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Alfalfa Autotoxicity

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Introduction

Alfalfa producers have observed for many years that attempts to re-establish alfalfa into existing alfalfa stands quite frequently result in failure. In recent years, researchers have begun to suspect that established alfalfa plants may produce toxic compounds that reduce or inhibit the germination of new alfalfa seedlings. The purpose of this publication is to summarize sane of the recent research findings and to describe cultural practices that will help insure success when reseeding alfalfa.

What is Autotoxicity?

Allelopathy is a phenomenon in which one plant produces a chemical (phytotoxin) that is added to the environment and is toxic to another plant. There have been many reports of weed-crop allelopathic interactions, including sunflowers on soybeans and lambsquarter on corn. Autotoxicity is a form of allelopathy, and involves the production of a chemical from one species that is toxic to plants of the same species, as in the case of alfalfa on alfalfa.

Research Results

A study conducted in Illinois (1) which compared yields and stand counts of alfalfa after six years under three different cropping sequences demonstrated the negative effects of an alfalfa-alfalfa rotation (Table 1).

Another study conducted in Illinois (2) indicated that there is more phytotoxic activity in the forage (top) portion than the crown and root portion of the plant. This suggests that the forage should be removed before plowing the stand and re-establishing alfalfa. This same study also indicates that stand density has an influence on germination of new alfalfa seedlings. When entire alfalfa plants from a stand of 3 plants/sq. ft. were plowed down, 57% germination of new seedlings occurred, but this value decreased to 32 and 20% germination with 6 and 9 plants/sq. ft., respectively.

There is some disagreement among researchers as to the length of time required between plowing the stand and re-establishment in order to avoid autotoxicity problems. Research in Michigan (3) indicates that two weeks between plowing and reseeding are adequate to eliminate autotoxicity problems, while Illinois research (2) indicates that at least one month may be required.

Cultural Practices to Minimize Alfalfa Autotoxicity

When planning to reseed an established alfalfa stand back to alfalfa, attention should first be given to correcting any soil pH or nutrient deficiencies. Use soil test results to bring the soil pH up to at least 6.8 and raise phosphorus and potassium soil levels to a high amount.

Table 1. Effects of three cropping sequences on alfalfa yields and stand counts after six years.

Cropping Sequence	Dry Matter Yield	Stand Count
	- - - - - T/A - - - - -	- - - Plants/sq. ft. - - -
Corn-alfalfa	3.8	4.6
Corn-soybean-alfalfa	3.5	3.8
Alfalfa-alfalfa	1.9	2.0

Source: University of Illinois

Time between plowing of the established alfalfa stand and reseeding is the major factor determining the magnitude of the autotoxicity problem. Alfalfa autotoxicity can be eliminated if the established stand can be plowed and seeded to another crop such as corn or oats for one year. The next best option, if erosion is not a problem, is to plow the established alfalfa stand in the fall and seed the following spring. A final choice is spring or summer plowing followed by seeding in a minimum of two weeks and preferably one month.

References

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3. Tesar, M. B. 1987. Re-establishing alfalfa after alfalfa without autotoxicity. In: Proc. 20th Central Alfalfa Improvement Conf., Champaign-Urbana, IL. pp. 8-9.

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