New Fertilizer Technologies

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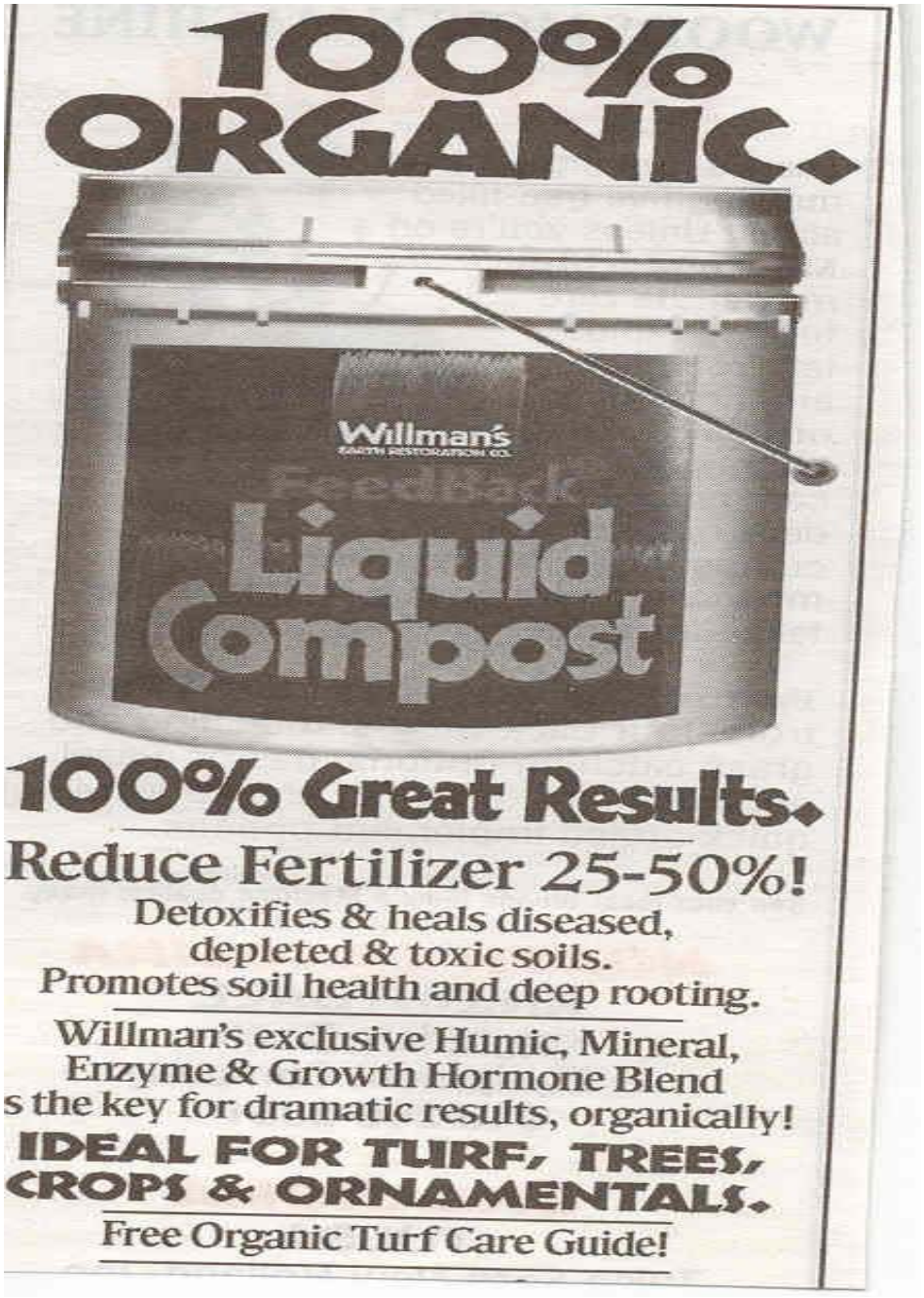
FERTILIZER Technologies

- Fertilizer
  - Has a guaranteed analysis
  - Contains fertilizer nutrients
  - Not a growth amendment or stimulant

Many of our ‘new’ fertilizer technologies are not new at all – simply a re-evaluation of existing technologies.

Fertilizer – has a guaranteed analysis.

Amendments do not.



Fertilizer


Harrells MAX
foliar nutritionals
Long Iron
15-0-0 with UMAXX®
GUARANTEED ANALYSIS
Total Nitrogen (N) 15.00%
15.00% Urea Nitrogen
Sulfur (S) 3.00%
3.00% Combined Sulfur
Iron (Fe) 6.00%
Derived from: low biuret urea and ferrous sulfate.
*7.50% urea nitrogen stabilized with dicyandiamide and N-(n-butyl) thiophosphone triamide.
UMAXX® is a registered trademark of Agrotain Int'l LLC.
• Rapid plant response
• Corrects iron deficiency
CAUTION: Keep out of Reach of Children
RECOMMENDED RATES
Spray Volumes For Turfgrass: Spray volumes can range from 0.5-4 gallons per 1,000 sq. ft. for adequate coverage. For LONG IRON tank mixtures containing amine formulations of herbicides, spray volumes greater than 2 gallons per 1,000 sq. ft. are recommended.
Bahiagrass, Bentgrass, Centipedegrass, Tall Fescue, St. Augustinegrass, and Zoysiagrass: Apply 2-8 oz. per 1,000 sq. ft. with sufficient water for good coverage. Three to five applications per growing season usually produce the best results. For bentgrass, do not exceed 5 fl. oz. per 1,000 sq. ft. per application. When temperatures can exceed 90° F, do not apply more than 3 fl. oz. per 1,000 sq. ft. to centipedegrass if applied with other fertilizers, pesticides, or specialty products.
Bermudagrass: Apply 4-10 fl. oz. per 1,000 sq. ft. with sufficient water for good coverage. Three to five applications per growing season usually produce the best results.
Bluegrass, perennial ryegrass and other northern grasses: Apply 2-8 fl. oz. per 1,000 sq. ft. with sufficient water for good coverage. Three to five applications per growing season usually produce the best results.
❑ 30 gal drum (113.52 liters) Net Wt. 327.9 lbs (149.1 Kg)
❑ 55 gal. drum (208.12 liters) Net Wt. 601.2 lbs (273.3 Kg)
❑ 250 gal. Tote (946 liters) Net Wt. 2732.5lbs (1242.2 Kg)
Weight per gallon: 10.93 lbs.

Fertilizer Technologies – sorting out the terms

- *Soluble*
  - Immediately available for plant uptake and growth
  - Produce a rapid response, more frequent application may be needed
  - Can have environmental issues if applied incorrectly
  - Often cheapest per pound of N
  - Burn if used incorrectly
- *Slow release*
  - Available over some longer period of time for plant use
  - Slower, long-term plant response, fewer applications
  - Can help with environmental protection, especially in sandy soils
  - May cost a bit more per pound of N
  - Often considered ‘safer’ to use – less risk of burn
  - There are different types of slow release fertilizers

Slow-Release Fertilizers

- Physically slow-release
  - Slow release via a physical coating around a soluble prill
  - Technologies have been around since the 1950s, others newer (80s and 90s)
    - SCU
    - PCU, resin-coat, multi-coat
- Chemically slow-release
  - Slow release by their manufacturing method (homogeneous) – 1950s
  - Ureaformaldehyde/Methylene urea
  - IBDU
- 'Stabilized' N sources
  - Keep N in certain forms via the presence of denitrification inhibitors and/or urease inhibitors
  - Not classed as a true 'slow release' fertilizer

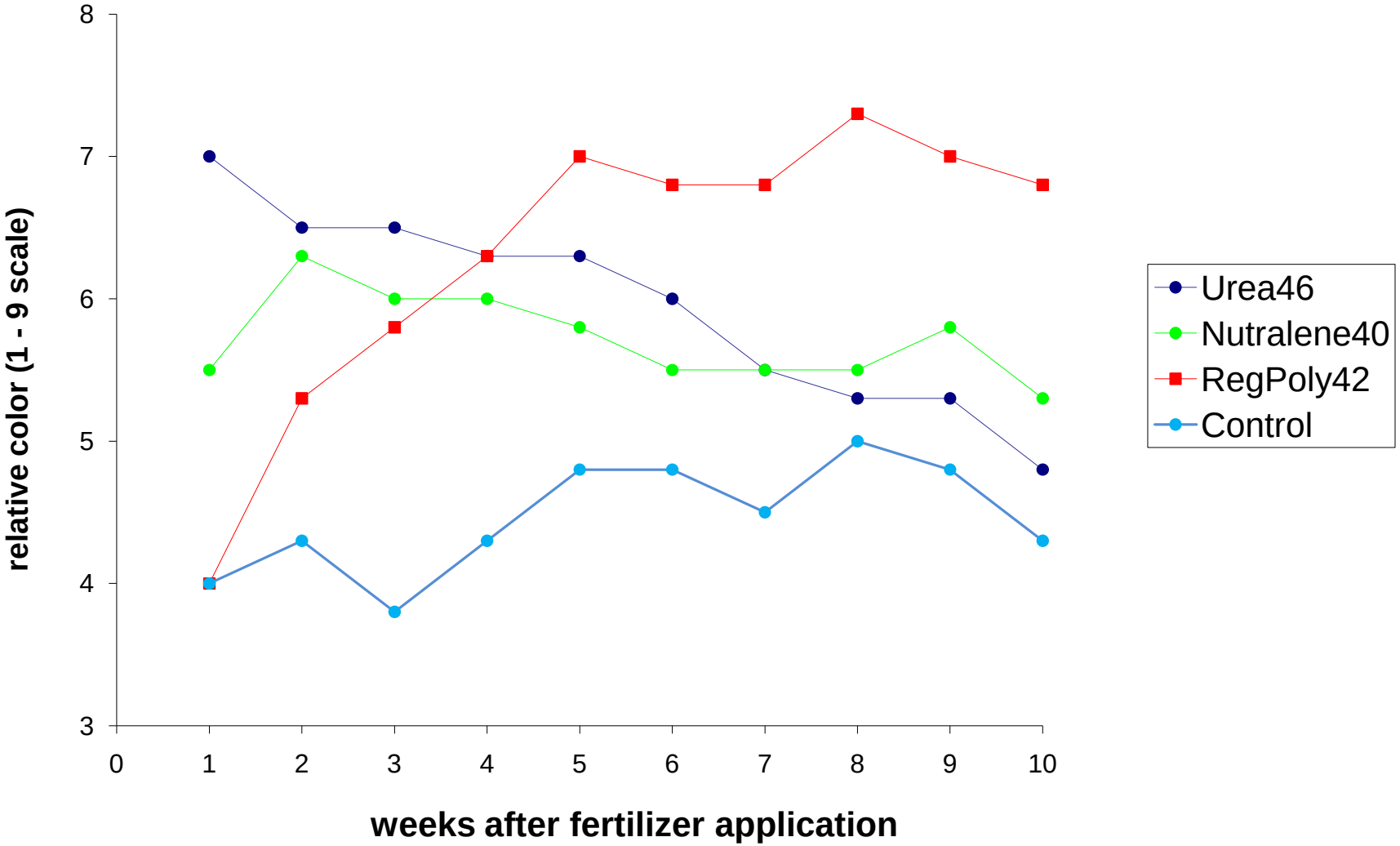
Ureaformaldehyde (UF)

- Ureaformaldehyde (UF) - one of the oldest controlled-release N technologies, commercialized in 1955.
- Urea and formaldehyde are reacted together to produce polymer-chain molecules of varying lengths. Longer the chains – slower the release.
  - *Ureaform*. Very slow solubility. Ureaform is largely of longer-chained molecules of UF polymers.
  - *Methylene ureas* are a class of sparingly soluble products that were developed in the 1960s and 1970s. Contain intermediate-chain-length polymers.
  - *UF solutions* are clear water solutions. Can include triazones.

Nutrient release from slow-release UF fertilizers:

Must have both the activity of water and microbes. Chains must be broken for conversion to plant-available N forms. Since microbial activity is needed, anything that affects that (soil moisture, pH, aeration, temperature) affects the rate of N release.

