EFFECT OF NITAMIN AND HEADLINE ON CORN GRAIN YIELD

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Introduction:
Corn acreage increased over 25% in Missouri and total acreage in the U.S. increased nearly 10 million acres from 2006 to 2007. High yield corn production systems have integrated fungicide applications to maximize photosynthetic efficiency of the plant. Over the past four years, median corn yields for 16 site/years increased over 8 bu/acre with a strobilurin fungicide such as pyraclostrobin (Headline®) (Nelson and Smoot, 2007). Plant growth stimulation with the strobilurin fungicides has been related to a reduction in the incidence of disease as well as increased nitrate uptake and assimilation in small grains (Köhle et al., unpublished). Research has shown that pyraclostrobin was important in stimulating nitric oxide, a key messenger in plants (Conrath et al., 2004). Increased nitrate uptake and assimilation following an application of a strobilurin fungicide would justify additional nitrogen fertilizer at the time of application to corn. Identifying fertilizer sources that synergistically increase yield with a fungicide treatment would provide opportunities to manage disease, reduce application costs, and provide additional fertilizer when crop demand is greatest.

The objective of this research was to evaluate response of corn to Nitamin (Georgia-Pacific Chemicals, LLC., Atlanta, GA) rates and tank mixtures with Headline.

Materials and Methods:
Field research was conducted Novelty (40.035997 N, 92.243783 W), MO. The soil was a Putnam silt loam (fine, smectitic, mesic Vertic Albaqaulfs). The study was a randomized complete block in plots 10 by 40 ft. with four replications. Treatments consisted of a factorial arrangement of Nitamin (30-0-0) at 0, 0.5, 1, 2, and 4 gal/acre combined with and without the fungicide pyraclostrobin (Headline®) at 6 oz/acre plus nonionic surfactant at 0.25% v/v applied at VT. An additional treatment of Headline at 3 oz/acre plus nonionic surfactant at 0.25% v/v plus Nitamin at 1 gal/acre was included in the study. Field information is shown in Table 1. Polymer-coated urea (ESN) fertilizer was banded beside each row at 200 lbs N/acre.

Treatments were applied with a CO_2 propelled hand boom at 15 gal./acre. Corn plants were exhibiting some N deficiency from V6 to VT; however, no additional N was applied to evaluate the benefit of foliar applied N at VT. Corn injury from 0 (no visual crop injury) to 100% (complete crop death) was evaluated 14 days after treatment based on the combined visual effects of N source on necrosis, chlorosis, and stunting. The incidence of foliar disease was rated on a scale of 0 (no disease) to 100% (complete infestation) 28 days after treatment. Plant greenness was rated on a scale of 0 (brown) to 10 (green) on 28 Sept. The center two rows were harvested for yield and converted to 15% moisture prior to analysis. Grain samples were collected. Grain protein, oil and starch will be determined using NIR spectroscopy. Data were subjected to an analysis of variance and means separated using Fisher's Protected LSD at $P \leq 0.05$.

Results:

Harvested population was similar for all treatments and ranged from 28,200 to 30,200 plants/acre (Table 1). Crop injury increased 2 to 5% when Headline plus nonionic surfactant was added to Nitamin at 2 to 4 gal/acre Injury was primarily localized necrosis of leaf tissue (Figures 1 and 2). There was a low incidence of disease and no difference in the incidence of disease was observed between the non-treated control and Nitamin or Headline treatments. Headline at 60 oz/acre plus Nitamin treated plants were greener two weeks before harvest. Similarly, grain moisture was 1.6 to 2.4% greater when Headline was applied alone or with Nitamin at 1 to 4 gal./acre when compared to the non-treated control. Grain yield increased 19 and 28 bu/acre when Nitamin was applied at 2 and 4 gal/acre, respectively (Figure 3). There was no increase in grain yield when Nitamin was tank mixed with Headline at 6 oz/acre; however, Nitamin at 1 gal./acre tank mixed with Headline at 3 oz/acre increased yield 23 bu/acre. A reduced rate of Headline (3 oz/acre) and Nitamin (1 gal./acre) had grain yields similar to Nitamin at 2 or 4 gal./acre alone or tank mixed with Headline at 6 oz/acre. In a year with some N deficiency, Nitamin alone at 2 to 4 gal/acre increased yield while the combination of Headline and Nitamin was additive only at a reduced rate of both products.

References:

Conrath, U., G. Amoroso, H. Köhle, and D.F. Sultemeyer. 2004. Non-invasive online detection of nitric oxide from plants and other organisms by mass spectroscopy. Plant J. 38:1015-1022.

