

Gibberellic Acid (GA₃) Preemergence to Turfgrass for Seedling Establishment

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The objective of these studies was to evaluate the response of soil applications of gibberellic acid (GA₃; RyzUp Smartgrass) prior to (PREPLANT) and at seeding (PRE) on uniformity of turfgrass emergence and stand establishment. We also investigated applications of GA₃ to stimulate emergence of weeds to minimize the grass weed seedbank prior to planting.

Two studies were established at the USDA Central Ferry Farm. Studies were planted using a double-disk grain drill modified to provide very little closing pressure. Both studies were conducted in a randomized complete block design with 4 replications. Plots were 10' by 25' long. Treatments were applied 1 month before planting (PREPLANT) and at planting (PRE). Treatments were applied using a backpack sprayer calibrated to deliver 15 GPA through four 11003 VS flat fan nozzles, detailed in Tables 1 and 2. Plots were sprinkler irrigated 0.5" every other day for an hour.

For study 1, three Kentucky bluegrass elite (Dauntless, Diva and Rubix) varieties and two varieties of perennial ryegrass (Playfast and Prominent) were planted on October 01, 2018 (four rows of each variety). No fertilizer was applied to study 1. For study 2, one Kentucky bluegrass elite (Dauntless) variety and three varieties of perennial ryegrass (Pillar, Playfast, and Prominent) were planted on May 28, 2019. Study 2 was fertilized at a rate of 45 lb nitrogen A⁻¹.

Weed density was assessed for both studies using a quarter-meter quadrant (two counts at random per plot) detailed in Table 2. Emergence of weed species in the seedbank for study 1 was observed on September 14, 2019, and May 14, 2019 for the second study. Seedlings in one-meter row of each turfgrass variety was quantified for both studies at the 2-leaf stage (after preemergence GA application) and at 5-leaf stage to determine stand establishment of turfgrass varieties; detailed in Tables 3a, 4a and 4b. Two-meter rows (at random per plot) of turfgrass biomass was collected on July 22, 2019; detailed in Table 4c. All data was analyzed by using analysis of variance (ANOVA) to compare group means in SAS 9.4 software, with treatments as the fixed effect and block as random.

Results

For study 1, weed density 14 days after preplant were not affected by any treatment (Table 2). GA applied at any rate had no effect on turfgrass densities at the 2-leaf stage compared to the nontreated control (Table 3a). Study 1 was terminated after geese flocks fed on the field at an early stage, which prevented the establishment of turfgrass species, thus density was recorded at the 2-leaf stage.

For study 2, weed density 14 days after preplant were not affected by any treatment (Table 2). GA applied at any rate had no effect on turfgrass densities at the 2-leaf or 5-leaf stage compared to the nontreated control (Table 4a and 4b). Based on dry biomass, GA did not have an effect on Dauntless and Playfast at any rate compared to the nontreated control. However, PRE applications of GA had a significant increase on biomass from Pillar and Prominent detailed in Table 4c.



Table 1. Treatment application details

	Study 1		Study 2	
Study Application	A	B	A	B
Date	8/31/2018	10/1/2018	4/30/2019	5/28/2019
Crop Stage	PREPLANT	PRE	PREPLANT	PRE
Air temperature (°F)	74.7	81	80.1	74.7
Soil temperature (°F)	68	75.2	64.4	68
Wind velocity (mph, direction)	7.4, NE	2.3, SW	3, SW	3, NE
Cloud Cover	5%	0%	0%	0%

Table 2. Weed densities 14 days after PREPLANT application for study 1 and 2. Means followed by the same letter are not significantly different ($\alpha=0.05$).

				Density (14 days after PREPLANT)	
				Spring 2019	
				Central Ferry Weed Density	
Active Ingredient	Rate	Application Description	Crop Stage	Study 1	Study 2
<i>lb ai A⁻¹</i>				----- 0.25m ² -----	
Nontreated				60	196
Gibberellin A ₃	0.025	1 month before planting	Prior to seeding	35	50
Gibberellin A ₃	0.05	1 month before planting	Prior to seeding	52	49
Gibberellin A ₃	0.025	PRE	At seeding	25	19
Gibberellin A ₃	0.05	PRE	At seeding	53	5
Gibberellin A ₃	0.025	1 month before planting	Prior to seeding	29	168
Gibberellin A ₃	0.025	PRE	At seeding		
Gibberellin A ₃	0.05	1 month before planting	Prior to seeding	33	25
Gibberellin A ₃	0.05	PRE	At seeding		
<i>LSD</i>				<i>NS</i>	<i>NS</i>

Table 3a. Density of turfgrass varieties (*Dauntless*, *Diva*, *Playfast*, *Prominent* and *Rubix*) for study 1 after both PREPLANT and PRE applications at the 2-leaf stage. Means followed by the same letter are not significantly different ($\alpha=0.05$).

