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

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Abbotsford Agriculture Centre
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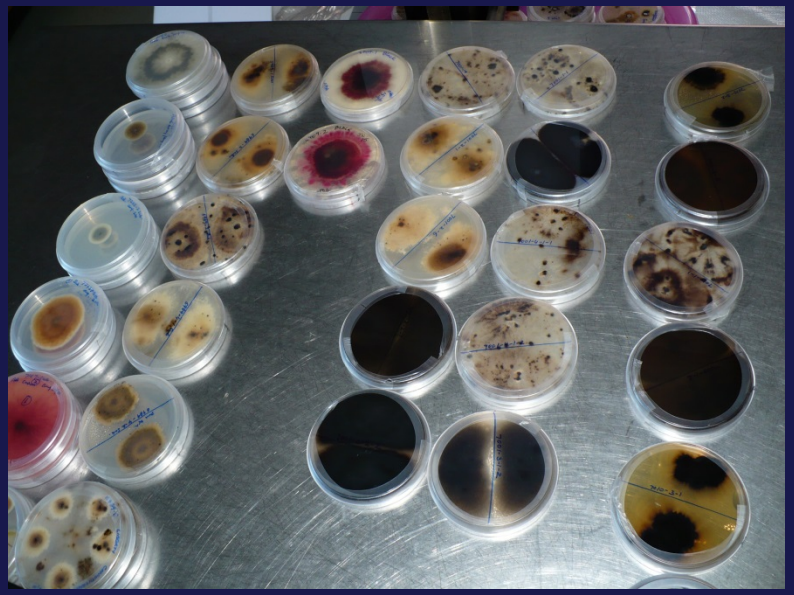
Ministry of Agriculture

Vision: BC's agricultural and natural plant resources are protected from plant health threats.



Ministry of Agriculture

Mission & Goals:

Contribute to the British Columbian's environmental, social and economic goals and values by:

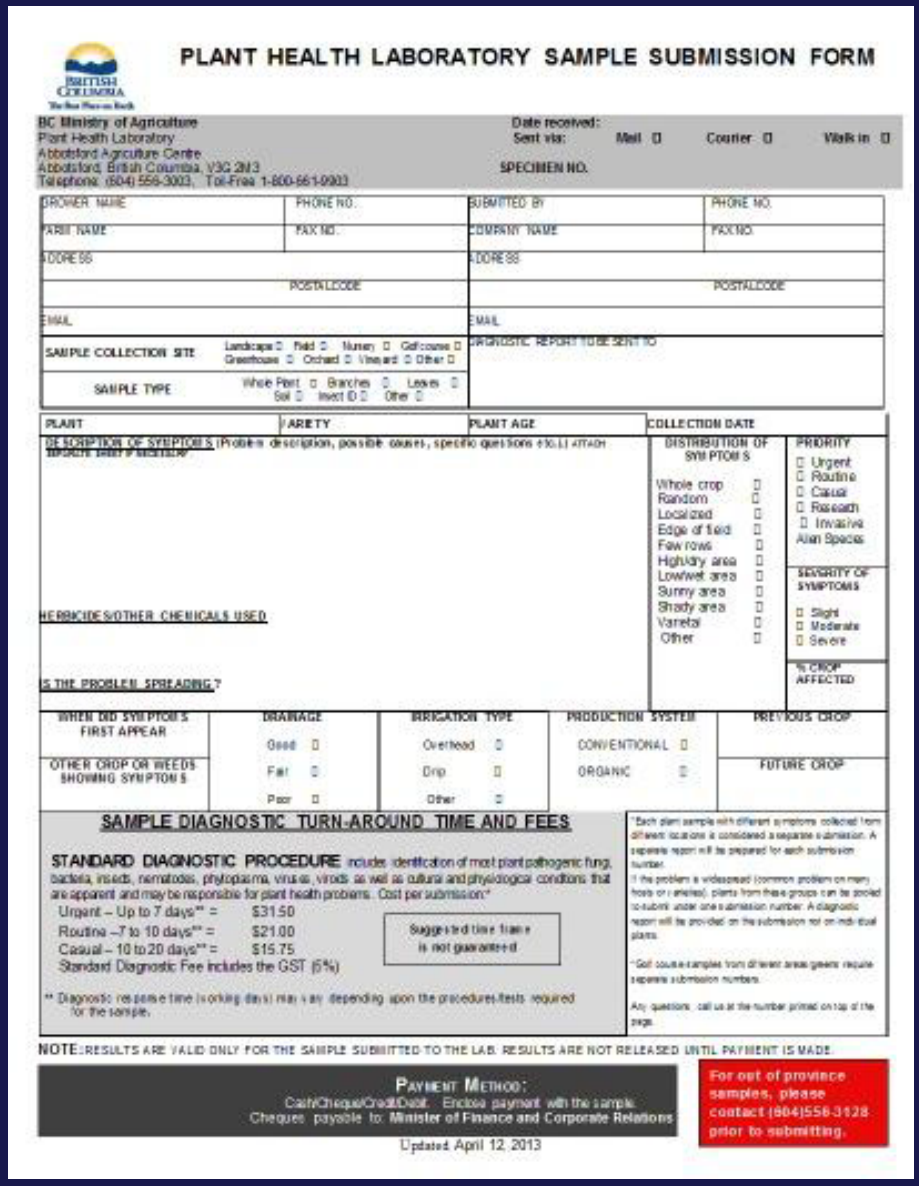
- Timely and accurate plant health diagnostics for BC's established and emerging plant health problems using latest tools
- Plant Pest Surveillance for potential and invasive pests throughout BC
- Support for industry led programs that address BC's priority plant health threats