Nelson, K.A. and R.L. Smoot. 2007. Effect of Quadris and Headline on corn grain yields in Northeast Missouri. Greenley Research Center Field Day Report. 30:14-16.

Table 1. Field information and selected management practices at Novelty, MO.

Field information and management practices	2008
Previous crop	Corn
Tillage	No-till
Planting date	May 20
Weed control	
Burndown (April 28)	Roundup PowerMAX 22 oz/acre
Preemergence (May 23)	Lumax at 3 qt/acre
Fertilizer rate (N-P-K lbs/acre) N was ESN	200-0-0
Hybrid	DK 63-42VT3
Seeding rate (seeds/acre)	30,000
Fungicide and foliar fertilizer application date	July 29
Air temperature (F)	95
Relative humidity (%)	63
Height (inches)	72
Harvest date	October 13

Table 2. Plant population, injury, incidence of disease (grey leaf spot and common rust) 28 days after treatment, greenness (1=brown to 10=green), and grain moisture as affected by Nitamin (30-0-0) alone and with Headline in 2008.

Treatment[a]	Rate	Population	Injury	GLS	CR	Greenness	Moisture
	gal./acre	No./acre	%	%	%	1-10	%
Nitamin	0	29,200	0	1.5	0	0	19.2
Nitamin	0.5	29,400	0	1.5	0	1.8	20.4
Nitamin	1.0	28,300	0	1.0	0	1.0	19.8
Nitamin	2.0	30,200	0	1.5	0	0.5	19.5
Nitamin	4.0	29,700	2	1.0	0	0.8	19.6
Headline at 6 oz/acre	0	28,500	0	1.0	0	1.8	20.8
Nitamin + Headline at 6 oz/acre	0.5	30,000	0	1.0	0	2.3	19.9
Nitamin + Headline at 6 oz/acre	1.0	29,300	0	1.0	0	2.0	21.1
Nitamin + Headline at 6 oz/acre	2.0	29,700	2	1.0	0	2.3	21.1
Nitamin + Headline at 6 oz/acre	4.0	28,300	7	1.0	0	2.5	21.3
Nitamin + Headline at 3 oz/acre	1.0	28,200	0	1.0	0	0.8	21.6
LSD ($P \leq 0.05$)		NS	1	NS	NS	1.4	1.6

[a]Abbreviations: CR, common rust (*Puccinia sorghi*); GLS, grey leaf spot (*Cercospora zeae-maydis*); LSD, least significant difference; and NS, non-significant.

[b]All Headline treatments were applied with nonionic surfactant at 0.25% v/v.

Figure 1. Corn injury with Nitamin at 2 gal/acre plus Headline at 6 oz/acre plus NIS at 0.25% v/v 14 days after treatment.

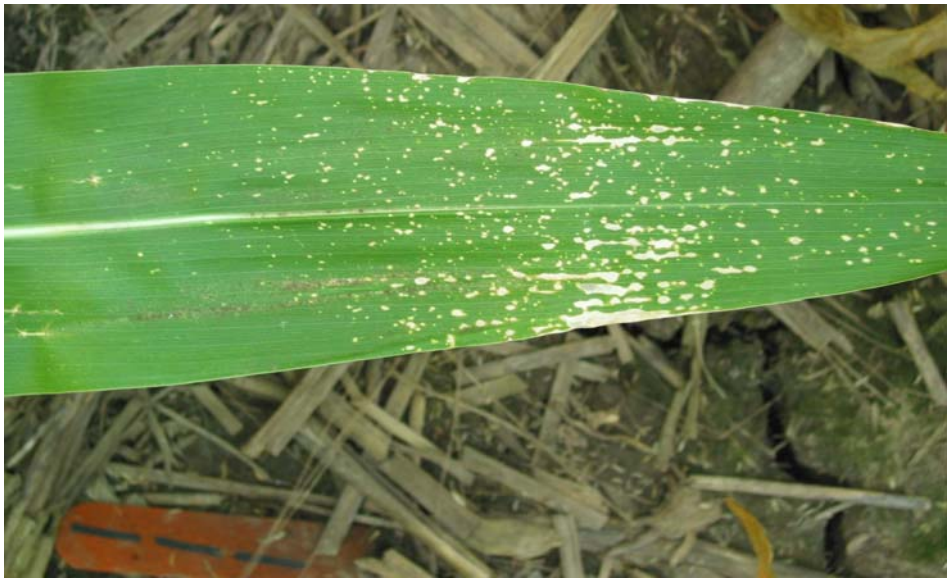

Figure 2. Corn injury closeup with Nitamin at 4 gal/acre plus Headline at 6 oz/acre plus NIS at 0.25% v/v 14 days after treatment.

