Evaluation of the Efficacy of Herbicide Tank-Mixes and Sequential Applications for the Control of Plantain (*Plantago* spp.) in Alfalfa

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RATIONALE & OBJECTIVES

- In 2018-2019, field and greenhouse trials were conducted in New Mexico to evaluate Sharpen® (saflufenacil) tank-mixed with other herbicides (initial and sequential applications) as potential options for control of broadleaf and buckhorn plantain in dormant-season alfalfa.

Objectives:

Compare the weed control performance of initial and sequential applications of Sharpen® alone or in combination with commercially available herbicide standards under greenhouse conditions.

Evaluate the effects of alfalfa yield as a result of initial or sequential applications of Sharpen® alone or in combination with other commercially available herbicide standards.

STUDY DESCRIPTION

Plot layout:

Field Study: Randomized complete block design, Los Lunas and Las Cruces, NM.

Greenhouse Study: Randomized complete block design, Las Cruces, NM.

Factors:

Field Study: Alfalfa varieties in both locations were not Roundup Ready®.

Los Lunas – mature, 6+ year old alfalfa (Reward II; fall dormancy = 4, dormant).

- Initial app. of treatments December 12, 2018; sequential January 22, 2019 (6 weeks after initial treatment (WAIT)).

Las Cruces – mature, 4+ year old alfalfa (TMA 990 Brand; fall dormancy = 9, non-dormant).

- Initial app. of treatments December 5, 2019; sequential January 15, 2019 (6 WAIT).
- Thirteen herbicide treatments including non-treated control (NTC).
  - › High rates of Sharpen® alone or tank-mixed with high rates of other commercially-available herbicides.
- Harvest yield data.
  - › Los Lunas – June 20, 2019 (27 WAIT); July 6, 2019 (30 WAIT).
  - › Las Cruces – April 9, 2019 (19 WAIT); June 6, 2019 (24 WAIT).
- Prior to each harvest, visible herbicide injury and reduction in canopy density and plant height was observed for Sharpen® + Roundup® treatments following initial and sequential applications at both locations.

Greenhouse Study: broadleaf and buckhorn plantain seeded into flats with potting soil, then transplanted into cone-tainers.

- Same thirteen herbicide treatments including NTC as used in field trial.
  - › Applied January 7, 2019; sequential in February 7, 2019 (4 WAIT).
- Percentage of injury data collected visually once a week after application for 6 WAIT.

Analysis:

Data were subjected to an analysis of variance (ANOVA) using SAS Proc Mixed followed by multiple comparisons of means using Fisher's LSD test at the α=0.05 probability level.

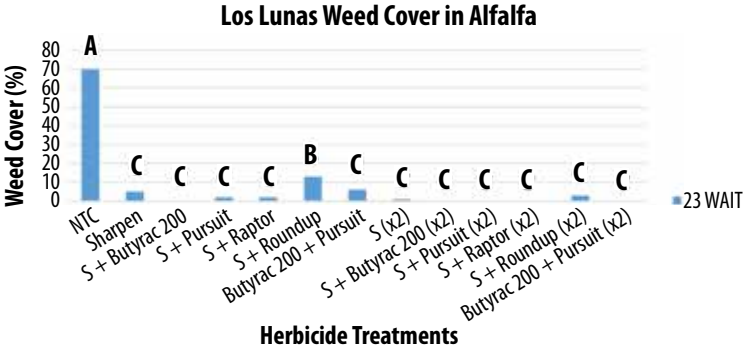
FIELD TRIAL RESULTS

- The final weed coverage (%) rating date (23 WAIT) at Los Lunas, indicated that initial and sequential herbicide applications of any treatment that contained Sharpen®, as well the sequential applications of Butyrac 200® + Pursuit® provided residual late-season annual weed (non-plantain) control when significantly higher populations of annual sowthistle (*Sonchus oleraceus*) and prickly lettuce (*Lactuca serriola*) were observed in the NTC and the initial Sharpen® + Roundup® treatments (**Figure 1**).
- Applications of Sharpen® + Roundup® resulted in a significant reduction in dry matter alfalfa yield for the first harvest date (19 WAIT) at Las Cruces, NM (**Figure 2**), but not at the second Las Cruces harvest, nor any of the harvest dates at Los Lunas (data not shown). This is

likely due to the continued growth of the non-dormant variety grown at Las Cruces compared to the dormant variety used at Los Lunas.