Relative Color of Hybrid Bermudagrass



Sulfur-Coated Urea (SCU)

- Sulfur-coated urea (SCU) fertilizers - developed in the 1960s and 1970s.
- SCU is urea coated with a layer of sulfur, and often a wax sealant.
- N release from SCU is by water penetration through micropores. If there is a wax sealant microbial activity will be needed as well.
- Release rate varies with coating thickness and integrity.

Polymer-coated fertilizers

- ***Polymer-coated fertilizers*** - Nutrients released via diffusion through a semipermeable polymer membrane. Release rate can be controlled by varying the composition and thickness of the coating. Release is largely controlled by temperature.

- ***Reactive Layer Coating*** - Two reactive monomers are simultaneously applied to the fertilizer substrate, which creates an ultra-thin membrane coating, which controls nutrient release by osmotic diffusion. Coating thickness determines the diffusion rate and the duration of release for RLC products.

- ***Polymer-coated sulfur-coated fertilizers –*** These are hybrid products that use a coating of sulfur and a secondary polymer coat. They are lower cost than poly-coated products. The nutrient-release mechanism is a combination of diffusion and capillary action. Greater uniformity in nutrient release compared to typical SCU fertilizers, tend to be less temperature sensitive.

POLYON®
Controlled-Release Fertilizer

POLYON® Urea
41-0-0 SGN 250

GUARANTEED ANALYSIS

Total Nitrogen (N)*.....41%
41% Urea Nitrogen

Derived from: polymer coated urea

*The urea in this product has been polymer coated to provide 41% slow-release Nitrogen (N).

Information regarding the contents and levels of metals in this product is available on the Internet at http://www.aapfco.org/metals.htm

Net weight: _____ (pounds) _____ (kilograms)

Agrium Advanced Technologies
Smarter Ways To Grow®

888.757.6072
www.agriumat.com

MANUFACTURED BY:
Agrium Advanced Technologies (U.S.) Inc.
100 Technology Loop
Sylacauga, AL 35151

XCU™
Slow-Release Fertilizer

XCU™
41-0-0 SGN 150

GUARANTEED ANALYSIS

Total Nitrogen (N)..... 41%

41% Urea Nitrogen*

Sulfur (S)..... 7%

7% Free Sulfur (S)

Derived from: polymer coated sulfur coated urea

*The urea in this product has been coated to provide 38% coated slow-release Nitrogen.

Information regarding the contents and levels of metals in this product is available on the Internet at http://www.aapfco.org/metals.htm

Net weight: _____ (pounds) _____(kilograms)

Agrium Advanced Technologies
Smarter Ways To Grow™
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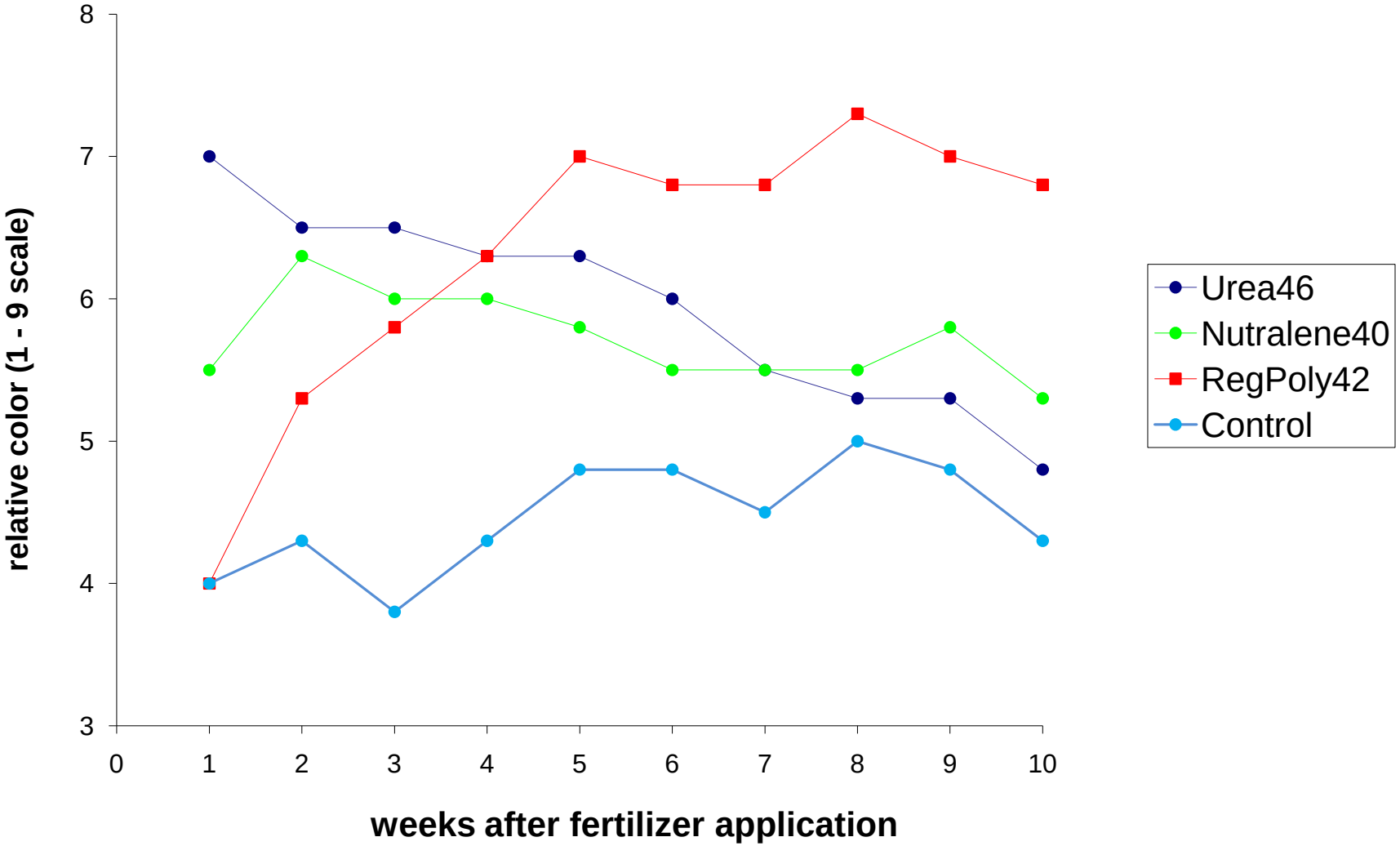
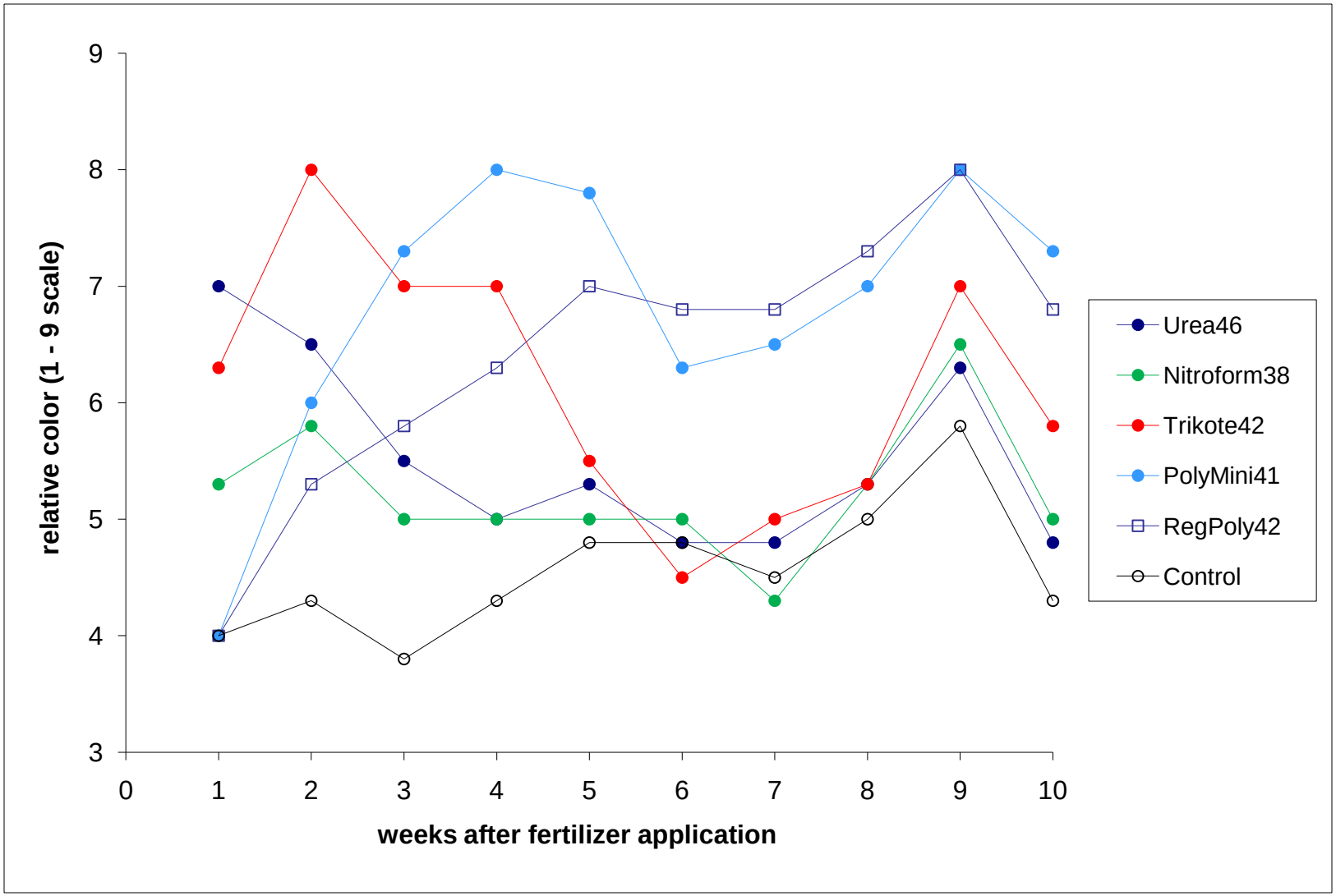
Relative Color of Hybrid Bermudagrass



