



Hairy Vetch as a Crop Cover

BENEFITS

Hairy vetch is an annual leguminous cover crop that is winter hardy throughout Pennsylvania if established in a timely manner. Hairy vetch fixes large amounts of nitrogen (N) that help meet N needs of the following crop, protects soil from erosion, helps improve soil tilth, and provides weed control during its vigorous growth in the spring and when left as a dead mulch at the soil surface. Hairy vetch can also be grazed or harvested as forage. Research has shown that hairy vetch mulch can increase main crop disease resistance and prolong leaf photosynthesis of the following crop.

ADAPTATION

Hairy vetch usually survives the winter in Pennsylvania as long as it is established in late summer/early fall. Hairy vetch does best on well-drained soils and is not recommended for poorly drained soils. It prefers a soil pH between 6.0 and 7.0 and is adapted to high soil fertility status (phosphorus, potassium, and sulfur). Some limited variety development has taken place in hairy vetch. 'Madison' was developed in Nebraska and is very cold tolerant. 'Auburn', 'Oregon', and 'Lana' are better adapted to warmer winters. Two new vetch varieties released by USDA are 'Purple Bounty' and 'Purple Prosperity'. These varieties were developed for their earlier spring growth. However, there is some evidence that these varieties exhibit reduced winter hardiness. Despite the existence of hairy vetch varieties, most seed is labeled "variety not stated" (VNS). Additionally, varieties self-select to adapt to local conditions after being reproduced in a certain area for many years. Minnesota research has shown better winter survival of hairy vetch grown from locally produced seed than from seed produced farther south. Consequently, where the seed was produced is as important as the variety.

NITROGEN FIXATION

Hairy vetch can fix large amounts of nitrogen that are released rapidly after it has been terminated. Decomposition and nitrogen release rates are faster if the vetch is

incorporated, but total amount of nitrogen released over the entire growing season is similar to vetch left on the surface as a mulch. The equivalent of 160 lbs/A N fertilizer can be released to the following crop by a killed hairy vetch cover, although 100 lbs/A N is more realistic. Typically, hairy vetch contains 3.5 to 4 percent nitrogen (dry matter basis). Conservative estimates are that 50 percent of this will be available to the following crop.



Figure 1. Hairy vetch as a crop cover.

ESTABLISHMENT

Drill 15–20 lbs/A hairy vetch seed 1–1.5 inches deep (use higher seeding rate when planning to terminate hairy vetch early in spring). It is possible to broadcast seed at 20–30 lbs/A and use a light disking or field cultivation to improve seed to soil contact. Use seed that has been inoculated with the appropriate rhizobium strain (hairy vetch/pea group *Rhizobium leguminosarum biovar viceae*) to guarantee nitrogen fixation. For success, hairy vetch needs to be established in late summer (before mid-August in northern Pennsylvania and higher altitudes; September 1 in central Pennsylvania; and before the middle of September in southern Pennsylvania). Later establishment will usually lead to a poor stand due to winterkill. If established more than three weeks prior to latest establishment date, hairy vetch may winter-kill due to excessive fall growth.

A good place in a crop rotation for hairy vetch establishment is after small grain harvest. Make sure crop residue from the previous crop is well distributed if establishing hairy vetch with no-till methods and kill existing vegetation with a burndown herbicide. More often than not, a fair amount of volunteer small grain will come up with the hairy vetch in the fall. This should be considered an advantage rather than a disadvantage. The small grains provide a quick cover, whereas the hairy vetch grows slowly in the fall. The small grains help retain and absorb nutrients such as nitrogen, phosphorus, and potassium. The small grains also provide mulch that is more resistant to decomposition and contributes to the buildup of soil organic matter. The C/N (carbon-to-nitrogen) ratio of the residue tends to be lower if the small grain is grown in companion with hairy vetch, contributing to faster decomposition of the small grain residue and less nitrogen immobilization.

