**Introduction**

Cover crops and organic amendments influence plant-available nitrogen (N) through immobilization and mineralization of soil N. The net result of these two processes is often difficult to predict and synchronize with crop demand for N. Three studies investigated the impact of winter cover crops and organic amendments on N bioavailability to broccoli, sweet corn and potato crops. The effects of these management practices on soil N bioavailability can be measured in situ using Plant Root Simulator (PRS™)-probes. Bioavailable soil N was measured using PRS™-probes and related to yield of broccoli and N uptake by sweet corn and potato.

**Results**

- **Broccoli**
  - Sullivan et al. (2008) (Western Oregon, USA) used PRS™-probes to measure soil N supply rates in summer broccoli following winter cover crop treatments (oat, vetch, fallow) with and without an organic N amendment (feather meal).
  - Winter cover crops were incorporated into the soil on May 15th followed by band application of a feather meal N source on June 9th at rates of 0 or 100 kg N/ha. Broccoli plants were transplanted on June 10th and the crop was harvested on August 21st.
  - Approximately one month after transplanting, PRS™-probes were inserted into root exclusion cylinders to measure soil N supply in the absence of root competition (Figure 1), which related to fresh broccoli yield (Figure 2).
  - Bary et al. (2008) (Western Washington, USA) investigated the impact of winter cover crop treatments (interseeded vetch, rye/vetch, fallow) (Figure 3) and feather meal application on soil N supply for sweet corn.
  - Winter cover crops were plowed down on April 29th followed by broadcast incorporation of feather meal as an N source on June 2nd at rates of 0 or 135 kg N/ha. Sweet corn was planted on June 29th and irrigated twice at the beginning of August at the beginning of December in 2007.
  - PRS™-probes were buried between the rows of sweet corn for two weeks from August 7th to 20th and correlated (r = 0.90) with total plant N uptake at the time of biomass harvest (beginning of October) (Figure 4).
  - PRS™-probes are a sensitive tool that can account for changing soil solution N availability provides a true in situ measure of temporal N bioavailability.
  - The consecutive measure of soil solution N availability provides a basis for accurate predicting nutrient supply uptake as influenced by mineralization and immobilization processes over the growing season.
  - PRS™-probes are a sensitive tool that can account for changing edaphic factors influencing soil N fluxes from soil amendments.

- **Sweet Corn**
  - Sharifi et al. (2009) (Atlantic Canada) evaluated PRS™-probes as a tool for predicting N supply rates to potato plants from two organic amendments.
  - Winter cover crops were incorporated into the soil on May 15th followed by band application of a feather meal N source on June 9th at rates of 0 or 100 kg N/ha. Broccoli plants were transplanted on June 10th and the crop was harvested on August 21st.
  - Immediately following planting, four pairs of PRS™-probes were inserted into root exclusion cylinders to measure net soil N supply rates in the absence of root competition.
  - The buried PRS™-probes were removed weekly and replaced with ‘freshnew’ PRS™-probes, which were placed into the same soil slot for one month to obtain a cumulative measure of the total soil N (NH4+-N + NO3--N) supply rates.
  - Cumulative PRS™-N (NH4+-N + NO3--N) supply rates reflected N supply from both the soil and organic amendments to total potato N uptake (Figure 5).

- **Potato**
  - Bary et al. (2008) (Western Washington, USA) investigated the impact of winter cover crop treatments (interseeded vetch, rye/vetch, fallow) (Figure 3) and feather meal application on soil N supply for sweet corn.
  - Potatoes (cv. Sheepdy) were planted at the end of May/beginning of June and harvested at the end of September/beginning of October.
  - Immediately following planting, four pairs of PRS™-probes were inserted into root exclusion cylinders to measure net soil N supply rates in the absence of root competition.
  - The buried PRS™-probes were removed weekly and replaced with ‘freshnew’ PRS™-probes, which were placed into the same soil slot for one month to obtain a cumulative measure of the total soil N (NH4+-N + NO3--N) supply rates.
  - Cumulative PRS™-N (NH4+-N + NO3--N) supply rates reflected N supply from both the soil and organic amendments to total potato N uptake (Figure 5).

**Conclusions**

- **Broccoli yield** increased in response to increasing PRS™-NO3--N supply rates as affected by cover crops and soil amendment during the initial, mid-season two-week in situ PRS™-probe burials (Figure 2).
- **Total sweet corn N uptake** was correlated (r = 0.90) with soil NO3--N supply rates measured using PRS™-probes placed in the soil at mid-season for a two-week period (Figure 4).
- **Total soil N** supply was enhanced by incorporation of vetch cover crops and by application of feather meal (Figure 2 and 3).
- **A two-week PRS™-probe burial** is a discrete measure of N supply rate and can relate to N bioavailability and plant N uptake during active biological growth over the season.
- **Total N uptake** of potato was linearly correlated (r = 0.77) with the cumulative PRS™-N (NH4+-N + NO3--N) supply rates measured over a period of 31 days immediately after planting (Figure 5).
- **Replacing fresh PRS™-probes** in the same soil slots provided a true in situ measure of temporal N bioavailability.
- **The cumulative measure of soil solution N availability provides a basis for accurate predicting nutrient supply uptake as influenced by mineralization and immobilization processes over the growing season**.
- **PRS™-probes are a sensitive tool that can account for changing edaphic factors influencing soil N fluxes from soil amendments.**

**References**


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