Abbotsford Agriculture Centre

History

- 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 HEALTH LABORATORY SAMPLE SUBMISSION FORM

BC Ministry of Agriculture
Plant Health Laboratory
Abbotsford Agriculture Centre
Abbotsford, British Columbia, V3G 2M3
Telephone: (604) 556-3003, Toll-Free 1-800-661-9903

Date received:
Sent via: Mail ☐ Courier ☐ Walk in ☐
SPECIMEN NO.

GROWER NAME	PHONE NO.	SUBMITTED BY	PHONE NO.
FARM NAME	FAX NO.	COMPANY NAME	FAX NO.
ADDRESS		ADDRESS	
POSTAL CODE		POSTAL CODE	
EMAIL		EMAIL	
SAMPLE COLLECTION SITE	Landscape ☐ Field ☐ Nursery ☐ Golf course ☐ Greenhouse ☐ Orchard ☐ Vineyard ☐ Other ☐	DIAGNOSTIC REPORT TO BE SENT TO	
SAMPLE TYPE	Whole Plant ☐ Branches ☐ Leaves ☐ Soil ☐ Insect ID ☐ Other ☐		

PLANT	VARIETY	PLANT AGE	COLLECTION DATE

DESCRIPTION OF SYMPTOMS (Problem description, possible causes, specific questions etc.) ATTACH SEPARATE SHEET IF NECESSARY

HERBICIDE/OTHER CHEMICALS USED

IS THE PROBLEM SPREADING?

DISTRIBUTION OF SYMPTOMS
- Whole crop ☐
- Random ☐
- Localized ☐
- Edge of field ☐
- Few rows ☐
- High/dry area ☐
- Low/wet area ☐
- Sunny area ☐
- Shady area ☐
- Variety ☐
- Other ☐

PRIORITY
- ☐ Urgent
- ☐ Routine
- ☐ Casual
- ☐ Research
- ☐ Invasive Alien Species

SEVERITY OF SYMPTOMS
- ☐ Slight
- ☐ Moderate
- ☐ Severe

% CROP AFFECTED

WHEN DID SYMPTOMS FIRST APPEAR	DRAINAGE	IRRIGATION TYPE	PRODUCTION SYSTEM	PREVIOUS CROP
	Good ☐	Overhead ☐	CONVENTIONAL ☐	
OTHER CROP OR WEEDS SHOWING SYMPTOMS	Fair ☐	Drip ☐	ORGANIC ☐	FUTURE CROP
	Poor ☐	Other ☐		