Penn G-2 color as affected by slow-release N source, 2007



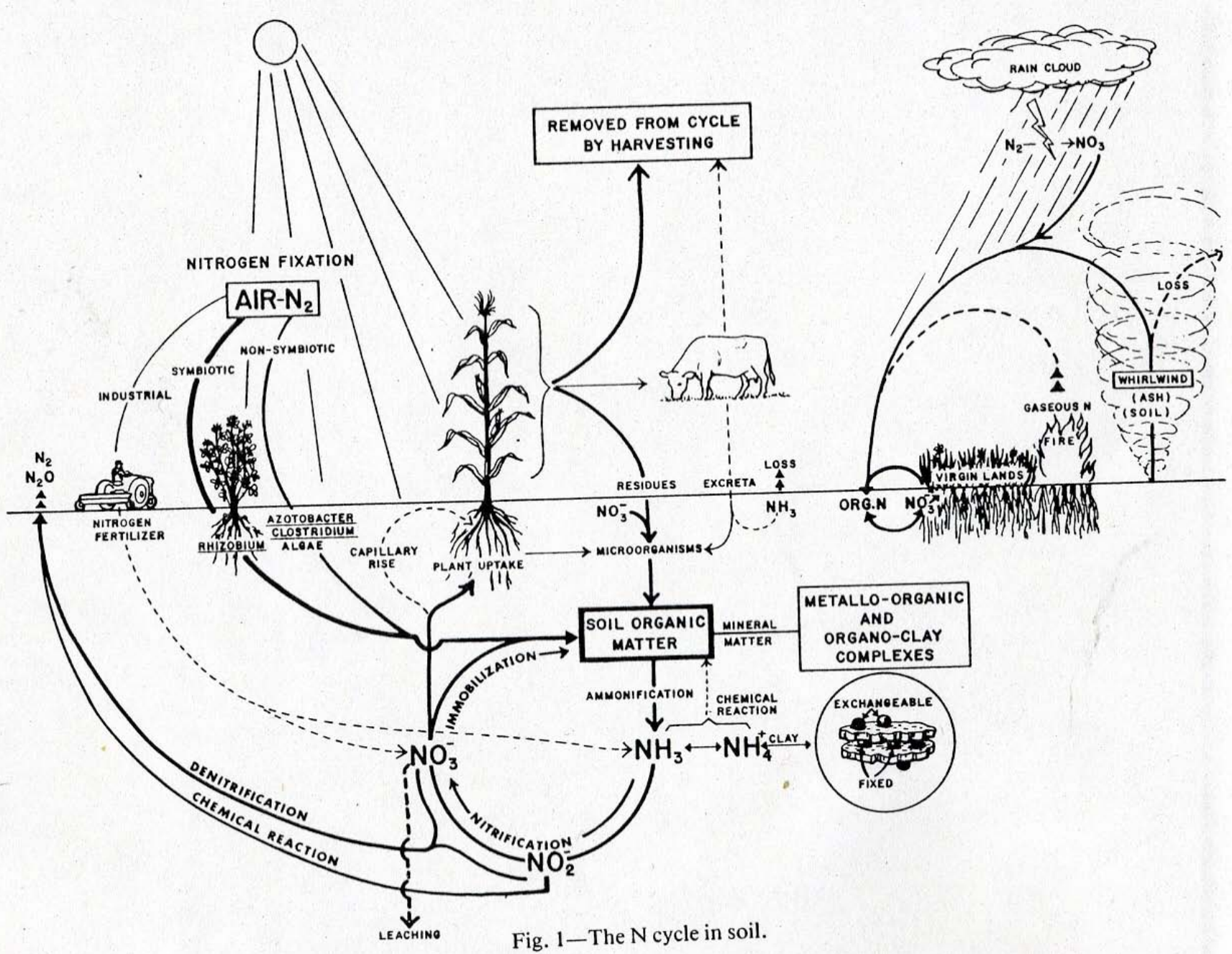


Fig. 1—The N cycle in soil.

Enhanced Efficiency Fertilizers

- Urea with dicyandiamide (nitrification inhibitor) and N-(n-butyl) thiophosphoric triamide (urease inhibitor).
- Urea with Maleic-Itaconic copolymer.
- Slow-release n sources in turf: methylene ureas and polymer-coated technologies.

'Stabilized' Nitrogen Fertilizers

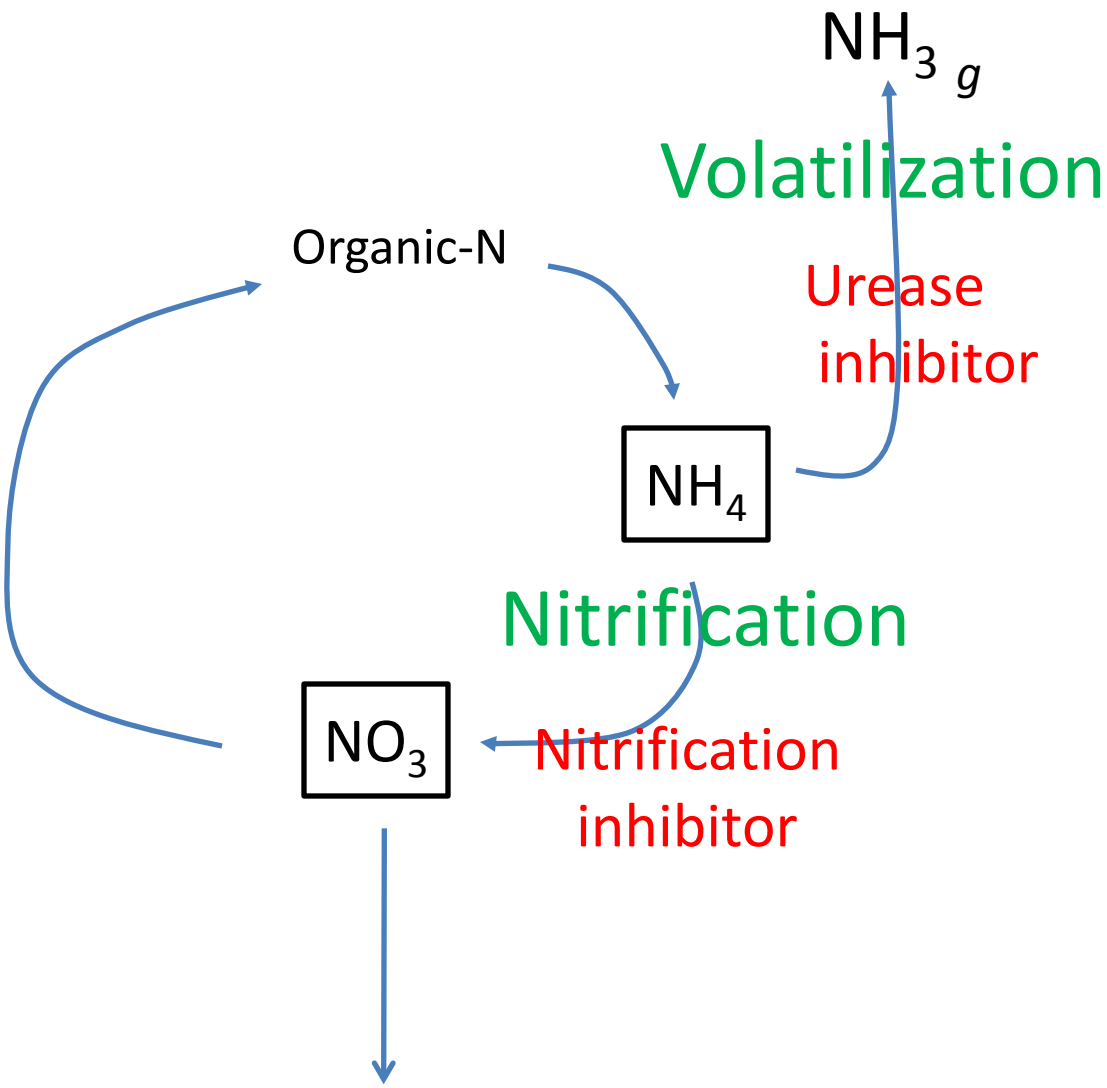
- Urea with the addition or either a nitrification inhibitor (dicyandiamide), urease inhibitor (N-(n-butyl) thiophosporic triamide), or both.

- N-(n-butyl) thiophosphorictriamide, or (NBPT) - inhibits the urea enzyme from attacking the urea molecule and causing volatilization. Inhibits the enzymes urease and ammonium mono-oxygenase. Trade names U-Flexx ®/U-Maxx®

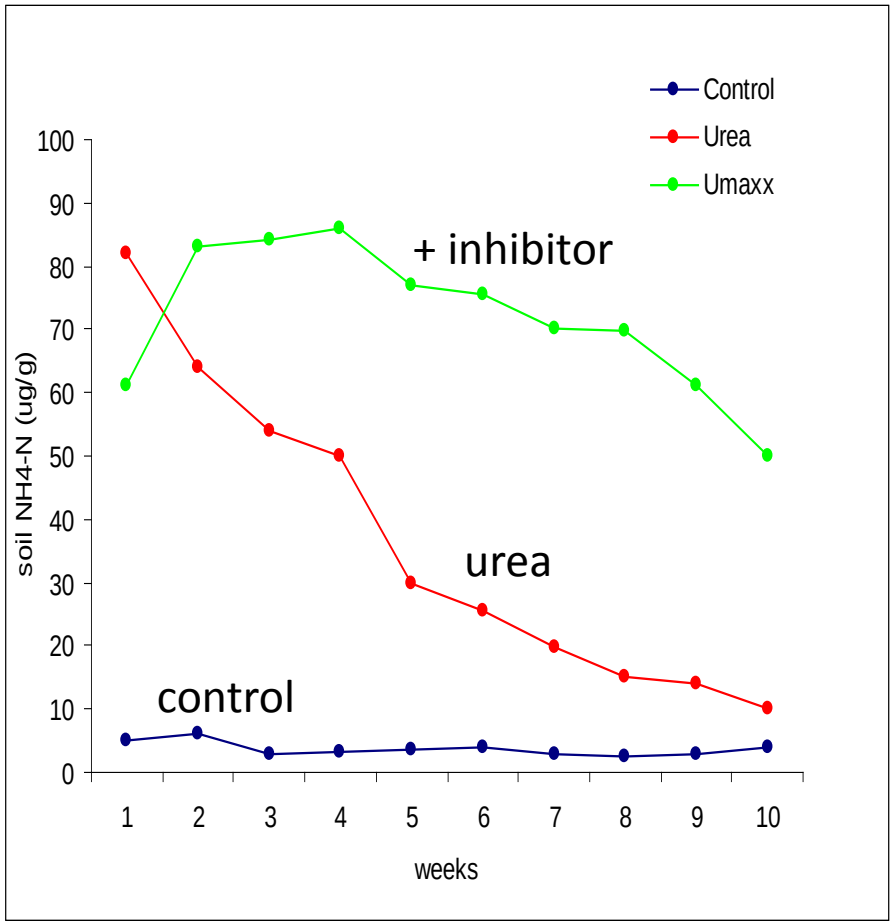
- Dicyandiamide ties up the enzyme sites of the Nitrosomonas bacteria, which is responsible for the conversion of ammonium to nitrite. The conversion process of ammonical(NH_4^+) nitrogen to nitrite (NO_2^-) nitrogen is greatly slowed.

Nitrogen Fertilizers w Inhibitors

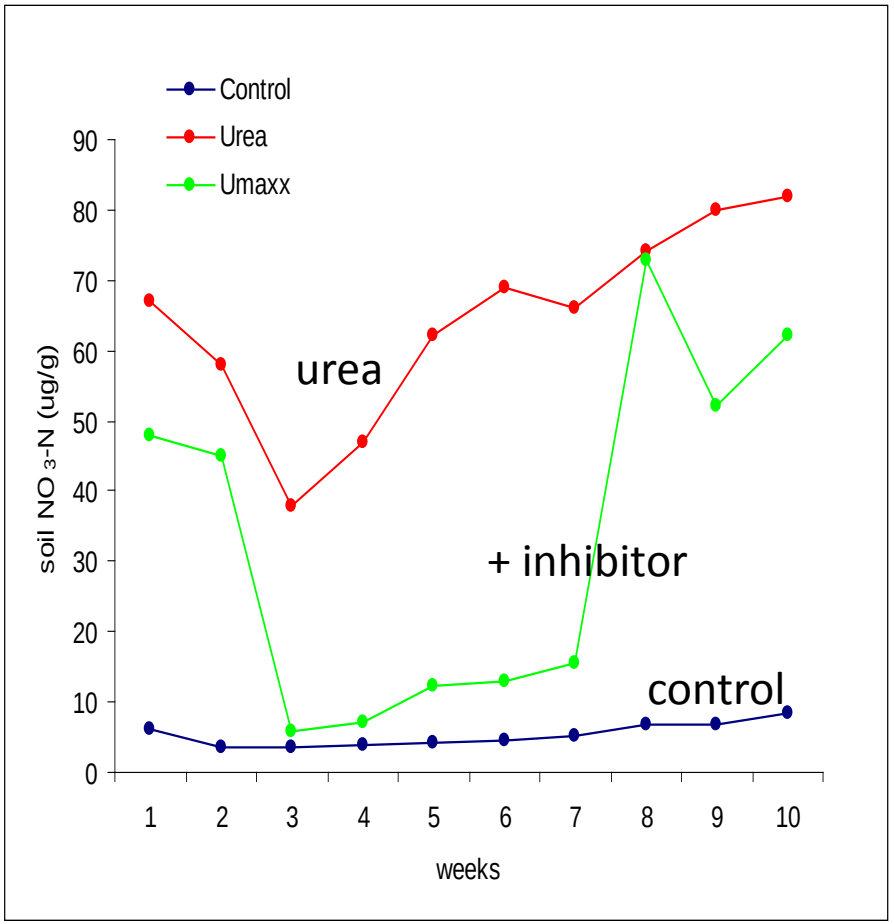
- Another product is NutriSphere-N, which is a maleic-itaconic copolymer


$NH_{3\ g}$
Volatilization
Organic-N
Urease
inhibitor
NH_4
Nitrification
NO_3
Nitrification
inhibitor

Nitrification – Conversion of ammonium into nitrate, done by nitrifying bacteria. Incubation study. Effect of addition of dicyandiamide.

