Techniques to Improve Weed Control in Seedling Alfalfa

By Mick Canevari[1]

ABSTRACT

Managing weeds is necessary when establishing new plantings of alfalfa to insure a healthier, more productive stand and the highest quality hay. Weeds compete with developing alfalfa seedlings for water, nutrients, and light. Weeds limit alfalfa growth, impede root development and lower the alfalfa yield. Weed free alfalfa improves harvest efficiency, increases marketing opportunities that result in higher prices. The economic returns of an appropriate, well-timed herbicide application can be realized in the first harvest and continue in additional harvest. Many factors contribute to obtaining a successful weed control program: Some of them include: planting time, weed size, herbicide selection, mode of action, spray volume and adjuvants.

TIME OF PLANTING

Planting alfalfa when soil temperatures are ideal favor rapid germination and growth. Vigorously growing alfalfa will reduce the negative impact of weeds and improve the performance of an herbicide. The best time to seed alfalfa is when the soil temperature is from 69º to 76º F. (Teuber, L, et al) Establishing alfalfa at this time will allow it to have at least equal if not a head start over problem weeds. Avoid planting at a time when soil or weather conditions (very cold or very hot) are unfavorable for alfalfa growth, since this usually favors opportunity for weeds to take over.

For example: In the San Joaquin Valley, it is common to plant in November and wait for rainfall to germinate seeds. This method is unpredictable when germination will occur and rarely results in a uniform population emerging before December, after which cold temperatures occur and cause alfalfa to grow slowly. Cold temperatures favor winter weeds more than alfalfa, especially mustards, shepherds purse, chickweed and cool season grasses that impact seedling growth. A non-uniform stand of seedling alfalfa will also delay an herbicide application and reduce herbicide performance.

The preferred planting time (northern San Joaquin Valley) would be late September into October, flood or sprinkler irrigate to establish a stand quickly and uniformly. Temperatures at this time of year are conducive for rapid growth of the alfalfa rather than the winter weeds. Summer weeds, such as nutsedge, pigweed, lambsquarter and barnyard grass have just about completed their growth cycle by September and are generally not as serious a problem. This window of time escapes the optimum growth period of summer or winter weeds.

The same scenario would apply for a spring planting when avoiding summer weed problems. Alfalfa plantings from February to April (depending on location and soil temp) will germinate in

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advance of most summer weeds allowing the alfalfa to germinate, cover the soil surface ahead of weeds. When planning to seed in the spring, it is advisable to prepare the seedbed in the fall. This will avoid most compaction problems associated with working wet soil that time of year. Winter weed growth can be controlled with paraquat or glyphosate so a weed free seedbed exists and only a light tillage is needed before planting.

WEED SIZE & HERBICIDE ACTIVITY

Small weeds are easier to control and have less negative impact on the developing crop than larger ones. Herbicide are also more effective and it takes less lbs of herbicide per acre to control a smaller immature weed than one that is older, larger, and has "hardened" from exposure to environmental conditions. Less spray per leaf is needed to kill an immature plant than an older one (See figure 1).

Younger plants leaf tissue allows quicker penetration of herbicides. Young weeds also have a shorter less developed root system that is unlikely to recover from an herbicide treatment. An immature weed usually has not fully developed reproductive tissue making it less likely to generate new growth following an herbicide treatment; this is especially true when using a contact herbicide such as paraquat or buctril.

Post emergence herbicides used in seedling alfalfa differ in their chemical makeup and have different modes of action to kill a weed. Pursuit, 2,4-DB, Poast and Prism move systemically into the plant through the leaf (translocation herbicide) and inhibit amino acid synthesis and other growth functions. Paraquat and Buctril herbicides are not as mobile and do their damage near the site of contact. They penetrate the leaf cuticle within hours and destroy nearby cell membranes before any appreciable movement into the plant. Velpar and Kerb are different; they function mainly through the soil, are absorbed by roots and move systemically up the plant. Therefore, weed size and herbicide activity are extremely important factors in selecting the correct herbicide for each situation.

Whichever type of herbicide used, they all perform better when weeds are small, vigorously growing and without moisture stress.

Treating smaller weeds is more economical since:

1. Smaller weeds are controlled easier.
2. Label recommendations will allow a lower rate of herbicide when weeds are smaller.
3. Lower spray volume cover and control smaller weeds better. This saves time by allowing more acres to be treated per tank load. Less refilling.
4. Competition from smaller weeds rarely impacts alfalfa growth or affects yield.

SPRAY VOLUME

The effectiveness of a post emergence herbicide hinges on many factors as previously discussed. Reducing the spray volume and applying a lower amount of spray solution per acre is another area being utilized with certain herbicides.

