

Fine-Tuning Fertilization in Your Hayfields



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Outline

- Fertilization Tips and Tricks
 - Increased nutrient use efficiency
- Tissue Sampling to Fine-Tune and Troubleshoot
- Sounds too good to be true!
 - N fertilizer savings
 - Foliar fertilizers

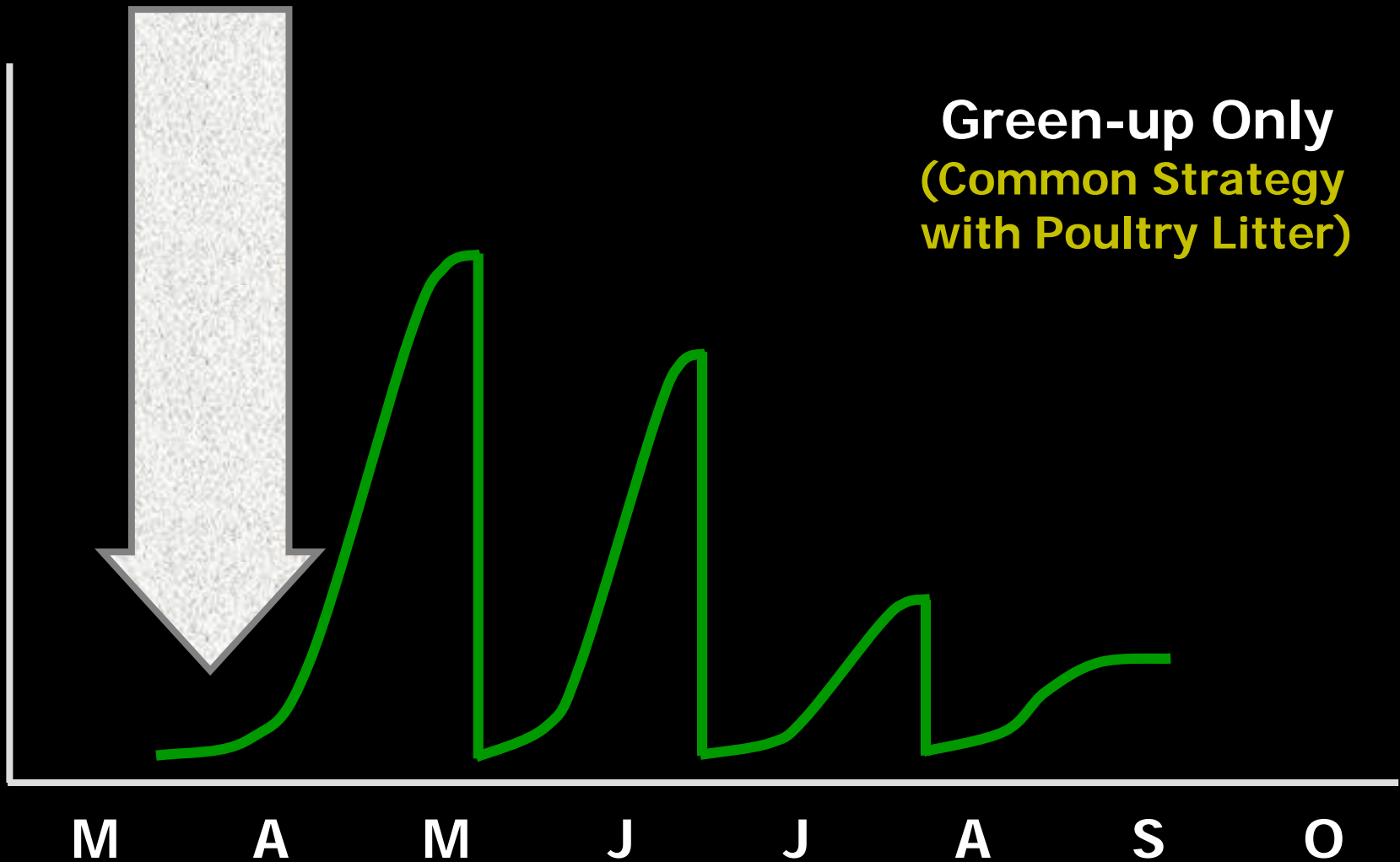


A Fertilization Trick

Split Your Nitrogen Applications!

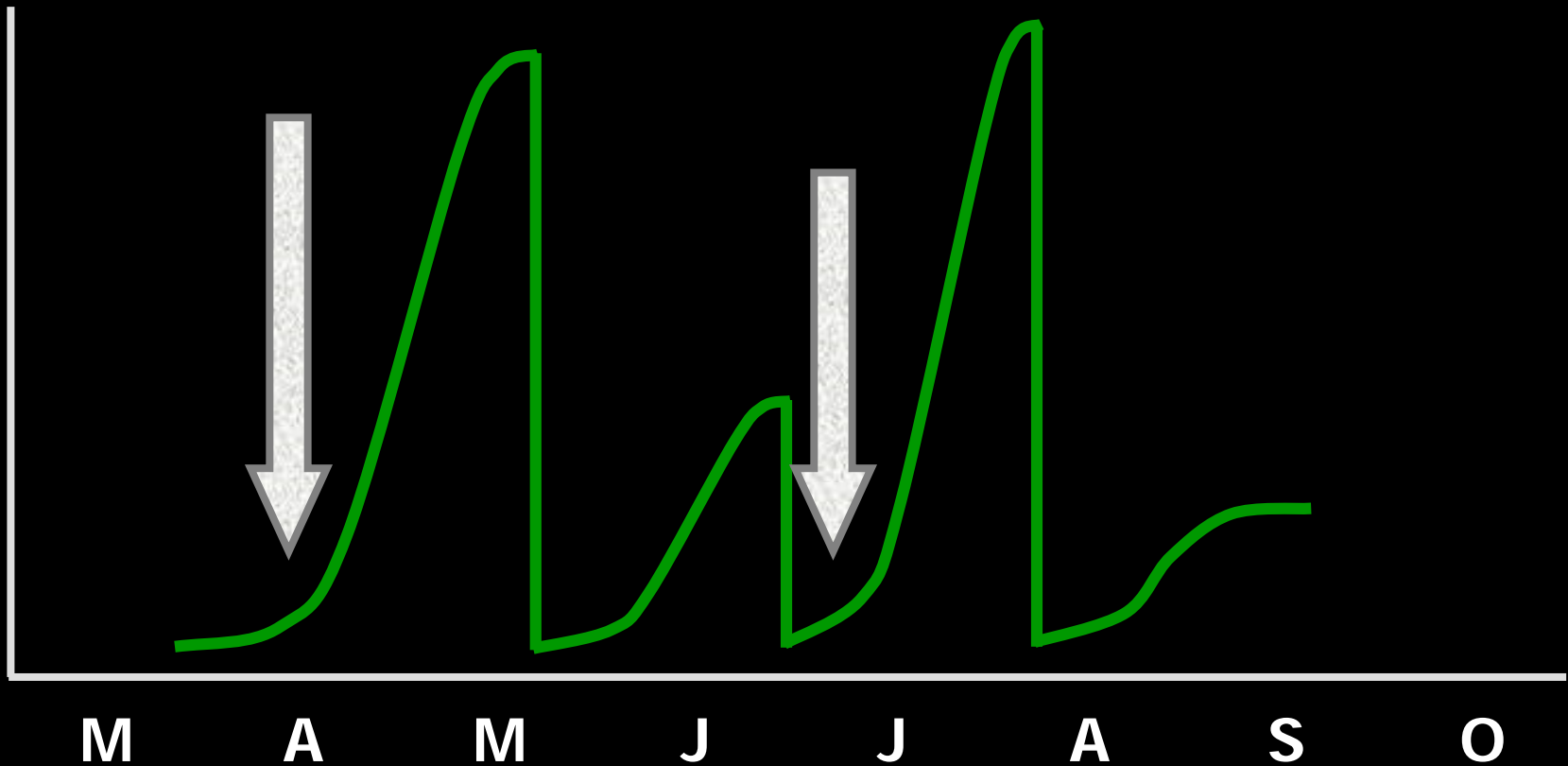
- Long-term, this can increase yields by 5-10% and increase NUE by 25-30%
 - Especially important under extremes
 - Leaching
 - Volatilization (in the case of urea-based products)
 - Late freeze
 - Drought
- Helps to prevent **NITRATE TOXICITY!**