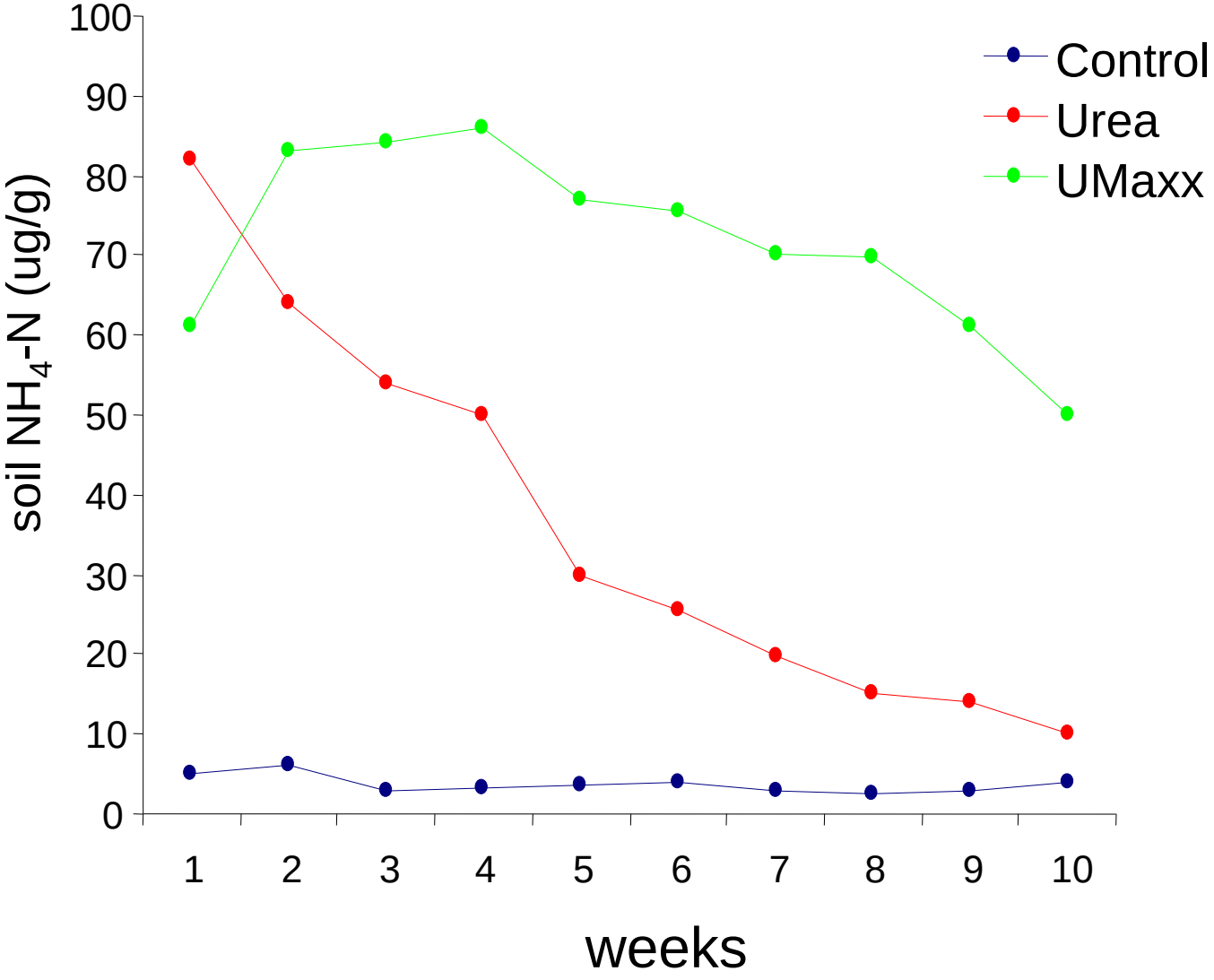


Extractable soil ammonium

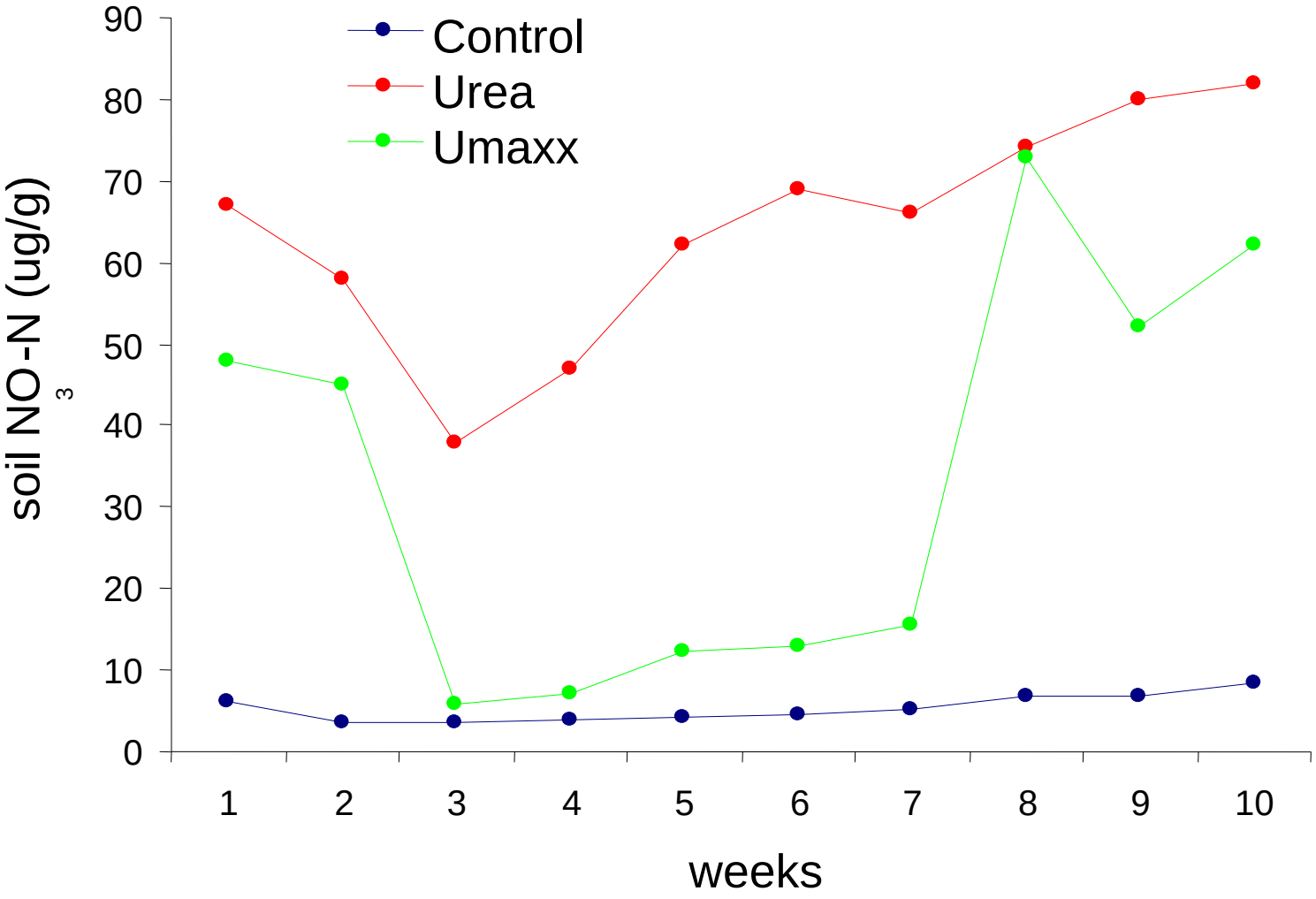


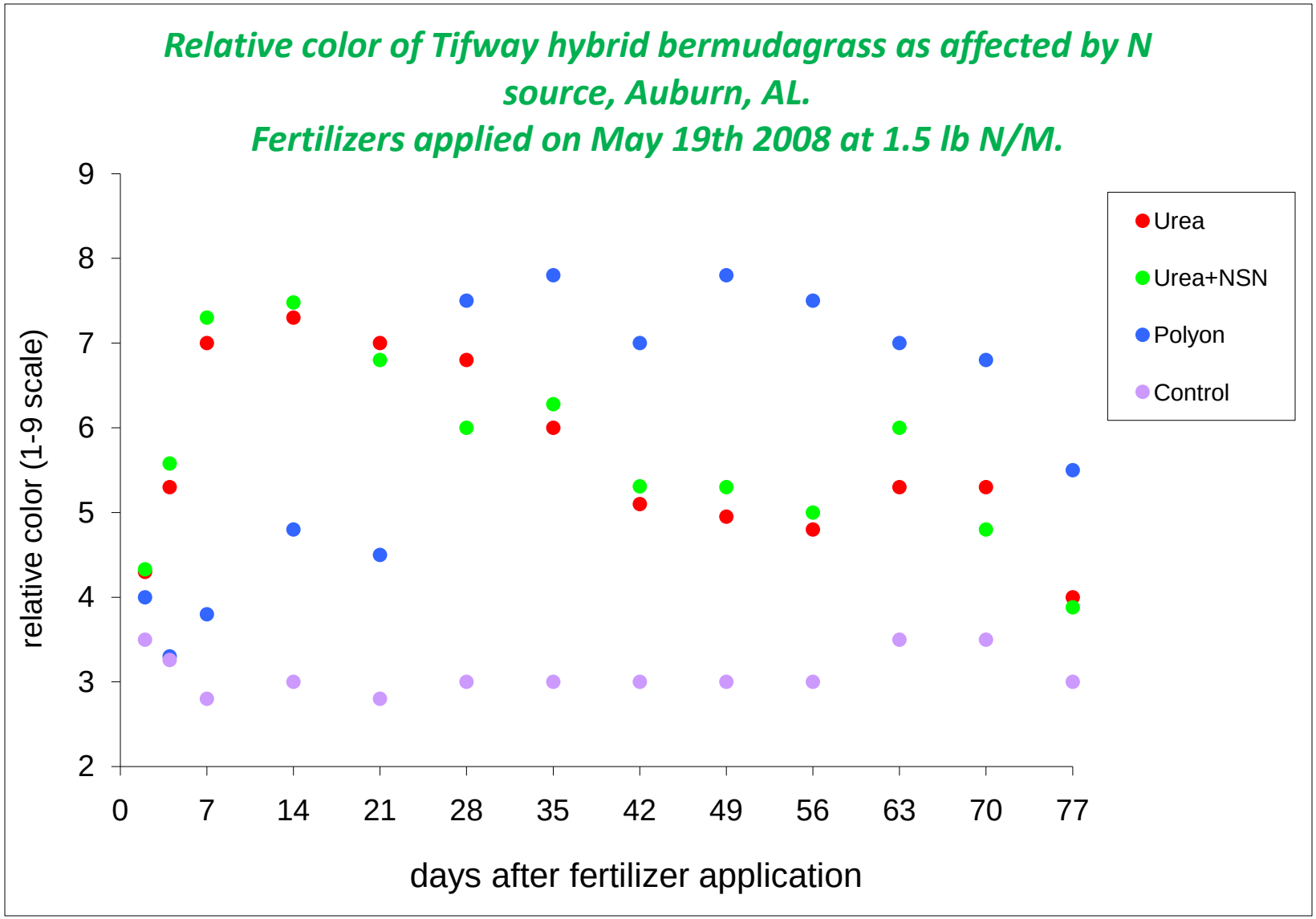
Extractable soil nitrate

Weekly 2M KCl Extractable Soil NH_4-N as Affected by N Source

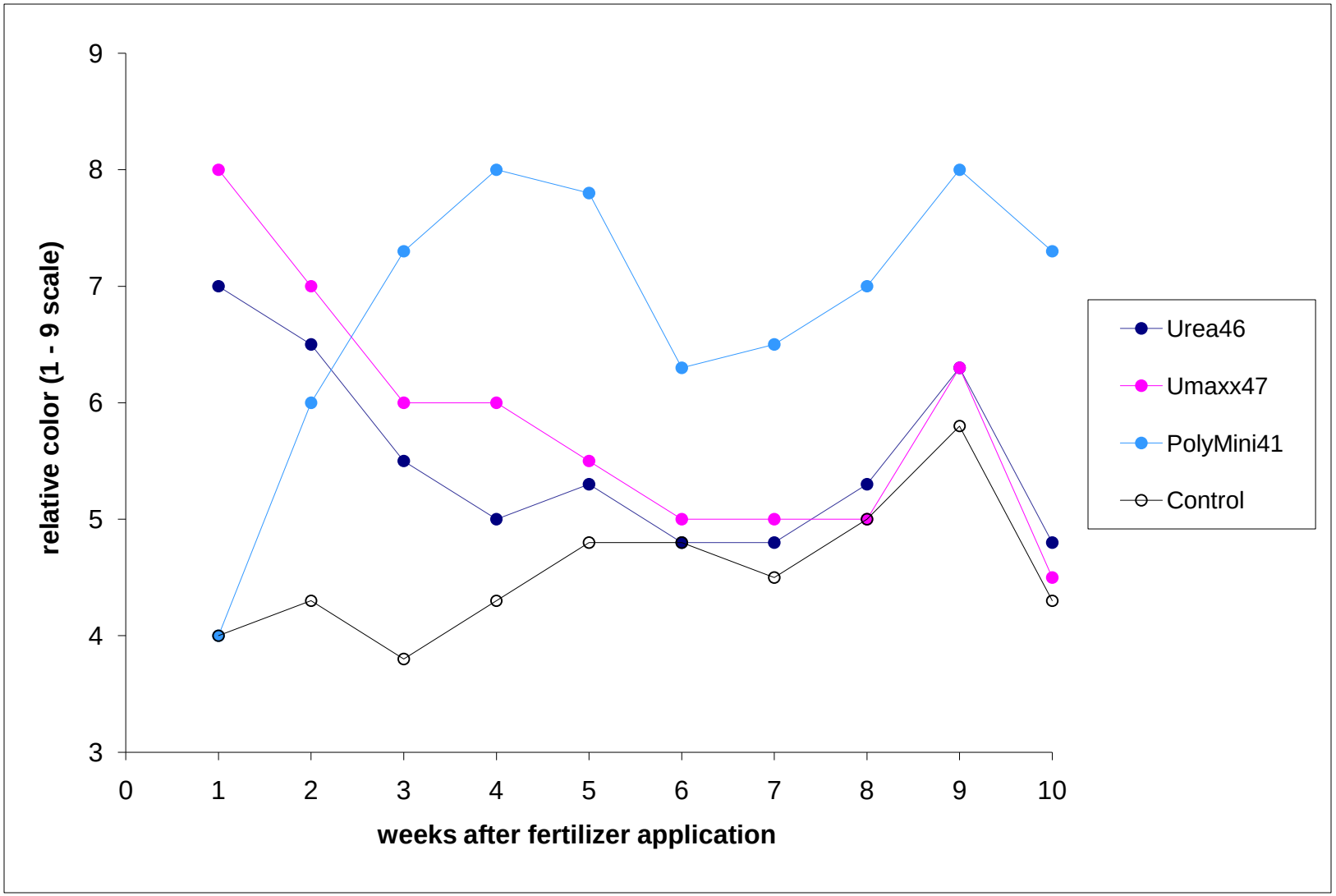


Weekly 2M KCl Extractable Soil NO_3-N as Affected by N Source



