FACTORS INFLUENCING BIO-CONTROL OF GREY SNOW MOLD ON CREEPING BENTGRASS BY ISOLATES OF *Typhula phacorrhiza*

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In previous studies, we obtained >70% suppression of grey snow mold on creeping bentgrass by applying inoculum of *Typhula phacorrhiza* (isolate T011) to turfgrass in November, prior to snow fall. Further investigations were designed to improve the efficacy of bio-control induced by this low-temperature-tolerant saprophytic fungus. A specific objective was to determine the effect of cellulose, inoculum concentration and time on the potential of isolates of *Typhula phacorrhiza* to suppress grey snow mold (*T. ishikariensis*) on creeping bentgrass.

RESEARCH PROCEDURE

Disease suppression potential of isolates T011 and T016 of *T. phacorrhiza* was evaluated on two 4 x 9 m swards of creeping bentgrass cv. Penncross with a history of severe infection by *T. ishikariensis*. Treatments in sward 1 included: i) applications of 50 and 200 g/m^2 of grain infested with isolate T011, ii) applications of a 5% w/v$_2$ suspension of cellulose to untreated plots and to plots treated with 50 g/m^2 of T011, iii) application of quintozene at 30 kg a.i./ha, and iv) an untreated control and plots treated with heat-killed (autoclaved) inoculum. Treatments in sward 2 included: i) applications of 50, 100, 200 and 400 g/m^2 of grain infested with T016, ii) application of quintozene at 30 kg a.i./ha, iii) applications of 100, 200, and 400 g/m^2 of heat-killed inoculum and iv) an untreated control.

The Horsfall-Barratt rating system was used to estimate diseases intensity (% necrotic foliage per plot) at weekly intervals from 30 March 1986 to 26 May 1986. Sclerotia of *T. phacorrhiza* and *T. ishikariensis* in each sward were counted from five soil cores (5 cm diameter) removed from each plot on 31 March 1986.

Residual disease suppression induced by isolate T011 was made by estimating the intensity of grey snow mold on 30 March 1986 in plots of creeping bentgrass treated with 200 g/m^2 of inoculum on 21 November 1984. No supplemental treatments were made to these plots in 1985.

RESULTS

Inoculum of *T. phacorrhiza* suppressed grey snow mold by more than 85%. Disease suppression induced by inoculum of isolate T011 at 50 g/m^2 was not significantly different from the suppression induced by quintozene (Table 1). Cellulose amendments did not enhance disease suppression (Table 1).

Table 1. Suppression of grey snow mold on creeping bentgrass by isolate T011 of Typhula phacorrhiza.

Treatment	Rate	Disease Suppression (%)
Killed inoculum	200 g/m^2	-23.57 A**
Killed inoculum + cellulose	50 g/m^2 + 5% w/v	-16.73 A
Cellulose	5% w/v	- 7.85 A
Killed inoculum	50 g/m^2	19.23 A
Live inoculum + cellulose	50 g/m^2	28.39 A
Live inoculum	50 g/m^2	52.02 B
Live inoculum	200 g/m^2	88.87 B
Quintozene	30 kg a.i./ha	95.35 B

* Mean of four values calculated as a percentage of disease in an untreated plot in each block recorded on 30 March 1986.
**Values followed by same letter are not significantly different at P=0.05 according to cluster analysis.

After snow melt, redevelopment of the turfgrass canopy was more rapid in plots treated with 200 g/m^2 than 50 g/m^2 of isolate T-011 (Table 2).

Table 2. Time required for the turfgrass canopy to redevelop and cover >95% of the area in plots of creeping bentgrass infested with Typhula ishikariensis and treated with inoculum of isolate T011 of T. phacorrhiza.

Treatment	Rate	Time
T011 inoculum	200 g/m^2	1.25 A**
T011 inoculum	50 g/m^2	3.75 B
T011 inoculum + cellulose	50 g/m^2 + 5% w/v	4.25 B
Untreated	-	7.00 C

* Mean of four values recorded as number of weeks from initial disease rating on 30 March 1986.
**Values followed by same letter are not significantly different at P=0.05 according to cluster analysis.

An increase in the concentration of isolate T016 significantly reduced the time required for redevelopment of the turf canopy, increased the number of sclerotia of T. phacorrhiza recovered, but did not increase disease suppression (Table 3).

Isolates T011 and T016 of T. phacorrhiza did not differ in their disease suppression potential. Grey snow mold was suppressed at 5 months but not at 17 months after treatment of isolate T011 at 200 g/m^2 (Table 4).

Sclerotia of T. ishikariensis present in untreated plots were not observed in plots treated with quintozene or with inoculum of isolate T011 or T016.

Table 3. Linear regression of intensity of snow mold suppression, time for >95% of turfgrass canopy to redevelop, and number of sclerotia of Typhula phacorrhiza recovered versus concentration of isolate T016 of T. phacorrhiza applied to creeping bentgrass.

Parameter	Slope Coefficient	r^2	t-value
Disease suppression	5.4×10^{-2}	.13	1.43
Time	-7.3×10^{-3}	.44	3.73*
Number of sclerotia	1.2×10^{-1}	.61	5.32*

* regression significant at P = 0.01
** regression significant at P = 0.001

Table 4. Residual suppression of grey snow mold by isolate T011 of Typhula phacorrhiza applied to creeping bentgrass on 21 November 1984.

Treatment	Rate	Disease Incidence* 14/4/85	30/03/86
T011 + grain	200 g/m^2	25.00 A**	60.93 A**
Untreated	-	94.14 B	67.18 A
Grain alone	200 g/m^2	94.73 B	67.18 A

* Mean of four values recorded after snow-melt in 1985 and 1986.
** Within a column, values followed by same letter are not significantly different according to cluster analysis.

CONCLUSIONS

1. Isolates of Typhula phacorrhiza provide significant bio-control of grey snow mold on creeping bentgrass.

2. Disease suppression induced by T. phacorrhiza inoculum at 200 g/m^2 is equivalent to suppression induced by quintozene at 30 kg a.i./ha.

3. An inverse relationship exists between the concentration of T. phacorrhiza applied to turfgrass and the time required for recovery from snow mold injury.

4. Cellulose fails to enhance efficacy of bio-control by T. phacorrhiza.

5. A single application of T. phacorrhiza inoculum fails to provide disease suppression for more than one season.