N Application Strategies



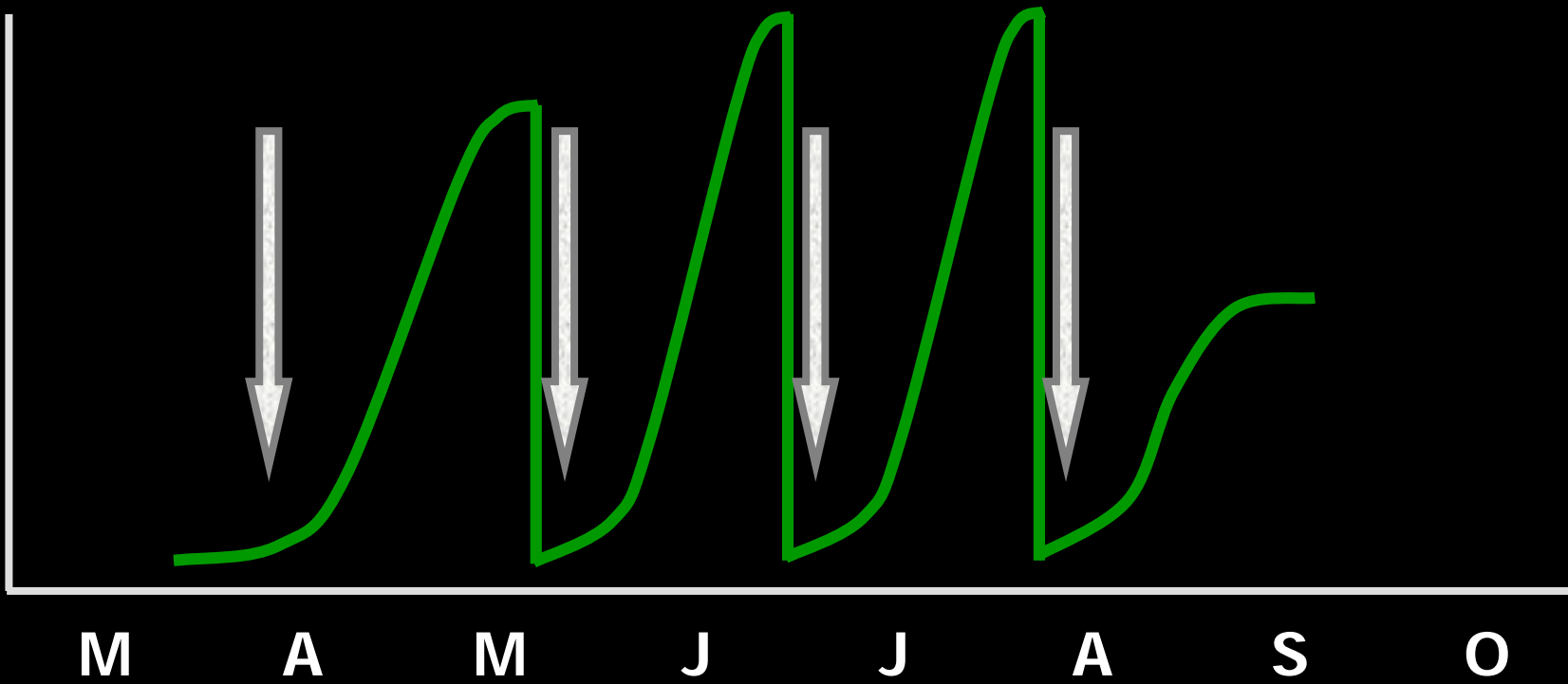
N Application Strategies

Green-up & After 2nd Cut

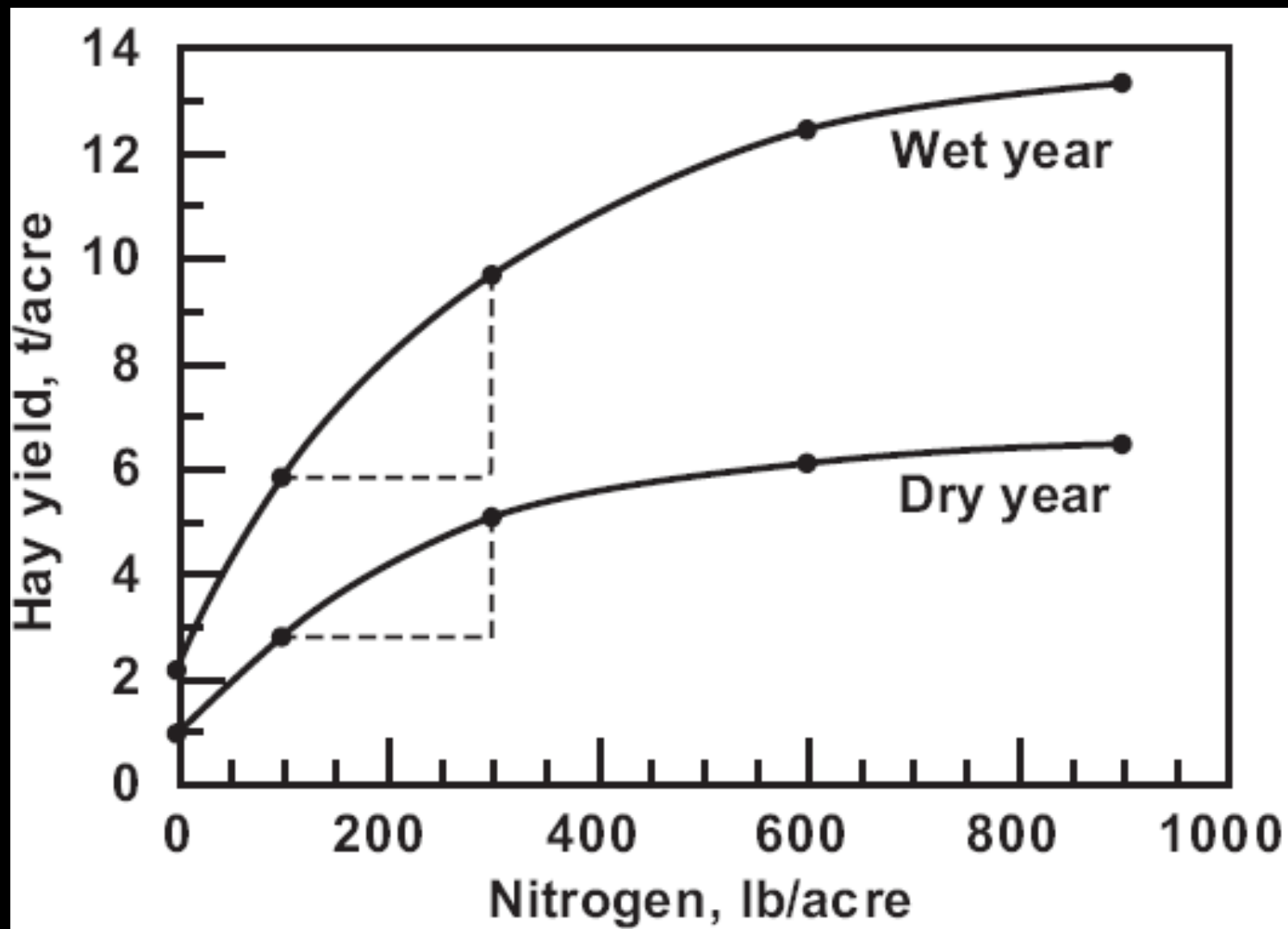


N Application Strategies

Green-up & After Each Cut



Hybrid Bermudagrass Yield Response to N Rate



Nitrogen Response: Rules of Thumb

Forage Type	N Response Above Critical Level*		
	Early Season	Mid-Season	Late-Season
	----- lb of DM/lb of N added -----		
Coastal bermuda	30-45	35-45	20-35
Tifton 85 bermuda	30-40	45-55	30-40
Annual ryegrass	5-12	10-20	15-30

* N fertilization above an annual ~40, 50, or 25 lbs of N/acre for Coastal bermuda, Tifton 85, and ryegrass, respectively.



Cost Implications of Different Nitrogen Response Rates

Nitrogen Response	Cost of N, \$/lb of N			
	\$0.50	\$0.60	\$0.75	\$1.00
<i>lbs of DM/lb of N</i>	<i>N Cost of Additional Production \$/lb of DM</i>			
5	\$0.100	\$0.120	\$0.150	\$0.200
10	\$0.050	\$0.060	\$0.075	\$0.100
15	\$0.033	\$0.040	\$0.050	\$0.067
20	\$0.025	\$0.030	\$0.038	\$0.050
25	\$0.020	\$0.024	\$0.030	\$0.040
