HARVEST AIDS TIMING AND SCHEDULING

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Abstract

Harvesting cotton as early as possible increases the likelihood of more ideal weather conditions and higher lint quality during the first part of the harvest season. It is important to apply harvest aids early enough to take advantage of the benefits of early harvest, while avoiding application so early that it decreases yield and quality of the cotton.

Introduction

Timing of harvest-aid applications is not exact. There is a relationship between maturation of later-developing bolls and degradation of the earlier bolls that already are open. The correct decision is a compromise between these two factors. Timing of harvest-aid application varies with the area of the country, harvest-aid materials used, type of harvest, and individual preferences.

Discussion

When harvest aids first were introduced. They were applied according to historical harvest dates; however, factors such as weather, heat unit accumulation, and cotton varieties made this technique largely undependable. Currently, timing is determined by the combination of techniques, each of which further confirms and verifies the others. These techniques are Percent Open Bolls, Cut Boll Technique, and Nodes Above Cracked Boll (NACB).

Percent Open Bolls

Percent Open Bolls was one of the earliest techniques developed; it was used extensively prior to the introduction of hormonal boll openers. Decisions for timing of defoliation were made by counting the total number of bolls on the plant that would contribute to harvest and calculating the percentage of these bolls that were open. The primary problem with this technique when used alone is that it does not allow for differences in boll development throughout the plant. If there is a gap in the fruiting pattern, some harvestable bolls may not be allowed to mature. Recommendations vary, but, for timing of defoliants, 65 to 90 percent of bolls should be open; for timing of desiccants in stripper cotton, 80 percent or more of bolls should be open. This technique should not be used alone, but rather in support of the other techniques described below.

Cut Boll Technique

The Cut Boll Technique is used to determine the maturity of the seed inside of the boll. This technique has been used extensively since development of hormonal defoliants and boll openers. Cutting a mature green boll is roughly equivalent to cutting a one-inch diameter, wet cotton rope, and the knife must be sharp to obtain usable results. Be careful with this technique: Immature green bolls are sliced easily and lack of resistance may cause an accident! Mature green bolls are difficult to slice; when sliced, the seed inside the mature boll will have a dark seedcoat and a fully developed pale green embryo inside. Seeds that are not yet mature will have a light-colored seedcoat and will contain a gelatin-like substance.

The Cut Boll Technique is straightforward, but the difficulty in making a timing decision involves determining the uppermost harvestable boll. If the cotton has experienced a definite cutout, normally the top large-sized green boll is the uppermost harvestable boll. There will be a definite gap between this boll and the smaller bolls on the top of the plant. If the cotton plant does not have this gap in fruiting, a realistic top harvestable boll must be selected and monitored, and recommendations should be based on this boll. Slight changes might need to be made as the time for defoliation approaches.

Nodes Above Cracked Boll

Nodes Above Cracked Boll (NACB) is a relatively new technique that uses the principles of plant monitoring to determine the proper time for harvest-aid application. This technique can use average heat unit accumulations to determine whether the plant is ready for harvest-aid application or approximately how long it will be until the plant is ready. Square initiation, flowering, and boll development proceed up the main stem in an orderly manner during the life of the cotton plant. At first-position fruiting sites, the difference in age of each node is approximately three days, or 55 heat units. This relationship occurs in theory throughout boll development in the plant. As the end of the season approaches and daily heat unit accumulation declines, allowance will need to be made for the three-day rule. The difference between nodes may be four – even five – days as the season end nears and cooler temperatures are present.

The NACB technique was developed from data generated in a Cotton Foundation-supported project (Kerby *et al.,* 1992). Field tests were conducted in California in 1989-1991 and in Oklahoma, Texas, and Mississippi in 1990 and 1991. The tests were set up with the following comparisons:

Plot A. On the day of defoliation, all FB1 (first fruiting branch) bolls were harvested from the fruiting branch with a cracked boll (NACB = 0) and the next eight nodes above this cracked boll. In some locations, only six nodes above the cracked boll could be harvested. Bolls were mechanically opened and allowed to dry. Lint was pooled from each position and ginned. Average lint per boll and fiber quality were determined for each respective position.

Plot B. On the day of defoliation, the fruiting branch with an FB1 cracked boll was tagged, and the plot was defoliated with 1.0 pound active ingredient per acre of Prep® tank-mixed with 2.0 pounds per acre of Folex® or Def®. When the effects of the harvest aid were fully expressed, the plots were harvested by position as related to NACB at the time of defoliation. Lint was pooled from each position and ginned, and fiber measurements were made as described in plot A.

Plot C. Plants were tagged as in plot B, but the plot did not receive any harvest-aid treatment. These plants were allowed to develop, and, late in the season when all the harvestable bolls were open, the plants were harvested by position according to where the cracked boll was located when the other plots were marked. Again, lint was pooled by position and ginned, and fiber measurements were made.

These treatments were made earlier than normal to ensure enough node positions above the FBI cracked boll to the top of the plant. In the less-determinate picker varieties, the number of positions above cracked boll usually equaled eight, but in the more-determinate stripper varieties of cotton, it was difficult to obtain an adequate sample size for more than six nodes above the cracked boll. At each test location, 200 to 300 plants were tagged for each treatment. In each test, the number of bolls for each position averaged between 50 and 150, providing sufficient sample size to make weight and fiber determinations. Standard HVI (High-volume Instrumentation) fiber analysis was performed by the Textile Research Center at Lubbock, Texas.

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The difference in boll size between plots that were harvested on the day of defoliation and those that had been treated with a harvest aid. This begins at the 2 NACB position and increases as NACB increases. At 4 NACB, bolls that were harvested after defoliation were 12 percent larger than those harvested immediately prior to defoliation and approximately 7 percent smaller than those allowed to remain on the plant until late in the season. Once boll size begins to be affected by increasing NACB, the relationship is nearly linear. Boll size decreased an average of 6.7 percent for each NACB greater than 2.8 at the time of defoliation. This relationship was true across all locations of the study. These data demonstrate that cotton bolls continue to gain weight after a defoliation treatment. Under a more harsh treatment, such as a high rate of desiccant, this increase in size would not be expected.

Evaluation of the data indicated that the only fiber property affected by early defoliation was micronaire. Differences in micronaire between bolls harvested at the time of defoliation and those harvested after defoliation began between 2 and 3 NACB and progressed in a nearly linear relationship. Micronaire decreased an average of 5.9 percent for each in NACB above 2.6. The rate that increasing NACB decreased micronaire differed by state, with the least effect in California and Oklahoma, and the greatest effect in Texas and Mississippi.

For these data to be accurately used, the number of fruiting branches and contribution of each position must be noted. Data have been developed in Mississippi (Jenkins *et al.,* 1990) and in California (Kerby *et al*., 1987) to determine fruiting patterns of cotton. These data show that, as node number at the top of the plant increases, the percentage contribution of each position decreases dramatically. Programs have been developed to calculate potential yield and micronaire loss using data for fruiting-site contribution under specific conditions. When these data were summarized, it was determined that defoliation of cotton at NACB of less than or equal to 4 results in a yield loss of less than one percent with no reduction in fiber quality. Defoliating at an NACB of greater than 4 may allow more immature fibers to be harvested, decreasing micronaire. In may cotton production regions. Producers may need to lower micronaire values to avoid high micronaire discounts. Under these conditions, defoliation at 5 or 6 NACB might be desirable.

Summary

Timing of harvest aids is accomplished by three techniques. These are (1) Percent open boll; (2) Cut boll technique; and (3) Nodes above cracked boll technique. More accurate timing determinations can be obtained by using combinations of these techniques.