

Are There Alternatives to Herbicides For Weed Control in Alfalfa?

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Abstract: Alfalfa, relatively free of unwanted vegetation, can be grown without the use of herbicides. However, this can be achieved only in an integrated management system using good agronomic practices that includes: proper field selection, knowledge of the weed infestation, proper land and seedbed preparation, proper cutting intervals, good insect and disease control, and other practices that will promote the vigorous growth of the alfalfa.

Keywords: Weed control; Use of herbicides in alfalfa; Integrated vegetation management

INTRODUCTION

Historical references to alfalfa date back to 1300 BC in Turkey and to 700 BC in Babylonia. However, Hendry (1), in his "Alfalfa in History," indicated that trade in the Mediterranean region as early as 4000 BC contributed to the spread of alfalfa. In these historical accounts, no references are made for the control of weeds in alfalfa. It is unlikely that they were not concerned about the growth of the less desirable plants in competition with their alfalfa. However, no information is available about the yield, quality of the hay or longevity of stands of alfalfa grown in ancient time. They must have managed fairly well because the popularity of this forage plant spread all over the world. Today, it is grown on nearly 100 million acres of land and is often called "queen of the forage plants."

Losses Caused By Weeds

Unwanted competing vegetation (weeds) has multiple adverse and often devastating effects on alfalfa. Weeds compete with the alfalfa for water, nutrients, and space. There are a large number of annual, perennial, and parasitic weeds that can infest alfalfa from the time the seed is planted and throughout the life of the stand. Weeds:

- a. can prevent the establishment of alfalfa in a newly planted field
- b. can reduce the yield of alfalfa
- c. can produce toxins that can adversely affect the growth of the alfalfa
- d. can be poisonous to certain animals consuming the forage
- e. can adversely affect the nutritional value of the hay
- f. can render the hay unmarketable or significantly reduce its market value
- g. can markedly increase losses in seed production due to direct competition in the field and in the separation of weed seed from the alfalfa seed during cleaning

In recent studies, Norris (2) concluded that, in newly planted fields, "Losses due to weed competition, if left uncontrolled, can be 100% by the first cutting."

Weeds that infest fields planted with alfalfa can be summer or winter annual grasses and broadleaved weeds as well as perennials. The numerous species of weeds growing in alfalfa differ significantly in their effects on newly planted as well as established stands. The time of planting, the rate of seeding, the vigor of the variety, and dormancy are but a few of the factors that can influence the competitiveness of alfalfa with weeds.

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Selective Herbicides

The use of selective herbicides in crop production dates back to the 1940's; their use in alfalfa is more recent. Today, selective herbicides are extensively used in newly planted as well as in older established fields. However, herbicides alone may not provide the desired control. Their most effective and economical use can be achieved - only in an integrated system of vegetation management when coupled with good agronomic and cultural practices.

With the intelligent use of herbicides, alfalfa growers have been able to:

- enhance the establishment of newly seeded fields
- improve the quality of the forage
- increase the market value of the hay
- prolong the life of the stand
- expand their market by "packaging" their product in different forms

However, herbicides are not indispensable for the profitable production of relatively weed free, good quality hay. Although to accomplish this will require greater managerial skill than that required with the use of selective herbicides.

Herbicides Are Not Indispensable

Alfalfa can be grown and good quality hay can be produced profitably without the use of herbicides. To accomplish this, a grower needs to be familiar with the habit of growth (physiology) of the alfalfa, have knowledge of the weed infestation, follow good agronomic practices, and be able to make timely managerial decisions. The following practices can significantly influence one's ability to profitably grow relatively weed-free alfalfa without the use of herbicides.

Proper field selection - Alfalfa is best adapted to medium textured soil with good internal drainage. Growing on sandy soil, the frequent irrigation required can encourage weed growth. On clay soils with poor or very slow internal drainage, the alfalfa can be injured by Phythophora, and the thinned stand becomes subject to invasion by weeds.

Knowledge of the weed infestation - Proper weed identification and keeping records of their distribution on the farm can enable a grower to select fields that are not infested with weeds that could be detrimental during stand establishment and the life of the stand. Through knowledge of the weed infestation one can avoid planting fields infested with parasitic dodder, perennial, and poisonous weeds. Knowing the weed infestation, the time of planting can be better scheduled to avoid or minimize weed competition.

