FEATURE ARTICLE

Bacterial Wilt: More Trouble for *Poa Annua*

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Bacterial diseases are uncommon in turfgrasses. Plant pathogenic bacteria are single-celled, usually rod-shaped, and they have rigid cell walls. They reproduce by binary fission and they may or may not be mobile. **Bacteria have no means of penetrating cells, so they must enter plants through natural openings such as stomates and hydathodes, or through wounds.** Once inside plants they cause injury by producing toxins, or they can plug vascular tissues. By occluding vessels, for example, they prevent the movement of water and nutrients, which causes plants to die, primarily due to lack of sufficient water. There is only one recorded bacterial disease of turfgrasses in the United States, and it is caused by *Xanthomonas campestris.*

The first recorded host for bacterial wilt in the United States was "Toronto" (also known as C-15) creeping bentgrass (*Agrostis stolonifera*). Because the cause of the disease was initially unknown it was referred to as "C-15 Decline." In creeping bentgrass the disease only has been reported to attack vegetatively propagated cultivars such as Cohansey, Nimisilia, and Toronto (Vargas, 1994). Since the original report of C-15 Decline in the early 1980s in the Midwestern United States, there have been no other formal reports of the disease in creeping bentgrass. **A closely related biotype, *X. campestris* pathovar *poannua,* causes a wilt disease in annual bluegrass (*Poa annua*). A biotype of this bacteria is being developed as a biological agent for annual bluegrass control and is sold under the trade name of XPO®.**

Currently, bacterial wilt is primarily considered a disease of annual bluegrass when grown on putting greens. Most of what we know about the nature of this disease was described by researchers at Michigan State University (Roberts et al., 1981). In "Toronto" creeping bentgrass, the bacteria are primarily limited to xylem vessels in roots, but it may be detected in crown and leaf tissue. **Once the xylem elements of a large number of roots become plugged with masses of bacterial cells, plants begin to wilt. Initial symptoms therefore appear as wilt and the leaves develop a blue-green color.** This stage is short-lived, and the leaves rapidly turn brown and shrivel. Large areas are destroyed in a nonuniform pattern within a few days. Adjacent "Toronto" in higher-cut collars or fairways displayed little or no injury. This disease is favored by periods of heavy rainfall followed by cool nights and warm and sunny days. Hence the disease is most likely to appear in the spring and autumn.

Bacterial wilt is a disease on the rise in annual bluegrass on putting greens. The increased incidence of the disease may be due in part to the trend for very low mowing heights and a higher frequency of topdressing. It primarily has been observed in the Mid-Atlantic and Northeastern regions of the United States. In annual bluegrass grown on greens, the disease generally first appears in late May or June, but may remain active throughout the summer. Individual infected annual bluegrass plants turn reddish-brown or yellow and die in spots about the size of a dime. When there is coalescence of numerous dead plants, the nonuniform browning can mimic anthracnose (*Colletotrichum graminicola*). **The disease should be confirmed by a pathologist.** In the laboratory, a diagnostician will cut leaves with a razor blade and look for oozes or streaming of bacterial cells on a microscope slide. Slow oozes from yellow or senescent tissues are common, but rapid streaming of cells from vascular bundles of mostly green leaves or roots is the best indicator of bacterial wilt. Unfortunately, it is very difficult to isolate and identify *X. campestris.*

