



# What you need to know about urea timing and sources for sugar beet

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# UREA

- Neutral molecule
  - Water soluble
  - Can leach without conversion to nitrate
  - Can leave site via runoff
- Nitrification is quicker than with AA
- Subject to volatilization loss



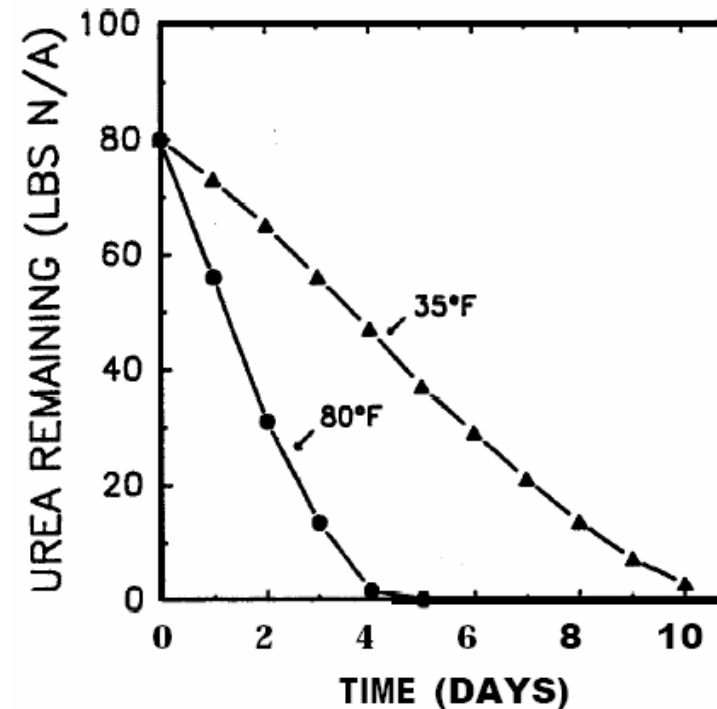
# Key Concepts

- Hydrolysis
  - Initial step where urea is converted to ammonia...this happens first
  - Urease enzyme is responsible for hydrolysis
  - Soil contain urease
  - Crop residue contains higher amounts of urease than the soil
- Nitrification
  - Conversion of ammonium to nitrite then nitrate
  - Bacteria are responsible
    - Nitrification rate slows when soils hit 50°F, pretty much stop at 32°F

# COLD SLOWS NITRIFICATION BUT NOT UREA HYDROLYSIS

## Soil temperature

- Hydrolysis increases with warmer temp.
- 35F (2° C) → 80 (27° C) hydrolysis rate doubles
- High rate even at 35° F



# FALL VERSUS SPRING APPLICATION

## Rate Trial Data

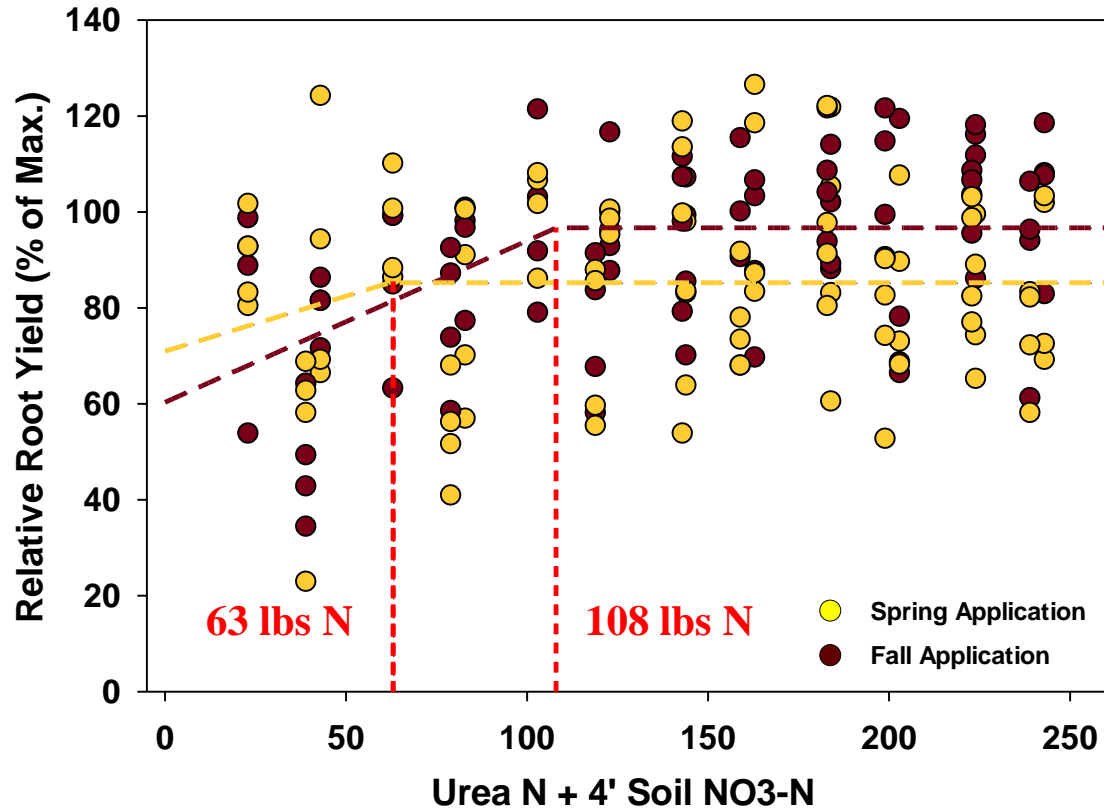
- Fall Application was better in 2 of 4 years for North trials
- Spring application was better in 2 of 3 years in the southern and northern trials
- No difference between fall and spring at 3 of 7 site-years

