NIRS data in breeding, publications, and databases: Needs for standards and equivalency assessment

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Objectives of this talk

- **Present background**
- **Introduce some issues related to NIRS data & considerations for soybean research community**
- **Lead to follow-up to help us make progress meeting seed composition and yield goals**

Background

- **Significant efforts to modify seed composition**
- **Considerable resources devoted to development**
- **Several different NIR platforms are available and being used**

Some considerations

- NIRS technology & appropriate use
- Data accuracy - Reference labs, methods
- Equivalency – agreement among users, platforms
- Data quality and appropriate use
  - NIRS data for screening in a breeding program
  - NIRS data in peer-reviewed publications
  - NIRS data and metadata in permanent databases – GRIN, SoyBase
  - NIRS data in published reports – QT, URT

Some considerations

- **Breeding programs for yield and quality traits require rapid, cost-effective, high-throughput for evaluation of large numbers of samples for screening and selection**

- **Many users, many labs, various platforms**

NIRS platforms used by soybean programs*

Organization	Manuafacturer	Model	Calibration Used
1	FOSS	6500 NIR	sob5we.equ
2	FOSS	XDS RCA XM-1100 series	Prediction models PFI_Fat, PFI_Protein
3	Perten	DA7200	unknown
4	FOSS	Rapid Content Analyzer-XDS	ds-wsb-adv
5	Perten	DA7250	2016 combined soy analytic calibration
6	Perten	DA7250	20140709Update20150318T
7	FOSS	Infratec 1241 Grain Analyzer	SO101301 SOYBEANS STM
8	FOSS	Infratec 1229 Grain Analyzer	SB0009901
9	Perten	DA7250	orignial calibration from Perten
10	Perten	DA7250	20150505 hrSoybeansCombined_...
11	FOSS	Infratec 1241 Grain Analyzer	SB201301 for bulk samples SB201304 for cuvette samples

*Survey of QT cooperators, summer 2016

NIRS Technology & Use

- **“Reflectance” or “Transmission”?**
- **Whole grain or ground samples?**
- **ID large differences between groups for preliminary selection & further evaluation**
- **Report accurate numbers for publication**
- **Marketing – producers @ point of sale?**

Data accuracy

- Accuracy of NIRS data with reference measurements
- Considerations regarding reference methods and labs
- Agreement among labs
- Standard methods and labs
- Standards for grain trade

Equivalency

- **Need to evaluate and work towards equivalency of results from various platforms**

****for appropriate use and application of that platform**

Data Quality & Use

- One pass, local calibrations, small samples . . .
- Use as initial screening tool to ID gross differences?
- Report accurate data for research, peer-reviewed publications, other uses?
- Metadata for publications and databases?

Data Quality & Use

- **Databases**
  - **The soybean research community is generating a large amount of data on some important sets of material**
    - **Large breeding populations**
    - **RIL populations**
    - **Diverse PI panels from USDA Soybean Germplasm Collection**
  - **What data quality standards to we establish for acceptance of data into databases like SoyBase and GRIN?**
  - **What data quality standards for publications?**

Data Quality & Use

- **Metadata –**
  - **What supporting information should be included with submission of data?**
  - **NIR platform = machine model, calibration details**
  - **What was analyzed? – whole grain? Ground samples? Other?**
  - **Number of samples, plots, environments measured**
  - **Other?**

Going Forward

- **Some data being gathered and evaluated from the 2016 Quality Traits tests**
- **Get some initial data on replicated sampled from multiple environments for FA, Sugars, Protein, Oil**
- **Develop plans for follow-up to work towards ongoing proficiency standards and equivaliency**

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