EFFECT OF HARVEST CONDITIONS AND LEAF HAIRINESS ON FIBER QUALITY

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Abstract

Recently, instances of what is referred to as "wet cotton" arriving at gins in the Texas High Plains has been on the increase. There are several theories as to the cause behind this increase, including improper desiccation of stripper-harvested cotton, the harvest of immature plants, harvesting in conditions of high humidity, or the new on-board module building stripper not allowing modules to breath and dry as much as traditional modules. Regardless of the cause, this issue has resulted in cotton that is more difficult to gin, particularly during the lint cleaning process, and has also impacted fiber quality. The objective of this study was to determine the impact of humidity conditions at harvest by stripping cotton at what is typically thought of as acceptable (<50% relative humidity) and above this 50% mark. Additionally, the leaf hairiness of varieties can impact fiber quality such as leaf grade and trash (Byrd et al., 2016). An additional objective was to determine if leaf hairiness or conditions at harvest had a great influence on fiber quality, or if there was any interaction, two smooth leaf and two hairy leaf varieties were included in the study. The heightened potential for leaf grade or trash content of ginned lint resulting from hairy leaf varieties could increase if these varieties were harvested during elevated humidity levels, resulting in higher seed cotton moisture content and reduced lint cleaning efficiency.

Two locations were utilized in 2017, one in Halfway, TX which was stripper harvested and in Snook, TX which was harvested with a picker-type harvester. The same varieties were planted at each location, which included the smooth leaf Fiber 1830 GLT (FM 1830) and NexGen 3522 B2XF (NG 3522 B2XF) and the hairy leaf Deltapine 1522 B2XF (DP 1522 B2XF) and PhytoGen 333 WRF (PHY 333 WRF). The actual trichome densities were determined by counting the number of trichomes per cm^2 on the leaves as well as the bracts from samples taken from each location. Harvest was scheduled to occur in a single day when conditions, specifically humidity levels, would vary within the same day to minimize the detrimental impacts of weathering were harvested to be separated by several days. At each location, an approximately 9 kg sample was collected from each plot and ginned at the USDA Cotton Production and Processing Research Center in Lubbock, TX. After ginning, samples were classed at the Texas Tech Fiber and Biopolymer Research Institute in Lubbock, TX.

Bract trichome density on both DP 1522 B2XF and PHY 333 WRF was greater by approximately 30 bracts cm^2 than FM 1830 GLT and NG 3522 B2XF, while the same pattern existed for leaf trichomes with differences ranging from 100 – 140 trichomes between the smooth and hairy leaf varieties. The same relationship was also present in bract trichome density from the Snook location, although DP 1522 B2XF had significantly fewer bracts cm^2 than PHY 333 WRF, but was no different than FM 1830 GLT. Similar to the bract trichome densities, DP 1522 B2XF had fewer leaf trichomes cm^2 than PHY 333 WRF, but was no different than FM 1830 GLT and NG 3522 B2XF. At harvest, humidity levels at the Halfway location averaged 31% during the optimal or low humidity harvest period, while at the elevated or high humidity harvest period humidity averaged 48%. Humidity levels at the Snook location ranged from 58 – 59% during the optimal harvest period, or when humidity was reduced, while during the elevated harvest period (increased humidity levels), humidity ranged from 74 – 84%. Although the moisture content of the harvested seed cotton measured in the field directly after harvest at both locations was significantly increased at the elevated harvest period compared to the optimal period, there were no differences in moisture content of the seed cotton when it was measured on the feeder apron immediately prior to ginning. While no fiber quality impact was observed due to harvest conditions, there was increased leaf grade present at the Halfway location resulting from PHY 333 WRF and DP 1522 B2XF, the two hairy leaf varieties, which agrees with the findings of previous research (Byrd et al., 2016).

While there was no impact of harvest conditions observed in either location, it is likely that more research is need from a sampling or storage aspect to fully determine the impact of humidity at harvest and potential interaction with variety hairiness characteristics. In the current study, samples were placed in mesh bags and stored in these bags until ginning. Replicating the round module by creating a more tightly packed but smaller version on these modules, or locating grower-cooperators and utilizing their commercial machines and round modules for this study would likely be more reflective of real-world scenarios. With increases in both cotton acreage and the utilization on-board module builder strippers and pickers, questions surrounding harvest conditions and the impact of variety characteristics, and harvest equipment, will continue.

References

Byrd, S.A., G.D. Collins, K.L. Edmisten, P.M. Roberts, J.L. Snider, T.A. Spivey, J.R. Whitaker W.M. Porter, and A.S. Culpepper. 2016. Leaf pubescence and defoliation strategy influence on cotton defoliation and fiber quality. Journal of Cotton Science 20: 280-293.