An overview of Plant Health Laboratory and B.C. Forest Tree Seed Pathology Project

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Vision: BC’s agricultural and natural plant resources are protected from plant health threats.
Mission & Goals: Contribute to the British Columbian’s environmental, social and economic goals and values by:

• Timely and accurate plant health diagnostics for BC’s established and emerging plant health problems using latest tools
• Plant Pest Surveillance for potential and invasive pests throughout BC
• Support for industry led programs that address BC’s priority plant health threats
Abbotsford Agriculture Centre

1767 Angus Campbell Road, Abbotsford
The Plant Diagnostic Lab was established in Cloverdale in 1967.

The lab declined accepting home gardener samples in 1982.

The lab started charging a fee-for-service in January 1999.
Plant Lab
Sample
Submission Form and Fee Schedule
Plant Lab is working towards accreditation ISO-17025
Lab tours

Educational materials

Students visiting lab
Diagnostics Provided in the field of

- Mycology
- Bacteriology
- Virology
- Entomology

- Nematology
- pH / EC on soil
- General evaluation of abiotic issues
Services Not Provided:

- Nutrient analysis on soil and plant tissue
- Micro-organisms assessment on soil (except nematodes)
- Pesticide residue analysis
- Plant variety analysis
- Mushroom identification

Above mentioned testing is provided by private sector labs
Methods for Disease Diagnosis

- Microscopic observation
- Culturing
- ELISA (micro-well & immuno strip)
- Moist bag incubation
- Omni-Log
- Molecular (DNA based)
Commodities served by the lab

- Berry and nut crops
- Ornamentals (Greenhouse and field, urban forest)
- Greenhouse vegetables
- Tree fruit and Grape
- Field vegetables

- Specialty crops
- Field crops
- Mushrooms
- Turf grass
- Christmas trees
- Forest Nursery and Forest Tree
- Seed Pathology
Who submits samples and sample submission trends
Submitter category

- BCAGRI
- GROWER
- INDUSTRY
- OTHER
Type of grower

# of samples

- Commercial: 94%
- Domestic: 5%
- Other agencies: 1%
What do we do for Forest Seed Pathology

- BC Ministry of Agriculture, PHL have a MOU with Provincial Tree Seed Centre (FLNRO) to perform Fungal Pathology assessment on selected tree seeds.
- We follow seed pathology protocols set by the Tree Seed Centre and provide results.
- The project was started in our lab in fall 2017 and we plated samples from 60 seed lots (a total of 30,250 seeds).
• Dry seed samples were tested for *Caloscypha fulgens*, *Sirococcus conigenus* and *Fusarium* spp.

• Evaluations were made for the above mentioned fungi and companion fungi listed in the MOU.

• Each seed was evaluated for the presence or absence of the fungi listed.
Brief overview of protocol

- Culture on general or semi-selective fungal medium (surface sterilized –CAL, SIR or not sterilized seeds- FUS)
- Incubate under optimal conditions.
- Evaluate plates for fungal growth for up to 3 weeks
- Identify each colony for fungal organism (morphology and microscopic examination)
- Report results
- Some molecular work to identify the organism (PHL addition)
Sub-cultured colony

Culturing

Ministry of Agriculture

0-day
5-7 days
7-10 days
10-20 days

Microscopic examination and/or DNA analysis
Data collection

- # of seeds with Caloscypha, Sirococcus or Fusarium spp.
- Number and genera of companion fungi
- Questions?
  - Is data collected for companion fungi used for any management purposes?
  - If not, do we want to continue to collect this information?
• With current methods (culturing and microscopic examination), we are mostly limited to identify Fusarium to genus level
• Fusariums can be saprophytic or pathogenic
• Is total count of seeds with Fusarium spp. good enough
  – What does it really tell us?
<table>
<thead>
<tr>
<th>Description</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td># of samples submitted for Fusarium assay</td>
<td>42</td>
</tr>
<tr>
<td># of samples where Fusarium spp. were detected</td>
<td>28</td>
</tr>
<tr>
<td># of samples where species was identified (molecular tools)</td>
<td>1</td>
</tr>
<tr>
<td># of samples where multiple possible species were identified</td>
<td>3</td>
</tr>
</tbody>
</table>
| # of samples where only genus level identification was obtained             | 24    | *what important info. does this provide?*
Gaps in Fusarium information

• What are all the Fusarium spp. that have been observed in seed assays in the past?
• Have they been tested for pathogenicity?
• Is there a short list of more aggressive Fusarium genera (pathogenic) and that are present in forest tree seeds in BC?
• Do we want to target only the pathogenic species?
Gaps in Fusarium spp. identification

- What other tools are available to go to the next level of identification?
- How is this information used with regards to management of seed pathogens to minimize losses in nursery and/or reforestation programs?
Limitations with current methods

- Currently assessment of companion fungi adds a lot of work that is probably not needed. If this information is not used, can we drop that?

- Culture techniques followed by morphological identification has its limitations for specificity of identification. There is overlap between species. Resources are limited to go to the next level of specificity by morphology alone.
Developing an Identification Strategy

• The first question is “How much information do you need”?
• This depends upon the specific requirements of the seed lot (target organism- Cal, Sir, Fus).

• Remember the level of identification must match the end use of the diagnosis.
There is a lot of work that needs to be done.
Suggestions going forward

• Do a pilot study and identify all the Fusarium species that are present on these seeds
• Select the isolates that are likely to cause disease and test that with a pathogenicity trial/assay
• Focus only on those trouble causing isolates
• Have species specific tests (molecular tools) where important species can be identified more accurately and preferably directly from seed.
Suggestions going forward

- Have Co-op students, a Master’s or a Ph.D. student working on aspects mentioned in the previous slide.
- Approach a researcher to find out if molecular tools tailored to BC forest seed health assessment needs can be worked on.
- Apply advanced tools to test for and gather species specific information.
- Eliminate culturing step if feasible?
- Have management tools in place to minimize crop losses in the nursery and re-forestation programs.
• Eventually where can we go with this approach (lot of savings in time and money in the long run)?
Ministry of Agriculture

Sub-cultured colony

Culturing

Microscopic examination and/or DNA analysis

0-day

5-7 days

7-10 days

10-20 days
Thank you

Questions?