

## Introduction

Nitrogen (N) could be one of your most costly inputs. It is the one nutrient that is most commonly lost to nature through soil leaching, volatilization, and denitrification. The purpose of this research was to compare N soil loss and retention between the standard uncoated Urea and a polymer coated Environmentally Smart Nitrogen (ESN). The objective of this study was to compare ESN with Urea for:

- Petiole Nitrate
- Tuber Yield
- Tuber Quality

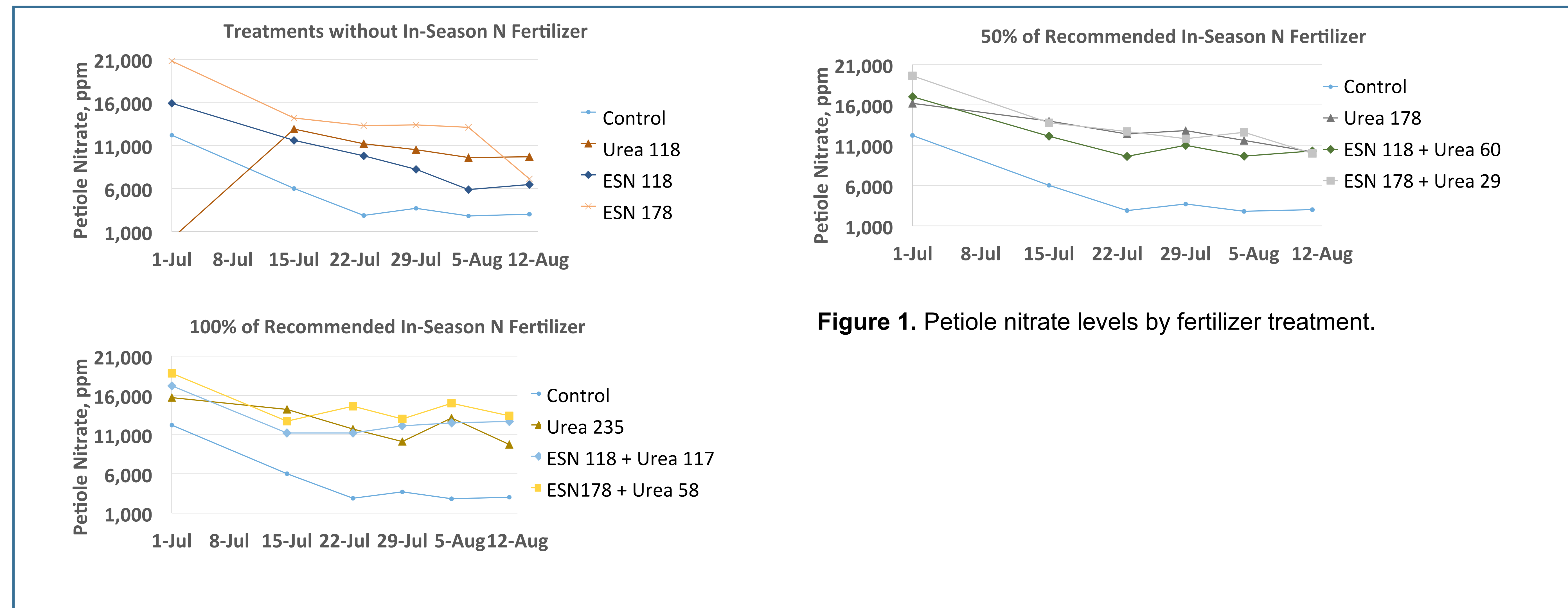
## Materials and Methods

- Soil type was a Pocatello Variant silt loam.
- Plots were six-rows (2015) and four-rows (2016) of Russet Burbank potatoes 12 m long.
- The experiment was conducted with a randomized complete block design with 10 treatments and 6 replications in 2015 and 11 treatments and 5 replications in 2016 (Table 1).
- Petiole samples were taken once per week for 7 weeks and analyzed for NO<sub>3</sub>-N.
- Potatoes were harvested by mechanically lifting 6 m of the center two rows.
- Tubers were weighed and graded for quality, size, specific gravity and defects.
- Statistical analysis was performed by Analysis of variance with mean separation with a Tukey-Kramer test using SAS software (SAS 9.3, Cary, NC)

