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HIGH PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC) ANALYSIS OF HIGH SPEED STICKINESS DETECTOR (H2SD) STICKY DEPOSITS

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Abstract

Frydrych et al. first described the H2SD (High Speed Stickiness Detector) in 1994. The general principle is the following: After conditioning the fiber samples for at least 12 hours, a specimen of 3.25 ± 0.25 g is taken and fed into the instrument to be mechanically opened. It forms a pad of 130 ± 10 mm per 170 ± 10 mm. The sample is then automatically transferred on a strip of aluminum originating from a roll. The aluminum is rolled along a conveyor belt, which transfers the sample in front of each station. The aluminum strip is rolled up at the other end of the machine. The sample is transported to the first press where pressure is applied for 25 ± 2 seconds while the heating element is in contact with the cotton. The heating element exerts a force of 1500 ± 100 N. Its surface area is 192 cm² (tolerance ± 1 cm²). Then, the sample is automatically transported to the second press where another pressure is applied for 25 ± 2 seconds at ambient temperature. This fixes the sticky points to the aluminum foil. The same amount of pressure is applied as during the hot-pressure phase. The sample is then transported to the cleaning station where the non-sticky material is removed by a combination of a cleaning roll and suction. The sticky point counting is made by image analysis. From this brief description of the H2SD, it is apparent there are at least 2 parameters that may have an influence on the number of sticky deposits counted on the aluminum foil, which are the hot plate temperature and the force applied by the cleaning roll.

A total of 81 cotton bales were selected for this study. Twenty-seven bales were contaminated mainly by white fly honeydew (referenced as Area 1), 27 bales were contaminated by aphid and white fly honeydew and some of them with high physiological sugars (referenced as Area 2), and 27 bales were contaminated mainly by aphid honeydew and some of them with high physiological sugars (referenced as Area 3). Three samples per bale were tested on the H2SD (3 replications per sample) with 4 different combinations of settings for hot plate temperature and cleaning roll pressure:

- 53ºC and High cleaning pressure
- 53ºC and Low cleaning pressure
- 27ºC and High cleaning pressure
- 27ºC and Low cleaning pressure

The results showed that for some bales from Area 3, there is an unknown substance that sticks to the aluminum foil at 53ºC but does not stick at 27ºC. At 53ºC and low pressure, Area 1 is more sticky than Area 3 (8% higher) but at high pressure Area 1 is less sticky that area 3 (34% lower). This revealed a strong interaction type of contamination * cleaning pressure at 53ºC. At 27ºC and low or high cleaning pressure, Area 1 is twice sticker than Area 3 (2.6 and 2.2 respectively). There is a slight but significant interaction type of contamination * cleaning pressure at this temperature.

High Performance Liquid Chromatography (HPLC) tests were then performed on the sticky deposits collected from the aluminum foil of the H2SD (after the image analysis was performed). Three samples per bale were analyzed (one replication per sample). The results showed that the quantities of sugars stuck on the aluminum foil were extremely low. On average, it represents only between 0.01% and 0.025% of the sugars present on the lint. The dominant compound on the aluminum foil for all areas is inositol (or a substance that has the same retention time with HPLC as does inositol). The percentages of glucose and fructose have the tendency to be lower on the aluminum foil than on the lint.

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