

## Soil Survey for Clubroot of Canola

### Purpose:

In the summer of 2016, clubroot disease was found throughout a field of canola in West Nipissing. Clubroot has been established in Brassica vegetable crops in Ontario for a number of years, but this was the first time the disease was confirmed in Ontario canola. A soil survey was conducted in 2016 and 2017 across the canola growing regions of the province, and clubbed roots were collected from infested canola fields. The purpose of this preliminary survey was to determine the current distribution of clubroot across canola growing regions of Ontario and to determine the pathotype (strain) present in each clubroot-positive field.



**Figure 1. The first case of a clubroot infection found in Ontario canola in 2016 (Photo credit: [www.ontariocanola growers.ca](http://www.ontariocanola growers.ca))**

### Methods:

Soil samples were taken from fields where canola has been grown in the last 3 years targeting the majority of canola growing regions in Ontario. Fields were sampled in autumn of 2016 and spring of 2017 based on voluntary participation by farmers and agronomists. Sample sites do not represent a comprehensive assessment of all canola fields or regions of Ontario.

For those samples taken by OMAFRA, approximately 20 soil cores (6-8" deep) were taken from each of the sampled fields and mixed thoroughly. Sampling was targeted to areas of the field where infections are likely to begin, including a "W" pattern near the typical entrance to the field and in some cases, in wet areas of the field. While taking the samples, sanitation procedures were carried out to ensure the samples were not contaminated and the disease was not spread during the sampling process. This includes using a bleach solution to clean soil probes, buckets, shovels and boots and/or using boot covers. Some samples were collected and submitted by farmers.

## Crop Advances: Field Crop Reports

A total of 127 soil samples were collected from the following regions or counties:

Thunder Bay District	Kawartha Lakes
Algoma District	Peterborough County
Manitoulin Island	Grey County
Cochrane District	Bruce County
Temiskaming District	Dufferin County
West Nipissing District	Wellington County
Sudbury District	Perth County
Ottawa-Carleton County	Oxford County
Renfrew County	Brant County
Lanark County	

Soil samples were stored in a refrigerator until a sub-sample could be sent to the University of Guelph Pest Diagnostic Clinic in Guelph, ON. A qualitative PCR analysis was conducted on all soil samples, and the results indicated “clubroot detected” or “clubroot not detected”.

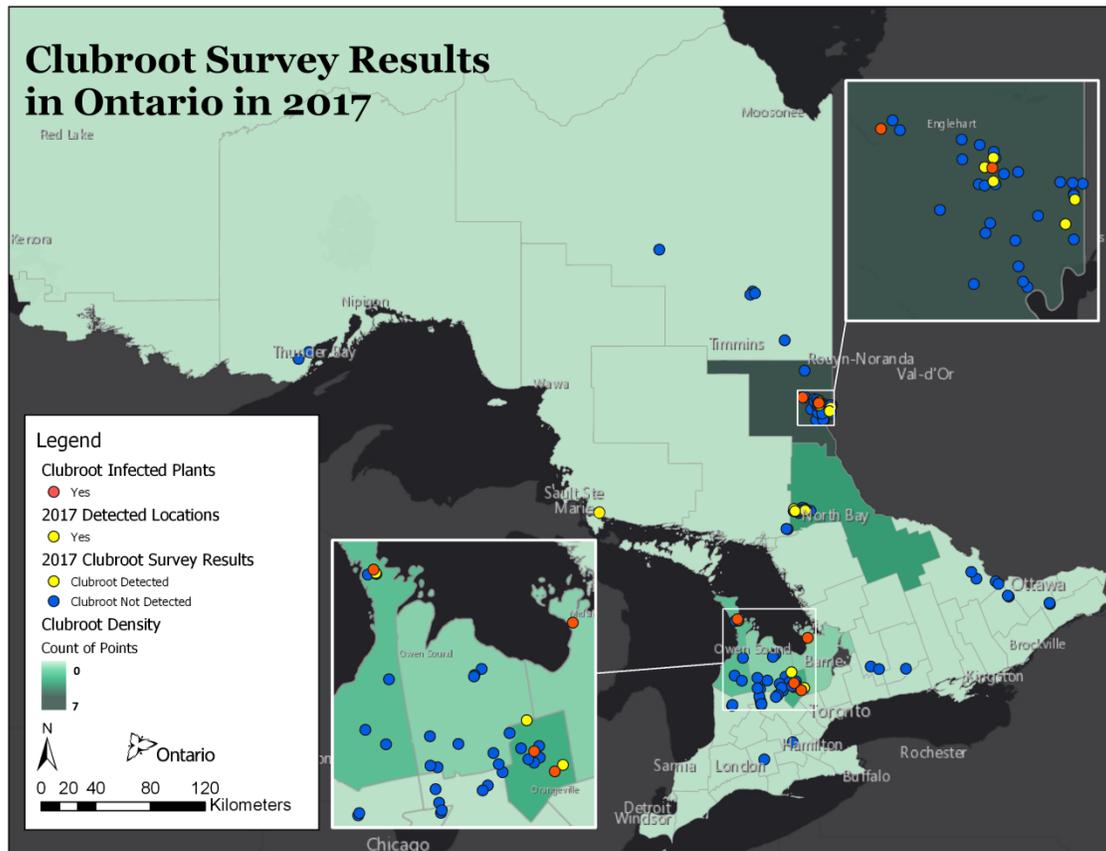
In addition, canola plants showing symptoms of clubroot were collected from farmers as reports arose about infected fields. These were used to determine the pathotype of clubroot present in each field. Clubbed canola root samples were collected from 6 canola fields in 2017, from the regions of Temiskaming, West Nipissing, Simcoe County, Dufferin County, and the Bruce Peninsula. In addition, clubroot-infested soil from two fields sampled in 2016 was used to produce clubbed roots for pathotype analysis.