30	\$0.017	\$0.020	\$0.025	\$0.033
35	\$0.014	\$0.017	\$0.021	\$0.029
40	\$0.013	\$0.015	\$0.019	\$0.025
45	\$0.011	\$0.013	\$0.017	\$0.022
50	\$0.010	\$0.012	\$0.015	\$0.020
55	\$0.009	\$0.011	\$0.014	\$0.018

Fertilization Trick

Account for N Loss from Urea-based Products



The Effectiveness of Some Alternative N Sources at Low, Medium, and High Fertilization Rates on Hybrid Bermudagrasses (Relative to Ammonium Nitrate).

Nitrogen Source	Fertilization Rates		
	< 200 lbs*	250-350 lbs	> 400 lbs
Ammonium Nitrate	100%	100%	100%
Amm. Sulfate	95-97%	95-105%	60-70%
Anhyd. Ammonia	92-94%	93-95%	94-95%
UAN Solution	80-85%	85-92%	92-95%
Urea	79-82%	82-92%	88-93%

* Actual lbs of N per acre per year.

Source: Burton and Jackson, 1962; Silveria et al., 2007.

Use of Urea-Based Products

- Without AN, users of N face risky alternatives.
 - NH_3 volatilization loss
- Urease is abundant in thatch & organic layers
 - High N use in hay.
- Enhanced Efficiency N Fertilizer Products may reduce volatilization loss
 - Urease inhibition
 - Encapsulate & release



