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COLLEGE OF AGRICULTURAL & LIFE SCIENCES
UNIVERSITY OF WISCONSIN-MADISON

Extension
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UW – Madison Weed Science Renz Lab

Comparing Herbicides for Perennial Weed Control

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Objective:

Evaluate perennial grass control (smooth brome) using different herbicide mixtures applied at two timings in spring.

Summary:

Perennial grasses are difficult to control, especially in the spring when temperatures can vary and vegetative growth is occurring. We tested if smooth brome can be suppressed in spring with sequential applications of Assure II (Quizalofop P-Ethyl) alone and mixed with either Liberty (glufosinate) or 2,4-D and compared to an experimental herbicide (AMV5233D). Initial applications in late April provided limited control two weeks after treatment (<40%) with treatments including Liberty showing the best suppression (25-35% control) although AMV5233D +2,4-D was similar (24% control). By late May (5/24, two weeks after B timing) sequential applications of Assure II alone or mixed with Liberty were providing the highest control (>80%). Interestingly AMV5233D +2,4-D gave similar control to these treatments at this rating, but by early June (6/9, 29 DAT B) only the sequential applications of Assure II were providing acceptable suppression (84%). Reduced control in early spring may have been due to low temperatures during application and a frost event that occurred after application. Additionally multiple emergence events occurred with smooth brome, so it is likely that foliar absorption of herbicides from the early application were reduced compared to later timings. As control never exceeded 90% these results highlight the challenge in maintaining high levels of control with smooth brome with spring applications. They emphasize the need to delay applications of these products until later in the spring when foliar uptake can be maximized.

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Herbicide Treatments			
Treatment Number	**Application Timing**	**Treatment**	**Rate**
1	-	Nontreated Control (NTC)	-
2	A	Assure II	12 fl oz/A
	A	Crop Oil Concentrate (COC)	1 % v/v
	B	Assure II	12 fl oz/A
	B	COC	1% v/v
3	A	Liberty	48.5 fl oz/A
	A	Ammonium Sulfate (AMS)	3 lbs/A
	B	Liberty	48.5 fl oz/A
	B	AMS	3 lbs/A
4	A	2,4-D Amine	24 fl oz/A
	A	COC	1% v/v
5	A	Assure II	12 fl oz/A
	A	Liberty	48.5 fl oz/A
	A	COC	1% v/v
	A	AMS	3 lbs/A
	B	Assure II	12 fl oz/A
	B	Liberty	48.5 fl oz/A
	B	COC	1% v/v
	B	AMS	3 lbs/A
6	A	Assure II	12 fl oz/A
	A	Liberty	48.5 fl oz/A
	A	2,4-D Amine	24 fl oz/A
	A	COC	1% v/v
	A	AMS	3 lbs/A
	B	Assure II	12 fl oz/A
	B	Liberty	48.5 fl oz/A
	B	COC	1% v/v
	B	AMS	3 lbs/A
7	A	AMV5233D	47.7 fl oz/A
	A	COC	1% v/v
	A	AMS	3 lbs/A
	B	AMV5233D	47.7 fl oz/A
	B	COC	1% v/v
	B	AMS	3 lbs/A
8	A	AMV5233D	47.7 fl oz/A
	A	2,4-D Amine	24 fl oz/A
	A	COC	1% v/v
	A	AMS	3 lbs/A
	B	AMV 5233D	47.7 fl oz/A
	B	COC	1% v/v
	B	AMS	3 lbs/A

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Herbicide Application		
Application Timing	A	B
Date	April, 27, 2022, 1:10pm – 2:03pm	May, 11, 2022, 10:15am – 1:15pm
Regulator PSI	48	44
Equipment	CO_2 pressurized 10-foot boom sprayer (20 GPA)	
Nozzles & spacing	Eight XR Teejet 11002VS Nozzles with 15-inch spacing	

Weather Data		
Weather Station	KWISAUKC15	
Application Timing	A	B
Temperature	40°F	86°F - 88°F
Wind Speed and Direction	7.8 mph ESE – 8.1 mph ESE	2.3 mph SSE – 3.91 mph E
Relative Humidity	45% - 49%	61% - 67%
Cloud Cover	100%	40%
Previous Rain Event Within 48 Hours	None	None
When $\geq$ 0.25 inches of precipitation occurred after treatment	3 DAT, 9:53am – 0.3 inches	15 DAT, 12:05am – 0.3 inches

