

## Frequently Asked Questions About Clubroot in Canola

After years of record-setting canola acres, many growers face challenges as a consequence of tight canola rotations. Clubroot is a serious disease that can cause major yield loss. BASF wishes to continually keep growers informed about the latest agronomic research information as it pertains to clubroot. The following questions and answers address several of the key findings with regards to the management of clubroot in canola.

### 1. What should growers and agronomists look for in terms of clubroot and where?

- Look for areas with premature ripening, thin canola areas.



Source: Strelkov, S., 2015. Found in *Clubroot disease of canola and mustard*, Agri-Facts, Alberta Agriculture and Rural Development

- Scout near field entrances and areas where water has moved soil.
- Pull plants and look for gall formations on roots – if late in the season, galls may have decayed into sawdust-like brown material. DNA tests can provide confirmation.



Source: Turkington, K., 2015. Found in *Clubroot disease of canola and mustard*, Agri-Facts, Alberta Agriculture and Rural Development

- If no patches exist, then dig up the roots of random plants near field entrances or other high traffic areas.
- Also scout non-canola fields and look at brassica weeds e.g. shepherd's-purse, stinkweed, flixweed, wild mustard and volunteer canola, which can act as a host and become infected.
- Also, be sure to consider volunteer canola as a potential source of clubroot, even if the volunteers are from a clubroot-resistant hybrid.

## 2. What is a clubroot-resistant canola hybrid?

A clubroot-resistant hybrid is a hybrid that is bred to be resistant to clubroot. This means that it is resistant to the predominant clubroot strains or pathotypes in Western Canada. No clubroot-resistant hybrids, including new ones with multiple resistance genes, are resistant to all the clubroot pathotypes detected in Western Canada to date. There is a classification system ranging from:

**Resistant (R)** – less than 30% infection compared to susceptible checks.

**Intermediate (I)** – between 30 and 50% infection compared to susceptible checks.

**Susceptible (S)** – more than 50% infection compared to susceptible checks.

## 3. Who should be growing a clubroot-resistant hybrid?

If you have clubroot on your farm or you know that there are fields that are infected with clubroot in the community that you farm in, you should be growing a resistant hybrid.

## 4. What is a farming community?

With respect to clubroot, a farming community is the area where you or others conduct your farming activities. If you farm across a large geography, or if you have external contractors that drive in your fields (custom work, agronomic support, etc.) and they travel larger distances, your community will be quite large.

## 5. If you find clubroot in your field(s) for the first time, what should be done?

The goal with scouting for clubroot is to find the problem early.

1. Pull the infected plants and either burn them or bury them in a landfill.
2. Lime the area to increase the soil pH – talk to your local Canola Council of Canada Agronomist regarding lime sources, particle sizes and rates, as this is an area where the science is quickly evolving.
3. Stop the movement of dirt from 2X the area and consider planting it to grass.
4. Increase your canola rotation to a minimum of 1 in 3 years.
5. Increase the scouting on your farm.
6. At a minimum, tell your neighbours that you found clubroot and tell them what your management plan is. Also consider reporting to the local Canola Council of Canada Agronomist.
7. Grow a resistant hybrid – consider first generation genetics.
8. Control volunteer canola and other brassica species in canola and non-canola crops.

## 6. You've been growing a clubroot-resistant hybrid and now are noticing patches that are thin and ripening early and are seeing large galls on the roots. What should be done?

Follow the same steps outlined above with the addition of the following:

- *Consider having the shifted or newly introduced population pathotyped.*  
Fields in Western Canada that have clubroot have more than 1 pathotype in the soil. With the use of resistance genetics, you will control the pathotypes that your hybrid has resistance to, but over time, because there are spores from other pathotypes that are not being controlled, you could see the predominant pathotype shift in your field. Also, selection pressure on the pathotypes being controlled can cause genetic changes in virulence of the pathogen to overcome resistance. To get galls tested for the predominant pathotype talk to your local Canola Council of Canada Agronomist who can get it sent to the University of Alberta for pathotyping.
- *Grow a clubroot-resistant canola hybrid with second generation genetics the next time you grow canola on that field.*

## 7. How much yield loss can growers expect from clubroot in canola?

0-100% - the following are estimates based on field observations if you do not use control measures:

- 1st year losses are typically below 1%.
- 2nd canola cycle around 10% yield loss.

- 3rd canola cycle greater than 50% yield loss.
- 4th canola cycle 90% or greater loss.

#### 8. In a confirmed clubroot field, how quickly will the pathotypes shift if you have been growing a clubroot-resistant hybrid?

It depends on your rotation. If you are farming with a short rotation (more frequent than 1 canola crop every 3 years) under a high clubroot spore load you could see the predominant pathotype shift after your second canola crop.

Under a lower spore load and a longer rotation between canola crops you will get more canola crop cycles.

#### 9. What is the difference between high spore load and low spore load?

It is really difficult to quantify a low spore load, we can only tell if farmers have a high spore load –  $1 \times 10^5$  spores per gram of soil is a high spore load.