Ammonium Nitrate



Urea



NBPT



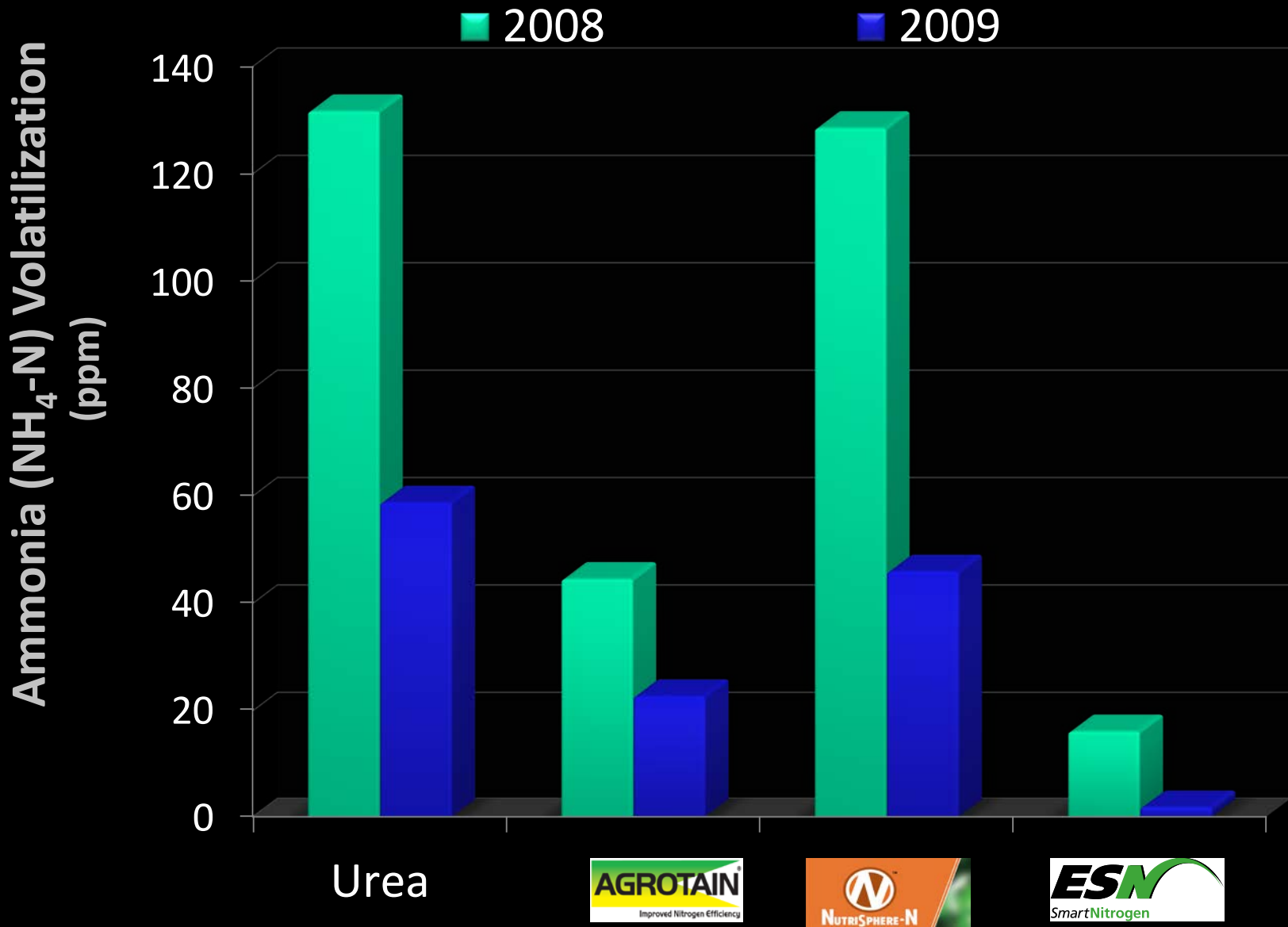
Polymer Coating



maleic-itaconic co-polymer

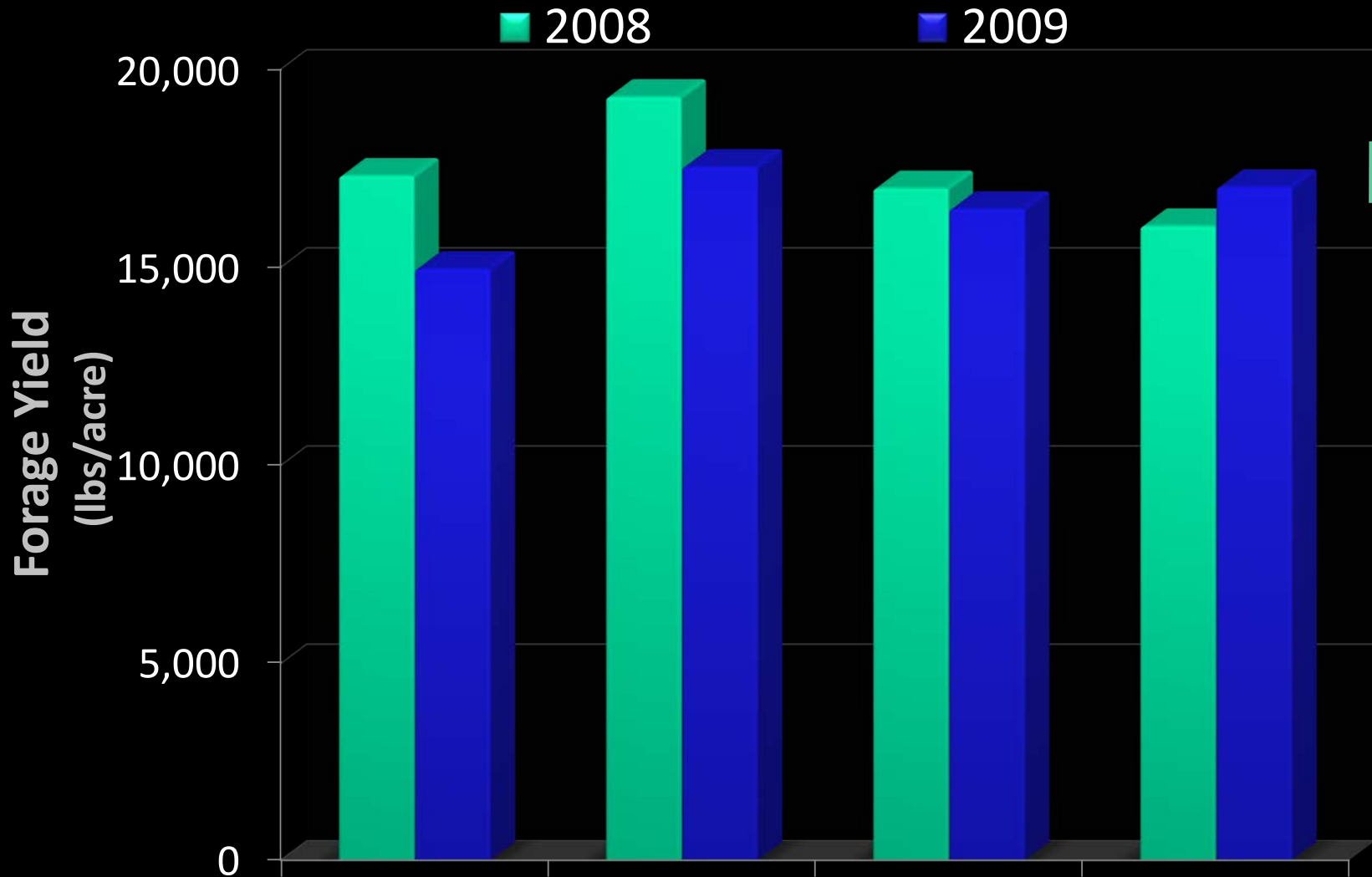
Ammonia Volatilization Trap Data

2008-2009 (avg. over two locations)



Bermudagrass Hay Yield

2008-2009 (Calhoun)



Urea



Agrotain Treated Urea


as compared to urea applied in the same way (averaged over 4 site-yrs):

- Reduced ammonia volatilization by over 63%.
- Produced 11% more forage yield.
- Recovered 19% more of the applied N.
- Did not substantially affect crude protein content.
- Did not substantially affect the risk of nitrate toxicity.



