# PRELIMINARY RESULTS on NEW SPECTROSCOPIC COTTON TRASH MEASUREMENTS

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## *TRASH PROGRAM, ACKNOWLEDGEMENTS*

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***COTTON INCORPORATED***

# OVERVIEW

•New methods to measure contamination in cotton are needed.
- Emphasis on type of trash/contamination as well as total trash content.
- Often occurs during harvesting.
- Complement high volume instrument testing.

•Two main types of contamination.
- Botanical trash/contamination (bark, leaf, seed coat fragments, etc.)
- Field trash/contamination (e.g., plastic bags)

•Spectroscopic techniques at SRRC reviewed.
- Near Infrared (NIR)
- Fourier transform Infrared (FTIR)

# PROGRAM SPECIFICS

## OBJECTIVE

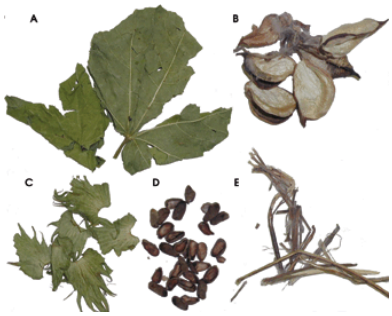
•Determine the feasibility of using NIR and FTIR spectroscopy to monitor botanical trash and field trash contamination in cotton.

## INSTRUMENTS

•NIR
- FOSS XDS NIR Spectrophotometer
- Bruker Optics MPA FT-NIR Spectrophotometer

•FTIR
- Bruker Optics Vertex 70 FTIR + Hyperion Imaging Microscope

## EXAMPLES of BOTANICAL TRASH




*Himmelsbach et al. J. Agric. Food Chem., Vol. 54, No. 20, 2006.*

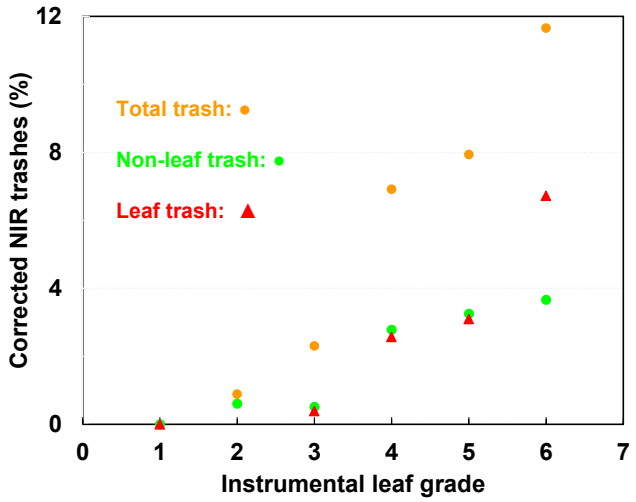
## EXAMPLES of FIELD TRASH

# LEAF GRADE by NIR

- **INSTRUMENT/SAMPLES**
  - Quantitative Measurement ("how much")
  - FOSS XDS NIR (Liu and Foulk)
  - 208 Validation Samples, Leaf Grades 1-7
- **RESULTS**
  - 89.9% correct identification
  - Identification of specific non-leaf components in mixtures by NIR and FT-IR difficult.

| LEAF GRADE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | TOTAL |
|---|---|---|---|---|---|---|---|---|
| No. Total | 32 | 32 | 32 | 32 | 32 | 32 | 16 | 208 |
| No. Correct | 29 | 27 | 32 | 30 | 27 | 29 | 13 | 187 |
| % Correct | 90.6 | 84.4 | 100 | 93.4 | 84.4 | 90.6 | 81.2 | 89.9 |