## Source Trial Data

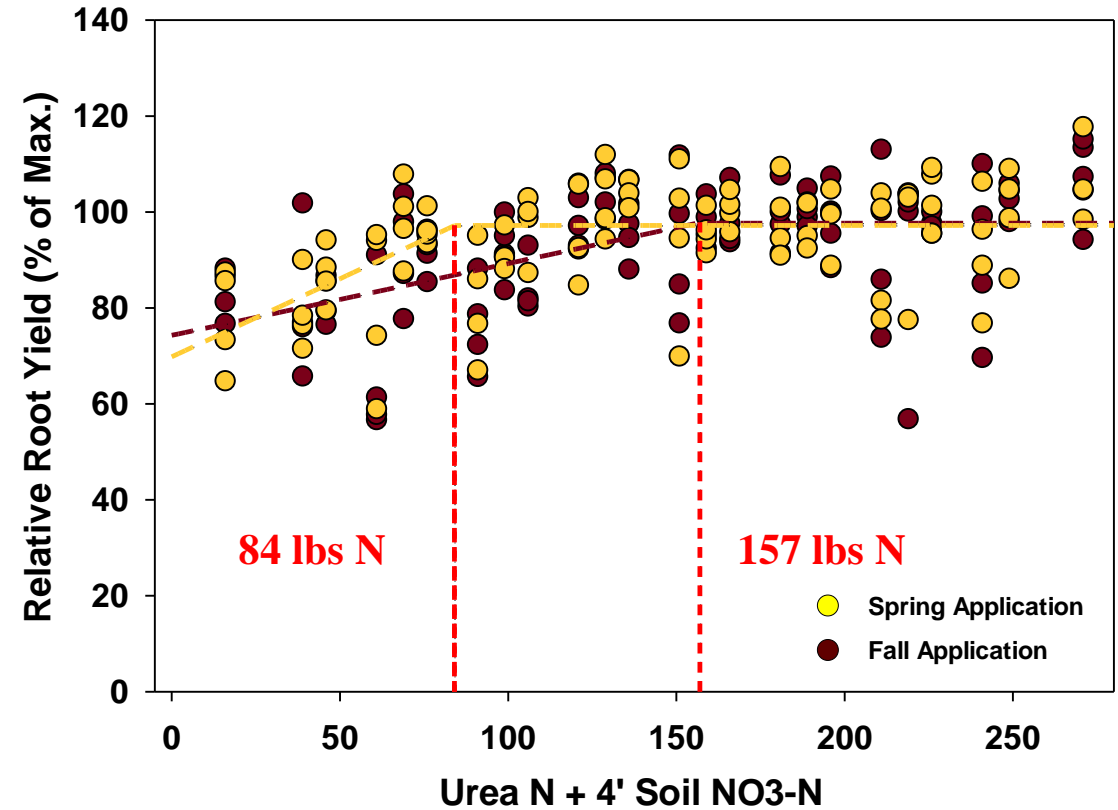
- Fall Application was better in 2 of 3 years for North trials
- Spring application was better in 1 of 3 years in the southern and northern trials
- No difference between fall and spring at 2 of 3 southern site-years