Br reducing the spray volume while maintaining the same herbicide rate, the herbicide concentration of the solution will increase. Some translocation herbicides (2,4-DB) Pursuit, Poast and Prism) can perform better using higher concentration solutions.

In past years the recommended gallons of spray solution applied per acre for herbicides ranged between 40 to 60 gpa and sometimes reached as high as 100 gpa. This often resulted in an excessive use of spray solution, lower herbicide efficiency and a greater potential for herbicide runoff. New nozzle technology reduces droplet size at a lower pressure with less drift problems with better coverage than the older nozzles at higher volumes.

Today's spray volumes for herbicide application can range between 10 gpa to 30 gpa with better weed control efficiency than the higher volumes. Systemic herbicides that may perform better with reduced volume applications are Pursuit, 2,4-DB, Poast and Prism. Pursuit (figure 2) has shown in alfalfa field studies that 10 to 20 gpa will give equal or better control of weeds than higher gallon usage. With today's higher chemical cost and mounting environmental concerns of pesticides moving into waterways, it is crucial to improve spray efficiency to save dollars and limit the potential of pollution problems to maintain a healthy environment.

ADJUVANTS

Adjuvants are materials added to a spray solution to enhance the performance of that solution. Adjuvants are recommended for use with most post emergence herbicide used in seedling alfalfa. Manufactures labels list the type of adjuvant that should be used with the herbicide.

To effectively control weeds, postemergence herbicides must move from the point of contact on the leaf surface to the plant cells; this is primarily done through the leaves. Adjuvants can help herbicides cover, adhere and penetrate these surfaces more effectively.

Adjuvants are separated into two categories: spray modifiers and activators. Spray modifiers are used to change the wetting, spreading and sticking ability of the solution. Activator adjuvants primarily influence the absorption of the herbicide by altering the leaf cuticle. Adjuvants that are most commonly used with postemergence herbicides are crop oil concentrates, non-ionic surfactants, organosilicones and certain commercial nitrogen fertilizers (See figure 3, 4).

Commonly used is a non-ionic surfactant adjuvant (surface-active-agent.) Surfactants enhance the dispersing, spreading, sticking and wetting of the herbicide on the plant surface. A surfactant can be used with most post emergence herbicides but may not be the best adjuvant for the specific herbicide or weed. Non-ionic surfactants have shown to work best with paraquat and 2,4-DB herbicides.

Other adjuvant types are oils; which are divided into two categories: mineral oils (COC) and seed oils (MSO). Mineral oils are made from distillation of petroleum products. Seed oils are extracted from soybean, sunflower, or canola seed. Methylated seed oil, a popular product now a day is a processed form of seed oil. MSO's have shown to work well with Pursuit and Raptor herbicide. The highly refined crop oil concentrate (COC's) work best with herbicides Poast and

Prism. Oil based adjuvants are also superior when used in hot temperatures were volatility and evaporation is highest.

Organosilicone (OS) surfactants are the newest type adjuvant used with herbicides. The advantage of using an OS as a spray adjuvant is its superior ability to release water tension on the leaf surface and spread the solution thinly and uniformly over various types of leaf surfaces. Their disadvantage is that they are so efficient in spreading, that the spray solution may run off the leaf causing herbicide loss and a rapid evaporation of the herbicide before it can be fully absorbed. The Organosilicone adjuvants when tested with alfalfa herbicides did not improve and in most cases performed worse than Oils or the Non ionic surfactant. However, there are products on the market that combine MSO's with an organosilicone surfactant and have shown excellent results when used with Pursuit, Raptor, Prism and Poast herbicides.

Nitrogen (Fertilizer) salts: There is an increased interest in using fertilizers as adjuvants in water based herbicides. Ammonium sulfate, Ammonium nitrate or Urea Ammonium Nitrate have been documented to increase efficacy of certain herbicides. There is still debate to the exact mechanism responsible for the positive results, but most researchers agree that the ammonium ion helps in penetrating the cuticle. Pursuit and similar chemistry herbicide (Raptor) have shown an increase in weed control when a fertilizer was added with a Non ionic surfactant or other adjuvants. Improved results with fertilizer have also been documented with Prism and Poast herbicides.

