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The Value of Weed Control in Alfalfa

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Good weed control is essential for effective alfalfa establishment and production. Weeds compete with alfalfa for water, nutrients, light, and space. This competition can result in decreased yield, quality, and palatability, increased harvest problems, and reduced stand persistence. The proper and timely use of cultural and chemical weed control methods are critical in the establishment and maintenance of a competitive, vigorous growing and dense stand of alfalfa.

Before the advent of selective herbicides, weed control in alfalfa stands was accomplished mainly through the use of cultural practices applied before and after establishment. Today, herbicides are available which provide the producer with means in addition to cultural control methods to help obtain the degree of weed control desired by the producer while providing additional flexibility in managing their farming system. However, herbicide use alone, without regard to cultural weed control measures, will seldom result in obtaining a desired degree of weed control. The cultural and chemical weed control methods must be integrated to maximize profits from the alfalfa stand.

To facilitate development and understanding of an integrated weed control program for alfalfa, stand development can be partitioned into three major phases: 1) the pre-establishment, 2) establishment, and 3) production phase.

Pre-establishment Phase

Even before the stand is planted, the producer must apply major weed control measures. A dense, vigorous alfalfa stand will control most weed pressures. Thus, a producer should apply all cultural weed control measures will optimize alfalfa establishment and persistence:
1. Select sites with proper soil drainage for stand establishment.
2. Soil test and correct soil pH and fertility.
3. Plan crop rotations to interrupt the buildup of certain weeds.
4. Plan crop rotations to avoid potential herbicide carryover.
5. Scout fields and map potential weed problems.
6. Select well adapted disease resistant varieties
7. Use weed-free seed and inoculate with rhizobium prior to planting.
8. Create a firm seedbed.
9. Provide seed placement 1/4 to 1/2 inches deep and good seed-soil contact.

Establishment Phase

Seedling alfalfa is generally a poor competitor with weeds. The amount of weed pressure exhibited during establishment is influenced by the type of method used for establishment, the time of year the stand was established, and the preparatory steps carried out under the pre-establishment phase.
Common alfalfa stand establishment methods include:
1) Alfalfa seeded with a small grain companion crop.
2) Clear seeded, use of a pre-plant herbicide but no companion crop.
3) Solo seeded, no use of a companion crop or herbicide.

Each establishment method has advantages and disadvantages depending on the time of year the stand was established, the potential for soil erosion, the anticipation of serious weed problems or lack there of, and the cropping needs of the producer. Alfalfa seeded with a companion crop utilizes the companion crops rapid emergence and growth to compete with potential weeds and stabilize the soil against erosion. This method is of definite value for potentially erodible sites and if small grain and straw production is a desired product. Chemical control is limited to treatment of broadleaf weeds. If the potential for a serious grass weed problem existed, the clear seeding method would be favored, since it would offer more flexible weed control. However, the small grain could be removed early for silage or green-chop to allow for post-herbicide treatment of the grass weed problem.

Clear seeding is increasing in popularity. The main advantage is that it allows for 2 to 3 harvests of alfalfa in the seeding year. The main disadvantage is that this method is not recommended on potentially erodible sites. The method requires a pre-plant incorporated herbicide which controls most grasses and certain broadleaf leaves. These herbicides provide only 6 to 8 weeks of weed control. Thus, alfalfa needs to be managed to provide rapid emergence and growth, so that the plants will be competitive after the herbicide has dissipated. Even though a herbicide is applied, the actual cost of establishment, harvest, and labor is often less than when seeded with a companion crop (Table 1).

Table 1. Crop Production - Seeding Year Costs of Alfalfa.

<table>
<thead>
<tr>
<th></th>
<th>Alfalfa with oat companion crop</th>
<th>Alfalfa clear seeded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed</td>
<td>Variable</td>
</tr>
<tr>
<td>Machinery</td>
<td>16.45</td>
<td>7.60</td>
</tr>
<tr>
<td>Seed</td>
<td>39.00</td>
<td></td>
</tr>
<tr>
<td>Fertilizer</td>
<td>36.40</td>
<td></td>
</tr>
<tr>
<td>Lime</td>
<td>36.00</td>
<td></td>
</tr>
<tr>
<td>Herbicide (PPI)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>24.00</td>
<td></td>
</tr>
<tr>
<td>Harvest</td>
<td>25.18</td>
<td>21.75</td>
</tr>
<tr>
<td>Total</td>
<td>65.63</td>
<td>140.75</td>
</tr>
</tbody>
</table>
Solo seeding in late summer is a common practice. Use of a companion crop is not usually recommended since competition for water and not light or space is the major limiting factor. A pre-plant incorporate herbicide is not recommended either since fewer weed species germinate in late fall offering less competition with the alfalfa seedlings. The higher summer temperatures also enhance the rate of germination and emergence of alfalfa. In addition, many of the germinating weed species are annuals, which are frost sensitive and subject to killing before they can produce much of a seed crop. Solo seeding is a viable establishment method in spring when weed infestation is not a problem.