# LEAF GRADE by NIR

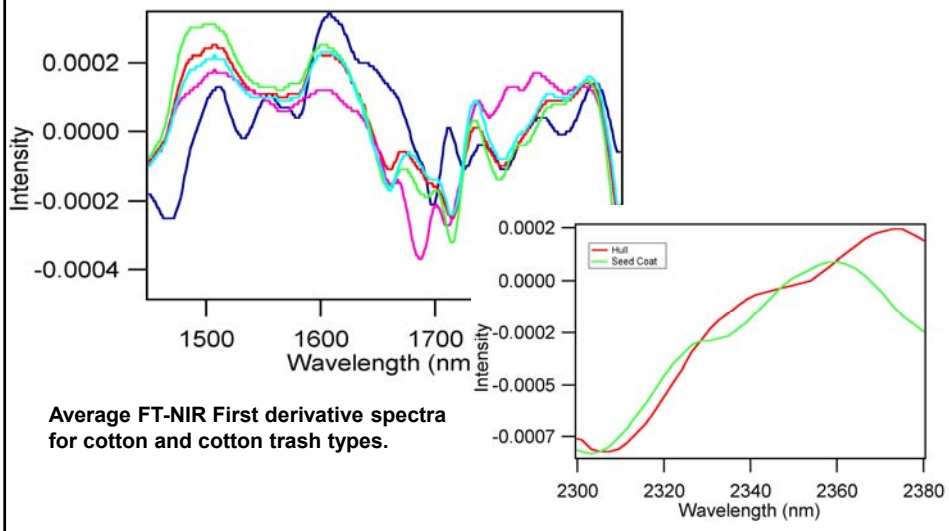


# BOTANICAL and FIELD TRASH IDENTIFICATION by NIR

- **INSTRUMENT/SAMPLES**
  - Qualitative Measurement ("what kind").
  - Bruker Optics MPA FT-NIR (Fortier, Rodgers and Foulk)
  - 128 Validation Samples, pure components
- **RESULTS**
  - 98.4% correct identification of pure components
  - Identification of mixtures by standard NIR difficult

| TRASH TYPE | No. Samples | No. Correct | % Correct |
|---|---|---|---|
| TOTAL BOTANICAL (Hull, Leaf, Seed Coat, Seed Meat, Stem) | 114 | 112 | 98.2 |
| TOTAL FIELD TRASH (Plastic Bags, Module Covers and Strap, Twine) | 14 | 14 | 100.0 |
| OVERALL TOTAL TRASH | 128 | 126 | 98.4 |

# BOTANICAL TRASH IDENTIFICATION by NIR




Average FT-NIR First derivative spectra for cotton and cotton trash types.

# FIELD TRASH IDENTIFICATION by NIR

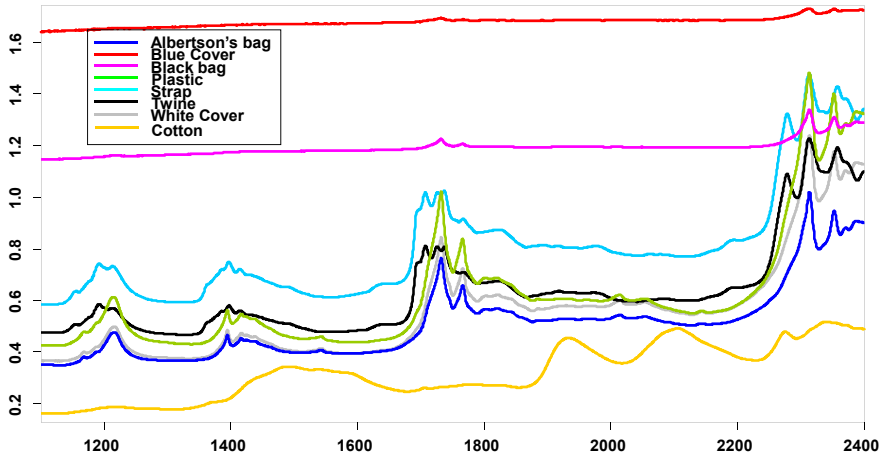
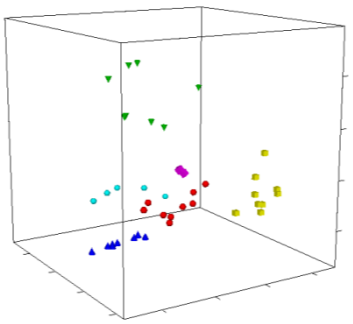
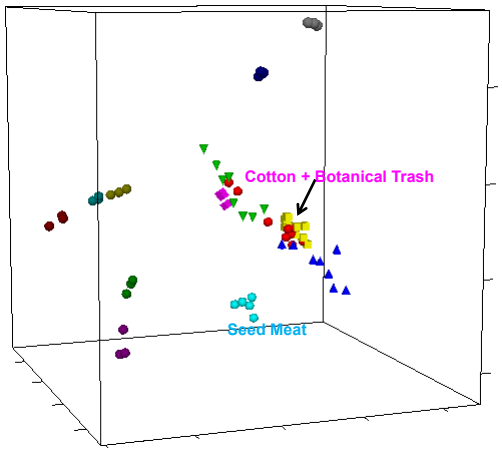



