

Downy Brome and Ventenata Control with Indaziflam in CRP: Year 3

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The study was established on a conservation reserve program (CRP) site near Albion, WA. The objective was to evaluate Esplanade® (indaziflam), Roundup® (glyphosate), rimsulfuron, and Plateau® 2XL (imazapic) for control of annual grasses (ventenata, *Ventenata dubia* (Leers) Coss. and downy brome, *Bromus tectorum* L.) in Palouse prairie.

Treatments were applied in the winter of 2016 when perennial grasses were dormant as a broadcast foliar application, detailed in Table 1 and Table 2. The study was conducted in a randomized complete block with 4 replications with 10 ft by 30 ft long plots. The CRP site has been established for more than 10 years. The main desirable species found in the site are *Pseudoroegneria spicata* and *Festuca idahoensis* commonly known as bluebunch wheatgrass and Idaho fescue, respectively.

Annual grass weeds and perennial grass (DESIRE) stand cover were visually assessed 31 & 43 months after treatment (MAT) (Table 3 & 5). First year biomass for all species was collected August 8, 2018 for assessment 30 MAT (Table 2). Second year biomass for all species was collected July, 23, 2019 for assessment 41 MAT (Table 4). Biomass was collected using 2 tenth meter squared quadrats randomly thrown in the plot. Cover data was collected using a 4 meter transect separated into 12 points. At each point, plant species were looked 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).



Figure 1. Nontreated control of ICB0116. Contains Idaho fescue, bluebunch wheatgrass, prickly lettuce, medusahead and Western salsify.

Table 1. Treatment application details for ICB0116.

Study Application	A
Date	2/25/2016
Application volume (GPA)	15
Air Temperature (°F)	54
Soil Temperature (°F)	40
Wind velocity (mph, direction)	5, N
Cloud Cover (%)	0

Results

During the first year, ventenata (VETDU) and desirable perennial grass cover 31 MAT did not differ across any of the treatments (Table 3).

Ventenata (VETDU) biomass had the greatest reduction 31 MAT in any mixtures that included Esplanade (indaziflam) which reduced biomass to 8 g m⁻² or less (Table 2). Downy brome (BROTE) was not significantly different between treatments, however all treatments, except Esplanade (5 fl oz A⁻¹) + Roundup WeatherMax (12 fl oz A⁻¹), reduced biomass to less than the nontreated (Table 2). Broadleaf weed biomass was similar for all treatments and the nontreated.

Treatment effects in the first year on biomass for the desirable perennial species, Idaho fescue (FESID) and smooth brome (BROIN), was dependent upon species and herbicide. The dominant species in across the study site was FESID. Indaziflam + rimsulfuron (4.5 oz A⁻¹) resulted in the largest biomass of FESID (195 g m⁻²) 31 MAT compared to other treatments and the nontreated (59 g m⁻²). Indaziflam typically resulted in an increase in FESID biomass compared to the nontreated, while Plateau had FESID biomasses similar to the nontreated (Table 2). There were no treatment differences for BROIN biomass 31 MAT.

During the second year, the entire site was treated for annual grasses. As a result, no annual grass species except for small amounts of medusahead were found on the site.

For the second-year biomass, there was no differences in perennial grass biomass 41 months after treatment (MAT) (Table 4). Both main species of grass, Idaho fescue and bluebunch wheatgrass did not have any differences (Table 4). Medusahead which was the only annual grass found did not have any differences between treatments. All perennial grass species biomass including bluebunch wheatgrass, Idaho fescue, slender wheatgrass, and intermediate wheatgrass combined were not affected by the treatments. The combination of all broadleaves also had no differences.

Table 2. First-year biomass of ventenata (VETDU), downy brome (BROTE), Idaho fescue (FESID), smooth brome (BROIN), all the broadleaves combined, and all the invasive annual grasses or desirable perennial grasses combined following application of indaziflam with different tank partners. Means followed by the same letter are not statistically significantly different ($\alpha=.05$).

Year 1: Biomass									
August 8, 2018 (31 MAT)									
Treatment	Rate		Invasive Annual Grasses			Broadleaf Weeds	Desirable Perennial Grasses		
	Field rate	lb ai A ⁻¹	VETDU	BROTE	COMBINED	COMBINED	BROIN	FESID	COMBINED
----- g m ⁻² -----									
Nontreated	-	-	50 a	11	61 ab	5	50	59 b	67 ab
Esplanade	5 fl oz/A	0.065							
Roundup WeatherMax	12 fl oz/A	0.420	8 b	39	19 bc	3	15	115 ab	120 ab
Induce	0.25% v/v								
Esplanade	7 fl oz/ A	0.091							
Roundup WeatherMax	12 fl oz/A	0.420	6 b	.01	5 c	8	70	100 ab	124 ab
Induce	0.25% v/v								
Rimsulfuron	3 oz/A	0.047	76 a	1	54 ab	8	3	82 ab	40 b
Induce	0.25% v/v								
Rimsulfuron	4 oz/A	0.063	116 a	1	117 a	5	8	60 b	54 ab
Induce	0.25% v/v								
Indaziflam+	4.5 oz/A	0.047							
Rimsulfuron		.0626	4 b	3	5 c	3	4	195 a	151 a
Induce	0.25% v/v								
Indaziflam+	6 oz/A	0.063							
Rimsulfuron		.0626	8 b	-	5 c	8	48	121 ab	74 ab
Induce	0.25% v/v								
Plateau 2XL	7 fl oz/A	0.109							
Induce	0.25% v/v		87 a	0.4	87 a	1	2	53 b	45 ab
Roundup WeatherMax	12 fl oz/A	0.420							
Induce	0.25% v/v		89 a	5	91 a	7	11	63 b	50 ab
		LSD (P-value=0.05)	3	NS	4	NS	NS	NS	NS

Table 3. First-year percent cover of ventenata (VETDU) and desirable perennial grasses following application of indaziflam with other tank partners. MAT = months after treatment. Means followed by the same letter are not statistically significantly different ($\alpha=.05$).

