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## ***Broccoli, Cole crops: Clubroot***

*Use Integrated Pest Management (IPM) for successful plant problem management.*

### ***Biology***

Clubroot is a disease that affects plants in the mustard family. It is caused by a soil-borne fungus-like organism. Affected plants develop abnormally large roots which may become swollen and club-shaped. Affected seedlings often die, while plants that are infected later usually develop severely distorted roots. The swellings may be on taproots, fine roots, or even on underground stems. Broccoli, cabbage, and cauliflower typically form spindle-shaped clubs on their fibrous roots. Fleshy-rooted host plants such as radish, rutabaga, and turnip develop more spherical clubs on the tap root or secondary roots. Unstressed plants with minor infections may show no aboveground symptoms. However, severe infections limit the ability of plants to take up water and nutrients, and may result in stunted growth, yellowing leaves, and daytime wilting during hot weather. Premature bolting (flowering and setting seed) may also occur. Clubroot is more severe on plants in cool, wet, acidic soils. The pathogen produces motile spores that can swim in wet soils. These spores can be moved by irrigation water, contaminated soils, infected plants and plant material, and by soil-contaminated tools and footwear. The pathogen is reported to survive up to 18 years in contaminated soil. In addition to the mustard family, plants in the rose, poppy, and grass families may be affected.

### ***Management Options***

#### **Non-Chemical Management**

- ~ Rotate crops. Do not plant susceptible crops repeatedly in the same location. At least 6 years are recommended between plantings.
- ~ Test soil pH and adjust appropriately. The clubroot pathogen prefers acidic soils, so maintaining a soil pH of 6.8 or higher can help prevent disease. Adequate nutrition, especially calcium and magnesium, is also important.
- ~ Good drainage is essential. Do not plant cole crops in poorly drained soils.
- ~ Purchase only disease-free transplants and plant in clean soil.
- ~ Control weeds (especially those in the mustard family), as they can serve as alternate hosts for the disease.
- ~ Do not compost diseased plant material.
- ~ Mildly affected plants can be hilled to encourage development of adventitious roots and increase yield.

***Select non-chemical management options as your first choice!***

#### **Chemical Management**

***IMPORTANT: Visit Home and Garden Fact Sheets for more information on using pesticides***

There are no fungicides labeled for home use for control of clubroot.

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*Images*



*~ Caption: clubroot symptoms on cabbage  
~ Photo by: L.J. du Toit*