



Efficacy of Residual Herbicides for Weed Control & Reducing Weed Impacts on Alfalfa Yield & Quality

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RATIONALE & OBJECTIVES

- Annual weeds can impact the economics of alfalfa production by reducing forage yield, nutritive value or by contaminating hay.
- As weeds continue to develop resistance to commonly used postemergence alfalfa herbicides, there's the need to evaluate the efficacy of residual herbicides and their impact on forage yield and quality.

Objectives:

Evaluate residual herbicide programs and application timing for control of herbicide-resistant weeds.

Determine the impact of weed control on alfalfa hay yield and quality.

STUDY METHODOLOGY

Locations:

Kimberly, ID and Scottsbluff, NE.

Years:

2021 and 2022.

Factors:

Postemergence herbicide (POST): paraquat vs no paraquat

Residual herbicides: non-treated; pendimethalin (Prowl® H2O) after 1st cutting; Prowl® H2O after 1st and 2nd cutting; acetochlor (Warrant®) after 1st cutting; Warrant® after 1st and 2nd cutting; flumioxazin (Valor® SX) after 1st cutting; flumioxazin (Valor® SX) after 1st and 2nd cutting.

Data collection:

Weed control, weed biomass, forage yield, and forage quality.

RESULTS

- Weed control was mostly due to the application of paraquat and treatments containing Prowl H2O resulted in slightly better weed control than Warrant and Valor SX (Figures 1 & 2).
- Weed control treatments had little impact on alfalfa and total forage yield (alfalfa + weeds). Where there were differences in forage yield due to treatments, it was as a result of weed biomass from poor weed control treatments (Table 1).
- Reduction in weed biomass due to good weed control increased forage quality (Figure 3).
- The relationship between the proportion of individual weed species biomass and alfalfa nutritive value was linear for all weed species evaluated and there were differences among weed species (Figure 4).

Figure 1. Efficacy of herbicides applied after the first cutting (cut 1) and first and second cutting (cut 1 & 2) on common lambsquarters and kochia control in 2021 and 2022, Kimberly ID. Data from 4 weeks after last herbicide application.

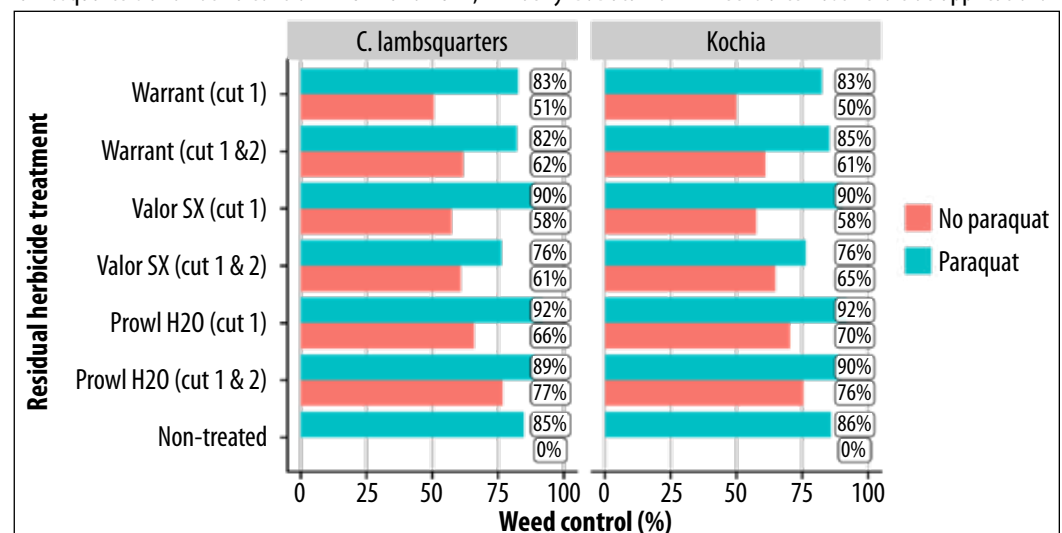


Figure 2. Paraquat application resulted in good weed control and high crop injury but the alfalfa recovered within three weeks after application.



No paraquat



1 week after paraquat application

Table 1. Weed biomass and forage yield as influenced by postemergence (POST) and residual herbicide treatments at 2nd cutting in 2021 and 2022, Scottsbluff, NE, USA.

