COTTON SEED CERTIFICATION

BACTERIAL BLIGHT RESEARCH REVIEW
DANFORTH PLANT SCIENCE CENTER
ST. LOUIS, MO
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Jason Woodward[1,2]

[1]Texas A&M AgriLIFE Extension

[2]Texas Tech University – Lubbock, TX

806-632-0762; jewoodward@ag.tamu.edu

DISCLAIMER

- Neither of the authors are seed pathologists, nor are they involved in the certification or inspection of seed production fields

- *Objective:* to generate a discussion on current inspection or certification procedures used to ensure the production of high quality and reliable seed needed to sustain the cotton industry

BACKGROUND AND PRESENTATION OUTLINE

- Cotton seed certification requirements have changed over the past 20 years
  - Requirements differ among crops and between states
- Topics covered today:
  - Certification information
    - Pest information *currently* included on certification
  - Seed certification agencies and procedures
    - Arizona, California, Mississippi, Texas and etc.
  - Current limitations and future needs for the certification of cotton seed

SEED CERTIFICATION

- *Purpose:* to maintain and make available high quality seed and propagating material of crop varieties
- Use of certified seed helps protect the buyer, providing a guarantee that seed meets a standard level of high genetic purity, germplasm identity, high germination rates, and minimal amounts od other crop seed, weed seed and inert matter

SEED TESTING FOR QUALITY

- Viability: Standard Germination tests (%), which are conducted under ideal conditions
  - Germination paper or similar method
- Cool-Warm Vigor Index (1 lb of seed required)
  - May not estimate or mirror field emergence, rather reflects vigor under varying conditions (68°F and 86°F)
  - Sum of percentages of plants meeting criteria
    - Excellent = 160>; Good = 140 - 159; Fair = 120 - 139; Poor = <120

Should microbes associated with non-germinated or low vigor seed be catalogued?

CERTIFICATION AGENCIES

- State Department of Agriculture or Crop Improvement Associations
  - Most commonly affiliated with Land Grant Universities
    - Arizona Crop Improvement Association
    - California Crop Improvement Association
    - Mississippi Crop Improvement Association
    - Texas Department of Agriculture
      - Association of Official Seed Certifying Agencies (AOSCA)

- Differences between cotton, potatoes and strawberry
  - Level of certification is dependent on the value of the crop

ASCOA - COTTON

- Cotton was one of the earliest crops for which ASCOA developed certification standards
- There is no National Variety Board for cotton, as is the case for other crops
- Rather, varieties enter into certification programs that are conducted by individual state seed certification agencies
- *"Changes in technology result in the expansion of programs and services to meet new challenges"*
  - Language between state procedures differs drastically, ASCOA certification procedures are not easily obtainable

SEED CERTIFICATION INFORMATION (NEW MEXICO)

IV. SEED STANDARDS:

Factor	Standards for Each Class Foundation/Registered	Certified
Pure seed (minimum)	98.00%	98.00%
Inert matter	2.00%	2.00%
Weed seed (maximum)	None	None
Other varieties (maximum)	0.00%	0.10%
Other varieties Differing in Lint Color	None	None
Other kinds	0.00%	0.02%
Total other crop seeds (maximum)	0.00%	0.30%
**Germination (minimum)	80.00%	80.00%

* Objectionable weed seed: Cocklebur (Xanthium. spp) and Sanbur a (Cenchrus pauciflorus), Morning Glory (Ipomoea ssp.), Jimson Weed (Datura stramoium).