# UREA RATE AND TIMING RESEARCH

## North Data - 4 Site-Years

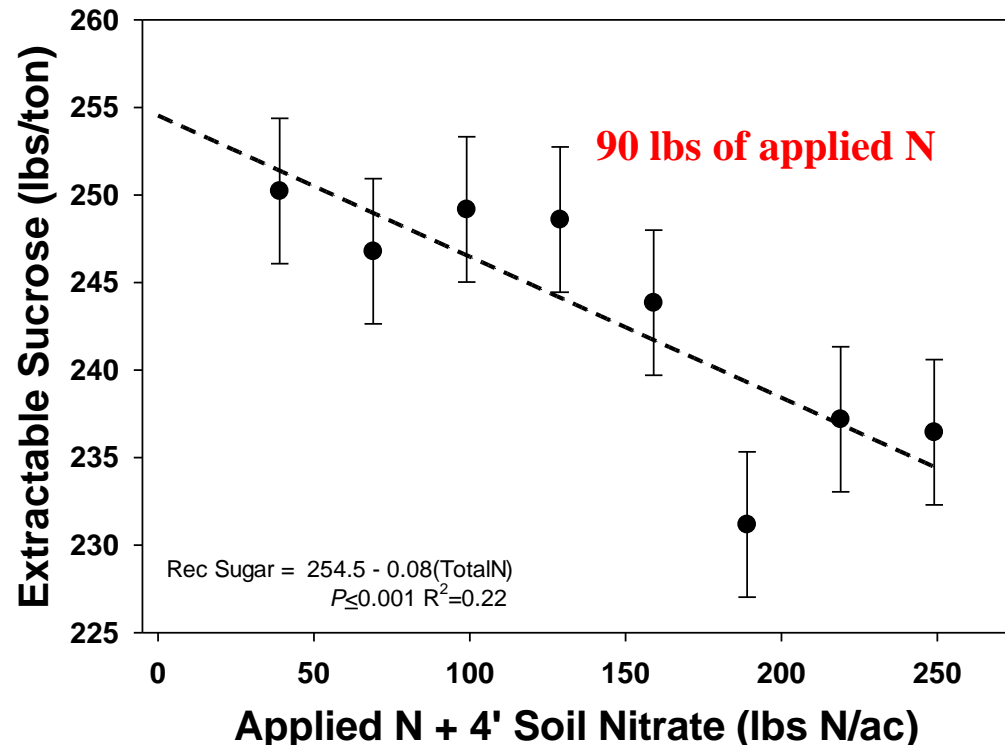


## South Data - 3 Site-Years



# RECOVERABLE SUCROSE

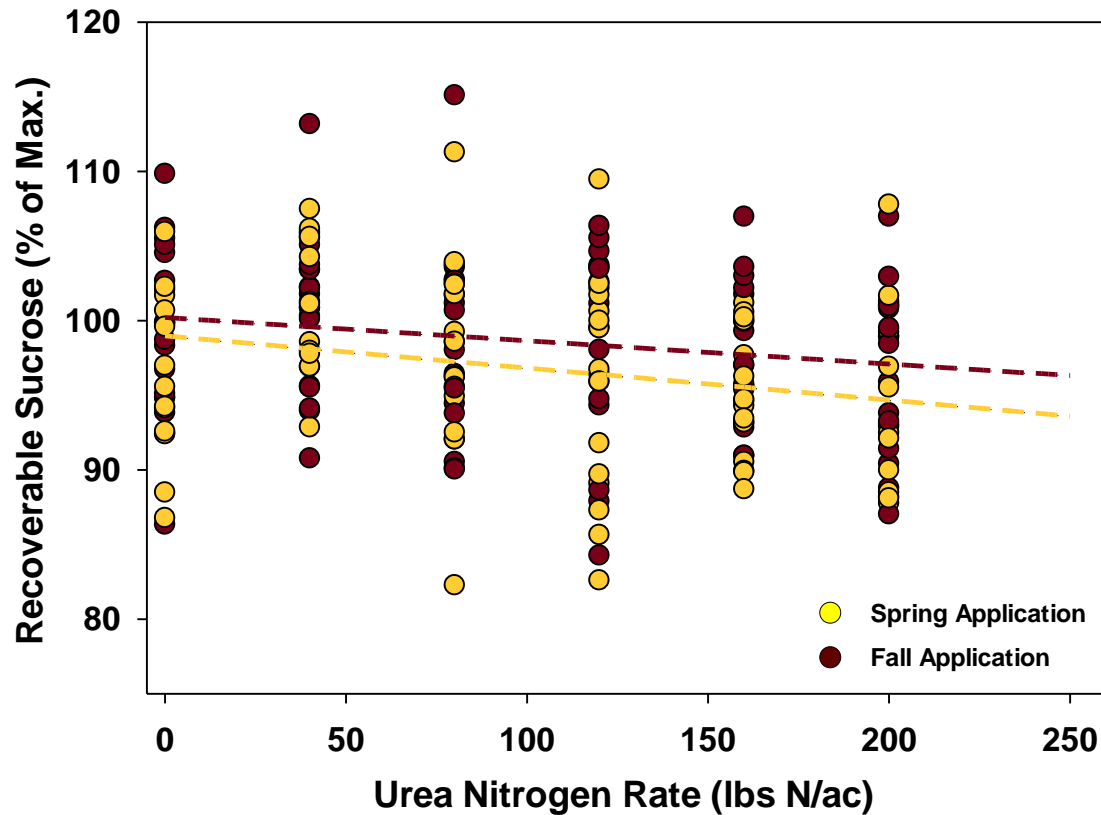
Hector - 2021



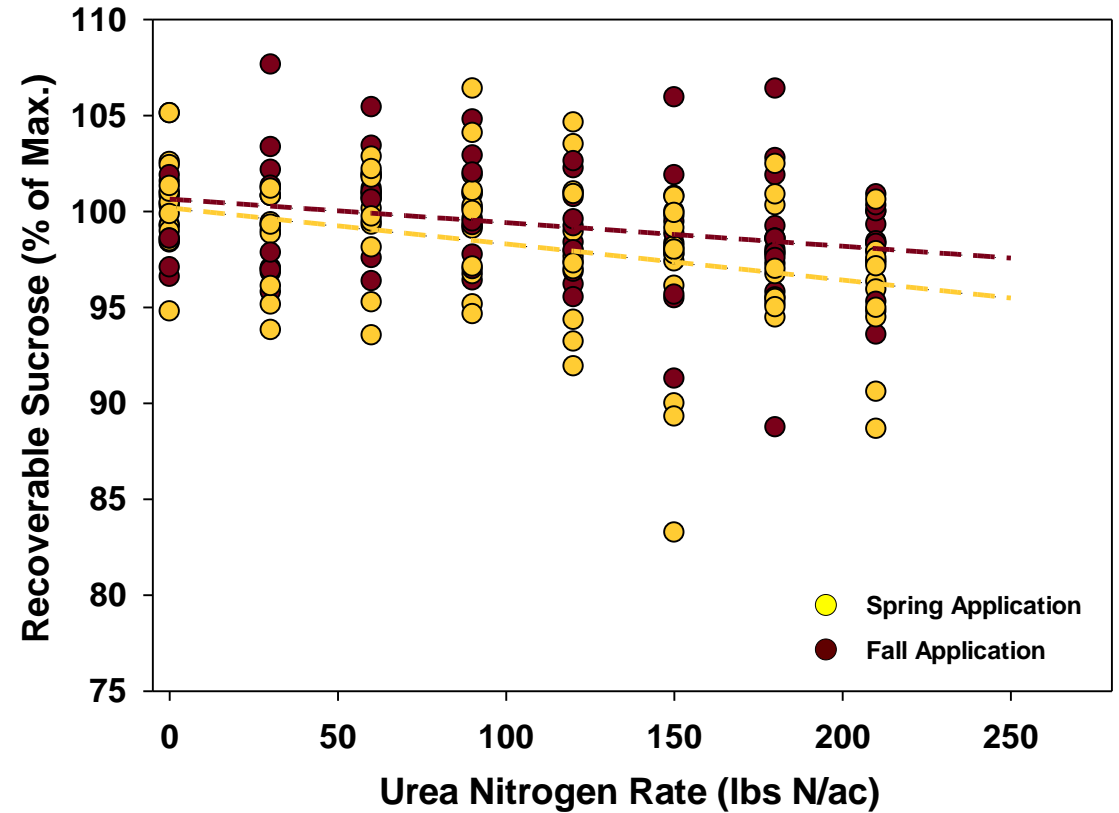
- Recoverable sucrose either decreased with increasing N rate or remained the same
- Data to the left is an example of a decrease
- There is not enough data in this dataset to get an exact value for where the decrease occur

