Research Seeks to Improve the Establishment and Subsequent Yield of Alfalfa Interseeded into Silage Corn

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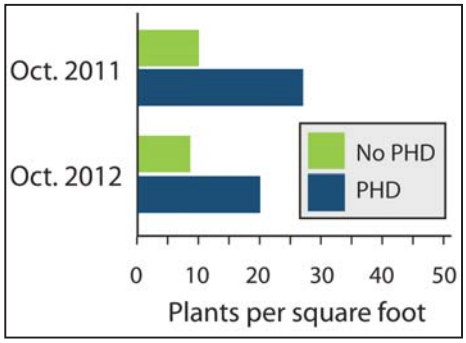
New approaches are needed to increase the annual dry matter (DM) yield of alfalfa, which is lower yielding than silage corn. This yield disparity has contributed to dairy farms abandoning alfalfa-corn rotations in favor of continuous production of silage corn. Eliminating alfalfa, however, can adversely affect the sustainability of crop production by increasing the amount of nitrogen fertilizer purchased, increasing soil erosion, and decreasing soil organic matter which negatively affects water infiltration and water holding capacity. Too much corn silage in the diet may also lead to impaired health and reduced milk production of cows.

Figure 1. Prohexadione treatment in June 2011 more than doubled plant density of interseeded alfalfa when sampled in October 2011 (following corn harvest) and in October 2012 (following one year of alfalfa forage production.)



Establishing alfalfa by interseeding into corn rather than by conventional spring-seeding after corn could double first-year yields of alfalfa, but interseeding is currently unworkable because competition between the co-planted crops leads to frequent stand failure of alfalfa and reduced yield of corn. The goal of this research is to identify plant growth regulator (PGR) treatments and management practices that will boost the success rate of alfalfa establishment by interseeding to greater than 80% while limiting yield depression of corn to less than 5%. An economic analysis suggests such a system could improve the profitability of first-year alfalfa by about $100/ac compared to conventional spring-seeded alfalfa (Grabber and Vadas, 2011, unpublished).

An initial screening of foliar-applied PGRs suggested that a calcium salt of prohexadione might be useful for limiting excessive top growth of interseeded alfalfa during its establishment in corn. Prohexadione is currently labeled for several orchard crops, peanuts, and grass seed production to limit shoot growth.

Field studies were carried out for four years on a silt loam soil near Prairie du Sac, WI, to evaluate prohexadione applications on alfalfa that was planted with Clearfield or Roundup-Ready corn (no-till) in early- to mid-May. Prohexadione was sprayed at 10-40 oz/ac with drop nozzles onto alfalfa seedlings about 4-6 weeks after planting.

Prohexadione applied in June typically reduced alfalfa top growth by about 20% in July and doubled or tripled alfalfa seedling stand density by mid-October compared to non-treated controls. Alfalfa interseeding reduced DM yields of corn silage by about 7% compared to corn grown without interseeded alfalfa. Prohexadione application on alfalfa had no effect on corn yields.

First-year alfalfa yields established the previous year by interseeding were two-fold greater than alfalfa conventionally spring-seeded after corn. Prior year prohexadione applications increased first-year alfalfa yields by about 12% and fall stand densities by 37 to 130% compared to untreated interseeded controls. Higher rates of prohexadione did not further improve alfalfa top growth suppression, stand density, or forage yields. Overall as illustrated in Figure 1 and Figure 2, the primary benefit of prohexadione treatment was to substantially improve stand density of interseeded alfalfa and this should markedly improve the success rate of alfalfa establishment in corn and ensure high yields of alfalfa across several cropping seasons. Some advantages of the corn-interseeded alfalfa system are depicted on the cover photo of this magazine (Figure 3).

Although the corn-interseeded alfalfa system has great potential, additional studies with prohexadione and other PGRs are needed to find ways of lessening corn yield reductions and to develop workable, cost-effective production systems for farms. Studies are being conducted, for example, with Mark Renz and Joe Lauer (UW-Madison) to see if lower, more economical rates of prohexadione in single or split applications can be effective for boosting stand density and subsequent yields of interseeded alfalfa. This study is also looking at how seeding rates of alfalfa and corn affect the establishment of interseeded alfalfa and forage yields of both crops.

Figure 2. Photos illustrating the benefits of applying prohexadione (PHD) on interseeded alfalfa.

Untreated interseeded alfalfa initially grew rapidly under corn, but its canopy died back in August, leaving sparse regrowth from few surviving plants.

AUGUST

Compared to the control, PHD treated alfalfa had less top growth and likely put more energy into root development. After canopy dieback in August, numerous shoots were produced from a large number of surviving plants.

About one month after corn harvest, plant density and fall regrowth were poor from the interseeded alfalfa control.

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Interseeded PHD treated alfalfa had a higher plant density and good fall regrowth following corn harvest. Corn harvest normally caused little damage to alfalfa stands if soil was firm.

Figure 3. The potential of interseeding to jumpstart alfalfa production is illustrated in the cover photo, which was taken during the first year of alfalfa production. Alfalfa interseeded into corn the previous year is ready for harvest in late-May/early-June (left), whereas alfalfa spring-seeded in April is still getting established (right). First year DM yields of interseeded alfalfa averaged 5 tons/ac compared to only 2.4 tons/ac for spring seeded alfalfa. Studies in WI have shown that foliar applications of prohexadione-calcium greatly enhance alfalfa establishment in corn.