** Minimum germination for fuzzy cotton is 70.00%

NEW MEXICO COTTON PRODUCTION STANDARDS

I. Land requirements: free of volunteer cotton plants

II. Field inspection: at least one official inspection of each field must be made prior to harvest

A. General - 'related to purity issues'

1. Isolation distances 100 feet to 3 miles

B. Diseases - solely Bacterial blight

1. Presence of Bacterial blight on susceptible strains [varieties] is not permitted
2. In 'tolerant varieties', a maximum infestation of not more than 5% is permissible

Inspection Fees = $2.50 per acre (required timing or timings not stated or broadly stated)

Application deadline for certification: July 15

Quantity of seed necessary for testing: 2 lb. (complete analysis) 8 oz. (germ test)

SOYBEAN VARIETY REVIEW BOARD

- Review of candidate varieties is conducted by the board and a ruling or report (Jan-Feb and/or Sept)
  - "Seed may be certified providing production meets standards of the Certifying Agency of the jurisdiction where the seed is grown"
  - Variety information: descriptions, claims and research data is considered for inclusion in the certification report
  - "Beyond this report the Board takes no position on the accuracy or truthfulness of any description or claim by the applicants."

SOYBEAN VARIETY REVIEW BOARD

Applicant:	Syngenta Seeds Inc.
Variety name:	OW1213195
Experimental name:	X2R1846

1. OW1213195 was selected from an F4 plant from a cross of a conventional line by a Roundup Ready 2 line. Winter nurseries were used to advance generations using modified single seed descent method. A single-row preliminary yield trial was used to evaluate yield and maturity then advanced to second year testing in 10-12 reps and on to 3rd and 4th year testing at 25-35 replicated locations. Evaluations and selections were based on yield, maturity, lodging, disease reactions and purity.

2. OW1213195 was tested in the midwest from the Dakotas, Iowa, Minnesota and Canada in the late I soybean growing areas. It can be grown where SCN is a problem. OW1213195 performs well in all areas where late group I varieties are grown.

3. OW1213195 has Rps 1-k for resistance to phytophthora It is resistant to race 3 and moderately resistant to race 14 of SCN and is intermediate for resistant to iron chlorosis.

4.

Plant Description		Mature Seed Description	
Relative maturity:	1.9	Mature hilum color:	Buff
Plant type:	Intermediate	Mature seed color:	Yellow
Stem termination:	Indeterminate	Seed shape:	Spherical flattened
Leaf shape:	Ovate	Average Number of Seeds per pound	2,800
Pod color (mature):	Tan		
Flower color:	Purple	Herbicide resistance:	Glyphosate - RR2Y
Hypocotyl color:	Light Purple		
Pubescence color:	Gray		

Variants and other identifying characteristics:
No variances observed.

5. Recognized classes of OW1213195 are breeder, foundation, registered and certified. Syngenta Seeds INC will maintain the variety and breeder seed as needed. No royalty fees or stewardship/licensing agreements are anticipated.

6.	Date first offered for sale (anticipated month/year):	Jan, 2015
7.1	Has Plant Variety Protection been applied for?	Will apply
7.2	If 7.1 is "Yes" or "Will apply", will the application specify that the variety is to be sold (Title V) by variety name only as a class of certified seed?	No
7.3	May the information on this application be provided to the U.S. Plant Variety Protection Office for use in its soybean database?	No
8.	Do you want the acreage certified each year to be published by AOSCA and certifying agencies?	No

Date this application was submitted: Dec 17, 2014

Date recommended by VRB: Feb 11, 2015

- Variety information:
  - Sect. 1 - Selection criteria and advancement information
  - Sect. 2 - Test location(s) description
  - Sect. 3 - Response to specific diseases (*Phytophthora* and SCN)
  - Sect. 4 - Plant and seed descriptions
  - **Sect. 5 - Proof of initial certification**

    Does this equal a Phytosanitary statement?
  - Sect. 6 - Anticipated date of sale
  - Sect. 7 - 7.1 PVP application; 7.2 Sold as Variety name (Title V) and 7.3 inclusion in PVP database
  - Sect. 8 - Publishing of certified acres

ARIZONA CROP IMPROVEMENT ASSOCIATION

- Membership: Active (voting) and Associate members
- Field inspection
  - Fee application $45.00
    - Cotton $1.50 per acre (assumption: one inspection)
    - Small grains
      - Foundation: three inspections ($2.50 per acre – Fee = $60)
      - Registered: two inspections ($2.00 per acre)
      - Certified: one inspection ($1.50 per acre)
- Certification fees: $0.30 cwt

