

Alfalfa Following Alfalfa: What Works and What Doesn't Work?

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Farmers often would like to go directly back into alfalfa when an old stand plays out. However, research has shown that it is often difficult to get new stands established when this is done. Some of the problems may be attributed to weeds, insects and diseases that build up over time and become difficult to control. Another reason is that alfalfa plants have been shown to produce chemical compounds that can inhibit germination and growth of new seedlings. This effect is called allelopathy or autotoxicity.

Allelopathy refers to the effect (usually negative) of chemical compounds from one plant on seed germination and growth of other plants. Autotoxicity is the term used for allelopathic effects of chemicals from one plant on seed germination and growth of other plants of the same species (Miller, 1996). Many studies have shown autotoxic effects of alfalfa on new alfalfa seedlings (Nielsen et al., 1960; McElgum and Heinricks, 1970; Klein and Miller, 1980; Hall and Henderlong, 1989); via (Miller, 1996).

Alfalfa autotoxic effects are significant enough that most researchers suggest rotating out of alfalfa for at least one growing season (Cosgrove, 1998). Others have indicated that waiting two weeks after plowing or three weeks after spraying with glyphosate can result in good stands of alfalfa (Tesar, 1993; Rasnake, 1995).

Many factors other than time can influence the degree to which autotoxicity in alfalfa will be expressed. Age of the existing stand is very important. It is felt that three year and older stands are much more likely to cause problems than younger stands. The amount of top growth present when a stand is killed or turned under can be a major factor. Recent research (Jennings and Nelson, 1998) indicates that soil texture may also play a role. Their study suggests that it would take less autotoxic materials to cause problems in sandy soils, but that autotoxic chemicals would stay in heavier textured soils longer. Some of these factors may help explain the variability in research results on alfalfa autotoxicity.

I will report briefly on two studies conducted recently and give my recommendation for dealing with alfalfa autotoxicity. The first is a study which I conducted at Princeton and reported on in detail at the 1995 Alfalfa Conference (Rasnake, 1995). In this study, alfalfa was seeded in the spring one, two, three and four weeks after the existing stand was killed with glyphosate or plowed under. Fall seedings were also made following corn, millet or fallow.

Initial stands were good for all treatments; however, by the end of the first growing season they had decreased significantly (Table 1). Fall seeding was only slightly better than spring seedings. The conventional-till seedings were slightly better than no-till (Table 2).

Table 1. Stand counts of alfalfa seeded no-till at different times after killing an existing stand.				
Treatments	Date			
	5/26/92	11/10/92	7/6/93	5/20/94
One Week*	23**	3	3	2
Two Weeks	28	5	3	2
Four Weeks	24	3	3	2
Millet	-	20	3	3
Corn	-	17	4	3
Fallow	-	19	3	4

*Spring seedings in April; Fall seedings in September.
 **Plants per square foot.

Table 2. Stand counts of conventional-till alfalfa seeded at different times after plowing under an existing stand.				
Treatments	Date			
	5/26/92	11/10/92	7/6/93	5/20/94
One Week*	28**	6	4	4
Two Weeks	37	7	5	4
Four Weeks	34	8	6	5
Millet	-	23	6	5
Corn	-	20	7	4
Fallow	-	25	6	5

*Spring seedings in April; Fall seedings in September.
 **Plants per square foot.

Yields in the year after seeding were good (Table 3) for all treatments. Only the no-till plot seeded one week after alfalfa was killed may have been less than the others. The conventional-till seeded plots had slightly higher yields than no-till plots.

Table 3. Second year yields* of alfalfa seeded at different times after killing an existing stand.		
Treatments	No-Till	Conventional-Till
One Week	4.8	6.9
Two Weeks	6.0	5.9
Four Weeks	5.3	6.6
Millet	5.6	5.8
Corn	5.8	6.3
Fallow	5.4	6.2
*Hay equivalent (T/A)		

The second study was conducted by Dennis Cosgrove at River Falls, Wisconsin (Cosgrove, 1998). In this study, alfalfa was seeded in the spring after an old stand of alfalfa was killed in the fall or zero, two and four weeks before seeding. There was also a check treatment of alfalfa seeded after corn was grown the previous year.

Stand counts (Table 4) were good for all treatments except where alfalfa was seeded immediately after the old stand was killed. Neither fall killing nor seeding alfalfa after corn improved stand densities. This is consistent with the results of the Princeton research in terms of initial stand densities.

Table 4. Effect of time of seeding alfalfa after an existing stand is killed on stand density.				
Treatment	1994		1995	
	No-Till	Conv.-Till	No-Till	Conv.-Till
0 Weeks	14*	6	14	19
2 Weeks	34	39	30	34
4 Weeks	40	27	31	34
Fall kill	34	31	30	43
After corn	29	35	30	47
*Plants per square foot.				

There were, however, differences in the first year yields (Table 5). All the plots seeded following alfalfa were lower yielding than those seeded following a corn crop. The plots seeded immediately after the existing stands were killed had the lowest yields as might be expected based on stand density. However, even when the old stand was killed the previous fall, the yields were significantly reduced.

Table 5. First year alfalfa yields* as affected by seeding time after killing an existing stand.				
Treatment	1994		1995	
	No-Till	Conv.-Till	No-Till	Conv.-Till
0 Weeks	11	11	9	9
2 Weeks	30	31	13	51
4 Weeks	42	86	54	60
Fall kill	58	79	66	61
After corn	100	100	100	100

*Yields expressed as % of check (after corn).

The conclusion is that while autotoxicity had little effect on seed germination and stand density, it did reduce plant vigor and growth. This effect was not observed in the Princeton research. In that study, the plants that survived appeared to be vigorous and healthy.

Recommendations

These studies illustrate the difficulty of predicting the results of seeding alfalfa soon after killing an old stand. They do show that problems with stand establishment and yields of alfalfa frequently occur. For these reasons, I recommend the following when seeding alfalfa after alfalfa:

2. For spring seeding, kill the old stand by tillage or herbicide the prior fall. On sloping land subject to erosion, use a small grain cover crop.
3. For fall seeding, it would be best to kill the old stand the prior fall as described above. This would permit harvesting as small grain

silage/hay crop plus a summer crop of corn silage or warm season annual grass forage crop.

4. Alfalfa can be reseeded two or three weeks after killing an existing stand if the grower is willing to risk reduced stands and possibly shorter stand life. In this situation, conventional till seeding is a better option than no-till.
5. The option with the greatest chance of success is to produce alfalfa in a rotation system that includes one or more years of a row crop such as corn between alfalfa stands. This not only is likely to result in better stands of alfalfa, but is also an advantage in weed control and insect and disease management.

References

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