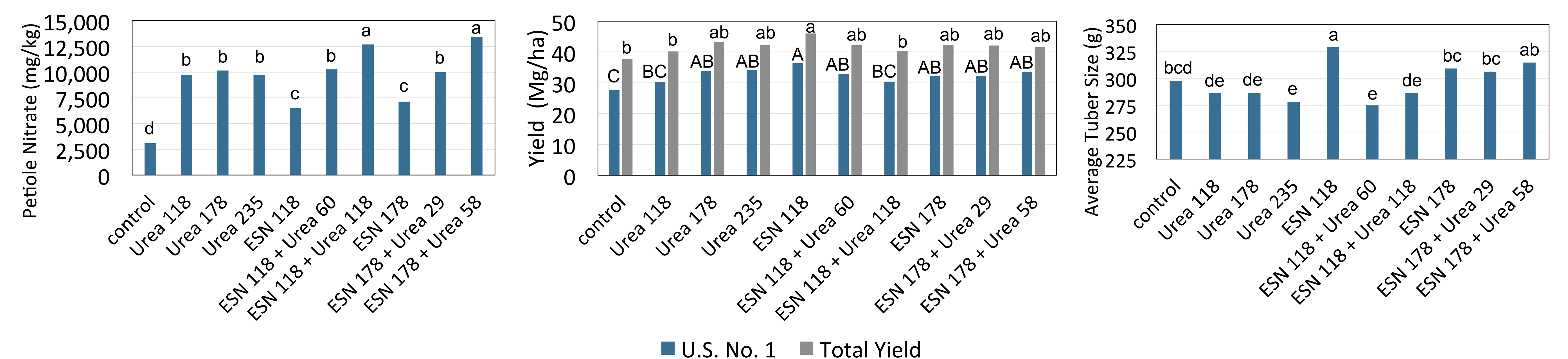
**Table 1.** Russet Burbank potato treatments

Treatment†	At Cultivation		In-Season	
	Source	Rate kg N ha <sup>-1</sup>	Mid-July -- kg N ha <sup>-1</sup> applied as Urea --	Mid-Aug
Urea 118	Urea	118	0	0
Urea 178	Urea	118	34	26
Urea 235	Urea	118	67	50
ESN 118	ESN	118	0	0
ESN 118 + Urea 60	ESN	118	34	26
ESN 118 + Urea 117	ESN	118	67	50
ESN 178	ESN	178	0	0
ESN 178 + Urea 29	ESN	178	17	12
ESN 178 + Urea 58	ESN	178	33	25
ESN 235	ESN	235	0	0

† Pre-plant + in-season fertilizer rates. ESN 235 treatment was for 2016 only.



**Figure 1.** Petiole nitrate levels by fertilizer treatment.



**Figure 2.** Petiole nitrate levels by fertilizer treatment on August 11, 2015.

**Figure 3.** Russet Burbank potato yields (cwt./ac.) for an ESN Trial in 2015

**Figure 4.** Russet Burbank average tuber size (g) for an ESN Trial in 2015

## Results and Discussion

- Petiole nitrate levels declined throughout the growing season as is typical, and these trends were similar among ESN and urea treatments with similar fertilizer amounts (Fig. 1).
- The 50 and 100% in-season treatments showed an increase in petiole nitrate from 22 July through 5 August in response to fertilizer application (Fig. 1), but the treatments that received ESN at cultivation had approximately 2,000 mg NO<sub>3</sub><sup>-</sup> less than the Urea treatments (Fig. 1).

- For the final petiole nitrate levels (11 August 2015), the ESN 118 + Urea 118 and ESN 178 + Urea 58 treatments had the highest petiole nitrate suggesting ESN application at cultivation improved N health over the growing season.
- In general, the US No. 1 yields increased with the first increment of N fertilization, which resulted in overall increases for marketable and total yields as well (Fig. 3).
- For total yield the addition of a full rate of N applied in-season resulted in a yield decrease (Fig. 3).
- Increasing N rate did not result in continued increases of yield regardless of fertilizer source or timing (Fig. 4).

## Conclusion

- The use of ESN fertilizer at cultivation may require less in-season N fertilizer application according to petiole and yield data.
- When using ESN fertilizer, petiole nitrate threshold levels for determining in-season N fertilization maybe lower than when using Urea.

**Acknowledgments:** We thank Alan Blaylock and Agrium for supplying fertilizers and funding for the research.