

Legume Cover Crops: Why does the Variety Matter? Brook Wilke, Department of Crop and Soil Sciences, Michigan State University

Legume cover crops are exceptional sources of fertility in organic cropping systems, and can completely replace the need for external organic fertilizers. Yet, the value of legume cover crops can also fluctuate dramatically depending on a host of factors, such as environmental conditions. We conducted multiple field and greenhouse experiments in Michigan from 2005-2008 to investigate the importance of carefully choosing legume cover crop varieties to buffer these fluctuations in cover crop performance.

We chose to work with two cover crop species, hairy vetch (*Vicia villosa*) and red clover (*Trifolium pratense*), which are commonly used by organic grain and vegetable farmers in Michigan. Our field studies were conducted at the W.K. Kellogg Biological Station and two on-farm sites, one in southwest Michigan and one in eastern Nebraska. We investigated multiple variables in our study, including planting time, cover crop variety, and cover crop variety mixtures. Seven red clover varieties all performed similarly across our experiments, consistently producing moderate amounts of biomass. In contrast, six hairy vetch varieties tested in field conditions differed in many characteristics, which led to variable performance across a range of growing conditions. These differences led to the possibility of obtaining large quantities of biomass, substantially more than any red clover variety, but also led to the possibility of cover crop failure.

The variations in hairy vetch traits and subsequent performance led us to propose four key reasons for carefully considering the variety before planting a legume cover crop, particularly hairy vetch.

1.

rowing degree days can be a useful tool to predict cover crop biomass, but cover crop varieties grow at different rates depending on the weather conditions. Thus, different formulas must be used for each variety to accurately predict hairy vetch biomass by growing degree day (Figure 1).

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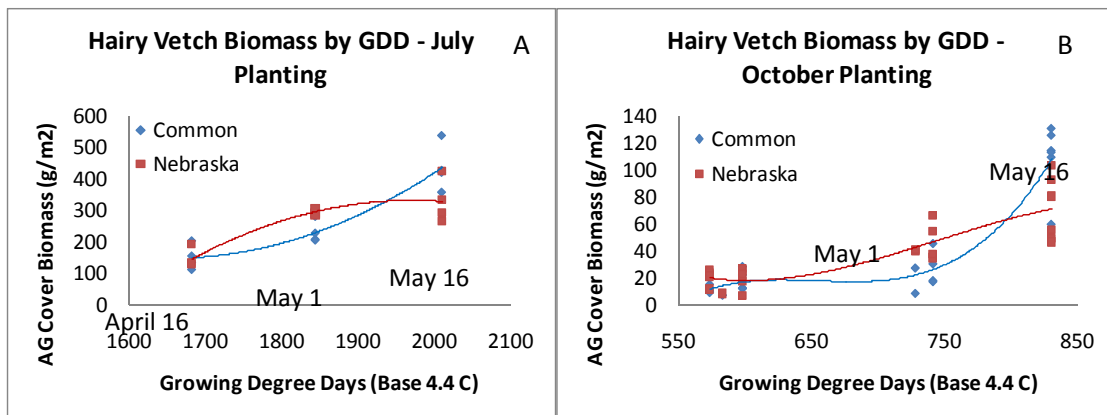


Figure 1. Spring above ground biomass for two hairy vetch varieties is plotted against growing degree days (Base 4.4 °C (40 °F)). Polynomial trendlines are shown on the graphs to identify patterns in the data. Dates are inserted in the graphs to help identify the time of year when these degree days are occurring. A) When planted in July, “Nebraska” grows faster early in the spring while “Common” catches up and grows faster after May 1st. B) This data stems from two different years of planting hairy vetch in October. The data are consistent with the July planting, indicating that “Nebraska” grows faster early in the spring and “Common” grows faster after May 1st.

2. H

airy vetch is advertised as a winter annual, which means that it is planted in the fall, overwinters, and grows again in the spring. However, our data suggest that the actual planting date can substantially influence biomass production. For example, when planted in early October (after soybean harvest), “Common” hairy vetch averaged 66 g/m² of biomass by mid-May of the following year, but when planted in late July (after wheat harvest), an average of 435 g/m² of biomass was produced. This trend varied slightly across varieties tested, but the general outcome was that October plantings resulted in substantially lower biomass than July planting.

3. T

he variable characteristics of hairy vetch can be useful for different planting niches; here are some examples.

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ased on Figure 1 above, “Nebraska” grows fast early in the spring, and would be a promising variety for early incorporation (between April 15th and May 1st), whereas “Common” grows faster after May 1st, and is ideal for later incorporation (after May 15th).

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Lana” hairy vetch does not survive the winter in Michigan, but grows very fast in the summer and fall after planting. Thus, “Lana” produces substantial amounts of fall biomass and creates a thick mulch layer, but prevents the need to spend time and money killing the cover crop in the spring.

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AU Early Cover” flowers earlier than the other varieties (as early as May 15th in one trial), making it ideal for no-till organic farming.

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Minnesota” is a certified organic variety that is similar to “Nebraska.”

4. V

ariety mixtures are useful for first time hairy vetch growers. Planting a mixture of varieties together in the same field helps to buffer against environmental factors unique to the specific farm or year. Thus, growers can evaluate and identify successful varieties for their farm, considering their specific needs. This concept may apply to other cover crop species as well.

In conclusion, red clover is a reliable cover crop species, as all varieties tested produced substantial amounts of biomass. Hairy vetch, in contrast, has the potential to produce more biomass as a cover crop than red clover, but varieties differ substantially in several key traits that may also cause cover crop failure depending on specific circumstances. These trait differences can be used to the advantage of cover crop growers, allowing them to match varieties to specific needs on their farm.

Appendix B: Hairy Vetch Variety Descriptions

1. “
Common” is a variety commonly sold in Michigan under the label of “Variety Not Stated.” This variety has few leaf hairs and is produced in the Pacific Northwest, primarily in Oregon. We obtained this variety from Michigan State Seed in Grand Ledge, MI. “
2. “
Nebraska” is produced in Nebraska, and is also sold as “Variety Not Stated,” but may stem from an old variety called “Madison.” However, “Nebraska” is much different than “Common,” as it is much more pubescent (hairy) and is bred to be more cold tolerant, but also grows slower during warm weather. We obtained this variety from Kaup Forage and Turf in Norfolk, NE. “
3. “
Lana” is a certified variety that was bred for Mediterranean climates such as that found in California. This variety is sometimes called Woolypod Vetch, and is fast growing during warm weather, but is not cold tolerant. We obtained this variety from S&S Seeds in Carpinteria, CA. “
4. “
AU Early Cover” is a certified variety that was bred at Auburn University for its early flowering characteristic, often two weeks earlier than other varieties. However, winter survival is mediocre in Michigan, and total biomass production is less due to its determinate growth pattern. We obtained this variety from Southern Proprietary Seed in Lake Oswego, OR.
“Minnesota” is a certified organic variety sold under the “Variety Not Stated” label. This variety appears to be similar in form and function to “Nebraska,” potentially stemming from an old variety called “Madison.” We o