



Belowground Dynamics of Inter-seeding Wheat and Pea

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Introduction

In order to determine the soil nutrient benefits of growing pea with wheat, we conducted a one year study using ion-exchange membrane technology, called Plant Root Simulator (PRS)TM-probes. The profitable crop was wheat and peas were grown as a potential natural fertilizer for wheat in a direct seeding (DS) system in the dryland cropping system near Pendleton, Umatilla County, OR. A preliminary study showed that pea did not matured when grown in a mixture with wheat, which resulted in a beneficial increase in wheat yield (S. Machado 2005 unpublished data).

Our research questions were:

- Are there differences in soil nutrient supply rate among 0, 50 and 100% pea seeding rates?
- Are soil phosphorous (P) and potassium (K) increasing with increasing pea rates?

This soil nutrient supply data can help growers to better understand soil fertility in this inter-seeding system which may allow them to grow crops more efficiently.

PRS (Plant Root Simulator)TM-probe

PRSTM-probes provided by Western Ag Innovations:

- Simulate root uptake of nutrient ions by exchanging HCO₃⁻ and H⁺ for soil nutrients
- Provide an *in situ* measurement over time
- Are a continuous sink for soil nutrients
- Simultaneously adsorb all plant nutrients
- Are sensitive to the effect of soil temperature and moisture on soil nutrient supply rate

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Methods

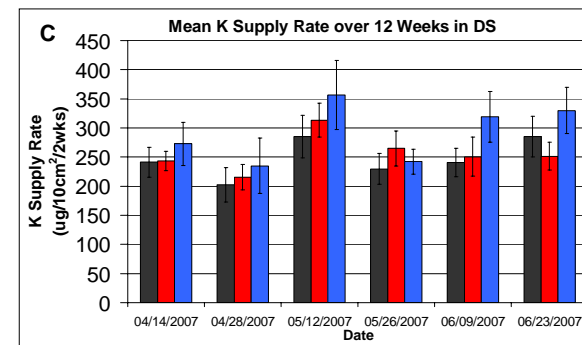
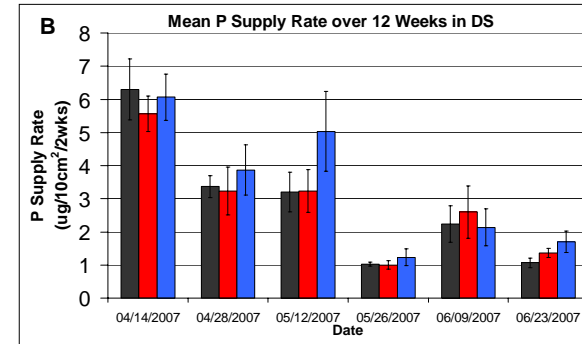
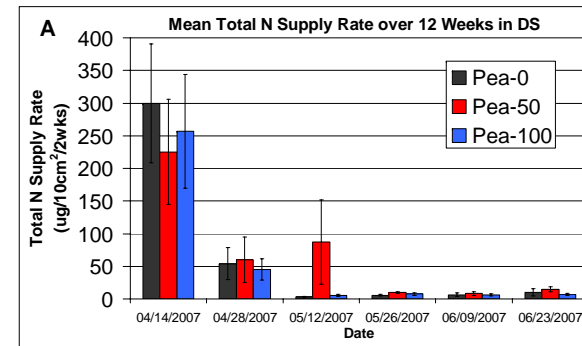
- Experimental design was a randomized complete block design
- Soft white winter wheat and 'Spector' winter pea were grown simultaneously in the same row
- Three pea seeding rates replicated 3 times:
 - Zero pea
 - Pea (50%) seeded at 3.5 seeds/ft²
 - Pea (100%) seeded at 7 seeds/ft²
- PRSTM-probe pairs (anion/cation) were vertically inserted into soil next to the seeding row to a depth of 6 inches
- PRSTM-probes were buried for 6 consecutive 2 week burials



Discussion

- The supply rate of total N (NH₄⁺-N+NO₃⁻-N) was around 50% larger for the 50% pea compared to 0 and 100% pea rate (p=0.033, n=6).
- There were no differences in P and K supply rates among the pea seeding rates.
- The data collected in one year does not provide evidence that peas provide beneficial nutrients to wheat.
- Unlike the preliminary study, the peas in this study matured and may have competed with wheat for soil nutrients and water.

Results



Total N (NH₄⁺-N+NO₃⁻-N), P, and K soil net nutrient supply rates for 0, 50, and 100% pea seeding rates grown with winter wheat seeded at a rate of 25 seeds/ft² (n=36). Measured using PRSTM-probes from April 14 to July 23, 2007.