Figure 5. Average FT-NIR absorbance spectra for cotton and field trash spectra over entire spectral range (1100-2400 nm). No preprocessing and standard method was applied.

# BOTANICAL and FIELD TRASH IDENTIFICATION by NIR

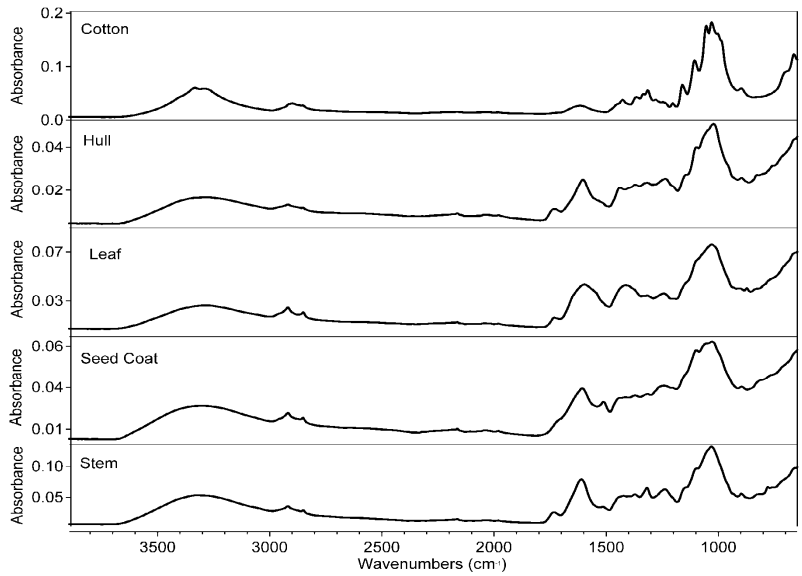


BOTANICAL TRASH SCORE PLOT:
Cotton, Leaf, Stem, Hull, Seed Coat, Seed Meat




FIELD + BOTANICAL TRASH SCORE PLOT

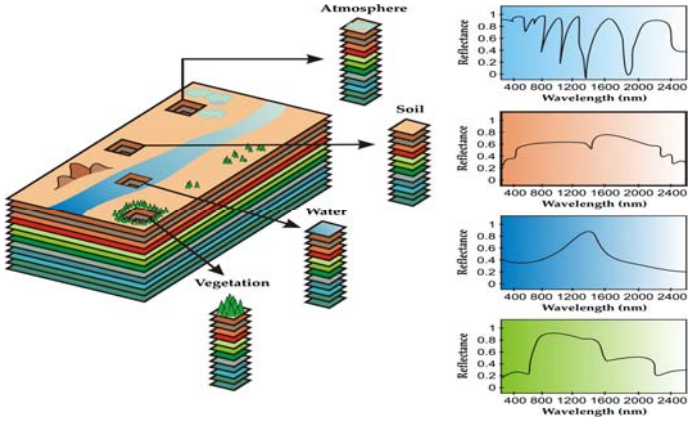
# COTTON and COTTON TRASH, FTIR/ATR




*Himmelsbach et al. J. Agric. Food Chem., Vol. 54, No. 20, 2006.*

# CHEMICAL IMAGING IDENTIFICATION of BOTANICAL TRASH

- **INSTRUMENT/SAMPLES**
  - **Qualitative-Quantitative Measurement ("what kind AND how much").**
  - **Bruker Optics Vertex 70 FTIR + Hyperion Imaging Microscope (Fortier and Rodgers)**
  - **Botanical Trash + Cotton Samples (mixtures)**



# CHEMICAL IMAGING, LEAF - COTTON IDENTIFICATION