Stickiness, Seed-coat Fragments:

Measurements and consequences

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Plan of presentation

• **Introduction**

• Sticky cottons: various solutions to counter this contamination from the field to the mill

• Seed-coat fragments, an impurity that can lead to quality and productivity troubles

• Conclusion
Introduction

• Cotton fibres contain various impurities
  – pieces of leaves,
  – stems or seeds…

• They may also be contaminated by insect honeydew.

• Although it is easy to remove the stem and leaf fragments, sticky particles and seed coat fragments (SCF) are difficult to extract.
Introduction

• These two contaminants remain in the cotton up to the spinning process where they cause production and quality losses.

• They have now become the main contaminants present in cotton.
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Stickiness

*Aphis* gossipii

*Bemisia* tabaci
Existing methods to measure stickiness

- Simple chemical method: not very well linked with stickiness

- Complex chemical tests: HPLC, Chromatography ... good for individual sugars quantification, but long and costly

- Mechanical and thermo-mechanical tests ...
Some used measuring devices for stickiness evaluation
Measurements can be done

- At the production stage (after ginning)
- At the trader stage on collected samples
- At the spinning mill

- These measurements are done to establish the stickiness level and organize the purchase
Stickiness: Two approaches

1. Counter stickiness in the fields:
   - Favourable sewing dates and of appropriate spacing between cottons rows
   - New varieties with determined growth cycle and low leaf area
   - Reasoned use of supplementary chemical treatments
   - Manual or mechanical topping, or application of defoliants, and early cotton harvest ...

=> Stickiness problem remains
Stickiness : Two approaches

• 2- Counter stickiness in the transformation stages:
  – Often used
    • Use of mixes
    • Change in moisture content
    • New auto-cleaning cards …
  – Under evaluation / research : for reducing the stickiness effect
    • Heating technique (Rieter, 1991)
    • Micro-wave (Polli, 1990)
    • Neutralization technique (Cirad, 1991) …
Spatial distribution of ‘Poisson’

Random distribution and homogeneous density

\[ \sigma^2 = \text{moyenne} \]
Spatial aggregative distribution

Agregates, non homogeneous density
=> over-dispersion

$\sigma^2 >$ moyenne
Chart taking care of the litigation risk
(1 measure / sample using H2SD)

Evaluation threshold

Example:

- litigation risk < 5%
- stickiness < 10 points

From
CFC/ICAC 11, 2001

=> Stickiness < 4 points at the classing

Classification threshold
Latest developments

- White fly honeydew and Aphid honeydew do not induce the same type of problems during transformation (Hequet, 2002)
- Stickiness potential of sugars ...
- CEN standards ongoing
- Reference cottons
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Some used measuring devices for SCF evaluation (1/2)

- Visual methods (ASTM D2496-80)
  - Nep-Tester on sliver, etc: time consuming
- Mechanical methods (trash removal)
  - MDTA-3, Zellweger-Uster
- Opto-electronic methods
  - AFIS, Zellweger-Uster (ASTM 1995),
  - FQT from Lintronics,
  - Lenzing Instruments
Some used measuring devices for SCF evaluation (2/2)

• Image analysis
  – On line Nep Control on Trützschler cards
  – Trascham / CATI by Cirad
  – Analyra by Cirad

• Evenness testers
  – UT3, UT4, Zellweger-Uster
  – Yarn Tester, Superba
Neps characterization on UT3 eveness tester

Eveness tester UT3

Provides a global counting of imperfections or neps on yarn

Not well adapted for breeding purposes where Seed Coat Fragment (SCF) content is required (heritability)
Neps characterization on UT3 eveness tester

Apply of a detailed analysis

- Lamp
- + Magnifyer
  - + UT3 stop on every nep
    - Thresholds:
      - - 200% for ring spinning
      - - 280% for open end
    - + Categorization (according to thresholds …)
Different types of nep in the yarn

- Immature fibers
- Process neps
- Seed Coat Fragment
- Sticky neps
- Trash particle

From Frydrych R. 1988
SCF detection on yarn boards
by Trashcam/CATI

Board construction

Scanner
SCF detection on yarn boards by Trashcam/CATI

• Counting SCF

• SCF Size distribution from size > 0.05 mm²

Size distribution can shift right or left by processing operations: fragmentation, removal ...
SCF size distribution before and after carding (Trashcam/CATI)

<table>
<thead>
<tr>
<th>Size classes (mm²)</th>
<th>Relative frequency (%)</th>
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<tr>
<td>0.13</td>
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</tbody>
</table>

- **Before carding**
- **After carding**

**Number** ➔ **Size** ➔ **Fragmentation**
SCF: shape, size (Trashcam) and length of the attached fibers (Analyra)

Various consequences ...

From Krifa M. 2001
Induced defaults in the yarn by SCF

Short default

Neps

Thick place

Long default

... and consequences of consequences ...

From Krifa M. 2001

5 mm
SCF in RS yarn, individual breaks on dynamometer

Bigger the SCF and longer the attached fibres
=> Increased number of breaks around SCF

Higher the quality of the fibers, more important is the loss in yarn strength in presence of SCF

From Krifa M. 2001
Breeding efficiency towards SCF

Square root transformed data

Selection for low SCF content
Selection for high SCF content

From Bachelier B. 1998
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Conclusion

- The results obtained for stickiness and seed coat fragments can today be used in the overall management of these two contaminants: from the field to the processing.

- If stickiness persists, it is possible to propose solutions in the field level and reduce its negative effects during spinning.
Conclusion

• Seed coat fragments should be well controlled through breeding.

• Still a lot of a research and development work to do ... as all troubles are not fixed.
Thank you for your attention