Each small grain/hairy vetch mixture has its advantages and drawbacks. In a mixed stand of hairy vetch and oats, the oats provide quick cover and capture snow that helps protect the young vetch seedlings in the winter. Since oats winter-kill in most of Pennsylvania, there will be a pure hairy vetch stand left in the spring. If the companion is rye, triticale, wheat, or barley, the small grain will survive the winter with the hairy vetch. The small grain provides quick cover and the vetch climbs up into the small grains in the spring. Research

in Maryland has shown that hairy vetch mixed with rye fixes almost the same amount of nitrogen as if it were grown without a companion. If volunteer small grain cannot be counted on, then it is recommended to seed a hairy vetch/small grain mix instead of pure hairy vetch. In this case, use no more than 2 bushels/A of oats or 1 bushel/A of rye, triticale, wheat, or barley mixed with a full seeding rate of hairy vetch. In spring, triticale and wheat mature at about the same time as hairy vetch, whereas rye will mature prior to hairy vetch flowering. Wheat and triticale may therefore be better suited in combination with hairy vetch if the goal is to terminate both at about the same stage of maturity prior to seed production.

It is possible to establish hairy vetch after early corn silage harvest in parts of Pennsylvania. However, attention needs to be paid to the herbicide program used; check the rotational restrictions on the label or in the *Penn State Agronomy Guide*. Although hairy vetch is not generally included as a rotational crop on the herbicide label, alfalfa and clover rotational restrictions should be similar to hairy vetch. Another option is to broadcast hairy vetch in standing soybeans, but this is uncommon because of the expense of the seed and the higher risk of failure with this method than if vetch is drilled. Seeding hairy vetch after corn grain or soybean harvest is not recommended because the vetch is then unlikely to survive the winter.

MANAGEMENT

Little management is usually required once hairy vetch is established. Fertilizer is usually not needed, and N fertilizer or manure applications can be detrimental because they stimulate grasses and small grains to be more competitive. Avoid traffic on hairy vetch as the wheels can destroy small seedlings as well as large plants.

TERMINATION

To fix much nitrogen, the hairy vetch should not be terminated too early in the spring (Table 1). This means that hairy vetch should be terminated after May 1 in southern Pennsylvania, after May 10 in central Pennsylvania, and after May 20 in northern Pennsylvania and higher altitudes. The vetch will still accumulate more nitrogen until early or mid-June, but the producer may wish to terminate the vetch before that to allow timely corn planting.

Table 1. Effect of termination date of hairy vetch in central Pennsylvania (established mid-August).

Vetch Termination Date	Vetch Dry Matter Biomass (lbs/A)	Vetch N Concentration (%)	Vetch N Content (lbs/A)	Estimated N Fertilizer Value (lbs/A)*
2007				
Early (May 4)	1,400	3.82	55	27
Middle (May 15)	4,300	4.43	190	95
Late (May 31)	6,600	4.15	274	137
2008				
Early (May 1)	3,200	2.49	80	40
Middle (May 14)	4,000	2.92	117	58
Late (May 31)	4,400	4.55	199	100

*Estimated based on 50 percent availability of vetch N. Data courtesy of Robert Gallagher.

A good herbicide program to terminate hairy vetch is a mix of glyphosate and 2,4-D or dicamba (Table 2). Glyphosate alone is not a recommended program to kill a legume such as hairy vetch since its performance is variable. Plant growth regulators such as 2,4-D and dicamba are effective but also require some delay (1–2 weeks) between application and corn planting to avoid corn herbicide injury. For faster desiccation, use paraquat and 2,4-D or paraquat and atrazine. Several other herbicides may also help manage hairy vetch in corn without having to delay corn planting. Using a herbicide for termination of hairy vetch and no-till establishment of the following crop helps maintain more benefits such as superior soil protection and greater moisture conservation than if tillage is used. The hairy vetch should be allowed to dry down for about 10–14 days to facilitate ease of planting. The threat of hair pinning of residue in the seed slot is greatest when no-till planting into a vetch cover that is dying but not dry and crisp. Monitor seeding depth of corn and that hairy vetch vines do not wrap around row cleaners. If the latter occurs, lift row cleaners up.

