Rhizoctonia Diseases in Aboveground Plant Parts of Agronomic and Vegetable Crops

Tom Kucharek, Professor and Extension Plant Pathologist in the Plant Pathology Department, University of Florida, Gainesville, FL 32611. May 1990; Copied February 2000.

Florida Cooperative Extension Service / Institute of Food and Agricultural Sciences / University of Florida / Christine Waddill, Dean

Introduction

Rhizoctonia solani is a soilborne fungus that is common in Florida. It is capable of existing and growing in the soil in the absence or presence of plants. The host range of *R. solani* is extensive. Most crops are susceptible to the fungus as a seedling blight, root rot, fruit rot or aboveground aerial blight. *R. solani* commonly causes seedling blights and root rots in plants and is therefore often regarded as a below ground pathogen only. That perception is incorrect. This fungus consists of different "groups" within the species which provide for a diversity of pathogenic potential. In warm and humid climates, such as in Florida, *R. solani* causes many plant diseases in aboveground plant parts in addition to those caused in belowground plant parts. This publication presents information about diagnosis and control of plant diseases caused by Rhizoctonia in plant parts above the soil surface. Plant Pathology Fact Sheet 1 discusses this same fungus in relation to seedling blights.

The primary habitat of Rhizoctonia is the soil. When conditions are suitable, hyphae of Rhizoctonia may penetrate plant tissues below the soil surface. The fungus grows as small threads (hyphae) in soil. It is abundant in and on dead and living plant litter, which is on or near the soil surface. Also, sclerotia (small pin cushion-like masses of hyphae) may be formed by the fungus and allow for long-term survival in soil or water (Fig. 6). As decomposition of plant litter occurs, beneficial fungi and bacteria colonize such litter, and Rhizoctonia is reduced.

In some situations, the fungus may cause diseases in plant parts above the ground. Rhizoctonia is often characterized as a non-spore-forming fungus, but under certain conditions with some isolates of the fungus, basidiospores are ejected above the soil surface or hyphae grow upward on the plant. When either of these situations occur during warm temperatures with high humidities, infection structures are formed, foliar plant tissues are penetrated, and disease occurs.

Symptoms

Rhizoctonia causes different types of symptoms in plant parts above the soil surface. These symptoms may be classified into four categories: leaf spots, blights, lower stem rots, and fruit rots. These diseases are commonly misidentified in the field because of the misconception that Rhizoctonia is limited to the infection of plant parts in the soil. Also, Rhizoctonia-induced diseases on aboveground plant parts sometimes appear similar to other diseases.

Leaf spots may be 2 inches or more in diameter or less than 1/4 inch in diameter. All spots begin from a single point of infection and therefore the earliest sign of a leaf spot may be no more than a pinpoint-sized dark spot (Fig. 1). After infection, the fungus grows on and in the leaf and causes small spots (Fig. 1) or larger spots that have concentric rings with alternate light or dark areas (Figs. 2, 3, and 4). Coloration of spots varies from a light brown to dark brown (Figs. 1, 2, 3, and 4). In some situations, the center of a spot will dry, become brittle, and separate from the leaf causing shot holes (Fig. 1) or large torn areas (Fig. 3). The target-shaped spots in tobacco leaves (Figs. 2 and 3) are similar in appearence to spots caused by *Alternaria tenuis* (brown spot). Microscopic diagnoses are recommended for such situations to determine which organism is causing the disease.

Blights caused by Rhizoctonia are classified differently from spots because they tend to be larger in size and are not necessarily round. Blights caused by Rhizoctonia are commonly called aerial blights. Diseased tissue is irregular in shape. Blighted leaves have light brown spots that are lobed (Figs. 5, 7, and 8). Tissue that has been recently infected may be greasy in appearance due to the breakdown of cells in the tissue (Figs. 4, 5, and 6). Some of the peanut leaflets in Fig. 4 have leaf spots and blights. Early in the morning or shortly after a wetting event, hyphae (strands) of the fungus can be seen on or between tissue (Fig. 6). These strands are sometimes confused with the webbing produced by spider mites. Sometimes aerial blights caused by Rhizoctonia are referred to as web blights.

