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SURVIVAL OF BOLL WEEVILS TRAPPED UNDER COTTON MODULE TARPS

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Abstract

The effect of module tarps on survival of boll weevils trapped on the upper surface of the module by the tarp was investigated. Weevil mortality was very high during hot weather whether weevils were under the module tarp or not. Significant differences in mortality between the tarped and untarped areas were noted during the moderate weather period, but not during the hot or cold weather periods indicating that extremes of temperature override any influence of the tarp. Variation in temperature indicated that weather factors such as solar radiation and rainfall may have different effects on the tarped and untarped areas. Work is in progress to develop a multiple variable model to predict weevil mortality from weather data factors, then to develop simple criteria to predict whether a cotton module has live weevils under the tarp.

Introduction

The lack of uniformity in the progress of boll weevil (*Anthonomus grandis* Boheman) eradication between the various cotton growing areas of Texas has raised concerns about transportation of live boll weevils in harvested cotton into areas from which the boll weevil has been "eradicated". Many gins take modules from large areas that include parts of different eradication zones at different levels of eradication. Boll weevils harvested with cotton and located on the upper surface of modules are probably trapped by module tarps then transported along with the module to the gin. It is possible that under some conditions weevils trapped under a module tarp may survive long enough to be released when the module tarp is removed prior to ginning.

The objective of the study was to determine what effect module tarps have on survival of boll weevils trapped on the upper surface of the module by the tarp.

Materials and Methods

A cotton module was placed in an area where no objects would shade the module during the day. Half of the module was covered with a blue, polyethylene module tarp and half was covered with 1x1inch nylon netting. Four sites were established on the module: two under the tarp at the center and end of the module, and two in the untarped, netted area also at the end and center of the module (Fig. 1).

A CR10 weather data logger (Campbell Scientific, Logan, UT) was placed next to the module and temperature probes were placed at two locations in the tarped and untarped areas (end and center of module) (Fig. 1). The logger was also configured to record air temperature and solar radiation. Hobo pro temp/rh (Onset Corp., Bourne, MA) units were placed at the same locations as the CR10 probes to record relative humidity.

Boll weevil mortality in the tarped and untarped areas of the module was measured by placing weevils confined in 10 by 4 cm cylindrical cages constructed from aluminum window screen and hot glue. Cotton was loosely placed along the bottom of each cage and weevils were placed atop the cotton. Cages were placed on the module with the weevils turned upward. Four cages were placed per site (16 cages per sample date) (Fig. 1), then a cage from each of the four sites was removed at 1, 2, 3 and 4 days after placement (DAP) and the weevils were examined for mortality using a heat table.

A second test was established to measure the effect of module tarp color on "under tarp" temperature. A second module was covered in strips with blue, yellow, white, black, silver and green tarps. A Campbell Scientific CR-10 and three HOBO dataloggers were installed to record temperatures.

Results and Discussion

During the cold and moderate weather periods weevil mortality increased with time both under the tarp and in the open area (Figs. 2 and 3). However, during the hot weather period, almost all mortality (95%+) occurred within one day after placement. This indicates that in hot weather weevils do not survive for long periods on the tops of modules, whether under a module tarp or not.

In all cases, weevil mortality under the module tarp was numerically lower than that in the open area (Figs. 4, 5 and 6). During the moderate weather period weevil mortality was significantly higher in the untarped area at all of the post placement intervals. During the cold and hot weather periods there were no significant differences in weevil mortality between the tarped and untarped areas at any of the collection intervals (DAP). Boll weevil mortality appears to be significantly lower under a module tarp in moderate weather. It is possible that extremes of temperature overcome any effect of the tarp on weevil mortality.

Average temperature across the four day time interval corresponding to each weevil test group by tarped and untarped area is shown in Fig. 7. In general, the tarped area had higher average temperatures during hot intervals and lower temperatures during cold and moderate intervals. This is not true in every case, though, suggesting that other factors such as solar radiation and rainfall may have different effects on the temperatures under the tarp and in the open area.

This report reflects preliminary analysis of the data. There was some weevil survival under the module tarp at 4 DAP in all of the three weather periods (Fig. 2). A computer model is under construction to predict weevil mortality (both under the module tarp and in the open area, and by tarp color) from multiple variables including temperature, solar radiation, relative humidity and rainfall. This model should allow the definition of relatively simple criteria such as number of hours above or below a temperature threshold on dry or wet, sunny or cloudy days that will result in 100% weevil mortality. These criteria can then be used to used to predict whether a module harvested in a boll weevil infested area is likely to have live weevils under the tarp prior to transport or ginning.