SAMPLE DIAGNOSTIC TURN-AROUND TIME AND FEES

STANDARD DIAGNOSTIC PROCEDURE includes identification of most plant pathogenic fungi, bacteria, insects, nematodes, phytoplasma, viruses, viroids as well as cultural and physiological conditions that are apparent and may be responsible for plant health problems. Cost per submission*

Urgent – Up to 7 days** = $31.50
Routine – 7 to 10 days** = $21.00
Casual – 10 to 20 days** = $15.75
Standard Diagnostic Fee includes the GST (5%)

Suggested time frame is not guaranteed

** Diagnostic response time (working days) may vary depending upon the procedures/tests required for the sample.

*Each plant sample with different symptoms collected from different locations is considered a separate submission. A separate report will be prepared for each submission number.
If the problem is widespread (common problem on many hosts or varieties), plants from these groups can be pooled to submit under one submission number. A diagnostic report will be provided on the submission not on individual plants.

*Golf course samples from different areas (greens) require separate submission numbers.

Any questions, call us at the number printed on top of the page.

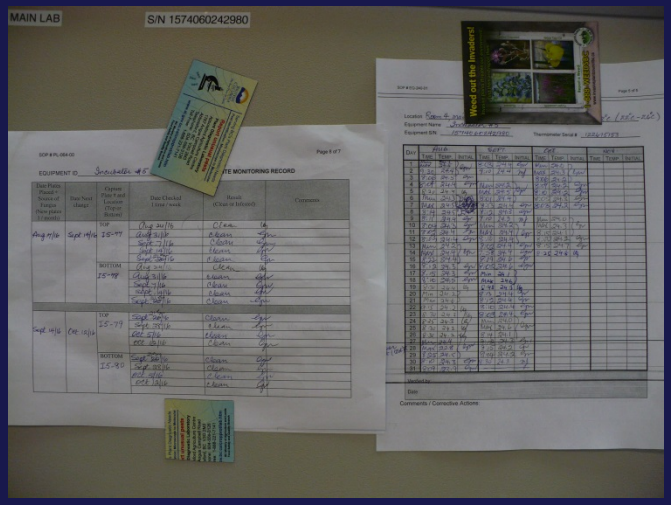
NOTE: RESULTS ARE VALID ONLY FOR THE SAMPLE SUBMITTED TO THE LAB. RESULTS ARE NOT RELEASED UNTIL PAYMENT IS MADE.

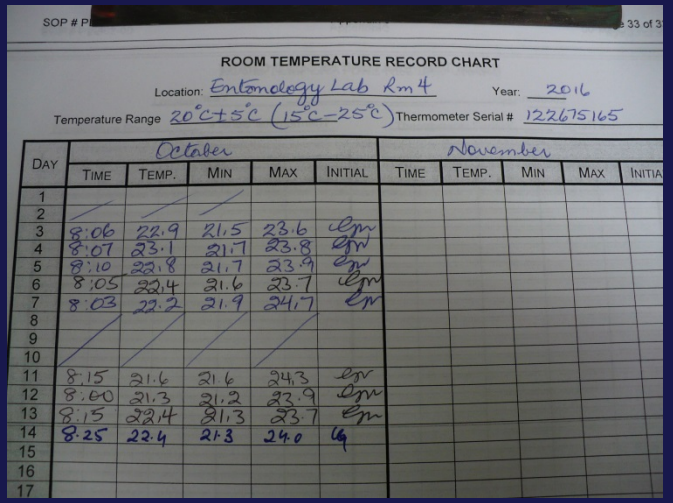
PAYMENT METHOD:
Cash/Cheque/Credit/Debit. Enclose payment with the sample.
Cheques payable to: **Minister of Finance and Corporate Relations**

For out of province samples, please contact (604)556-3128 prior to submitting.

