VORTEX SPINNING OF ELITE GERMPLASM

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Abstract

In 1984, the U.S. textile manufacturing industry counted 300,000 rotor spinning positions and 14,330,000 Ring spinning spindles. Ten years later, in 1994, we witnessed a dramatic increase in the number of rotor positions, i.e., 1,008,000 (+336%), and a rapid decline in the number of spindles, i.e., 6,261,000 (-56%). By 2004, the number of rotors were cut by nearly 45% and the number of spindles by 74%. For Ring spinning, it represents a decrease of 88.8% compared to 1984. At its peak (1997), the U.S. textile manufacturing industry consumed 2,471,000 metric tons of cotton (about 10.8 million bales). At its lowest point, in 2011, the consumption of cotton in the U.S. shrunk to 718,490 metric tons (about 3.3 million bales). Since 2008, the consumption has oscillated between 3.3 and 3.8 million bales per year. The decreased consumption of cotton within the U.S. textile manufacturing industry led to an increased reliance on the international market for the sale of U.S. cotton. For example, for the 2018/19 crop year, about 14.8 million bales of cotton were exported, corresponding to 82.7% of the production. But, the focus of the dominant international textile industries is on Ring spinning. China has about 100,000,000 spindles installed. It is 115 times the installed Ring spinning capacity present in the U.S.

Thus, we need to produce cotton that fits the dominant market, i.e., Asia and Ring-spun yarns. It means we need cotton with fibers that are long, uniform, mature, fine, strong, and with low contamination levels. It should be the strategy for the short-term but not for the long-term. Indeed, labor costs in Asia are increasing. It is forcing spinning mills to consider potential alternative spinning technologies such as Airjet/Vortex spinning. If cotton could be adapted to Vortex spinning, its throughput would make it competitive with rotor spinning (faster than rotor). It could produce yarns competitive with Ring-spun yarns in some market segments such as the 30Ne, the primary target market for U.S. cotton (the range of possible yarn counts is narrower than for Ring spinning). However, because of poor fiber length distribution compared to synthetic fibers, cotton is not the fiber of choice in the Vortex spinning market. Therefore, this project aims to determine the impact of fiber properties on Vortex yarn quality.

Fifteen elite lines from the Wayne Smith program were grown in College Station in 2019 and 2020. We observed good correlations for most fiber properties between the two test years. These correlations are better than expected as very different growing conditions, harvesting methods (hand in 2019, machine in 2020), and ginning (pre-cleaning in 2020 but not in 2019) were observed in 2019 and 2020. Due to the poor weather conditions in 2020, bundle strengths tend to be lower and SFC(w) higher in 2020. This logically translated into poorer length distributions in 2020. Nevertheless, several of these lines performed extremely well in Vortex spinning both years. Some are far surpassing the Uster statistics for a few yarn quality parameters.

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