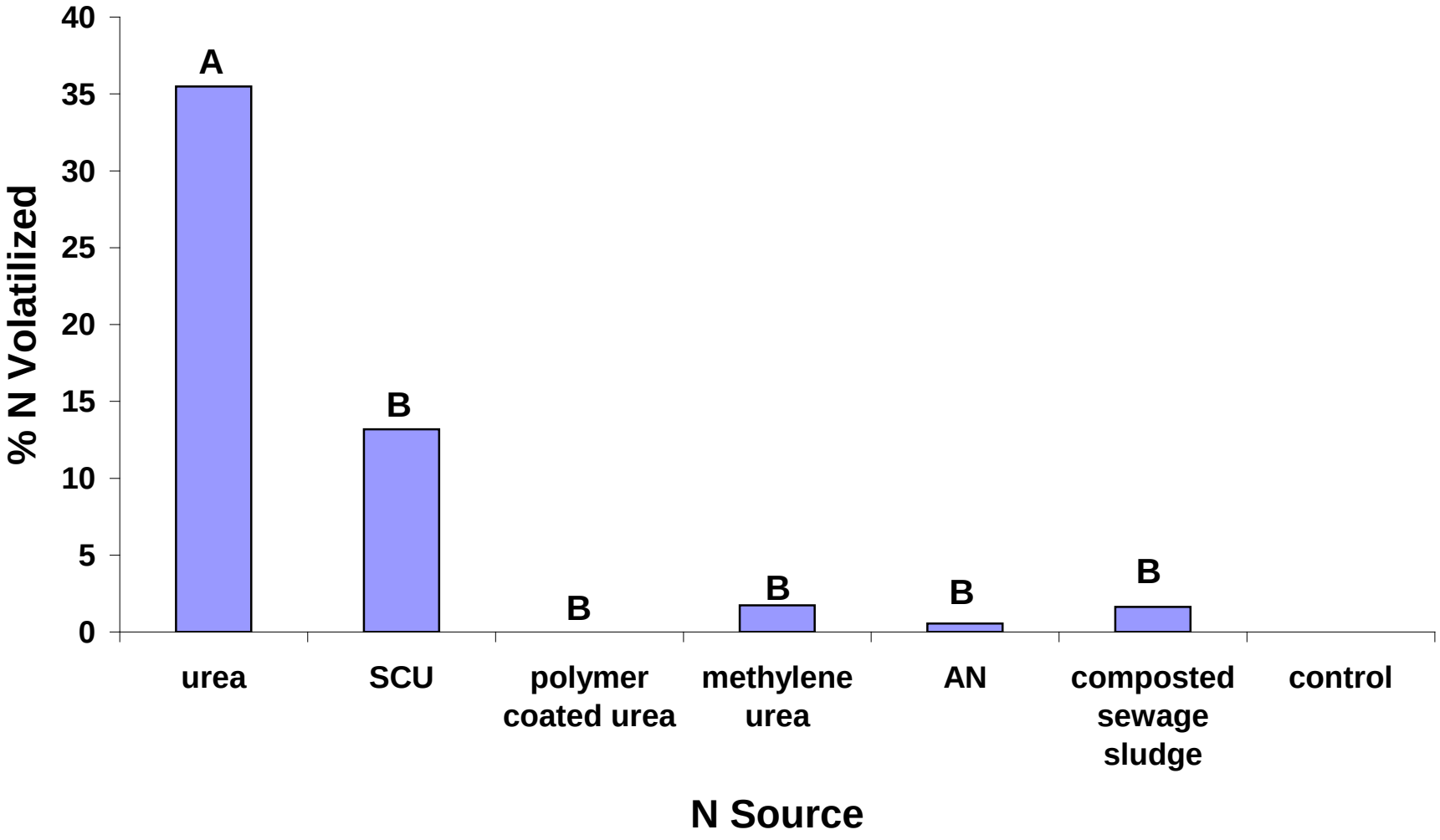

Relative color of Tifway hybrid bermudagrass as affected by N source, Auburn, AL.
Fertilizers applied on May 19th 2008 at 1.5 lb N/M.
relative color (1-9 scale)
9
8
7
6
5
4
3
2
0
7
14
21
28
35
42
49
56
63
70
77
days after fertilizer application
Urea
Urea+NSN
Polyon
Control

