

## CLUBROOT

*Plasmodiophora brassicae*



### Overview:

Clubroot is caused by the soil-borne disease *Plasmodiophora brassicae*. Infection by this pathogen causes large galls to form on roots, which interferes with water and nutrient uptake. This pathogen affects plants in the Brassicaceae family which includes vegetable crops like cabbages, cauliflowers, radish, and canola, and can reduce yields significantly.

In the late 1800s a large portion of the cabbage crop failed in Russia due to infection by *P. brassicae*. The Russian scientist Woronin identified the pathogen and named it. In the U.S., first reports of clubroot occurred in the 1850s and up until 2003 it was only sporadically reported on the Canadian prairies. At this time it was first identified on canola in Alberta.

Clubroot galls release spores into the soil which may remain viable for up to 20 years. Germination of the spores produces a life stage of the disease which infect root hairs of the host plant. The following life stage infects the root cortex resulting in the galls, which produce spores and the life cycle begins again.

Since infection by *P. brassicae* reduces the host plant's ability to obtain resources, symptoms of infection are stunting, yellowing and wilting. Examination of the plant's roots for galls is the only way to confirm infection. Some other factors can cause root swelling, so if clubroot is suspected it should be confirmed by qualified individuals.

### Identification:

Large, club-shaped galls form on the roots of host plants, which initially are "firm and have a whitish-coloured appearance, but become soft, spongy and take on a brownish colour as they mature and decompose later in the season." The extent of galling varies and depends on; amount of *P. brassicae* inoculum in the soil, environmental conditions at the time, and the presence of any resistance in the host plant.

### Prevention:

Knowing how clubroot is spread and managing the pathways is key to prevention. Spores can be spread from infected soil by ANY machinery, particularly by cultivators and/ or movement of infected soil. Strict sanitation procedures can effectively manage the risk of

spread by machinery. Baled forage, silage, bedding, and manure from infested fields can transfer resting spores. The potential for spores to be transported by erosion is being researched.

### **Control:**

**Sanitation:** Once a field is infested with clubroot, a strict sanitation program is required to prevent spread. This protocol will apply to ANY vehicle, machinery and even foot traffic that enter and leave the field. A mud-free washing area at the field's edge will prevent spread.

**Cultural:** Crop rotation and the proper use of P. brassicae resistant varieties can prevent establishment and lower the disease threshold of an already infested field. There are a multitude of government, municipal, and crop councils/associations which can provide assistance with beneficial management practices regarding clubroot. The local Agricultural Fieldsman is a good place to start.

**Chemical:** A soil fumigant and a soil fungicide are registered for use on clubroot. Application of fumigants requires the appropriate applicator certification. Always check product labels to ensure the product is registered for use on the target plant in Canada by the Pest Management Regulatory Agency. Consult your local Agricultural Fieldman or Certified Pesticide Dispenser for more information.

**Biological:** Soil micro-organisms are being researched as possible controls for clubroot.

