Seed Treatment Study with Novartis Apron XL on Bentgrass and Ryegrass

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Abstract

Results of two greenhouse studies indicated seed treatment applications of Apron XL 15g ai/100kg seed alone, and in combination with Maxim at three rates (2.5, 5.0 and 10.0g ai/100kg seed) significantly decreased Pythium 'damping off' with two cool-season turfgrass species. Twenty-three days after seeding 'Linn' ryegrass and 'SR1020' bentgrass into a sand media inoculated with *Pythium aphanidermatum*, less foliar blighting of fungicide treated seedlings was also observed compared to the not treated controls for each turfgrass species. This observation demonstrated a continuing systemic activity of the fungicide treatments following germination. Initial germination was somewhat delayed four days after seeding of (4 day) bentgrass, however the effect was slight and was not observed eight days after seeding. A delayed germination was also noted for Linn ryegrass seedlings and this delay persisted over a14 day observation period when compared to the not treated control treatment seedlings.

Introduction

Turfgrass seedling germination is primarily influenced by environmental conditions such as adequate water supply, proper temperature, adequate oxygen, and light. Seedling germination failure can occur due to lack of the proper environmental conditions, but seedlings frequently fail to emerge due to disease occurrence. Damping-off is a common turfgrass seedling disease problem, most often caused by *Pythium* and *Rhizoctonia* spp. Treating turfgrass seed with a fungicide aids in controlling pre-emergence seedling death due to damping-off. Fungicide seed treatments, which are systemic, will also help in preventing post-emergence seedling death. This investigation determines the efficacy of Apron XL and combinations with Maxim for control of Pythium 'damping off' of seedlings of two turfgrass species.

Materials and Methods

Two greenhouse studies were conducted using 'SR1020' bentgrass and 'Linn' ryegrass to compare seed germination rates, seedling stand development and residual systemic activity of fungicide treated turfgrass seeds. Fungicides were applied to turfgrass seeds using a slurry application method by the Tryon Group Inc., as according to protocol. A seedling germination bioassay was initiated 03 and 14 December, 1998. A high seeding rate of approximately 1.5g ryegrass and 1.0g bentgrass seed was seeded into a 3.5 inch nursery pot containing a washed sand media infested with 1.5cc or 3.0cc/yd^3 of rye grain colonized with *Pythium aphanidermatum* (P#1). Each fungicide seed treatment was replicated four times, and included a non-inoculated and inoculated check treatment for each turfgrass species. All seed treatments were placed on a greenhouse bench and maintained with adequate moisture for sustained plant growth.

Greenhouse Study #1: This study was initiated 03 December using a washed sand media infested with *P. aphanidermatum* inoculum (3cc/yd^3). The infested rye grain seed inoculum used in this experiment was thoroughly mixed into the sand medium used for establishing seedling stands in the germination study. Two rates of inoculum were used for the sand media, (1.5g/3.5inch pot) and (1g/3.5 inch pot) for the bentgrass and ryegrass respectively. Each turfgrass test seed treatment was placed on the surface of the *Pythium* infested sand maintained in 5 in. pots. The treatments were maintained on a greenhouse bench at 75F (daytime temperature) and initially covered with plastic film, to insure adequate moisture for germination. Data was taken 4, 6 and eight days after initiation of seed germination by visual estimation of percent stand for bentgrass and for ryegrass.

Greenhouse Study #2: This study was initiated 14 December, using two inoculum levels 1.5cc and 3.0cc/yd^3 of *Pythium* infested ryegrain.. Linn ryegrass and SR1020 bentgrass were seeded at the same rate as greenhouse study #1. Data was taken 27 December, 1998, 14 days after seeding. Observations were taken on seedling stands and direct seedling height (cm). Turfgrass seedlings were cut back to a height of 3.5 cm, 4 January, 1999. Seedlings were challenged with *Pythium* isolate P#1 by foliar inoculation using the colonized rye grain inoculum. Data was taken 06 (22day post) and 07 (23day post) January to determine foliar blighting (cm diam.) and systemic activity on seedlings of the fungicide seed treatments.