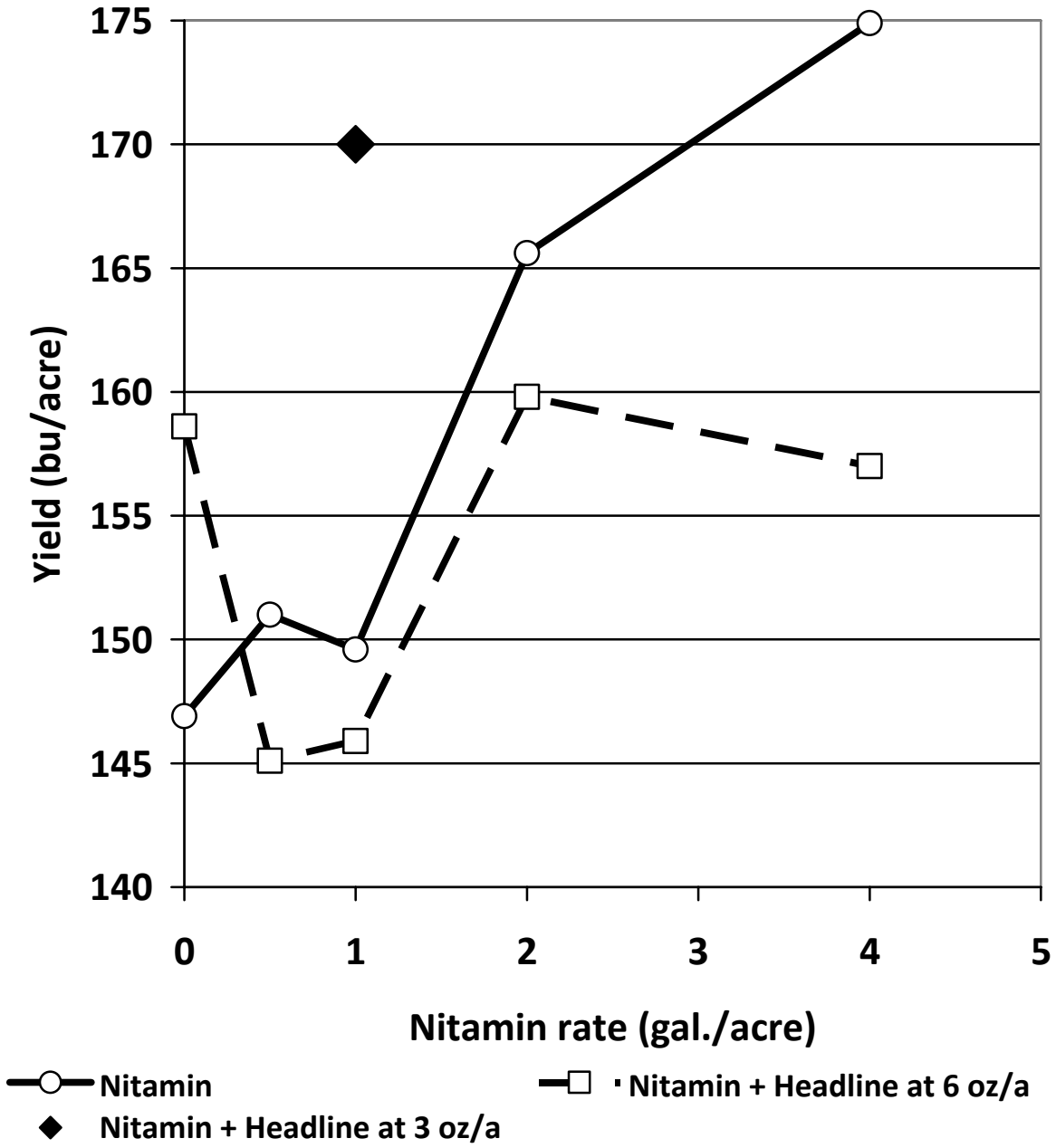

Figure 3. Grain yield response to Nitamin rates with and without Headline at 6 oz/acre or 3 oz/acre plus nonionic surfactant at 0.25% v/v. LSD ($P \leq 0.05$) was 18.