

## HOW TO SUBMIT PLANT SAMPLES FOR DIAGNOSIS

1. Ensure the sample is representative of the problem. A whole plant with roots and soil is best. If the plants are small, send several.
2. DO NOT send dead plants. Send a plant that is in the process of dying.
3. DO NOT add moisture to the sample.
4. Specimens must be fresh. Be certain to include as many identifiable stages of the disease as are represented. See examples in next pages.
5. DO NOT expose the sample to heat or freezing, minimize crushing.
6. Dig up the plants instead of pulling them from the ground to save feeder roots. Cover the root ball in burlap or plastic to keep the soil in contact with the roots and prevent them from drying out.
7. Package securely, and enclose appropriate payment. Mail, courier or bring the sample to the Laboratory in-person.
8. It is important that you collect the sample prior to pesticide application. Once pesticides have been applied, it may be difficult to get an accurate and timely diagnosis.
9. **If you are not sure how to take a sample, call the laboratory for advice.**

### Plant Health Laboratory

1767 Angus Campbell Road, Abbotsford, BC V3G 2M3

604-556-3003 or Toll-Free: 1-888-661-9903

**Good Samples:** These samples show symptoms but are not dead



**Poor Samples:** Dead material, branches or plants



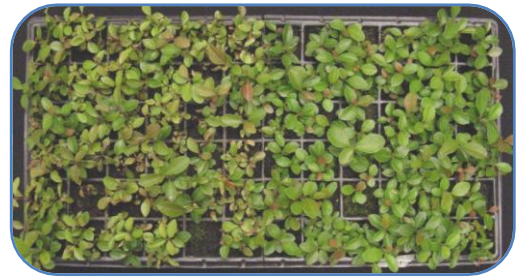
**Remember:**

- Proper diagnosis begins with a good sample. Submitting good quality specimens is essential to ensure that a correct diagnosis is achieved.
- In addition to the physical sample, it is important to provide background information about the plant. Fill out the Plant Health Laboratory Sample Submission Form with as much detail as possible. The submission form can be found at: [www.al.gov.bc.ca/cropprot/lab.htm](http://www.al.gov.bc.ca/cropprot/lab.htm) or can also be filled out at the laboratory.
- Photos of the problem can be included in the submission or emailed to laboratory staff to give a better understanding of the problem in the field, greenhouse or landscape.
- The results are only applicable to the sample submitted. Accuracy of the disease diagnosis is directly related to the quality of the plant sample submitted and information provided to the laboratory.

## SAMPLE SPECIFIC INSTRUCTIONS AND EXAMPLES

### Greenhouse plugs and cuttings:

Submit plugs and cuttings in the trays. When plants are small, ensure that several plants are sent and that they are not dead. If mailing, package to minimize the media from covering the foliage. Cuttings and media can be placed in separate plastic bags.



### Container grown plants:

Send the whole plant in a container, or several containers showing varying degrees of symptom development. Cover the container with a plastic bag and twist tie around the stem of the plant so that the soil is not dislodged.





## Field grown plants:

Dig up the plant including the root ball. Cover the root ball with a plastic bag and twist tie around the stem of the plant so the soil is not dislodged. Include soil and feeder (fine) roots.



## Turf:

Samples should be at least 10 cm x 10 cm and at least 5 cm deep. Take samples from the advancing margin of the affected areas. Place the samples in a plastic bag and cut a few holes in it to allow for some air movement.



## Insect Identification:

Soft bodied insects can be placed in isopropyl alcohol in a vial. Live insects should not be shipped. Dead insects should be placed in a crushproof container. Send several specimens.

Plant tissue showing insect damage should be sent in a plastic bag.