Results and Discussion

Greenhouse Study#1: All fungicide treatments provided protection from seedling damping off. The inoculated non-fungicide treated check had only 12 seedlings as opposed to 98 seedlings with the non-inoculated check (Table 1). Apron XL treatments were all at least 81seedlings by 8 days. Early bentgrass seedling germination seems to have been slowed somewhat by the fungicide treatments however, 4 days after seeding, the non-inoculated check was estimated at 81 seedlings, while the fungicide treated seedlings ranged from 41 for Apron XL 15g ai/100kg seed to 33 for Apron XL plus Maxim 10g ai/100kg seed. The inoculated non-fungicide treated check had significantly less germinated seedlings.

The non-inoculated ryegrass check had ca 42 seeds germinated at 4 days post seeding, while the inoculated non-fungicide treated check had only 14 germinated seeds, a 42% decrease in the number of germinated seeds. Apron XL 15g ai/100kg had 14 germinated seeds, while Apron XL 15g ai/kg plus Maxim 10g ai/100kg seed had 18 germinated seeds. Eight days post seeding, the non-inoculated check had 138 germinated seedlings while the inoculated check had only 48. Apron XL alone at 15g ai/100kg seed had ca 78 germinated seedlings, while the addition of Maxim at 2.5g, 5g and 10g/100kg seed produced 89, 72 and 67 germinated seedlings. (Table 1.)

Both the ryegrass and bentgrass benefitted from fungicide seed treatments, however higher levels of Maxim (10g ai/100kg) delayed the initial seedling germination and stand establishment.

Greenhouse Study#2: Two inoculum levels were used in study #2 (1.5cc and 3.0cc/yd^3) to determine how disease pressure affected the performance of the same fungicide seed treatments. As with the first greenhouse study, all fungicide treated turfgrass seeds produced greater plant growth than the inoculated-non-fungicide checks (Table 2). Differences between fungicide seed treatments was not significant for seedling stand or seedling height, regardless of disease pressure or turfgrass species (Table 2). Turfgrass under higher disease pressure generally had a

lower number of germinating seedlings and slightly shorter seedlings 14 days after seeding, compared to those grown under lower disease pressure. These results indicate the higher disease pressure has more of an repressive effect on fungicide action than low levels of disease. In this instance, the fungicide treatments were able to overcome both levels of fungal inoculum.

Pythium blight was greater on the non-fungicide treated check than the fungicide seed treatments 23 days after seeding into infested media. Foliar blighting was more pronounced on bentgrass than on ryegrass seedlings (Table 3). The use of Apron XL alone was not as effective for foliar disease suppression as was the use of Apron + Maxim at increasing levels. There was increasing foliar blight suppression with increasing concentrations of the Maxim (Table 3). The additions of higher rates of Maxim 5.0g ai and 10g ai/100kg seed were best for Pythium suppression. This indicated the presence of systemic residual fungicide activity at least 21 days in the turfgrass foliage from using fungicide seed treatments (Table 3). Overall foliar blighting was greater on bentgrass than ryegrass varieties. The variety 'Linn' ryegrass has been used in past studies to determine foliar blighting, with high levels of disease on the untreated checks. This could also be an indication that the seed treatments are more efficacious on ryegrass species than bentgrass.

Table 1. Seedling stand estimates for *Pythium* inoculated turfgrass species influenced by fungicide seed treatments in Greenhouse Study #1.