Acknowlegement

The authors wish to thank Lanthia Jones, Andy Cranmer, Trey Archer and Jimmie Castro for their assistance in completing the experiment.

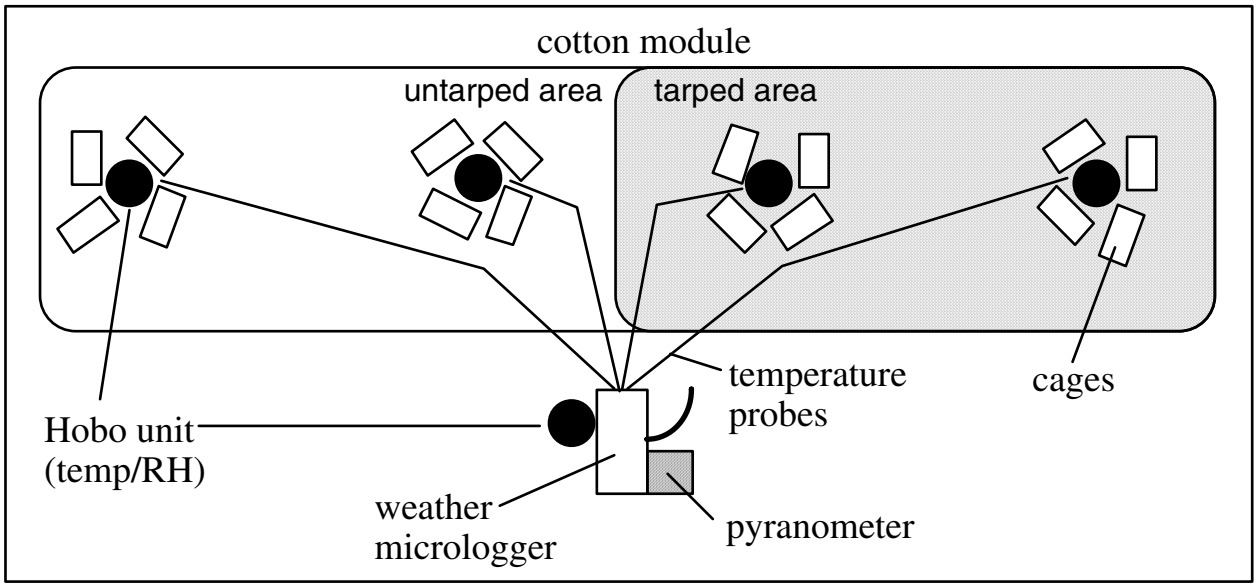

Figure 1. Diagram of module survival study, Lubbock, TX, 2001-02.