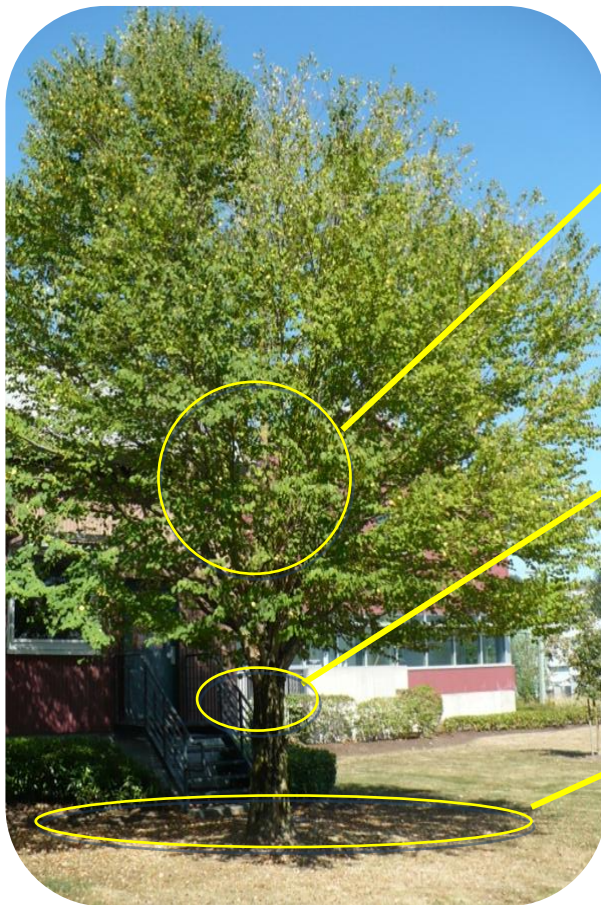
## Large trees and shrubs:

Large trees that are dying require selection of specific plant parts for submission. Photos of the whole specimen are very useful. Send samples in a plastic bag unless otherwise stated.

**LEAF SAMPLE:** Select leaves that are partially green and partially symptomatic. This will enable the lab to check for fungi, bacteria and viruses that cause leaf spots/blights.

**STEM AND BRANCH SAMPLES:** Check for cankers (dark, split, or sunken areas) on the stems and branches. Send in branches that are not longer than 60 cm in length. The stems of large specimens can be scraped in the area of the canker. The organism will be most active in the zone of delineation (where the dead tissue meets live tissue).

**ROOT AND SOIL SAMPLES:** Leaf dieback is often caused by problems occurring in the roots. Collect fine roots near the drip line of the tree. Collect soil from the top 20 cm, place in a plastic bag, and bury the roots in the soil collected.



**Collect leaves and branches where live and dead tissues are present**

**Collect live and dead tissue from cankered area**

**Collect fine roots and soil from drip line of plant**

## Root and soil samples:

Roots can be checked for root rotting organisms, nematodes and insect damage. Soil can be tested for pH, salt levels (EC- Electrical Conductivity), nematodes, and clubroot in brassicas.





## Stem and Branch samples:

Branch samples can only be evaluated for insect damage, fungi, and bacteria if symptomatic tissue is submitted. Usually the crown, roots and soil are necessary for proper evaluation. If signs of organisms (fungal bodies, canker lesions, vascular streaking/discoloration, galls) are present on the branch, no other parts would need to be submitted if this is considered the primary problem.



Verticillium wilt  
in maple:  
Note vascular  
discoloration

## Leaf samples:

Leaf samples can only be tested for viruses, bacteria, fungi and insect damage. Symptoms may be an indication of what is happening in the roots or lower down in the stem. A whole plant may be required to find the problem.



## Blossom and fruit samples:

Fruit samples can only be checked for viruses, fungi, bacteria and insects. Fungi that affect fruit may be present on leaves and stems, therefore a whole plant would give a better evaluation of the problem.



## Fleshy material: (e.g. Fruits, vegetables and commercial mushrooms):

Wrap the material in dry newspaper. Place the newspaper wrapped specimen in a plastic bag and close the bag. Cut a few holes in the bag to allow air movement. Place wrapped material in a box and send it to the lab.