Study 1				Density (After PRE at 2-leaf stage)				
				Fall 2018				
				Central Ferry				
Active Ingredient	Rate	Application Description	Crop Stage	Dauntless	Diva	Playfast	Prominent	Rubix
<i>lb ai A⁻¹</i>				----- # m ⁻¹ -----				
Nontreated				0	0	3	7	4
Gibberellin A ₃	0.025	1 month before planting	Prior to seeding	0	0	3	7	2
Gibberellin A ₃	0.050	1 month before planting	Prior to seeding	0	0	7	7	0
Gibberellin A ₃	0.025	PRE	At seeding	1	0	8	10	1
Gibberellin A ₃	0.050	PRE	At seeding	0	0	8	11	0
Gibberellin A ₃	0.025	1 month before planting	Prior to seeding	0	0	8	11	0
Gibberellin A ₃	0.025	PRE	At seeding					
Gibberellin A ₃	0.050	1 month before planting	Prior to seeding	3	2	8	6	2
Gibberellin A ₃	0.050	PRE	At seeding					
				NS	NS	NS	NS	NS

Table 4a. Density of turfgrass varieties (*Dauntless*, *Pillar*, *Playfast*, and *Prominent*) for study 2 after both PREPLANT and PRE applications at the 2-leaf stage. Means followed by the same letter are not significantly different ($\alpha=0.05$).

Study 2				Density (After PRE at 2-leaf stage)			
				Spring 2019			
				Central Ferry			
Active Ingredient	Rate	Application Description	Crop Stage	Dauntless	Pillar	Playfast	Prominent
<i>lb ai A⁻¹</i>				----- # m ⁻¹ -----			
Nontreated				15	27	30	24
Gibberellin A ₃	0.025	1 month before planting	Prior to seeding	13	30	32	38
Gibberellin A ₃	0.050	1 month before planting	Prior to seeding	35	35	21	27
Gibberellin A ₃	0.025	PRE	At seeding	20	36	19	48
Gibberellin A ₃	0.050	PRE	At seeding	22	41	23	45
Gibberellin A ₃	0.025	1 month before planting	Prior to seeding				
Gibberellin A ₃	0.025	PRE	At seeding	22	27	22	42
Gibberellin A ₃	0.050	1 month before planting	Prior to seeding	21	34	29	36
Gibberellin A ₃	0.050	PRE	At seeding				
				LSD	NS	NS	NS

Table 4b. Density of turfgrass varieties (Dauntless, Pillar, Playfast, and Prominent) for study 2 after noth PREPLANT and PRE applications at the 5-leaf stage. Means followed by the same letter are not significantly different ($\alpha=0.05$).

Study 2				Density (At 5-leaf stage)			
				Spring 2019			
				Central Ferry			
Active Ingredient	Rate	Application Description	Crop Stage	Dauntless	Pillar	Playfast	Prominent
				----- # m ⁻¹ -----			
<i>lb ai A⁻¹</i>							
Nontreated				17	18	18	24
Gibberellin A ₃	0.025	1 month before planting	Prior to seeding	18	22	14	18
Gibberellin A ₃	0.050	1 month before planting	Prior to seeding	21	32	17	22
Gibberellin A ₃	0.025	PRE	At seeding	18	23	19	26
Gibberellin A ₃	0.050	PRE	At seeding	18	23	21	26
Gibberellin A ₃	0.025	1 month before planting	Prior to seeding	18	23	19	20
Gibberellin A ₃	0.025	PRE	At seeding				
Gibberellin A ₃	0.050	1 month before planting	Prior to seeding	15	25	16	24
Gibberellin A ₃	0.050	PRE	At seeding				
<i>LSD</i>				<i>NS</i>	<i>NS</i>	<i>NS</i>	<i>NS</i>

Table 4c. Turfgrass biomass for varieties Dauntless, Pillar, Playfast, and Prominent 8 weeks after planting for study 2. Means followed by the same letter are not significantly different ($\alpha=0.05$).

Study 2				Biomass (8 weeks after planting)			
				Spring 2019			
				Central Ferry			
Active Ingredient	Rate	Application Description	Crop Stage	Dauntless	Pillar	Playfast	Prominent
				----- # m ⁻¹ -----			
<i>lb ai A⁻¹</i>							
Nontreated				0	5 c	5	4.4 cd
Gibberellin A ₃	0.025	1 month before planting	Prior to seeding	1	5 c	6	2.9 d
Gibberellin A ₃	0.050	1 month before planting	Prior to seeding	1	6 bc	6	5.8 bcd
Gibberellin A ₃	0.025	PRE	At seeding	0	13 a	8	8.0 abc
Gibberellin A ₃	0.050	PRE	At seeding	1	10 ab	6	9.8 ab
Gibberellin A ₃	0.025	1 month before planting	Prior to seeding	1	7 bc	6	7.1 abcd
Gibberellin A ₃	0.025	PRE	At seeding				
Gibberellin A ₃	0.050	1 month before planting	Prior to seeding	1	6 bc	6	10.3 a
Gibberellin A ₃	0.050	PRE	At seeding				
<i>LSD</i>				<i>NS</i>	4.73	<i>NS</i>	4.23

Disclaimer

Some of the pesticides discussed in this presentation were tested under an experimental use permit granted by WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to \$7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by WSDA and/or the U.S. Food and Drug Administration. It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.