STRATEGIES TO CONTROL WEEDS IN ESTABLISHED ALFALFA

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ABSTRACT

Alfalfa is grown for its high-quality forage and controlling weeds in alfalfa is a crucial part of producing a profitable crop. Weeds can reduce the palatability of the product to livestock and the marketability to their owners. Like many pest management activities weed control is best addressed using an integrated pest management approach. The first step is to identify the weed and learn about the biology of the plant, to best control the weed and prevent reproduction. Reducing the number of seeds produced in and around the field is essential for long lasting weed free stands. Alfalfa is a highly competitive dense crop and weeds can be limited, first and foremost by good agronomic practices. Proper irrigation and fertilization are practices that immediately boost crop productivity and competitiveness. Other cultural methods such as early cutting can prevent weeds from going to seed. Often in established stands herbicides are relied upon to kill weeds when they are small and before they have a chance to produce seed. Utilizing all tools available can allow growers to produce a high-quality crop free of the weeds that reduce the quality marketability of the product being produced.

INTRODUCTION

Weed control in established alfalfa is paramount to producing a quality palatable forage for livestock. While not all weeds are poisonous or cause physical harm to livestock most will affect quality and yield and in turn the marketability of the hay. Buyers do not like to purchase hay that has a bunch of brown weeds contaminating it, and in normal years the price paid will be significantly less than weed free hay.

Alfalfa is a highly competitive crop that is excellent at excluding weeds once established. Following proper establishment practices, such as variety selection, irrigation practices, and initial weed management will go a long way to starting off a thick stand. Thick competitive stands are fundamental to successful weed management with limited inputs. Once a stand is established, what weed management practices take place depends on climate, corresponding dormancy, and frequency of cutting. There are both cultural and chemical components that play into weed control.

USING IPM TO CONTROL WEEDS

When dealing with weeds it is important to think about how they reproduce and preventing reproduction is paramount to any weed control strategy. Prevention starts with identification of the

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weed. Once a weed is identified, understanding the biology of the weed will allow you to choose what methods will best prevent it from reproducing.

What season does the weed germinate?
How long do the seeds last in the soil?
Will it reproduce by its roots?
What herbicides are it susceptible too?

Are just a few of the questions that can be answered after a weed is identified. Answers to these questions will help you choose when, what, and how to target the weed to prevent reproduction. Being able to ID the weeds when they are small is fundamental as large weeds are not often as easily controlled. The name of the game when it comes to weed control in established alfalfa stands is prevention. The goal is to prevent conditions that favor weeds, while also preventing weeds that are present from being able to reproduce.

Proper stand management is essential for competitive hay that will crowd out weeds. Alfalfa that is under-irrigated will favor weeds that do well in dryer conditions, where over-watering alfalfa will lead to weeds that are more competitive with wet feet. In addition, not keeping up with fertility will limit the growth potential of the crop favoring weeds that do well with less. Allowing longer periods between cutting can favor the sugar reserves deep in the roots of the crop, allowing for more vigorous regrowth following cutting. Any agronomic practice that favors crop growth and stand longevity will favor weed suppression because of alfalfa's competitive nature. Cutting stands frequently to meet dairy hay quality will often lead to weaker alfalfa stands that become weedier more quickly overtime.

Physical weed control methods are a pillar of an IPM program, however in established stands their uses are limited in the permanent crop. In regions where the crop goes dormant, hitting the fields with a drag, or spring tooth harrow prior to green up, can be a good way to uproot winter annual weeds that have recently germinated. There is a downside to dragging as it may lead to crown damage leading to an increased risk of diseases and infection. If weeds are not controlled the act of harvesting can be utilized as a physical control tool to suppress weed seed production. Keeping an eye on the weeds and cutting them in combination with the crop during the early flower stage of the weed will prevent or reduce the amount of seeds that go back into the soil seed bank. Keeping in mind that these weeds will often "stool" branching and growing shorter to still put on some seeds not completely eliminating reproduction. Cutting earlier than desired is also a double edge sword, as the crop might not be cut at the optimal quality/yield intersection if cutting is timed for weed control. Cutting after weeds have flowered and seeds have been formed, can also concentrate weed seed under the windrow (photo one). Cutting does have its place in an IPM program to suppress weeds if done at the right time.