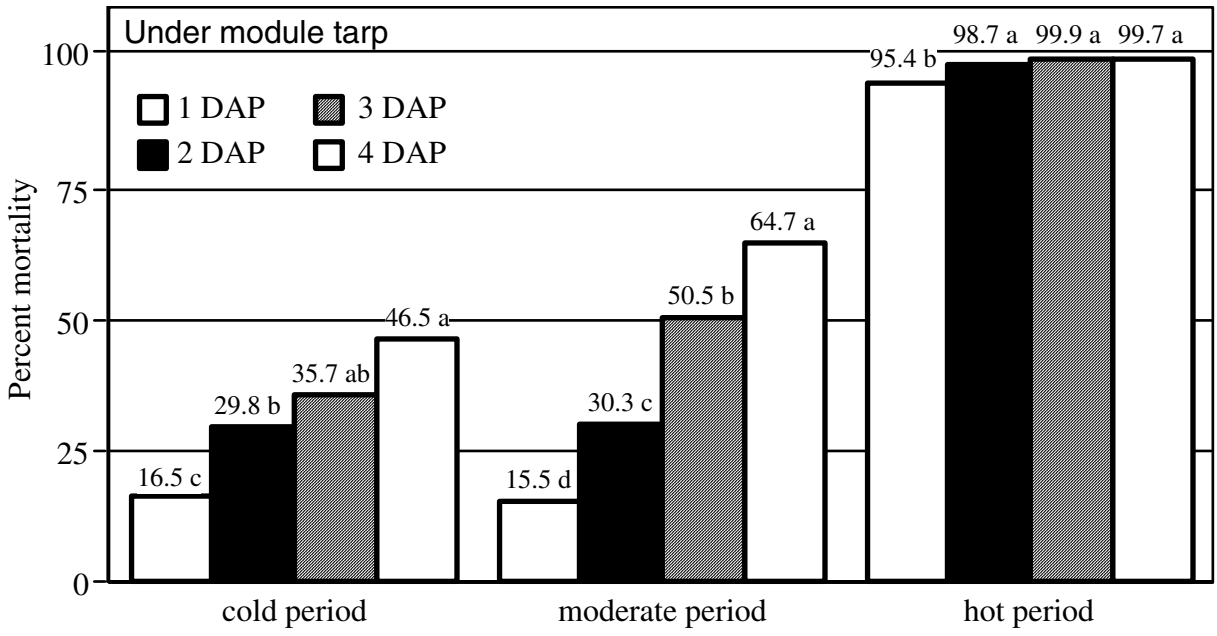

Figure 2. Percent mortality of boll weevils placed on the upper surface of a cotton module under a module tarp by day after placement (DAP) and temperature period. Months included in temperature periods: cold, Nov. to mid-Feb.; moderate, mid-Feb. to April and mid-Sept. to Oct.; hot, June to Mid-Sept. By temperature period, means followed by the same letter are not significantly different (P>0.05, LSD).

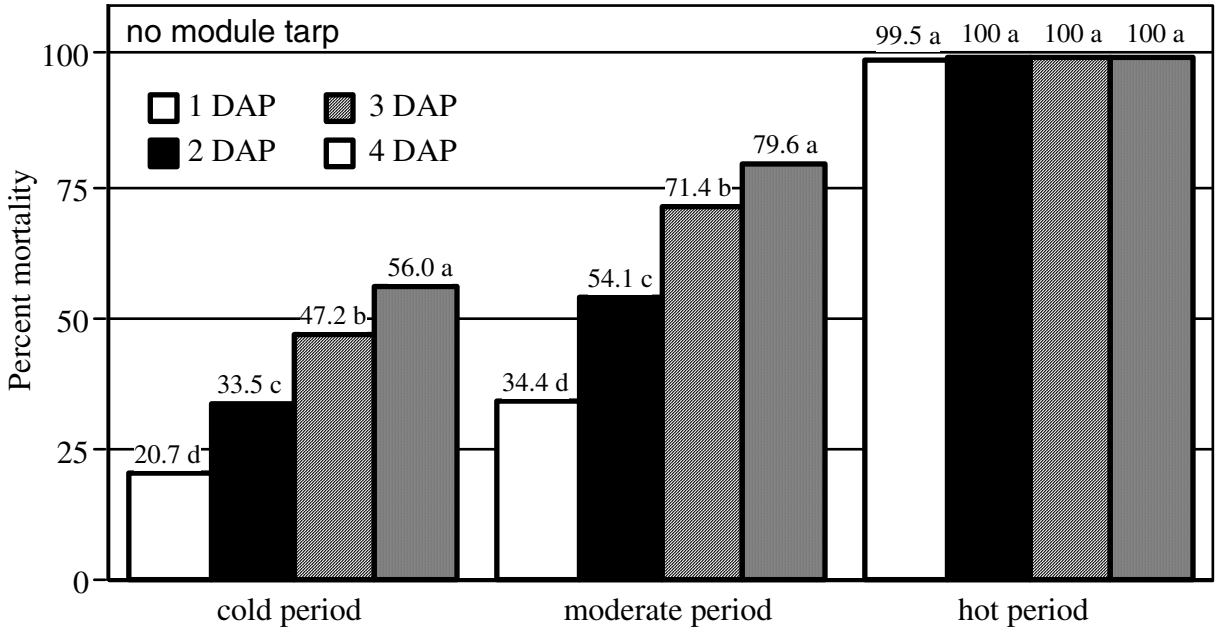

Figure 3. Percent mortality of boll weevils placed on the upper surface of a cotton module by day after placement (DAP) and temperature period. Months included in temperature periods: cold, Nov. to mid-Feb.; moderate, mid-Feb. to April and mid-Sept. to Oct.; hot, June to Mid-Sept. By temperature period, means followed by the same letter are not significantly different (P>0.05, LSD).

