Interaction of Corn Seeding Rate and Nitrogen Application Rate on Corn Grain Yield

Gregory A. LaBarge, Robert W. Mullen* and Peter R. Thomison

The Ohio State University and *Potash Corp/PCS Sales

INTRODUCTION

A common question from growers and consultants is whether or not nitrogen rates should to be adjusted higher for corn at higher populations. Though it seems that additional nitrogen would be necessary to feed more plants per hectare when compared to fewer plants, yield data from a number of experiments does not clearly indicate that this is the case. Yield response with newer hybrids actually indicates better nitrogen use efficiency and utilization of applied N. A field trial was conducted from 2006 to 2011 to look at yield response to varying nitrogen rates with two different seeding rates and corn followed by corn and soybean followed by corn rotations.

OBJECTIVES

The objectives of this study were:

- To determine if increased corn (*Zea mays* L.) seeding rates require higher nitrogen (N) rates to maximize grain production.
- To determine the influence of rotations effects on corn yield.

MATERIALS AND METHODS

- Experimental location: Northwest Agricultural Research Station – OARDC located near Hoytville, OH established in 2006. Soil type is a Hoytville silty clay loam, 0 to 1 percent slopes (fine, illitic, mesic, Mollic Epiaqualf).
- Corn seeding rates 74,100 seeds/ha & 98,800 seeds/ha
- Starter N rates: 0 for the check treatment and 44 kg N/ha for all other treatment
- Sidedress N rates: 0, 22, 90, 157, and 224 kg N/ha applied as anhydrous ammonia at V4-V5
- Previous crop: each year corn was planted after both corn and soybeans (*Glycine max,* L.)
- Experimental design: RCBD with 4 replications
- Plot size: 4 rows (0.76 m spacing) by 24 m
- Harvest area: 2 center rows by 24 m
- One hybrid was used annually for the trial and listed by year starting in 2006 were Pioneer 34A16, 34A18, 35F40, PO35F44, PO518XR, PO413AM1

RESULTS

Figure 1. Corn Nitrogen Response with Two Seeding Rates and Two Crop Rotations (2006-2011)

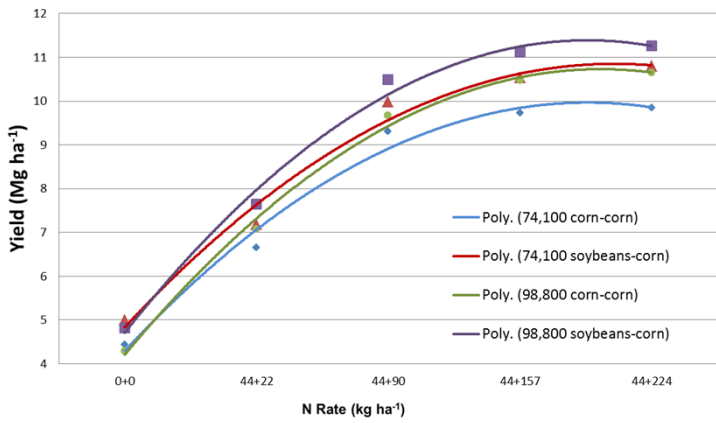

Table 1. Agronomic Optimum Nitrogen Rate (AONR) and Economical Optimum Nitrogen Rate (EONR) at $6.50 per bushel corn and $0.65 per pound nitrogen minus AONR expressed in kg ha^{-1}

Soybean-Corn	2006	2007	2008	2009	2010	2011	2006-2011
AONR-74100	269	246	269	214	222	220	250
AONR-98800	258	212	269	216	236	216	236
EONR-AONR-71400	0	-44	0	-18	-28	-34	-29
EONR-AONR-98800	-18	-30	-16	-17	-25	-29	-24
Corn-Corn	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2006-2011**
AONR-74100	223	227	269	234	216	199	236
AONR-98800	260	203	269	240	268	223	249
EONR-AONR-71400	-18	-35	0	-24	-28	-22	-28
EONR-AONR-98800	-25	-25	0	-19	-38	-21	-26

Discussion

- Corn at the 98,800 plants ha^{-1} resulted in higher yields regardless of previous crop when compared to the 74,100 plants ha^{-1} at 11.3 Mg ha^{-1} for soybean-corn and 10.5 Mg ha^{-1} for corn-corn.
- At AONR or EONR, the corn-corn at the 98,800 plants ha^{-1} and the 74,100 plants ha^{-1} soybean-corn yielded equally at 10.5 Mg ha^{-1}.
- Corn planted at 98,800 plants ha^{-1} in the soybean-corn rotation was the highest yielding system at 11.3 Mg ha^{-1} .
- Nitrogen rates were not different with an experiment average of 242 kg ha^{-1} AONR and 216 kg ha^{-1} EONR.
- The 2008 was a high N use cropping year with the AONR and EONR being equal and at the highest rate and was the lowest average yield year of the study.
- In summary, our current data does not support the idea that higher seeding rates necessarily translate into higher rates of N.