

HOW CLUBROOT AFFECTS YOUR CROP.

Can survive in soil for up to 17 years

Millions of resting spores released

- Water and nutrient uptake restricted
- Reduced seed production
- Stunting and premature death
- Rare virulent types are becoming more prevalent

CLUBROOT LIFE CYCLE

Adapted from Ohio State University

Are able to move and seek out root hairs

Resting spore

Zoospore

Young seedling

Zoospores encyst on root hairs

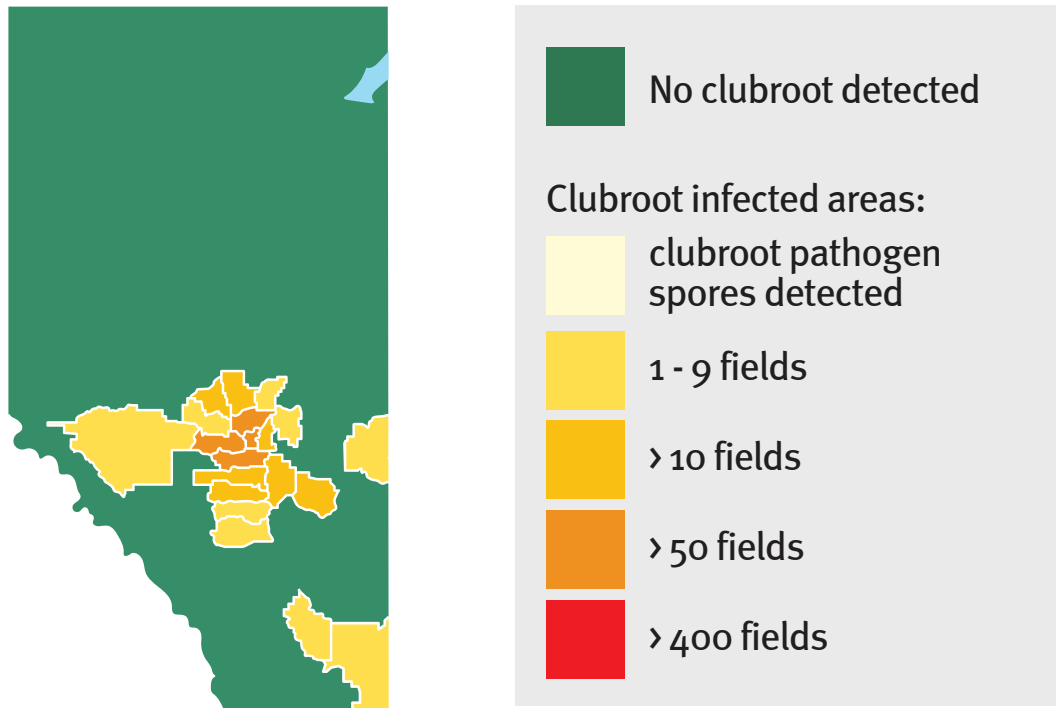
Infected root

Clubbed roots disintegrate

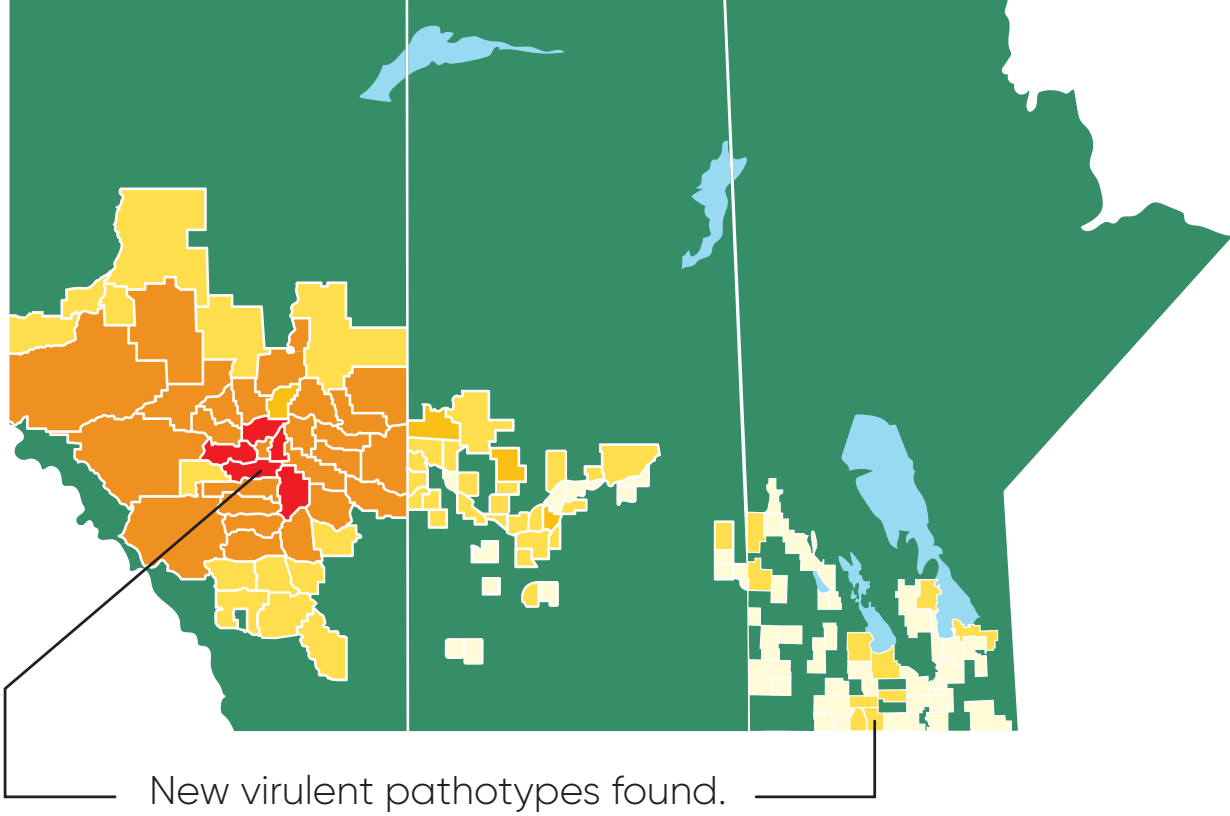
A GROWING THREAT IN WESTERN CANADA.