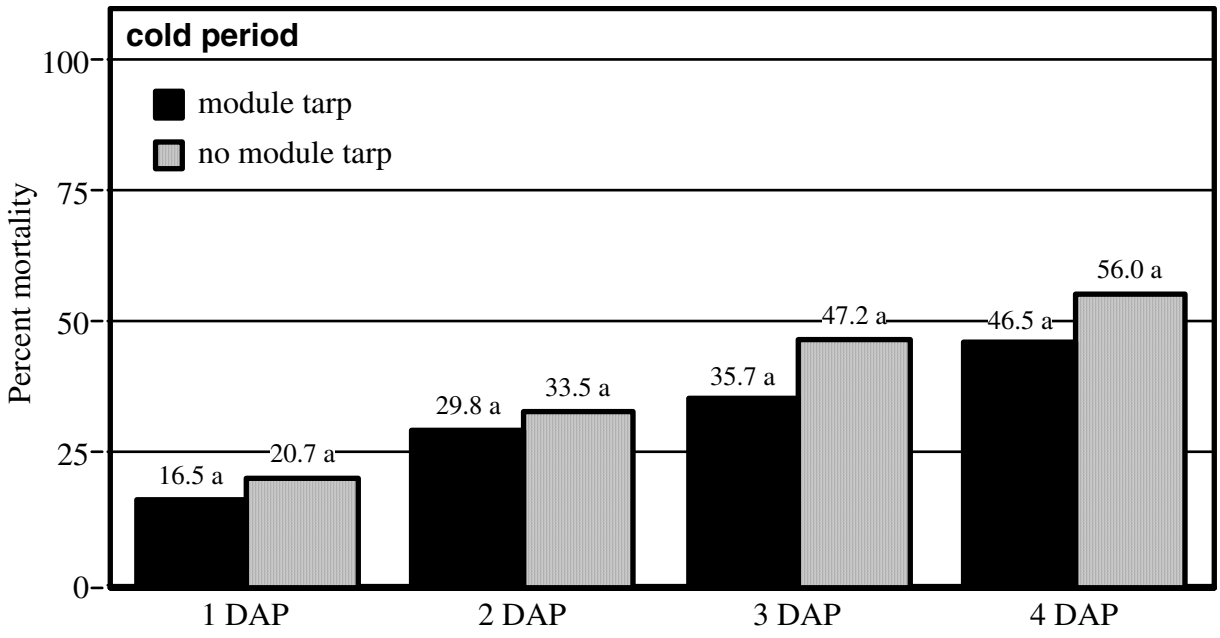

Figure 4. Percent mortality of boll weevils on the upper surface of a cotton module by tarping and day after placement (DAP) during a cold temperature period (Nov. to mid-Feb). By DAP, means followed by same level are not significantly different (P>0.05, LSD).

