



WHITE RUST OF HORSERADISH

White rust, caused by the oomycete *Albugo candida*, is a very damaging disease of horseradish in most of horseradish growing areas in the world. White rust is not a common disease of horseradish in Illinois, but it widely occurs in northern regions of the United States, Canada, and Europe. Severe white rust on leaves prevents normal root growth and can result in significant yield reduction. Plants are infected at all growth stages (Figure 1). *A. candida* also infected other brassica crops, but biotype of the pathogen may differ among the hosts.

Symptoms

Symptoms first appear as small yellow (chlorotic) areas on both leaf surfaces (Figure 2). The white pustules then appear within the chlorotic areas on the lower leaf surface (Figures 2 and 3). These pustules are grayish- to creamy-white and vary in shape from oval to irregular. The expanding pustule eventually ruptures the epidermis of the leaf, exposing the powdery white spores (sporangia) beneath. The pathogen may also infect the crown of the plant, and can occasionally infect the root.

Disease Cycle

Albugo candida is an obligate parasite, which means that it survives in



Figure 1. A horseradish plant with white rust on leaves.



Figure 2. Horseradish leaves with white rust symptoms: left, chlorotic areas on upper leaf surface; and right, pustules on lower leaf surface.

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infected plant tissues. The pathogen also survives as oospores (thick-walled sexual spores) (Figure 5). Oospores can survive for several years under dry conditions. Under moist conditions, oospores germinate to form numerous motile (zoospores). Zoospores swim in water and infect plants at the point of contact. *A. candida* also spreads from infected plants growing in horseradish cull piles (Figure 4) left in the field. In addition, *A. candida* maybe introduce to the field on infected sets. Infected leaves produce pustules and sporangia are produced in the pustules (Figure 5). Sporangia can be dispersed by wind , rain, or insects to neighboring plants. White rust develops in cool, moist conditions. Temperatures in the 60 to 70°F range are most favorable for infection and development of the disease.

Disease Management

White rust of horseradish can be managed by using disease-free planting stocks, two- to three-year crop rotation away from horseradish, destroying horseradish cull piles in or near commercial fields, and application of effective fungicides. Sets for the following year's planting should be taken only from the terminal end of the healthy root. Sets located near the crown should be avoided. Also, discolored, cracked or swollen sets should be destroyed. Application of fungicides should begin at the first sign of the disease. The field should be scouted regularly, especially during moist conditions, and plants sprayed with effective fungicides. Quadris 2.08SC (azoxystrobin) and Cabrio 20EC (pyraclostrobin) have been registered for control of white rust of horseradish. For updates on fungicide control of white rust on horseradish, contact area extension specialist.



Figure 3. White rust pustules on the lower surfaces of leaves of horseradish.



Figure 4. A horseradish cull pile in a commercial horseradish field.

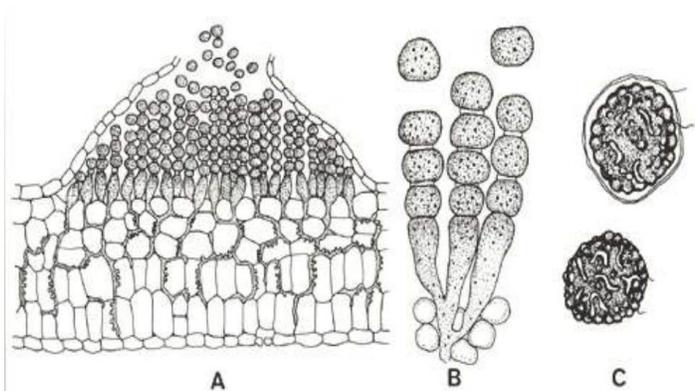


Figure 5. Reproduction bodies of *Albugo candida*, causal of white rust: (A), a pustule with sporangia; (B), chains of sporangia; and (C) oospores.