Factor	Lamb ¹	Palmer ¹	Biomass		
			Total Weed	Alfalfa	Total Forage
-----Biomass (ton/A)-----					
POST	<i>P</i> = 0.09	<i>P</i> = 0.25	<i>P</i> = 0.24	<i>P</i> = 0.01	<i>P</i> = 0.01
No paraquat	0.32 a ²	0.32 a	1.12 a	2.19 a	2.30 a
Paraquat	0.23 a	0.24 a	0.89 a	1.91 b	1.99 b
Residual	<i>P</i> < 0.001	<i>P</i> = 0.02	<i>P</i> = 0.03	<i>P</i> = 0.13	<i>P</i> = 0.04
Non-treated	0.61 a	0.37 ab	1.36 a	2.27 a	2.94 a
Prowl [®] H2O, 1 st cut	0.16 d	0.16 b	0.85 bc	1.93 a	1.99 bc
Prowl [®] H2O, 1 st & 2 nd cut	0.13 d	0.30 ab	0.75 c	1.88 a	1.90 c
Warrant [®] , 1 st cut	0.30 c	0.16 b	1.10 ab	2.31 a	2.36 ab
Warrant [®] , 1 st & 2 nd cut	0.33 bc	0.15 b	1.08 a-c	2.12 a	2.22 a-c
Valor SX [®] , 1 st cut	0.34 bc	0.34 a	1.00 bc	2.03 a	2.13 a-c
Valor SX [®] , 1 st & 2 nd cut	0.44 b	0.45 a	0.90 bc	1.82 a	1.91 bc
POST * Residual	<i>P</i> = 0.22	<i>P</i> = 0.62	<i>P</i> = 0.49	<i>P</i> = 0.82	<i>P</i> = 0.89

¹Lamb; common lambsquarters; Palmer; Palmer amaranth.

²Within columns for each factor, means followed by the same letters are not different according to Fisher's protected LSD at the 0.05 significance level.

Figure 3. Linear relationships between weed biomass proportion and alfalfa forage quality.

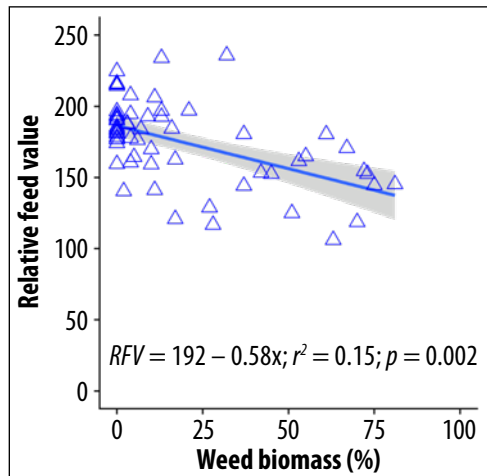
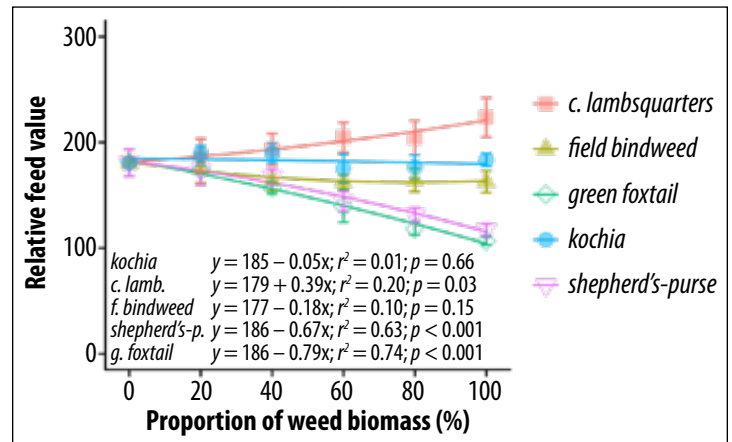


Figure 4. Linear relationship between the biomass proportion of individual weed species (kochia, common lambsquarters, field bindweed, shepherd's-purse, and green foxtail) and alfalfa forage quality.



CONCLUSIONS/SUGGESTIONS

- Residual herbicides, especially Prowl H2O and Valor SX are promising for the control of ALS and glyphosate-resistant weeds such as kochia and Palmer amaranth in alfalfa.
- Postemergence and residual weed control treatments had little impact on alfalfa and total forage yield (alfalfa + weeds) and thus, these herbicide programs may not be economical under very low weed pressure.
- With heavy weed pressure, effective weed control may improve forage quality by reducing weed biomass.
- There's a need to evaluate these residual herbicides as part of herbicide programs that include other herbicides applied at planting (before first cutting).
- Although paraquat remains an effective herbicide for postemergence weed control in alfalfa (Figure 2), there's a need to evaluate alternative postemergence burndown herbicide for weed control between cutting.