Accomplishing Difficult Trials: Variety Testing

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Overview
Difficult Aspects of Variety Trials

- What is the objective of the testing protocol?
  - To determine germplasm (variety) differences?
  - Or, to determine differences in the trait x germplasm “system”?

- If germplasm differences (across several traits), then “conventional” management is required.
- If system differences, then separate management for each variety is required.

- Based on the title / topic assigned, we will primarily discuss variety or germplasm comparisons.
Overview
Difficult Aspects of Variety Trials

- Maturity Differences
  - What is the maximum difference in maturity within a trial?

- Trait Differences
  - E.g. – When 2 or more herbicide traits are included, do you use a “conventional” herbicide system?
  - Agronomic Traits vs. Site considerations –
    - nematode population (nematode traits) or irrigation (drought traits)

- Seed Treatments –
  - Standard Seed Treatment vs. Commercial “Brand” Packages

- Crop Management Decisions –
  - Average for the test or Variety Specific Management

- Representative Locations
  - Not skewed toward “high-yield” environments
  - Timely management – pest management, irrigation, PGR applications, etc.
  - Investigate the outliers
Other issues -

- Limited resources
  - Private - need for contract testing due to limited internal resources / locations
  - Public – research stations have difficulty in maintaining and upgrading their farming facilities and capabilities
- Public Testing –
  - University resources are limited –
    - Can the public sector manage their tests as timely as the above average grower?
  - Many companies are looking for reliable, timely, and representative data on their products.
Maturity Differences

- Larger issue in determinate fruiting crops
  - Soybeans - maximum maturity group difference-  
    + or – 0.5 MG
  - Corn – maximum RM difference  
    + or – 3 to 5 days
- Cotton – indeterminate fruiting –
  - Tests divided into 2 maturity groups
  - Typically – Early-Mid and Mid-Full  
    - Varieties entered and management approach (PGR, Irrigation, etc.)
  - Many tests are conducted as a single maturity  
    - How was the test managed? For which maturity or variety in the test?
Trait Differences

- Insect Resistance
  - E.g. Cotton – 2-gene B.t. cotton varieties
    - E.g. Bollgard II vs. Widestrike
    - Have differences in control strengths: bollworm vs. army worms
  - Over-sprays to give control for all species?
  - Does this give an advantage to varieties with one trait over the other?

- 2 or more different herbicide tolerance genes
  - E.g. Roundup Ready Flex, Liberty Link
  - Use conventional herbicide / weed control management
  - Split varieties into separate blocks for each HT trait and treat accordingly
  - Variety or systems trial?
Agronomic Traits

- Varieties / Hybrids with and without drought traits
  - Irrigated and Dryland sites
  - Total in-season rainfall + irrigation or stress level of each site
  - Characterize performance as a function of environment
- Varieties / Hybrids with Nematode or Disease resistance
  - Locations with and without the nematode or disease pressure
  - Characterize the disease or nematode pressure for the test and for each plot (spatial variation)
  - Grid sampling? Yield monitor / mapping analysis?
- Importance of selecting and characterizing the site location
Seed Treatments

- Standard treatment for all varieties
  - Base treatments from brand to brand are different
  - Over treat on top of base treatment
- “Equivalent” treatments (e.g. fungicide + insecticide)
  - Are equivalent treatments close enough?
  - Will the crop compensate for any differences?
- Commercial seed treatment packages tied to a seed brand
  - Confounding of variety X seed treatment
  - OR create data on the products that growers will purchase
From 2005 OVT location

Cruiser Treated

Fungicide only
Crop Management Approach

- Manage the entire test under a single management?
  - Managed for the “average” of the test?
  - Managed for a standard variety?
  - Or a defined management approach? E.g. aggressive PGR

- Or manage each variety separately?
  - E.g. plant population, pest control, PGR, harvest aid timings and rates, harvest date.

- Match crop management approach currently used by growers
  - E.g. PGR, seed drop rate
  - Typical OVT drops 4 seeds per foot vs. 2 to 3 seed per foot for most growers.
Cotton OVT location
Lack of Growth Regulator Management
Proper Growth Regulator Management in Irrigated Cotton
Timely Management

• Match the management of “typical” or “average” grower

• E.g. – Irrigation
  • Furrow irrigated test (full irrigation)
  • Follow local irrigation timing criteria (keep up, timely)
  • Manage appropriately for full irrigation
    • PGR, fertility, maturity management, etc.

• E.g. – Plant Growth Regulator
  • Follow local standards for timing and rate
  • Apply timely
Location Selection – Represent the geography

- Avoid skewing the data toward one end of the yield range
  - Typically skewed toward the high yield environments
  - Need a full range of yield environments for stability analysis

- Representative sites
  - Soil Texture and Topography
  - Irrigation
    - Irrigated vs. Rainfed
    - Irrigation amount (limited water 30% ET vs. full water 75%+ ET)
    - Irrigation type – furrow, pivot, drip
  - Planting date
    - E.g. early-planted soybeans, double-crop soybeans
Investigate the “Outliers”

- To fully understand the performance of any new product (pesticide, variety, trait, etc.) investigate the “why” of any data points that appear to be outliers.
- This approach may help you understand the full performance profile of the product.
  - E.g. an OVT location in the Midsouth was replanted during the first year of broad testing on DP 555 BG/RR. When the stability graph was reviewed, a review of the “outlier” was required.
Yield Response for DP 555 BG/RR
All data through 4 January 2003 (268 Locations)

\[ y = 92 + 1.038x \quad R^2 = 0.879 \]
Summary

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