

Esplanade at Early Preemergence Timings for Annual Invasive Grass Weed Control in CRP: Year 2

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The study was established on a conservation reserve program (CRP) site near Albion, WA. The objective of the study was to evaluate Esplanade® (indaziflam), indaziflam + rimsulfuron, and Plateau® 2XL (imazapic) for control of annual grasses (ventenata, *Ventenata dubia* (Leers) Coss., downy brome, *Bromus tectorum* L.) and medusahead *Taeniatherum caput-medusae* (L.) Nevski.) in Palouse prairie. Treatments were applied preemergent at 2 or 1 month prior to germination or early postemergence detailed in Tables 1 and 2. Application A was applied in August, application B in September and application C in October. The study was conducted in a randomized complete block design with 4 replications of 8' by 20' long plots.



Figure 1. Nontreated control for ICB0918 with transect line shown for collection of cover data. Contains ventenata, Idaho fescue, downy brome, medusahead and Western salsify

Biomass for all species was collected July 11, 2018 for assessment 11 months after the first treatment timing (MAAT) (10 months after the second treatment timing (MABT) or 9 months after the third treatment timing (MACT)) (Table 2). Invasive annual grass weed cover and desirable perennial grass cover was visually assessed 13 MAAT (12 MABT or 11 MACT) (Table 3). Second year biomass for all species was collected July 11, 2019 for assessment 23 MAAT (22 MABT or 21 MACT) (Table 4). Weed cover and perennial grass stand was visually assessed 24 MAAT (23 MABT or 22 MACT) (Table 5). Biomass was collected using 2 tenth meter squared quadrats randomly thrown in the plot. Cover data was collected using a 4-meter-long transect separated into 12 points. At each point, plant species were assessed at a foot off either side and assessed on a presence/absence basis. All data were subjected to an analysis of variance using the statistical package built into the Agricultural Research Manager software system (ARM 8.5.0, Gylling Data Management).

Table 1. Treatment application details for ICB0918.

Study Application	A	B	C
Date	August 23, 2017	September 26, 2017	October 16, 2017
Application volume (GPA)	20	20	20
Timing	2-month PRE	1-month PRE	Early POST
Air temperature (°F)	85.4	55.1	58
Soil temperature (°C)	22	14.5	9
Wind velocity (mph, direction)	5 W	0 N	4.5 N
Cloud cover	50%	2%	0

Results

During the first year; ventenata (VETDU) cover at 13 MAAT (12 MABT, 11 MACT) was the lowest using indaziflam + rimsulfuron applied at 6 oz A⁻¹ (79%) compared to the nontreated (100%) (Table 3). Biomass for VETDU at 11 MAAT (10 MABT, 9 MACT) was a significantly lower for all treatments (>35 g m⁻²) and the nontreated (93 g m⁻²) (Table 2). Notable treatments included indaziflam + rimsulfuron

at 4.5 oz A⁻¹ and 6 oz A⁻¹ (<5 g m⁻²) (Table 2). Downy brome (BROTE) and medusahead (ELYCM) biomass was similar to the nontreated (Table 2). There was also no difference in biomass among broadleaves however, all treatments released broadleaf biomass (>33 g m⁻²) compared to nontreated (3 g m⁻²). Low density perennial grass stands at the site may have contributed to the high number of broadleaves. The combination of all invasive annual grasses had the least amount of biomass when indaziflam + rimsulfuron was applied at 4.5 oz A⁻¹ and 6 oz A⁻¹ with a biomass of 6 g m⁻² and 1g m⁻², respectively (Table 2).

Perennial grass cover at 13 MAAT (12 MABT, 11 MACT) was not significant between the treatments (Table 3). Idaho Fescue (FESID) biomass at 11 MAAT (10 MABT, 9 MACT) had no significant difference between treatments (Table 2).

During the second year: VETDU cover at 24 MAAT (23 MABT, 22 MACT) did not have significant difference (Table 5). Biomass for VETDU at 23 MAAT (22 MABT, 21 MACT) was significant lower for esplanade and indaziflam + rimsulfuron treatments (<7 g m⁻²) compared to the nontreated (40 g m⁻²), except for esplanade applied at timing B (18 g m⁻²) which was not different from the nontreated control (Table 4). Plateau 2XL biomass (>17 g m⁻²) was similar to the nontreated (40 g m⁻²) (Table 4). Downy brome (BROTE) and medusahead (ELYCM) biomass were not different from the nontreated (Table 4). The broadleaf weed biomass was similar among herbicide treatments and timings. All invasive grass species had the least amount of biomass with Esplanade at 7 fl oz A⁻¹ and indaziflam + rimsulfuron was applied at 4.5 oz A⁻¹ found in timings B and C respectively (3 g m⁻²). Cover of ventenata in treatments containing indaziflam was attributed to the vententata completing its lifecycle by germinating and living in the residue layer present at the site. When assessed, the vententata noted in the plot had limited roots.