Rots of plant parts just above the soil surface may be an extension of disease just below the soil surface (Figs. 9, 10 and 11). Rotted areas begin as small reddish-brown orange discolorations on the tissue and later the fungus causes sunken or cratered rots (Figs. 9 and 10). When such infections occur, plants may have discolored leaves and upper plant parts due to the reduction of upward translocation of nutrients and water from the soil. Later plants may fall over (lodging) or die. With crops such as celery (Fig. 9) and onions (Fig. 10), the edible portion of the plant becomes unusable. With salad crops such as lettuce, endive, and spinach, which naturally have leaves that touch the soil, a rot occurs on the stem and lower leaves (often called bottom rot). Such rots may not be noticed until the plants wilt, die, or are harvested. Also, secondary soft rot bacteria often follow such infections; this results in mushy tissue.

Brace roots of field corn which support the plants may be rotted which results in lodging and lower yields (Fig. 11). A disease called limb rot occurs in peanut vines that are in contact with the soil. Lesions of limb rot may be two inches or more in length, light brown in color, and may contain concentric rings. Pegs of peanuts may also have lesions caused by Rhizoctonia. These lesions vary in color, and may be infected with other fungi also. Laboratory tests are essential for such diagnoses. Rots of plant parts at or just above the soil surface sometimes originate during the seedling stage or on transplants.

Fruit rots caused by Rhizoctonia occur either because the fruit is in direct contact with the soil or is part of an aerial blight infection. Symptoms in fruits are variable when infected with Rhizoctonia, but they usually occur on the side of the fruit that contacts the soil. In cucumbers, lesions begin as slightly raised blister-like (edema) spots that are dry or greasy. Later, these spots enlarge, become reddish-brown-orange and sunken (Fig. 12). This disease is called belly rot and has caused culling or more than 50% of the fruit. A similar disease occurs in winter squash (Fig. 13) and pumpkin (Fig. 14) fruit where the fruit is in contact with the soil. With winter squash, the infected area often has raised bumps (edema) or netting (Figs. 13 and 14). When fleshy fruits, such as tomatoes or beans, are in contact with the soil, Rhizoctonia causes

a disease called soil rot (Figs. 15 and 16). Where Rhizoctonia causes an aerial blight, the fruit becomes greasy (Fig. 8) and seed is reduced in size, rotted, or not produced.

Sometimes the fungus, *Pythium* sp. causes fruit rots that initially appear similar to rots caused by Rhizoctonia. As the disease progresses, however, Pythium-induced diseases often form large masses of pure white hyphae (mycelia) (Fig. 17). Cucumber fruit may be infected with both fungi.

Control

Control of Rhizoctonia-induced diseases in aboveground plant parts begins prior to the planting of the crop. Avoid planting in low and wet, or poorly drained land. The soil should be plowed with a mold board plow to bury old plant debris which reduces the amount of Rhizoctonia near the soil surface where it survives best. Soil preparation should be completed 30 days prior to planting so that the beneficial soil microflora have ample time to rot old debris and become established as natural biological controls against Rhizoctonia. Never plant a crop into freshly tilled soil where green plant matter has not decomposed. Diseases caused by Rhizoctonia are commonly more severe in a crop which follows legume crops such as beans, southern peas, or soybeans. Therefore crop rotation that excludes legumes should be beneficial.

Other cultural controls include the avoidance of deep seeding, deep transplanting, dense planting schemes, excessive overhead irrigation, and excessive fertilization (especially nitrogen) that promotes rank foliar growth. Remember, aerial blights caused by Rhizoctonia are more likely to be a problem where excessive humidities exist during warm weather. Crops should be planted when soil temperatures are ideal for rapid seed germination or plant growth. This reduces the amount of inoculum in young plants that can serve as a source of disease later in the season. Purchase healthy transplants or propagation stock from a reputable transplant producer.

Fruit rots of vegetables caused by Rhizoctonia and certain other fungi that originate in the soil can be reduced significantly by trellising the crop or by using a full-bed mulch (e.g., plastic) on which the fruit can form. Any method that reduces direct contact of soil with fruit would serve the same purpose.

