

CHANGING TRENDS IN NORTHEAST CALIFORNIA ALFALFA WEED MANAGEMENT

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ABSTRACT

Northeast California alfalfa producers have experienced reduced winter annual weed control in recent years with paraquat + metribuzin especially with shepherdspurse. Several factors seem to explain the poor weed control including changes in weed growth, weather, and crop management. Weed control trials conducted near Tulelake, CA from 2021 to 2024 evaluated herbicide performance in established alfalfa. Fall applied paraquat or saflufenacil with or without a preemergent herbicide, late winter applied flumioxazin + paraquat or saflufenacil, and fall and spring applied imazamox gave significantly better control of shepherdspurse compared to late winter applied paraquat + metribuzin. Flumioxazin + paraquat or saflufenacil gave over 90% control of flixweed and prickly lettuce. Spring applied imazamox provided less than 50% control of both weeds. A major downside to using flumioxazin and saflufenacil in established alfalfa is they do not control emerged grass weeds. Paraquat is the only labeled herbicide for controlling small, emerged broadleaf and grass weeds in established conventional alfalfa.

Introduction

Northeast California alfalfa growers have relied on a combination of paraquat and metribuzin or hexazinone applied in late February or early March to control winter annual weeds in established alfalfa for the last twenty years. Unfortunately, winter annual weed control in conventional alfalfa has become increasingly difficult in recent years. Five circumstances explain the reduced weed control from late winter dormant herbicide treatment. First, some weeds especially shepherdspurse are emerging earlier in the fall (September) and growing more during warm winter weather patterns making them too big to control with conventional dormant season herbicides. Second, alfalfa stand density in several fields has decreased due to summer drought, irrigation curtailments, and delayed stand removal. Third, windy weather can delay applications of winter dormant herbicides into late March or early April, again allowing weeds to grow too large. Fourth, lack of measurable precipitation after application prevents herbicide incorporation in the soil. Fifth, some weed populations developed tolerance and resistance to common dormant herbicides such as metribuzin. Finally, some growers have started irrigating after last cutting to bank soil moisture due to unpredictable irrigation water deliveries from year to year. While irrigating in the fall has water storage benefits, it also provides moisture for early germination of winter annual weeds.

From 2021 to 2024, IREC staff conducted winter dormant herbicide trials in grower fields around Tulelake, CA with the hope of finding herbicide options that offer effective weed control. Small plot trials (10ft by 30ft) were laid out in a randomized complete block design with four replications. Herbicides were applied with a CO₂ powered backpack sprayer at 20 GPA. All treatments included a nonionic surfactant (NIS) at 0.25% v/v or methylated seed oil (MSO) at 0.5% v/v in the case of treatments with saflufenacil and carfentrazone. Herbicides were applied at various timings ranging from fall after the first hard frost until April when alfalfa had 3 inches of regrowth. After herbicide application, visual estimate of weed burndown, weed density, weed

