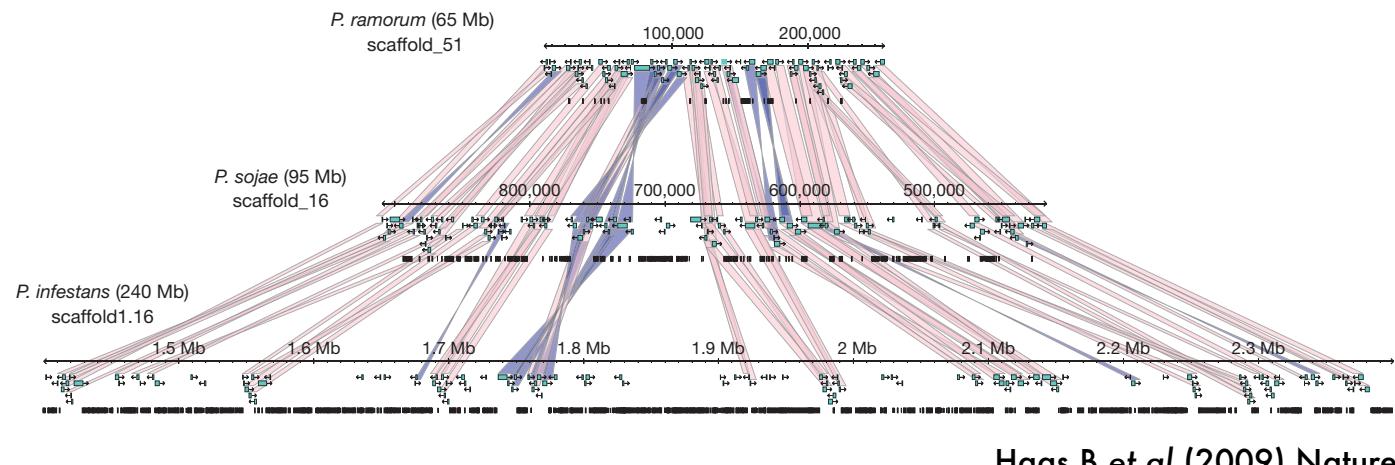
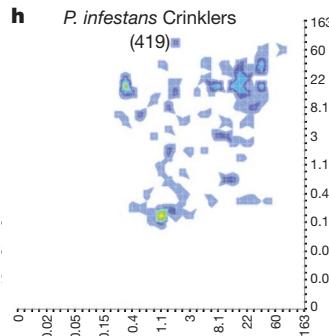
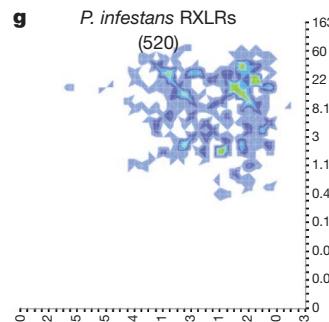
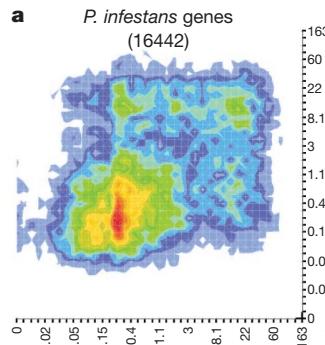
Effectors with known avirulence activity belong to the RxLR class



→ High rates of amino acid polymorphisms and evidence of positive selection

→ Highly up-regulated during the early biotrophic phase of infection

Genome architecture underpins accelerated adaptation to host plants



- ➡ Repetitive DNA accounts for ~74% of the genome
- ➡ Rich and diverse population of transposons
- ➡ Discontinuous distribution of gene density
- ➡ Fast evolving effector genes are localized to highly dynamic regions (gene-sparse, repeat-rich)

Working with *Phytophthora infestans*

- Grows well on media (RSA, Pea Agar, V8)
requires subculturing every 2-4 weeks
sporulates well from culture
infection easy to perform in lab conditions

- Can be stored for up to 6 months at 4°C
- Longer storage requires liquid nitrogen preservation

- Transformable
- Lots of information and resources available
 - collections of strains
 - populations structures (euroblight.net)





+



10-14 d RSA plates

cold water (4°C)



- spores collection
- 1-3 h hatching time (depends on strain)



drop inoculation



scoring at 6-10 dpi

Phytophthora infestans
inoculation