Another Fertilization Trick

Apply P in late summer or fall.

- 
- P can essentially be applied any time during the year on established forage crops.
 - Purchase P fertilizer in “off-peak” times of the year (i.e., summer and fall)
 - Demand for the product is low
 - Demand for spreading services is low
 - Less risk of P runoff

Another Fertilization Trick

Split Your Potassium Applications!



40-50%
in the Spring

50-60%
in mid – late season

K is for Persistence

Not Competitive Leafspot Diseases

Poor Winterhardiness

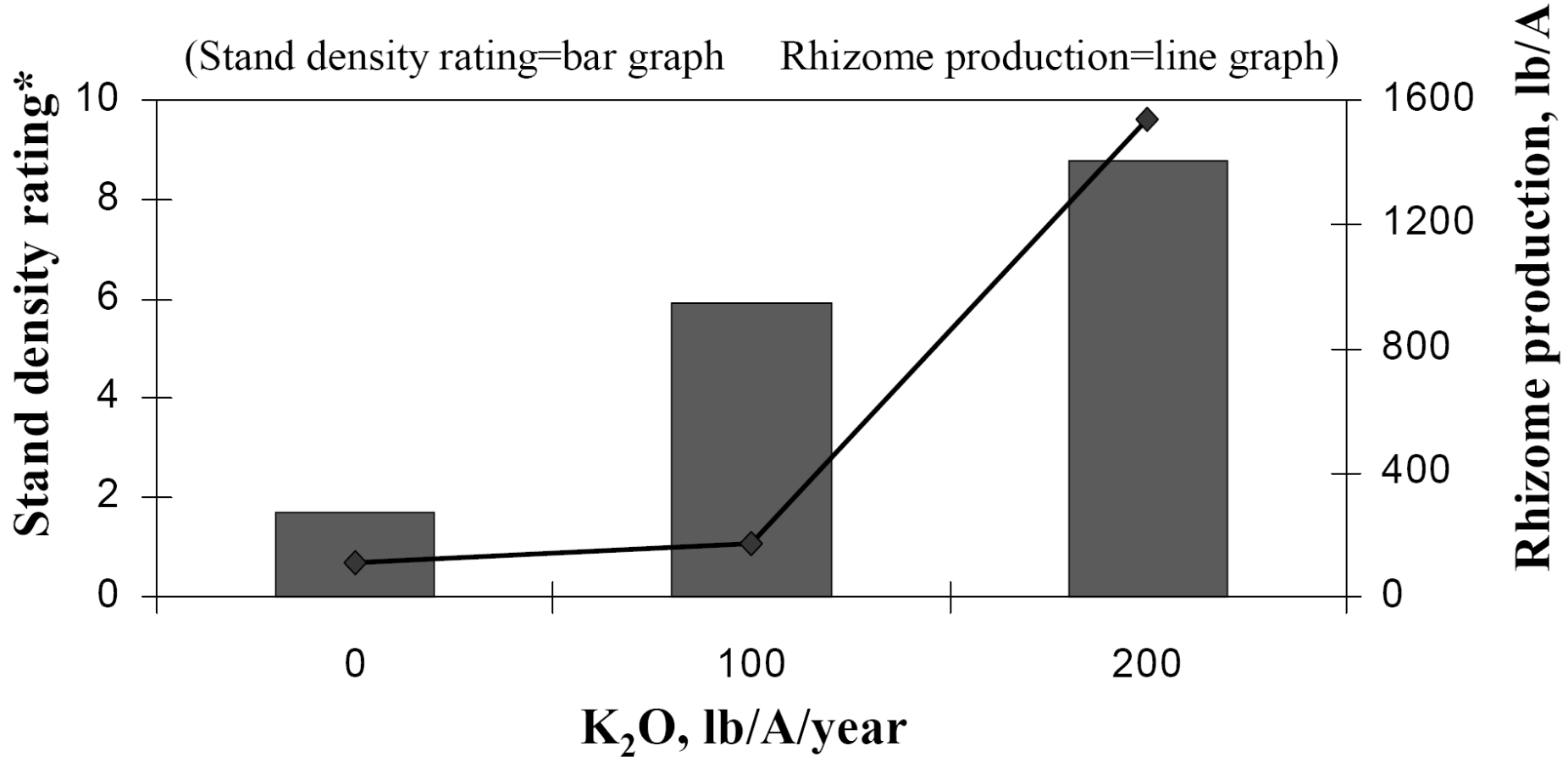
Grows Very Slow

Poor Stress Tolerance

The Stand is Gone!