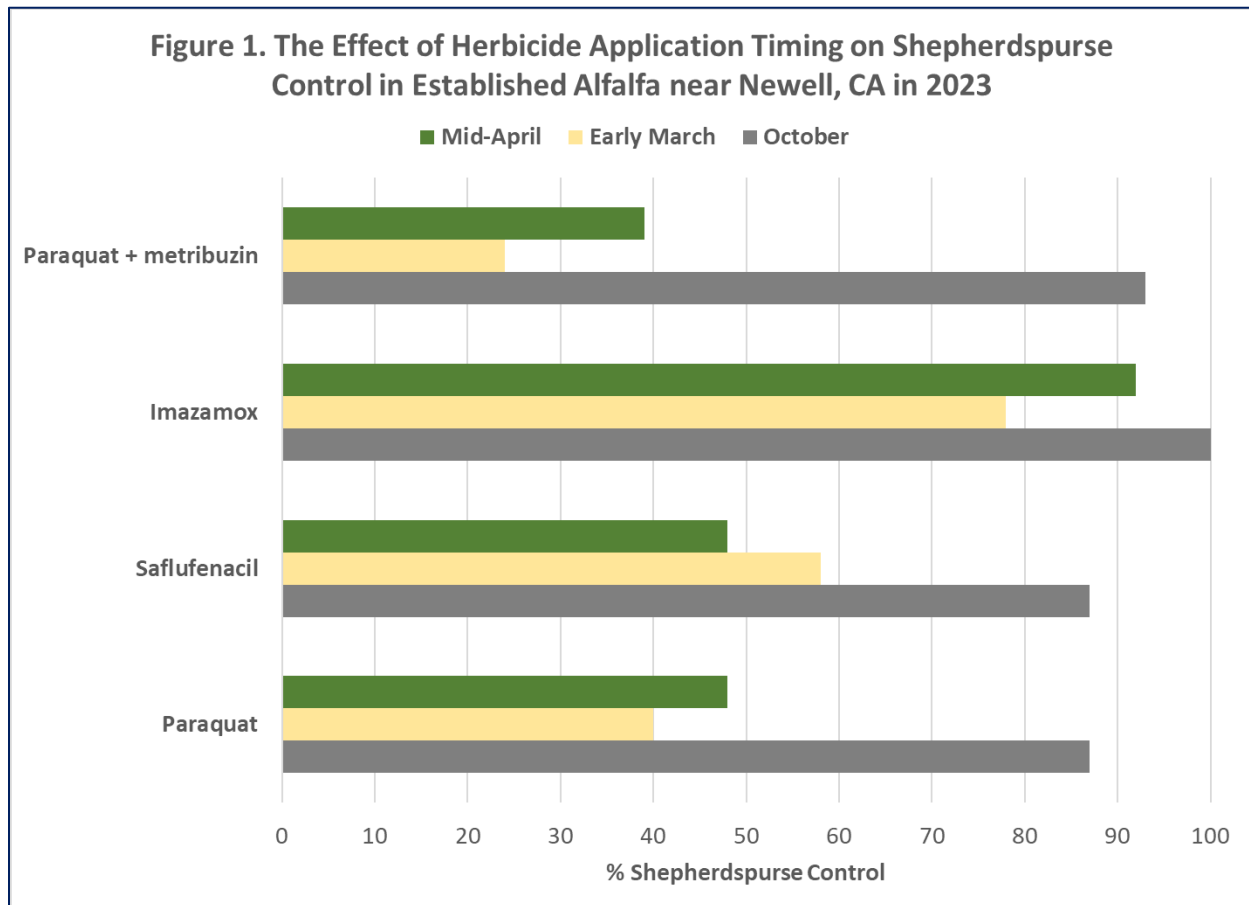
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control, and crop injury (chlorosis and stunting) were evaluated 7 to 30+ days after treatment in each plot.