Year 1: Cover			
		September 25, 2018 (31 MAT)	
Treatment	Field rate	VETDU	Desirable Perennial Grasses
		%	
Nontreated	-	100	100
Esplanade	5 fl oz/A		
Roundup WeatherMax	12 fl oz/A	100	100
Induce	0.25% v/v		
Esplanade	7 fl oz/ A		
Roundup WeatherMax	12 fl oz/A	69	100
Induce	0.25% v/v		
Rimsulfuron	3 oz/A		
Induce	0.25% v/v	100	100
Rimsulfuron	4 oz/A		
Induce	0.25% v/v	100	100
Indaziflam+Rimsulfuron	4.5 oz/A		
Induce	0.25% v/v	88	100
Indaziflam+Rimsulfuron	6 oz/A		
Induce	0.25% v/v	90	100
Plateau 2XL	7 fl oz/A		
Induce	0.25% v/v	100	100
Roundup WeatherMax	12 fl oz/A		
Induce	0.25% v/v	100	100
LSD (P-value=0.05)		NS	NS

Table 4. Second-year biomass of Idaho fescue (FESID), bluebunch wheatgrass (AGRSP), medusahead (ELYCM), prickly lettuce (LACSE), western salsify (TRODM), and all the broadleaves combined, and all desirable perennial species combined following application of indaziflam with different tank partners. MAT = months after treatment. Means followed by the same letter are not statistically significantly different ($\alpha=.05$).

Year 2: Biomass								
		July 23, 2019 (41 MAT)						
Treatment	Field rate	Invasive Annual Grasses	Broadleaf Weeds			Desirable Perennial Grasses		
		ELYCM	LACSE	TRODM	COMBINED	FESID	AGRSP	COMBINED
g m ⁻²								
Nontreated	-	0	14	3	58	8	39	47 c
Esplanade	5 fl oz/A							
Roundup WeatherMax	12 fl oz/A	0	3	5	38	1	59	60 c
Induce	0.25% v/v							
Esplanade	7 fl oz/ A							
Roundup WeatherMax	12 fl oz/A	0	27	3	80	0	40	40 c
Induce	0.25% v/v							
Rimsulfuron	3 oz/A							
Induce	0.25% v/v	0	15	5	54	9	65	73 bc
Rimsulfuron	4 oz/A							
Induce	0.25% v/v	0	11	12	57	0	37	57 c
Indaziflam+Rimsulfuron	4.5 oz/A							
Induce	0.25% v/v	0.2	3	1	16	25	121	145 ab
Indaziflam+Rimsulfuron	6 oz/A							
Induce	0.25% v/v	0	5	2	35	2	81	83 bc
Plateau 2XL	7 fl oz/A							
Induce	0.25% v/v	1	35	22	96	1	27	28 bc
Roundup WeatherMax	12 fl oz/A							
Induce	0.25% v/v	0	14	5	46	34	8	173 a
LSD (P-value=0.05)		NS	NS	NS	NS	NS	NS	60

Table 5. Second-year percent cover of Idaho fescue (FESID), bluebunch wheatgrass (AGRSP), medusa-head rye (ELYCM), prickly lettuce (LACSE), western salsify (TRODM), and panicle willowweed (EPIP) following application of indaziflam with different tank partners. MAT = months after treatment. Means followed by the same letter are not statistically significantly different ($\alpha=.05$).

		Year 2: Cover					
		September, 16 2019 (43 MAT)					
Treatment	Field rate	Invasive Annual Grasses	Broadleaf Weeds			Desirable Perennial Grasses	
		ELYCM	LACSE	TRODM	EPIP	FESID	AGRSP
		%					
Nontreated	-	0	100	100	100	100	100
Esplanade	5 fl oz/A						
Roundup WeatherMax	12 fl oz/A	0	100	100	100	100	100
Induce	0.25% v/v						
Esplanade	7 fl oz/A						
Roundup WeatherMax	12 fl oz/A	0	100	100	100	100	100
Induce	0.25% v/v						
Rimsulfuron	3 oz/A						
Induce	0.25% v/v	0	100	100	100	100	100
Rimsulfuron	4 oz/A						
Induce	0.25% v/v	0	100	100	100	100	100
Indaziflam+Rimsulfuron	4.5 oz/A						
Induce	0.25% v/v	13	100	100	100	100	100
Indaziflam+Rimsulfuron	6 oz/A						
Induce	0.25% v/v	0	100	100	100	100	100
Plateau 2XL	7 fl oz/A						
Induce	0.25% v/v	25	100	100	100	100	100
Roundup WeatherMax	12 fl oz/A						
Induce	0.25% v/v	0	100	100	100	100	100
LSD (P-value=0.05)		NS	NS	NS	NS	NS	NS

Figure 2. Climate (2018) from nearest weather station located ~4 miles east of trial site