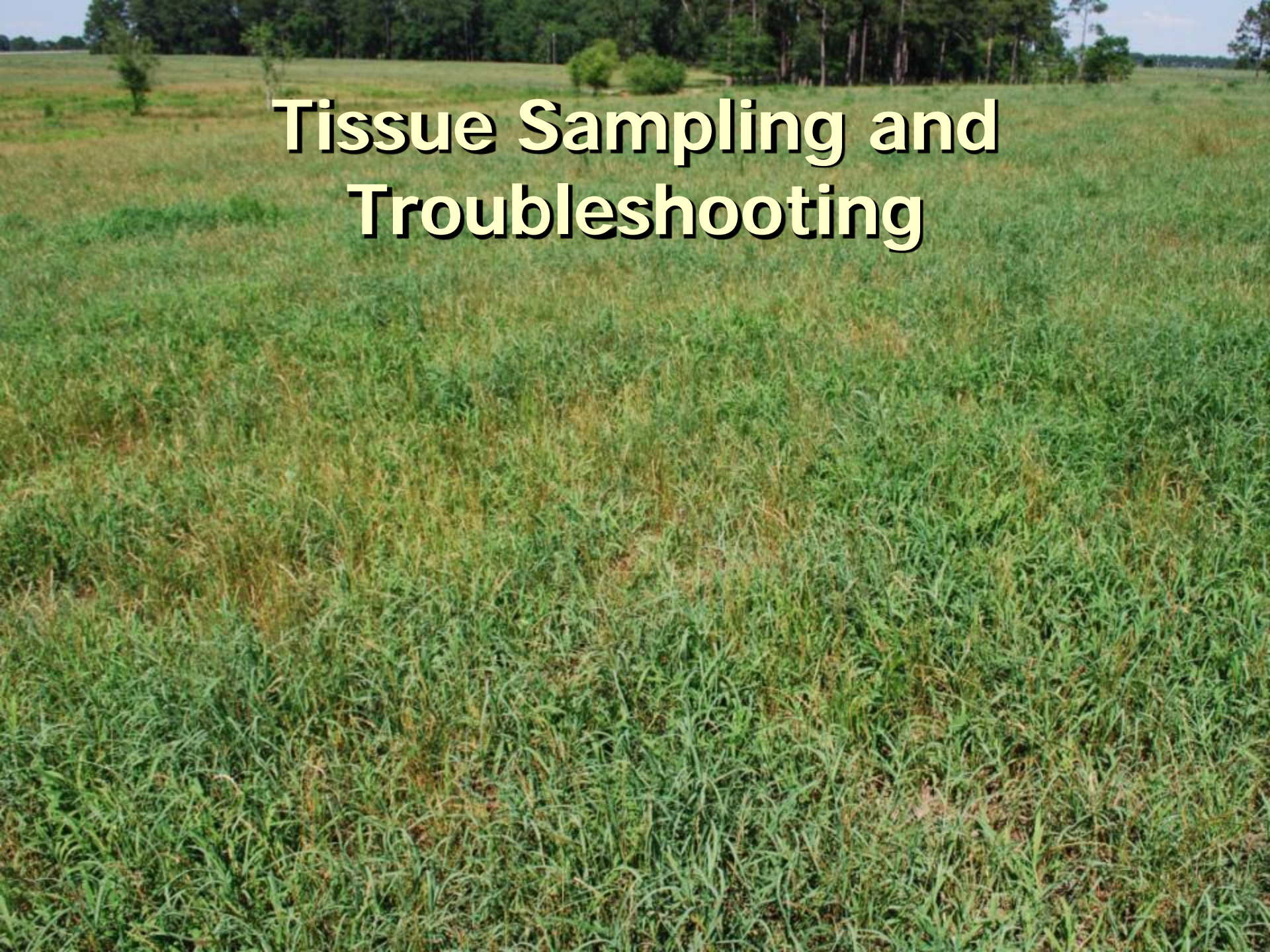


K is the Key to a Good Stand

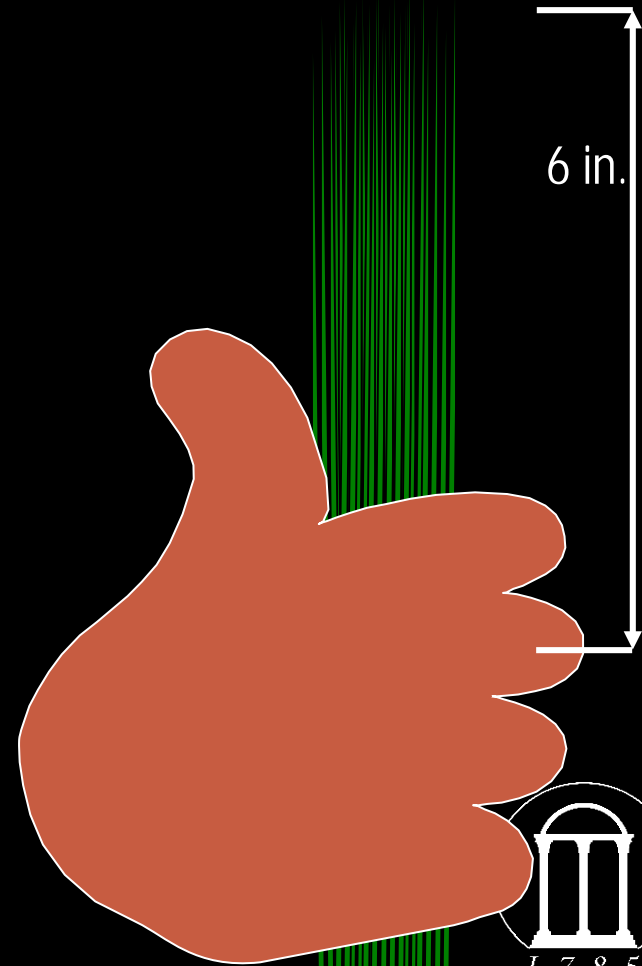
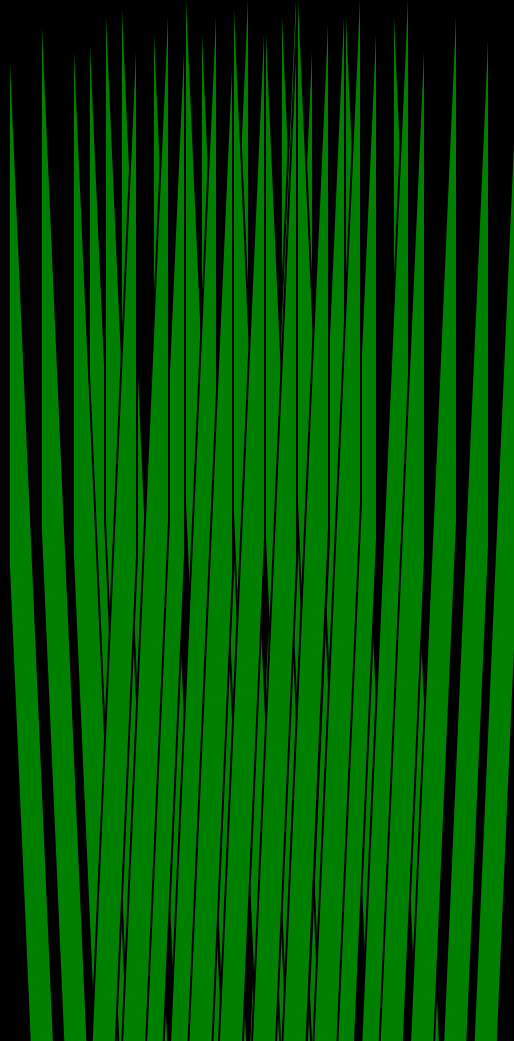


* 0= bare ground, 10 = thick stand Initial soil K was low (51 ppm by Texas A & M extraction)

Tissue Sampling and Troubleshooting



Tissue Sampling



Troubleshooting

Bad Zones

- Tissue Sample
- Soil Sample
- Other(?)

