Organic Cotton Varieties
Background

- National Organic Standards
  - Organic seed *if available*
  - Genetic engineering not allowed in variety development process
  - Non-GE varieties *with no disallowed seed treatment*
- NOSB Seed Processing Exemption
  - 205-601 ‘Synthetic substance allowed for use in organic crop production’ HCl for delinted cotton seed for planting
  - Petitioned 2002, approved, renewed and last recommended ~2020
- **Non-GE variety and seed processing options are limited**
Planting Seed Production Issues

- Stringent isolation distances required
  - Pollinators are abundant in organic fields
  - Cotton is exposed to cross-pollination over a long period of time
  - “Chemical rogueing” used in GE variety production is not possible

- ‘Off-types’ have always been a part of seed production guidelines
  - NOSB designates GE not allowed in variety development, but not specific tolerances for GE off-types
    - Brands and customers expect organic certification to be ‘GE-free’
    - GOTS or other certification agencies may require tolerances
    - Testing is expensive

- GE off-types can multiply faster in non-GE seed production cycles
  - Herbicide or insect resistant off-types yield more if herbicide drift or insect pressure occurs
Some Breeding Objectives

- Common with general variety development
  - Yield, abiotic stress, host plant choice tolerance to insects (thrips, etc.)
  - Resistance to diseases not managed by alternate, non-host crop rotation, e.g., bacterial blight
- Consideration for organic production
  - Boll type to withstand weathering until killing frost
  - Lower leaf pubescence (higher grades without defoliation)
  - High fruiting/vegetative ratio (no PGR allowed – short internodes, etc.)
- Fiber quality range from high-end textiles to non-wovens
- Strategies to minimize GE trait contamination!!!
Non-commercial Options

- Varieties with Plant Variety Protection but no Utility Patent can be produced for planting seed under the PVP farmer exemption
- Since 1994, farmers can only plant back on their own farm
- Maintaining purity can be difficult
  - Ginned under organic standards minimizes physical contamination
  - Limited custom delinting options and strict clean-out procedures
  - Both pollen- and seed-mediated gene flow
- Planting seed block can be isolated but must start with clean seed
- FM 958 is current production standard to beat (high yield, good quality, bacterial-blight resistant, storm-proof boll, compact plant type)
  - **However, since seed for feed is valuable, its desirable to buy planting seed**
Commercial Varieties Developed w/o GE Methods (request approved seed treatment)

**Upland** (Pima or Pima x Upland hybrid seed may also be available)

**Check variety guides for characteristics and ask for GE testing results**

- Americot – UA48
- BS&D – 224, 4X, 598, 9X, Ton Buster Elite, Ton Buster Magnum, Tamcot 73 and three new Tamcot varieties being reviewed for future commercialization
- Seed Source Genetics – UA222, UA103, UA 107, UA114
- Varieties from above companies are tested in AgriLife Research Lubbock variety trials
- MAY seed (Turkey – country does not allow GE production) lists 6-7 varieties on website
  - AgriLife Research tested 257, 404, 771 at one location in 2019
  - MAY 771, only one we tested listed on website, had good yield, short staple (okay for non-woven)
- International Seed Technology BRS varieties from Brazil
  - Tested by AgriLife Research Lubbock, usually late, loose, but a good one in 2021
  - [https://lubbock.tamu.edu/](https://lubbock.tamu.edu/)

Please be sure all seed (Upland or Pima) was produced in a FOV4-free area
2021 Lubbock Irrigated* Preliminary Results

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield (#/A)</th>
<th>Rank (of 50)</th>
<th>Mat (% open)</th>
<th>SR (FM 958=6)</th>
<th>Micronaire</th>
<th>Length (in)</th>
<th>Strength (g/tex)</th>
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<td>IST BRS 286</td>
<td>856</td>
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<td>1.09</td>
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*Limited irrigation, planted late
Texas A&M AgriLife Research

- Lubbock breeding program began working with some organic cotton farmers in 2009 to understand objectives and concerns with organic cotton planting seed
- USDA-NIFA-OREI grant 2010-2014 supported Lubbock breeding and entomology programs to develop thrips-tolerant germplasm and evaluate OMRI-approved insecticide for early season pests
- Two germplasm lines were released that provided protection equal to approved insecticides


Breeding Process for Organic Cultivars

- Texas A&M AgriLife Research conducts screening, crossing, and F1 seed increase in the greenhouse, testing each parent plant for GE.
- Early generation nurseries are planted with isolation required with regulated traits, in on-station fields not certified but managed as organic.
- Seed from non-segregating F4 or later single progeny rows is tested for GE, processed for replicated trials, and put in isolated seed increase blocks.
- In the case of GE contamination, individual plants in seed increase block are tested, and ‘caged’ if clean.
- It is extremely difficult to produce amounts of clean seed needed for small-plot, replicated trials on farmer cooperator certified farms.
- Internal trials are planted at up to five locations, and managed organically.
Breeding Progress

• Adventitious presence of GE traits is a critical issue in cultivar development and planting seed production

• OREI funded Texas A&M AgriLife breeding programs in Lubbock and College Station to develop okra-leaf cultivars to distinguish them from GE cultivars and assist with purity maintenance

• Two cultivars are submitted for approval to the Texas A&M Plant Release Committee and registration to J. of Plant Registrations


• A proposal is submitted to USDA-NIFA-SARE to support non-GE seed production strategies

CA 4014 and CA 4015 were tested at three locations in 2018, one location in 2019, and one location in 2020. In 2018, one location was dryland, and the other two were irrigated. In 2019 and 2020, the locations were irrigated. Four commercial cultivar checks were included in each of the tests: FM 958, FM 989, DP 491, ST 474. CA 4014 and CA 4015 are well adapted to the Texas High Plains and were comparable to checks, especially FM 958. CA 4014 had equal yield and higher lint turnout than CA 4015. CA 4015 stood out for its early maturity and could be an option in situations where the crop is produced in a short season.
Stakeholder Engagement

- Breeding pipeline for potential organic cultivars is continuous
  - ~80-100 strains are tested for 1ˢᵗ, 2ⁿᵈ, or 3ʳᵈ time in multi-location trials each year at Halfway, Lubbock, and Lamesa under varying water regimes
- Internal data are not posted on website, but available to any interested party electronically or print by request
- 2021 demonstration trial at AG-CARES with 9 candidate cultivars and FM 958 with GPS coordinates and QR codes to data was destroyed by hail and tornado
- Pending seed availability demonstrations will be planted each year and stakeholder feedback solicited
- Stakeholder feedback sought includes farmer preferences and interested planting seed producers and processors