

at a glance

- White rot affects onions, garlic, shallots, and other *Allium* species.
- White rot is highly contagious and destructive, making soil unusable for *Allium* production for up to 20 years.
- White rot is spread by tiny black sclerotia, about the size of a poppy seed, which have a pathogen structure similar to a seed and form on decayed plant tissue.
- Cool, moist conditions between 50°F and 75°F are most conducive for the spread of the disease.
- No effective remedies for the home garden exist.
- No resistant varieties of either garlic or onions are available.

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Beware Signs of White Rot in Garlic and Other *Allium* Crops

Introduction

White rot is a very serious disease of garlic and onion (*Allium* species) due to its highly aggressive nature: it can survive for a lengthy period of time in the soil between crops and spreads easily. The disease is caused by the fungus *Stromatinia cepivora* (Berk). Its dormant stage is a sclerotium (plural: sclerotia) that allows the disease to survive between plantings of susceptible crops and over the winter. Just one individual sclerotium for every two pounds of soil is enough to initiate acute infection. Its transmission can happen more easily than you might realize: cool, wet conditions favor the disease, so garden tools and shoes that have come into contact with infested soil very effectively spread the pathogen. Once infected, plants may yellow, wither, and die, or their bulbs may rot later in storage.

White rot affects all *Allium* species including onions, shallots, and garlic, although onions and garlic are the most susceptible. The long-term consequences of the small, black sclerotia are severe, rendering the affected ground unusable for garlic or onion production for up to two decades (Coley-Smith et al. 1990). Currently, no effective chemical or cultural controls exist. Experimental methods that stimulate then starve the disease organisms have proven unsatisfactory, only reducing but not eliminating the disease organism.

Because white rot most commonly spreads through infected plant material, start your defense by purchasing planting stock from Idaho State Department of Agriculture (ISDA)–inspected producers.¹

According to Idaho law, gardeners living in the twenty-county quarantine area in Idaho² are only allowed to buy bulbs, sets, and transplants that have been grown and inspected for planting purposes from inside the same area. True onion seed shouldn't be contaminated. Another strategy includes being more mindful of the movement of soil and water that may be contaminated with this organism.

1. A list of current approved producers is available from ISDA Plant Industries by calling (208) 332-8651.

2. Counties within the white rot control areas include Ada, Bingham, Blaine, Boise, Bonneville, Canyon, Cassia, Elmore, Gem, Gooding, Jefferson, Jerome, Lincoln, Madison, Minidoka, Owyhee, Payette, Power, Twin Falls, and Washington in Idaho, and Malheur County in Oregon.



Figure 1. Yellowing (chlorotic) aboveground symptoms of garlic plants infected with white rot (*Stromatinia cepivora*). Courtesy of University of Maine Cooperative Extension.

Identification

Initially, infected plants show yellowing and wilting of the leaves, starting with the older leaves (Figure 1). The plants may also appear stunted. As the roots rot, the diseased plants continue to weaken and become easy to pull out of the ground. You may see white fluffy growth, the fungal mycelium, near the base of the plant.

It's easy to confuse the initial symptoms of white rot with *Fusarium* basal rot, another soil-borne garlic disease, but any presence of tiny black sclerotia indicates white rot. University of Idaho Extension offices can usually confirm the presence of the fungal structures with the aid of a microscope.

In the early stages of white rot, sclerotia start to form on decayed tissue (Figure 2). Sclerotia are very small, about the size of a poppy seed. An infected bulb can produce hundreds of sclerotia—meaning that over just a few seasons the soil can become severely infested with this pathogen. Severity of the disease depends on the number of sclerotia in the soil.

Optimum soil temperatures for white rot infection are between 60°F and 65°F, but infection can occur anywhere from 50°F to 75°F. The same soil moisture conditions that favor crop growth are also favorable for infection and spread. If the disease is detected, stopping irrigation will help to reduce its spread. Symptoms usually appear midseason when the weather is cool and wet, typically mid-to-late June.

Management

Managing white rot consists of avoidance and sanitation, since there are no cost-effective strategies for the home gardener. Make sure your onion, shallot,



Figure 2. Sclerotia (black, round, poppy seed-sized dormant structures) and white mycelium produced by the white rot fungus on an infected garlic bulb. Courtesy of University of Maine Cooperative Extension.

or garlic sets are disease-free prior to planting. If you notice yellow, stunted, and wilting plants throughout the growing season like those displayed in Figure 1, inspect the afflicted plants for white rot as well as other potential diseases, including pink rot and soft rot bacterial infection, or pest infestations like onion maggot. Upon confirming the presence of white rot, pull all affected plants and any neighboring ones, which most likely are also infected. When disposing of diseased plants, carefully contain all soil and plant material so that you don't inadvertently spread sclerotia. For example, bag the diseased plants in black plastic bags and take them to a landfill. At midseason, reinspect your plants for any evidence of white rot's return or the development of small, black sclerotia.

If you again discover white rot in your garden, step up your strategy. Avoid planting any *Allium* plants, including garlic, onion, and shallots. Sanitize any garden tools you've used—wash them thoroughly with soap and water, removing any clumps of dirt, and then soak them in a 10% bleach (2% sodium hypochlorite) solution for at least two minutes. If possible, avoid planting any root crops. Any future *Allium* species plantings will need to be located in another area of your garden that is beyond the reach of water or soil movement from the infected area.

White rot is common in many places around the world, including the United Kingdom, where producers routinely test the soil for the presence of white rot before conducting a commercial planting of any *Allium* crop. We encourage Idaho growers to utilize the same kind of assistance at the University of Idaho diagnostic lab at Parma, which offers a soil testing service for white rot.

Prescreening is a useful stopgap tactic for growers, especially since researchers have yet to develop any white rot-resistant varieties of garlic or onion. While they've tried a number of biological control approaches, the results have been inconsistent. Thus, the most effective control is to avoid planting in disease-infested soil by either carefully inspecting or soil testing for the pathogen.

Additional Reading

Coley-Smith, J.R., C.M. Mitchell, and C.E. Sansford.

1990. "Long-Term Survival of Sclerotia of *Sclerotium cepivorum* and *Stromatinia gladioli*." *Plant Pathology* 39 (1): 58–69.

<https://bsppjournals.onlinelibrary.wiley.com/doi/pdf/10.1111/j.1365-3059.1990.tb02476.x>, accessed 10 October 2019.

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