NODES ABOVE WHITE FLOWER AND HEAT UNITS AS INDICATORS OF HARVEST AID TIMING Josh B. Bynum, J. Tom Cothren, and Robert G. Lemon<br>Texas A\&M University<br>College Station, TX<br>James R. Mahan<br>USDA-ARS<br>Lubbock, TX


#### Abstract

Management strategies to optimize cotton yields may be achieved by fine-tuning current practices. Various methods are currently used to determine timing of harvest aid application. One method is the use of growing degree-day units and/or heat units (HU). This concept triggers harvest aid application based on accumulated heat units following cutout, which is defined as the time when the nodes above white flower equals five (NAWF=5). A guideline has been set for harvest aid timing to occur at 850 HU after cutout. In some regions, it appears that this guideline calls for harvest aid application prematurely, and may potentially reduce overall yield. A study was conducted at the Texas Agricultural Experiment Station in Burleson County, Texas, to assess proper timing of harvest aid application. The study was arranged in a split-plot design with four replications. Treatments consisted of evaluating HU accumulations of $650,750,850,950$ and 1050 once the crop has reached NAWF $=3,4$ or 5 . There were significant differences in percent open boll counts at defoliation for both NAWF and HU. NAWF $=4$ and 950 HU most closely coincided with the 60 percent open boll method of harvest aid timing. Significant differences occurred between NAWF and HU for percent open boll at harvest. No significant differences were observed between NAWF for lint yield; however, there were differences in lint yield for HU with 950 and 1050 yielding more than the other treatments.


## Introduction

Timing of harvest aid application is critical and poses potential problems when mistimed. The consequences of premature harvest aid application could result in reduced profit to the grower through additional applications, reduced lint yield, poor fiber quality, and delayed harvest (Witten et al., 2003). A delayed application of harvest aids may also reduce lint yield and fiber quality through late season inclement weather. Currently, there are many methods utilized for determining application of harvest aid materials. One method utilizes accumulated heat units (HU or DD60's) following physiological maturity, known as cutout. Cutout is the growth stage where five nodes are found above the uppermost first position white flower. Upon reaching cutout, HU are calculated by taking the average of the maximum daily temperature and the minimum daily temperature and subtracting the base temperature of $60^{\circ} \mathrm{F}$.

## Objectives

The objectives of this study were 1) to determine the proper timing for harvest aid application to optimize lint yield and fiber quality through calculating accumulated heat units after reaching cutout and furthermore, 2 ) to determine if the current guideline of NAWF $=5$ and 850 HU is indicative of proper harvest aid timing.

## Materials and Methods

The following study was conducted at the Texas Agricultural Experiment Station in Burleson, County, Texas. The field study was arranged as a split-plot design with three nodal positions of NAWF $=3,4$, and 5 as the main plots and 5 subplots of $650,750,850,950$, and 1050 accumulated HU. Treatments were replicated four times and plots were four rows wide by 32 feet in length on 40 -inch centers. All treatments were defoliated with a tank-mix of Dropp 50 WP ( $0.1 \mathrm{lb} / \mathrm{A}$ ), Def 6EC ( 6.0 $\mathrm{oz} / \mathrm{A})$, and Prep 6EC ( $21.3 \mathrm{oz} / \mathrm{A}$ ), and the middle two rows of each plot was harvested 14 days after defoliation. Assessment of treatment effects were obtained by percent open boll counts immediately prior to defoliation, and percent open boll counts at day of harvest. A 10 -saw gin was utilized for processing seed cotton to determine lint yield. Samples were sent to the International Textile Center in Lubbock, Texas, to evaluate lint quality. Statistical analysis used was the general linear model in SAS v8.02, and means were separated using Fisher's Protected LSD at the $5 \%$ significant level for all parameters.