Chemical controls include seed treatment with an effective fungicide, soil fumigation with a broad spectrum liquid or gaseous fumigant, and sometimes a fungicide spray. Seed treatments reduce the amount of early season inoculum. Likewise, soil fumigation reduces the initial fungal population. Where soil fumigation is used, it is important to avoid recontamination of fumigated soil by not moving soil from unfurnigated areas into the fumigated area. Contamination of fumigated soil is commonly done with tillage equipment, soil on footware, and flowing water from excessive rain or irrigation, Aerial blights and sometimes fruit rots caused by Rhizoctonia can be reduced by fungicide sprays. Contact your County Extension Office for current information.

Figure 1. Tobacco leaf with shotholes.

Figure 2. Tobacco leaves with round brown spots.

Figure 3. Tobacco leaves with large spots and blight-type lesions.

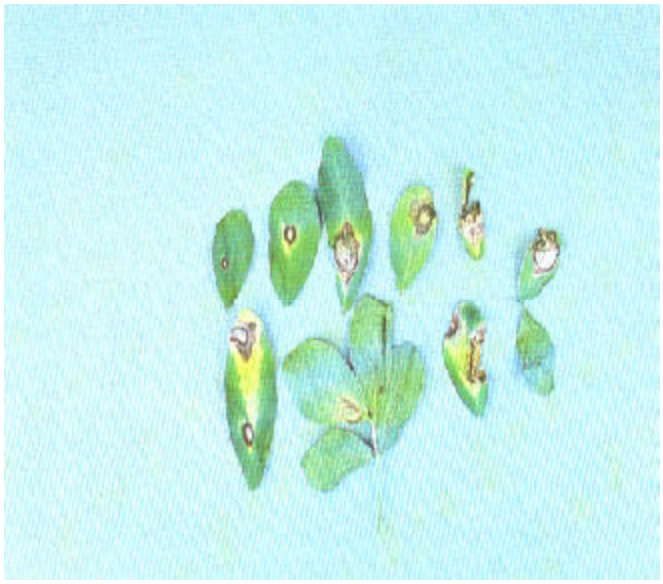

Figure 4. Peanut leaflet with spots and blight.

Figure 5. Peanut leaves with aerial blight.

Figure 6. Aerial blight in peanuts.

Figure 7. Southern pea leaflets with aerial blight.

Figure 8. Aerial blight in soybeans.

Figure 9. Stalk rot in celery.

Figure 10. Bulb and leaf rot in onions.

Figure 11. Brace root rot in field corn.

Figure 12. Belly rot in cucumber.

Figure 13. Belly rot in spaghetti squash.

Figure 14. Belly rot in pumpkin.

Figure 15. Soil rot in tomato.

Figure 16. Soil rot in beans.

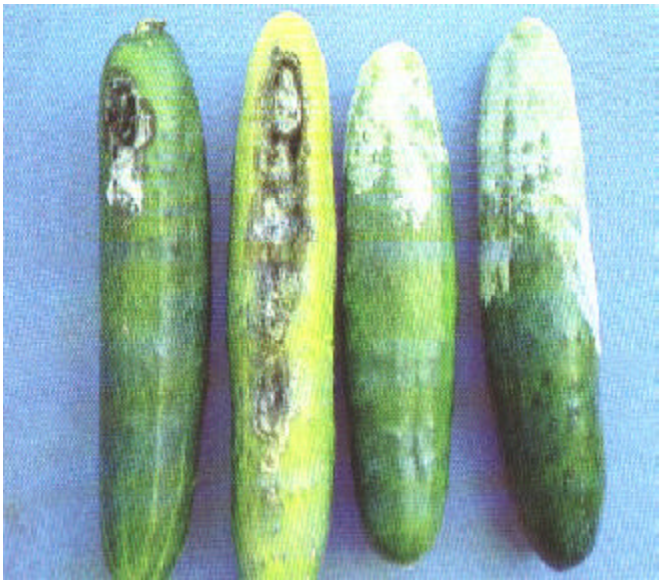

Figure 17. Cottony leak in cucumber caused by *Pythium* spp.