Treatment/ ai/100kgseed	Turfgrass Species* SR1020 Bentgrass	Seedling Stand† 4day	6day	8day
Non-inoculated Ck		82a‡	87a	88b
Inoculated no-fungicide Ck		7c	10b	12c
Apron XL 15		41b	85a	98a
Apron XL 15+ Maxim 2.5		40b	81a	81b
Apron XL 15+ Maxim 5.0		40b	84a	86b
Apron XL 15+ Maxim 10.0		33b	81a	82b
	Linn Ryegrass			
Non-inoculated Ck		42a	117a	138a
Inoculated no-fungicide Ck		14b	36c	48c
Apron XL 15		14b	64b	78b
Apron XL 15+ Maxim 2.5		19b	66b	89b
Apron XL 15+ Maxim 5.0		13b	54bc	72b
Apron XL 15+ Maxim 10.0		18b	49bc	67bc

* Two cool-season turfgrass species: SR1020 bentgrass seeded at 1.0g rate and Linn perennial ryegrass seeded at 1.5g.

† Bentgrass seedling stand is a mean estimated by percent germination. Ryegrass seedling stand taken by direct count of seedlings.

‡ Means within columns and species followed by the same letter are not significantly different.

Table 2. Influence of disease pressure on seedling stand establishment and seedling height 14 days after seeding.

Treatment/ ai/100kgseed	Turfgrass Species* SR1020 Bentgrass	1.5cc/yd^3 Seedling Stand†	1.5cc/yd^3 Height‡	3.0cc/yd^3 Seedling Stand	3.0cc/yd^3 Height
Non-inoculated Ck		491a§	24 a	341a	14.5a
Inoculated no-fungicide Ck		10 b	4.5b	27 b	0 b
Apron XL 15		465a	20 a	337a	18 a
Apron XL 15+ Maxim 2.5		454a	21 a	310a	13.7a
Apron XL 15+ Maxim 5.0		502a	25 a	388a	15.7a
Apron XL 15+ Maxim 10.0		540a	26 a	423a	19.3a

Treatment ai/100kgseed	Linn Ryegrass	1.5cc/yd^3 Seedling Stand	1.5cc/yd^3 Height	3.0cc/yd^3 Seedling Stand	3.0cc/yd^3 Height
Non-inoculated Ck		200 a	87a	179a	63a
Inoculated no-fungicide Ck		13.3b	36b	1.5 c	0 b
Apron XL 15		200 a	86a	180a	70a
Apron XL 15+ Maxim 2.5		200 a	88a	175a	66a
Apron XL 15+ Maxim 5.0		200 a	87a	175a	65a
Apron XL 15+ Maxim 10.0		200 a	90a	175a	68a

* Two cool-season turfgrasses seeded at (bentgrass) 1.0g and (ryegrass) 1.5g/container.

† Seedling stand data taken by direct seedling count in individual containers.

‡ Seedling height in mm.

§ Means within columns and species followed by the same letter are not significantly different.

Table 3. Influence of disease pressure on fungicide treated seedling stands and residual protection from foliar blight 23 days after seeding into an inoculated media.

Treatment/ ai/100kgseed	Turfgrass Species*	Percent Foliar Disease†
Non-treated Ck	SR1020 Bentgrass	88.5a‡
Apron XL 15		56 ab
Apron XL 15+ Maxim 2.5		53 bc
Apron XL 15+ Maxim 5.0		33 cd
Apron XL 15+ Maxim 10.0		24 d
Treatment/ ai/100kgseed	Turfgrass Species*	Percent Foliar Disease†
Non-treated Ck	Linn Ryegrass	55 a‡
Apron XL 15		19.4b
Apron XL 15+ Maxim 2.5		3.2 c
Apron XL 15+ Maxim 5.0		4 c
Apron XL 15+ Maxim 10.0		2.1 c

* Two cool-season turfgrasses seeded at 1.0g and 1.5g. Data is mean of both levels (8 reps/trtmt).

† Percent foliar disease 23 Days after seeding turfgrass into a sand media inoculated with *Pythium* (P#1) at two levels (1.5cc and 3.0cc/yd^3). There was no statistical difference between foliar blighting and soil inoculum level, foliar blighting.

‡ Means within columns and species followed by the same letter are not significantly different.