## Results and Conclusions

Significant differences were present for percent open boll counts at defoliation (POBD) for the NAWF main effect treatments, with NAWF $=3$ and 4 being greater than NAWF $=5$ (Table 2). Heat units also had a significant effect on POBD with 1050 HU being greater than all others (Table 2). NAWF $=4$ and 950 HU most closely coincided with the 60 percent open
boll method of harvest aid timing. Significant differences occurred between NAWF and HU for percent open bolls at harvest POBH (Table 3). No significant interaction was detected between NAWF and HU for lint yield. No significant differences were observed between NAWF and lint yield; however, yields for HU at 950 and 1050 were higher than all other treatments. The NAWF $=4$ and 1050 HU treatment produced the highest yield.

## References

SAS Institute. 1999. The SAS System for Windows - Release 8.02. SAS Institute, Cary, NC.
Witten, T.K. and J.T. Cothren. 2003. Characterization of Harvest By Heat Unit Accumulation. Proceedings of the Beltwide Cotton Conference, Nashville, TN. 6-10 Jan. 2003. National Cotton Council of America, Memphis TN.

Table 1. Defoliation timings

| Heat Units | $\mathbf{5}$ | $\mathbf{4}$ | $\mathbf{3}$ |
| :---: | :---: | :---: | :---: |
| 650 | $8 / 21$ | $8 / 25$ | $8 / 27$ |
| 750 | $8 / 25$ | $8 / 29$ | $9 / 1$ |
| 850 | $8 / 29$ | $9 / 2$ | $9 / 5$ |
| 950 | $9 / 2$ | $9 / 8$ | $9 / 11$ |
| 1050 | $9 / 8$ | $9 / 13$ | $9 / 16$ |

Table 2. Percent open boll at defoliation.

| Heat Units | $\mathbf{5}$ | $\mathbf{4}$ | $\mathbf{3}$ | Pr $>\mathbf{F}<.0001$ |
| :---: | :---: | :---: | :---: | :---: |
| 650 | 7.07 | 13.06 | 12.99 | 11.0 d |
| 750 | 12.34 | 13.11 | 16.69 | 14.1 d |
| 850 | 29.10 | 33.81 | 34.93 | 32.6 c |
| 950 | 36.67 | 59.76 | 54.89 | 50.4 b |
| 1050 | 61.44 | 70.58 | 84.96 | 72.3 a |
| Pr>F.022 | 29.32 b | 38.07 a | 40.85 a |  |

Table 3. Percent open boll at harvest.

| Heat Units | $\mathbf{5}$ | $\mathbf{4}$ | $\mathbf{3}$ | Pr $>\mathbf{F}<. \mathbf{0 0 0 1}$ |
| :---: | :---: | :---: | :---: | :---: |
| 650 | 26.81 | 31.48 | 48.08 | 35.5 d |
| 750 | 34.10 | 35.54 | 38.66 | 36.1 d |
| 850 | 58.97 | 74.13 | 79.93 | 71.0 c |
| 950 | 64.33 | 91.94 | 93.56 | 83.3 b |
| 1050 | 97.70 | 98.62 | 97.34 | 97.9 a |
| $\operatorname{Pr}>\mathrm{F} .0004$ | 56.38 c | 66.34 b | 71.52 a |  |

Table 4. Lint yield (lb/A).

| Heat Units | $\mathbf{5}$ | $\mathbf{4}$ | $\mathbf{3}$ | Pr>F $<\mathbf{0 0 0 0 1}$ |
| :---: | :---: | :---: | :---: | :---: |
| 650 | 950 | 973 | 1036 | 987 b |
| 750 | 976 | 1061 | 1050 | 1029 b |
| 850 | 988 | 1093 | 1062 | 1048 b |
| 950 | 1082 | 1157 | 1135 | 1125 a |
| 1050 | 1161 | 1172 | 1144 | 1159 a |
| $\operatorname{Pr}>\mathrm{F} 0.12$ | 1032 a | 1091 a | 1085 a |  |

