

PROJECT TITLE: Nutrient Requirements of Short-season Dryland Corn Grown in Eastern Washington Using Direct Seeding Methods

INVESTIGATORS:

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Cooperator-growers: John Aeschliman, Colfax, WA.

OBJECTIVES:

1. Determine optimal nitrogen rate and application timing for dryland corn production in eastern Washington using direct-seeding methods.
2. Assess the effects of added P, Zn, and S on corn yield and in-season tissue concentrations to establish sufficiency levels of nutrients most commonly deficient in eastern Washington.
3. Develop a nutrient management extension publication for dryland corn grown in eastern Washington.

KEY WORDS: Nitrogen fertility, dryland corn

STATEMENT OF PROBLEM: Dryland corn is gaining interest as an alternative crop in direct seed systems of eastern WA. Corn yields of 6.9 Mg ha⁻¹ were obtained last year with short season corn using direct seed methods near Colfax, WA. While much is known about the nutrient requirements for corn grown in the Midwest US, very little is known about optimal fertilizer timing, placement, or rate when corn is grown in the Mediterranean climate of the PNW. Growers who are currently growing corn in the Palouse have been applying high levels of N while neglecting other nutrients like zinc that are critically important for optimum corn yield. For corn to be a feasible alternative crop, fertility studies are needed to provide growers with the tools necessary to make decisions regarding the nutrient needs of corn, thus reducing over-fertilization and future environmental impact.

ABSTRACT OF RESEARCH FINDINGS: Two field sites were established in Fall 2001 following wheat harvest in the high (20-24 in) rainfall zone at the USDA-Palouse Conservation Field Station near Albion, WA and intermediate (16-20 in) zone at the John Aeschliman Farm west of Colfax, WA. Both sites had long term no-till history. Nitrogen was applied at rates ranging from 10 to 190 kg N ha⁻¹ (9 to 170 lb N acre⁻¹) with two timing approaches: 1) all but 10 kg N ha⁻¹ applied at planting or 2) 56 kg N ha⁻¹ applied in the fall with a spoked-wheel injection system and the remainder applied at planting, 2 inches to the side and 2 inches below the seed row. Additional treatments were added to evaluate corn responsiveness to P, S and Zn fertilization under these conditions. Dryland, direct-seeded corn was responsive to N fertilization at the Colfax site. Corn yields increased from 2400 to 3300 kg ha⁻¹ (40 to 55 bu acre⁻¹) with increasing N rate up to 160 kg N ha⁻¹ (150 lb N acre⁻¹). No advantage to split fall-spring N timing was observed. No responses to P, S or Zn. At the Albion site, no significant responses to fertilization were observed despite overall higher yields of 3596 kg ha⁻¹ (60 bu acre⁻¹). Corn roots sampled at anthesis were observed to be concentrated in the upper 90 cm (3 ft), with a few roots observed beyond 120 cm (4 ft).

RESULTS AND INTERPRETATION

Reasonable corn grain yields were obtained when direct-seeded into wheat stubble during a drier than normal growing season at the two locations, with maximum yields of 3310 kg ha⁻¹ at Colfax and 3810 kg ha⁻¹ at Albion. Grain yields increased with increasing total N applied to 160 kg N ha⁻¹ at Colfax, but splitting N between fall and spring did not improve yields (Fig. 1).

Treatments will be imposed on the existing plots in 2002-2003 to simulate corn-corn-wheat rotation.

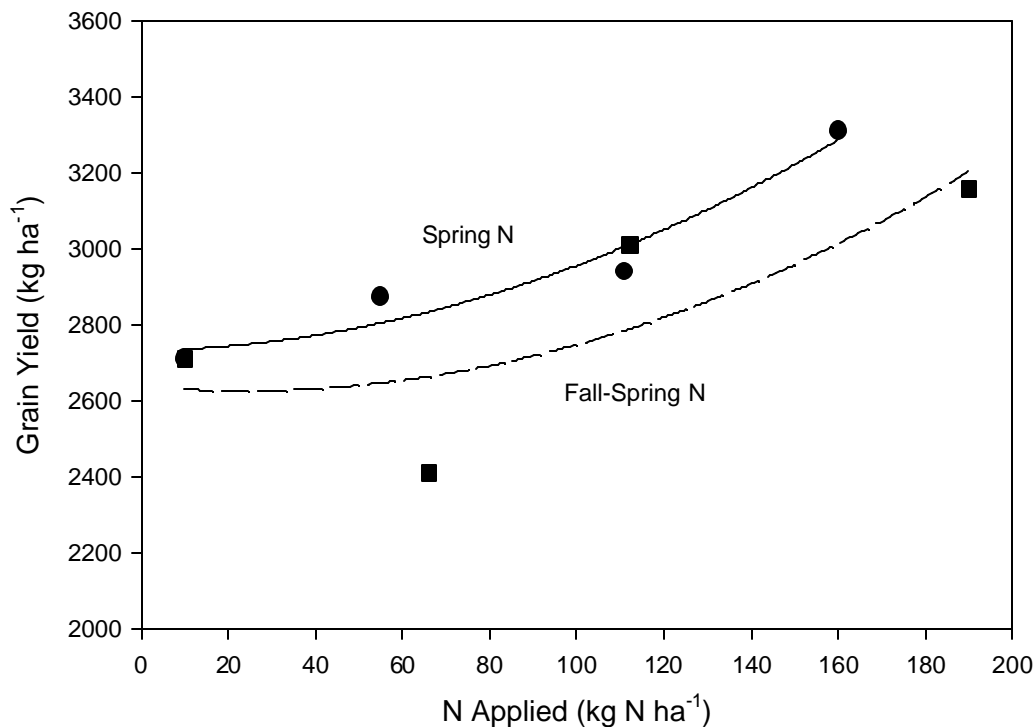


Fig. 1. Corn grain yield response to N rate and timing, direct-seeded into winter wheat stubble (Aeschliman farm, 2002).

In contrast, no responses to fertilization were observed at Albion, although soil test N did not indicate high residual N at that location and average yields were higher at this location. Corn roots sampled at anthesis were observed to be concentrated in the upper 90 cm, with a few roots observed beyond 120 cm, suggesting that pre-season soil water availability in this zone might be used as an indicator of yield potential in conjunction with in-season precipitation predictions. Preliminary results indicate fall N fertilization of corn is not necessarily advantageous in direct-

seeded dryland corn in Eastern Washington.

INTERACTIONS WITH OTHER SCIENTISTS: Dennis Roe (NRCS), Dave Huggins (USDSA ARS) and John Aeschliman were consulted on corn production practices that had been established by early adopters in Eastern Washington. Joe Yenish (WSU) and Frank Young (USDA ARS) were consulted on weed control (Atrazine) management in this alternative cropping system.

PUBLICATIONS

Bodley, M.K., G.J. Schwab, W.L. Pan, E.D. Harwood, R.P. Bolton. 2002. Nutrient management of semi-arid, short season corn in direct cropping systems. Poster 164227, Agronomy Abstracts, American Society of Agronomy, Madison, WI.

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