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Textiles — Cotton-fibre stickiness — Detection of sugar by colour reaction

Textiles — Collage des fibres de coton — Détection de sucre par réaction colorée

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

Page

Foreword

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Introduction

Honeydew on the surface of cotton fibre can be transferred to a metallic surface of the spinning machines or rubber rollers, etc., resulting in lapping. As a result, it may lower the efficiency of the yarn production and yarn quality. Cotton stickiness is due mainly to entomological sugars produced by insects, which are designated by the term “honeydew”. This test method is used to evaluate the degree of honeydew contamination by visualization of honeydew droplets in cotton fibre.

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Textiles — Cotton-fibre stickiness — Detection of sugar by colour reaction

1 Scope

This International Standard describes a method for evaluating the degree of cotton-fibre stickiness arising from honeydew contamination through detection of sugar by the colour reaction of a specific treated paper.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
colour-reaction solution
solution consisting of *p*-aminobenzoic acid, acetone, phosphoric acid and water

2.2
colour-reaction paper
filter paper containing colour-reaction solution prepared before the testing

2.3
brown colour spots
spots on the tested colour-reaction paper which are developed by reacting honeydew sugars with *p*-aminobenzoic acid placed in a convection oven

2.4
stickiness grade
grade which indicates the incidence of cotton-fibre stickiness

3 Principle

Honeydew droplets that may occur in a specific cotton web with its fixed surface area and mass are transferred to a colour-reaction paper after a press and incubator lap. The resultant paper image may be evaluated by comparing the appearance of the developed brown spots (honeydew reaction) with a series of five visual standards from which a visual grade is assigned, or the resultant paper image of the brown spots may be scanned into an electronic file for image profile analysis.

4 Reagents

Use only reagents of recognized analytical grade.

4.1 ***p*-Aminobenzoic acid**.

4.2 **Acetone** (minimum assay to be > 99 %).

4.3 **Phosphoric acid** (minimum assay to be > 85 %).

4.4 **Water**, distilled.

5 Apparatus

5.1 Mechanical opening device, comprising a rotating opening roller covered with metallic card wire suitable for processing cotton fibres into the homogeneous web.

EXAMPLE Fibre cleaner, miniature carding machine or other.

5.2 Analytical balance, weighing to an accuracy of 0,01 g.

5.3 Glass plates or polished stainless plates, at least 100 mm × 100 mm 0/+5 mm.

NOTE Each test sample (there are three per sample) requires two plates. A minimum of six glass plates per sample is required.

5.4 Stopwatch.

5.5 Pressing system, applying a mass of 4 kg on a 100 mm × 100 mm area for 1 min.

5.6 Filter paper: cellulose-containing paper (pore size 5 µm) cut into 100 mm × 100 mm pieces.

5.7 Colour-reaction device, convection oven or similar device which is uniformly heated and maintained at (120 ± 0,5) °C for 5 min at least.

NOTE the air velocity in the oven is about 1 m/s to 2 m/s.

5.8 Cotton-fibre stickiness replicas[1)], the different stickiness replicas are given through five coloured or grey-level images (Figures 1 and 2).

In general, the cotton stickiness grade is assigned by comparing with the grey replicas (Figure 1). It is recommended that coloured replicas (Figure 2) be used as a reference for more precise evaluation.

5.9 Image analysis device, comprising image input apparatus like a scanner and image analysis program. All kinds of the commercial scanners can be used, but the resolution of 200 dpi (0,1 mm/pixel) at least is necessary for this test. The image analysis program may be available from KOTITI (Gyeonggi-do, Korea) or may be programmed for oneself.

6 Preparation

6.1 Sampling and preparation of test specimen

6.1.1 Take at random three laboratory samples from a cotton bale, each weighing (5 ± 0,1) g.

6.1.2 Remove impurities and prepare three webs, each of mass (5 ± 1) mg/cm^2, by means of the mechanical opening device (5.1).

6.1.3 Cut one test specimen of 100 mm × 100 mm from each web.

NOTE Card matt, lap, or sliver can also be used as a sample.

1) Cotton-fibre stickiness replicas are available from KOTITI (Korea Textile Inspection & Testing Institute), 138-7 Sangdaewon-dong, Jungwon-gu, Seongnam-si, Gyeonggi-do. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.

6.2 Colour-reaction solution

6.2.1 Dissolve (10 ± 0,01) g of *p*-aminobenzoic acid (4.1) in (300 ± 1,0) ml of acetone (4.2) thoroughly in a 1 000 ml volumetric flask.

6.2.2 Add (10 ± 0,01) ml of phosphoric acid (4.3) to the volumetric flask. Fill the volumetric flask with distilled water (4.4) to the 1 000 ml mark and mix to be sure that all chemicals are thoroughly dissolved.

It is preferable to test immediately after preparing the colour-reaction solution because acetone is volatile. Also, it is recommended that the colour-reaction solution be kept in a bottle under refrigerating conditions. Take into account security precautions to manipulate the solution.

6.3 Colour-reaction paper

6.3.1 Prepare a sheet of filter paper (5.6) by cutting a (100 × 100) mm square for each test specimen.

6.3.2 Wet the filter paper with colour-reaction solution (6.2) and squeeze to remove excess solution by using an instrument such as a wringer [pick-up: (70 ± 5) %].

It is recommended that the colour-reaction paper be sealed off and kept under refrigerated conditions. Do not use colour-reaction paper more than 30 days after its production.

7 Procedure

7.1 Colour-reaction device set-up

Set the colour-reaction device (5.7) in order to obtain a temperature at (120 ± 0,5) °C across its entire space.