Cover for Idaho fescue 24 MAAT (23 MABT, 22 MACT) had no difference between timings or treatment types (Table 5). Biomass for Idaho fescue at 23 MAAT (22 MABT, 21 MACT) was not different between treatments (Table 4).

Figure 2. Climate from nearest weather station located ~4 miles east of trial site

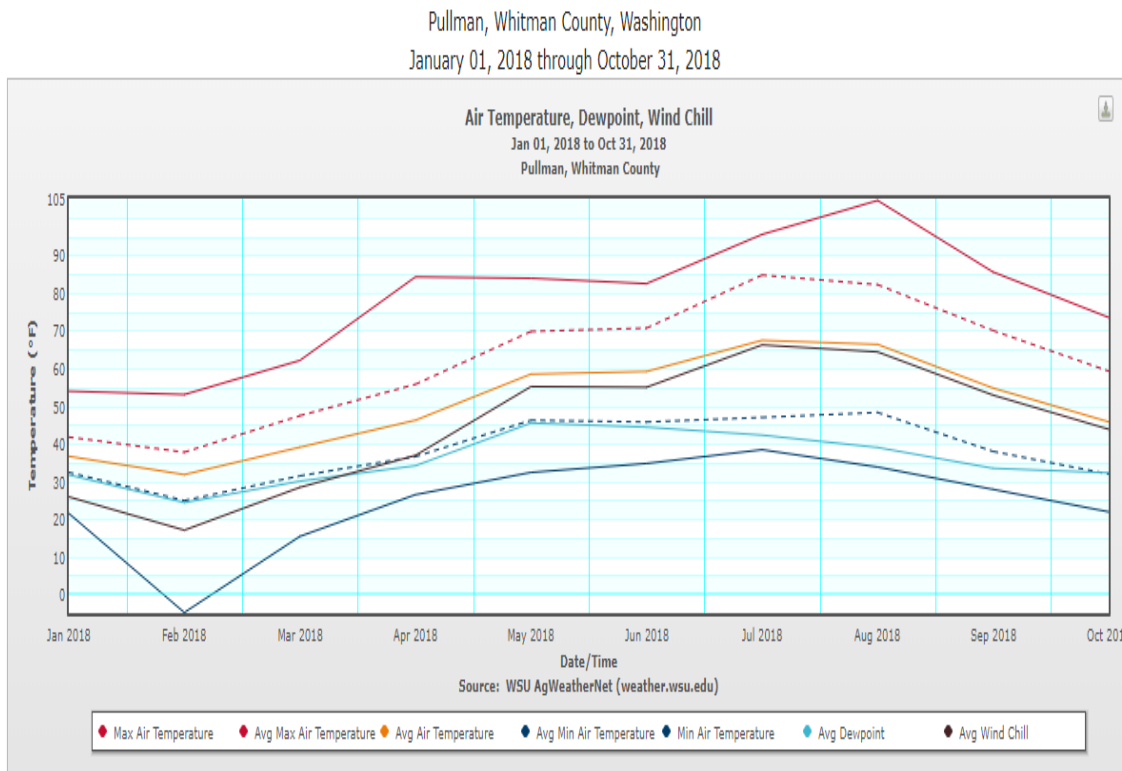


Table 2. Biomass of ventenata (VETDU), downy brome (BROTE), medusa-head rye (ELYCM), Idaho fescue (FESID), and all of the broadleaves or invasive annual grasses combined (COMBINED) on July 11, 2018 (11 MAAT, 10 MABT, 9 MACT) following application of indaziflam, rimsulfuron, and imazapic. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

YEAR 1: Biomass									
July 11, 2018 (11 MAAT, 10 MABT, 9 MACT)									
Treatment	Appl. Code	Rate		Invasive Annual Grass			Broadleaf Weeds	Desirable Perennial Grass	
		Field rate	lb ai A ⁻¹	VETDU	BROTE	ELYCM	COMBINED	COMBINED	FESID
		g m ⁻²							
Nontreated		-	-	93 a	2	1	118 a	3	12
Esplanade NIS	A	5 fl oz/A 0.25% v/v	0.065	35 b	2	0	80 ab	45	21
Esplanade NIS	A	7 fl oz/A 0.25% v/v	0.091	15 b	1	0	40 bc	47	46
indaziflam + rimsulfuron NIS	A	4.5 oz/A 0.25% v/v	0.047 0.063	1 b	0	1	28 bc	35	23
Plateau 2XL NIS	A	7 fl oz/A 0.25% v/v	0.109	32 b	0	2	40 bc	83	40
Esplanade NIS	B	5 fl oz/A 0.25% v/v	0.065	25 b	1	1	50 bc	57	48
Esplanade NIS	B	7 fl oz/A 0.25% v/v	0.091	7 b	2	0	19 bc	33	51
indaziflam + rimsulfuron NIS	B	4.5 oz/A 0.25% v/v	0.047 0.063	5 b	1	0	6 c	61	64
Plateau 2XL NIS	B	7 fl oz/A 0.25% v/v	0.109	21 b	0	0	30 bc	53	27
indaziflam + rimsulfuron NIS	C	3 oz/A 0.25% v/v	0.031 0.063	27 b	5	0	40 bc	58	45
indaziflam + rimsulfuron NIS	C	4.5 oz/A 0.25% v/v	0.047 0.063	1 b	5	2	17 bc	35	34
indaziflam + rimsulfuron NIS	C	6 oz/A 0.25% v/v	0.063 0.063	1 b	1	0	1 c	43	48
Plateau 2XL NIS	C	7 fl oz/A 0.25% v/v	0.109	35 b	0	0	40 bc	69	13
<i>LSD (P-value) = 0.05</i>				40	NS	NS	43	NS	NS

