



Pythium Damping-off & Root Rot in Tobacco Float Systems

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IMPORTANCE

Pythium diseases, including damping-off and root rot (FIGURE 1), are perennial problems in tobacco float beds and can cause severe losses or delays in transplanting. Every tobacco transplant grower should take steps to manage these diseases, since control measures are most effective when used preventively. *Pythium* diseases can be minimized through a combination of sound cultural practices and timely application of fungicide.

SYMPTOMS

Pre-emergent damping-off

Pre-emergent damping-off refers to seedling death before or immediately after germination, before plants may even be observed. *Pythium* species (spp.) are one of several pathogen groups to cause pre-emergent damping off. This earliest occurrence of *Pythium* disease results in a low germination percentage, which may sometimes be mistaken for a bad seed lot.



FIGURE 1. PLANTS AFFECTED CHRONICALLY BY PYTHIUM ROOT ROT ARE STUNTED AND YELLOWED; MANY TIMES THESE PLANTS ARE ISOLATED TO WELL-DEFINED AREAS IN FLOAT BEDS.



FIGURE 2. WHEN INFECTED BY *PYTHIUM* SPP., TOBACCO ROOTS THAT EXTEND INTO FLOAT WATER ARE GENERALLY NECROTIC AND LIMP, OFTEN ADHERING TO THE BOTTOMS OF FLOAT TRAYS. **FIGURE 3.** IN ADVANCED STAGES OF *PYTHIUM* ROOT ROT, NECROSIS EXTENDS WELL INTO PLUG ROOTS. **FIGURE 4.** WHEN LEFT UNCONTROLLED, *PYTHIUM* ROOT ROT CAN CAUSE SEVERE STUNTING OR DAMPING-OFF OF TOBACCO SEEDLINGS.



Root rot

Initial symptoms of *Pythium* root rot tend to occur on the roots that extend from trays into float water (water roots). Water roots affected by *Pythium* spp. show brown necrosis, and outer root layers slough away easily when smoothed through the fingers. When a transplant tray containing *Pythium*-infected plants is turned on its side, necrotic roots adhere to the tray's bottom (FIGURE 2). Infected roots eventually fall away and some re-growth may be observed; however, new growth will become infected if fungicide is not used. As the disease progresses, yellowing and stunting of transplants commonly occurs in well-defined areas of a float bay (FIGURE 1). These foliar symptoms can be mistaken for a fertility problem, so growers should inspect roots before increasing float bed fertility.

Post-emergent damping-off

Post-emergent damping-off results in complete death of previously established seedlings. During a severe *Pythium* outbreak, root rot can progress from

plug roots (FIGURE 3) into the lower stems of plants, causing stunting and a narrowing of the stem at the soil line. Plants will fall over at this weak point, then rot on the media surface (FIGURE 4). Not only does this reduce the number of transplants that can be set, but the decaying plant material can also become infested with other plant pathogens.

CAUSE & DISEASE DEVELOPMENT

There are several species of *Pythium*, fungus-like organisms also known as oomycetes or water molds, that cause diseases in tobacco seedlings. *Pythium* spp. thrive in the float system because they require water for reproduction and movement. Initial infections likely result from germination of resting structures (oospores) of *Pythium* spp., which can

infect plants directly or differentiate into structures (zoosporangia) that produce swimming spores (zoospores). Once zoospores are released, they swim in float bed water toward tobacco roots by sensing the naturally-occurring chemicals released by transplant roots. Zoospores latch (encyst) onto tobacco roots and *Pythium* grows into the root system to establish an infection. Many cycles of zoospore production are possible after initial infections occur. Water temperatures greater than 72°F favor rapid development and spread of *Pythium* diseases in float systems.

The most common ways for *Pythium* spp. to be introduced into float systems are contaminated water, infested soil, or recycled (and contaminated) Styrofoam trays. *Pythium* spp. are common in natural soils and surface water, so any introduction of these sources can contaminate float beds. *Pythium* spp. can persist from year to year in root tissues left behind within contaminated Styrofoam float trays. Trays are a major source of inoculum when used the following season.

