

2017 USAFRI Research Project Objectives

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

Project Award: \$8,580

Justification:

- As of 2017, alfalfa hay remains the most valuable cash crop in the state of New Mexico with an estimated annual gross of just over \$168 million (Lauriault et al., 2017). Additionally, hay yields reflected a 2% increase, along with an increase in revenue of \$10 million, compared to 2016 for the state. Furthermore, the overall value of alfalfa hay is further increased by its essential contributions, as feed and forage, to livestock production (i.e. meat, milk, textiles) which continues to lead New Mexico in overall agricultural commodities. According to the New Mexico Agricultural Statistics for 2016, the dairy industry contributed approximately \$1.19 billion in total milk sales with the livestock industry netting \$895 million in total sales for the State of New Mexico (USDA NASS, 2017). Crop production acreage and the availability of resources for management continue to decline; however, it is still important to maximize yield and quality of all alfalfa production as much as possible during the growing season to meet the ever-increasing agricultural needs of growers, producers, farmers, ranchers, dairy managers, and industry personnel throughout the state of New Mexico.

As demand for quality alfalfa continues to increase, managing weeds remains a critical and ever-present component of successful production. While weeds that emerge during the initial seeding stages of alfalfa typically have the greatest impact by competing for light, water, space, and nutrients, late season weeds that populate established alfalfa fields can have a significant impact on yield through continued competition for resources throughout the growing season (Beck et al., 2017). Additionally, the presence of late-season annual and perennial weeds can lower forage quality, reduce stand longevity, cause premature stand loss or reduction, increase the incidence of disease and insect damage, and create detrimental harvesting issues (Ashigh et al., 2010; Green et al., 2003, Gilbert et al., 1988).

Perennial weed populations are especially difficult to control in perennial crops like alfalfa, because management practices have to address seed production and vegetative reproductive structures which allow the plant to survive from season to season. Simple perennial weeds like plantain (*Plantago* spp.) have a hardy root system that allows the plant to die back and survive during non-ideal environmental conditions, then proctors tissue regrowth and re-establishment once conditions become ideal again. Broadleaf plantain (*P. major*) and buckhorn plantain (*P. lanceolata*) are particularly difficult-to-control weeds whose infestations are widespread in alfalfa fields throughout the state of New Mexico and other areas of the western U.S. (Sulser and Whitesides, 2012; Elmore et al., 2007). Weed management on these simple perennial weeds must focus primarily on injury to the root system; however, it is difficult for herbicide active ingredients to move effectively enough within the entire plant to injure a hearty root system located deep within the soil (Elmore et al., 2007). Similarly, the use of herbicides to control broadleaf weeds like plantain in a broadleaf crop like alfalfa further complicate any effective management. As a result, there are only a few registered herbicides, such as glyphosate and MCPA that have been reported to cause injury to plantain in alfalfa fields in New Mexico (Beck et al., 2017). Additionally, the continued use of these select few herbicide active ingredients to manage a specific population of weeds like plantain in alfalfa over time, can also lead to the development of herbicide resistance in the target weeds (Orloff et al., 2009). As a result, research to evaluate the effectiveness of

newly registered herbicides, as well as tank-mixes of older traditional herbicides with different active ingredients is greatly warranted for control of plantain in alfalfa.

Sharpen® (BASF Corporation) has recently acquired a supplemental label for broadleaf weed control in dormant-season alfalfa in the state of New Mexico (BASF Corporation, 2017). The active ingredient in Sharpen® is saflufenacil, which causes plant cell membrane damage and eventually plant death by inhibiting the production of protoporphyrinogen-oxidase (herbicide group 14). Specifically, Sharpen® can offer contact burn-down control of perennial broadleaf weeds including, but not limited to, field bindweed (*Convolvulus arvensis*) and dandelion (*Taraxacum officinale*) during limited (dormant) season growth of alfalfa. Sharpen® was assessed as a potential herbicide option for late-season broadleaf and buckhorn plantain control in greenhouse evaluations and crop injury assessed in alfalfa fields in Los Lunas in 2017 and 2018. Single applications of the highest rate of Sharpen® resulted in injury to the plantain, yet they eventually recovered (data not shown). One treatment that was added to the 2017-2018 greenhouse trial was an application of Sharpen® combined with a second active ingredient, which yielded the most herbicide injury to the plantain, but limited control (data not shown). As a result, further research into applications of Sharpen®, as well as tank-mixes and sequential applications of saflufenacil combined with other active ingredients to potentially improve plantain control in alfalfa is warranted. The objectives of this study are to: 1) compare the weed control performance of initial and sequential applications of saflufenacil alone or in combination with commercially available herbicide standards under greenhouse conditions, and 2) evaluate the effects on alfalfa quality and yield as a result of the applications of single or multiple applications of saflufenacil alone or in combination with other commercially available herbicide products. Should results indicate that Sharpen®, alone or tank-mixed, provides acceptable control of plantain and equivalent crop safety compared to the non-treated control, we will take action to include plantain as a target weed in the most up-to-date product label.

The results of this study will be shared with alfalfa growers and professionals at the 2019 Southwest Hay & Forage Conference, County Forage Workshops, and Field Days taking place at the Agricultural Science Centers throughout the region. Results will also be published in both research and extension publications with credit given to NAFA and USAFRI, respectively.

Objectives:

- The objectives of this project are to 1) Compare the weed control performance of initial and sequential applications of saflufenacil alone or in combination with commercially available herbicide standards under greenhouse conditions, and 2) Evaluate the effects on alfalfa quality and yield as a result of the applications of single or multiple applications of saflufenacil alone or in combination with other commercially available herbicide products.