# RECOVERABLE SUCROSE

North Data - 4 Site-Years



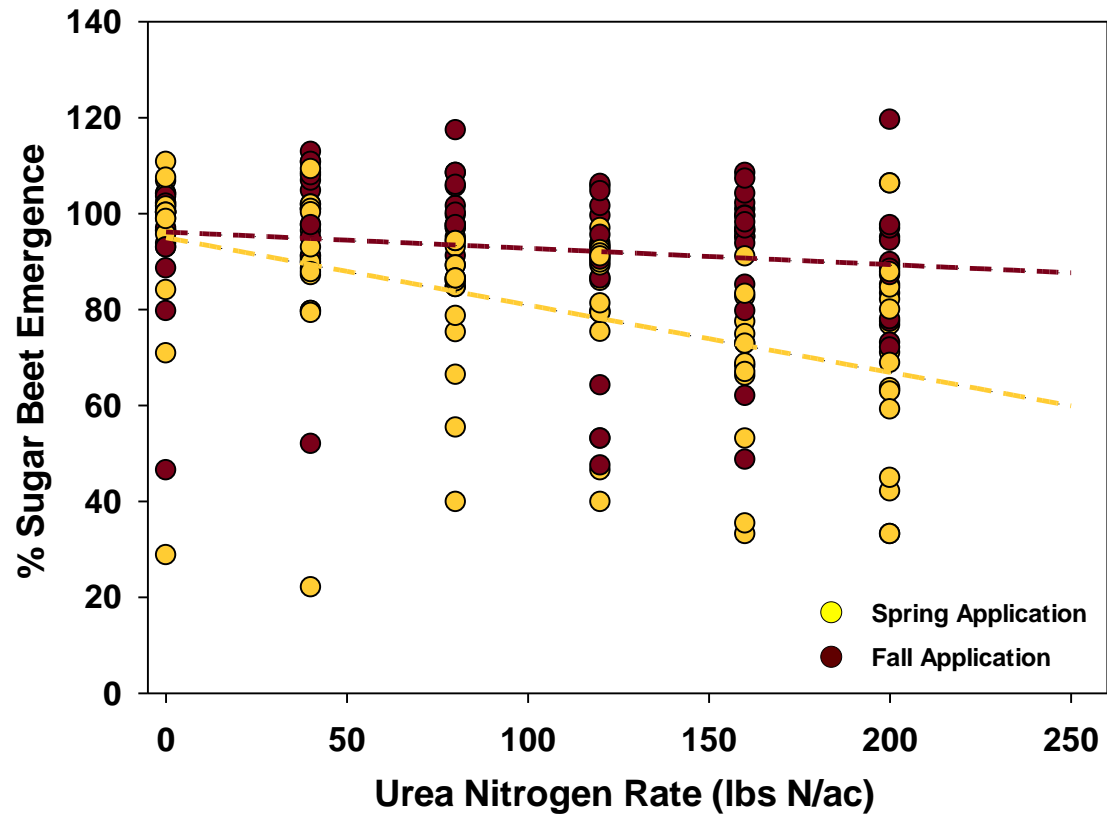
South Data - 3 Site-Years



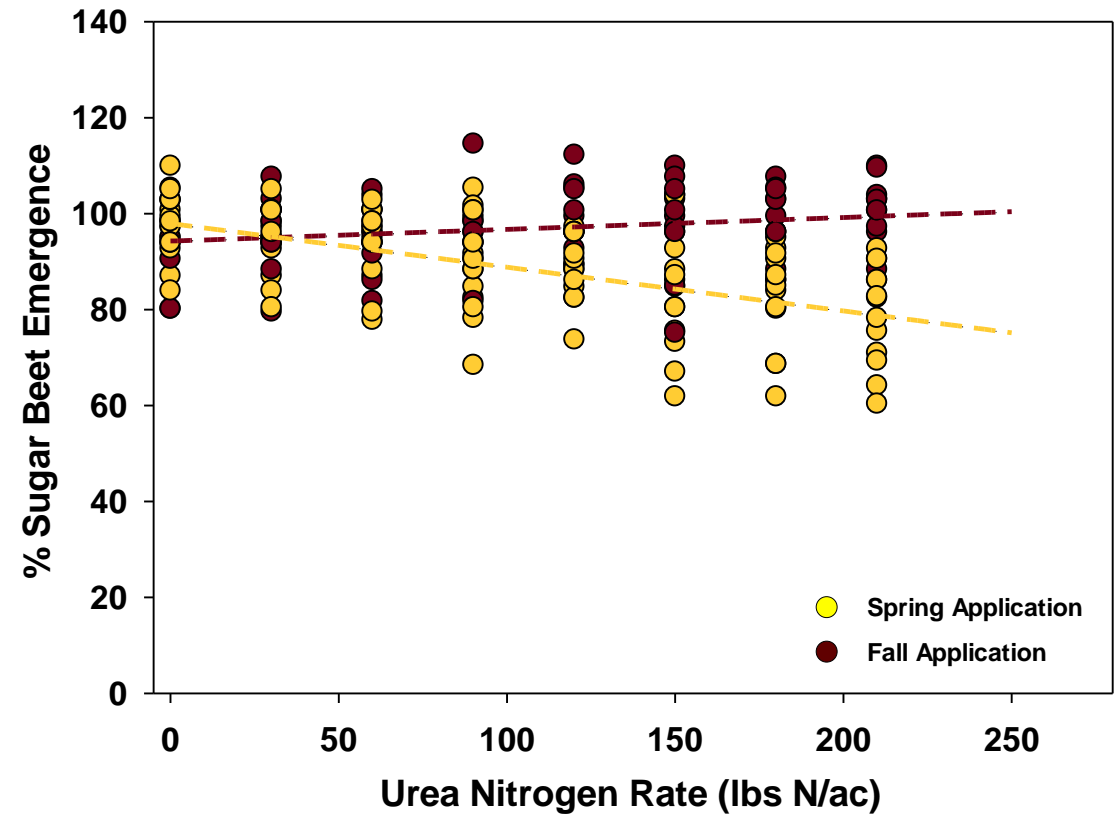


# EMERGENCE

## North Data - 4 Site-Years



## South Data - 3 Site-Years



# SOURCE TRIAL