Thousands of infested fields have been identified across canola growing regions.

CLUBROOT AFFECTED AREAS IN 2011



CLUBROOT AFFECTED AREAS IN 2020*



*Cumulative clubroot infestations from 2005-2020 for Alberta, 2008-2020 for Saskatchewan and 2009-2020 for Manitoba. Source for Alberta: Strelkov et al. 2021. Can. Plant Dis. Survey. In Press. Please visit <https://www.alberta.ca/cumulative-clubroot-infestations-in-alberta.aspx> for updates.

HOW TO SPOT CLUBROOT.

Scout fields throughout the season and pull up roots to look for characteristic galls.



DEFENDING AGAINST CLUBROOT IN WESTERN CANADA

IT'S NEVER TOO EARLY TO START PROTECTING YOUR CROP FROM CLUBROOT.

Clubroot can cause up to 100% yield loss.*

Caused by a fungal-like microorganism, clubroot is a soil-borne disease that results in distinctive club-like/gall symptoms forming on plant roots.

Clubroot is spread via infested soil moving from field to field. Infested soil can move as soil tags on farm equipment, or by wind and water erosion.

A PROACTIVE AND INTEGRATED APPROACH TO PROTECTING CANOLA.

- 1. PRACTICE A 1-IN-3 YEAR CANOLA ROTATION.**
- 2. GROW CLUBROOT RESISTANT CANOLA HYBRIDS** if you are in an at-risk region, even if clubroot has not yet been identified in your fields.
- 3. PREVENT AND MINIMIZE MOVING SOIL** between and within fields. Work on infested areas last, practice soil conservation, and clean equipment, vehicles and boots.
- 4. CONTROL HOST WEEDS AND VOLUNTEER CANOLA EARLY** (<4 weeks). Serious gall formation and spore propagation starts happening at 5-6 weeks. Host weeds include stinkweed, wild mustard, shepherd's purse and flaxweed.
- 5. SCOUT FOR SIGNS OF CLUBROOT** and look for virulence shift early and often. If incidence increases above 10-15% of plants infected in a resistant crop, there may be a virulence shift within the field.
- 6. PRACTICE PATCH MANAGEMENT.** Consider grassing patches to further prevent soil movement.
- 7. CONTROL PH (LIMING)** strategically to help reduce clubroot infection, especially in dryer years.

IF YOU FIND CLUBROOT.

Contact your local area agronomist and inform your provincial agriculture governing body.

ALBERTA: Contact your local municipality/county by visiting aaaf.ab.ca/directory or call 310-FARM.

SASKATCHEWAN: Contact the Saskatchewan Ministry of Agriculture at 1-866-457-2377 or your local regional office.

MANITOBA: Contact Manitoba Agriculture at 204-745-5660.

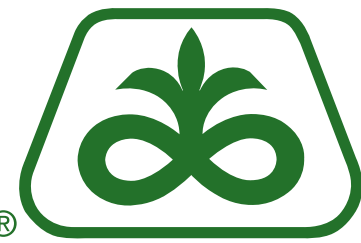
LEADING THE INDUSTRY IN CLUBROOT RESISTANCE.

Corteva Agriscience developed and commercialized the first clubroot resistant (CR) hybrid in 2009 through Pioneer. Today, we offer a portfolio of CR hybrids with different sources of clubroot resistance and continue advancing new sources of clubroot resistance in our hybrids to help manage the growing threat. Our goal is for all canola product advancements from Corteva to be clubroot resistant so that you may apply a rotational strategy of hybrids with different sources of clubroot resistance for proactive management.

*In extreme cases
Source: Canola Council of Canada

MAXIMIZE YOUR YIELD. PROTECT YOUR CANOLA AND YOUR PROFITS.

Pioneer offers a complete portfolio of clubroot resistant hybrids.



PIONEER®

Pioneer Protector® brand canola hybrids give you the yield, performance, profitability and protection against disease and harvest challenges that you have come to trust.

ASK YOUR PIONEER SALES REPRESENTATIVE ABOUT PIONEER PROTECTOR® CLUBROOT CANOLA.