Penn G-2 color as affected by slow-release N source, 2007

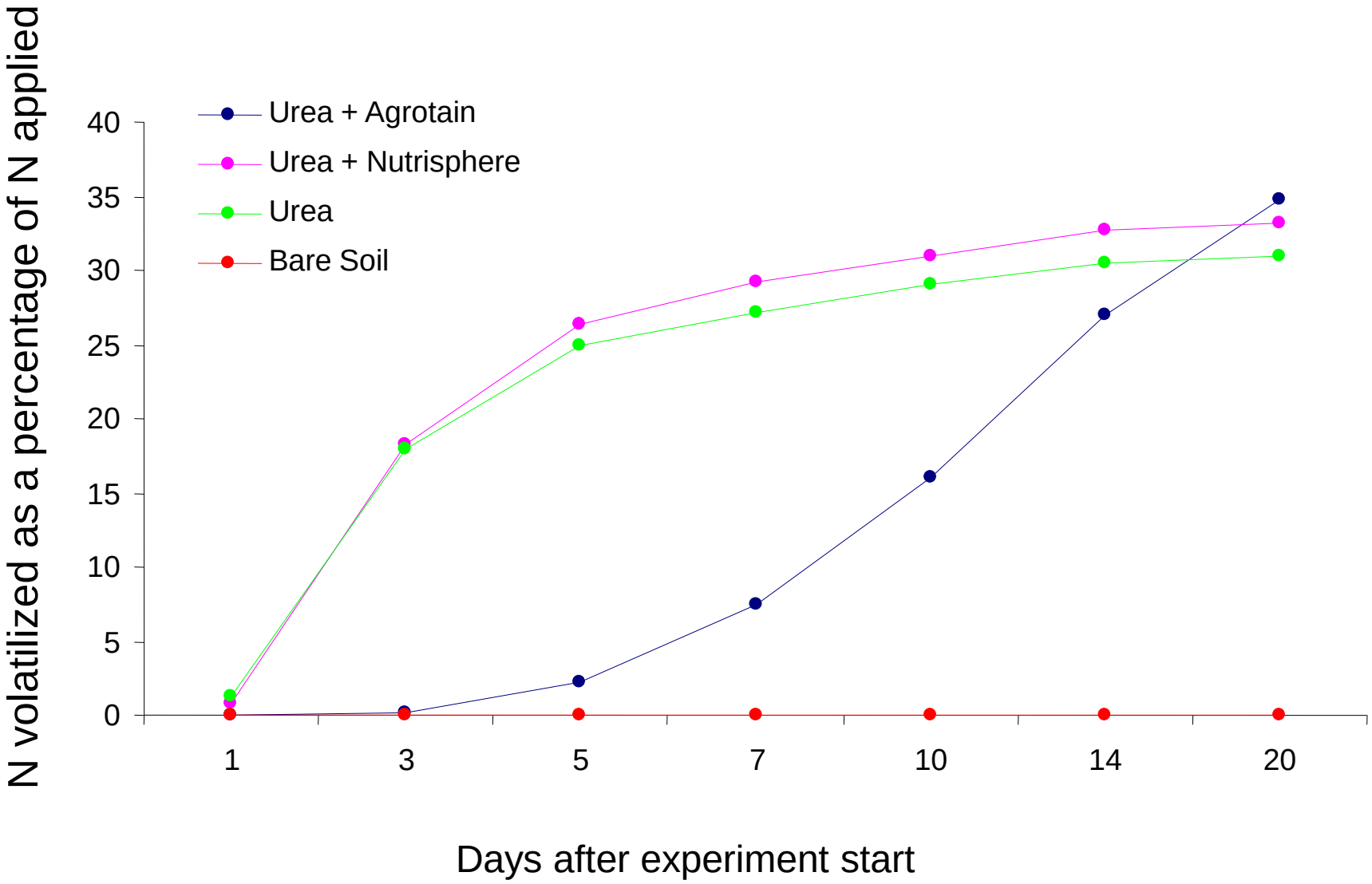


Volatilization – Lab Method

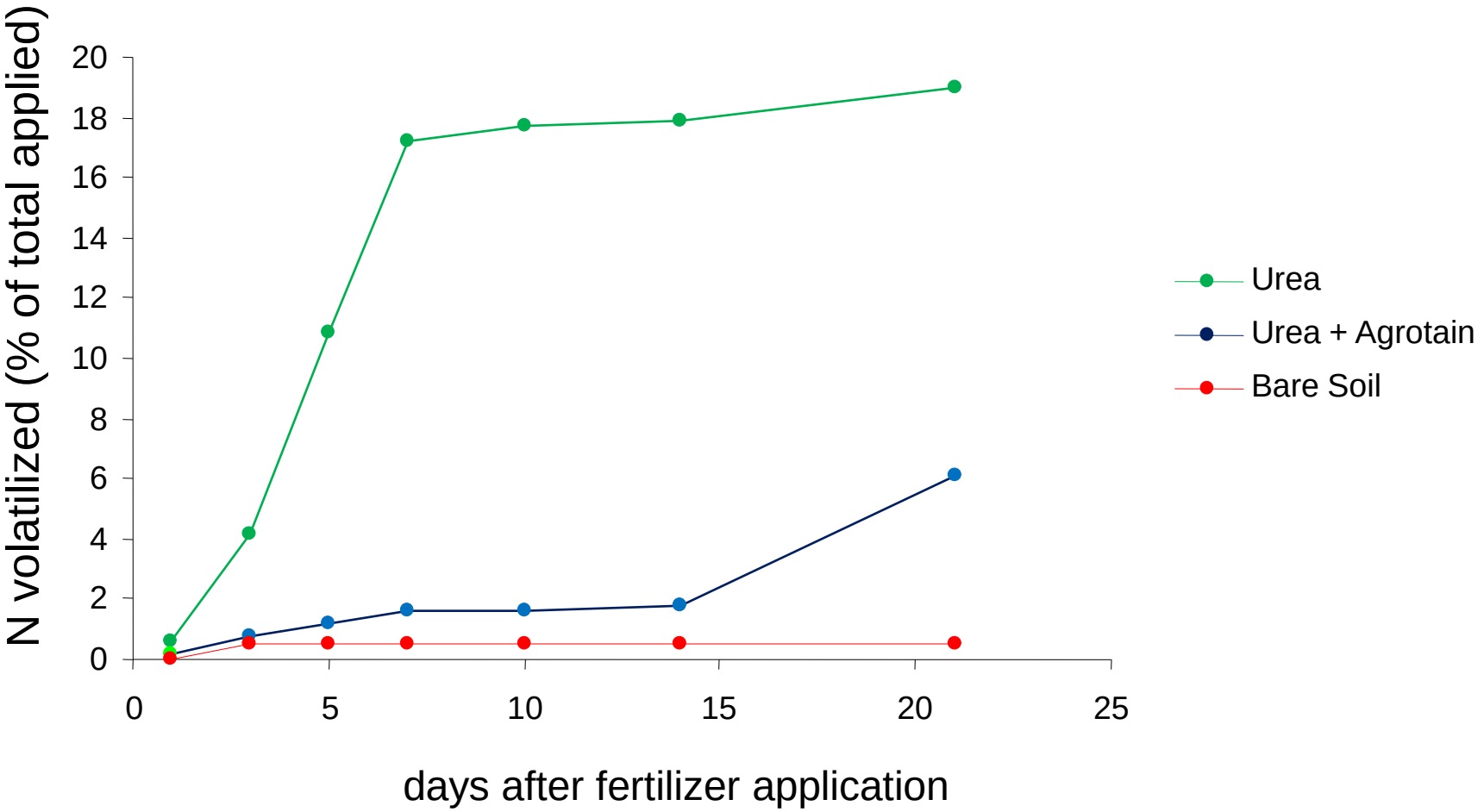
Ammonia Volatilization Over 10 Days



N volatilization as affected by N source, 70F



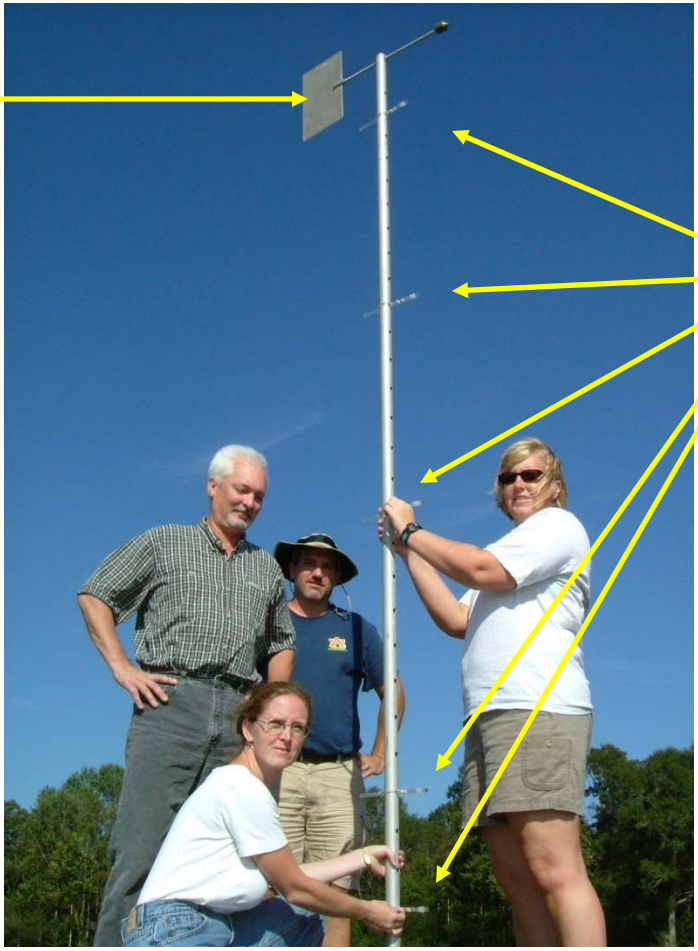
Ammonia volatilization as affected by N source, 50F