7.2 Transferring honeydew droplets to colour-reaction paper

7.2.1 Place a sheet of colour-reaction paper (6.3) on the glass or polished stainless plate (5.3).

7.2.2 Spread a test specimen (6.1) evenly over the colour-reaction paper and cover it with another glass plate or polished stainless plate.

7.2.3 Load a weight (see 5.5) on the plate for 1 min, timed using a stopwatch (5.4).

7.2.4 Remove the weight, plate and specimen on the colour-reaction paper.

7.3 Colour-reaction phase

Place the colour-reaction paper used in 7.2 in the colour-reaction device and maintain it at (120 ± 0,5) °C for 5 min, then take it out of the colour-reaction device. The tested colour-reaction paper doesn't need cooling down or conditioning before the assessment is carried out. It is recommended that the assessment be carried out within 10 min of finishing the test, because the colour of the tested paper becomes darker over time.

NOTE The colour shade of tested colour-reaction paper may change according to the performance of the colour-reaction device. When the image of the tested colour-reaction paper is significantly blurred or dark in comparison with the colour replicas (see Figure 2), it is recommended to control the reaction temperature and time.

8 Assessment of cotton-fibre stickiness

8.1 General

Evaluate the cotton-fibre stickiness either visually, using the cotton-fibre stickiness replicas (5.8), or instrumentally, using an image analysis device.

8.2 Visual assessment

8.2.1 Compare the tested colour-reaction paper with the reference image replica (see Figures 1 and 2) and assign a grade of replica that most closely matches the appearance of the reaction paper.

8.2.2 Grade each specimen in accordance with the grading scheme given in Table 1. If the grading appears between two grades, mark a "+" sign on the top right of the lower grade (e.g. C^+).

8.2.3 Due to the subjective nature of the assessment, it is recommended that more than one observer carry out the assessment.

Table 1 — Visual assessment

Grade	Description
A	Non-stickiness
B	Light stickiness
C	Moderate stickiness
D	Severe stickiness
E	Very severe stickiness
NOTE Confine observations to the colour spot itself developed on the tested colour-reaction paper.	

8.3 Evaluation using image analysis device

8.3.1 Scan the tested colour-reaction paper with a resolution of at least 200 dpi using image input apparatus like a scanner (see 5.9).

8.3.2 Load the scanned colour image file in the image analysis program.

8.3.3 Determine the stickiness grade using the image analysis program to evaluate the number and area of coloured spots on the scanned image.

9 Results

Record the grading for each specimen and select the lowest grade among the three test results determined in 8.2. The variation in the result should be no more than half a grade. If this variation is more than half a grade, the grading of each specimen shall be reported.

10 Test report

The test result shall include the following information:

a) a reference to this International Standard;

b) a description of the laboratory sample;

c) number of test specimens and number of observers;

d) date of test;

e) the individual and final grade assessed;

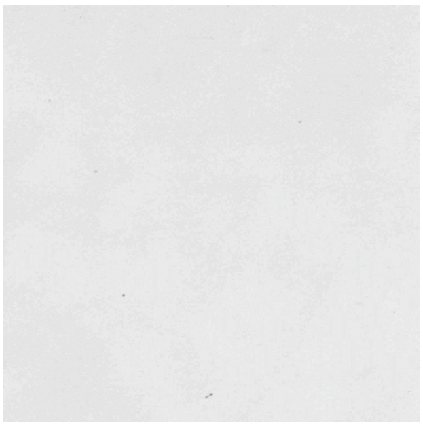
f) whether the result is based on:

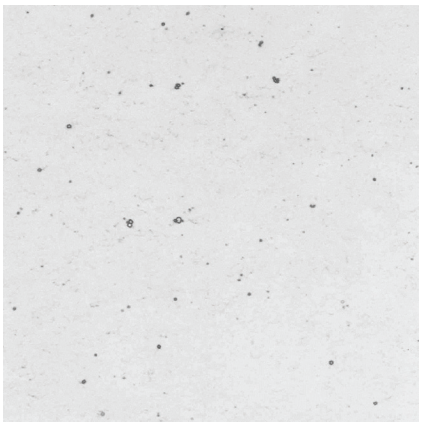
   1) visual assessment,

   2) instrumental assessment;

g) the test conditions, such as pressure, colour-reaction temperature and time;

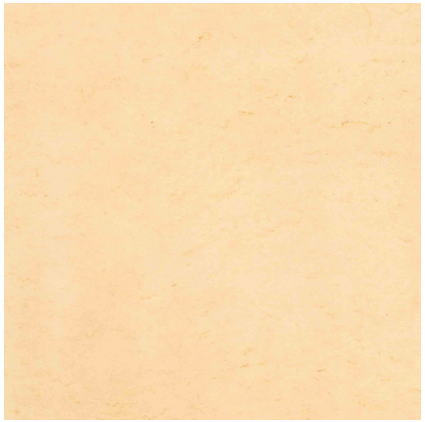
h) details of any deviations from the test method.

	
Grade A	**Grade B**
	
Grade C	**Grade D**



Grade E

Figure 1 — Cotton-fibre stickiness replicas (grey image)



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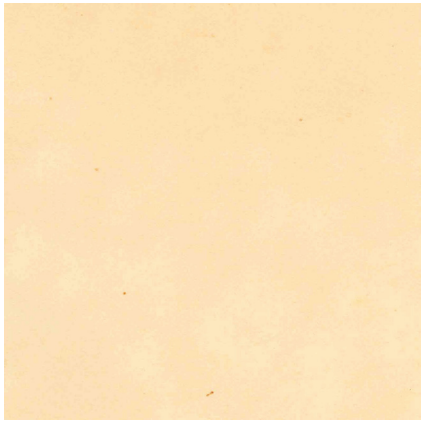

Grade B

Grade C

Grade D

Grade E

Figure 2 — Cotton-fibre stickiness replicas (colour image)

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