Alfalfa varieties differ markedly in seedling survival when interseeded into corn and treated with prohexadione-calcium

John H. Grabber, Mark J. Renz, and Heathcliffe Riday

Interseeded alfalfa could serve as a dual purpose crop for providing groundcover during silage corn production and forage during subsequent years of production, but this system has been unworkable because competition between the co-planted crops often leads to stand failure of interseeded alfalfa. Recent Wisconsin studies have demonstrated that foliar application of the growth retardant prohexadione-calcium (PHD) on seedlings greatly improved the establishment and subsequent dry matter yield of interseeded alfalfa, but stand failure of interseeded alfalfa still routinely occurred at some locations. Therefore this study was initiated to determine if seedling survival of interseeded alfalfa differed among varieties and was associated with reported varietal traits. The study was conducted in 2015 at two locations in Wisconsin where interseed alfalfa had routinely succeeded (Prairie du Sac, PDS) or failed (Arlington, ARL) to establish in corn. Twenty varieties from several seed companies were selected to represent germplasm differing in traits such as pest resistance, fall dormancy, traffic/grazing resistance, salt tolerance, lodging resistance, forage quality, and tolerance to glyphosate herbicide. In early to mid May, four rows of each alfalfa variety were no-till interseeded at 18 kg of live seed ha^{-1} between corn rows immediately after imidazolinone-resistant corn was planted at 90,000 seed ha^{-1} in rows spaced 76 cm apart. Corn was fertilized with 210 kg N ha^{-1}, weeds were controlled by a post-emergence application of imazethapyr, and PHD was sprayed on alfalfa in mid June at 0 or 0.5 kg a.i. ha^{-1}. A randomized complete block design with four replications was used at both locations, with varieties assigned to whole plots and PHD treatment assigned to subplots. Immediately after silage corn harvest in mid September, wheel traffic was uniformly applied to all subplots to mimic compaction that would occur on producer fields. Alfalfa plant density and other plant characteristics (plant height, leaf and stem mass, and visual assessment of foliar disease) were monitored between mid June and mid October. At both locations, plant density of all alfalfa varieties declined in a similar manner between June and late August. By mid October, however, average stand density at PDS exceeded ARL by 2.8-fold and early season treatment with PHD enhanced plant survival by an average of 2-fold at PDS and 2.7-fold at ARL. More importantly, there were considerable and consistent differences in the survival of alfalfa varieties and in their response to PHD treatment at both locations. Averaged across locations, plant density of alfalfa varieties ranged from 18 to 90 plants m^{-2} without PHD and 55 to 210 plants m^{-2} with PHD. Plant density responses of varieties to PHD treatment ranged from not significant to an increase of nearly 4-fold. Stand density in October was not associated with plant characteristics measured earlier in the season or with most plant traits, however, the two varieties with the leafhopper-resistance trait ranked first in plant survival among the 17 conventional varieties and first among the three glyphosate-tolerant varieties we evaluated. Overall these results suggest successful establishment of interseeded alfalfa can be accomplished over a wider array of locations if an appropriate variety is used. Based on these findings, additional interseeding trials will be conducted in 2016 to further evaluate the survival and the response of glyphosate-resistant vs. conventional alfalfa varieties to PHD and to further assess the importance of the leafhopper resistance trait for plant survival.