Herbicide Application Timing

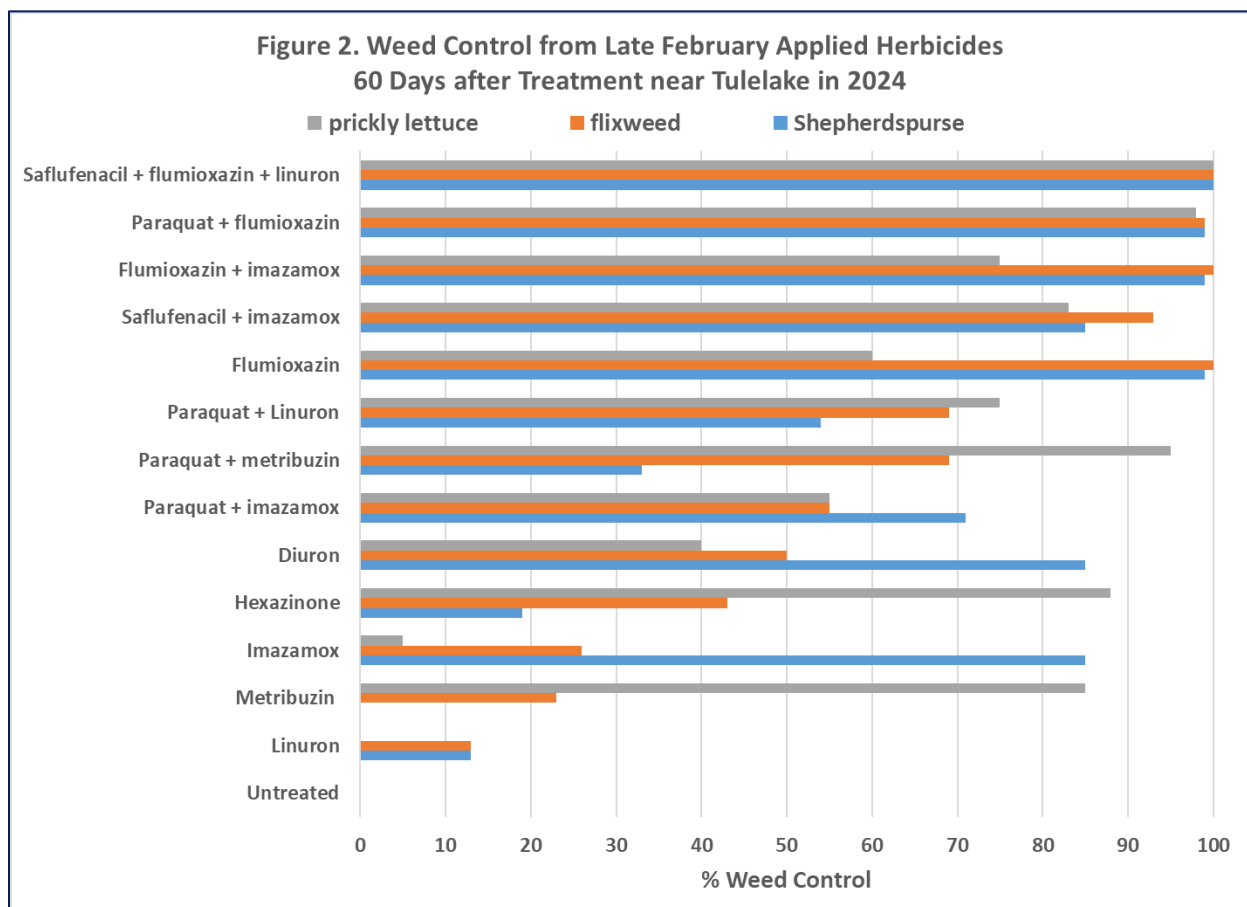
Late winter is normally the preferred application window for applying herbicide for winter weed control in alfalfa. Historically weeds are yet to emerge or small at the time of application. Late winter normally allows for adequate precipitation to incorporate preemergent herbicides within a month of application. Late winter also prevents the chance of leaching herbicides below the weed germination zone which can happen with water soluble preemergent herbicides applied in the fall especially during wet winters.

An exception to applying herbicides in late winter is if weeds emerge in early fall. Recent research showed fall application of burn-down herbicides alone or in combination with preemergent herbicides provide the best control of early emerging weeds such as shepherdspurse (Figure 1). A downside to this strategy is more weeds can emerge over the winter requiring a second herbicide application in late winter. Spring herbicide application after alfalfa breaks dormancy is rarely recommended as most weeds have grown too large to kill with labeled herbicides and the risk of crop injury is high. The major exceptions to this rule are application of glyphosate for weed control in Roundup Ready alfalfa and use of imazamox or imazethapyr for winter weed control.