Good Zones

- Tissue Sample
- Soil Sample
- Other(?)

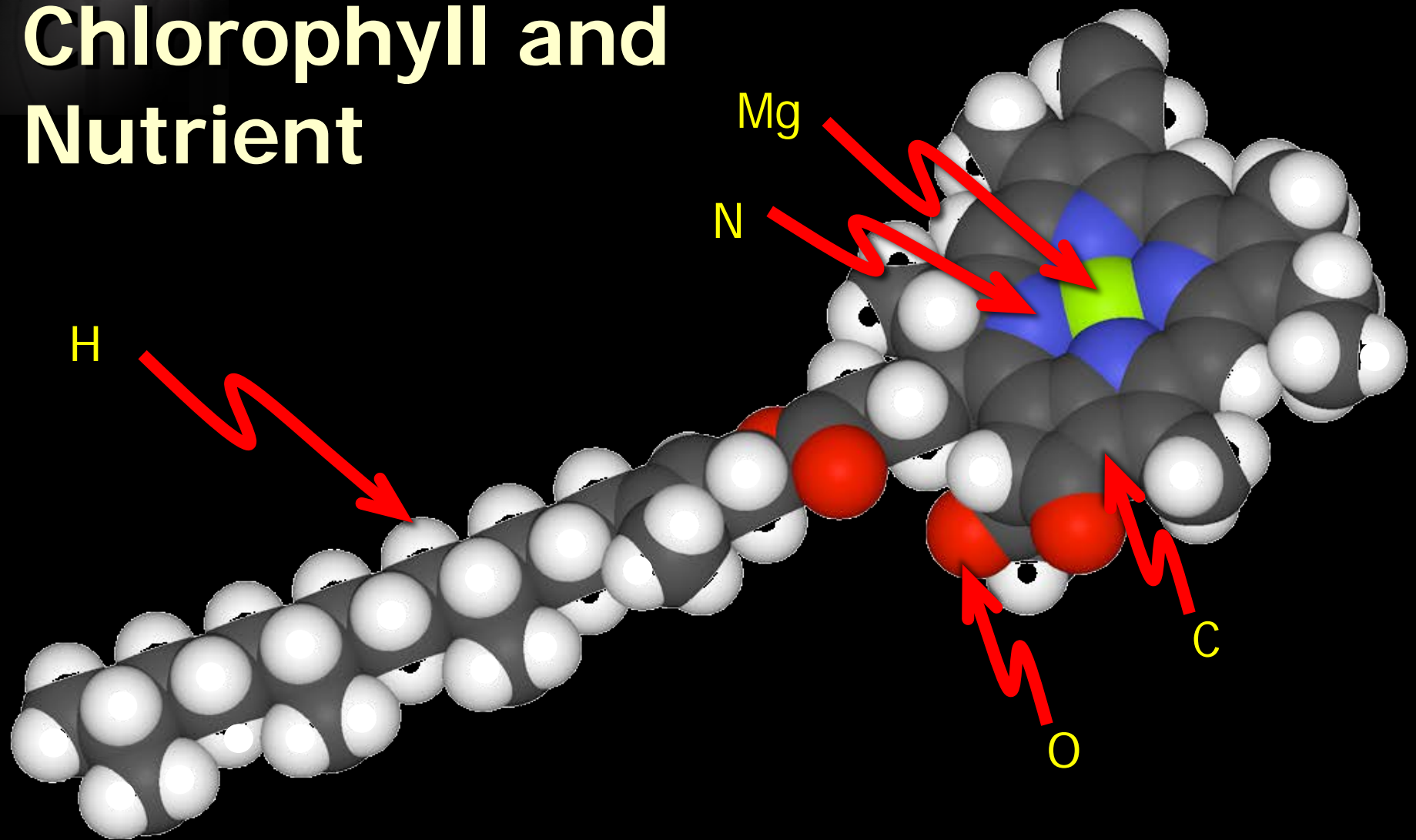
Representative Samples

- ~ 20 similar specimens



Which is the better hay?