Research Plot Information	
Plot Dimensions	10 feet by 25 feet
Design	Randomized Complete Block, 4 blocks
Soil Type	Richwood silt loam
Soil Characteristics	20.8% clay, 0.97% organic matter, 6.4 pH, 4 % slope

Plants Present at Application A – Developmental Stage		
Species	**Average Height (in)**	**Phenological Stage**
Smooth Brome (*Bromus inermis*)	5.55	Vegetative

Plants Present at Application B – Developmental Stage		
Species	**Average Height (in)**	**Phenological Stage**
Smooth Brome (*Bromus inermis*)	5.67	Vegetative

Smooth Brome 43 DAT A, June 9, 2022: Nontreated Control

Smooth Brome 43 DAT A, June, 9, 2022: Assure II @ 12fl oz/A + COC 1% v/v, sprayed at both timing A and B

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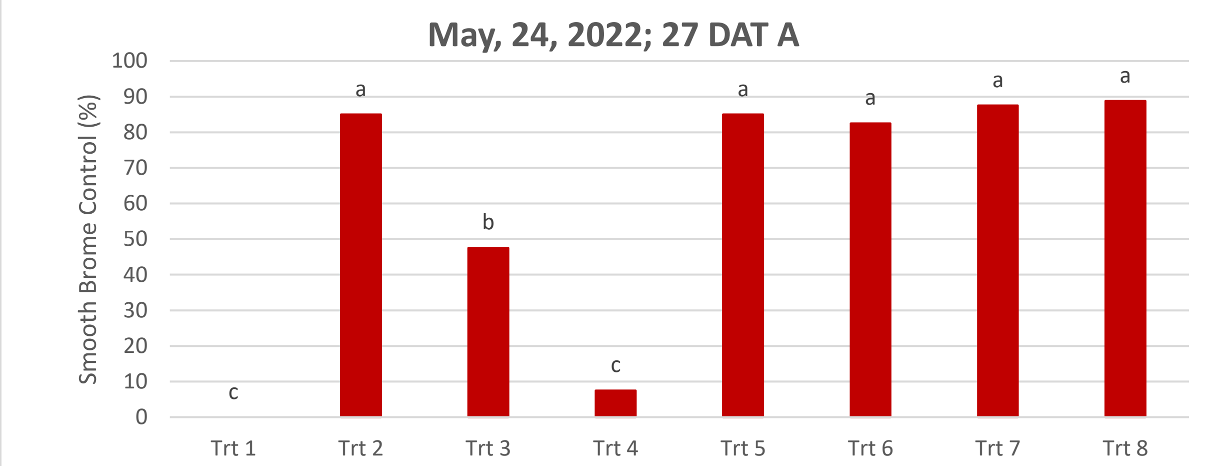
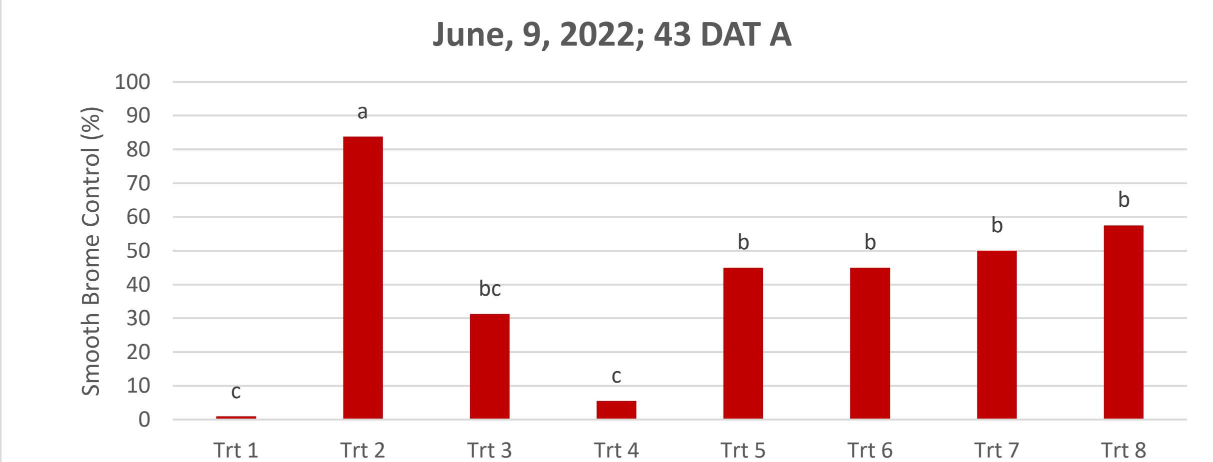
Index of Ratings and Results