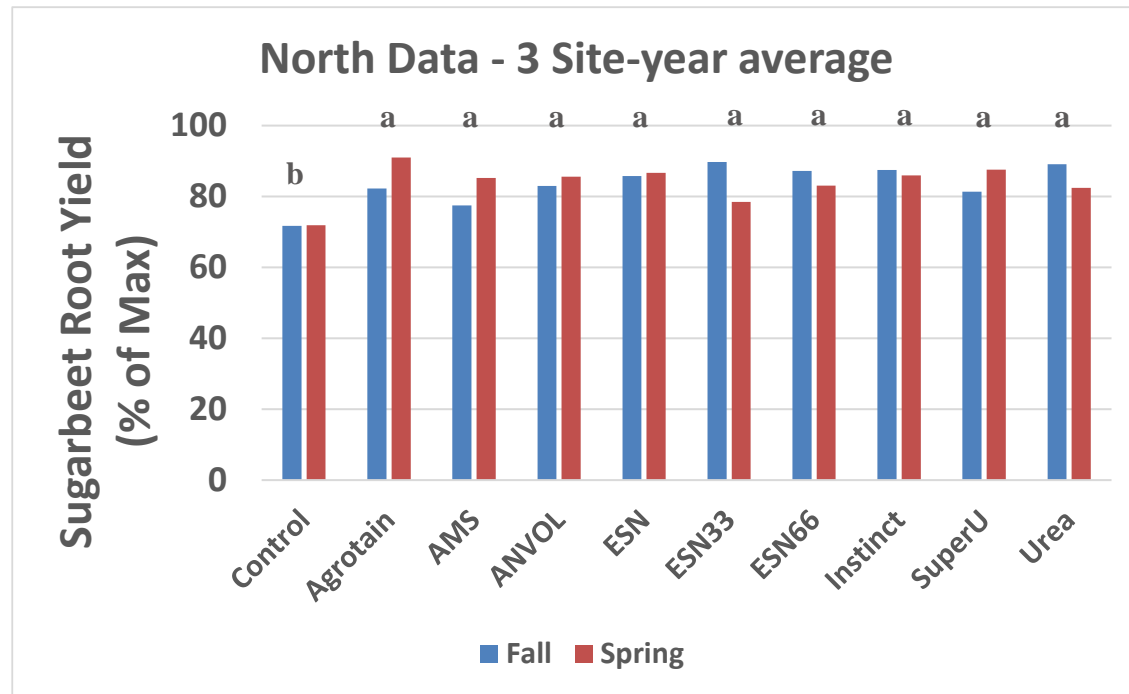
1. 0N control
2. 100% Urea
3. 66% Urea/33% ESN
4. 33% Urea/66% ESN
5. 100% ESN
6. Anvol (1.5 qt/ton)
7. Agrotain (low rate 0.45 qt/ton)
  - 2qt/ton labeled rate
8. Super-U
9. Instinct NxtGen (24 oz/acre)
10. AMS