DISEASE MANAGEMENT

Quality tobacco transplants are one of the most important parts of a successful growing season. Through careful management, it is possible to achieve excellent control of *Pythium* diseases and good transplant quality.

Sanitation

Sanitation is an important part of *Pythium* disease management in the float system.

- Use new or properly sanitized trays to prevent carryover of *Pythium* spp. from one season to the next. Trays can be steam-sterilized by heating to between 165°F and 175°F for at least 30 minutes or by immersing trays in a solution of 1-part household bleach to 9-parts water for several minutes. Regularly replace bleach solution as trays are cleaned, since organic matter can deactivate bleach's antimicrobial properties. Alternatively, trays can be sprayed with the bleach solution and covered overnight. Any time bleach is used, trays should be rinsed with fresh water prior to filling.

FIGURE 5. TYPICAL SYMPTOMS OF INJURY CAUSED BY IMPROPER MIXED/APPLIED TRIDIAZOLE (TERRAMASTER). THIS TYPE OF INJURY IS COMMON WHEN RECOMMENDED DOSES ARE EXCEEDED, OR IF THE FUNGICIDE IS MIXED OR APPLIED IMPROPERLY.

- Whether steam or bleach is used, try to replace trays every 3 to 4 years. Trays that have reached this age become pitted and have more surface area to be cleaned; this increased surface area promotes pathogen carryover from year to year.

- Never use pond or surface water to fill float beds, since water from these sources is likely contaminated with *Pythium* spp., as well as other plant pathogens, such as *Phytophthora* or *Fusarium*.

- Make sure that shoes, tools, and equipment are cleaned with a 10% bleach solution before bringing them into a transplant facility.

Fungicides

Preventative use

Two fungicides, Terramaster 4EC and Oxidate, are labeled for use in float systems. Terramaster 4EC is very effective against *Pythium* root rot when used correctly. Detailed information on this fungicide can be found on the product label, or refer to *Kentucky-Tennessee Tobacco Production Guide* (ID-160) or *Fungicide Guide for Burley and Dark Tobacco* (PPFS-AG-T-08).

For preventive use, apply 0.7-1 fluid oz. of product per 100 gallons of float water beginning 2 to 3 weeks after seeding or when roots first enter the water. Sequential applications of 0.7 to 1 fluid oz. per 100 gallons of water can be made at least 3 weeks apart up to 5 days before transplanting; do not exceed 3.8 fluid oz. per 100 gallons of float water per season. When using Terramaster, make sure that the product is mixed thoroughly in float bays to minimize the risk of plant injury (FIGURE 5). Oxidate is also available



for use in the float bed system and may be utilized by organic tobacco producers, but efficacy data is lacking at the time of this publication.

Rescue treatments

“Rescue” applications of Terramaster (1.4 fluid ounces per 100 gallons of float water) in systems with active *Pythium* root rot will halt further development of disease and symptomatic seedlings will likely recover. However, the higher rates of Terramaster used in rescue treatments increase the risk of plant injury AND recuperating plants may still harbor *Pythium*, which can increase their susceptibility to black shank and Fusarium wilt. For these reasons, preventive use of Terramaster is recommended over curative applications. Before using Terramaster, or any pesticide, refer to the label for specific instructions and safety information.

Additional comments

Please note that Terramaster and Oxidate are the only products labeled for controlling *Pythium* root rot on tobacco seedlings grown in float beds. Other products, such as Banrot, Rovral, Iprodione 50W, Ridomil Gold SL, or generic hydrogen peroxide are not approved for this use.

ADDITIONAL RESOURCES

The following University of Kentucky publications are available at County Extension offices, as well as on the Internet.

- Fungicide Guide for Burley and Dark Tobacco (PPFS-AG-T-08)
<http://plantpathology.ca.uky.edu/files/ppfs-ag-t-08.pdf>
- Burley and Dark Tobacco Production Guide, (ID-160) 1.6 MB file
<http://www.ca.uky.edu/agc/pubs/id/id160/id160.pdf>

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