

Final Report:

Split Residual Herbicide Treatments for Late-Season Weed Control

Andrew Kniss, Jim Heitholt, Tyler Hicks, and McKenzie Barth

University of Wyoming, Department of Plant Sciences

Dry bean producers across Wyoming, especially those growing dry bean for seed, are continuing to encounter late-season weeds. These weeds present harvest challenges and also cleaning issues after harvest, even though they may not have substantial impact on total dry bean yield. Herbicide programs in dry beans typically include both preemergence (PRE) and postemergence (POST) herbicides sprayed sequentially during the growing season. PRE herbicides control early-emerging weeds (like kochia and common lambsquarters) but dissipate in the soil before some late-season weeds emerge. POST herbicides are typically effective for emerged weeds, but do not provide sufficient residual weed control to control weeds emerging after the POST application (including pigweed and nightshade species, and Venice mallow among others).

The objective of this research was to evaluate the use of two soil-residual herbicides (halosulfuron and dimethenamid-P) in two different use patterns:

- the full recommended rate applied before dry bean emergence (PRE)
- a partial rate applied before bean emergence and another application again at the bean 2 to 3 trifoliolate stage (SPLIT)

Our hypothesis was that the SPLIT application will reduce late-season weed density compared to PRE treatments, but may negatively impact control of early-emerging weeds.

METHODS:

Field studies were conducted at the Powell Research and Extension Center in 2021 and repeated in 2022. 'Poncho' dry bean was planted in 22-inch rows, and PRE herbicide treatments were applied within 1 day of planting. POST herbicide treatments were applied when the dry beans were at the 2 to 3 trifoliolate stage of growth. The residual herbicides halosulfuron (trade name: Permit) and dimethenamid-P (trade name: Outlook) were applied either at the full recommended rate PRE or split into PRE and POST applications (Table 1). Weed density was evaluated approximately 30 d after POST applications, and beans were harvested for yield at maturity (September). The study design was a randomized complete block with four replicates per year. Weed density and bean yield was analyzed using contrasts to compare PRE treatments with SPLIT treatments for each herbicide.

Table 1. PRE and SPLIT treatment groups for Permit (halosulfuron) and Outlook (dimethenamid-P) applied in the field studies at Powell, 2021 and 2022.

Timing	Herbicide	Trade name	Product rate	Treatment Group
Planting	pendimethalin halosulfuron	Prowl + Permit	2 pints/A 0.66 oz/A	Permit PRE
Planting	pendimethalin halosulfuron	Prowl + Permit	2 pints/A 0.66 oz/A	Permit PRE
2-3 trifoliolate	imazamox + bentazon	Varisto	21 fl oz/A	
Planting	pendimethalin halosulfuron	Prowl + Permit	2 pints/A 0.5 oz/A	Permit SPLIT
2-3 trifoliolate	halosulfuron	Permit	0.5 oz/A	
Planting	pendimethalin halosulfuron	Prowl + Permit	2 pints/A 0.5 oz/A	Permit SPLIT
2-3 trifoliolate	imazamox + bentazon halosulfuron	Varisto + Permit	21 fl oz/A 0.5 oz/A	
Planting	pendimethalin dimethenamid-P	Prowl + Outlook	2 pints/A 21 fl oz/A	Outlook PRE
Planting	pendimethalin dimethenamid-P	Prowl + Outlook	2 pints/A 21 fl oz/A	Outlook PRE
2-3 trifoliolate	imazamox + bentazon	Varisto	21 fl oz/A	
Planting	pendimethalin dimethenamid-P	Prowl + Outlook	2 pints/A 10 fl oz/A	Outlook SPLIT
2-3 trifoliolate	dimethenamid-P	Outlook	11 fl oz/A	
Planting	pendimethalin dimethenamid-P	Prowl + Outlook	2 pints/A 10 fl oz/A	Outlook SPLIT
2-3 trifoliolate	imazamox + bentazon dimethenamid-P	Varisto + Outlook	21 fl oz/A 11 fl oz/A	

RESULTS:

Split applications of halosulfuron (Permit) reduced hairy nightshade by 57% compared to PRE treatments, but did not significantly impact density of pigweed, lambsquarters, or kochia (Figure 1). Split applications of dimethenamid-P (Outlook) reduced density of hairy nightshade by 52%, redroot pigweed by 58%, and common lambsquarters by 42% compared to PRE treatments. Split application of residual herbicides did not affect kochia density compared to the full rate applied PRE.