References

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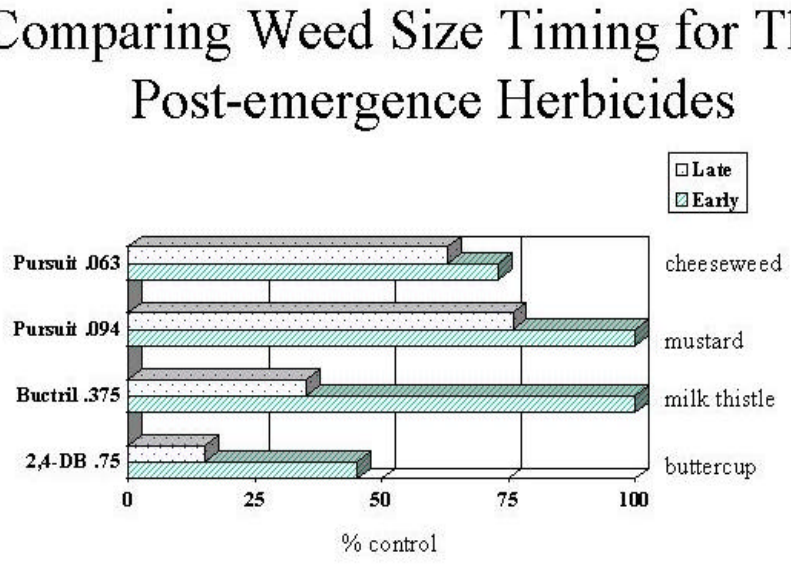
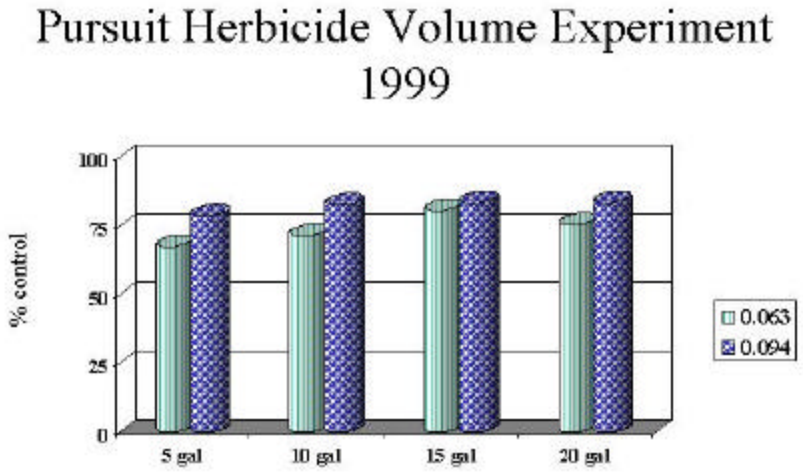
Figure 1



Weed Size

Early Treatment 1/7/97	Late Treatment 2/6/97
Cheeseweed 1-2"	3-8"
Mustard 3-5"	5-7"
Milk thistle 6-8"	8-12"
Buttercup 2-4"	4-7"

Figure 2



Composite of 6 weeds: shepherd's-purse, chickweed, redsmaid, miners lettuce, bluegrass, burning nettle

Figure 3

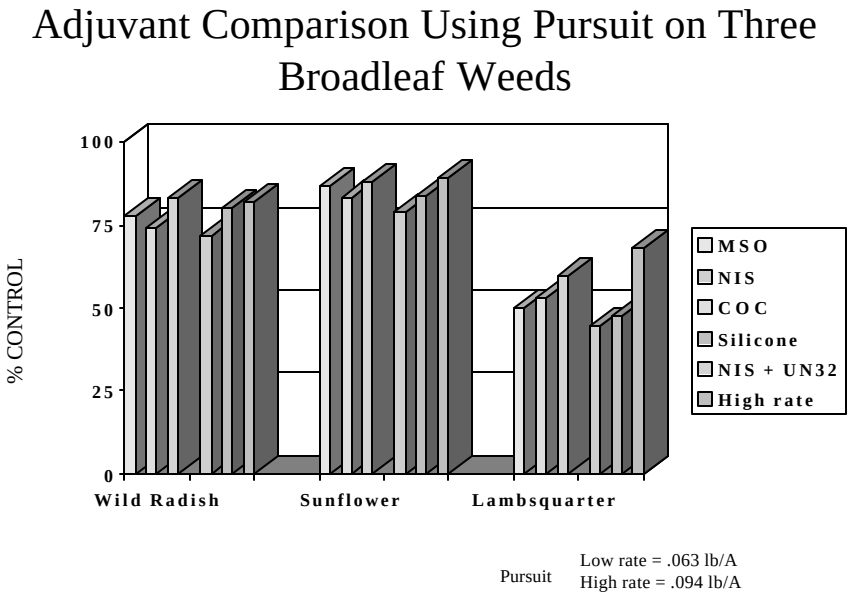


Figure 4