

**PROJECT TITLE:** The strategic use of broadcast and controlled release fertilizer to facilitate N applications and improve nitrogen use efficiency in direct seed systems

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**INTERIM OR FINAL REPORT:** Interim (first year) report

**PROJECT OBJECTIVES:**

1. Determine whether early- or late-fall broadcast of conventional or controlled release nitrogen (N) fertilizers can replace deep banding and/or spring broadcast applications;
2. Assess the feasibility of replacing deep-banded conventional N fertilizer with seed banded controlled release fertilizer;
3. Evaluate select N timing and placement strategies in the context of a typical Palouse toposequence (assess the N treatment by landscape position interaction).

**KEY WORDS:** Nitrogen, Controlled Release, Efficiency

**AGRONOMIC ZONE OF INTEREST:** These studies take place in the high-rainfall zone of the Palouse. This zone was selected because high precipitation conditions typically result in low N use efficiency and present more challenges for N management.

**PRODUCTION SYSTEM BEING INVESTIGATED:** Annual crop; direct seed winter wheat.

**STATEMENT OF THE PROBLEM TO BE ADDRESSED:** Early access to nutrients placed near the seed is thought to be critical in direct seed systems, especially in situations where soil test values and temperatures are low. However, deep banding requires heavy equipment and the power to pull it. Alternative placements that do not require deep banding of fertilizer, such as seed placement or broadcasting, could reduce heavy equipment requirements and perhaps improve profitability. Controlled release fertilizer technologies are advancing rapidly and offer the potential to place most or all the crop N requirement with the seed. The strategic use of application timing and/or controlled release N fertilizer placed with the seed offers the potential to eliminate deep banding and spring applications, and thereby facilitate N applications while increasing N use efficiency in direct seeded winter wheat.

**ABSTRACT OF RESEARCH FINDINGS:**

None – new project.

**RESULTS AND INTERPRETATION:**

This project was initiated in the fall of 2004. Results are not available yet. A brief description of methods and treatments installed in 2004 is included below.

1. Determine whether early- or late-fall broadcast of conventional or controlled release N fertilizers can replace deep banding and/or spring broadcast applications;

2. Assess the feasibility of replacing deep banded conventional N fertilizer with seed banded controlled release fertilizer;
3. Evaluate select N timing and placement strategies in the context of a typical Palouse toposequence (assess the N treatment by landscape position interaction).

Treatments outlined in Table 1 were initiated in a study placed at the Palouse Conservation Field Station in early October 2004. These treatments address, in part, Objectives 1 and 2 above. Due to space constraints, a separate timing study was placed in a nearby location with treatments outlined in Table 2. These treatments address, in part, Objective 1.

**Table 1.** Treatment table for primary controlled release fertilizer study initiated in 2004 at the Palouse Conservation Field Station.

Treatment Table		
Treatment #	Treatment Type	N (lbs/acre)
1	(Deep Band, DB) Control	0
2	Urea (DB)	50
3	Urea (DB)	100
4	Urea (DB)	150
5	Urea (DB)	200
6	Urea (DB)	250
7	Urea (Broadcast, BC) Late Fall	150
8	Urea (BC) At Seeding	150
9	Urea (BC) Early Spring	150
10	Controlled Release Fertilizer (Polyon 43% N) (DB)	50
11	Controlled Release Fertilizer (Polyon 43% N) (DB)	100
12	Controlled Release Fertilizer (Polyon 43% N) (DB)	150
13	Controlled Release Fertilizer (Polyon 43% N) (DB)	200
14	Controlled Release Fertilizer (Polyon 43% N) (DB)	250
15	Controlled Release Fertilizer (Polyon 43% N) (Seed Band, SB)	150
16	Controlled Release Fertilizer (Polyon 43% N) (BC) at seeding	150
17	CRF (Polyon 43% N) (50% DB:50% SB)	150

**Table 2.** Treatment table for secondary application timing fertilizer study initiated in 2004 at the Palouse Conservation Field Station.

Treatment Table		
Treatment #	Treatment Type	N (lbs/acre)
1	Control	0
2	50% broadcast at seeding: 50% broadcast in late fall	150
3	50% broadcast at seeding: 50% broadcast in early spring	150
4	100% broadcast in late fall	150

The site has a preplant residual N level less than 75 lb/acre. Individual plot dimensions are 7 feet wide by 50 feet long. Each study is a randomized complete block design with four replications. The conventional N source was dry urea applied in a deep band placed 3 inches below the seed using a Fabro drill. Broadcast fertilizer was applied with the Fabro drill by raising the fertilizer disks above the soil surface during seeding of these plots. The controlled release material is dry urea coated with a polymer designed to release all of the nitrogen in 60 days under standard conditions. Under typical fall conditions in eastern Washington the release is expected to take 90-120 days.

In addition to the treatments outlined in Tables 1 and 2, the 150 lb N/acre conventional urea deep band (treatment 4 from Table 1), 150 lb N/acre controlled release deep band (treatment 12 from Table 2), and 150 lb N/acre broadcast at seeding (treatment 8 from Table 1) treatments were installed in continuous strips approximately 3,000 feet long spanning a typical Palouse hill from south-southwest facing to north facing slope. These continuous broadcast strip included six, 30-foot segments in which no fertilizer was applied (control segments). The strips address objective 3 above.

All plots were seeded with Falcon hard red winter wheat at the rate of 100 lb seed/acre. A total of 50 lbs of 16-20-0 per acre was placed with the seed.

#### **INTERACTION (COOPERATION) WITH OTHER SCIENTISTS CONDUCTING RELATED ACTIVITY**

This project involves two STEEP researchers as principle investigators. Since improving N efficiency is an important topic for many involved in STEEP research, additional collaborations are expected as the project develops.

#### **PUBLICATIONS AND PRESENTATIONS:**

None yet.