White rot diagnostics and biology

James Woodhall
Parma Research and Extension Center
University of Idaho

University of Idaho plant diagnostic labs

- Parma and Idaho Falls
- Any plant disease issue
- Visual and microscopic examinations
- Isolation and culturing
- DNA barcoding
- qPCR from soil and plant material

NPDN
National Plant Diagnostic Network

White rot

- *Stromatinia cepivora* = *Sclerotium cepivorum*
- Spread by soil-borne sclerotia (1 per 2.2 lbs soil)
- Regulated pathogen in the Treasure Valley
- Most important pathogen of *Allium* worldwide

13
14
15
16
17

Means of transmission

- Soil-borne sclerotia
  - At least 20 years
  - 30-40 years likely

- plant material
- water movement
- soil movement
- equipment movement
- human movement

White Rot in the western United States

- **1918**: First found in La Grande, Oregon
- **1930s**: San Francisco area
- **1940s**: Gilroy, Tulelake, Walla Walla, Klamath Falls
- **1950s**: Salinas, Nevada, Willamette Valley, Oregon
- **1970s**: Central Oregon, San Joaquin Valley
- **1989/2018**: Treasure Valley (not established)
- **2004**: Marion Co., Oregon
- **2008**: Crook Co. Oregon
- **2010**: home-grown garlic in the Palouse Falls region, WA

Disease management

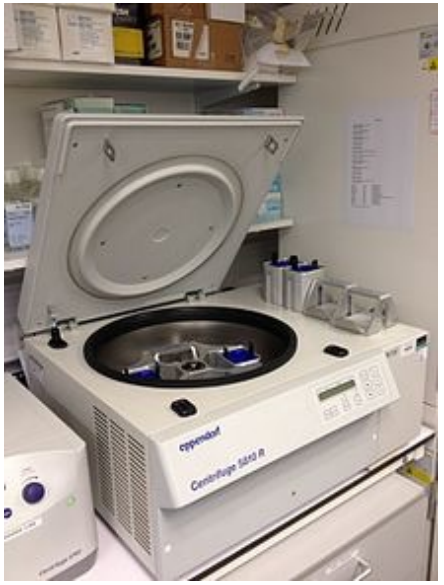
- Dipping seed garlic in water at 115 ˚F (46 ˚C) is effective, but higher temperatures may kill the cloves.
- Germination stimulant
- Fungicides at planting: Tebuconazole, Fludioxonil and Boscalid with Tebuconazole
- Botran 5F (2, 6-dichloro-4-nitroaniline)

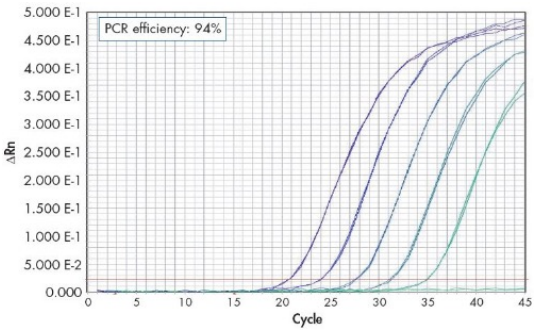
- **Avoidance is the only effective means for disease management**

