

International Conference on Enhanced-Efficiency Fertilizers

An IFA-New Ag International Event

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**NEW AND IMPROVED METHODS FOR DETERMINING
NUTRIENT RELEASE CHARACTERISTICS OF EEF**

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New and Improved Methods for Determining Nutrient Release Characteristics of EEF

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Drivers for Method Development

- **New technologies**
 - New products for Ag and specialty.
 - New Claims.
- **Environmental drivers**
 - Water & air pollution.
 - Nutrient Management.
- **Regulatory issues**
 - No official method to measure longevity claims.
 - Consumer confusion or lack of protection.



Goals of Taskforce

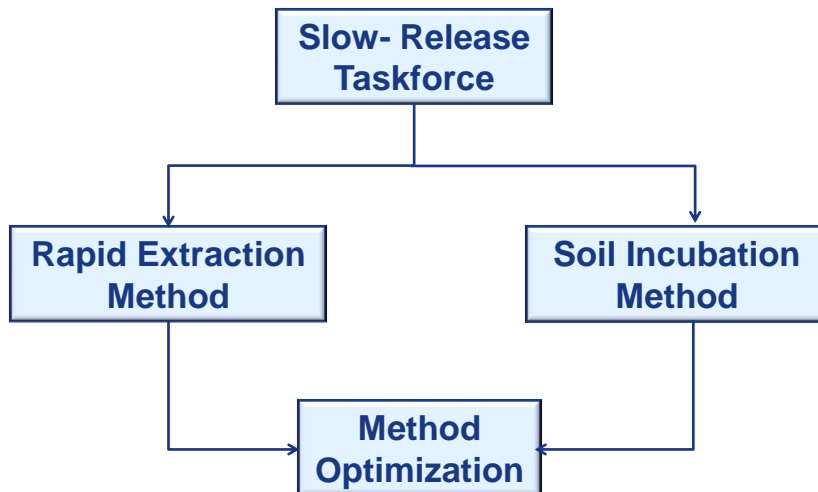
- Can be used to verify longevity claims.
- Must be able to be used as a regulatory method- it must be fast.
- Does not change claims of current products.
- Uses common laboratory & analytical equipment.
- Measure release, no what fails to release.
- Can be used to extract multiple nutrients.
- Can be correlated to a biologically active method.

Stakeholders

- **Regulatory Tool**
 - Use as a method to verify SR claims of specific longevities.
 - International harmonization efforts for regulation and analysis of SR materials.
- **Industry-QA/QC**
 - As final QC check before shipment of products.
 - To evaluate storage or attrition of materials.
 - As a predictor of performance based on release rate.

Stakeholders

- **Users, blenders & advisors**
 - Use method as a tool to formulate blends that closely match plant needs.



Accelerated Lab Extraction Method



Overview of Methodology

Four extraction sequences:

Extraction #1- 2 hrs @ 25 C

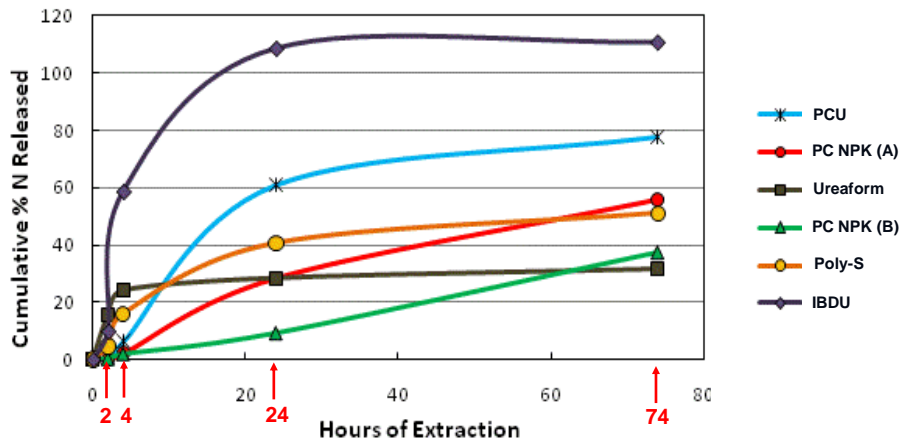
Extraction #2- 2 hrs @ 50 C

Extraction #3- 20 hrs @ 55 C

Extraction #4- 50 hrs @ 60 C



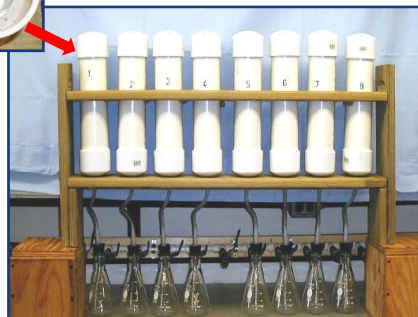
Accelerated Lab Extraction Method



Soil Incubation Method

Procedure

- 1710 g sand + 90 g soil.
- 450 mg N.
- Mix N source with entire sand/soil mix.
- Ammonia trap.