Proper land and seedbed preparation is essential and it can have lasting influence on the stand and weediness of the field. Through proper land (preferably laser) leveling, depressions in the field where water stands, can be avoided. Proper land leveling can prevent the accumulation of irrigation water at the head and tail end of the checks. A fine, firm, moist seedbed is desirable to plant the alfalfa seed to a uniformly shallow depth of 1/2 to 1 inch.

Seed quality and seeding rate - High quality seed with good viability, certified to be free of weed seeds, should be planted. Seeding rates ranging between 15 to 30 pounds per acre are often used. Fifteen pounds of seed per acre can provide more than 70 plants per square foot if all seeds germinate. At the end of the first year,

McClellan (3) found no differences in plant populations or yields of alfalfa seeded at 14.4, 24.6, and 33.0 pounds of seed per acre. However, the higher seeding rate provided better competition with weeds.

Time of planting - To avoid excessive weed competition and insure vigorous growth of the alfalfa seedling, daytime temperatures between 60° F to 70° F after planting are desirable. The seedlings have good frost tolerance once the first trifoliolate leaf has developed. The desirable time of planting varies from one area of the state to another. In the central San Joaquin Valley, October and early November planting is desirable to minimize weed competition.

Companion or nurse crops - Planting cereal crops, preferably oats, with the alfalfa can minimize weed growth and increase the forage yield the first year of the stand. Lanini (4), in recently concluded studies, reported that an oat companion crop significantly increased the biomass production and decreased the weed population in an alfalfa stand. In areas of the United States where grasses and alfalfa are grown in mixed population, weeds are less of a problem.

Fertilization can insure vigorous growth - The application of phosphorous prior to planting can stimulate the rapid growth and root development of alfalfa seedlings. In many soils the use of low rates, 20 to 30 pounds per acre, of nitrogen can be beneficial for the growth of the seedlings. However, high rates of nitrogen may encourage weed growth.

Preirrigation and timely crop irrigation - Irrigating the field prior to planting will germinate weed seeds that can be destroyed with shallow cultivation during the final seedbed preparation. Weed seeds generally germinate in the top 2 1/2-inch layer of soil. Deep tillage following preirrigation can bring up additional weed seeds into the germinating zone.

Irrigating immediately after cutting can encourage weed infestation. Sunlight reaching the wetted soil surface will stimulate the germination of weed seeds. Lehman (5) demonstrated that alfalfa is slower in starting regrowth and more plants can die when irrigated soon after cutting, thus reducing weed competition.

It is desirable to irrigate alfalfa fields at least seven days prior to cutting. Delaying irrigation 10 to 14 days after cutting can significantly reduce the establishment of weeds and provide greater competition from alfalfa.

Proper cutting interval can provide good weed control - Perhaps cutting interval can have the most significant effect on weed control in established stands. Through proper cutting interval, the invasion of summer annual grasses, especially the foxtails (*Setaria* spp.) can be minimized or prevented. Norris (6) clearly demonstrated that cutting cycles of 25 days encouraged weed growth. Cutting cycles of 32 to 35 days minimized the growth of summer annual grasses. The cutting interval can be influenced by the temperature and moisture, but a 4- to 6-week interval, or waiting until ten percent of the plants are in bloom, has been a very effective weed control strategy.

Grazing or early cutting can be detrimental to the stand and can encourage weed infestation and the spread of weeds by grazing animals. However, under certain conditions, grazing or early cutting can be used to control weeds, especially winter annuals. In newly planted fields which are heavily infested with weeds, an early cutting may be desirable to minimize shading and prevent weed seed production. Grazing is used extensively in the high desert areas for the control of winter

annual weeds. But, grazing animals, especially sheep, moved from certain locations, can introduce undesirable weed seeds into a relatively clean field.

Traffic and soil compaction - The detrimental influence of excessive traffic and the resulting soil compaction on the alfalfa stand was demonstrated by Sheesley (7) and his colleagues. Properly timing the irrigation relative to cutting, drying, and baling operations that require many trips through the field, can minimize the problem, especially if the wheels on the equipment are positioned to trail one another to reduce the area over which traffic occurs.

Insect and disease control are rarely considered essential components of weed control. Alfalfa, weakened by infestations of insects and diseases will not provide as effective weed competition as healthy alfalfa plants.

In Conclusion

Excellent alfalfa can be profitably produced for forage or hay without the use of selective herbicides. To achieve this requires proper planning, following good agronomic practices and developing an integrated vegetation management system that will insure the vigorous growth of the alfalfa to the detriment of the unwanted competing vegetation.

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