**Established Phase**

Established, uniform alfalfa stands can compete effectively with most annual, biennial, and perennial weeds under normal cultural practices. The best weed control program in alfalfa is to follow good cultural management that will ensure a vigorous, healthy stand.

During the establishment year, typical annual grass and broadleaf weeds such as foxtail, ragweed, lambsquarter, and pigweed appear, but are not usually found the next year if a good alfalfa stand was established. But perennials such as white cockle, yellow rocket, quackgrass, and dandelion may become established with alfalfa, or after alfalfa is established, and persist in spite of alfalfa’s competitiveness. Initial control is largely dependant on the pre-establishment and establishment practices. The same is true for winter annuals such as pennycress, downy brome, shepherd’s purse, and chickweed. Winter annuals germinate in late summer and fall, continue to grow after alfalfa becomes dormant, and can become so dense that they seriously reduce the yield potential and stand persistence. Accurate scouting and timely fall herbicide application is critical to the control of winter annual weed problems.

It is rare for an alfalfa stand to be established weed free. After planting, scouting is required to ascertain the emerging weed pressures. These weed pressures will change with time, as the stand thins due to disease, harsh climatic conditions, and mismanagement. Producers need to know which weeds can become an economic threat, at what levels, and how to correct the problem. Economic threat refers to the potential of weeds to decrease yield, quality, palatability, or persistence of a stand.

Chemical control of weeds in an established stand will not improve the alfalfa in the stand and frequently will not improve yield of the stand. There may often be a reduction in yield associated with a herbicide treatment besides that of the loss in harvested weeds. Herbicide treatments may injure alfalfa reducing initial regrowth potential, and herbicide harvest restrictions can reduce income potential from the lost grazing or harvest time. However, it will maintain the quality, palatability, and possibly reduce drying time of the harvested product. The main question is whether the potential improvement in quality and palatability offsets the decrease in yield and cost of chemical control.

Numerous researchers have published data on the quality and palatability of various weeds commonly associated with alfalfa stands. A few of these...
publications are listed at the end of this paper. The quality information can be used in various ways to determine the value of weed control in alfalfa stands. Two examples are given below.

Example 1. Using the loss of protein to determine lost income.

1. Determine the level of weed infestation - quackgrass at 25% of the stand.
2. Assume a 5 ton/ac dry matter yield in year 2 of this stand.
   - 75% alfalfa at 20% crude protein or 1500 lb protein.
   - 25% quackgrass at 14% crude protein or 350 lb protein.
3. Assuming equal alfalfa yields without quackgrass, the same field would have produced 2000 lb protein.
4. Thus there is a loss of 150 lb of protein. With crude protein at $0.22/lb (based on soybean meal supplement), the weed problem results in a $33/A loss.
5. Chemical control at less than $33/A would increase net returns. Or does it? Is the assumption made under 3. accurate? Usually when a weed is controlled the yield is somewhat reduced because of the loss of weeds. But the assumption under 3. for treatment of quackgrass is supported by Dutt et al. (1979) in which was also reported a 20% increase in milk production with quackgrass-free alfalfa.

Example 2. Calculate the relative feed value (RFV) of weed infested and weed-free alfalfa to determine market value advantage. Adapted from Rudesill et al., 1988. Establishment year data.

Table 2

<table>
<thead>
<tr>
<th>Yield (lb/A)</th>
<th>RFV</th>
<th>Current value Seeding year income/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check (alfalfa plus weeds) 4758</td>
<td>121</td>
<td>$65</td>
</tr>
<tr>
<td>Post weed control treatment 4910</td>
<td>129</td>
<td>$78</td>
</tr>
</tbody>
</table>

Increased income before treatment costs $36
What about palatability? There is general information on palatability ratings of weeds. However, researchers have yet to determine what percent unpalatable weeds in alfalfa would reduce feed intake. Stage of maturity of the weeds and the kind of livestock being raised must also be considered.

Summary

Good weed control starts with establishing and maintaining a highly competitive stand of alfalfa. The value of weed control in established stands depends on the vigor and density of the alfalfa. Weed control is advisable in stands of alfalfa thick enough to compete with any reinvansion of weeds after treatment. Conversely, weed control is not recommended for thin, weak stands of alfalfa since open areas will just be infiltrated by weeds tolerant of the chemical treatment. The only exception may be to control noxious or poisonous weeds in the stand.

Chemical weed control cannot substitute for good cultural practices but can enhance them for a more complete weed control program. The producers' decisions on what cultural and chemical management practices to apply should be based on alfalfa and weed species stand densities and the producers need to meet feed or marketing requirements.

Some publications on the effects of weeds on forage quality.