Table 3. Percent cover of ventenata (VETDU) and desirable perennial grasses at September 25, 2018 (13 MAAT, 12 MABT, 11 MACT) following application of indaziflam, rimsulfuron, and imazapic. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

YEAR 1: Cover				
			September 25, 2018 (13 MAAT, 12 MABT, 11 MACT)	
Treatment	Application Code	Field Rate	VETDU	Desirable Perennial Grasses
			%	
Nontreated		-	100 a	100
Esplanade NIS	A	5 fl oz/A 0.25% v/v	100 a	100
Esplanade NIS	A	7 fl oz/A 0.25% v/v	67 ab	100
indaziflam + rimsulfuron NIS	A	4.5 oz/A 0.25% v/v	100 a	100
Plateau 2XL NIS	A	7 fl oz/A 0.25% v/v	100 a	100
Esplanade NIS	B	5 fl oz/A 0.25% v/v	100 a	100
Esplanade NIS	B	7 fl oz/A 0.25% v/v	77 ab	100
indaziflam + rimsulfuron NIS	B	4.5 oz/A 0.25% v/v	69 ab	100
Plateau 2XL NIS	B	7 fl oz/A 0.25% v/v	100 a	100
indaziflam + rimsulfuron NIS	C	3 oz/A 0.25% v/v	75 ab	100
indaziflam + rimsulfuron NIS	C	4.5 oz/A 0.25% v/v	100 a	100
indaziflam + rimsulfuron NIS	C	6 oz/A 0.25% v/v	21 b	100
Plateau 2XL NIS	C	7 fl oz/A 0.25% v/v	94 a	100
<i>LSD (P-value = 0.05)</i>			<i>41.8</i>	<i>NS</i>

Table 4. Biomass for ventenata (VETDU), downy brome (BROTE), medusa-head rye (ELYCM), Idaho fescue (FESID), and all of the broadleaves or invasive annual grasses combined (COMBINED) on July 11, 2019 (23 MAAT, 22 MABT, 21 MACT) following application of indaziflam, rimsulfuron, and imazapic. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

YEAR 2: Biomass								
July 11, 2019 (23 MAAT, 22 MABT, 21 MACT)								
Treatment	Appl. Code	Field Rate	Invasive Annual Grasses				Broadleaf Weeds	Desirable Perennial Grass
			VETDU	BROTE	ELYCM	COMBINED	COMBINED	FESID
			g m⁻²					
Nontreated		-	40 a	1	0	27	15	41
Esplanade NIS	A	5 fl oz/A 0.25% v/v	7 b	1	0	7	9	95
Esplanade NIS	A	7 fl oz/A 0.25% v/v	3 b	1	0	3	10	106
indaziflam + rimsulfuron NIS	A	4.5 oz/A 0.25% v/v	6 b	3	0	8	17	112
Plateau 2XL NIS	A	7 fl oz/A 0.25% v/v	19 ab	5	1	21	18	36
Esplanade NIS	B	5 fl oz/A 0.25% v/v	18 ab	0	1	11	15	83
Esplanade NIS	B	7 fl oz/A 0.25% v/v	3 b	0	0	3	10	113
indaziflam + rimsulfuron NIS	B	4.5 oz/A 0.25% v/v	4 b	0	0	3	16	99
Plateau 2XL NIS	B	7 fl oz/A 0.25% v/v	17 ab	0	0	14	28	79
indaziflam + rimsulfuron NIS	C	3 oz/A 0.25% v/v	6 b	13	0	11	12	74
indaziflam + rimsulfuron NIS	C	4.5 oz/A 0.25% v/v	5 b	1	0	7	6	90
indaziflam + rimsulfuron NIS	C	6 oz/A 0.25% v/v	2 b	1	0	3	18	103
Plateau 2XL NIS	C	7 fl oz/A 0.25% v/v	24 ab	1	0	16	15	41
<i>LSD (P-value = 0.05)</i>			21	NS	NS	NS	NS	NS