Chemical methods are often relied upon for weed control. In colder climates conventional methods use tank mixes of a burn down herbicide and a residual herbicide either in the fall, or late winter to control winter annuals in the first cutting. During this slow growth period cold tolerant winter annual weeds have the conditions needed to grow at a time when the alfalfa is less competitive. In strong stands, after first cutting secondary herbicide treatments are often not needed in a

competitive crop. In older stands with lots of bare ground subsequent applications may be needed of preemergent products to reduce summer annual weed populations. Often products such as trifluralin and pendimethalin are utilized mid-season to prevent weed seed germination.

In warmer desert climates, where alfalfa never goes dormant, things shift. As opposed to making applications of herbicides in the cooler parts of the year many residual products, that do have some foliar actively, are applied during the warmer months as the plant growth slows and approaches a summer dormancy with little growth because of the heat. Multiple applications of herbicides with both foliar and residual actively are needed in warmer climates to suppress weeds. Well irrigated alfalfa in warm conditions is the perfect environment for residual herbicide to experience microbial degradation and break down over time. Herbicide programs should focus on multiple applications with residual products throughout the year to prevent weed contamination in all cuttings.

Perennial weeds are often very difficult to control in an established alfalfa stand. Certain perennials can be controlled or suppressed, but it is a best practice to control these weeds by rotating out of alfalfa. Rotating out of alfalfa is a good way to alter the section pressure to the population of weeds which have developed under the condition of an alfalfa stand. Rotation also allows mechanical methods such as tillage, or an herbicide not registered in alfalfa to be utilized. Often rotating to an annual graminoid or grain crop for two years will help clean up a field from common alfalfa weeds, as well as diseases. One major exception to controlling perennial weeds in established stands is in Roundup Ready alfalfa. Roundup Ready alfalfa can be an excellent option to clean up dirty fields infested with either annual or perennial weed species. Multiple applications of the broad-spectrum product glyphosate can be applied per year, helping kill roots and reducing seeds in the seedbank. However, there are some drawbacks to the Roundup Ready systems which have been documented, such as the interaction with frost in cold climates. Generally, as glyphosate does not provide any pre-emergence control of weeds it is best to tank mix it with a residual material for extended control.

Herbicide resistance is also something that should be considered when managing weeds in alfalfa. There have been 513 cases of herbicide resistance documented globally as of 2020 (with many more suspected). Fifteen of these cases have been documented to have developed in alfalfa production, seven in Australia, six in the United States, and one in Israel and Italy respectively. Many of the other weeds which have developed resistance in other crops still have the ability to grow in alfalfa. Weeds have developed the ability to withstand application of not just one mode of action, but in certain cases multiple modes of action. Italian ryegrass is resistant to four modes of action and has been documented to be growing in alfalfa within California. In order to combat herbicide resistance, the best management practice of always using multiple effective modes of action during an application is encouraged. If a weed is already resistant to a mode of action, that mode of action should not be considered effective in a tank mix. Glyphosate resistance is widespread throughout parts of the globe, which can impact the effectiveness of the RR system.

In the United States the WSSA did a survey of weed scientists who work in Alfalfa for what weeds are most problematic in broadleaf crops. The survey was conducted in 2016 as well as in 2019. Results can be found in table one. Pigweed species, including palmer amaranth red root pigweed etc. moved to the top of the list in both most common and most troublesome in a three year period.

Photo two shows a suspected resistant palmer amaranth population in alfalfa. Considering the rise of herbicide resistant pigweeds, that could be a good explanation of the shift of them being problematic in the United States alfalfa production.

WSSA Survey Weeds in Alfalfa			
2016		2019	
Most Common	Most Troublesome	Most Common	Most Troublesome
Mustard spp.	Canada thistle	Pigweed spp.	Pigweed spp.
Dandelion	Mustard spp.	Mustard spp.	Canada thistle
Foxtail spp.	Dandelion	Bromus	Bromus
Pigweed spp.	Downy Brome	Kochia	Dandelion
Bromus spp.	Kochia	Dandelion	Mustard spp.

Table one: Most common and troublesome weeds courtesy of the WSSA 2016 and 2019 surveys https://wssa.net/wssa/weed/surveys/

Photo One: Strips of shepardspurse in an alfalfa field. It was suspected this field was contaminated the previous year, and cut after seed production. Seeds were then concentrated in the windrows resulting in strip of heavy weed pressure the following year.

Photo Two: Suspected herbicide resistant palmer amaranth population in Alfalfa down in the low desert. Photo courtesy- of Michael Rethwisch UC Farm Advisor-Palo Verde Valley

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