

Vetch as a Cover Crop Preceding Silage Corn

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Fall planted cover crops are valuable for retaining nutrients in the soil over the winter for use by next years' crops, as well as for protecting soil from erosion and building up soil organic matter. Vetch is known for biomass production, nitrogen fixation, and rapid breakdown in the soil, once it is killed. There is some thought that vetch has been seeded at rates greatly exceeding what is necessary. This experiment was designed to test the hypothesis that lower seeding rates of vetch would produce biomass comparable to that of higher, currently recommended, seeding rates, and that a corn crop following vetch cover crop would yield as well under reduced vetch seeding rates.

In the fall of 2011, Vetch was planted in at the UMass Agronomy Farm on an 80 x 150 ft piece. Plots were 12 x 25 ft, and there were 4 replications of 6 planting rates ranging from 0 to 62.5 pounds pure live seed per acre. Planting was done using a cone seeder, with row spacing of 7 inches. Soil was sampled at depths of 0-6 inches and 6-12 inches on November 18, 2011. Nitrate concentration of the soil was measured. Tissue was also sampled from two 1.3 meter sections of row on November 18, 2011. Biomass and nitrogen content of sampled vetch were determined. Biomass samples were taken three times in the spring. Rows could no longer be followed, thus 0.5 m² subsections were sampled. Vetch was mowed low with a flail mower in late May, and plots were planted to corn (Pioneer PO210AM-R) at 30 inch row spacing, 37000 seeds per acre, on June 4, 2012. Corn was harvested as for silage September 7, 2012. Subsamples were taken of 10 feet of row for each plot to estimate silage yield.

Soil sampling on November 18 showed a reduction in soil nitrate in the top 6 inches of soil as the seeding rate of vetch increased (Table 1). This is consistent with vetch taking up nitrogen from the soil. The effect was not statistically significant deeper in the soil, 6-12 inches.

Table 1. Effect of seeding rate of vetch on soil nitrate.

Seeding Rate	Soil nitrate, $\mu\text{g N g}^{-1}$ soil	
	0-6 inches	6-12 inches
0 lb/Acre	2.05	2.35
12.5	2.30	2.94
25	1.65	1.97
37.5	1.89	1.95
50	1.54	1.64
62.5	1.51	1.60
Signif ^z	*	ns
linear	*	

^z ns = not significant at odds of 1:20, * = significant at odds of 1:20.

Repeated tissue sampling showed that while the higher seeding rates increased soil nitrate uptake from the soil as of mid-November, and resulted in greater biomass accumulation in mid-November, this trend did not extend to the following spring. By April there were no significant differences in biomass accumulation related to seeding rate from 12.5 to 62.5 pounds of seed per acre (Table 2).

Table 2. Effect of seeding rate on biomass accumulation of vetch.

Seeding Rate	Sample Date			
	Nov 18, 2011	Apr 13, 2012	May 4, 2012	May 21, 2012
0 lb/Acre	-	-	-	-
12.5	176	1510	2490	3240
25	339	1400	1860	3190
37.5	478	1770	2570	3070
50	547	1340	1690	3290
62.5	531	1640	2080	3360
Signif ^z	**	ns	ns	ns
linear	***			

^z ns = not significant at odds of 1:20, ** = significant at odds of 1:100, *** = significant at odds of 1:1000.

Analysis of corn silage yield was difficult, as two plots had unusually low yields, and both were from the same seeding rate; 50 pounds vetch seed per acre. When those plots were excluded, yield results were as shown in Table3.

Table 3. Effect of seeding rate of vetch on yield of corn the following season.

Vetch Seeding Rate	Yield in tons per acre	
	Silage @ 70% moist	Earcorn @ 25% moist
0 lb/Acre	21.7	4.31
12.5	28.6	5.29
25	31.3	5.79
37.5	31.7	6.12
50	24.6	4.64
62.5	28.9	5.44
All vetch	29.4	5.55

Seeding rate did not influence corn yield. However, given that the different vetch seeding rates resulted in similar biomass production, it would not be expected that different corn yields would result from vetch different seeding rates. If corn yield in plots which had vetch are compared with those without vetch, earcorn yield was significantly higher in the vetch plots at odds of 1:20, and silage yield was higher in vetch plots at odds of 6:100. That yield was higher in the vetch plots than the no-vetch plots suggests that the vetch cover crop was beneficial. If increases of over 7 tons silage per acre or 1.2 tons earcorn per acre could be expected increase in crop value would more than cover the cost of growing and killing the cover crop.

This experiment has been repeated in 2012-2013.