

Clubroot Disease

CAGC INFORMATION ALERT

First Published 04 – 2008

Canadian Association of Geophysical Contractors
1045, 1015 - 4th Street SW Phone: 403 265 0045
Calgary, Alberta Fax: 403 265 0025
T2R 1J4 E-mail: info@cagc.ca

Information

Alert

03-08

The information in this alert has been taken from various sources that are referenced at the end of this document. For more detailed information on this subject, members are encouraged to access these corresponding links.

Clubroot Disease has become quite a concern for a number of landowners in the farming community; so much so that seismic crews have been locked out on a number of quarters and sections. Clubroot is not a new disease in Canada or Alberta; however, it is just in the last few years that it has been found in a number of counties throughout Alberta.

How it Affects Crops

Infecting crops through root hairs, clubroot stimulates abnormal growth of affected parts resulting in a swollen club. This swollen club acts as a nutrient sink by not allowing the infected roots to transport sufficient water and nutrients to the aboveground plant parts.

Warm soil (20-24°C), high soil moisture and acid soil (pH less than 6.5) are environmental factors that favour infection and severe disease development. Unfortunately, these conditions exist in a significant portion of the traditional canola growing areas of Alberta.

Why it is a Concern to Landowners

Currently Clubroot continues to spread and is of significant concern for Alberta producers. Although it has not yet been detected in Saskatchewan, producers there are also quite concerned about vehicles and equipment coming from Alberta that may spread the disease.

Research with canola indicates that infestations approaching 100% led to 50% yield losses, while 10-20% infestations led to 5-10% yield losses. As a rough estimate, the % yield loss from clubroot is about half the % of infected plants.

Canola producers are faced with a 3 year ban if their crops are found to have a light infestation while a heavier infestation will result in a 5 year ban of growing canola.

What is Clubroot Disease

Clubroot is caused by a soil-borne fungus which infects plants in the crucifer family (canola & cabbage); however broccoli, brussel sprouts, cauliflower, Chinese cabbage, kale, kohlrabi, radish, rutabaga, turnip, rapeseed and mustard are also susceptible to this disease.

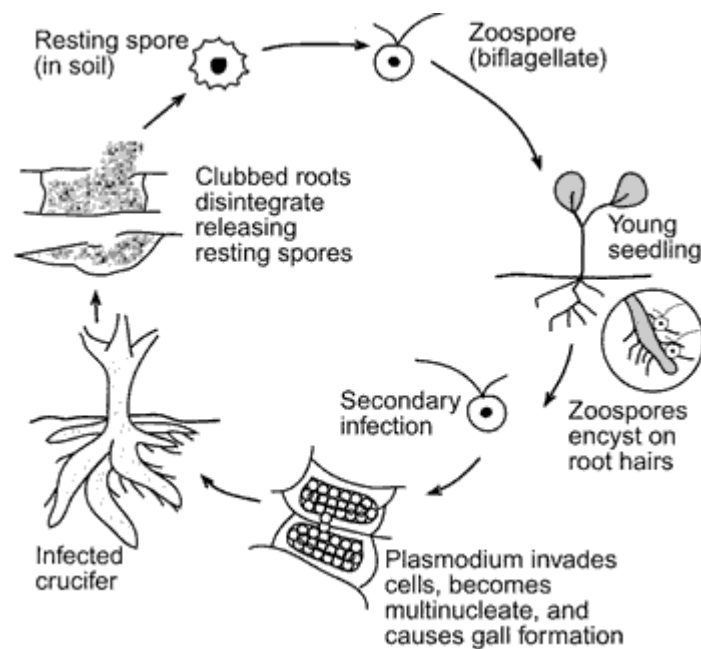


Figure 1 - Life Cycle of Plasmodiophora Brassicae, the Pathogen that Causes Clubroot

- Resting spores¹ germinate in the spring, producing zoospores;
- These zoospores then swim in soil water attaching themselves to the root hairs of young seedlings causing infection;
- After infection takes place through root hairs, the pathogen forms an amoeba-like cell. This abnormal cell multiplies and then joins with others to form a naked mass of protoplasm with many nuclei (aka plasmodium). This mass eventually divides to form many secondary zoospores that are released into the soil;
- These second generation zoospores re-infect the roots of the initial host or nearby plants and are able to invade the interior of the root. Once in the cortex, the amoeba-like cells multiply or join with others to form a secondary plasmodium. As this plasmodium develops, plant hormones are altered, which causes the infected cortical cells to swell. Clusters of these enlarged cells form “clubs” or galls;
- The clubbed roots disintegrate releasing millions of resting spores thus beginning the process all over again.

¹ These resting spores are extremely long lived with a half-life of about 4 years, but they can survive in soil for up to 20 years. It is the longevity of these resting spores that is a contributing key factor to the seriousness of the disease.

Prevention

Managing clubroot after establishment in a canola field is difficult as there is no known clubroot resistance in current Canadian canola varieties. The resting spores, as seen in Figure 1, are most likely to spread via contaminated soil by wind or water erosion and field machinery (equipment used in seismic operations would be included here).

While the potential for spreading this disease is found to be lower in colder temperatures, the best form of prevention (in all weather conditions) is to restrict the movement of contaminated material. This can be achieved by ensuring all machinery is thoroughly cleansed when leaving by:

- Knocking or scraping off soil lumps and sweeping off loose soil
- After removing soil lumps, wash the equipment off with a power washer, preferably with hot water or steam
- Finish by misting equipment with a weak disinfectant (1-2% household bleach solution).

What Is Being Done About It?

The threat of clubroot to Alberta canola growers is being addressed through regulations and research. Clubroot was added as a declared pest to the *Agricultural Pests Act* in April 2007. Alberta Agriculture and Food is responsible for this Act however, enforcement is the responsibility of the local municipality. The owner or occupant of land has the responsibility of taking measures to prevent the establishment of any pest on land, property and livestock and to control or destroy all pests in the land or property.

Control measures for clubroot are specified in the Alberta Clubroot Management Plan. It is important to understand that these control measures represent an acceptable minimum standard that is to be applied in all municipalities across the province. Municipalities, however, can adopt more stringent standards within their own jurisdictions.

Additional Information:

Counties with confirmed clubroot from surveys conducted 2003-2007:

Sturgeon	Camrose	Westlock
Leduc	Flagstaff	Strathcona
Parkland	Newell	Lac Ste. Anne
Wetaskiwin	Barrhead	



Figure 3 – Moderate Infection



Figure 4 – Severe Infection

SUPPORTING REFERENCES

"Clubroot Disease of Canola and Mustard." Alberta Agricultural and Rural Development. 23 Apr. 2008 <[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex8593#Prevention](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex8593#Prevention)>.

"Clubroot of Canola - Frequently Asked Questions." Alberta Agricultural and Rural Development. 23 Apr. 2008 <[http://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/all/faq7389](http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/faq7389)>.

Clubroot infested areas in Alberta." Alberta Agricultural and Rural Development. 23 Apr. 2008 <[http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/All/prm11821](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/All/prm11821)>.

"Alberta Clubroot Management Plan." Alberta Agricultural and Rural Development. 23 Apr. 2008 <[http://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/all/agdex11519](http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/agdex11519)>.

"Clubroot of Canola - Frequently Asked Questions." Alberta Agricultural and Rural Development. 23 Apr. 2008 <[http://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/all/faq7389](http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/faq7389)>.

"Clubroot of Crucifers." The Ohio State University Extension. Plant Pathology. 23 Apr. 2008 <<http://ohioline.osu.edu/hyg-fact/3000/3118.html>>.