

KEYS TO ALFALFA ESTABLISHMENT IN HIGH YIELDING SILAGE CORN

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Alfalfa has often been replaced in rotations by corn silage, in part because corn produces greater forage dry matter yield than alfalfa. First year yields of spring-seeded alfalfa are particularly low, often being one-half that of subsequent full production years. Planting small grain, grass, or legume companion crops with alfalfa can modestly improve forage yields in the establishment year, but seeding companion crops with alfalfa often reduces forage quality. Thus, new approaches are needed to increase the yield of alfalfa, especially during its first year of production.

One way to bypass the low yielding establishment year would be to interseed alfalfa into corn to jumpstart full production of alfalfa the following year. When successfully established, first year dry matter yields of interseeded alfalfa are two-fold greater than conventionally spring-seeded alfalfa. During and after establishment, interseeded alfalfa also serves as a cover crop to reduce soil and nutrient loss from cropland. Unfortunately, this system has been unworkable because traditional intercropping methods require producers to plant corn at low density (sacrificing high silage yields) to allow reliable establishment of alfalfa. Therefore the USDA-Agricultural Research Service, the University of Wisconsin, and institutions in other states are working to develop reliable methods for establishing alfalfa in high yielding silage corn. During the course of this work in Wisconsin, it has become apparent that successful establishment of alfalfa in corn can be greatly improved by using growth altering and protective agrichemicals. Using appropriate alfalfa varieties, adequate alfalfa seeding rates, and proper planting dates also help to ensure successful establishment of alfalfa in silage corn.

Initial studies from 2008 to 2014 demonstrated that foliar applications of a growth retardant known as prohexadione (PHD) on interseeded alfalfa increased seedling survival by 40 to 300% under high yielding corn seeded at up to 35,000 plants per acre. Because of its effectiveness and low toxicity, efforts are now moving forward to register PHD this use in time for the 2020 growing season. Work conducted in 2017 and 2018 found that fungicide and insecticide applied after PHD further doubled survival of interseeded alfalfa to give good stand establishment, even when corn was planted at populations of up to 44,000 plants per acre. Follow up work in 2018 and 2019 will identify suitable rates and the best timing to apply PHD, fungicide, and insecticide to ensure good establishment of interseeded alfalfa at reasonable cost. Other work from 2015 to 2017 found that alfalfa interseeding suppressed weeds in corn. Weed control was further improved by applications of Roundup, Warrant and Buctril herbicides.

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Other Wisconsin interseeding studies in 2015 and 2016 found substantial and consistent differences in plant survival among 38 conventional, glyphosate-resistant, and leafhopper-resistant alfalfa varieties. Without PHD treatment, plant density of alfalfa varieties following corn ranged from 2 to 8 plants per square foot in 2015 and from 0 to 1 plants per square foot in 2016. Applying PHD to alfalfa varieties increased plant density by up to 5-fold. Several studies in 2012 and 2013 indicated shifting the seeding rate of alfalfa from 8 to 16 lb per acre increased alfalfa plant density by up to 50% following corn harvest. Other studies carried out from 2016 to 2018 suggested survival of PHD treated alfalfa under corn was up to 50% greater when interseeding was carried out immediately after corn planting rather than waiting until corn had emerged or reached the two-leaf stage.

Based on the abovementioned work, experiments on producer fields were recently initiated in Wisconsin and in three other states to identify factors that influence the success or failure of alfalfa establishment under corn in a wide variety of growing conditions. In 2018, these experiments confirmed the benefits of PHD and fungicide applications and highlighted the need for adequate weed control and good seedbed preparation for good alfalfa establishment. Additional farm cooperators will be needed for studies in 2019. Other ongoing or planned experiment station trials will investigate breeding of alfalfa for improved survival under corn, evaluate the compatibility of various corn hybrids with interseeded alfalfa, and refine nitrogen fertilizer and other management practices to ensure corn-interseeded alfalfa production systems will be reliable, high yielding, and profitable for farmers.