Incubation Lysimeters

Soil Incubation Method

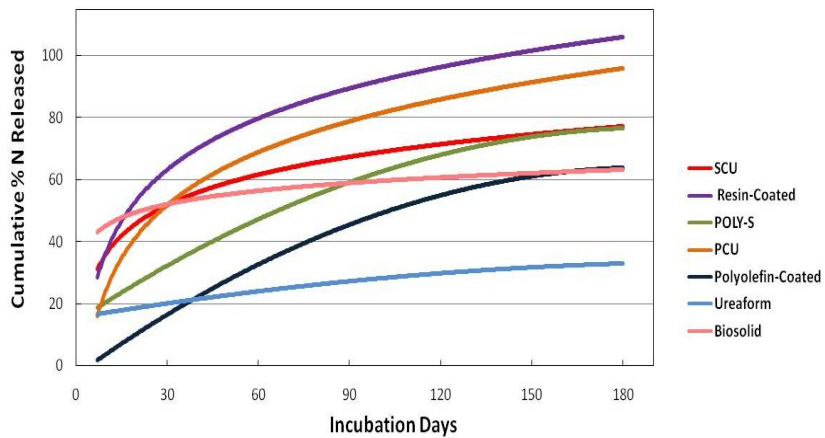


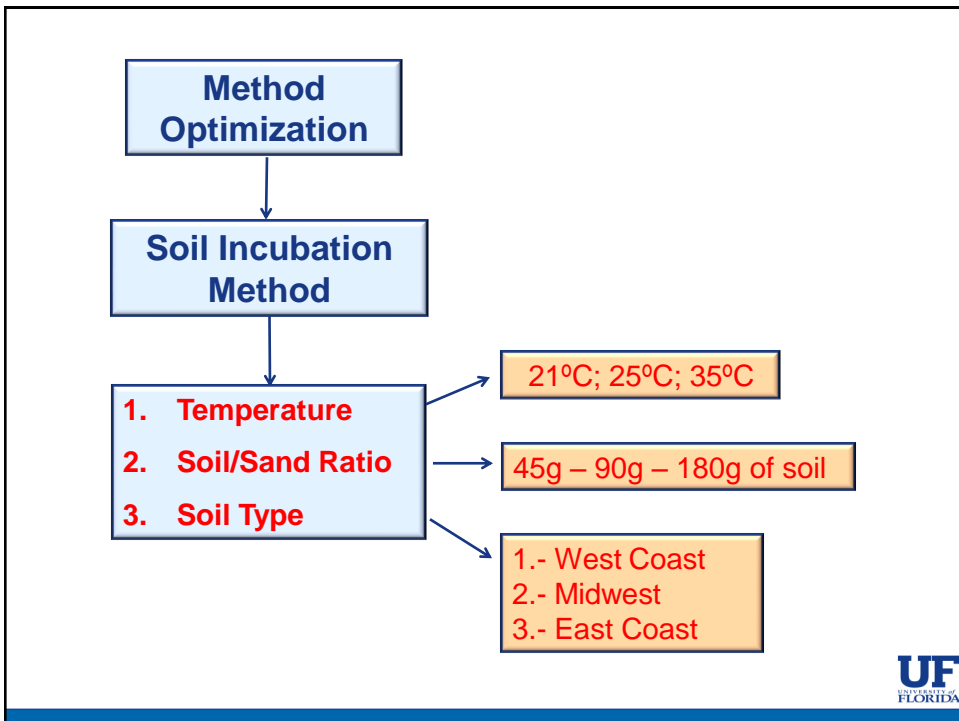
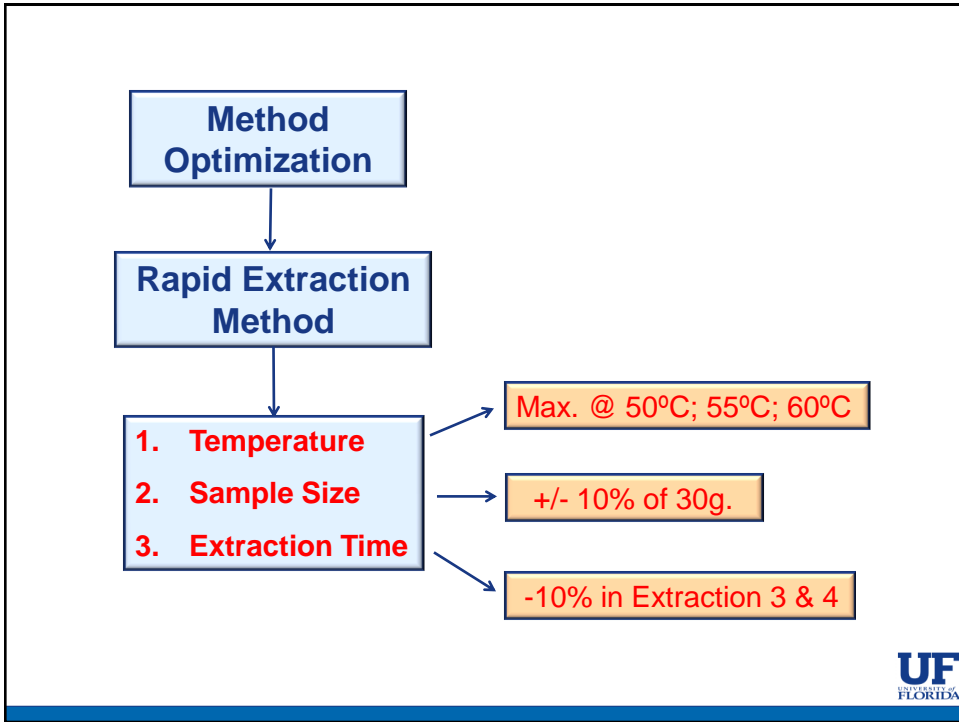
Column Leaching



Leachates

Soil Incubation Method





Results- Method Optimization

- **Rapid Lab Extraction**
 - Temperature effect.
 - Rest of the variables had no effect on N release.
- **Soil Incubation Method**
 - Coated-fertilizers
 - No temperature effect between 70 & 77°F.
 - Soil/sand ratio had *no effect* on N release rate.
 - Slow-release fertilizers
 - Great temperature effect at 95°F.
 - Soil/sand ratio had *an effect* on N release rate.

In-house Validation of Lab Method

- Ruggedness testing
 - Evaluates the effect of small changes of several factors on the results of the method.
 - Youden & Steiner Experimental Design. “Statistical manual of the Assoc. of Official Analytical Chemist.” AOAC. Washington, DC, 1975.
 - Methodology appears to be robust.

Conclusions

- **Lab Extraction Method**
 - Highly optimized.
 - Robust & reliable.
- **Soil Incubation Method**
 - No volatile ammonia.
 - 98% of applied soluble N recovered.
 - Nitrification occurring – microbes active.

On-going / Future Tasks

- Statistical correlation of lab extraction method with soil incubation method.
- Multiple laboratory validation of the lab extraction method.
- Get lab method accepted by APPFCO for use in state fertilizer labs for verification of controlled release claims.