Passive Micrometerological Technique – Field Study

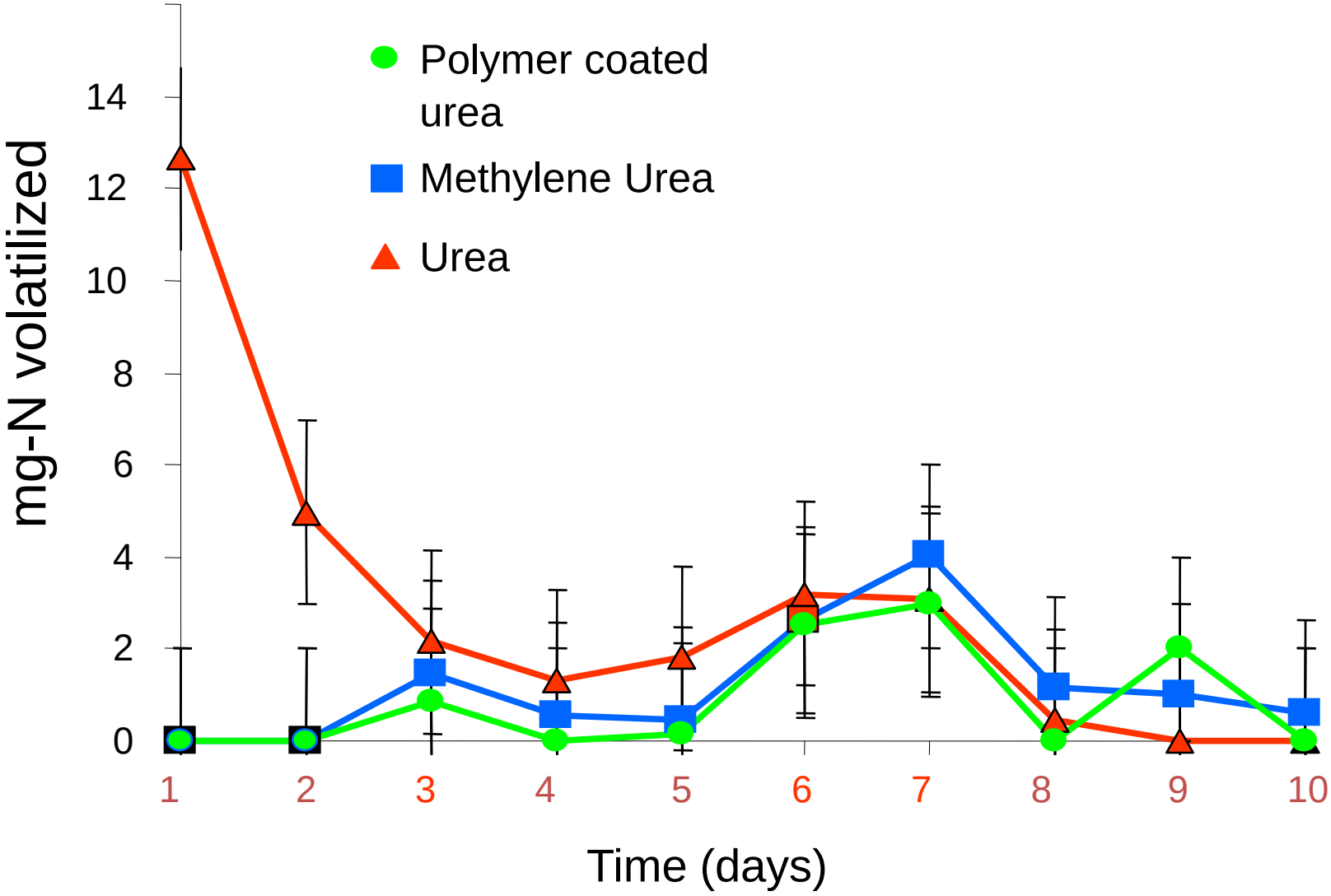
10 foot (3 m) tall aluminum mast

Wind vane

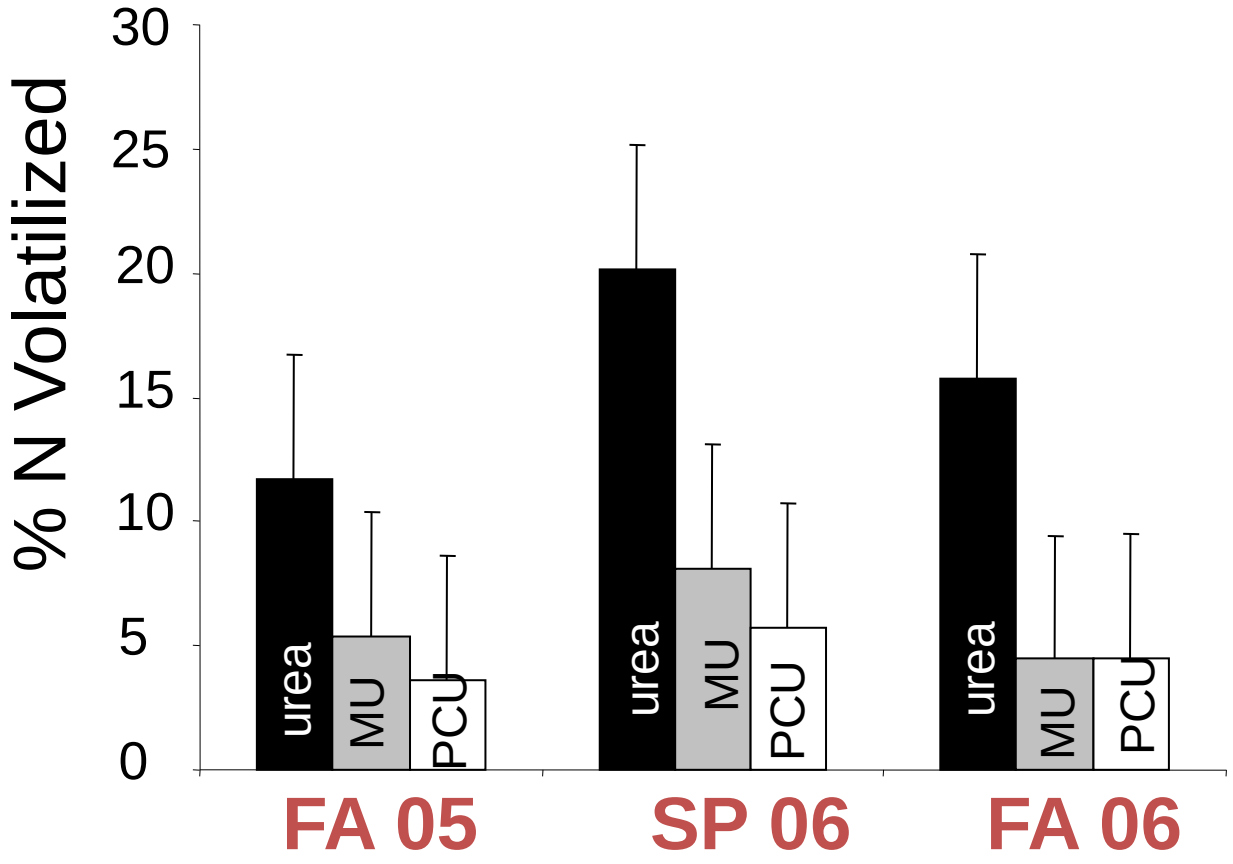


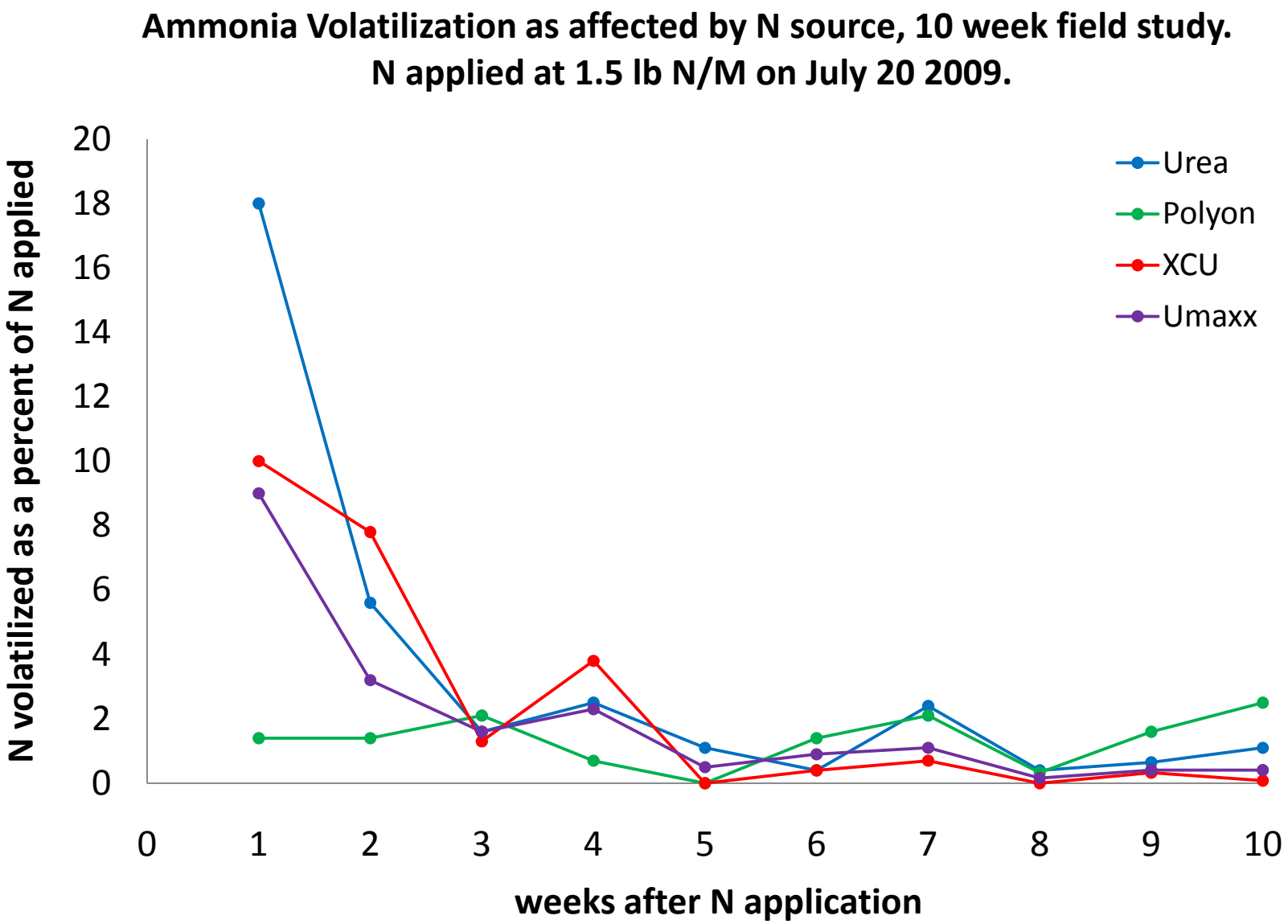
Oxalic acid-coated tubes inserted perpendicular to mast at 5 heights

Ammonia Volatilization Over 10 Days
Field - Spring 2006

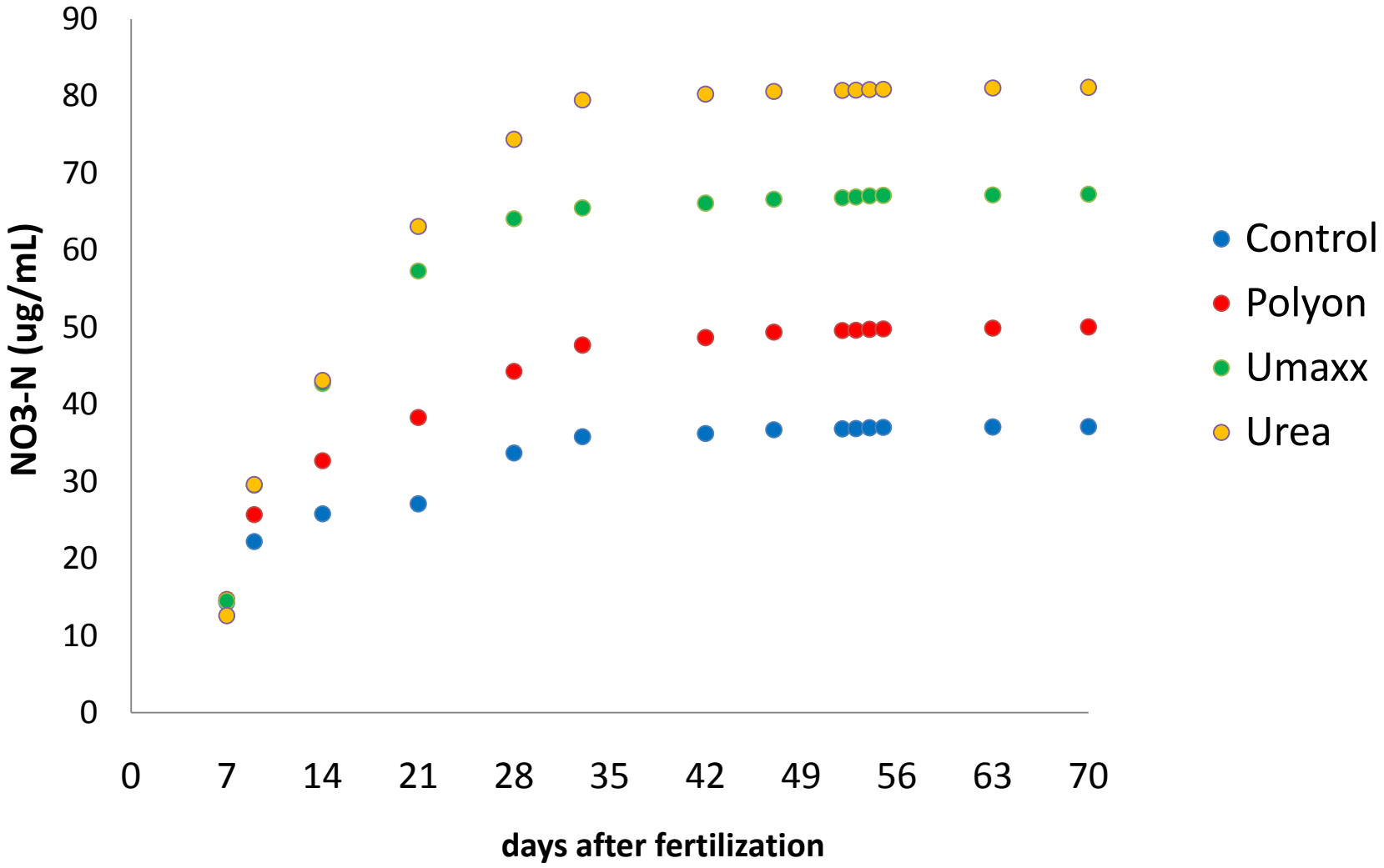


Total Ammonia Loss as a % of Total N Applied – Field Study

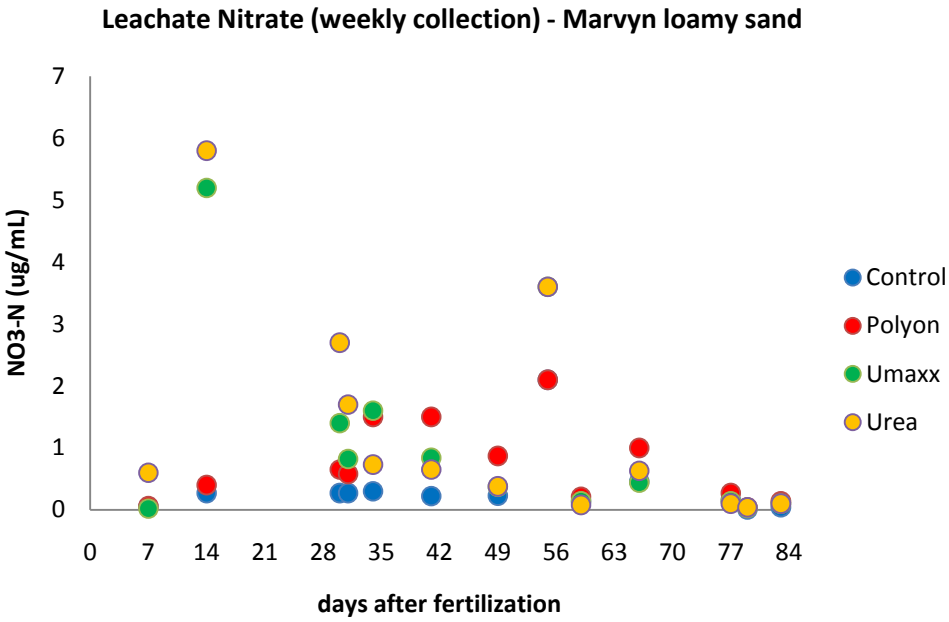


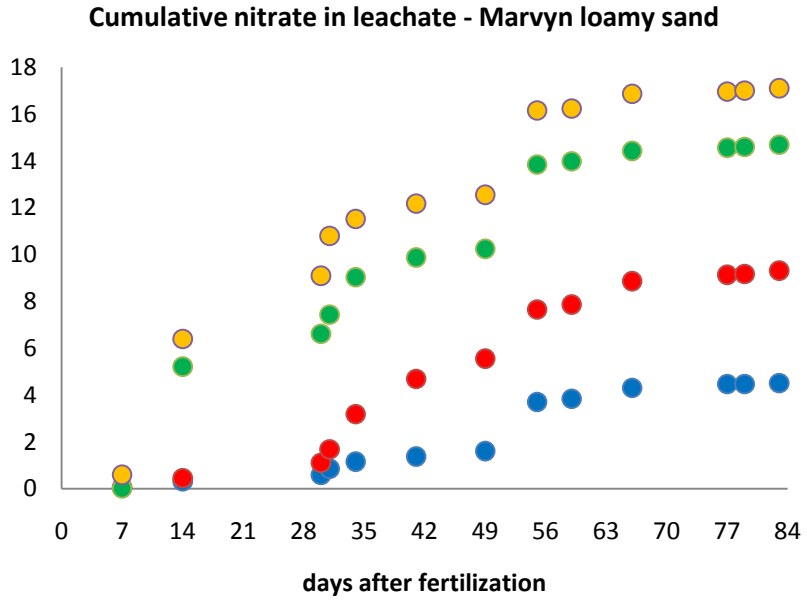

Ammonia Volatilization as affected by N source, 10 week field study.
N applied at 1.5 lb N/M on July 20 2009.
N volatilized as a percent of N applied
20
18
16
14
12
10
8
6
4
2
0
0
1
2
3
4
5
6
7
8
9
10
weeks after N application
Urea
Polyon
XCU
Umaxx

Cumulative nitrate in leachate – sand - 2008



Nitrate-N in leachate – Marvyn loamy sand - 2009





‘Added’ Fertilizers

- Sea kelp extracts
- Humate-based materials
- Bring some added nutrient benefits
- Some possible hormonal effects (growth regulator)
- Rate and dosage issues?

