

# ESTABLISHING ALFALFA FOLLOWING ALFALFA: HOW LONG DO WE WAIT?

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It has long been recommended that alfalfa fields be rotated to another crop such as corn for at least one growing season before reestablishing alfalfa. One reason for doing this is that insect and disease levels build up in the old alfalfa and this time is needed to allow them to die out. Another reason is that alfalfa plants have been shown to produce compounds that inhibit the germination and growth of new alfalfa seedlings. This is called autotoxicity or allelopathy.

Recently researchers from other states have indicated that it may not be necessary to have a full growing season between alfalfa crops. In fact, many are of the opinion that as little as two weeks is long enough after plowing an old stand to reseed a new one, or three weeks for no-till seeding. The reasoning seems to be that the autotoxic compounds will break down in that time and perhaps we are doing a better job of controlling insects and diseases.

We decided to take a new look at how soon we can reestablish alfalfa following alfalfa at the Research Center in Princeton in 1992.

## Methods

The research area was a four year old stand of alfalfa on a Russellville silt loam soil. This is a moderately well drained soil with a depth of about 30 inches to a fragipan. It tends to be wet in the spring, delaying tillage until mid-April most years. The treatments consisted of conventional tillage (turn plow and disk) and no-till (spray with Roundup) as the large blocks. In each of these areas, alfalfa was seeded one, two, three and four weeks after treatment, or in the fall following pearl millet, corn or fallow. One plot was seeded with nothing done to the old stand and one plot was left with no treatment to the old stand which averaged four alfalfa plants per square foot.

A similar set of plots was seeded in 1993 adjacent to the first plots and a smaller number of treatments were seeded in 1994 in another part of the same field. Stand counts were taken periodically and the plots were harvested for yields.

## Results and Discussion

Growing conditions were good in 1992 and good stands of alfalfa were obtained in all the spring seeded plots two to four weeks after seeding (Table 1 and 2). The only exception was where alfalfa was direct seeded into the old stand of alfalfa. In this case, the seed germinated, but all the new plants died within two months. Autotoxicity may have been a factor, but competition from the old plants appeared to be the main problem. The spring

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seeded plots quickly thinned out and by November were down to four or five plants in the no-till plots and six or seven in the conventional tilled plots. The fall seedings produced good stands of alfalfa with all the treatments. In all cases, the conventional-till plots were a little better than the no-till plots. By the end of the third growing season, the no-till plots were down to two to four plants per square foot and conventional-till to four or five. Part of the difference may have been due to the fact that the conventional-till plots were broadcast and the no-till plots were drilled in 8-inch rows.

Treatment	Stand Counts*						
	5/26/92	6/29/92	11/10/92	7/6/93	Stem 7/9/93	10/14/93	5/20/94
1	22.7	12.0	3.0	2.6	28.9	1.8	1.8
2	27.7	12.3	4.7	3.1	24.6	2.0	1.9
3	23.3	11.7	3.7	2.7	26.0	1.9	1.4
4	24.3	12.0	3.3	3.0	27.6	1.9	2.2
5			19.7	2.6	26.4	2.2	2.4
6			16.7	3.9	25.7	3.4	3.1
7			18.7	4.6	36.1	2.6	3.7
8			3.7	2.7	20.3	1.5	2.2
9	3**	0**	0**	2.9	24.4	1.4	2.0

\*Plants per square foot.  
\*\*Represents new plants only.

Treatment	Stand Counts*						
	5/26/92	6/29/92	11/10/92	7/6/93	Stem 7/9/93	10/14/93	5/20/94
1	28.3	15.3	6.0	4.3	24.0	4.7	3.9
2	36.7	16.0	6.7	4.7	23.5	4.1	4.2
3	44.0	21.7	6.7	5.0	20.4	4.2	3.9
4	34.3	29.3	7.7	5.6	25.6	5.0	4.6
5			23.0	6.2	29.1	5.5	5.0
6			19.7	6.9	22.2	4.9	4.1
7			25.0	6.2	28.0	5.7	4.8

\*Plants per square foot.

The 1993 yields from the plots seeded in 1992 (Table 3) were good even though rainfall in July and August was less than half the average. The conventional-till plots averaged over a half ton more hay per acre than the no-till plots. There were no differences between the spring seeded and fall seeded treatments. Yields varied considerably among the spring seeding dates, but only the one week after spraying, no-till seeding appeared to be much lower than the others. There were no significant differences among the fall seeding treatments.

Treatment	1993 Total Yields by Treatment*	
	No-Till	Conventional-Till
1. One Week	4.81	6.87
2. Two Week	6.00	5.85
3. Three Week	5.86	5.02
4. Four Week	5.30	6.58
5. Fall (Pearl Millet)	5.60	5.81
6. Fall (Corn)	5.82	6.34
7. Fall (Fallow)	5.35	6.18
8. Check	5.71	--
9. Seeded into old stand	6.09	--

\*Hay equivalent tons per acre.

