Alfalfa Establishment: Roundup-Ready Not Ready, Consider Wheat Companion Crop

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THE HERBICIDE AGE

Companion crops, like oats, have traditionally been used for establishment of alfalfa. A survey in the 1980's revealed that more than half of producers used companion crops. Although companion crops are still popular especially on erodible land, today many producers direct-seed alfalfa and use herbicides for weed control during establishment. Herbicides reduce risks associated with competition of the companion crops and provide more reliable alfalfa establishment and yield potential than companion crops. Initially, pre-plant incorporated herbicides (e.g. Eptam, Treflan) were widely used, but have been replaced with post-emergent herbicides such as Raptor and Roundup.

HAPPENINGS WITH ROUNDUP-READY® ALFALFA

In 2005, the first genetically engineered alfalfa varieties with tolerance to the herbicide Roundup® (glyphosate) were made available to producers. Roundup is a widely used post-emergent herbicide (applied after crop and weeds emerge) that kills a broad spectrum of weeds. It is deactivated in the soil and has no known environmental concerns. Roundup-tolerant corn and soybean varieties have been used by producers for several years. "Roundup-Ready" alfalfa varieties with tolerance to Roundup application allowed use of Roundup for control of many weeds during establishment and for repeated application of the herbicide as stands matured. Compared to many herbicides, Roundup causes less injury to seedling alfalfa. Research at the University of Minnesota showed that Roundup-Ready alfalfa varieties had similar yields and forage quality as standard varieties (Forages and Grazingslands online, July 2007).

In 2006, a suit was brought against the release of the technology. In 2007, a federal court in California prohibited the further sale of Roundup-Ready alfalfa varieties and ruled that an additional assessment of the environmental impact of the technology be conducted (Federal Register Vol 73.4, January 7, 2008). The court found that USDA-APHIS, the regulating agency, violated the National Environmental Policy Act by not preparing an adequate Environmental Impact Statement in connection with the approval and release of the Roundup-Ready trait in alfalfa. Concerns by the plaintiffs in the suit against the technology relate to its impact on organic agriculture, the potential flow of pollen from genetically engineered alfalfa to other non-engineered alfalfa, and the development of herbicide-resistant weeds. Organic producers cannot use genetically engineered seed or forage produced from genetically engineered seeds; producers have valid concerns about control of the technology so it does not affect their organic certification (http://www.usda.gov; and search for organic certification).

Currently, the United States Department of Agriculture is developing a comprehensive Environmental Impact Statement (EIS). All citizens had an opportunity for input into this statement (aforementioned Federal Register entry Docket# APHIS-2007-044) and will later have an opportunity to review a draft EIS. Although the possibility of an appeal remains, a decision on the use of this new alfalfa technology is not likely to be made until 2009 or 2010. If ultimately allowed to be sold, seed of Roundup-Ready alfalfa may be available in late 2009 or 2010.

COMPANION CROPS FOR ALFALFA ESTABLISHMENT

Record grain prices have sparked an interest in the use of small grain companion crops for alfalfa establishment. Contracts for spring wheat are nearly $20/bushel, an all time record.

Should alfalfa producers use a wheat companion crop this spring? Companion crops provide several advantages including: reducing wind and water erosion, suppression of weeds, and insurance of a crop yield during alfalfa seeding. Small grain companion crops like oat, barley, and wheat can be harvested for forage or grain and straw. Recent research, conducted by the University of Minnesota, evaluating companion crops indicate that some companion crops may have profit potential.

Table 1 shows results of a trial conducted at Waseca. The use of all companion crops limit alfalfa yields in the seeding year compared to those achieved when a herbicide is used (3-4 tons/ac), but alfalfa yields in the year following seeding were similar to those that were normally achieved by using herbicides. In comparing companion crops, pea and flax had low grain yields and were unable to suppress weeds. As a result, alfalfa yields in the year following the seeding year, with pea and flax, were lower than for other grain crops. Alfalfa yields in the year following wheat and

Table 1. *Grain and alfalfa yields when companion crops were seeded in the spring at Waseca in 2006.*

Companion Crop	Grain bu/ac	Alfalfa ton/ac	
	2006	*2006*	*2007*
Spring oat	*84*	*0.4*	*6.3*
Spring wheat	*48*	*0.5*	*6.5*
Spring barley	*78*	*0.4*	*5.9*
Field pea	*54*	*0.2*	*4.8*
Flax	*19*	*0.4*	*6.7*
Control (no companion crop)	-	-	*6.1*

This was a silt loam soil with medium levels of P and K fertility. No fertilizer was applied before seeding. Small grains were Jim oat, Alsen wheat, Lacey barley, Trapper field pea, and Omega-3 golden annual flax seeded at recommended rates for grain production.

oat were similar to those that had been observed when a herbicide was used for establishment in the seeding year. The wheat yields at Waseca of 48 bu/ac will result in a significant net profit at wheat prices of $10-20/ac even if alfalfa yield in the seeding year suffers.

CAUTION: It is critically important that producers understand the risk associated with the use of companion crops. They compete with the alfalfa seedlings for light, water, and minerals; and can smother the small seedlings if the crop lodges before harvest or windrows of straw are deposited. Risks of using companion crops are enhanced if drought occurs in the spring or if wet weather delays grain harvest. Many times, the use of spring-seeded companion crops has resulted in complete alfalfa stand loss.

Therefore, for the past 30 years it has been recommended that if alfalfa establishment and yield is the goal, herbicide should be used or if a companion crop is used, remove it early (e.g., boot stage for forage) and get the cut forage off the field quickly. Do not let windrows lay on the ground for more than three days, as they will smother the alfalfa seedlings.

Have Your Cake and Eat It, Too. Instead of risking alfalfa seedling competition with spring-seeded small grains, consider planting the grain in the spring, harvesting the grain in midsummer, and seeding the alfalfa in late summer. In southern Minnesota, alfalfa should be seeded by August 15. But caution here, too:

- this approach can be risky for alfalfa since timely rains in August are necessary to get the seed up to the 5-leaf stage before the first fall frost.
- volunteer grains and weeds that can compete with alfalfa seedlings may need to be controlled using a herbicide.
- straw from the harvested grain crop should be uniformly distributed in the field in order to avoid interference with alfalfa seedling establishment.