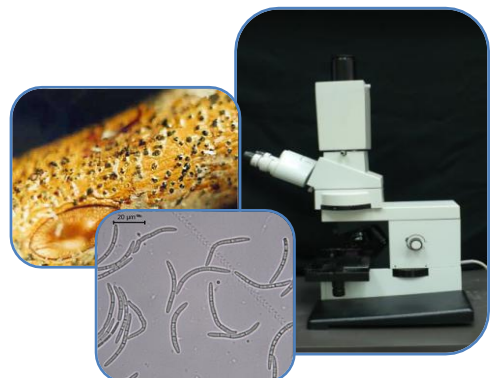


## HOW TO INTERPRET TERMINOLOGY USED BY THE PLANT HEALTH LABORATORY

Plant Laboratory staff achieve a diagnosis by using many techniques and tests. Some methods are described below.

### Microscopy

By examining symptomatic tissue that has active growth, a pathologist can identify whether the problem is bacterial or fungal. Fungal pathogens producing spores in or on symptomatic tissue can be identified using a microscope. Microscopic examination can show morphological details that help to identify the organism involved. It is difficult to identify other types of pathogens using this method.



### Moist Chamber Incubation

Placing symptomatic plant tissue in a moist chamber for a short period will encourage the growth of any fungal pathogens present. The sample is then examined under a microscope and fungal characteristics are recorded and matched with reference material to identify the fungus. Different fungi grow at different rates, therefore results may be obtained in as little as 2-3 days or it may take weeks before a pathogen can be identified.



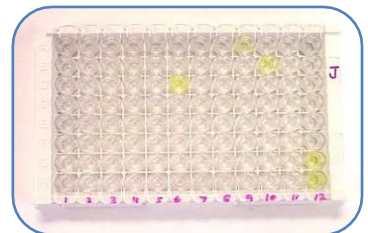
### Culturing

Culturing allows for purification and separation of organisms found in the plant. The pathogen (bacterium or fungus) is isolated from the plant and grown on a specialized medium in Petri plates. Morphological characteristics produced on the plate (color, shape, size, sporulating bodies etc.) are specific to an organism and aid in its identification. Culturing does not provide identification but enables the laboratory staff to use microscopy or other specialized tests to identify the organism that is isolated. Different organisms grow at different rates and sample diagnostic turn-around time often depends on the growth rate of the organism in question.



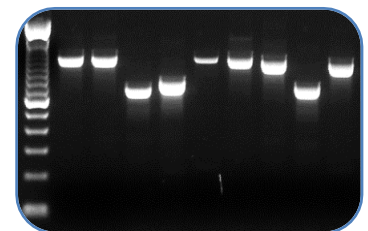
### ELISA

Enzyme-linked Immunosorbent Assay (ELISA) is able to detect proteins that belong to specific microorganisms. ELISA has been used for medical, veterinary and plant disease diagnosis for many years. ELISA works by having specific antibodies that can recognize proteins that are unique to specific pathogens. It is a sensitive test with high level of accuracy. The Plant Health Laboratory uses this method to detect a number of pathogens including fungus-like organisms, bacteria and viruses.



### PCR – DNA finger printing

The Polymerase Chain Reaction (PCR) can rapidly detect DNA that is unique to an organism. PCR can be highly sensitive, rapid and can detect a low number of genetic molecules specific to an organism. PCR can detect the presence of an organism whether it is dead or alive in the tissue, where other methods cannot. It is far more sensitive than ELISA. The Plant Health Laboratory uses this technology to detect a number of pathogens.



### Abiotic

An abiotic disorder occurs when the symptoms on the plant are not caused by biological organisms such as insects, mites or pathogens. Abiotic disorders are associated with non-living causal factors such as weather, soil conditions, chemicals, mechanical injuries, cultural practices and, in some cases, a genetic predisposition within the plant. Abiotic factors do not include live organisms, do not spread, and cannot be controlled by pesticides.