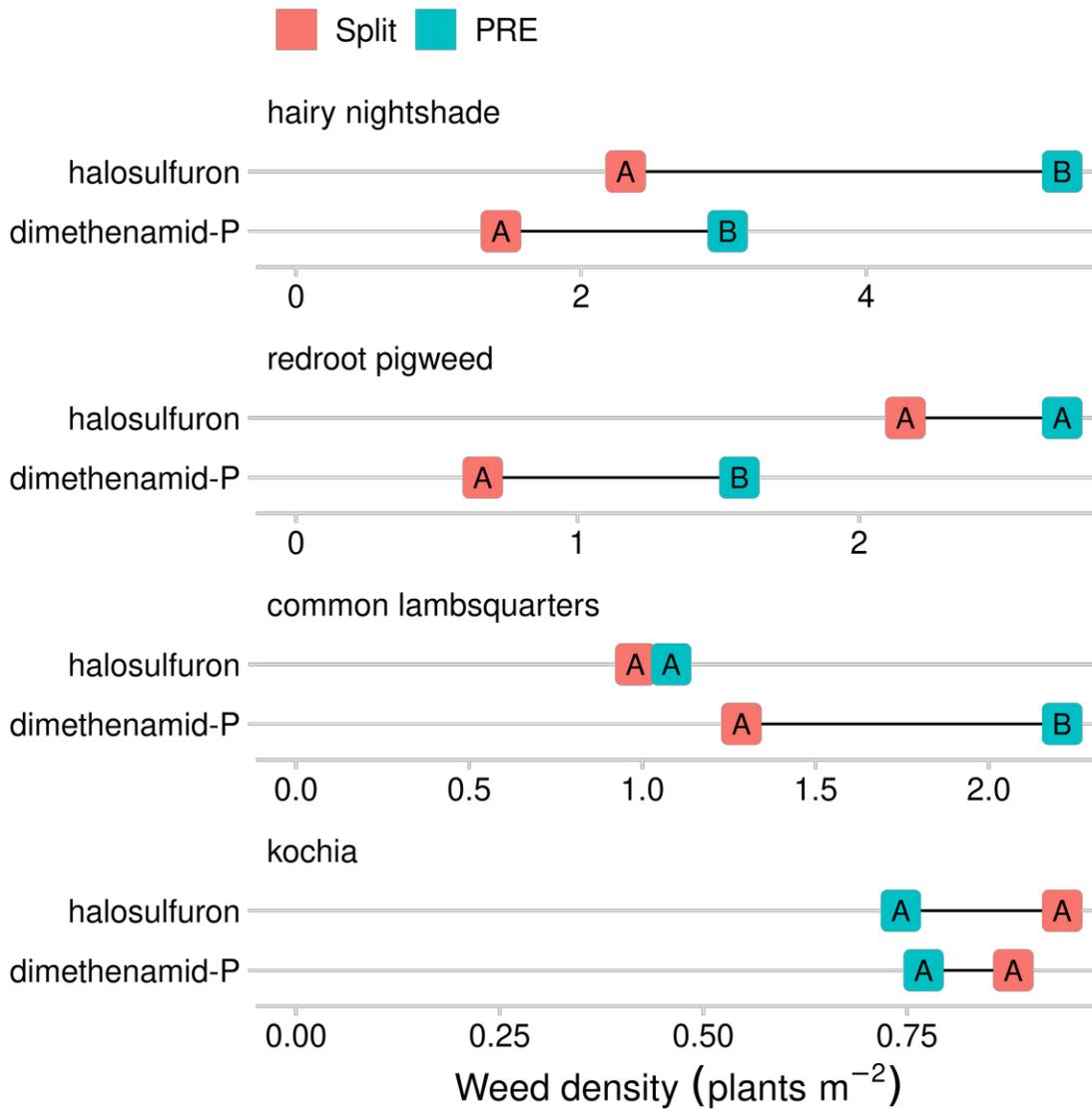


Figure 1. Weed density in response to herbicide and application pattern. Points on the same line with the same letter indicate the estimated marginal means are not statistically different (P-value > 0.05).

Table 2. Dry bean yield in response to herbicide and application pattern.

Herbicide	Application timing	Dry bean yield
		- lbs/acre -
halosulfuron (Permit)	PRE	1350
halosulfuron (Permit)	SPLIT	1750
dimethenamid-P (Outlook)	PRE	1780
dimethenamid-P (Outlook)	SPLIT	1640
		NS

Dry bean yield was not significantly different between PRE and SPLIT treatments (Table 2). Split application of residual herbicides has the potential to reduce weed density without negatively impacting dry bean yield or early emerging weed control.