- Soil tests for clubroot spore load results could be used to assess the clubroot risk level, but the downside of this test could be that it could create problems for interpretation. Fewer spores mean lower risk, but clubroot infection can still occur at 1,000 spores per gram of soil, or less. If one field has 10,000 spores per gram and the neighbouring field has 100,000, both fields could have a problem due to potential soil movement between fields. Furthermore, if a test shows 1,000,000 spores per gram, the field is clearly at risk and symptoms are likely to appear under most conditions.
- Adding to the grey area is that results can be different depending on the lab (results cannot be compared lab to lab because of their different sampling, storage, extraction and analysis protocols).
- When sampling to determine the spore load in a heavily-infested area, collect samples from only that area, as a composite sample from other areas may dilute the spore concentration. Also, to get a fair estimate of spore load within a heavily-infested area, include soil from the canola row and from between the rows. (Canola Watch how to test for clubroot pathogen, 2018)
- The bottom line on soil testing for clubroot is that several labs offer this service, and positive results can be a useful management tool, but negative results do not mean the field is risk-free as it could just come down to not sampling the right area.

#### 10. What clubroot pathotypes is InVigor L234PC resistant to? Where should it be grown?

- The nomenclature around clubroot pathotyping continues to evolve as the science and detection methods advance. Due to this uncertainty, there is real risk that what we believe is a particular pathotype today, may actually be a population of multiple pathotypes that we have yet to understand.
- InVigor L234PC is resistant to the predominant pathotypes present across Western Canada, plus additional recent newer pathotypes.
- InVigor L234PC has been tested and is resistant against a wide range of clubroot pathotypes, including many of the new pathotypes that have been identified, and we are confident that InVigor L234PC is going to be effective against most of these new and emerging pathotypes.
- In fields where InVigor L135C, InVigor L241C, InVigor L255PC and InVigor Health L258HPC cannot be grown due to the pathotypes that have overcome the resistance within these hybrids, InVigor L234PC can be used as it will perform better due to additional effectiveness against some of the new pathotypes.
- InVigor L234PC is good option in areas where clubroot has been a problem for several years and a grower has used the first generation hybrids multiple times.

#### 11. What is a first generation versus second generation clubroot hybrid?

- First generation hybrids contain resistance genetics that were initially deployed to combat clubroot for InVigor® hybrid canola. This includes InVigor L135C, InVigor L241C, InVigor L255PC and InVigor Health L258HPC. They were designed to control the predominant pathotypes in Western Canada at the time of their registration.

- Second generation hybrids contain additional sources of resistance designed with multiple genes so that they are effective against a wider range of pathotypes.

**12. If concerned about clubroot and there is no confirmed clubroot in your farming community, but you would like to grow an InVigor clubroot-resistant hybrid, is this the best choice?**

Our InVigor hybrid lineup contains some higher yielding hybrids that do not confer clubroot resistance. If clubroot is not in your community these would be better choices. Utilize the hybrid that best fits your operation.

**13. If not particularly concerned or have little risk of clubroot infection but a clubroot hybrid has an agronomic characteristic of interest such as standability (InVigor L241C or InVigor L255PC) or exceptional yield and potential to straight cut (InVigor L255PC), should I be growing these hybrids?**

While we would likely suggest a hybrid such as InVigor L252 or InVigor L230 for standability, or InVigor L233P for exceptional yield potential, the clubroot hybrids noted above do have a good fit based on those agronomic characteristics.

In both cases there is a theoretical risk in exposing the clubroot-resistant genes to low levels of clubroot spores that may be undetected by the grower. Exposing the clubroot resistance genes to this low level of spores could cause the population to shift prior to needing the clubroot genetics to help manage the disease on your farm.

**14. Other companies are labeling what pathotypes they are resistant to. What is BASF's response to this approach?**

The science and nomenclature are evolving, and we continue to learn about clubroot population dynamics. Secondly, clubroot pathotypes within populations are diverse and are highly variable within a field. Generalizations about predominant pathotypes can lead to poor field performance. Furthermore, there are no commercial testing facilities providing robust pathotyping for clubroot currently.

## Clubroot Resistant Canola Decision Checklist

Each grower has a different level of risk tolerance and needs to make decisions appropriate for their farming operation. If you feel that you are doing a good job with the checklist below, then growing an InVigor hybrid that best fits your operation is likely the best decision for your farm. Otherwise growing a clubroot-resistant hybrid will be your best choice.

- Growing canola in a 1 in 3 year or greater rotation
- Scouting, especially near field entrances for early detection of clubroot
- Minimizing tillage to prevent soil movement
- Limiting or eliminating external traffic on fields
- Cleaning equipment prior to entering fields
- Having a soil pH of 7.2 or greater, or considering liming of fields with lower pH

For further information related to clubroot please visit [www.clubroot.ca](http://www.clubroot.ca). You can also contact your local BASF representative or call **AgSolutions**® Customer Care at 1-877-371-BASF (2273).

**Always read and follow label directions.**

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