5-0-1

Bio Green™

Product Specifications

Nitrogen derived from Feed Grade Urea,
Potassium derived from sulfate of potash
Iron derived from ferrous sulfate.
Contains non plant food ingredients:

- 10% Humic Acid from Leonardite
- 7% Fulvic Acid
- 2% North Atlantic Kelp (ascophyllum nodosum)

Weight per gallon..... 9.5 lbs.
pH..... 3.9
Nitrogen per gallon..... .48 lbs nitrogen

Product Description:

Because of Bio Green's unique bio based formulation, it is effective in all types of soil and on all types of plant life. Professional turf, lawns, flowers, shrubbery, trees, row and forage crops, pastures and natural habitats, etc. all thrive with Bio Green. Bio Green is ideal for spray applications to turf, foliar feed, trunk spray and root injection of trees and ornamentals. Bio Green is non-clogging and non-abrasive to equipment.

Bio Green uses nutrients that focus on the expansion of topsoil organisms. By providing foods based on pH, nutrient content and a large number of physiological factors, that these organisms will use efficiently, the numbers of these organisms will return to properly balanced populations quickly. Additionally, the plant nutrients in Bio Green are held in suspension in the liquid concentrate and are readily available to the seeds or plants. They become readily
available to the seeds or plants when catalyzed with water and applied.

Application Recommendations

Tank Mixing: Dilute product in a tank sprayer at a rate of 20 gallons of water to 1gallon of Bio Green concentrate. Apply 5 gallons of concentrate per acre on turf and trees. *Product can be mixed stronger (up to 10 to 1).*

Golf Course: Apply weekly at a rate of 1 gallon of Bio Green concentrate per acre to all turf areas.

Sports Field: Apply at a rate of 6 gallons of Bio Green concentrate per acre every 6 weeks. (If weekly or bi-weekly applications are used, divide application rate accordingly)

For Distressed Turf and Turf with Insect Problems :
Apply weekly at a rate of 2 gallons of Bio Green concentrate per acre until heath of turf is restored. Spot treat pest, weed or fungus accordingly

Trees: Dilute at normal rate. Apply a soaking spray to tree from top to bottom on foliage and trunk. Apply 3-5 times per season. *For distressed trees, apply every 3 weeks.*

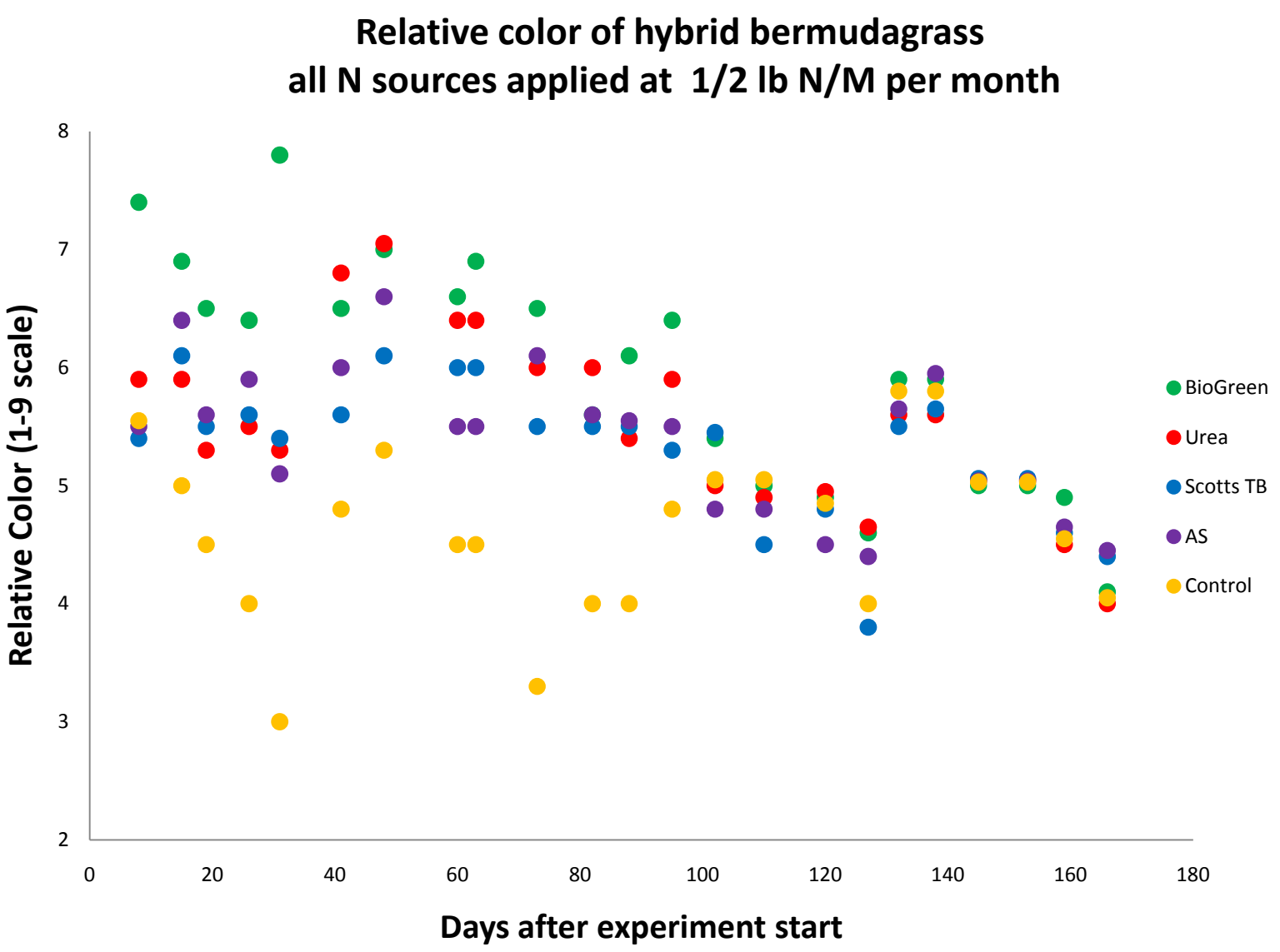
Shrubs and Flower Beds: Dilute at normal rate. Apply a soaking spray to plants on the foliage and stems. Apply every 4-6 weeks.

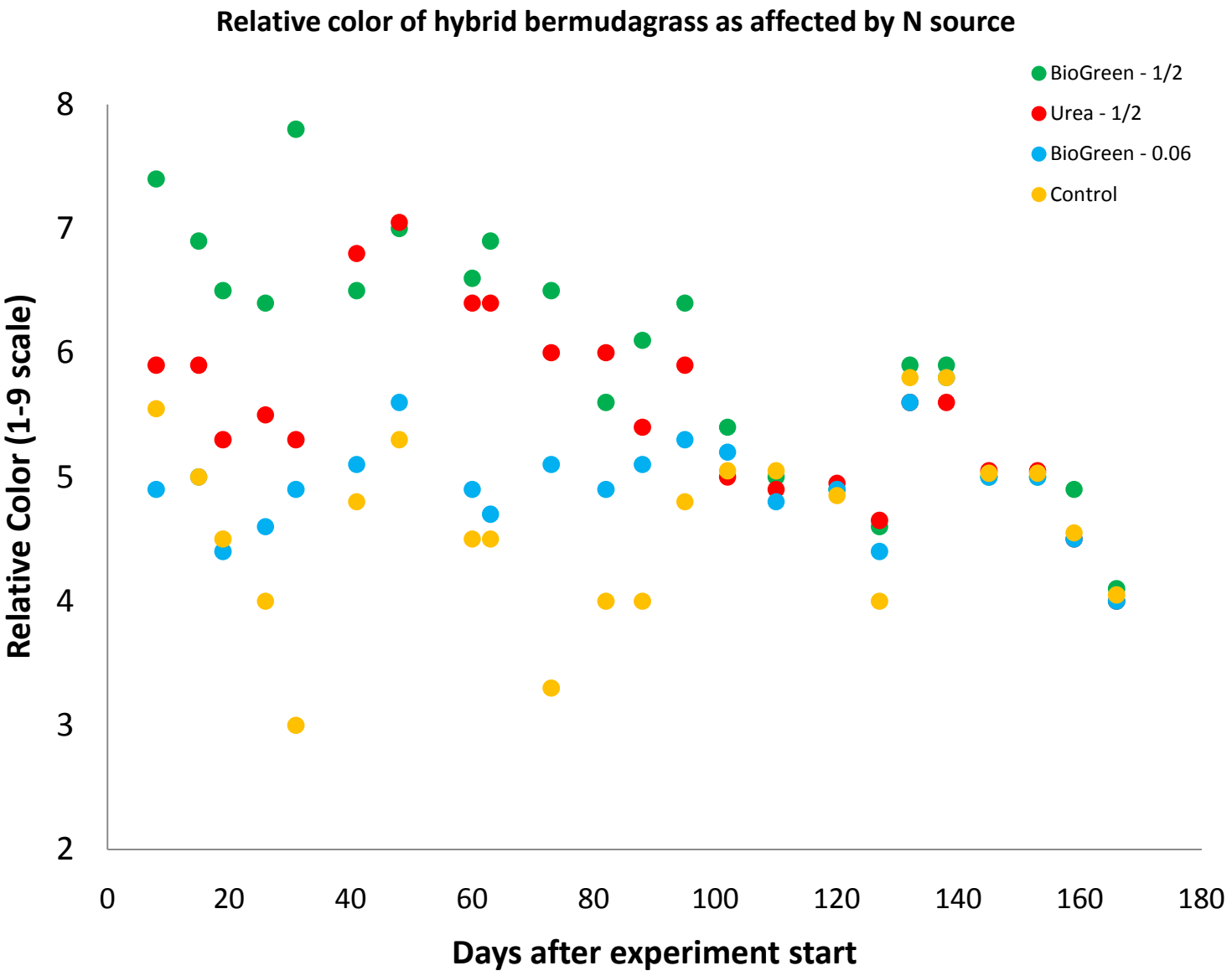
Sod Production:

1) Two Applications
Apply at a rate of 3 gallons per acre at seeding and at 2 weeks prior to cutting.
2) Three Applications
Apply at a rate of 2 gallons per acre at seeding, at mid season and at 2 weeks prior to cutting.

Storage and Handling:

All Bio Green products can be stored in normal warehouse


Relative color of hybrid bermudagrass
all N sources applied at 1/2 lb N/M per month
Relative Color (1-9 scale)
8
7
6
5
4
3
2
0
20
40
60
80
100
120
140
160
180
Days after experiment start
BioGreen
Urea
Scotts TB
AS
Control


Relative color of hybrid bermudagrass as affected by N source
BioGreen - 1/2
Urea - 1/2
BioGreen - 0.06
Control
Relative Color (1-9 scale)
8
7
6
5
4
3
2
0
20
40
60
80
100
120
140
160
180
Days after experiment start

But you need to know the price per pound of N ……

Urea: $12.50 for 50 pounds of 46-0-0
Ammonium sulfate: $8.00 for 50 pounds of 21-0-0

Urea:

$$\frac{\$12.50}{50 \text{ lb } 46\text{-}0\text{-}0} \times \frac{100 \text{ lb } 46\text{-}0\text{-}0}{46 \text{ lb N}} = 0.54/\text{lb N}$$

Ammonium sulfate:

$$\frac{\$8.00}{50 \text{ lb } 21\text{-}0\text{-}0} \times \frac{100 \text{ lb } 21\text{-}0\text{-}0}{21 \text{ lb N}} = 0.76/\text{lb N}$$