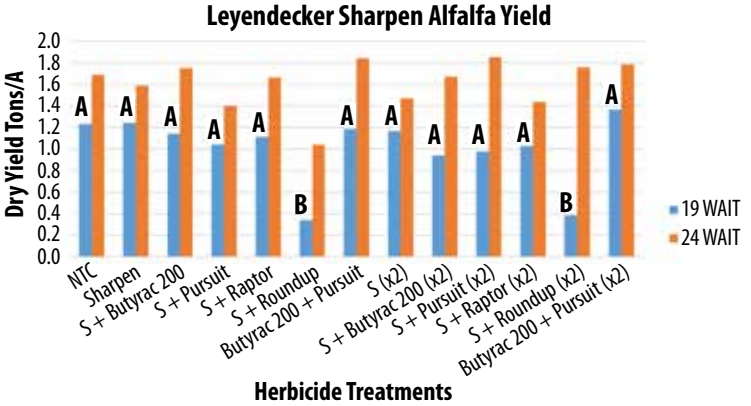
- The addition of a sequential herbicide application did not significantly reduce alfalfa yield for either locations (data not shown).

Figure 1. Weed percent cover (%) in response to applications of initial and sequential tank-mixes of Sharpen® combined with other commercially available herbicides at the New Mexico State University Agricultural Science Center at Los Lunas, NM. Initial applications were made on December 12, 2018, and sequential applications were made on January 22, 2019 (6 WAIT).



Bars having the same letters are not significantly different at α = 0.05, LSD = 6.52; S = Sharpen®; x2 = sequential application of herbicide treatment 6 WAIT; LSD = least significant difference. Predominant weeds that were present in the NTC plots and areas surrounding the trial included annual sowthistle (*Sonchus oleraceus*) and prickly lettuce (*Lactuca serriola*).

Figure 2. Alfalfa dry matter (DM) yield for 2 cuttings in 2019 in response to applications of initial and sequential tank-mixes of Sharpen® combined with other commercially available herbicides at the New Mexico State University Leyendecker Plant Sciences Center at Las Cruces, NM. Initial applications were made on December 12, 2018, and sequential applications were made on January 22, 2019 (6 WAIT).

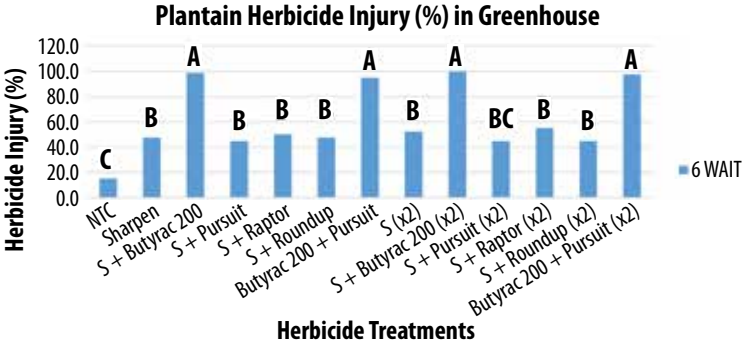


Bars having the same letters are not significantly different at α = 0.05, LSD = 0.7 (19 WAIT) and 0.5 (24 WAIT); S = Sharpen®; x2 = sequential application of herbicide treatment 6 WAIT; LSD = least significant difference.

GREENHOUSE TRIAL RESULTS

- After 6 WAIT, visual ratings for percent weed injury (%) on broadleaf plantain indicated that applications of Sharpen® + Butyrac 200® and Butyrac 200® + Pursuit® provided the highest percentages of weed injury compared to other herbicide treatments (Figure 3).
- By 6 WAIT, all herbicide combinations and application timings that contained Sharpen® and a mixture of Butyrac 200® + Pursuit® provided significantly greater herbicide injury symptoms compared to the NTC.
- By 6 WAIT, the addition of sequential treatments of all herbicide combinations did not result in a significant increase in injury to broadleaf plantain.

Figure 3. Visual ratings for percent injury (%) to broadleaf plantain in 2019 in response to applications of initial and sequential tank-mixes of Sharpen® combined with other commercially available herbicides at the New Mexico State University Leyendecker Plant Sciences Center Greenhouse at Las Cruces, NM. Initial applications were made on January 7, 2019, and sequential applications were made on February 7, 2019 (4 WAIT).



Bars having the same letters are not significantly different at α = 0.05, LSD = 27.4; S = Sharpen®; x2 = sequential application of herbicide treatment 4 WAIT; LSD = least significant difference.

CONCLUSIONS

- Field observations of dry yield in response to applications of Sharpen® tank-mixed with other commercially available herbicides indicated that Sharpen® tank-mixes may be applied in semi-dormant alfalfa with minimal affects to yield. However, caution should be approached when applying Sharpen® + Roundup® where alfalfa fall dormancy does not allow for slowed-growth during the winter months and the alfalfa variety is not Roundup Ready®.
- Field observations for the amount of weed cover (%) within test plots indicated that Sharpen® would be a viable candidate for late-season residual control of winter annual weeds such as prickly lettuce compared to the NTC.
- The greenhouse data indicated that Sharpen® tank-mixed with Butyrac 200® may provide adequate injury to control broadleaf plantain; however, sequential applications were not needed for increased injury. This research continues.

Alfalfa
U.S. Alfalfa Farmer Research Initiative

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