

2006 Florida Plant Disease Management Guide: Spinach¹

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Specific Common Diseases

Damping-off (*Rhizoctonia solani* and *Pythium* spp.)

Symptoms: Damping-off disease affects young plants during or after emergence. The causal fungus invades the seed, emerging root, or stem and will rapidly rot the plant. Emerged plants are often invaded at the soil line where a maroon to reddish-brown lesion (*Rhizoctonia*) will develop that girdles the stem and causes a seedling to wilt to death. *Pythium* causes a soft lower stem decay that may be greasy-black in color.

Cultural Controls: Insure that all previous crop and weed debris has completely decomposed prior to planting.

Chemical Controls: See PPP-6.

Downy Mildew (*Peronospora farinosa* f. sp. *spinaciae*)

Symptoms: Lesions begin as indefinite yellow blotches on the upper leaf surface. As infection proceeds, the lower surface of these spots becomes covered with a purplish mat of fungal sporulation.

Infection and disease development can be rapid resulting in blackened leaves and/or dead plants, especially during wet weather periods. Under less favorable weather, infected plants exhibit stunting and creamy yellow leaves.

The pathogen is an obligate parasite that over seasons in spinach, spinach seed, and through sexual spores in the soil. At least three races of this pathogen are known to exist. Preferred weather for fungal reproduction is between 45-59° F. Infection requires a wet leaf surface.

Cultural Controls: Exercise crop rotation to avoid overlapping winter and spring spinach crops. Hot water treatment of seed at 122° F for 25 minutes will eradicate the seedborne presence of this fungus. Host plant resistance is available, but the development of new races may limit effectiveness.

Chemical Controls: See PPP-6.

Mosaic (*Cucumber mosaic virus*)

Symptoms: Spinach infected with *Cucumber mosaic virus* (CMV) will exhibit mottling on new leaves. This mottling will develop into full leaf chlorosis that is accompanied by leaf curling and

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distortion. Leaf and plant death can occur. Stunting can be quite apparent if plants are infected at an early age.

This virus infects plants in at least 34 plant families that include such economically important crops as cucumber, squash, pepper, turnip, muskmelon, watermelon, eggplant, tobacco and carrot. Many weeds also host this virus, especially dayflower, *Commelina* spp. Aphids carry and spread CMV.

Cultural Controls: Plant varieties with tolerance or resistance to CMV. Pursue perennial weed control to prevent reservoirs of this virus near fields.

Stemphylium Leaf Spot (*Stemphylium botryosum*)

Symptoms: *Stemphylium* leaf spot was first reported in California in 1997, and appears to have become endemic. Foliar symptoms were first observed in Florida during the 2000-2001 growing season, although the fungus had been previously reported as a seed mold. Left uncontrolled, the disease may result in significant losses, particularly in spinach that is densely planted for the newly popular “spring salad mixtures”

The disease starts out as small circular, gray-green leaf spots, approximately 2-5 mm in diameter. Visual symptoms appear about one week following exposure to the pathogen. As the disorder progresses, lesions expand, and coalesce, covering larger portions of tissue. Seven to ten days after their initial appearance, diseased foliar tissues turn light tan to brown, and become papery in texture. Asexual spores (conidia) are dark brown, oblong with rounded ends, and have both longitudinal and transverse cross walls. Borne singly on typically unbranched conidiophores with a swollen tip, conidia may be viewed microscopically on the surface of older lesions. However, sporulation is not readily apparent to the naked eye, as with spinach downy mildew and white rust.

Although infection may take place over a relatively wide-range of temperatures, the disease is favored by moderate to warm temperatures (18 to 24° C) and prolonged periods of leaf wetness.

Spores are disseminated by wind, rain splash, irrigation, and farm implements or workers. Primary inoculum is thought to originate from infested seed or crop debris in or near the field.

Cultural Controls: There does not appear to be a wide range in cultivar resistance to *Stemphylium botryosum* at the present time. California research showed only slightly less favorable lesion development on the savoy spinach cultivar “Vienna” than on other types or varieties tested. Favored by free moisture, cultural practices that promote unnecessary periods of leaf wetness, i.e. overhead irrigation, should be avoided as much as possible.

Chemical Control: Fungicides may be useful in slowing or lessening the impact of the disease. Of the currently registered fungicides, strobilurin compounds appear to offer the most efficacious control. To avoid possible phytotoxicity, care should be exercised to read the specific label regarding their use or mixture with other pesticides or adjuvants, particularly during warmer weather. See PPP-6.

White Rust (*Albugo occidentalis*)

Symptoms: Infected plants exhibit white, blister-like pustules on the leaves, mostly on the lower surface and petioles. Pustules are about 1/8 inch in diameter and can be solitary or grouped. Leaves with numerous infections will discolor and brown. The fungus can survive in crop debris as sexual spores for about a year. The fungus is also hosted by the weed relative, *Chenopodium capitatum*, which is not known to occur in Florida at this time. Other close weed relatives of spinach can exhibit a similar white rust disease but the pathogen in these situations does not infect spinach.

Cultural Controls: Crop rotation is advised where the disease becomes established. All weed species of *Chenopodium* should be eradicated since their role in harboring the spinach white rust fungus is unknown. The varieties Wintergarden, Jewel, and Crystal have resistance to this disease.

Chemical Controls: See PPP-6.