

## **CAN WE FOLLOW ALFALFA WITH ALFALFA?**

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The question of how soon alfalfa can safely be reseeded following an old stand of alfalfa has been debated for many years. It has been a topic of the Kentucky Alfalfa Conference on at least two other occasions (Rasnake, 1995; Rasnake 1999). Recent research has attempted to determine what causes the problem, how it is affected by soil conditions, and whether the problem can be reduced through plant breeding. This paper will review some of the research.

The problem of following alfalfa with alfalfa is due to a condition called autotoxicity in which the old alfalfa plants produce chemicals that inhibit germination of alfalfa seed, or damage the new seedlings. The result can be poor stand establishment or reduced vigor of the new plants. In research we conducted at Princeton (Rasnake, 1995) we saw no problems with stand establishment or alfalfa yields if seeding was delayed three weeks after killing an old alfalfa stand either with herbicides or tillage. The stands did decline over a period of three years to three or four plants per square foot. However, there were only slight advantages to delaying seeding beyond a few weeks after killing the old stand.

A study conducted in Wisconsin (Cosgrove, 1998) showed very similar results on alfalfa stand establishment. Stands were as good for alfalfa seeded two weeks after the old stand was killed in the spring as they were if the alfalfa had been killed the previous fall or where corn had been grown the previous year. However, there were yield differences during the first year. Alfalfa seeded two or four weeks after the old stand was killed yielded about half as much as alfalfa seeded after corn. When alfalfa was killed in the fall before spring seeding, yields were about two thirds of alfalfa seeded following a corn crop. The conclusion was that while autotoxicity had little effect on stand density, it did reduce plant vigor.

This study illustrates the fact that stand counts alone are not a good way to test for autotoxicity in alfalfa. Treatments need to be evaluated for several years to determine any long term effects.

The actual chemical(s) involved in alfalfa autotoxicity have not been positively identified. However, it is believed that it is a direct chemical effect on the alfalfa seedling rather than on indirect pathogenic effect (Nelson, 2000). It is also not clear where the chemical(s) occur in the alfalfa plant. The autotoxic effects of water extracts of alfalfa plant parts were ranked as leaf (greatest), seed,

root, flower, and stem (least) (Miller, 1996). This suggests that autotoxicity could be reduced by killing the old stand when little or no top growth was present. This could be while the plant is dormant or just after a hay harvest. Killing with a herbicide could not take advantage of this timing since most require growing leaves to be effective.

There is evidence that whatever the chemical is, its impact decreased with time. How much time it takes to dissipate depends on moisture, temperature, and soil type. Therefore, the effects of autotoxicity vary geographically (Undersander, et al., 2000). The effects can be expected to last longer in the North and East than in the South and West of the United States. Soil type, especially soil texture, has been shown to influence the time alfalfa autotoxic effects remain in the soil (Jennings, 1998). They showed in laboratory studies that the autotoxic chemicals moved through a sandy loam soil much faster than a silty clay loam soil. However, it took less of the extract to cause autotoxicity in the sandy soil. This indicates coarse textured soils could be reseeded with alfalfa sooner than fine textured soils if rainfall or irrigation occurred before reseeding. This is not likely to help Kentucky farmers since most of our good alfalfa soils are silt loam or finer.

There is some indication that tolerance to autotoxicity in alfalfa varies with genetics. Attempts are being made to develop varieties through breeding that will be tolerant (Moutray, 2000). However, there are no varieties currently available that can be considered tolerant enough to seed immediately after killing an old stand of alfalfa.

Much work has been done and continues to better understand the autotoxicity problem with alfalfa. Until a better solution is found, Kentucky farmers are best advised to stick with the "tried and true" method of alfalfa reestablishment. That means providing for at least one growing season between alfalfa stands. The minimum is a fall kill for spring seeding or spring kill for fall seeding. This could include spring plowing with a corn silage crop and alfalfa seeded in the fall. If corn is harvested for grain, alfalfa will need to be seeded the next spring. A rotational crop between alfalfa stands has benefits in addition to avoiding autotoxicity such as weed, insect and disease suppression. So, even if the autotoxicity problem is solved, most farmers should still seriously consider at least one growing season between alfalfa crops.

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