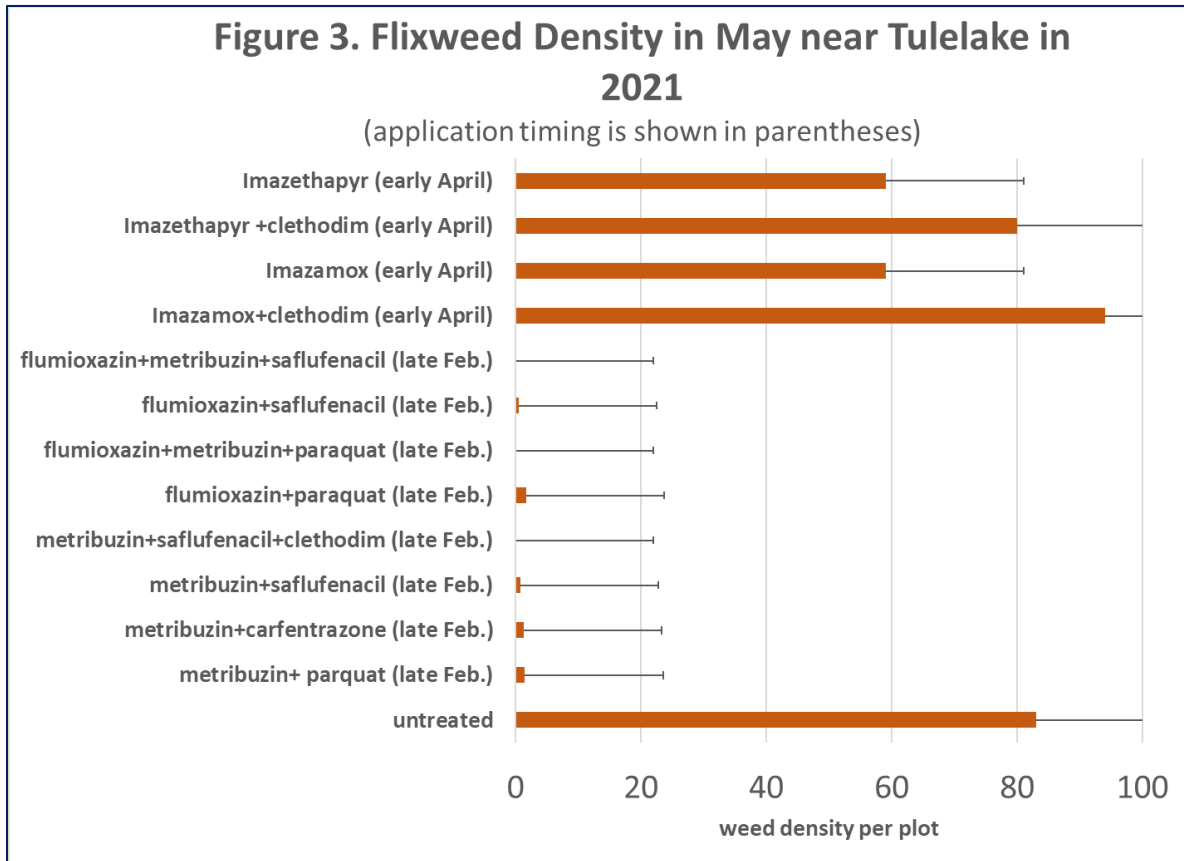
Choice of herbicide active ingredient

Paraquat in combination with hexazinone or metribuzin has been the most popular herbicide treatment for winter weed control for 20+ years. Historically, this combination controlled shepherdspurse, flixweed, prickly lettuce, and downy brome as evidenced by Western US weed management guidelines including UC IPM (Long et al, 2024 & Prather, 2022). As recently as 2020 late winter applications of metribuzin + paraquat in Honey Lake Valley trials provided 90% control of shepherdspurse, and 95% control of tumble mustard. However, in recent trials conducted in the Klamath Basin, late winter application of metribuzin or hexazinone alone or metribuzin + paraquat provided less than 70% control of shepherdspurse and flixweed (Figure 2). Both herbicides still gave over 80% control of prickly lettuce, but poor control of mustard weeds is unacceptable for dairy quality alfalfa. There has been an observation of more fields contaminated with mustard weeds throughout the region.

