International Textile Manufacturers Federation (ITMF)

International Cotton Committee on Testing Methods (ICCTM)

Stickiness WG

Introduction

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Plan of presentation

- Introduction
- Stickiness: origins
- Stickiness: measurement
Introduction

The challenge for cotton today

- To remain competitive with synthetic fibers
- To maintain acceptable profitability in production

Reduction of the production and processing costs
Introduction

The challenge for cotton today

Cotton fiber stickiness  →  Disruption / defects Spinning process
Introduction

The challenge for cotton today

Cotton fiber stickiness → Disruption / defects
Spinning process
Introduction

The challenge for cotton today

Cotton fiber stickiness

Defects / Disruption of the spinning processes

Producer
Classer
Trader
Researcher
Spinner
Producer

Price discount

Higher spinning cost
Lower yarn quality

Additional operations
Plan of presentation

✓ Introduction

✓ Stickiness: origins

✓ Stickiness: measurement
Origins of stickiness

Stickiness

Vegetal parts
Origins of stickiness

Stickiness

Vegetal parts

Oil traces
Origins of stickiness

- Vegetal parts
- Oil traces
- Waxes
Origins of stickiness

Stickiness

- Vegetal parts
  - Oil traces
  - Waxes
  - Plant sugars
## Origins of stickiness

<table>
<thead>
<tr>
<th>Fiber constituents (%)</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>cellulose</td>
<td>12</td>
<td>60</td>
<td>82</td>
<td>90</td>
</tr>
<tr>
<td>proteins</td>
<td>15</td>
<td>8.4</td>
<td>4.3</td>
<td>0.9</td>
</tr>
<tr>
<td>pectic substances</td>
<td>4.5</td>
<td>3.9</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td>reducing sugars*</td>
<td>30</td>
<td>15</td>
<td>2</td>
<td>0.3</td>
</tr>
<tr>
<td>waxes</td>
<td>4</td>
<td>3.1</td>
<td>1.9</td>
<td>0.9</td>
</tr>
</tbody>
</table>

*Mainly glucose and fructose*

Source Parry, 1982
Origins of stickiness

- Vegetal parts
  - Oil traces
  - Waxes
  - Plant sugars
    - Insect sugars

APHIDS

WHITEFLIES
Origins of stickiness

Mature boll covered with honeydew
Origins of stickiness

Mature boll covered with honeydew
Main sugars (in %) determined by HPLC in aphid, whitefly and aleurod honeydew, harvested on *G. hirsutum*

<table>
<thead>
<tr>
<th>Insect</th>
<th>Mono-saccharides</th>
<th>Polysaccharides</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Sucrose</td>
</tr>
<tr>
<td><em>Aphis gossypii</em></td>
<td>25</td>
<td>12</td>
</tr>
<tr>
<td><em>Bemisia tabaci</em></td>
<td>19</td>
<td>16</td>
</tr>
<tr>
<td><em>Trialeurodes abutilonea</em></td>
<td>44</td>
<td>33</td>
</tr>
</tbody>
</table>

Source Hendrix et al., 1992
Origins of stickiness

• The most important cause of stickiness is due to these entomological sugars.

• Honeydew has now become one of the main contaminants present in cotton.

• Sticky points remain in the cotton from the field up to the spinning processes where they cause production and quality losses.

• The behavior of contaminated fibres during processing is highly dependent upon the quantity and the type of the main sugars present in fibres
Plan of presentation

✓ Introduction

✓ Stickiness: origins

✓ Stickiness: measurement
Stickiness measurement

**Chemical methods**

- Simple
  - Perkins
  - Fehling
  - Color reaction

- Complex
  - HPLC
  - GC
Stickiness measurement

Chemical methods
- Simple
  - Perkins
  - Fehling
  - Color reaction

Complex
- HPLC
- GC

Physical techniques
- Infra-red
Stickiness measurement

Chemical methods
- Simple
  - Perkins
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- Complex
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Physical techniques
- Complex
  - Infra-red
- Mechanical
  - Mini-card

ITMF Reference method
Stickiness measurement

Chemical methods
- Perkins
- Fehling
- Color reaction

Physical techniques
- HPLC
- GC

Mechanical
- Infra-red
- Mini-card

Thermo-mechanical
- SCT
- H2SD
- FCT / FQT
- Quickspin

Simple

Complex

ITMF Reference method

ITMF Recommended method
Stickiness measurement

Some measuring devices for stickiness evaluation

Credit: M. Watson
Stickiness measurement

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Thank you

for

your attention