The Plant Health Laboratory provides diagnosis of plant health problems caused by diseases and insects affecting crops and plants grown in B.C.. The Plant Health Laboratory is part of the Plant Health Unit in the Plant and Animal Health Branch.

**THE PLANT HEALTH LABORATORY DOES NOT ANALYZE SOIL OR TISSUE FOR NUTRIENT CONTENT OR CHEMICAL RESIDUES. WE DO NOT IDENTIFY MUSHROOMS, PLANT VARIETIES OR WEEDS**

Note: All test results are confidential and will remain the property of the client except where the Plant Health Laboratory is required to report the results (quarantine or regulatory significance) to the Canadian Food Inspection Agency.

## SAMPLE PACKAGING AND SUBMISSION INFORMATION

1. If a sample cannot be mailed immediately, keep it refrigerated or out of direct sunlight. Avoid sending samples on Friday.
2. Soil samples for pH, EC (electrical conductivity), clubroot and nematode assessments may require specific collection techniques. Call the Plant Health Laboratory for specific instructions if you are not sure.
3. Package the sample securely enclosing a cold pack if shipping during periods of warm weather.
4. Fill out the form with as much detail as possible, attach another sheet if necessary. Diagnostic forms should not be packaged in a manner where they will be in contact with soil or tissue.
5. Send urgent or perishable samples by courier.
6. For out of province samples, please contact (604) 556-3128 before submitting samples.

**PLANT HEALTH LABORATORY SAMPLE SUBMISSION FORM**

BC Ministry of Agriculture  
Plant Health Laboratory  
Abbotsford Agriculture Centre  
8800-16th Street, Abbotsford, BC V3G 2M3  
Telephone: (604) 556-3003 Toll Free: 1-800-661-9903

Date received: \_\_\_\_\_  
Specimen No. \_\_\_\_\_

GROWER NAME: \_\_\_\_\_ PHONE NO: \_\_\_\_\_ FAX NO: \_\_\_\_\_  
ADDRESS: \_\_\_\_\_ TOWN/VILLAGE: \_\_\_\_\_  
CITY: \_\_\_\_\_ DISTRICT: \_\_\_\_\_  
COUNTRY: \_\_\_\_\_

SAMPLE COLLECTION SITE: \_\_\_\_\_  
SITE TYPE: \_\_\_\_\_

PLANT: \_\_\_\_\_ VARIETY: \_\_\_\_\_ PLANT AGE: \_\_\_\_\_ COLLECTION DATE: \_\_\_\_\_

DIAGNOSTIC REPORT USE ONLY

DIAGNOSIS: \_\_\_\_\_

STANDARD DIAGNOSTIC PROCEDURE: Includes identification of most plant pathogens (bacteria, fungi, nematodes, phytoplasmas, viroids, viruses) as well as cultural and physiological conditions that are reported and may be applicable to plant health problems. Cost per submission: \$131.50 (Urgent - Up to 7 days\*\* = \$21.00; Routine - 7 to 10 days\*\* = \$21.00; Casual - 10 to 20 days\*\* = \$19.75; Standard Diagnostic Fee includes the GST (5%))

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

## PLANT HEALTH LABORATORY

BC Ministry of Agriculture  
Abbotsford Agriculture Centre  
1767 Angus Campbell Rd  
Abbotsford BC, V3G 2M3

Tel: (604) 556-3003, Toll free: 1-800-661-9903  
Fax: (604) 556-3010  
<http://www.al.gov.bc.ca/cropprot/lab.html>  
Hours of operation: Monday to Friday  
8:30 A.M. to 4:30 P.M.

**Failure to recover or identify a disease or insect in a sample does not imply that a field or commodity represented by the sample is free of the organism. Due to uneven distribution and/or seasonal fluctuations of disease or insect population in plant tissue and limitations of the sampling procedure used, the Plant Health Laboratory does not guarantee, warrant or imply, as a result of negative test results, freedom of infection in the population from which the sample was withdrawn.**