Slow Release Nitrogen Fertilizer for Potato: A Summary of Three Years Data

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Abstract

Concerns over elevated levels of nitrate-nitrogen (NO_3-N) in groundwater beneath sandy soils in Wisconsin have precipitated development of new management systems for nutrient use and application methods, especially for nitrogen in potato production. We initiated a three year research study on the use of a steady-release fertilizer (Nitamin®) starting in 2004, to evaluate this product as a supplemental nitrogen (N) fertilizer for potato. The study was conducted at the Hancock Research Farm in Hancock, Wisconsin. The study consisted of a randomized complete block design with five blocks and three treatments. Although not always statistically significant, the steady-release fertilizer increased yield over the conventional fertilizer in all three years (2004, 2005 and 2006) with an average of 2,128 kg per ha compared to the standard fertilizer. There were more cull potatoes for the standard N fertilizer in 2004, but this was not the case in 2005. The culls in 2006 were the same for both treatments. The unusually high numbers of culls in 2005 were the result of scab. Applying the steady-release fertilizer resulted in more N uptake by the tubers, but there were no significant differences in NO_3-N concentrations between fertilizer treatments for either wells or porous cup samplers.

Objective

Determine if the use of a new steady-release fertilizer (Nitamin®) will reduce nitrate leaching to groundwater without reducing potato yield.

Materials and Methods

Location: Hancock Ag Research Station, Hancock,WI.

Soil: Plainfield loamy sand (sandy, mixed, mesic, Typic Udipsaments)

Variety: Russet Burbank

Design: Randomized Complete Block with 5 replications

Treatments:

2 N sources:

- conventional (ammonium sulfate at emergence and ammonium nitrate at tuberization
- urea formaldehyde polymer (Nitamin®)

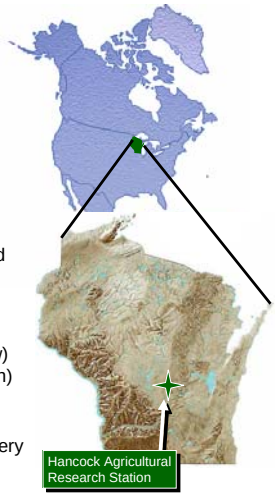
2 N rates of Nitamin® :

-112 kg ha^{-1} (2004 & 2005) 168 kg ha^{-1} in 2006 (Low)

-224 kg ha^{-1} (2004 & 2005) 280 kg ha^{-1} in 2006 (High)

Measurements:

- yield, size grade, specific gravity, internal defects
- tuber N concentration, N uptake and N apparent recovery
- porous cup sampler NO_3-N at 1-m depth
- groundwater monitoring well water NO_3-N



Results

Year	N Treatment	Total Yield	A	Grade B	Culls
		Mg ha^{-1}	Mg ha^{-1}	Mg ha^{-1}	Mg ha^{-1}
2004	Conventional	35.7ab	24.9ab	7.4	3.5A
2004	Nitamin High	38.1a	27.9a	7.1	3.1AB
2004	Nitamin Low	31.8b	22.1b	7.4	2.4B
2005	Conventional	66.6AB	45.1A	3.5	18.0b
2005	Nitamin High	70.6A	40.0B	3.6	27.0a
2005	Nitamin Low	63.9B	34.2B	3.6	26.2ab
2006	Conventional	72.7AB	57.9	6.0A	8.7
2006	Nitamin High	75.6A	61.5	5.4AB	8.7
2006	Nitamin Low	71.6B	59.4	4.9B	7.3

*values followed by the same lower case letter are not significantly different at the 0.05% level and those with the same upper case letter are not significantly different at the 0.10 % level.

Table 1. Effect of nitrogen source and rate on potato yield and size grade.

Year	N Treatment	Total Yield	N	Uptake	Fertilizer
		Mg ha^{-1}	%	kg ha^{-1}	kg ha^{-1}
2004	Conventional	35.7ab	1.55	100b	224
2004	Nitamin High	38.1a	1.63	115a	224
2004	Nitamin Low	31.8b	1.50	85c	112
2005	Conventional	66.6AB	1.64ab	200ab	224
2005	Nitamin High	70.6A	1.68a	208a	224
2005	Nitamin Low	63.9B	1.55b	184b	112
2006	Conventional	72.7AB	1.36	188	280
2006	Nitamin High	75.6A	1.34	193	280
2006	Nitamin Low	71.6B	1.23	174	168

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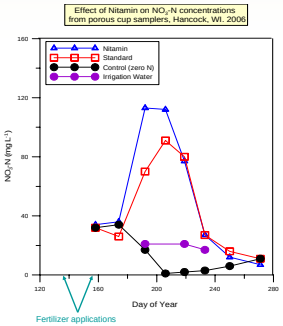
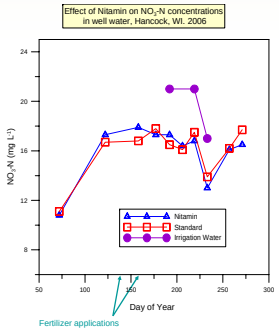
Table 2. Effect of nitrogen source and rate on tuber N and uptake.





Conclusions

+ Nitamin® increased yields and N uptake over conventional fertilizer all 3 years but not statistically significant.
+ Nitamin® increased grade A potatoes in 2 of 3 years.
+ Little or no difference in well water and porous cup sampler NO_3-N concentrations between fertilizer sources for all 3 years.