Biological control of annual bluegrass

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Traditional weed control in agriculture has been accomplished primarily through the use of chemical herbicides and cultivation. Cultivation practices are of little use for weed control in turfgrass management.

Turf managers, therefore, tend to rely heavily on chemicals for weed control. Chemical herbicides tend to exhibit rather broad spectrum characteristics. Two common examples are 2,4-D and glyphosate (Roundup, Rodeo, etc.). The advantage of such broad spectrum activity is that, for example, with 2,4-D many broadleaf weeds will be affected by one chemical.

In the case of glysophate, virtually all plants will be affected, making this a very important renovation tool. The disadvantages of broad spectrum chemicals is that non-target plants may be affected. A slight gust of wind can carry that herbicide to some landscaping trees or shrubs, putting an end to the tender loving care that was needed to properly establish these plants at the site.

Another disadvantage is that weeds from the same family or group of plants as the desirable propagated plant cannot be controlled without also harming the desirable plants.

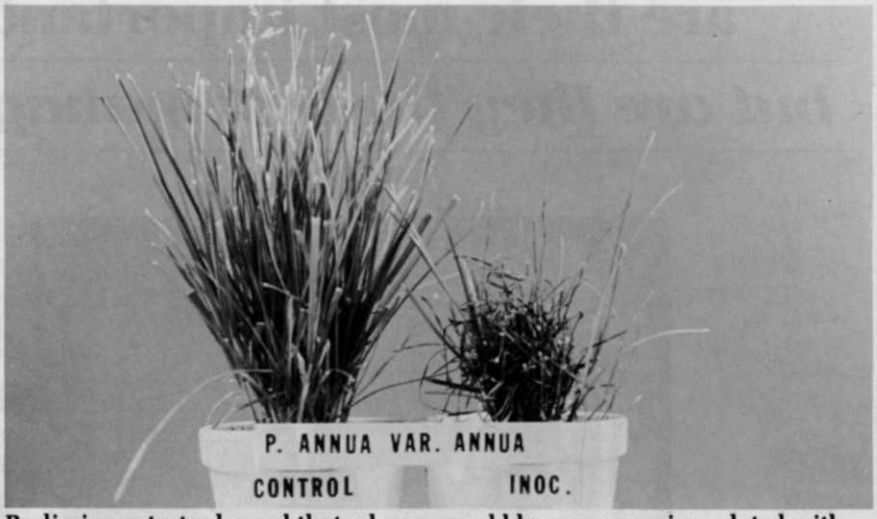
Very few chemicals exist that are species or cultivar specific. It is precisely this characteristic that makes annual bluegrass *(Poa annua)* the most important weed problem on golf courses, lawns and other turfgrass sites.

No chemicals currently exist that can selectively eliminate annual bluegass from desirable Kentucky bluegrass *(Poa pratensis)* and creeping bentgrass *(Agrostis palustris)*.

The problem is compounded by the fact that, whereas annual bluegrass seeds will normally be controlled by a pre-emergence herbicide, annual bluegrass also occurs as a perennial *(Poa annual var. reptans)*. Clearly an effective control is needed because the annual bluegrass component of many lawns and golf courses exceeds 50 percent of the grass species.

Poa attacker

A bacterium that attacks annual bluegrass was discovered in Michigan in 1984 and 1985. The bacterium was first observed selectively suppressing annual bluegrass in golf course and lawn sites. Through various physiological-biochemical, morphological and immunilogical criteria, the bacterium was characterized as a type of *Xanthomonas* species.



Preliminary tests showed that when annual bluegrass was inoculated with the bio-control bacterium, plants succumbed within two weeks. Non-inoculated control plants remained healthy and continued to grow.

Preliminary studies in the laboratory demostrated that the bacterium could effectively suppress and kill annual bluegrass (Photo 1).

Symptoms began to be expressed approximately five days after inoculation of the annual bluegrass with the bacterium. The weed was killed 1½ to 2 weeks after inoculation.

Microscopy studies showed that the bacterium is systemic within the plant. The xylem vessels, which transport fertilizer and water nutrients from the roots to the leaves, was affected by the bacterium.

Further experiments revealed that in mixed stands of grasses, the bacterium will selectively eliminate only the annual bluegrass. In all the experiments, the Kentucky bluegrasss and creeping bentgrass continued to grow unharmed (Photo 2).

In fact, concentrations have been increased 1,000 to 10,000 times without any effects upon the desirable grasses. We have also performed very successful overseeding programs.

When mixed stands of annual bluegrass, Penncross creeping bentgrass and Adelphi Kentucky bluegrass were inoculated with the bio-control bacterium, only the annual bluegrass was suppressed and eventually killed.

If developed into a marketable product, we would anticipate that the bacterium would require four or five applications the first year for a renovation program. Thereafter, we suspect one or two applications per year may be needed to keep annual bluegrass from re-establishment into maintained turfgrass areas.

This biological herbicide is unique. It is highly selective, affecting only one species of the grass family. None of the many tested cutivars (or varieties) of Kentucky bluegrass creeping bentgrass, ryegrass, fescue, rice, wheat, corn, oats, etc. have been affected by the bacterium.

Our observations of natural field situations suggest that the bacterium practically disappears to non-detectable levels several weeks after application. This is an advantage over some chemical pesticides which have been known to linger in the environment for many months.

Field testing has begun. We hope that other strains may be developed that selectively controls other weeds. If so, the biological herbicides may provide effective alternatives to chemical pesticides, particularly those that are harmful to people and the environment. **LM**

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