

RENOVATING ALFALFA STANDS IN ARIZONA

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Figure 1. Left: One year old alfalfa stand; Right: Four year old alfalfa stand.

Introduction

Alfalfa is an important crop grown in Arizona with approximately 250,000 acres in production in 2011 and 2012 and 260,000 acres for 2013 (USDA, NASS 2013). A typical yield for Arizona alfalfa growers is approximately 8.2 tons per acre (USDA, NASS). In central Arizona where fields are irrigated, harvest typically starts in March and lasts until November, with majority of production occurring from March to mid-July. Central Arizona producers will typically keep stands for three to four years before rotating. Older alfalfa stands age and thin and will eventually decline in plant density and yield (Figure 1). Producers often wish to improve their stands by reseeding after a failed seeding, thinning, or summer scalding.

Allelopathy and Autotoxicity

Allelopathy occurs when a plant produces a chemical that inhibits the development and growth of neighboring plants of the same or different species. When the production of a chemical is toxic to plants of the same species it is known as autotoxicity. Alfalfa produces autotoxic water soluble, phenolic chemicals that damage new seedlings; these autotoxic chemicals are released from leaves, flowers, stems, and roots (Nielson et al., 1960; Hedge and Miller, 1992; Seguin et al., 2002). Attempts to increase the density of older stands by reseeding are often unsuccessful due to the damage caused by autotoxic chemicals. These chemicals can also reduce the long-term yields of surviving new plants. The amount of time the autotoxic chemicals remain in the soil and the affect they have on new alfalfa seedlings is a function of soil type, temperature, and amount of moisture.

Reseeding New Stands

If alfalfa plant densities are too low within the first year of planting, it is possible to increase the density by over-seeding. Fields that are less than one-year old have fewer autotoxic chemicals than those with older plants because the plants are smaller and low density stands produce less toxin than higher density stands (Canevari and Putnam, 2007). However, if the problem that caused poor establishment isn't corrected, then over-seeding may not work.

Stand Renovation

Older alfalfa stands decline and plant densities decrease with time; these trends can be exacerbated by weeds, insects, disease, scalding, traffic, and compaction. A common renovation practice is to lightly disk or cultivate to disturb the soil and drill seed directly into the stand at 10-20 lbs seed/acre. Interseeding alfalfa to prolong a declining alfalfa stand does not involve the costs that come with completely re-establishing the stand, but interseeding is not always successful (Canevari and Putnam, 2007; Seguin et al., 2002). Newly planted seed may germinate but die during the seedling stage, or not germinate at all. Some growers have seen success in Arizona for interseeding, but the conditions are not entirely understood. The best thing to do is to work to fill in bare spots. Reseeding may work in an area of the field where there were no or only a few alfalfa plants prior to reseeding. The negative effects of autotoxicity are usually avoided by allowing time for degradation of allelopathic chemicals between termination of an existing alfalfa stand and establishment of new alfalfa in the same field (Jennings and

Nelson, 2002). At minimum, an interval of 2-3 weeks is usually adequate for planting alfalfa after alfalfa in Arizona.

Citations

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