SEED FIELD SCOUTING PRACTICES IN MISSISSIPPI

- Coordinated by the MS Crop Improvement Association (formerly MS Seed Improvement Association)
  - Board made up of the seed producing companies in MS
  - They have no regulatory power
- Fields are scouted based on a specific set of "issues" to be observed:
  - Presence of particular weeds
  - Verify the variety planted is the one to be harvested based on morphology and physiology of the plant
  - Specific diseases that may be on a countries' phytosanitary list: 2012 list included 1) anthracnose, 2) bacterial blight, 3) Verticillium wilt

Slide courtesy: T. Allen

MISSISSIPPI SCOUTING PROCEDURE

- Scouting generally conducted in August
- Only scout the particular field location a single time
  - Can miss symptoms of particular diseases
- Scout each field in a randomized pattern across the field based on AOSCA (seed certifying agency) practices
  - Generally, 10 points in each field and observe all of the plants along 52-72 row feet at each point

Slide courtesy: T. Allen

BASIC REGULATIONS FOR MISSISSIPPI

- The certified inspector must be the one who observe symptoms
  - A consultant may find bacterial blight at one point in the season, but by the time the inspector is there the disease symptoms may no longer be present
- Inspector passes the information regarding the presence of particular diseases back to the Plant Board
  - The MS Plant Board provides pertinent phytosanitary information for fields if and when a particular disease is observed

Slide courtesy: T. Allen

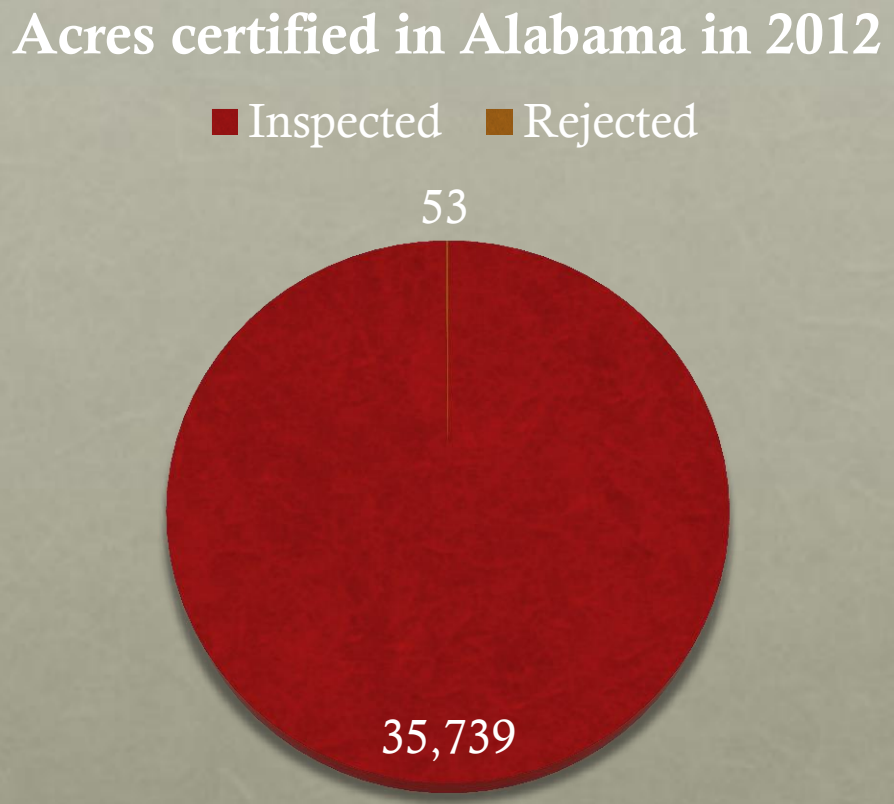
POTENTIAL PITFALLS: A MISSISSIPPI PERSPECTIVE

- MS seed situation:
  - Seed does not legally have to be certified
  - MS Crop Improvement Association is **NOT** a regulatory authority
    - They are **ONLY** quality assurance (more from the varietal standpoint)
- Very little seed produced in MS is used for planting in MS
- For the purposes of sale the documentation on the bag simply has to state:
  - Percent germination
  - Weed free
  - Documentation of the variety

