

VERTICILLIUM WILT OF POTATOES IN ARID
REGIONS OF THE PACIFIC NORTHWEST

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"Early maturity" or "early dying" are terms commonly used to describe verticillium wilt of potatoes as it occurs in arid regions of the Pacific Northwest. This disease is caused by the soil-borne fungus Verticillium dahliae Kleb*. This fungus can infect a wide variety of plants and inhabits, to some extent, most agricultural soils in the major potato-producing areas. Arid soils of the Pacific Northwest are favorable for survival of this pathogen and air and water dispersal, along with a wide host range and long survival potential of the microsclerotia (resting body of the fungus) probably make V. dahliae indigenous to most soils.

Verticillium is a comparatively weak pathogen and disease severity is directly proportional to the amount of fungus in the soil and the number of root infections which occur. A few root infections will not produce any recognizable symptoms or cause of early dying of potato vines.

Verticillium infects a plant by penetration of the root** cortex followed by the invasion of the water conducting tissues (xylem). Disease symptoms do not begin to appear until some time after flowering and tuber set. The first symptom is a yellowing of the older leaves which is usually unilateral in development. A progressive yellowing and dying of leaves upward on the stem occurs and the plant dies prematurely*** High summer temperatures and moisture stress increases the rate of disease development and severity.

* Microsclerotia producing type. There is taxonomic controversy on whether the microsclerotia producing types (MS) should be called V. dahliae or V. albo-atrum. Many workers believe that only those types producing darkened mycellium (DM) and no microsclerotia should be called V. albo-atrum. The DM form is rarely isolated from potatoes in the Pacific Northwest but is the predominate form of Verticillium causing disease in N. E. United States, Canada, and Europe. The etiology and epiphytology of the disease produced by the MS and DM forms differs considerably and has led to many misconceptions about this disease.

** Roots of potato plants are resistant to infection until 4-6 weeks after plant emergence.

*** How Verticillium causes premature death of the potato plant has not been clearly established. Both mechanical blockage of the water conducting tissues and production of "toxins" by the fungus appear to be important.

Other symptoms associated with verticillium wilt are (1) vascular browning in stems, (2) stem-end browning of tubers, (3) wilting of leaves, and (4) many diseased stems remain erect. None of these symptoms are highly diagnostic and may be caused by other potato disorders.

In late stages of disease, the fungus leaves the xylem and invades the surrounding tissues and many microsclerotia are formed within the dead tissues under a moist cool environment or when the vines are buried in the ground. This is the primary way the fungus increases in the soil.

V. dahliae can persist in the soil for many years (records over 16 years) in the absence of a known susceptible crop. Recent studies have shown that V. dahliae can colonize the roots of many non-host plants (i. e. wheat and barley) and has limited saprophytic ability to colonize crop debris in the soil. This may aid in the long-term maintenance of the fungus infestation.

While disease severity is proportional to the amount of fungus in any given soil, certain soils exhibit a so-called "disease-suppressing" effect. Equal amounts of Verticillium added to different soils may result in different disease severities. This may account for part of the variation in the severity of verticillium wilt at different locations which have had similar management.

OTHER CONSIDERATIONS

Seed Transmission:

Seed-borne inoculum does not play a significant role in the epidemiology of verticillium wilt caused by the MS types of Verticillium.

Cultural Practices:

No modifications of "good" potato culture are known which will reduce verticillium wilt severity. Fertilization and irrigation practices which produce the best yields on non-infested land will also produce the best yields on Verticillium infested land. Crop rotation is beneficial to potato production; however, verticillium wilt persists in being a problem. Certain cropping sequences may influence the rate of build-up and severity of verticillium wilt but this has not been adequately investigated.

Resistant Varieties:

There is good resistance within known varieties and selections and potato breeders are using this to develop commercially acceptable varieties which are resistant to verticillium wilt.

Chemical Treatment:

Soil fumigation will give economic yield increases on land where verticillium wilt is the limiting factor in production. Recent work in Washington indicates that certain systemic soil insecticides may delay "early dying" of potato vines and increase yields.