Development of Alternative Weed Management Strategies in Landscape and Turf

The development of alternative weed management strategies in landscape and turf settings involves the use and implementation of novel biocontrol practices which can provide efficacious control over the course of the growing season.

Use of pathogenic organisms to control weeds has not proven particularly effective, due to problems in obtaining consistent control and difficulty in formulation of biocontrol organisms. Organically derived products, such as corn gluten meal, have also not provided consistent control, especially in commercial settings such as golf courses, parks and athletic fields where improved control is desirable.

One novel approach which shows strong potential is the selection, development and use of allelopathic or weed suppressive turfgrasses or groundcovers to naturally control annual weeds in the landscape, without the use of herbicides. Fescues, especially *Festuca rubra* spp., produce secondary products known as allelochemicals with potent ability to suppress weed seed germination and growth.

A collection of fescues was established as part of the NTEP trials at Cornell's turf farm. Quality and weed suppressive ability were evaluated in fall 1999 and spring of 2000. Of the 80 cultivars evaluated, five cultivars were identified that provided significantly greater weed suppression (>85%) when compared to other cultivars. In the laboratory, the same cultivars exhibit potent ability to suppress or kill crabgrass seedlings, even 2 weeks after fescue seeding. The chemicals produced by fescue seedlings which are responsible for growth inhibition in agar and sand cultures are currently under evaluation. Once the allelochemicals are isolated and identified, we plan to evaluate gene expression and isolate genes which are responsible for biochemical production of these inhibitors. This would be a highly valuable trait to incorporate into other less competitive turfgrasses.

In addition, an extensive literature search was conducted to select for groundcovers with known allelopathic or weed suppressive potential in the landscape. Drs. A. Senesac and Weston are currently propagating 40 different ornamental groundcovers which will be evaluated over a 3 year period for use in the landscape as far as stand establishment, aesthetic appeal and weed suppressiveness. Numerous species have been identified with strong weed suppressive potential. They will be established in both Ithaca at the Bluegrass Lane research facility and Long Island at the Riverhead research facility. A weed suppressive index will be determined for the materials under evaluation, based on growth measurements obtained. Recommendations will be developed for cultivar and species selection, seeding or planting rate and mowing heights for optimal management strategies of these ground covers and turfs to encourage maximal weed suppression.

Herbicides are also currently under evaluation for control of annual weeds in turf as well as turf growth regulation. Crabgrass control was evaluated in 1999 and 2000 using a variety of products. Due to drought in 1999, crabgrass germination was less consistent but numerous products were effective. Adjuvants were evaluated for use in control of annual broadleaf and grass weeds, to determine if organosilicon based surfactants provided improved control.

Our findings showed that under last year's difficult growing conditions, surfactants provided no additional postemergent activity of standard herbicides. Newly developed chemistry is also under evaluation for difficult to control species such as zoysia grass, and broadleaf weeds including veronica spp. and ground ivy. Zoysia grass control was not effective with early season application of ethofumesate which was reported to be effective in Georgia for zoysia suppression. Quinclorac was shown to provide effective suppression of veronica and ground ivy in mixed turf stands at all rates evaluated. Other studies with newly labeled products and products under development are underway in container ornamentals and field turf research plots.

Mugwort (*Artemisia vulgaris*) is a common perennial weed problem in turf and nursery plantings which is difficult to control, either culturally or with herbicide treatment. It propa-

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