Stand counts for the 1993 spring seedings started out good, but by June they were down to 8 and 12 plants per square foot for the no-till and conventional-till plots, respectively (Table 4). By the end of the year the no-till plots were down to 3 and conventional-till to 6 plants per square foot. The conventional-till plots maintained their stands in 1994, but no-till stands continued to decline. The fall seeded plots in 1993 had severe problems with weeds (henbit and chickweed). The no-till plots did not maintain adequate stands in 1994. The conventional-till stands were adequate, but less than desirable.

Treatment	No-Till			Conventional-Till		
	6/93	10/93	10/94	6/93	10/93	10/94
Spring Seeded	8	3	2.0	12	6	6
Fall - Following Sudax	-	*	0.3	-	*	4
Fall - Following Corn	-	*	0.9	-	*	5
Fall - Following Fallow	-	*	1.3	-	*	5

\*Too many seedlings and weeds to count.

Yields of the 1993 spring seeded plots were good in 1993 and 1994 except for the first no-till seeding (Table 5). Stands in that plot were not adequate for yield checks. In the other three spring seeding dates, yields were not significantly different between the no-till and conventional-till plots. The 1994 yields of the plots seeded in the fall of 1993 were much lower than the spring seedings. The fall-seeded no-till plots were very poor. Only the summer fallow treatment produced significant yields. There were no significant differences among the conventional-till fall-seeded treatments.

Table 5. Yields of reestablished alfalfa following a five-year old stand <sup>a</sup> .				
Treatments	No-Till		Conventional-Till	
	1993	1994	1993	1994
----- Hay Equivalent T/A -----				
Seeded April 29	<sup>b</sup>	<sup>b</sup>	2.85	2.60
Seeded May 10	2.60	2.38	2.33	2.87
Seeded May 22	2.51	2.01	2.08	2.42
Seeded May 28	2.40	2.93	1.97	2.47
Fall - Sudangrass	-	<sup>b</sup>	-	1.31
Fall - Corn	-	.50	-	1.85
Fall - Fallow	-	1.38	-	1.74

<sup>a</sup>Seeded in 1993 (cut July, Aug. & Nov.). Two cuttings in 1994 (June & July) first cut not measured.

<sup>b</sup>Stand not good enough to harvest.

The 1994 plots were reduced to four treatments (Table 6). All the spring seeded plots had adequate stands one month after seeding. However, by September, the no-till plots were down to three and one plants per square foot for the one-week and four-week treatments, respectively. One problem was heavy weed pressure in the no-till plots. Also, the seeding dates were late (May 10 and 31) because of the wet weather in April, and July and August were dry and hot. The conventional till plots maintained good stands (seven plants per square foot) into the fall. All the fall seeded plots had good stands three weeks after seeding. However, by Nov. 30 the no-till plots were down to three plants per square foot. The conventional-till plots still had good stands going into the winter.

Treatment	No-Till		Conventional-Till	
	9/22	11/30	9/22	11/30
Spring - One Week	3.4	4	6.7	7
Spring - Four Week	0.8	<1	6.7	9
Fall - Following Corn	24.0	2	27.0	21
Fall - Following Sudax	21.0	3	22.0	20

### Conclusions

The results of this research indicate that autotoxicity is not a problem in getting alfalfa seed to germinate and grow if seeding is delayed at least one week after the old stand is killed. Stands did decline quickly (over one growing season) to about four or five plants per square foot. The reason for the decline was not apparent; however, competition among plants was definitely a factor. The surviving plants were strong and healthy, producing good yields and surviving well throughout the experiment.

Fall seeding after the old stand was killed in the spring with fallow, corn or summer annual grass during the summer was no better than the spring seedings. Two additional factors that may have affected the fall seedings were winter annual weed (henbit and chickweed) competition and heaving of plants during winter due to freezing and thawing.

One thing that was quite obvious is that the conventional-till seedings were much better than no-till in almost every situation. One possible explanation is that the new plant roots tended to grow into the old root channels and as a result, came into contact with more of the chemicals, disease organisms or whatever was responsible for loss of seedlings. Another factor that may have been involved is the fact that no-till plots were seeded with a drill in eight-inch rows while the conventional-till plots were broadcast seeded. The no-till plots were also affected more by weeds. Whatever the reason, it seems obvious that no-till seeding is not a good option in this situation.

While this research shows that alfalfa can be reestablished soon after an old stand is killed, it should be used only where there are compelling reasons to do so. The best bet still is to use a rotation that will have a field out of alfalfa at least a year. There are very few alfalfa fields in Kentucky that are not suitable or would not benefit from being in corn one year out of six or eight.