

FTIR spectroscopic analysis of stained cotton fibers

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Date: Feb 11, 2020

Sample information:

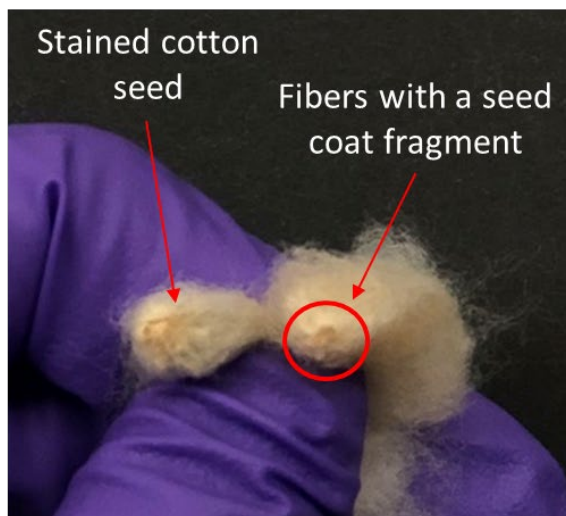
Stained and white cotton samples were received from Dr. Randy Boman, Cotton Agronomics Manager, Windstar, Inc.

Results:

1. According to our visual observations, stained fibers are located at the Chalazal end of seeds. In addition, we could see more stain at the fiber base region.



2. Once we remove fibers, we could easily observe a small broken area in the seed coat at the Chalazal end of the stained cotton fibers. When we pulled fibers from the stained seeds, the fiber bundle came out with a piece of a seed coat at the Chalazal end as given below. We did not observe any seed damage at Chalazal end in white cotton seeds. In addition, seeds from the stained samples are much smaller compared to those of the white “unstained” cotton samples.

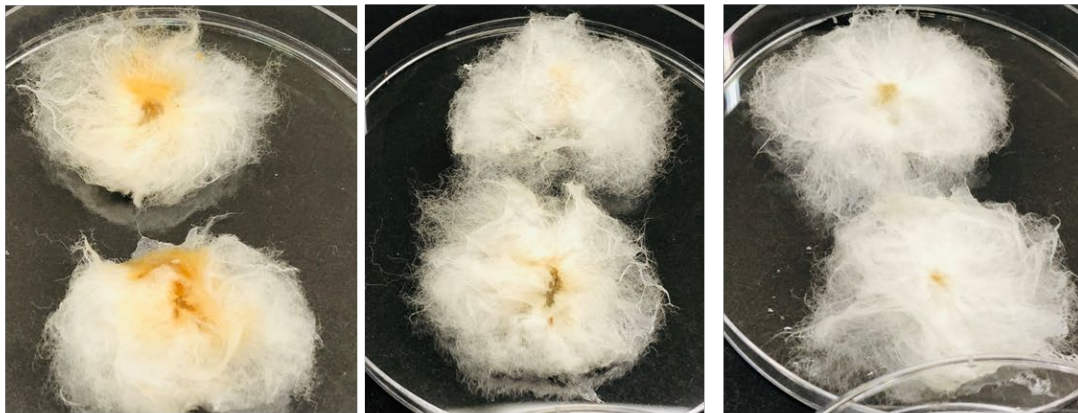


3. We collected stained seed cotton, white seed cotton from the same stained cotton boll, and seed cotton from the white cotton sample. Then we added distilled water to these samples until the seed become wet ($\sim 700 \mu\text{l}$) to check whether the staining is coming from seeds. After 24 h, we could see stained fibers in the white seed cotton that were selected from stained cotton bolls.

Before adding water



Immediately after adding water



24 h after adding water



4. We longitudinally sectioned a couple of seeds from both stained and white cotton samples using a razor blade. The white cotton seeds were hard to cut using the razor blade compared to that of the stained seeds. In addition, seed coats of the white cotton seeds look darker, thicker, and well developed compared to that of the stained sample. The stained cotton seed coats look discolored.



According to these results, stained cotton seed coats seem to be weak, particularly at the Chalazal end. Cotton seed coat contains different biomolecule that could easily stain fibers in the presence of moisture (rain after boll opening or due to the presence of moisture inside cotton bolls even before opening).

5. We collected FTIR spectra from stained fibers, white fibers in stained cotton bolls, and fibers in white cotton.
- Spectra of white fibers collected from both samples look identical and representative of a typical spectrum of mature cotton fibers.
 - Fiber contamination could either increase the intensity of existing infrared vibrations or produce new infrared vibrations.

- There are some spectroscopic differences between white and stained fibers (e. g. at 1596, 1400, 818, 778 cm^{-1}), which are indicative of fiber contaminations with non-cellulosic compounds possibly coming from cotton seeds.