If tillage is used, it is important to realize that most conservation tillage tools such as chisel plows or disks are unlikely to completely kill the hairy vetch. The vines of hairy vetch, which can be 4 feet tall, tend to wrap around chisel shanks, making this tool unsuitable to incorporate hairy vetch cover crops. If using a chisel plow, it is recommended to shred the vetch using a tool such as a flail mower before plowing. Vetch does not tend to wrap around disk plow assemblies, but incorporation of the vetch may not be sufficient to allow seedbed preparation. The moldboard plow is the most effective tillage tool for fully incorporating and killing a heavy hairy vetch

stand. It is important to have a lead coulter in front of each plow bottom to avoid wrapping of hairy vetch vines on the standard assembly. Unfortunately, the moldboard plow has been shown to have greater negative effect on soil than any other common tillage tool used in field crop production.

Organic growers are interested in using hairy vetch and no-till corn, but they cannot use herbicides. Investigations have started into killing hairy vetch with a hollow drum with blunt blades and then no-tilling corn into the mulch. The timing of this practice is essential for success. Penn State research has shown that hairy vetch is consistently killed when rolled after the first pods appear on the vetch plants, which is not until late May in southern Pennsylvania and early to mid-June in central Pennsylvania. Rolling and immediately planting has provided the greatest vetch control and weed suppression. The thick vetch mulch provides a good weed-suppressing mat, making further weed control usually unnecessary. It is important to minimize mulch and soil disturbance when planting the main crop to avoid stirring up weed seeds. If the hairy vetch mulch does not adequately control weeds in this system, additional control measures using a high-residue cultivator or other postemergence strategies will be necessary.

Hairy vetch contains from 0 to 25 percent hard seed (seed that does not immediately germinate). This seed can come up in future years as a weed in winter small grains. Research is ongoing to develop methods to reduce hard seed by scarification or other methods. At present it is recommended to use hairy vetch no more than once every three years in the rotation to avoid problems with volunteer vetch in small grains.

Table 2. Effectiveness of herbicides for control of selected legume cover crops.

	Rate (lbs ae or ai/acre)	Hairy Vetch	Crimson Clover	Austrian Winter Pea
Glyphosate ¹	0.37	6	6	6
	0.75	7	7	7
	1.50	8	8	8
Paraquat	0.50	7	7	7
	0.75	8	7	8
2,4-D LVE	0.25	8+	7	8
	0.50	9+	8	9
Dicamba	0.25	8+	8+	8+
	0.50	9+	9+	9+
2,4-D + dicamba	0.50 + 0.25	10	10	10
	0.50 + 0.50	10	10	10
Clopyralid	0.195	9	9	9
Atrazine	1.00	7	7	7
	2.00	8	8	8
Paraquat + 2,4-D LVE	0.75 + 0.25	9+	9	9
Glyphosate + 2,4-D LVE	0.75 + 0.25	9	9	9
Paraquat + atrazine	0.75 + 1.0	9	9	9
Glyphosate + atrazine	0.75 + 1.0	8	8	8

Ratings are based on labeled application rates (0 = no control, 10 = complete control). Results may differ with variations in cover crop size, temperature, and rainfall. Only glyphosate, paraquat, or 2,4-D may be used prior to seeding soybean. Follow label guidelines. Herbicides should be applied to cover crops with at least 6 inches of spring growth.

1. Glyphosate rate in lbs ae/acre; 0.5 lb paraquat = 2 pt Gramoxone Inteon; 0.195 lbs clopyralid = 5 oz Hornet 78.5WDG or 6.7 fl oz Stinger 3S.

MANAGEMENT SUMMARY

Seeding rate: 15–30 lbs/A (lower rate if drilled; higher when tilled in)

Seeding depth: 1–1.5 inch

Inoculation: use vetch/pea *Rhizobium* inoculant

Biomass accumulation: mostly in the spring (April/May)

Nitrogen fixation: mostly in the spring (April/May)

Burndown herbicide: 2,4-D, dicamba, clopyralid, or mixes

Soil preparation and main crop planting: vetch vines can wrap around tillage shanks or row cleaners

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