RECONSTRUCTION OF COMPLETE FIBER LENGTH DISTRIBUTIONS FROM HVI FIBROGRAMS

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Abstract

Length is one of the most critical factors in determining cotton fiber quality as it has been shown to be an essential predictor in yarn quality. The two most common instruments used to measure fiber length are the Uster High Volume Instrument (HVI) and the Uster Advanced Fiber Information System (AFIS). As far as fiber length is concerned, the two instruments differ in that HVI is very fast but provides two measurements of fiber length (upper half mean length and uniformity index derived from only two span lengths in the fibrogram) while the AFIS is much slower but can produce an entire fiber length distribution of a sample from which several length statistics are derived—not only mean and upper half mean but also short fiber content and upper quartile length among others. Due to the slow speed and high cost of AFIS testing, breeders prefer the HVI for a vast majority of their sample testing even though it provides less information. To remedy this, we present a method by which a fiber length distribution can be reconstructed from an HVI fibrogram using established fibrogram theorems based on proven sampling assumptions. First, we show that a simulated sample of fibers based on a bimodal distribution and the sampling assumptions of the fibrosampler matches the mathematical theory. Then, we use the resulting virtual sample to construct a fibrogram on which we apply the newly proposed method. Results show that statistics derived from the reconstructed distribution based on the new method match the same statistics that can be calculated from the given bimodal distribution.