Clubroot soil sampling on the Prairies

Soil testing is a useful tool to detect the clubroot pathogen at low levels, monitor the spore load, or detect the pathogen in the absence of a host crop. Based on its biology, the presence and quantity of the clubroot pathogen, *Plasmodiophora brassicae*, is known to be variable as it occurs in patches in a field. Due to this variability, a false negative may occur when a soil sample fails to detect the pathogen in a field where it is present at low levels or only in a small area of a field. To reduce the chance of false negatives, it is important to collect soil samples in a manner that increases the likelihood of detecting the pathogen in a field.

How to take a representative soil sample

- Reduce the risk of false negatives by focusing sampling on high clubroot risk areas in the field. Based on experiences in Alberta, Saskatchewan, and Manitoba, the highest risk areas include field entrances, low spots, areas with low pH, natural water runs, and other high-traffic areas.
- Ensure biosecurity protocols are followed to minimize contamination. Sanitize tools and equipment between fields if composite samples are being taken, or between samples for multiple samples within a field.
- Brush off the top layer of crop residue to expose the bare soil. Sample the soil from the top five to 10 cm (two to four inches). Each sample should be approximately 475 to 710 ml (two to three cups) in volume.
- Soil sampling for clubroot needs to be completed separate from soil fertility testing, as they require two different protocols and soil depths.
- Ensure soil samples are allowed to dry if they are collected in damp conditions. Samples can be air dried by leaving the bag open in a dry, secure area. Avoid contamination between samples while drying.
- Submit soil samples with all required information to a designated testing lab, such as those listed under "Clubroot" on the Canola Encyclopedia.
- Collect soil samples in the fall when clubroot galls are degrading or in the spring the year after a canola crop is seeded. Spring soil sampling is recommended when a clubroot-resistant canola variety is grown.

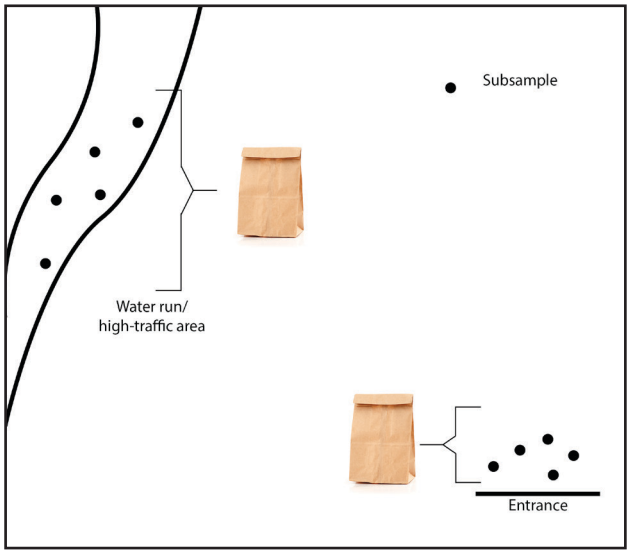
Limitations to Soil Sampling

- One major limitation to soil sampling is the patchy distribution of clubroot spores within the field. This can result in soil sampling activities that miss an infested clubroot patch, resulting in a false negative.
- False negatives can also result from composite samples that dilute the pathogen present to below the detection limit of laboratory testing.
- Sampling in the field can also catch a patch edge, and then would not reflect the maximum number of spores present. This could result in an underestimation of the spore concentration in the fields.

Early detection of clubroot in a field

Individual soil samples at each high-risk area

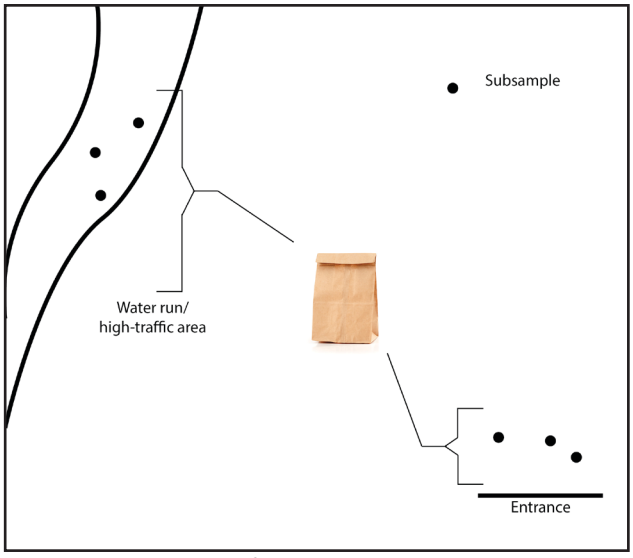
- At each site, take a composite sample of five locations within a small area. For example, at the field entrance collect five subsamples of approximately 120 ml (0.5 cups) of soil per subsample. Combine subsamples into one bag to be tested. Repeat for each risk area (example: low spots, natural water runs, or other high-traffic areas).
- This method has the lowest risk of false negatives, which can result from the dilution of infested clubroot soils in a composite sample.
- The method requires multiple tests per field and multiple test fees, which can be cost restrictive if many fields need to be tested.



Individual soil samples at each high-risk area

Composite soil sample from high-risk areas

- Focus only on the high-risk areas in the field.
- At each high risk area, collect 120 to 250 ml (0.5 to one cup) of soil at two to three sites and combine them into a single sampling bag. For example, collect two to three subsamples (120 ml or 0.5 cups each) at the field entrance and two to three subsamples (120 ml or 0.5 cups each) at a low spot or other high-risk area and combine them into one soil sampling bag.
- There is an increased risk of false negatives with this method compared to individual samples at each high-risk area. However, there is improved accuracy compared to testing only at a single site, with a similar testing cost.
- If only one sample is to be tested per field, this is the recommended approach.



Composite soil sample from high-risk areas

Monitoring spore levels in a field over time

- Clubroot testing in soil relies on detecting pathogen DNA. Pathogen spore levels in the soil can then be used to monitor the spore load over time to determine the impact of your management practices in that field.
- For the most accurate detection, take a single soil sample at one point in the field, as close to the centre of a clubroot patch as possible. Ensure you record the GPS location and take future samples from the same GPS location.
- Alternatively, a small composite sample can be taken throughout the clubroot patch to get an average estimate of the spore load in that proximity.
- A full field or multiple site composite increases the risk of false negatives and could underestimate the potential impact of disease in the most severely infested areas in the field.
- Make sure to collect soil samples at the same time of year and from the same location to improve your ability to monitor spore levels over time.