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A simple method to increase alfalfa yields in the establishment year

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A simple method to increase alfalfa yields in the establishment year

Abstract: *Any practice that would improve alfalfa's profitability could increase its use by producers. The method tested in this study—mixing seed of nondormant and dormant cultivars at planting—is simple, and could improve traditionally poor yields during the establishment year.*

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$6,000 for one year

Background

The economic returns of alfalfa production are unfavorable in the establishment year, when yields typically range from 40 to 60 percent of established stands and when seed costs must be factored into the mix. Yields can be maximized by clear-seeding alfalfa with an herbicide and harvesting three or four times beginning 60 days after planting. But even then, yields never reach the levels of fully established stands.

A possible means of improving the first year yield may be to include a portion of nondormant seed (from the southwestern United States) with the adapted upper midwestern U.S. cultivar at the time of seeding. Although this may seem counterintuitive, it could be successful if the nondormant plants produced higher yields than the adapted cultivar, and if the loss of these plants over winter did not adversely affect stand life or yield in subsequent years. Given that most established alfalfa stands have excess plants after the first year, the loss of nondormant plants over winter may not be a serious problem.

Another consideration in using nondormant alfalfa cultivars is a possible negative effect on forage quality. These cultivars typically have fewer but thicker stems than dormant and semi-dormant cultivars. Stems, and stem bases in particular, are the least digestible parts of an alfalfa plant.

The objectives of this experiment were to test seed mixtures consisting of various proportions of dormant and nondormant alfalfa cultivars to determine the effect of mixtures on seeding year yield, yield in the second production year, and forage quality.

Approach and methods

Two nondormant cultivars and two commonly grown midwestern alfalfa cultivars were used in the experiment. Two mixtures of dormant/nondormant cultivars and pure stands of all four cultivars were seeded in field studies at Iowa State University research farms near Ames, Nashua, and Castana in April 1998. These Iowa locations were chosen for their diverse soil and climate conditions.

Forages were harvested for yield four times in 1998, including once in late October, and in 1999. Plants were counted in May and October 1998, and in June 1999. Forage quality was assessed at the first and fourth harvests in 1998 by analyzing digestibility, crude protein, and neutral detergent fiber. In general, both alfalfa mixtures responded similarly, so the two mixtures were pooled and data presented in terms of nondormant material in the planting mixture.

Results and discussion

Stands of all cultivars and their mixtures established well. In May 1998, approximately one month after planting, the number of established plants for all cultivars was very high. The 100 percent nondormant plots had slightly fewer plants than the others, primarily due to a weaker stand of one cultivar (Mecca). By the end of the establishment year, however, no differences were evident among any of the cultivars or treatments. Although the 1998-1999 winter was mild for Iowa, significant stand loss was observed for nondormant cultivars, but plant numbers in plots with 0 and 10 percent nondormant seed did not differ. Thus, plant numbers may not be affected if a small percentage of the seed planted is a nondormant cultivar, but more substantial amounts of nondormant seed included in the seeding mix will likely depress plant numbers after winter.

Across locations, forage dry matter yields in pure stands differed between the dormant and nondormant cultivars for both years. The two nondormant cultivars tested here will yield more than adapted cultivars in the upper Midwest, if a late autumn harvest is taken.

Autumn 1998 was warm, dry, but sufficiently moist, and ideally suited for plant growth. However, because most of the benefit from nondormant cultivars accrues in the autumn, years with early frosts or otherwise unfavorable autumn growth or harvest conditions will likely not show any production improvement when compared with dormant cultivars.

Mixture yields in 1998 were intermediate to the two pure stands. Mixtures with 30 percent nondormant seed, but not those with 10 or 50 percent, produced more total yields than the than the dormant cultivar pure stands. No yield increase can be expected from including 10 percent nondormant seed at planting, and this was the only mixture that had stands similar to the pure dormant cultivar stands.

Yield in the second production year is the key to the successful use of the dormant/nondormant cultivar mixtures. Despite the mild winter, large yield reductions were observed in the nondormant cultivars. Even though the plant numbers were similar for the plots with 0 and 10 percent nondormant seeds, the 10 percent nondormant plots produced less forage than the dormant pure stands in 1999. These results suggest that inclusion of even small amounts of nondormant seed in the mixture can have serious implications for the post-establishment year results.

Forage quality was similar for all mixtures of the first harvest in 1998. However, at the final harvest, the nondormant cultivars showed lower forage digestibility, lower crude protein, and higher fiber content. The higher yields observed in these cultivars, then, were offset by lower quality. However, the overall quality of the samples was quite high, so this modest quality decline is probably immaterial when considering the dietary needs of the livestock.

Conclusions and impact of results

This study determined that mixing nondormant seed with the adapted cultivars can marginally increase seeding year yields in some locations. The improvement comes at a cost, however, and even small amounts of nondormant seed can have adverse effects on second-year alfalfa production. The investigators do not recommend mixing any quantity of nondormant alfalfa seed with adapted cultivars at planting.

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