*All sources supplied 45 lbs N per acre*



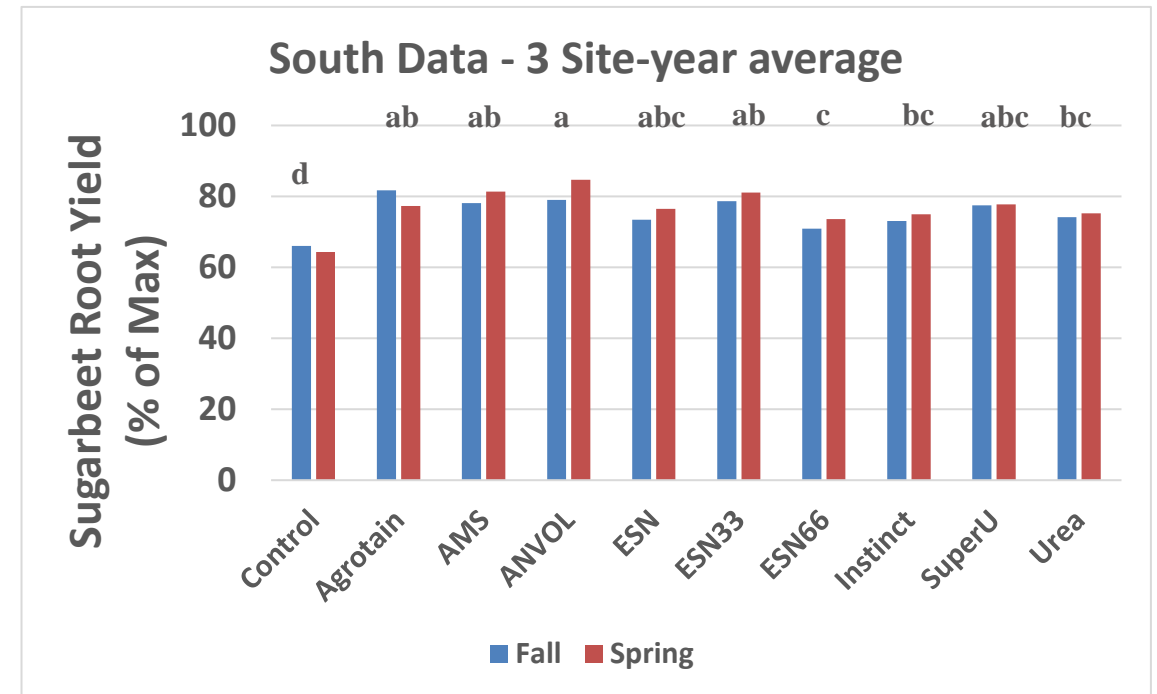
# SOURCE ROOT YIELD DATA BY REGION

## North



## South

*+1.4% root yield for spring application*



*Maximum yield as determined in the rate response trial*

# A FEW THINGS TO CONSIDER

- The trend towards greater yield with urease inhibitors may point to N loss occurring from ammonia volatilization
- Spring application typically favored when spring precipitation is higher
- Fall urea yielding more at Crookston is surprising but might be a result of shallow incorporation into dry soils
- I did not present any recoverable sucrose data, but the rate trials show a decrease with increasing N rate

# INHIBITORS: WHAT'S NEW

- Limus – BASF
  - NBPT & NPPT: Urease inhibitors
- Centuro – Koch
  - Nitrification inhibitor for AA and liquid ammonia sources (UAN)
- Anvol – Koch
  - Duromide: urease inhibitor
- Instinct – Corteva
  - Microencapsulated nitrapyrin



# RATE OF A.I. IS IMPORTANT

Table 5. List of tested and recommended NBPT-containing urease inhibitors (based on product labels available in March, 2019) and suggested application rates for urea and urea-ammonium-nitrate (UAN).

Product Name	Manufacturer	Weight Per Gallon lb/gallon	NBPT Concentration %	Recommended Volume <sup>†</sup>	
				Urea qt/ton fertilizer	UAN
Agrotain Advanced	Koch Fertilizer, LLC	8.87	30	2.0	1.0
Agrotain Ultra	Koch Fertilizer, LLC	8.84	26.7	3.0	1.5
ANVOL <sup>††</sup>	Koch Fertilizer, LLC	9.26	16	1.5	0.75
Arborite AG-NT	Weyerhaeuser NR Co. <sup>‡</sup>	9.15	24.0	3.0	1.5
ContaiN	AgXplore	8.5	unknown <sup>§</sup>	4.0	2.0
Factor	Rosen's, Inc.	9.09	24.5	3.25	1.625
Limus	BASF	9.06	16.88 <sup>#</sup>	3.0	1.5
N-Fixx PF	Helena Chemical	8.50	unknown <sup>§</sup>	3.0-4.0	1.5-2.0
Nitrain	Loveland Products	8.93	26.7	3.0	1.5-2.8
Nitrain Express	Loveland Products	8.99	24.8	3.0	1.5
N-Veil	Invictis Crop Care, LLC	8.92	26.7	3.0-4.0	2.0-3.0
PinnitMax	Corteva Agriscience	9.26	50	1.5	0.75

1.3 to 1.8 lbs  
NBPT/ton urea

0.065-0.09%  
w/w

<sup>†</sup> One ton of fertilizer approximates 181 gallons of 32% UAN and 187 gallons of 28% UAN.

