Cover Crop Biomass Accumulation and Nitrogen Release

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Cover crops play an important role in agricultural ecosystems by controlling soil erosion, enhancing soil fertility, improving nutrient cycling, and suppressing weeds. With the increased use of legume cover crops in crop rotation, there is need for a better understanding of their role in nitrogen cycling. Information on cover crops nitrogen accumulation in early spring and release patterns after incorporation are important for crop management decisions. Legume cover crops fix atmospheric nitrogen, while cereal cover crops absorb nitrogen remaining after the previous crop reducing nitrate leaching potential. Legume nitrogen contribution and cereal retention of nitrogen both may lessen the need for added nitrogen fertilizer.

Field studies were conducted at the Univ. of Massachusetts Agronomy Research Farm in 1995. The soil was Hadley fine sandy loam (coarse, mixed, mesic, Fluventic Dystrochrept).

Cover Crop Treatments: (replicated in 4 blocks in a Randomized Block Design)

- Hairy Vetch - 34 kg/ha
- Rye - 100 kg/ha
- Control (no cover crop seeded)

Crop Management:

- Cover crop samples were taken weekly from 0.1 m^2 area.
- Nylon mesh bags (7 x 18 cm) containing cover crop residues were placed in soil at 7.5 and 22.5 cm depths.
- Mesh bags were recovered at 1, 3, 5, 8, 12, and 18 weeks after placement.
- Soil samples were collected weekly.

Dry matter accumulation in rye and vetch were similar approximately 6,700 kg ha^{-1} (Fig. 1). Depth of mesh bag placement in the field had no significant impact on decomposition and dry matter losses. Vetch residue lost 50% of its dry matter in 3 weeks, compared to 9 weeks for rye (Fig. 2). Vetch released 60% of N in 2 weeks with only 20% left after 18 weeks compared to rye which had 60% of total N remaining in the residue bag at the 18th week (Fig. 3). Prior to incorporation the soil NO_3-N levels under vetch and rye cover crops were low. However, soil NO_3-N levels were significantly higher for vetch one week after incorporation (Fig.4).

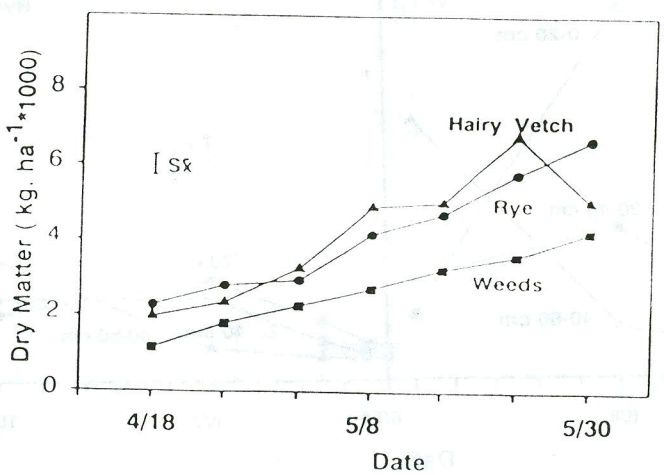

Figure 1. Above ground biomass accumulation of cover crops and weeds in no cover plots.

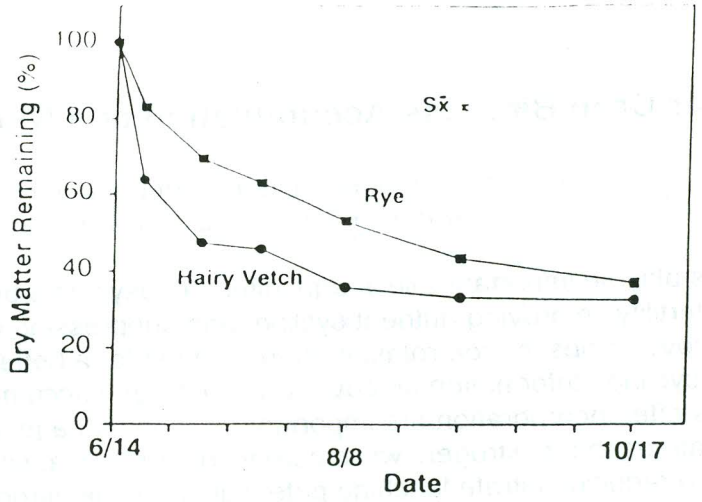

Figure 2. Dry matter remaining of cover crops during decomposition.

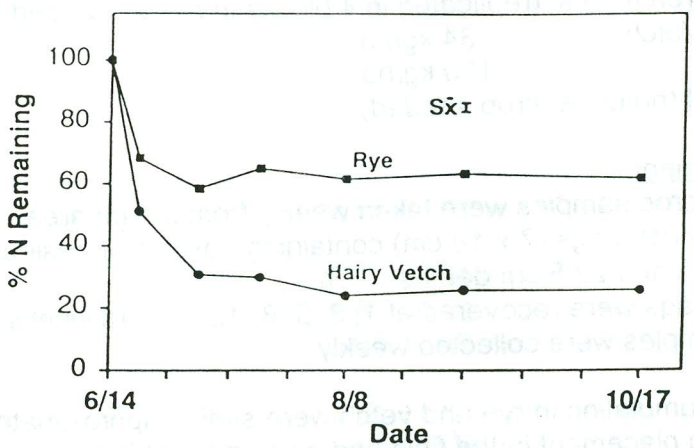

Figure 3. Percent nitrogen remaining of the quantity initially incorporated.

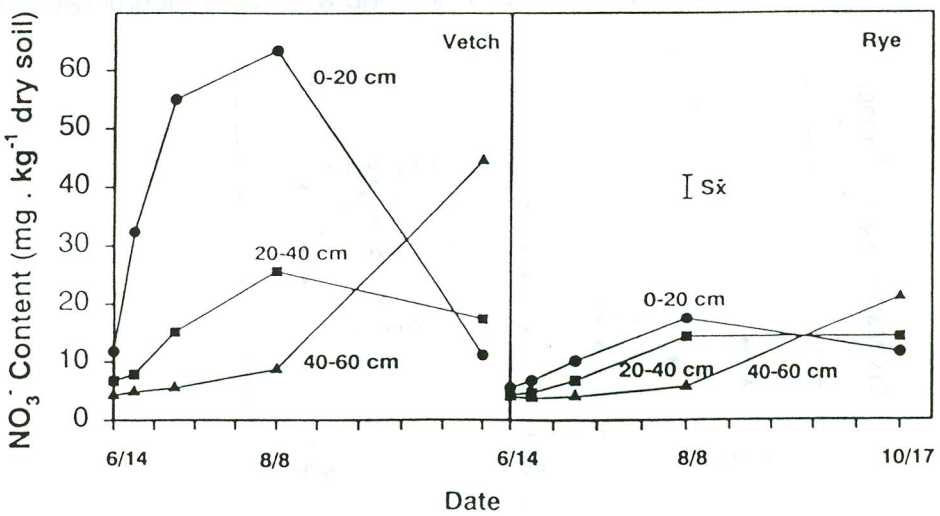

Figure 4. Soil nitrate-N content during cover crop decomposition.