Management

Increasing the mowing height reduces disease severity dramatically, but also slows the speed and therefore playability of putting greens. **Mowing turf when leaves are dry may slow the progression of the disease. Should the disease be restricted to one or a few greens, a "dedicated mower" should be used.** It is best to use a lightweight, walk-behind greens mower. **The dedicated mower should be disinfected with a 10% Clorox® solution or similar disinfectant after use, and the mower should not be used on disease-free greens. Topdressing should be avoided when the disease is active.** This is because sand abrades and wounds tissue, and creates openings for easy entry of the bacteria. Antibiotics suppress bacterial wilt, but they are very expensive, difficult to handle, and generally do not provide an acceptable level of control (Vargas, 1994). Products containing copper, such as copper hydroxide (Kocide®), may provide good short-term control. Kocide is labeled for algae control in turfgrass and may be tank-mixed with fungicides. Kocide is primarily used to control bacterial diseases in fruits and vegetables. There are, however, no label recommendations for using the product for bacterial wilt control in turf. Depending on formulation, the rate that is labeled for algae control in turfgrasses (0.5 to 1.0 lb/1,000 ft^2; 225 to 450 g/93 m^2) would likely severely injure greens. Anecdotal observations suggest that rates in the range of 0.5 to 2.0 oz/1,000 ft^2 (15 to 60 g/93 m^2) are relatively safe for

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Chipco Proxy...

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tardant effects usually are apparent after about 7 to 10 days. Proxy is currently only registered on several cool-season turfgrass species. They are as follows:

- Kentucky bluegrass (*Poa pratensis*)
- Perennial ryegrass (*Lolium perenne*)
- Bentgrass (fairway height) (*Agrostis* spp.)
- Tall & fine-leaf fescue (*Festuca* spp.)

Proxy maybe used on fairways, roughs, and other commercial turfgrasses. Currently, the label prohibits its use on putting greens. The use rate for Proxy will be 5 oz/1,000 ft^2 and should be applied in 0.5 to 4 gallons of water/1,000 ft^2. The use of surfactants is not recommended. Reapplications may be made at the following intervals:

- Kentucky bluegrass: 7 weeks
- Perennial ryegrass: 7 weeks
- Bentgrass: 4 weeks
- Tall & fine-leaf fescues: 4 weeks

As with any plant growth regulator, proxy should only be applied to actively growing turf under favorable growth conditions. Applications of Proxy should be avoided during periods of stress. As with any new product, Proxy should be tested under local conditions prior to wholesale application.

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greens. Some discoloration may be masked by tank-mixing Kocide with chelated iron or slow-release, liquid forms of nitrogen. Kocide should be applied in at least 5.0 gallons of water/1,000 ft^2 (19 L/93 m^2). Using lower water dilutions when applying Kocide could intensify turf injury. In situations where the disease is chronically severe, greens composed primarily of annual bluegrass may have to be renovated.

XPO® — The Biological Agent

Eco-Soil Systems® of San Diego, California, is developing ***X. campestris* pathovar *poannua* as a biological agent for annual bluegrass control on golf courses.** The biotype being developed was discovered by Dr. Joseph M. Vargas, Jr. of Michigan State University. According to tests reported by Eco-Soil Systems, the XPO biotype does not infect creeping bentgrass. Various biotypes of *X. campestris* have been tested in the United States. The reported levels of annual bluegrass control with some *X. campestris* biotypes have varied from 0 to 82% (Johnson, 1994; Zhou and Neal, 1995). Like all biological agents, the level of control will vary from year to year and possibly from region to region. This is because most biological agents require some very specific environmental conditions in order to incite disease.

Currently, the XPO bacterial must be fermented on-site using the Bioject System®. After a suitable fermentation period, the liquid is pumped into and delivered by a conventional sprayer. **It is recommended that XPO be applied four times in the spring and autumn.** The bacteria are sensitive to UV light. Therefore, the product should be applied in the evening when the turfgrass leaves are dry. **Immediately following application, the treated turf must be mowed.** The mowing creates wounds, which allows for the entry of the bacteria. According to Mr. John Lensing of Eco-Soil Systems®, the company has an aggressive research program planned for 1999. These research efforts should contribute a lot of new information regarding how best to achieve maximum annual bluegrass control with XPO. According to some initial estimates, levels of annual bluegrass control in the 5 to 10% range typically occur. However, the use of gibberellic acid to stimulate elongation of annual bluegrass leaves prior to applying XPO may boost control into the range of 50% or higher. There also is some evidence that XPO can infect rough bluegrass (*Poa trivialis*). Obviously, extensive field testing in various climatic zones will be required to provide more meaningful information on how best to use the product.

References

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