Hairy Vetch: An Early-flowering Winter Hardy Cover Crop for Minnesota

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Simplified rotations, made possible by the availability of synthetic fertilizers, have resulted in the preferential removal of winter annuals from large expanses of agricultural lands (Tonitto et al., 2006). This reduction in the duration of living plant cover on the fields is accompanied by a reduction in nitrogen-fixation, water losses and contamination, increased soil erosion, and depletion of soil organic matter stocks (Peoples et al 1995). If farming systems are to remain productive and sustainable in the long-term, it will be necessary to replenish the reserves of these nutrients that are removed or lost from the soil.

Consequently, there is a renewed interest in the role of legumes in diversified cropping systems associated with soil quality benefits reported with cover crop use. Research has shown that biologically fixed nitrogen (BFN), specifically nitrogen fixed through legume-rhizobia symbiosis, can contribute a significant amount of available nitrogen for subsequent grain uptake (Bollero and Bullock 2013). Hairy vetch (Vicia villosa Roth), in particular, can produce 60 to 120 lb/acre of nitrogen (Undersander et al., 2013).

The vetches (plants of the genus Vicia) are comprised of about 150 species of vetch, several of which were of agricultural importance centuries ago for BFN and forages (Undersander et al 2013). Worldwide, hairy vetch is grown more extensively than any other vetch variety, due primarily to its high degree of winterhardiness (Klages, 1928). It has not been shown, however, to reliably overwinter in the Upper Midwest (Harbur et al 2009). This variable winter hardiness, compiled with an extended time needed to mature in the spring, the prevalence of hard seed, and potential to become weedy, has limited the incorporation of hairy vetch into agricultural rotations. Therefore, in order to improve hairy vetch as a winter cover crop for our region, it is necessary to understand the degree of variability present within the species.

The objective of this research is to evaluate ecotypes based on primary traits such as winter hardiness and early-flowering, as well secondary characteristics such as biomass.
and seed yield, vigor, and hardseededness. Thirty hairy vetch accessions are being evaluated: 12 of which were from earlier University of Minnesota selections for winter hardiness, and 18 new accessions were gathered from regional and northern seed companies. This two-year study is taking place at three locations: St. Paul, Becker, and Roseau, MN. We utilized two different planting dates, September 4th and September 17th, in the first 2013-14 trial. Effects of variety, location, and planting date were analyzed for each trait of interest.

Results indicate that our current germplasm indeed contains genetic variation, and that variation may also interact with the environment. Most notably, we found that the original ecotypes developed in Minnesota, were more winter hardy than other non-native ecotypes. More analysis is needed to evaluate any interactions present, as well as stability and correlations among traits. These initial selections are the foundation for a traditional recurrent breeding program, with the goal of releasing a reliable winter hardy, early-maturing hairy vetch cultivar to fit in the narrow window of opportunity for cover crops in Minnesota.

References


