

## Nursery Research Needs List 3/08

### High Priority:

#### STOPPING THE SPREAD

1. Effective, fast, reliable methods for (early) detection in plants, water, soil
2. Detection vs. recovery of *P. ramorum* in soil and water
  - Distribution in the nursery – where, how much, when to sample?
  - Persistence
  - Infectivity (\*Need a way to stimulate chlamydospore germination)
  - Quantification – quantitative PCR difficult in soil
  - Distinguishing dead vs. dormant
3. Epidemiology
  - Understanding the sources of inoculum – plants, leaf litter, potting media, substrate, water
  - rate of spread
  - threshold populations
  - leaf wetness period
  - means of dispersal: splash distance vs. aerial dispersal
  - Are there “superspreaders/spore pumps” in nursery? (versus dead-end hosts)
    - Cultivar and species differences
    - Rhodo vs. lilac vs. Kalmia
    - Type of spore produced (sporangia vs. chlamydospores)
  - What environmental conditions and cultural practices influence disease incidence in a nursery?
    - Irrigation Practices
      - What physiological state does the host need to be in order to become infected?
  - What inoculum load is needed in irrigation water to cause plant infection?
  - What is the inoculum threshold required for a plant to become infected by *P. ramorum*-contaminated soil? How about water (i.e., streams)?
    - Practical way to determine if irrigation water is infested
    - Dose-response relationships
    - Baiting vs. quantification
    - Effect of sprinkler heads, etc. – practical management tools for growers

#### SYMPTOMLESS HOSTS and ROOT INFECTIONS

4. What are conditions when infections may be latent and symptoms are not visible
  - What is the frequency with which this occurs in the field?
  - Significance of this in spreading the disease?
    - Which hosts?
    - Root infections
    - Can you have chlamydospores in asymptomatic tissue?
5. Is it possible to have a symptomless carrier?
6. Investigate frequency and importance of root infection in horticultural hosts.

#### REPEAT/RECURRENT NURSERIES

7. How to distinguish between repeat and recurrent. Recurrent means the pathogen is now residing in the nursery (potentially in the ground) and recovery occurs over multiple years.
  - genotype isolates to track epidemiology
  - sources and pathways
  - modeling approaches – connectivity
  - critical importance of getting researchers involved in infested nurseries quickly: soil sampling, spread, location (involve modelers), focal pts., distribution of pathogen in the nursery

- investigate soil & roots
- nursery layout, procedures and protocols, environment, physical location...? Is there a common thread?
- Soil treatment options: fumigation, solarization, heat treatment
- Water treatment options

Network analysis/modeling

### BUFFERS

8. What crops can be planted next to HR plants in nursery settings, have the same growing requirements, e.g. shade, water requirements.... and remain resistant or completely immune?

### **Medium priority**

#### FUNGICIDES

9. Several publications on existing registered materials but we need to evaluate new and existing chemistries but is market big enough?

- Fungicides and fungistats including fungicide management
- Biocontrol
- Efficacy on different hosts
- Do they prevent sporulation?
- Understanding conditions when fungicides could/should be effective
- Concern that fungicide only suppresses symptom development & delay – needs more attention, could still result in spread (long residual activity)
- Perceptions about amounts used may not be accurate
- Examine management issues to reduce fungicide usage.
- What is the residual of various fungicides?

10. What sanitation methods are effective for disinfection of nursery beds, propagation facilities, pruning shears...?

- What sanitation methods are effective for disinfection? (From medium to high priority, we must have better tools and understanding of sanitation to stop the spread of *P. ramorum*)
- For soil sterilization, add chlorine dioxide to the list of chemicals to test on *P. ramorum* (There are many advantages to this chemical.)
- Are there other valid treatments for nursery stock, e.g. heat treatment to remove surface inoculum?

### **Lower Priority:**

11. What impact does pruning of Host and Associated Plants (HAP) have on their susceptibility to infection?

12. Determine if potting media and/or the components will harbor *P. ramorum* propagules.

13. Can *P. ramorum* be detected in chemically treated plants via molecular diagnostics? **yes**

14. Of the regulated host genera, are there resistant varieties of Camellias, Rhododendrons and Viburnums?

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### **Additional Nursery research needs 3/7/07**

- Examine dormancy factors
- Can *P. ramorum* survive under growing/weed mats? (Lani showed that it could)
- Investigate potential insect or snail transmission of spores
- Is 2m adequate to prevent splash dispersal from infected plants? (Steven H. feels it has sufficiently worked in the UK)
- Is composting a safe method of destruction since it is becoming increasingly more difficult to take infected crops to landfills or deep bury.
- Identify thermal death point threshold (temp/time)

- g) How will western regulatory agencies assure that only nurseries following BMPs ship out of affected areas? BMPs will minimize risk of movement of infected nursery stock only for nurseries who follow them.
- h) "Benchmark" USA/EU number of spore equivalents at outbreak sites to determine the EU's position on the epidemic progress curve (using Judith Turner's quantitative method)
- i) How long is the latent period and under what cultural conditions?

**Notes:**

- UCD rewets soil that is dry for better detection
- GA Chill summer soils prior to isolation
- Nurseries that recycle, sample at different times of the year directly at the drains/sump pumps
- Leaf litter removal from HR plants beds is effective in reducing the inoculum load (this is already posted as a BMP. Is it in the enhanced nursery protocol?)
- Review Australia's BMPs
- Is 90-day hold and inspection during growing season adequate? Should it be extended? In UK seems to be effective.
- Soil sampling under camellia pots from previously CN maybe the source of latent infections (e.g. FL)