Smooth Brome Control



Bars labeled with the same letter do not significantly differ (P=0.05, LSD)



Refer to page 2 for treatment mixes corresponding to tables

Bars labeled with same letter do not significantly differ (P=0.05, LSD)

Pre-Treatment Rating – April, 26, 2022 1/2								
Trt. No.	**App. Timing**	**Treatment**	**Rate**	**Smooth Brome Cover (%)**	**Broadleaf Weed Cover (%)**	**Kentucky Bluegrass Cover (%)**	**Wild Parsnip Cover (%)**	**Baregrou nd/ Litter (%)**
1	-	NTC	-	15.0 -	0.3 -	1.3 -	0.5 -	83.0 -
2	A A B B	Assure II COC Assure II COC	12 fl oz/A 1% v/v 12 fl oz/A 1% v/v	20.0 -	0.5 -	2.8 -	0.8 -	76.0 -
3	A A B B	Liberty AMS Liberty AMS	48.5 fl oz/a 3 lbs/A 48.5 fl oz/a 3 lbs/A	17.0 -	0.5 -	2.5 -	1.3 -	79.0 -
4	A A	2,4-D Amine COC	24 fl oz/A 1%v/v	20.0 -	0.3 -	4.0 -	0.5 -	75.5 -
5	A A A A B B B B	Assure II Liberty COC AMS Assure II Liberty COC AMS	12 fl oz/A 48.5 fl oz/a 1% v/v 3 lbs/A 12 fl oz/A 48.5 fl oz/a 1% v/v 3 lbs/A	12.5 -	0.0 -	3.5 -	0.8 -	83.3 -
6	A A A A A B B B B	Assure II Liberty 2,4-D Amine COC AMS Assure II Liberty COC AMS	12 fl oz/A 48.5 fl oz/A 24 fl oz/A 1% v/v 3 lbs/A 12 fl oz/A 48.5 fl oz/A 1% v/v 3 lbs/A	13.3 -	0.5 -	3.3 -	0.5 -	82.5 -
Statistics[1]								
Least Significant Difference (LSD) P=.05				11.17	0.69	3.25	1.07	20.25
Standard Deviation				7.59	0.47	2.21	0.73	13.77
Coefficient of Variation (CV)				45.76	136.98	74.47	80.43	17.87
Treatment Prob(F)				0.6920	0.7304	0.7672	0.1023	0.4663

[1] All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.

Pre-Treatment Rating – April, 26, 2022 2/2								
Trt. No.	App. Timing	Treatment	Rate	Smooth Brome Cover (%)	Broadleaf Weed Cover (%)	Kentucky Bluegrass Cover (%)	Wild Parsnip Cover (%)	Bareground/ Litter (%)
7	A A A B B B	AMV5233D COC AMS AMV5233D COC AMS	47.7 fl oz/A 1% v/v 3 lbs/A 47.7 fl oz/A 1% v/v 3 lbs/A	15.0 -	0.5 -	3.5 -	1.0 -	62.5 -
8	A A A A B B B	AMV5233D 2,4-D Amine COC AMS AMV5233D COC AMS	47.7 fl oz/A 24 fl oz/A 1% v/v 3 lbs/A 47.7 fl oz/A 1% v/v 3 lbs/A	20.0 -	0.3 -	3.0 -	2.0 -	74.8 -
Statistics[2]								
LSD P=.05				11.17	0.69	3.25	1.07	20.25
Standard Deviation				7.59	0.47	2.21	0.73	13.77
CV				45.76	136.98	74.47	80.43	17.87
Treatment Prob(F)				0.6920	0.7304	0.7672	0.1023	0.4663

[2] All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.