Updated April 12, 2013

Plant Lab is working towards accreditation ISO-17025





ROOM TEMPERATURE RECORD CHART

Location: Entomology Lab Rm 4 Year: 2016

Temperature Range 20°C±5°C (15°C–25°C) Thermometer Serial # 122675165

Day	October					November				
	Time	Temp.	Min	Max	Initial	Time	Temp.	Min	Max	Initia
1										
2										
3	8:06	22.9	21.5	23.6						
4	8:07	23.1	21.7	23.8						
5	8:10	22.8	21.7	23.9						
6	8:05	22.4	21.6	23.7						
7	8:03	22.2	21.9	24.7						
8										
9										
10										
11	8:15	21.6	21.6	24.3						
12	8:00	21.3	21.2	23.9						
13	8:15	22.4	21.3	23.7						
14	8:25	22.4	21.3	24.0						
15										
16										
17										

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

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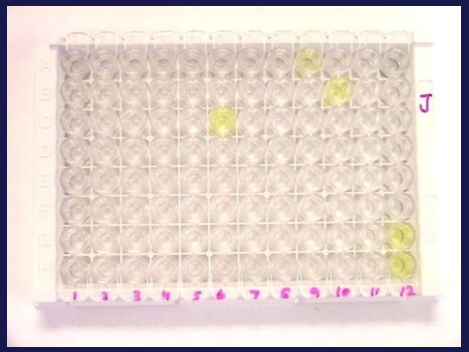
Methods for Disease Diagnosis

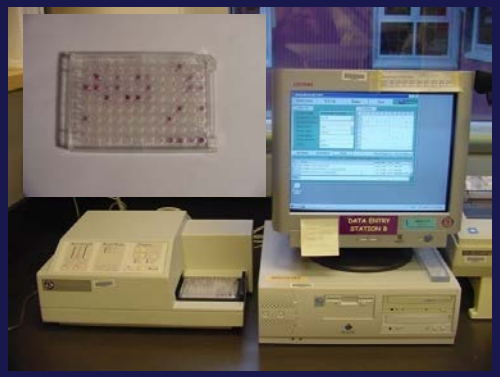
Microscopic observation

Culturing

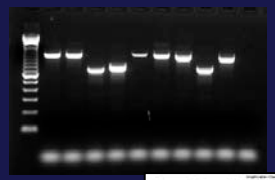


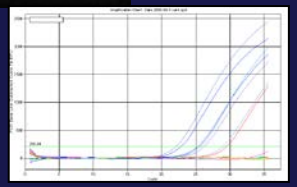
ELISA (micro-well & immuno strip)

Moist bag incubation



Omni-Log





Molecular (DNA based)

