Nitrogen Cycling with Oilseed Radish Cover Crop in Midwestern Crop Rotations

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Introduction
Oilseed radish (Raphanus sativus var. Groundhog) is excellent at scavenging nitrogen (N), creating macropores, and penetrating the soil because of its large taproot. Oilseed radish (OSR) takes up a large amount of N, but little is known about the timing of N release and the pathways for movement after decomposition. Since OSR winterkills, it could be releasing its N too soon for the subsequent crop to benefit. Therefore, pairing OSR with high C:N cereal cover crop, such as oats (Avena sativa L.) or cereal rye (Secale cereale L.) could tie up N longer in the spring and make more available to the subsequent corn crop. OSR is excellent at penetrating the soil, but it is unknown how the deep soil penetration affects other soil physical properties.

Objectives
To assess the effect of OSR, OSR/oat, OSR/rye on soil NH₄ and NO₃ concentrations and select soil quality measurements compared to the control.

Design
Cover crop treatments were established into wheat stubble in RCB design with 3 replicates at Purdue’s Diagnostic Training Center (DTC) on August 30, 2011 into Toronto silt loam (Udollic Epiaqualf) soil. Cover crops were seeded at a rate of 13 (OSR), 7/31 (OSR/oat), and 7/36 kg ha⁻¹ (OSR/rye). Starter fertilizer was applied at corn planting at a rate of 39 kg N ha⁻¹ as 10-34-0. Starter was the only fertilizer applied in order to look at cover crop N cycling and return to the subsequent cash crop with low N availability.

Methods

2011
- Background and Fall Soil N Sampling
- Fall Biomass Sampling (Two 0.25 m² frames per plot)
  - OSR tubers, aboveground vegetative biomass, and roots harvested within frame
- Spring Soil N Sampling
  - Every 2 weeks March-May to observe NO₃ release and movement at 3 positions
- Penetration resistance, soil temperature, infiltration, V6 & VT corn tissue samples, V6 soil samples, and corn yield (only penetration resistance shown)

2012
- Soil NO₃⁻-N Concentration Results

Control treatments

Oilseed radish treatments

Control 6-15 cm

Control 15-30 cm

Control 30-45 cm

Below OSR tuber to 45 cm depth

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