Slide courtesy: T. Allen

SOUTHERN SEED CERTIFICATION ASSOCIATION (AUBURN)

- Crops certified:
  - Bahaigrass (1,317)
  - Peanut (28,992)
  - *Sericia lespedeza* (675)
  - Soybeans (1,422)
  - Sun hemp (375)
  - Oats (182)
  - Rye (350)
  - Wheat (1,808)
  - Bermudagrass (38)
  - Triticale (129)



CURRENT INDUSTRY STANDARDS RELATED TO SEED PRODUCTION

- Standards undoubtedly vary from company to company
  - General consensus is to focus on Bacterial blight and Fusarium wilt (esp. *Fov* race 4)
  - Other diseases to consider (Alternaria, Verticillium, etc.)
- Major driving force appears to be related to

CURRENT INDUSTRY STANDARDS RELATED TO SEED PRODUCTION

- 'Certifiers or inspectors' are routinely in the field
  - Minimum vs. maximum vs. optimum number of inspections
    - Timing is as critical as number of inspections
  - Tolerances are at the discretion of the companies thresholds
    - Fields with disease related issues are scrutinized
    - **A best management practice** would be to have a *Zero Tolerance*, rejecting fields where diseases caused by seedborne pathogens are identified

OREGON POTATO SEED CERTIFICATION STANDARDS

- Governed by the Oregon State
  - Board is administered through OSU Extension Service
  - Divided into two parts:
    - Foundation Seed and Plant Materials Project
    - Certification Project – county extension agents serve as certification representatives

OREGON POTATO SEED CERTIFICATION STANDARDS

- Disclaimer of Warranty
  - Certification does not constitute a warranty of either the Oregon Seed Certification Service or the grower of certified seed potatoes……
- Refusal to Approve: "The certification inspector may refuse to approve a field for certification due to unsatisfactory appearance caused by weeds, poor growth, poor stand, disease, insect damage and/or any conditions that may prevent through inspection or may reflect unfavorably upon the certification program"

SUMMARY

- Changes have been made regarding the certification of cotton seed
- The involvement of state agencies varies around the country
- Seed quality, seed purity, weed seed and inert material are low hanging fruit
  - Disease identification / isolation are more difficult
- Procedures of companies are different, but the same….
  - Phytosanitary inspections are required for international movement of seed
    - The country(s) targeted for sale trigger which diseases are being screened
- Diseases caused by seedborne pathogens are a significant threat to the cotton se

