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CHARACTERIZATION OF HARVEST BY HEAT UNIT ACCUMULATION

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Abstract

Improvement in cotton *(Gossypium hirsutum* L.) management is essential to maintain profitable and sustainable production. Effective harvest aid application and timing is an important step in producing profitable and premium quality cotton. Improper timings and/or application of harvest aid materials can potentially impact overall cotton yield and lint quality, thereby influencing net returns obtain by the producer. There are many methods currently used in determining proper timing of harvest aid materials. One of the methods currently used is the use of growing degree-day units and/or heat units (HU) to assess maturity and timing of harvest aid application, providing a more scientific assessment of maturity based upon cotton maturity indices. The growing degree-day concept bases harvest aid application on accumulated heat units after physiological maturity (i.e. cutout, nodes above white flower – NAWF=5). From cutout, heat units are accumulated to determine harvest aid application. Currently, 850 HU after cutout is the guideline set for harvest aid application. However, in some areas this benchmark appears to result in early application of defoliants resulting in decreased lint yield. Field studies were conducted, in 2000 (one location) and 2002 (two locations), at the Texas Agricultural Experiment Station in Burleson County, near College Station, TX. Two cotton varieties, DP 20B and DP 422B/RR, were planted and subsequently treated with harvest aids at 650, 750, 850, 950, and 1050 HU after cutout. Harvest aid application, across all treatments, consisted of a tank-mix with Dropp® (thidiazuron) @ 0.1 lb./A, Folex®/Def® (tribufos) @ 1.0 pt./A, and Prep™ (ethephon) @ 1.33 pt./A being applied at each accumulated HU. All treatments were then machine harvested, with a two-row spindle picker, 14 days after harvest aid application to obtain lint yield and fiber characteristics. Both cotton varieties exhibited the same response, in all years, with respect to defoliation and percent open bolls at day of harvest aid application and harvest. Increasing heat units accumulated after cutout significantly improved overall harvest aid performance. Furthermore, 650 and 750 HU treatments did not provide acceptable defoliation performance at harvest while all other treatments were within acceptable ratings. Treatments having less than 950 HU exhibited 50 percent or less open bolls on day of harvest aid application. At 14 DAT, 650, 750, and 850 HU had less than 84 percent open bolls where 950 and 1050 HU showed greater than 90 percent open bolls. The effect of overall defoliation and percent open bolls at harvest was more realized with lint yields ranging from 703 (DP 422B/RR) and 803 (DP 20B) to 1240 (DP 422B/RR) and 1290 (DP 20B) lbs. of lint per acre with 650 HU yielding the least and 1050 HU being the most. Most notable was that 850 HU yielded only 941 and 1019 lbs. of lint per acre for DP 422B/RR and DP 20B, respectively. Even though as HU increased after cutout and lint yield was also significantly increased, micronaire values also increased. The effect of increasing micronaire could potential lead to lint quality deductions decreasing overall price per pound. However, the overall financial influence in this study with all fiber quality discounts and premiums, using 2002 CCC loan values, resulted in significantly increased net returns ranging from 309 (DP 422B/RR) and 361 (DP 20B) to 552 (DP 422B/RR) and 573 (DP 20B) dollars per acre. The overall conclusion from these studies indicates that increasing time after cutout to harvest aid application will increase overall lint yield, but will also increase micronaire values which may reduce overall price per pound. Also, 850 HU does not appear to be a benchmark for cotton harvest aid appliaction. These data also lead to the conclusions that NAWF=5 is not indicative of cotton cutout and/or an upper limit threshold may need to be implemented in calculating growing degree-days in cotton. These two factors together or singularly would delay harvest aid application after cutout thereby increasing lint yield. Further evaluation regarding the definition of cotton cutout (i.e. physiological maturity), boll maturity indices, and last effective boll population needs to be closely evaluated to improve timing of harvest aid applications using heat units.