

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 common bermudagrass 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 that 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).

Determination of *Acremonium* content showed actual infection levels different from those expected in the original and later seedlots. New seedlots were obtained for fairway overseeding trials for 1994, 1995 and 1996. All plots were maintained with good fertilizer, weed control, irrigation and 2 cm mowing practices.

One half of each original field plot was overseeded to crabgrass in spring of 1994, 1995 and 1996. Bermudagrass fairway plots were overseeded with new seedlots of the 12 cultivars in the fall of 1994 and 1995. Half of each plot was overseeded with crabgrass each spring and evaluated for crabgrass suppression. No differences in crabgrass stand could be attributed to any of the 12 cultivars. A range of crabgrass stands occurred when it was overseeded into a strip in each plot of the 99 cultivars of the NTEP Perennial Ryegrass Test.

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, but inconsistently.

Development of a ryegrass extract-agar-crabgrass seed bioassay was attempted, but problems with fungal contamination and poor seed germination persisted. Bioassays using soil from under each cultivar, or

mixing dried powdered leaf-stem tissue of each cultivar into soil in petri dishes showed inhibition of crabgrass seed germination and growth, but inconsistent results per cultivar over the tests.

We are conducting a well-rounded research approach to allelopathy in perennial ryegrasses, but inconsistencies in results over bioassays are very disappointing. Perhaps eventually, selection of ryegrass cultivars for crabgrass inhibition may become an important part of IPM programs.

Table 7. Crabgrass germination suppression by powdered tissue mixed into soil in petri dishes.

Cultivar	Tissue grams	Germination %	Sign	Cultivar	Tissue grams	Germination %	Sign
Loretta	0	51	-	Gator	0	58	-
	500	42	N		500	46	Y
	1000	43	N		1000	26	Y
	1500	41	Y		1500	24	Y
Derby	0	42	-	Derby Supreme	0	58	-
	500	40	N		500	44	Y
	1000	33	N		1000	49	N
	1500	34	N		1500	30	Y
Envy	0	34	-	Omega II	0	29	-
	500	18	Y		500	35	N
	1000	13	Y		1000	21	N
	1500	15	Y		1500	24	N
Manhattan II	0	28	-	Saturn	0	60	-
	500	15	Y		500	51	N
	1000	9	Y		1000	32	Y
	1500	9	Y		1500	31	Y
SR 4200	0	48	-	Brightstar	0	46	-
	500	44	N		500	42	N
	1000	35	N		1000	27	N
	1500	29	Y		1500	17	Y
Assure	0	33	-	Yorktown III	0	38	-
	500	32	N		500	19	Y
	1000	34	N		1000	16	Y
	1500	15	Y		1500	6	Y

Sign = significant difference at one standard deviation
 Y = Significant phytotoxic effect compared to control
 N = No significant phytotoxic effect compared to control