All root samples were submitted to the lab of Dr. Mary Ruth McDonald at the University of Guelph to determine the specific clubroot pathotype. The analysis takes many weeks to conduct, so results are currently only available for half of the clubbed root samples.

### **Results:**

The distribution of clubroot is widespread throughout canola fields in Ontario and there is some diversity of clubroot pathogens from samples that have been processed to date. Figure 1 shows the results of the canola field soil survey to date, including all samples taken in 2016 and 2017 (samples taken in Manitoulin are not yet included on the map; these samples were negative). There are 12 fields where clubroot has been detected through soil samples, and infected plants and yield loss were found in some additional areas in 2017. Known clubroot positive fields are located in the regions of Algoma, Temiskaming District, West Nipissing, Simcoe County, Bruce County (in the peninsula), Dufferin County, and at the Dufferin-Grey county border.

The result of the pathotype analysis for 3 samples was pathotype 2 (P2), and one was pathotype 8. There are 4 canola root samples currently under pathotype evaluation.



**Figure 1. Clubroot survey results for 2016 and 2017. Blue dots indicate fields that were soil sampled and clubroot was not detected, and yellow dots are where clubroot was detected in soil. Red dots indicate fields with infected plants and yield loss.**

**Summary:**

Above ground symptoms of clubroot include yellowing, stunting, wilting, premature ripening, and plant death. The above ground symptoms are similar to those of other diseases and nutrient deficiencies, as well as lack of water, or high temperatures. Proper diagnosis of clubroot infection must include digging up plant roots to check for gall formation. Roots of infected plants become malformed and cannot adequately transport water or nutrients.

Ontario canola growers should now make it a regular practice to walk areas of the field that ripen prematurely or look unhealthy and pull up plants to check for clubbed roots. If certain areas of the field often look unhealthy or ripen prematurely because of a wet spot or some other soil characteristics, it is still good practice to pull up plants and check for clubroot. Ontario farmers in all regions should monitor for clubroot every year and in every field.

## Crop Advances: Field Crop Reports

Clubroot spores can remain dormant in soil for 20 years or more, and cannot be eradicated from fields. There may be little to no yield loss in fields where clubroot has been detected if spore counts in the field remain low. However there can be up to 100% yield loss in patches in a field if clubroot spore counts are high, and when conditions favour clubroot such as wet soils and pH below 6.5. There are currently no pesticides that offer effective control. However, clubroot spore counts can be significantly reduced when there is no Brassica host plants present, so controlling volunteer canola and brassica weeds along with the use of long rotations (2 to 3 year break from canola) is strongly recommended.

There are also clubroot resistant varieties available. The varieties used in a given field should be matched to the predominant pathotype of clubroot present. It is important to note that while there will be a predominant pathotype, fields likely contain a population of differing pathotypes. Farmers should begin using resistant varieties before they have high levels of clubroot spores in the field (e.g. before significant yield loss has been observed). If a farmer is at risk by proximity to areas that currently have clubroot, or because they employ custom operators who move soil from farm to farm, they should consider using resistant varieties now. Be aware that the repeated use of a resistant variety, especially on a short rotation and where spore counts are very high, can create a selection pressure in the field that promotes growth of clubroot pathotypes not targeted by the resistant plants, causing a shift in the pathotype population that can “overcome” that variety and render it useless in that field. Early adoption of resistant varieties and maintenance of low spore counts will protect the longevity of the resistance technology.

Clubroot moves from field to field through the movement of soil. Canola growers that have had clubroot detected in their fields should practice sanitation procedures and limit the amount of soil carried on equipment from field to field. Removing all loose soil from equipment can significantly reduce the number of clubroot spores transferred between fields. Further washing and sanitation with bleach should be used before parking equipment for the winter, or between working in fields where there is a high risk of clubroot and a desire to ensure it does not spread. Because clubroot can move any way that soil moves, practices that prevent erosion or overland water flow will also limit transfer of the disease. Farmers that use custom operators are likely at a greater risk of having clubroot move onto their farms. Be aware that clubroot can be present in soil in any field or crop for 20 years or more, there does not have to be canola present for clubroot to exist.

Clubroot has now been found in multiple counties in Ontario. All canola growers should familiarize themselves with details of clubroot disease; comprehensive resources can be found at [www.clubroot.ca](http://www.clubroot.ca). In addition, canola growers should now make it a regular practice to observe their fields for patches that are yellow, wilted or ripen prematurely, and pull up plants from those areas to check for galled roots. It is suggested that growers try test strips of clubroot resistant varieties on-farm to evaluate their yield and lodging performance in advance of detecting the disease, or to make use of resistant varieties a regular practice if a field is at risk of clubroot.

**Next Steps:**

The pathotype analysis of the 4 remaining clubbed root samples will be completed in 2018. Additional soil sampling and pathotype analysis of clubroot will be conducted as funding is secured. Farmers are welcome to submit soil or plant samples to Meghan Moran if clubroot is suspected. Samples can be stored if funding is not immediately available.

**Acknowledgements:**

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