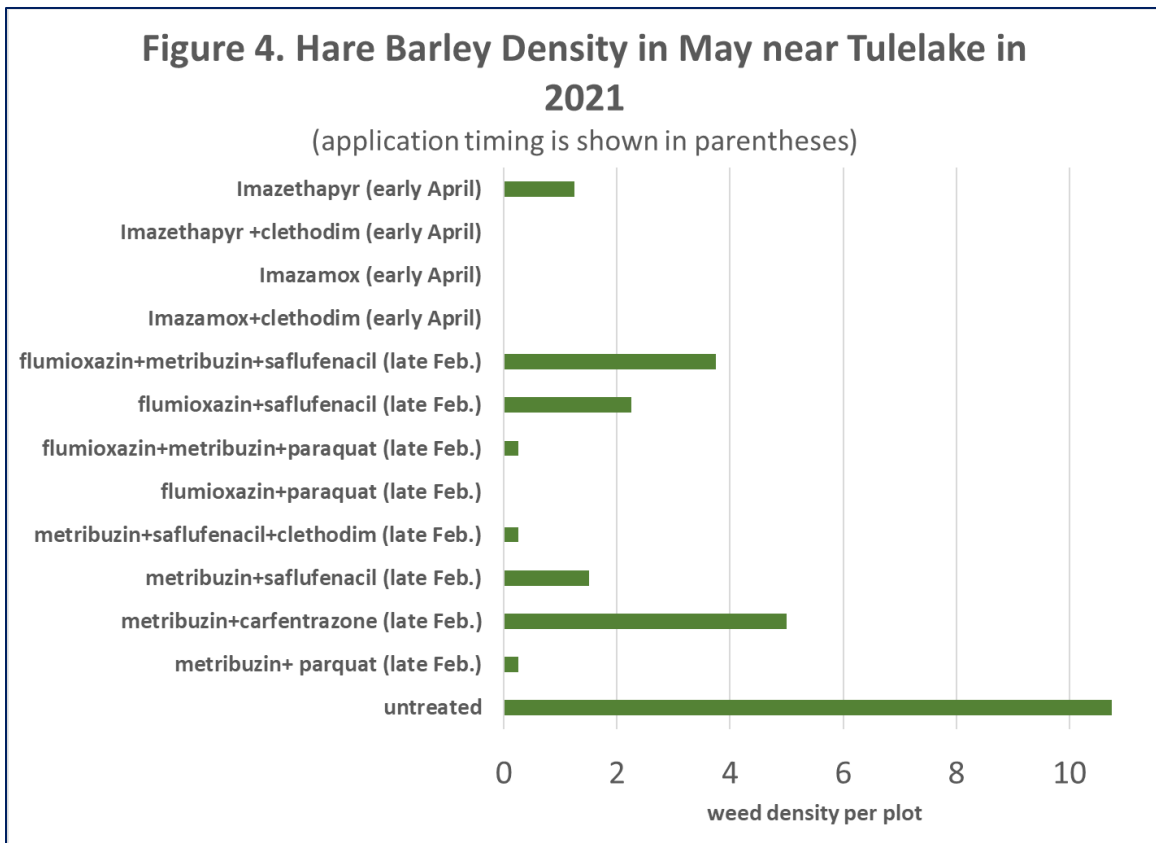


Flumioxazin is an alternative to hexazinone and metribuzin for winter weed control in alfalfa. It offers preemergent and early postemergent control of several broadleaf weeds. It is not as popular as metribuzin since it does not control most grass weeds. Flumioxazin applied in late winter provided over 90% control of shepherdspurse and flixweed (Figure 2). It only gave 60% control of prickly lettuce and failed to control hare barley when used alone. When tank-mixed with paraquat it gave over 90% control of all weeds (Figures 2 and 4). Flumioxazin, a PPO inhibitor, has a different mode action compared to metribuzin and hexazinone, photosynthesis inhibitors making it a good rotation choice for resistance management.

Imazamox and imazethapyr use in established alfalfa has increased in recent years. These herbicides are frequently used in seedling alfalfa, but they can also be used in established alfalfa. Tulelake trials showed imazamox provided over 80% control of shepherdspurse and less than 50% control of emerged flixweed (Figures 2 & 3). Imazamox is usually preferred over imazethapyr since it controls some grass weeds like foxtail and cheatgrass. Both herbicides do not control prickly lettuce and have long plant-back restrictions for rotational crops limiting their wide scale use in established alfalfa, especially in older stands.



Ongoing concerns with paraquat toxicity, worker safety, and corresponding regulations threaten its future in alfalfa. Two alternative contact, burndown herbicides that are used alone or tank-mixed with preemergence herbicides are saflufenacil and carfentrazone. Both control several small broadleaf weeds, but they do not control grasses (Figures 2, 3, & 4). Saflufenacil causes more injury compared to paraquat limiting use to 90+ days before the 1st cutting date. Saflufenacil sometimes gave erratic weed control when temperatures are very cold (personal observation). Adding a grass specific herbicide like clethodim to saflufenacil or carfentrazone can provide grass control, but this mix significantly increases the cost of the application and works best in warm weather.



Summary

Conventional alfalfa growers in Northeast California should consider alternatives to late winter applications of paraquat and metribuzin especially if they experience weed escapes. In fields with shepherdspurse, fall applied paraquat or saflufenacil with or without a preemergent herbicide or late winter applied flumioxazin + paraquat or saflufenacil gave the best control. Fall, winter, and spring applications of imazamox were effective at controlling shepherdspurse. Winter and spring applications of imazamox gave poor control of flixweed and prickly lettuce. Saflufenacil and carfentrazone are effective alternatives to paraquat for controlling broadleaf weeds. Paraquat is the only labeled contract burndown that controls broadleaf and grass weeds. Planting Roundup Ready alfalfa in problem fields is another effective control option for winter weed control in alfalfa.

REFERENCES

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