Cultural control for reducing initial inoculum

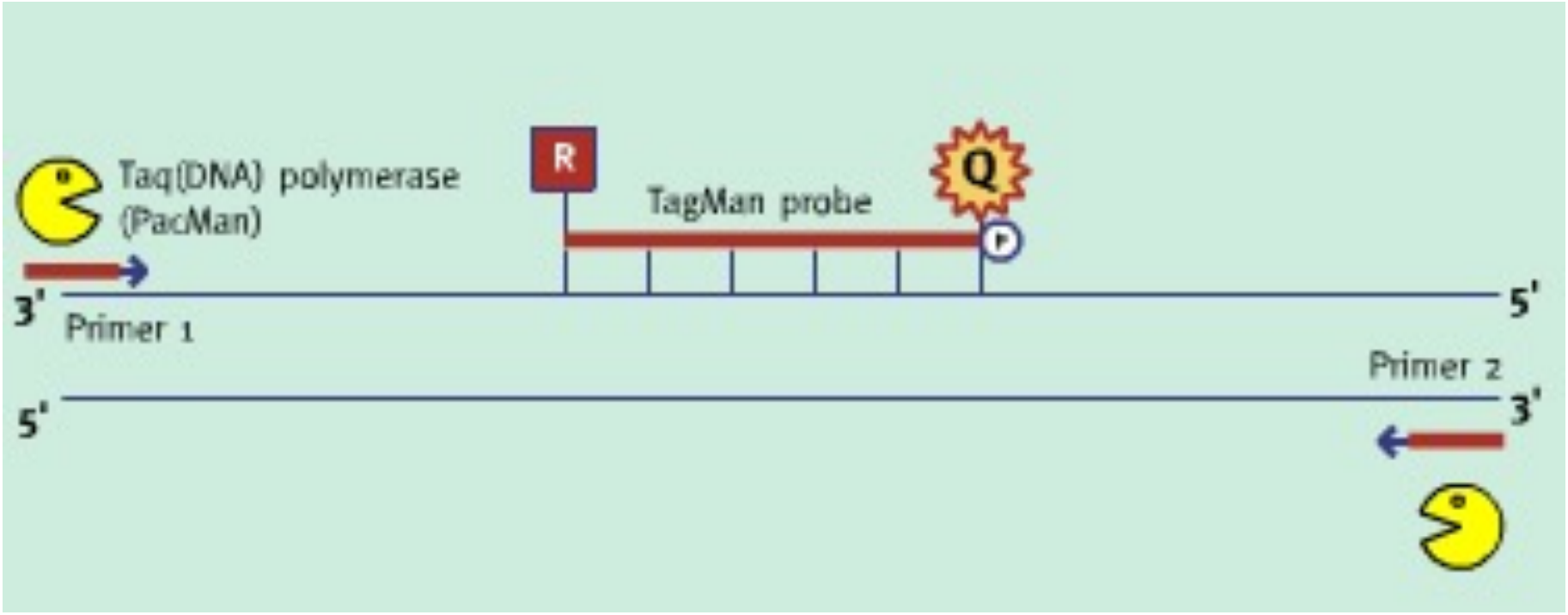
- Quarantines/hygiene
- Effective crop rotation
- Soil testing

