Allelopathy vs. *Acremonium* Endophytes vs. Competition Effect On Crabgrass Suppression by 12 Perennial Ryegrasses

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Goals:

- *Conduct Lemna bioassays for allelopathic effects from leaf-stem and root tissue extracts from field grown plants.*
- *Conduct crabgrass seedling bioassays by overseeding crabgrass into the field plots.*
- *Evaluate crabgrass suppression by overseeding the perennial ryegrass cultivars into a common bermudagrass lawn area and overseeding with crabgrass.*
- *Conduct crabgrass seedling bioassays by overseeding crabgrass into petri dishes containing the surface 1 cm of soil from a 5 cm diameter plug.*
- *Determine Acremonium endophyte content of field grown plant stems.*
- *Determine Acremonium endophyte contribution to allelopathy in the cultivar(s) showing strong allelopathic effects in the bioassays.*

Twelve (12) perennial ryegrasses, which range from moderate to high stand density and zero to 95 percent endophyte infection, were selected and six replications of field plots were planted in late October, 1993. The cultivars and their expected percent endophyte infection are LORETTA (0), GATOR (0), DERBY (5-10), DERBY SUPREME (40-45), ENVY (40), OMEGA II (76), MANHATTAN II (50-90), SATURN (80), SR4200 (80-85), BRIGHTSTAR (90), ASSURE (95), and YORKTOWN III (97).

Our basic laboratory evaluation for allelopathy is the *Lemna minor* L. (duckweed) bioassay. The *Lemna* bioassay measures allelopathic effects of extracts of plant tissues against the growth rate of duckweed fronds. Extracts from shoots are applied to duckweed cell plates at three concentrations. The amount of allelopathic inhibition (or stimulation) of duckweed varies with season of shoot tissue sample collection and extract concentration. All cultivars have affected duckweed growth.

We are still working to refine a ryegrass extract-agar crabgrass seed bioassay. Tissue extracts are added to agar in the cell plates; then crabgrass seeds are placed on the agar and seedling germination and development are measured. Procedures to stabilize crabgrass germination rate in controls are still being worked on. Early results suggest that extracts can inhibit germination directly and/or cause yellowish seedlings that don't live long.

The perennial ryegrass overseeding into common bermudagrass fairway test was initiated in the summer of 1994 by preparing an area with weed control, fertilizing and mowing at 3/4 inch height. The 12 perennial ryegrasses were overseeded at 60 g/1.5 x 1.5m plot after vertical grooving on October 25. Crabgrass was overseeded into the east half of each plot after spiking on March 30, 1995, and benefin pre-emergence was applied to the west half of each plot.

Visual estimates of percent winter broadleaf weeds were taken in February, March, April and May. The mean broadleaf weed cover increased to only 2.4 percent, with a range of 0 to 5 percent in April and decreasing to nearly zero in May. The differences were not statistically significant. Adjacent non-overseeded bermudagrass plots had 23 percent broadleaf weeds in May. Overseeding, of course, reduced winter weeds.

Visual estimates of percent ryegrass cover were made in February (82%), March (86%), April (98%), May (97%), June (59%) and in July in the east (16%) and west (23%) halves of the plots (mean percentage in parentheses). The differences among cultivars were significant only in March. LORETTA and MANHATTAN II were highest with 91 percent and BRIGHTSTAR was lowest with 76 percent cover and statistical overlap was abundant. By May it was possible to distinguish bermuda by making estimates in the morning when dew was on the turf. The mean percentage of bermudagrass cover was 3 percent in May, 41 percent June, and, in July, 63 percent in the east half and 76 percent in the west half.

Crabgrass seedlings were not discernable in May or early June. The east half of the plots where crabgrass had been overseeded had a mean of 21 percent crabgrass with a range of 5 to 40 percent in mid-July. The west half of the plots where pre-emergence herbicide had been applied did not have crabgrass.

Differences due to ryegrass cultivars in crabgrass by percent cover estimates and stem counts per 4-inch diameter plug were not statistically significant. Thus any differences in allelochemical content of the 12 perennial ryegrass cultivars selected for this investigation were not great enough to produce practical field differences in crabgrass suppression.

The NTEP 1994 Perennial Ryegrass Test was undertaken as an adjunct to our allelopathy studies. It was planted in the fall of 1994, fertilized well in the fall and late winter and mowed at a 3 ½ inch height. On April 1, 1995 a 21-inch strip on the western edge of the plots was spiked, overseeded with crabgrass and kept mowed at a 3/4 inch height.

The visual estimate of percent crabgrass cover in the 99 perennial ryegrass cultivars was taken on July 24. Although statistical overlap was abundant, APM and TOPHAT plots had only 8 percent crabgrass while Linn had 45 percent. Whether these differences are due to allelopathy and/or density cannot be determined by this test, but clearly Linn was the least dense and APM and TOPHAT were among the more dense cultivars.