IS THERE A NEED FOR ACTION

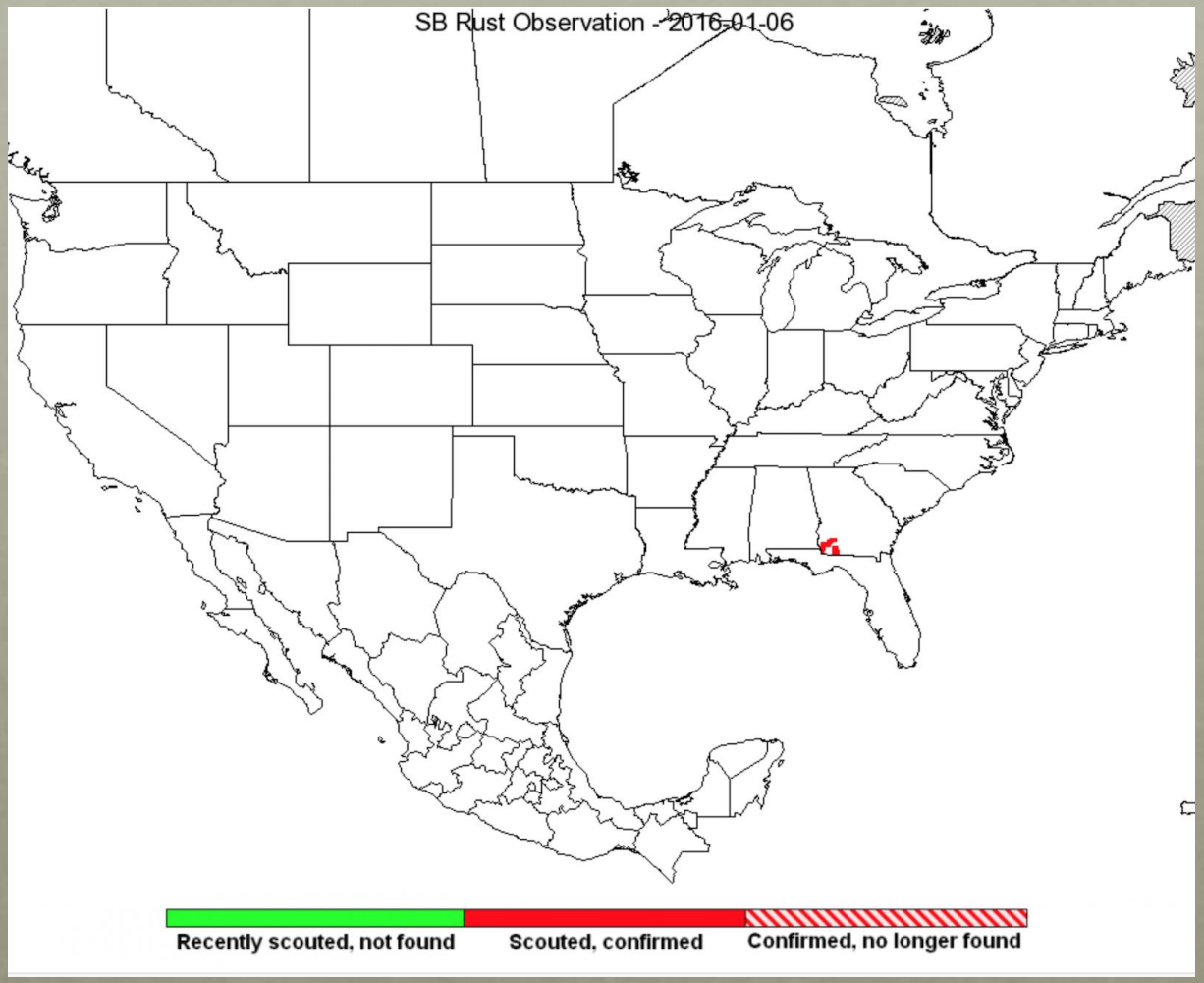
- Have seed certification procedures loosened enough to allow for the reemergence of seedborne pathogen related issues?
- Is there a need to standardize certification programs across the industry?
  - What are some of the imitations:
    - High turn over among field certifiers?
    - Out of site out of mind? (a need for routine trainings)
    - To many acres not enough resources (manpower of financial)

IS THERE A NEED FOR ACTION

- What changes can be or need to be made to improve seed certification from a seedborne pathogen standpoint?
  - Increase how rigorous fields are inspected (time and intensity)
  - Implementation of molecular methods for diagnosis
- If changes are needed, how does that affect the bottom line?
  - Grower standpoint:
    - Improved final product, piece of mind of a quality product
    - Loss of revenue if contracted field is rejected
      - Successful implementation could result in how many fields are rejected
  - Industry standpoint:
    - What is the cost of implementing changes?
    - A cost benefit analysis is needed (who gets stuck with the bill)

NETWORKING AND THE DISSEMINATION OF INFORMATION

Similar method to the soybean rust IPM-PIPE, zeroing in on the target (refine timing?)



QUESTIONS / COMMENTS / CONCERNS

OVERVIEW OF SEED CERTIFICATION PROTOCOLS

COTTON DISEASE COUNCIL SYMPOSIUM : BELTWIDE COTTON CONFERENCE

Jason Woodward[1,2] and Shawn Wade[3]

[1]Texas A&M AgriLIFE Extension, [2]Texas Tech University and [3]Plains Cotton Growers, Inc. – Lubbock, TX

806-632-0762; jewoodward@ag.tamu.edu