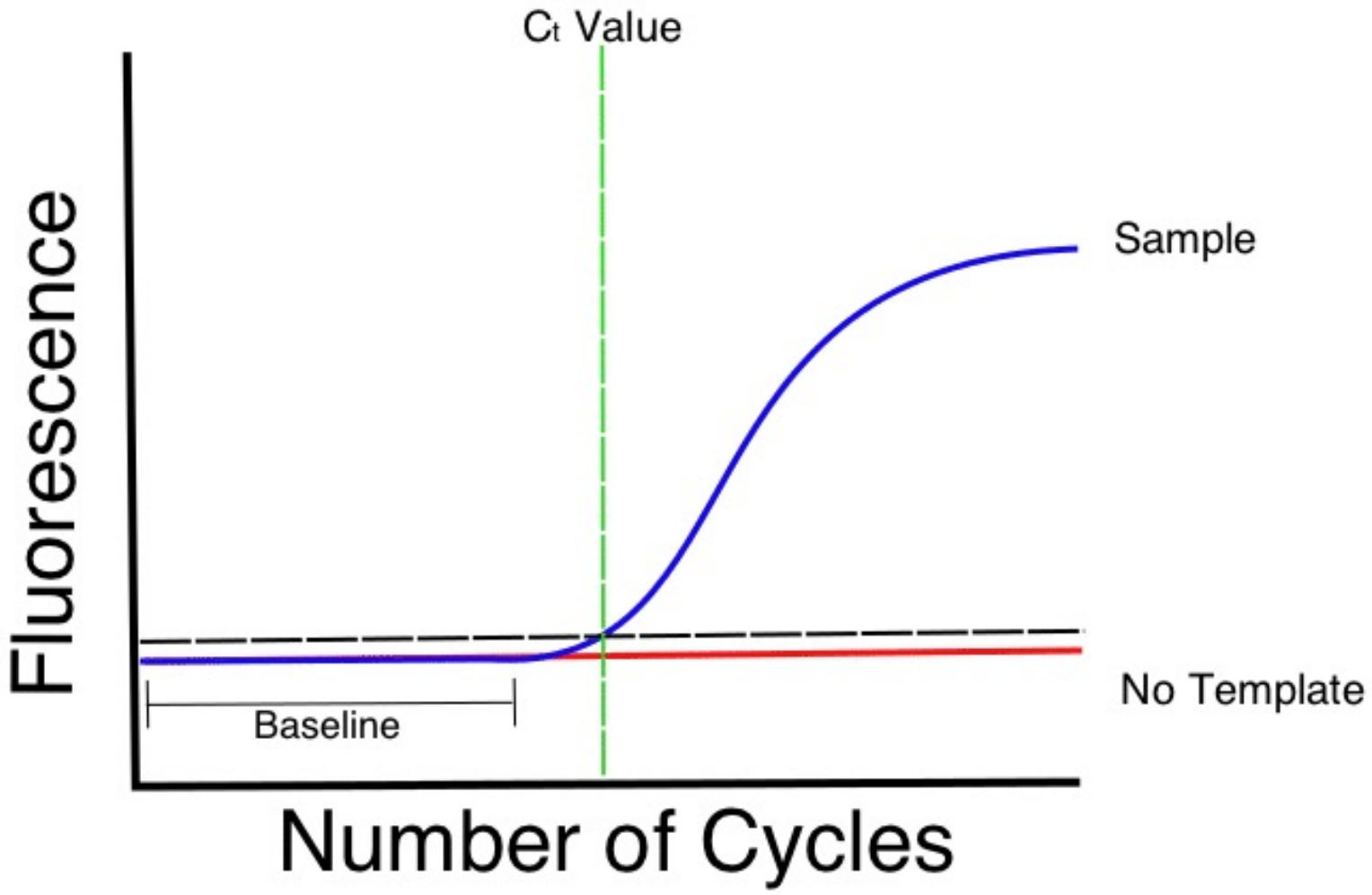
Lab Soil DNA extraction

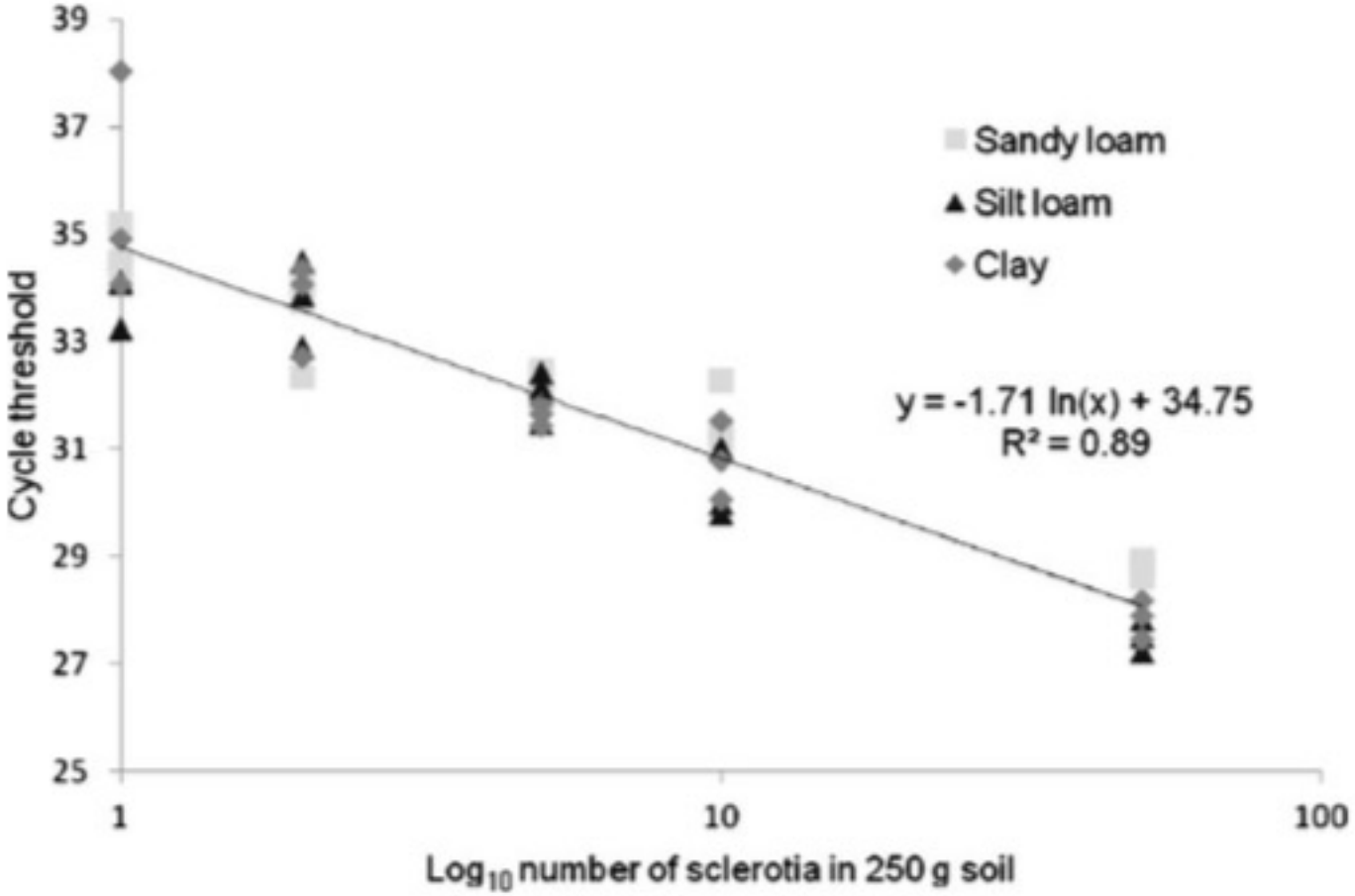




Real-time PCR chemistries - TaqMan




Ct Value
Fluorescence
Sample
No Template
Baseline
Number of Cycles



Eur J Plant Pathol (2012) 134:467–473
DOI 10.1007/s10658-012-0025-2

A new large scale soil DNA extraction procedure and real-time PCR assay for the detection of *Sclerotium cepivorum* in soil

James W. Woodhall · Kathryn M. Webb · Patricia M. Giltrap · Ian P. Adams · Jeff C. Peters · Giles E. Budge · Neil Boonham

Soil testing with TaqMan Spring 2019

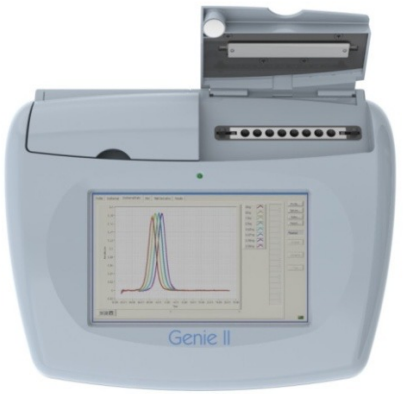
Area	Type of operation	Locations Sampled	Number of soil samples	Number of TaqMan positive samples
SW Idaho	Onion producers	8	30	0
SW Idaho	Garlic producers	2	8	0
Boundary	Commercial	3	22	3
Boundary	Community Garden	1	6	1
Boundary	Home garden	2	2	0
Bonner	Commercial	1	3	0