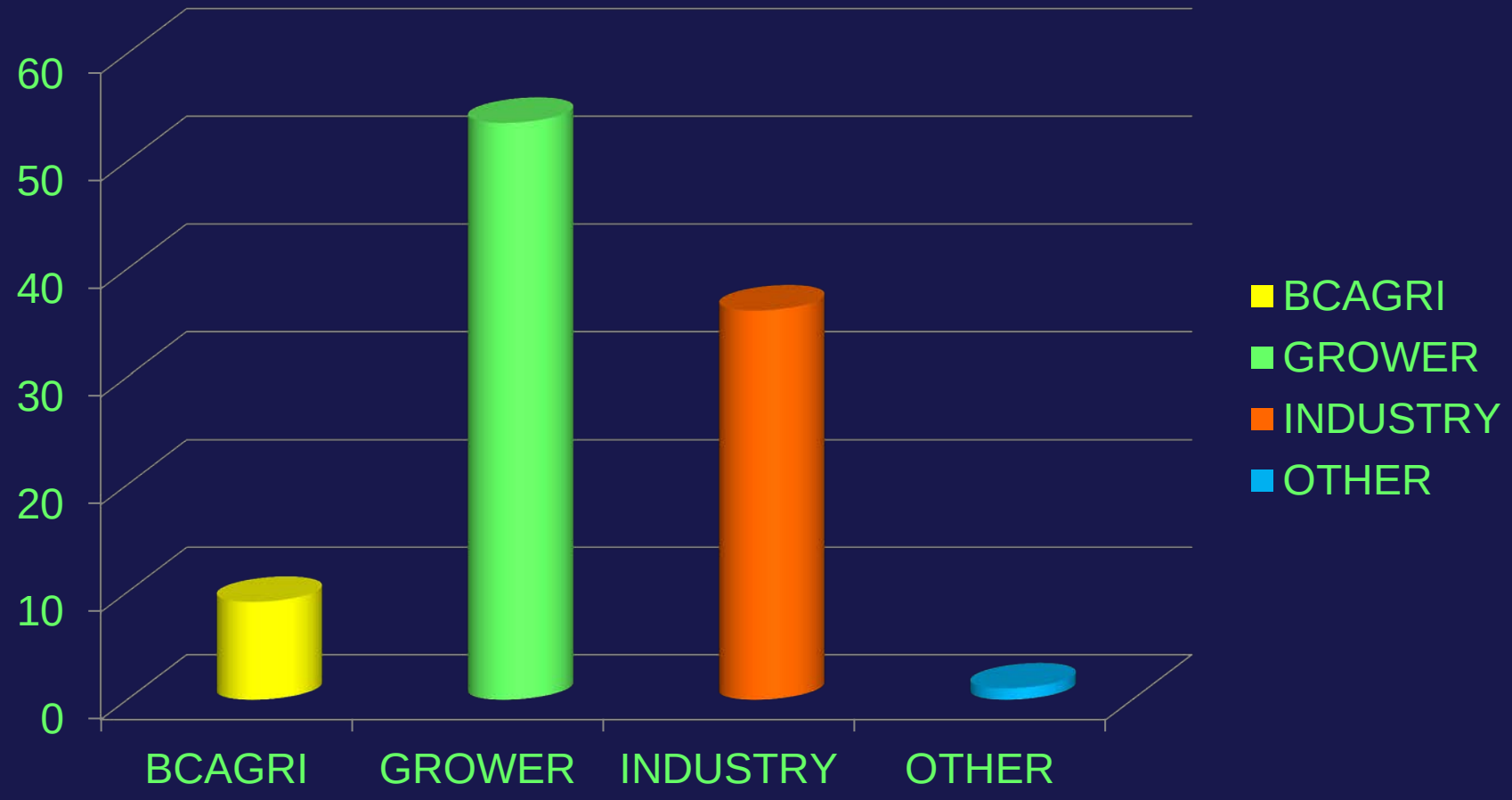
Commodities served by the lab

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

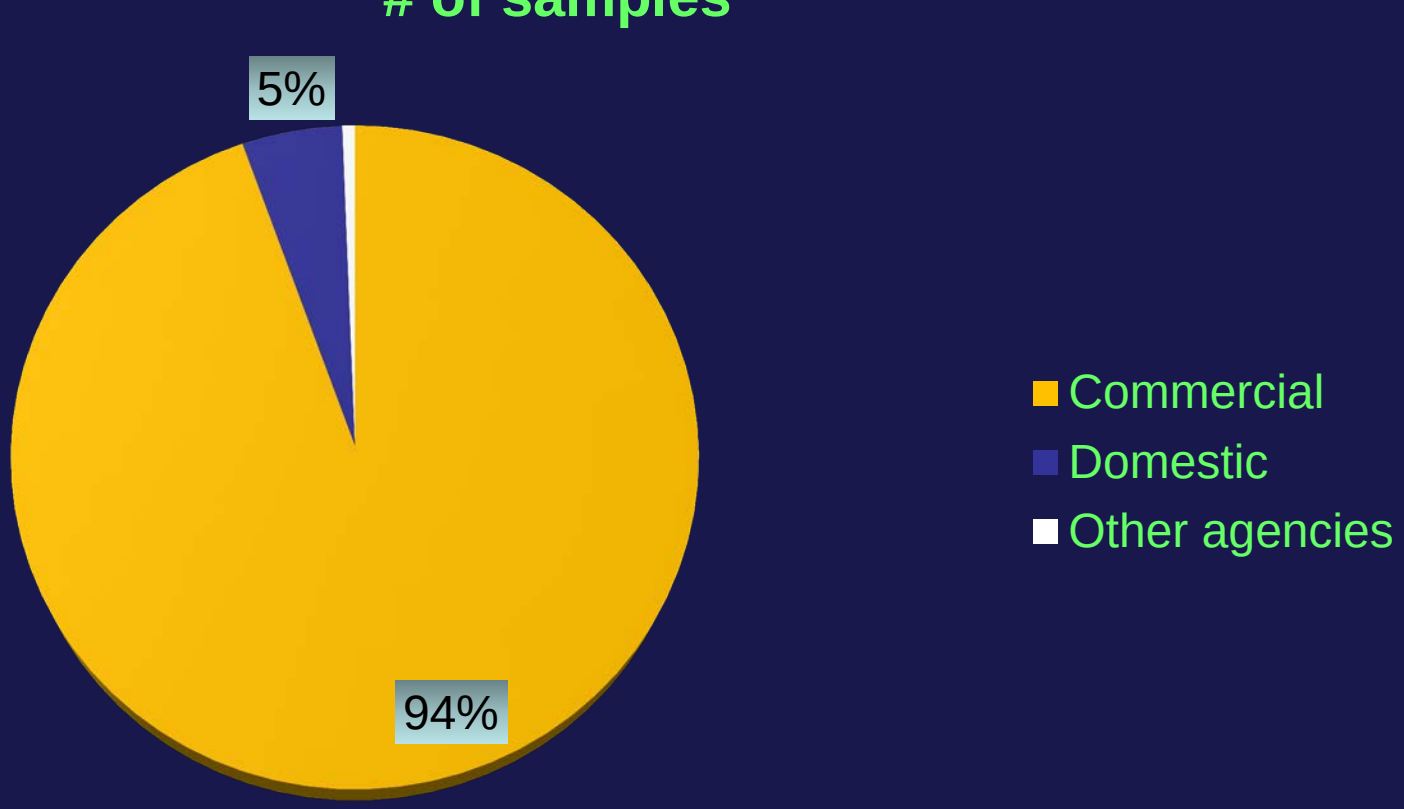
Specialty crops
Field crops
Mushrooms
Turf grass
Christmas trees
Forest Nursery and Forest Tree
Seed Pathology