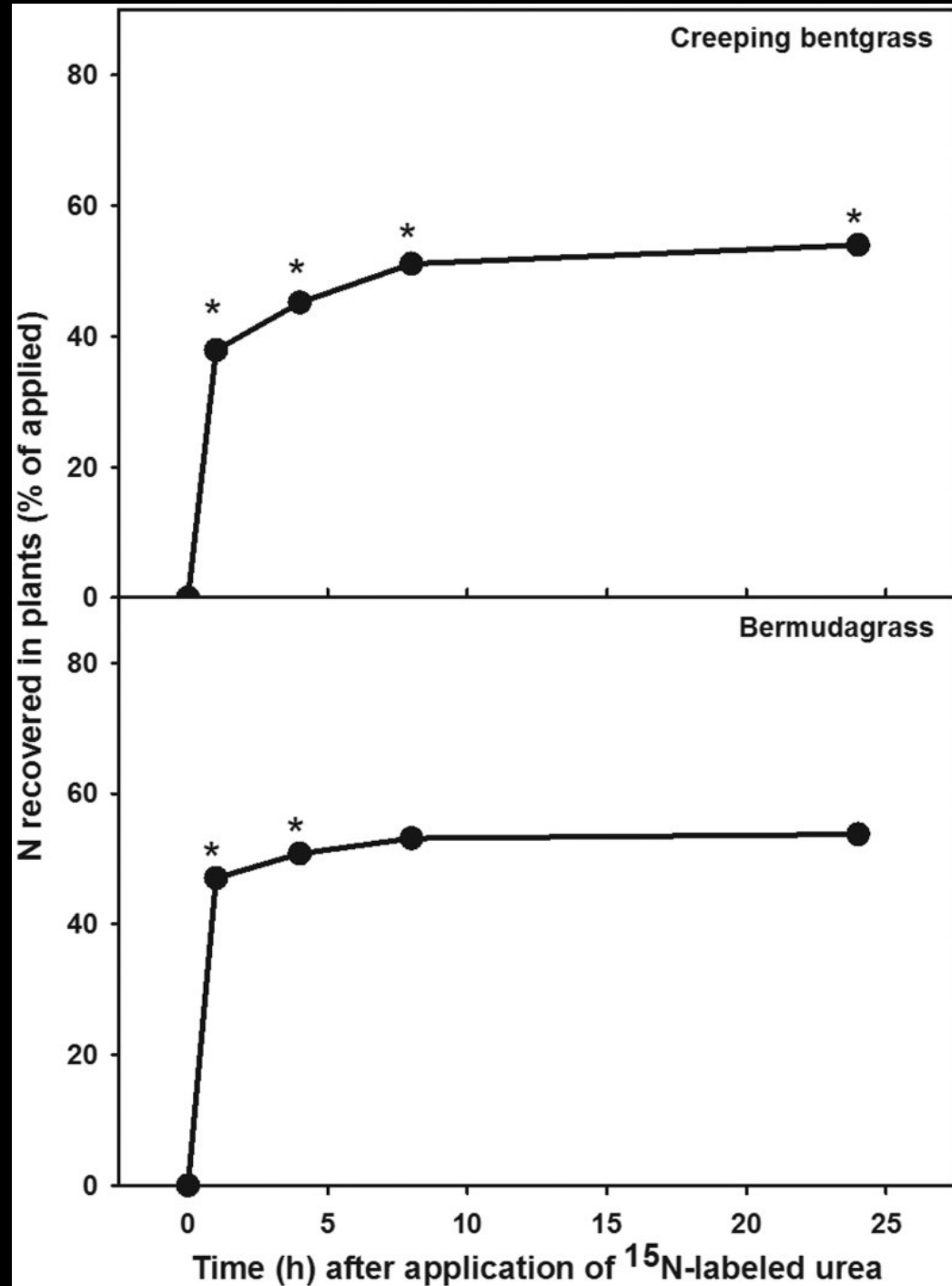
Chlorophyll and Nutrient



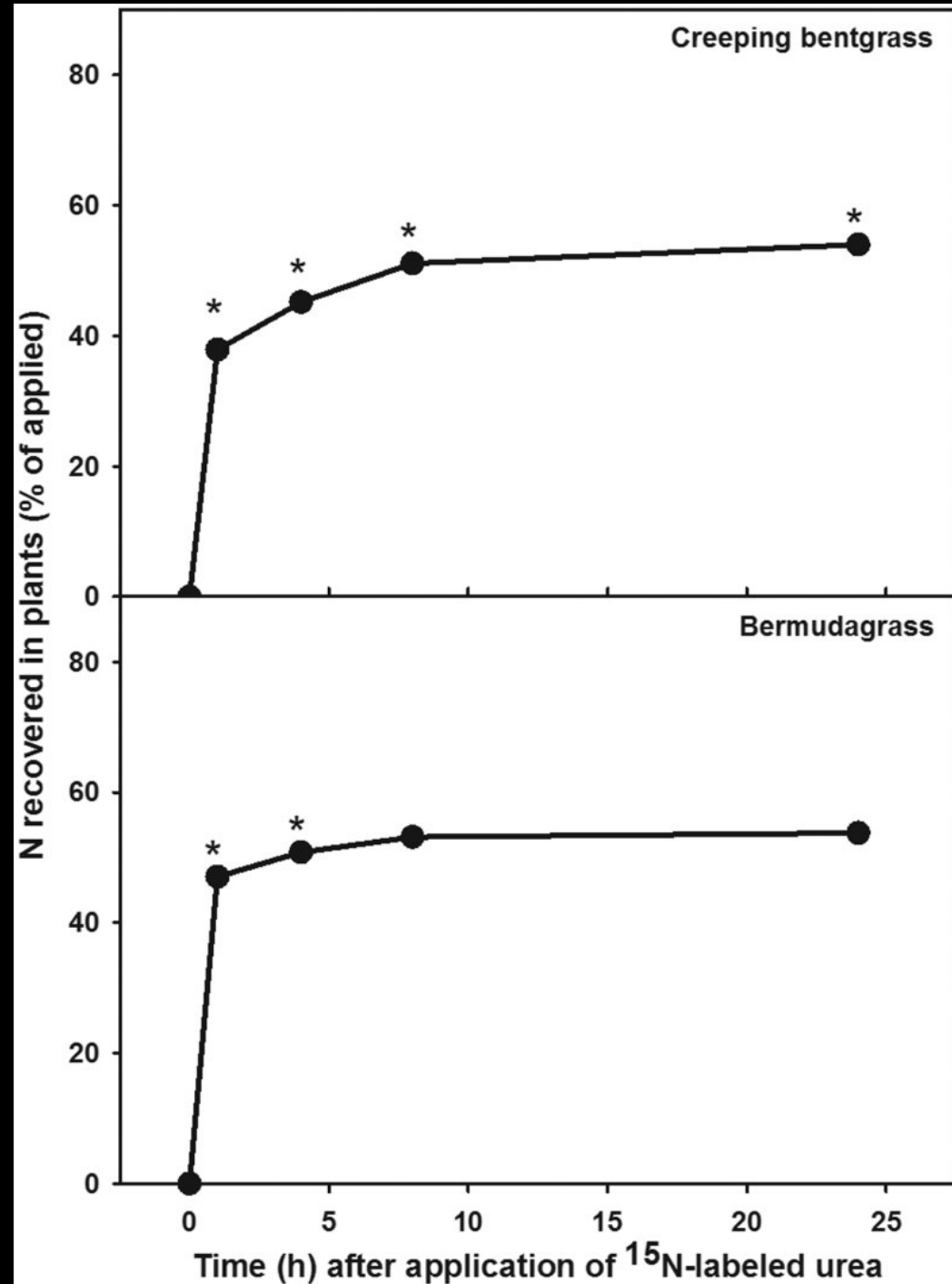


Foliar Fertilization for Forage Crops?

- Over 50% of applied N is absorbed in < 5 hrs.
- But, this is at relatively low rates
 - Avg. over 4.5 and 11 lbs of N/acre in this study.
 - Stiegler et al., 2010. Crop Sci. 51:1253-1260.



- Even if 60% absorption, at rate of 11 lbs/acre, that's only 6.7 lbs of N absorbed foliar.
 - Highest rate of absorption I could find in literature.
- At higher rates, foliar fertilizers often burn (salt or chemical injury) the plant tissue
- In a separate study (Totten et al., 2008. J. Plant Nutr. 31:972-982), no consistent difference in clipping yield of turf.



Foliar Fertilizer Applications

- Even if the product is 100% efficient (likely isn't)
- The most a plant can take up across via the leaves is the equivalent of 10-12 lbs/acre of the nutrient
 - Works for many micro-nutrients (small quantities needed)
 - Not feasible for macro-nutrients without multiple applications. (large quantities needed)



QUESTIONS?



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