The problem

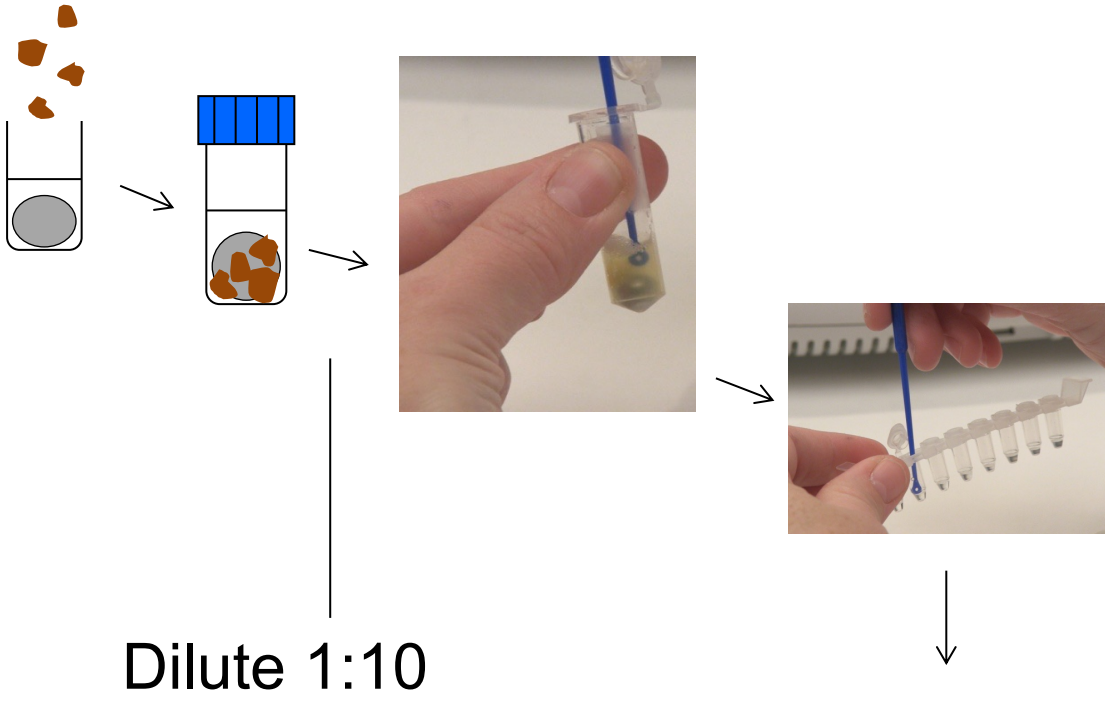
- Parma is situated within the Treasure valley regulated area
- Surrounded by onion fields
- Minimize entry of infested material
- Infected bulbs can have millions of sclerotia
- Still need to confirm diagnosis where atypical/critical field

Point of care testing as a solution

- Genie II (Optigene)
- Genie III
- Genie IIIC
- BioRanger (Diagenetix)



LAMP process



Note: This type of DNA Extract is not suitable for archiving

Rapid development and validation of new LAMP assay for 2019

- Alignment and manual assay design over mismatches between related species
- Specificity
- Sensitivity
- Comparison with standard test (TaqMan)

Conclusions

- Rapid development of a point of care molecular test
- Allowed greater engagement with growers
- LAMP is useful confirmation test
- First time when point of care testing used to avoid submission to a diagnostic lab due to quarantine concerns

Acknowledgments

- Kate Painter
- Jennifer Jensen
- Miranda Harrington
- Lara Brown
- IEOOC
- National Plant Diagnostic Network