14 DAT A – May, 11, 2022 1/2							
Trt. No.	**App. Timing**	**Treatment**	**Rate**	**Smooth Brome Control (%)**	**Smooth Brome Injury (%)**	**Green vegetation in Plot (%)**	**Wild Parsnip Injury (%)**
1	-	NTC	-	0.3 d	1.3 d	76.3 a	0.0 -
2	A A B B	Assure II COC Assure II COC	12 fl oz/A 1% v/v 12 fl oz/A 1% v/v	5.0 cd	14.3 cd	42.5 bc	0.0 -
3	A A B B	Liberty AMS Liberty AMS	48.5 fl oz/a 3 lbs/A 48.5 fl oz/a 3 lbs/A	7.0 cd	25.0 bc	57.5 b	2.7 -
4	A A	2,4-D Amine COC	24 fl oz/A 1%v/v	0.0 d	0.0 d	81.3 a	0.0 -
5	A A A A B B B B	Assure II Liberty COC AMS Assure II Liberty COC AMS	12 fl oz/A 48.5 fl oz/a 1% v/v 3 lbs/A 12 fl oz/A 48.5 fl oz/a 1% v/v 3 lbs/A	35.0 a	56.3 a	31.3 c	8.3 -
6	A A A A A B B B B	Assure II Liberty 2,4-D Amine COC AMS Assure II Liberty COC AMS	12 fl oz/A 48.5 fl oz/A 24 fl oz/A 1% v/v 3 lbs/A 12 fl oz/A 48.5 fl oz/A 1% v/v 3 lbs/A	25.0 ab	50.0 a	32.5 c	10.0 -
Statistics[3]							
LSD P=.05				11.78	17.77	15.21	11.62
Standard Deviation				8.01	12.08	10.35	7.47
CV				55.84	40.83	21.43	179.63
Treatment Prob(F)				0.0001	0.0001	0.0001	0.3828

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

[3] All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.

14 DAT A – May, 11, 2022 2/2							
Trt. No.	**App. Timing**	**Treatment**	**Rate**	**Smooth Brome Control (%)**	**Smooth Brome Injury (%)**	**Green vegetation sin Plot (%)**	**Wild Parsnip Injury (%)**
7	A A A B B B	AMV5233D COC AMS AMV5233D COC AMS	47.7 fl oz/A 1% v/v 3 lbs/A 47.7 fl oz/A 1% v/v 3 lbs/A	18.8 bc	42.5 ab	26.3 c	7.3 -
8	A A A A B B B	AMV5233D 2,4-D Amine COC AMS AMV5233D COC AMS	47.7 fl oz/A 24 fl oz/A 1% v/v 3 lbs/A 47.7 fl oz/A 1% v/v 3 lbs/A	23.8 ab	47.5 a	38.3 c	5.0 -
Statistics[4]							
LSD P=.05				11.78	17.77	15.21	11.62
Standard Deviation				8.01	12.08	10.35	7.47
CV				55.84	40.83	21.43	179.63
Treatment Prob(F)				0.0001	0.0001	0.0001	0.3828

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

[4] All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.

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27 DAT A – May, 24, 2022 1/2								
Trt. No.	**App. Timing**	**Treatment**	**Rate**	**Smooth Brome Control (%)**	**Smooth Brome Injury (%)**	**Kentucky Bluegrass Control (%)**	**Green vegetation in Plot (%)**	**Woody Vine Control (%)**
1	-	NdsTC	-	0.0 c	0.0 b	21.3 -	85.0 a	6.3 b
2	A A B B	Assure II COC Assure II COC	12 fl oz/A 1% v/v 12 fl oz/A 1% v/v	85.0 a	62.5 a	66.0 -	25.0 b	23.8 ab
3	A A B B	Liberty AMS Liberty AMS	48.5 fl oz/a 3 lbs/A 48.5 fl oz/a 3 lbs/A	47.5 b	77.5 a	93.3 -	41.3 b	23.8 ab
4	A A	2,4-D Amine COC	24 fl oz/A 1%v/v	7.5 c	5.0 b	44.8 -	66.3 a	10.0 b
5	A A A A B B B B	Assure II Liberty COC AMS Assure II Liberty COC AMS	12 fl oz/A 48.5 fl oz/a 1% v/v 3 lbs/A 12 fl oz/A 48.5 fl oz/a 1% v/v 3 lbs/A	85.0 a	65.5 a	71.0 -	47.5 bc	31.3 b
6	A A A A A B B B B	Assure II Liberty 2,4-D Amine COC AMS Assure II Liberty COC AMS	12 fl oz/A 48.5 fl oz/A 24 fl oz/A 1% v/v 3 lbs/A 12 fl oz/A 48.5 fl oz/A 1% v/v 3 lbs/A	82.5 a	55.0 a	98.0 -	45.0 bc	30.0 ab
Statistics[5]								
LSD P=.05				14.85	34.91	51.50	20.94	26.72
Standard Deviation				10.10	23.74	35.02	14.24	18.17
CV				16.7	46.12	47.93	35.33	67.6
Treatment Prob(F)				0.0001	0.0003	0.0435	0.0001	0.0144

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

[5] All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.