Who submits samples and sample submission trends

Submitter category



Type of grower



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)

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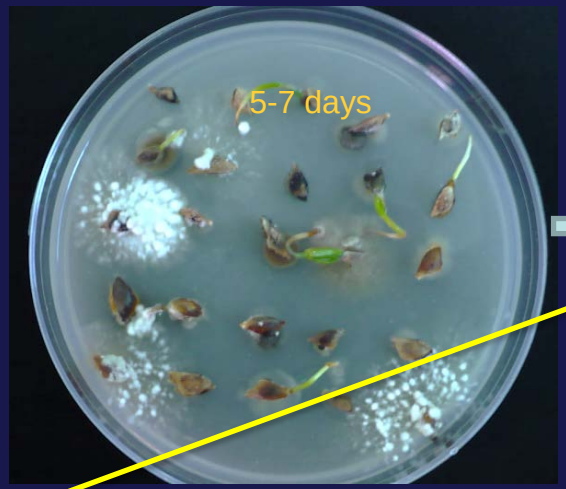
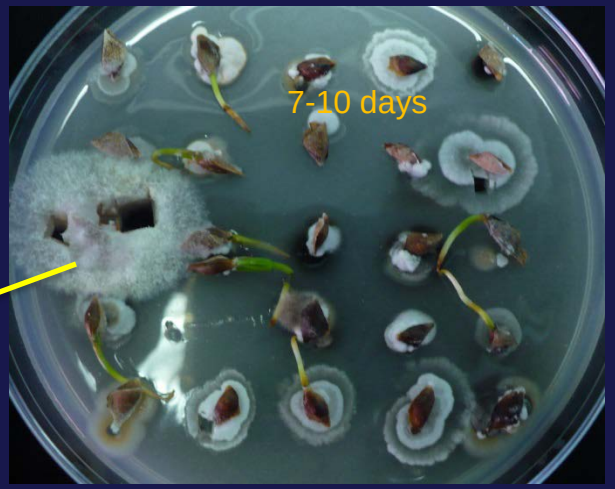
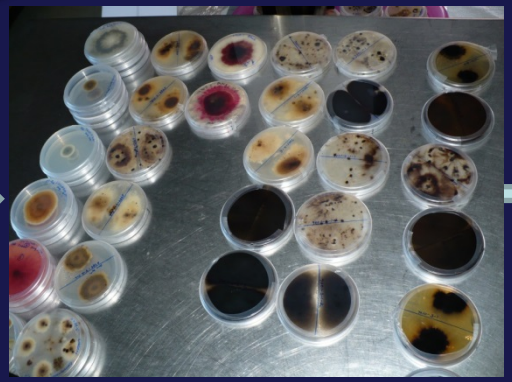
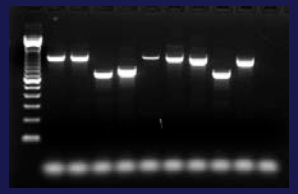
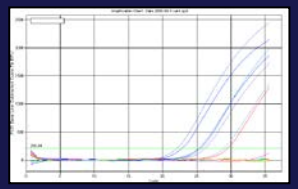