<sup>‡</sup> Arborite AG-NT (Nitrolock Technology) distributed by Gavilon Fertilizer

<sup>§</sup> Unknown, the product label does not specify the concentration of NBPT in the product.

<sup>#</sup> Limus contains 16.88% NBPT and 5.63% NPPT, which is a proprietary urease inhibitor owned by BASF.

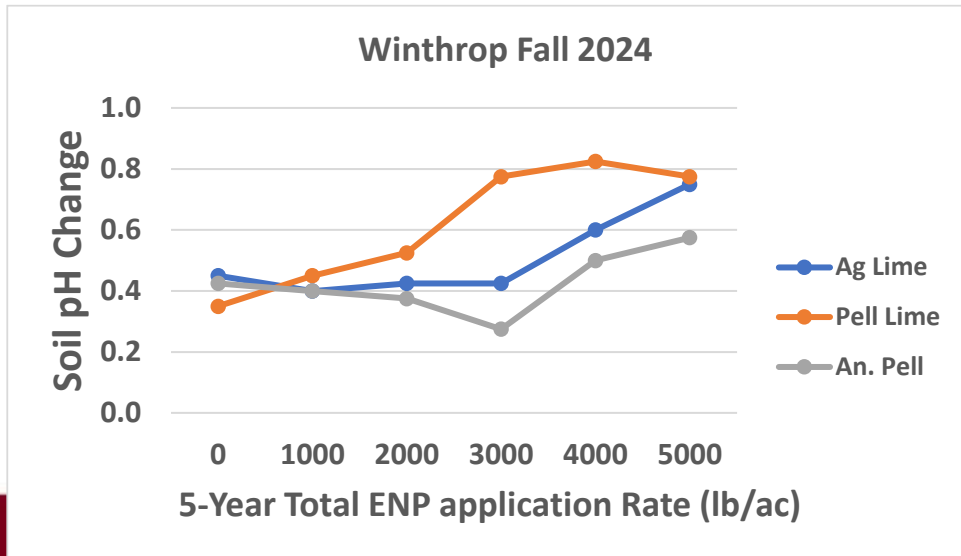
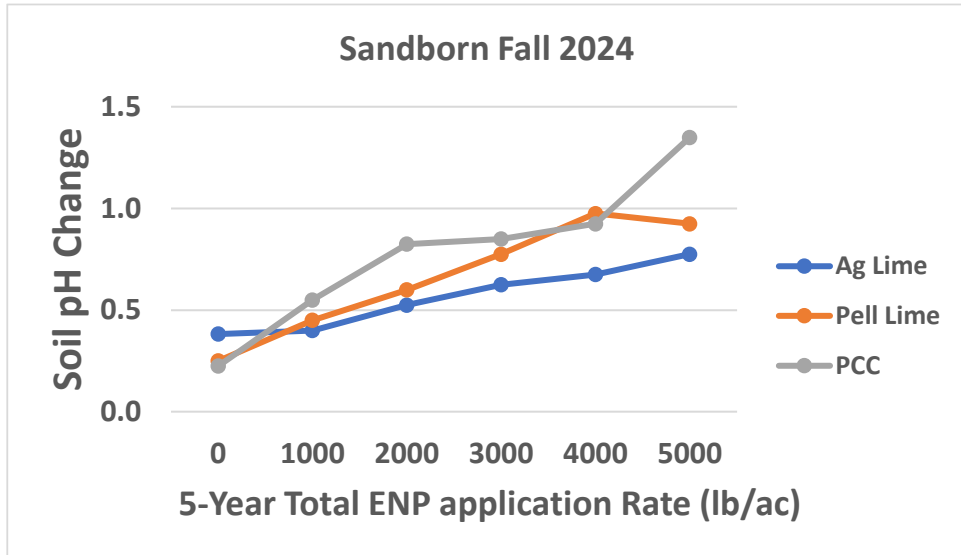
<sup>††</sup> ANVOL contains 16% NBPT and 27% duromide which has also been shown to reduce ammonia volatilization loss.

Roberts et al.

Data generated March 2019

<https://www.uaex.edu/publications/PDF/FSA->

# LIME STUDY – PH CHANGE AFTER ~1 YEAR



- AG lime – 1300 lbs ENP/ton
- Pell lime – 1847 lbs ENP/ton
- PCC – 1055 lb ENP/ton
- Materials all applied at the same ENP rate/ac
- Proposed five- year studies at each location
- Yield was no affected by lime in 2024



**Thank You  
Questions?**

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