27 DAT A – May, 24, 2022 2/2								
Trt. No.	**App. Timing**	**Treatment**	**Rate**	**Smooth Brome Control (%)**	**Smooth Brome Injury (%)**	**Kentucky Bluegrass Control (%)**	**Green vegetation in Plot (%)**	**Woody Vine Control (%)**
7	A	AMV5233D	47.7 fl oz/A	87.5 a	77.5 a	94.5 -	46.3 bc	61.3 a
	A	COC	1% v/v					
	A	AMS	3 lb/A					
	B	AMV5233D	47.7 fl oz/A					
	B	COC	1% v/v					
	B	AMS	3 lb/A					
8	A	AMV5233D	47.7 fl oz/A	88.8 a	68.8 a	95.8 -	38.8 bc	28.8 ab
	A	2,4-D Amine	24 fl oz/A					
	A	COC	1% v/v					
	A	AMS	3 lb/A					
	B	AMV5233D	47.7 fl oz/A					
	B	COC	1% v/v					
	B	AMS	3 lb/A					
Statistics[6]								
LSD P=.05				14.85	34.91	51.50	20.94	26.72
Standard Deviation				10.10	23.74	35.02	14.24	18.17
CV				16.7	46.12	47.93	35.33	67.6
Treatment Prob(F)				0.0001	0.0003	0.0435	0.0001	0.0144

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

[6] All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.

43 DAT A – June, 9, 2022 1/2							
Trt. No.	**App. Timing**	**Treatment**	**Rate**	**Smooth Brome Control (%)**	**Kentucky Bluegrass Control (%)**	**Green vegetation in Plot (%)**	**Woody Vine Control (%)**
1	-	NTC	-	1.0 c	1.0 c	91.8 a	1.0 -
2	A A B B	Assure II COC Assure II COC	12 fl oz/A 1% v/v 12 fl oz/A 1% v/v	83.8 a	99.0 a	30.0 c	25.0 -
3	A A B B	Liberty AMS Liberty AMS	48.5 fl oz/a 3 lbs/A 48.5 fl oz/A 3 lbs/A	31.3 bc	68.5 a	63.8 b	35.0 -
4	A A	2,4-D Amine COC	24 fl oz/A 1%v/v	5.5 c	35.3 b	85.0 a	30.0 -
5	A A A A B B B B	Assure II Liberty COC AMS Assure II Liberty COC AMS	12 fl oz/A 48.5 fl oz/a 1% v/v 3 lbs/A 12 fl oz/A 48.5 fl oz/A 1% v/v 3 lbs/A	45.0 b	82.0 a	47.5 bc	18.8 -
6	A A A A A B B B B	Assure II Liberty 2,4-D Amine COC AMS Assure II Liberty COC AMS	12 fl oz/A 48.5 fl oz/A 24 fl oz/A 1% v/v 3 lbs/A 12 fl oz/A 48.5 fl oz/A 1 % v/v 3 lbs/A	45.0 b	97.0 a	45.0 bc	22.5 -
Statistics[7]							
LSD P=.05				25.17	28.44	18.37	28.53
Standard Deviation				17.12	19.34	12.49	19.40
CV				42.93	22.47	22.3	80.2
Treatment Prob(F)				0.0001	0.0001	0.0001	0.2907

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

[7] All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.

43 DAT A – June, 9, 2022 2/2							
Trt. No.	App. Timing	Treatment	Rate	Smooth Brome Control (%)	Kentucky Bluegrass Control (%)	Green vegetation in Plot (%)	Woody Vine Control (%)
7	A A A B B B	AMV5233D COC AMS AMV5233D COC AMS	47.7 fl oz/A 1% v/v 3 lbs/A 47.7 fl oz/A 1% v/v 3 lbs/A	50.0 b	87.3 a	46.3 bc	36.3 -
8	A A A A B B B	AMV5233D 2,4-D Amine COC AMS AMV5233D COC AMS	47.7 fl oz/A 24 fl oz/A 1% v/v 3 lbs/A 47.7 fl oz/A 1% v/v 3 lbs/A	57.5 b	93.3 a	38.8 bc	25.0 -
Statistics[8]							
LSD P=.05				25.17	28.44	18.37	28.53
Standard Deviation				17.12	19.34	12.49	19.40
CV				42.93	22.47	22.3	80.2
Treatment Prob(F)				0.0001	0.0001	0.0001	0.2907

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

[8] All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.