Sub-cultured colony







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?

Fusarium spp..

- 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 ?

Data from PHL 2017-2018

# of samples submitted for Fusarium assay	42
# of samples where Fusarium spp. were detected	28
# of samples where species was identified (molecular tools)	1
# of samples where multiple possible species were identified	3
# 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 re-forestation 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) ?

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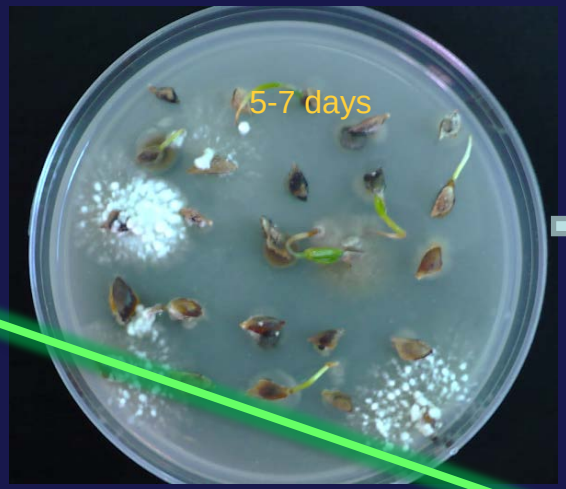

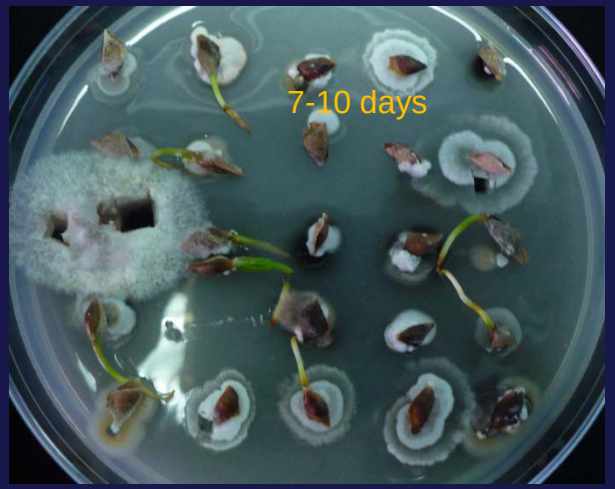

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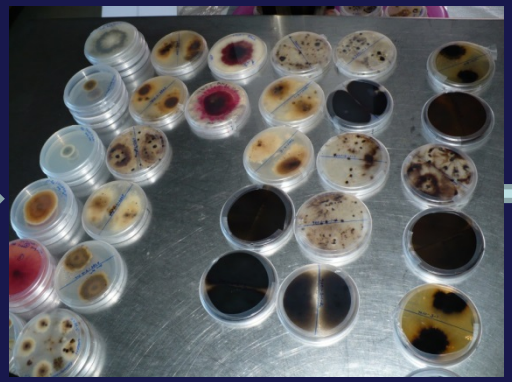

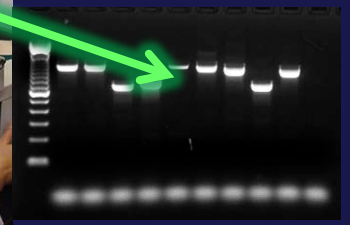

Microscopic examination and/or DNA analysis

Thank you