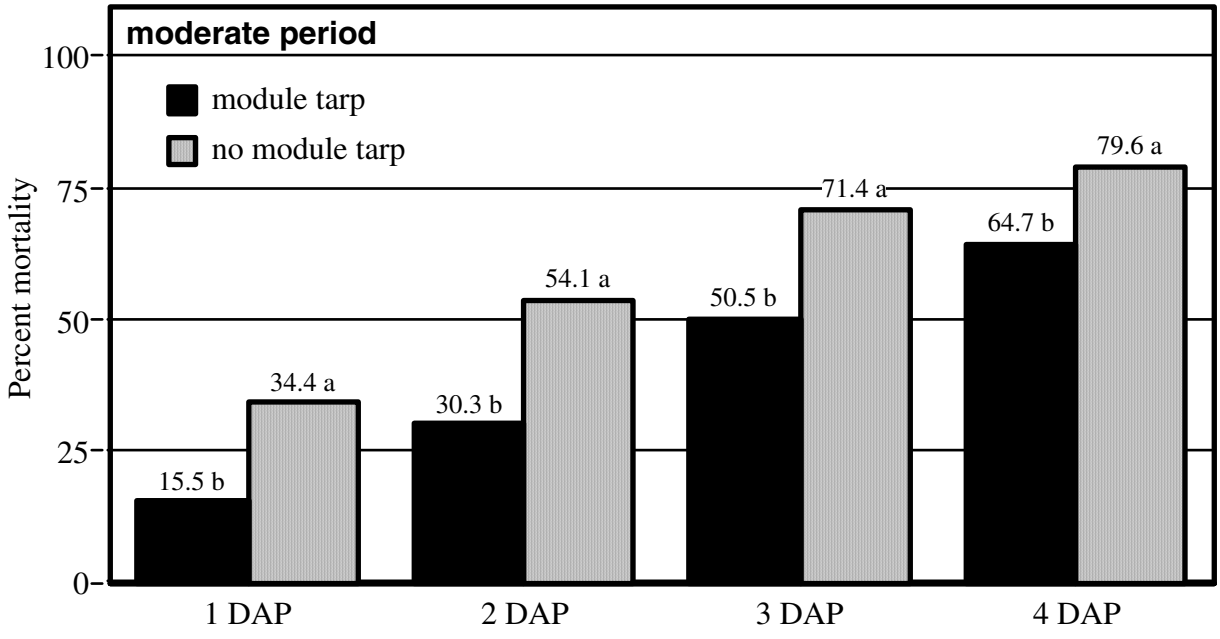

Figure 5. Percent mortality of boll weevils on the upper surface of a cotton module by tarping and day after placement (DAP), during a moderate temperature period (mid-Feb. to April and mid-Sept. to Oct). By DAP, means followed by same level are not significantly different (P>0.05, LSD).

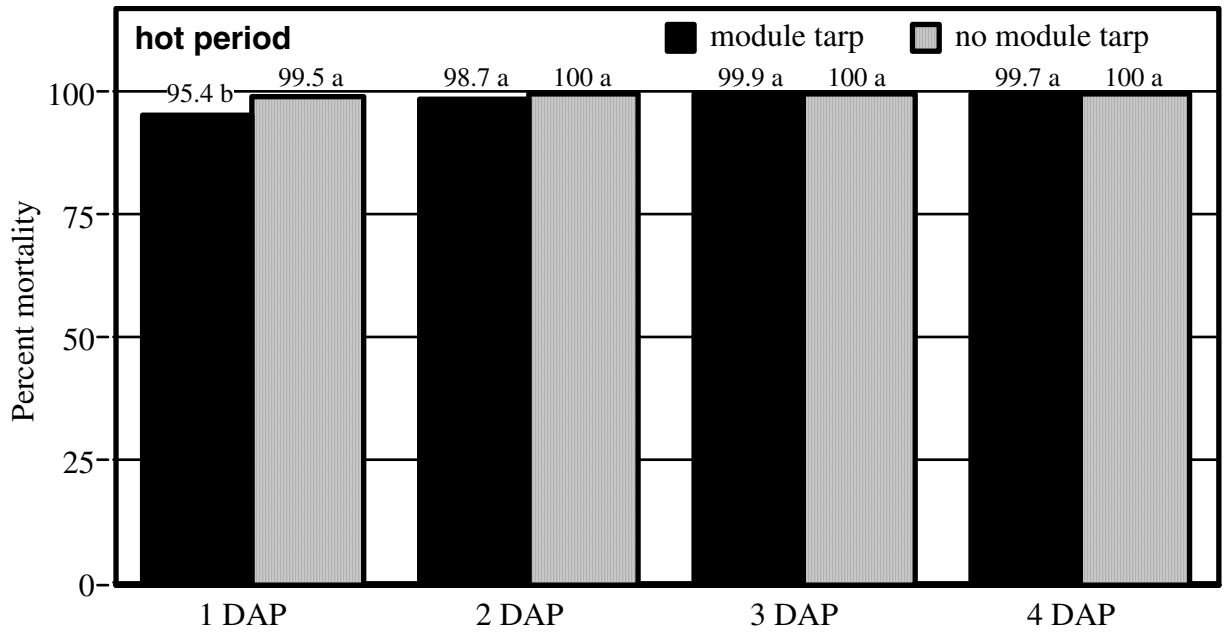

Figure 6. Percent mortality of boll weevils on the upper surface of a cotton module by tarping and day after placement (DAP), during a hot temperature period (June to Mid-Sept). By DAP, means followed by same level are not significantly different (P>0.05, LSD).

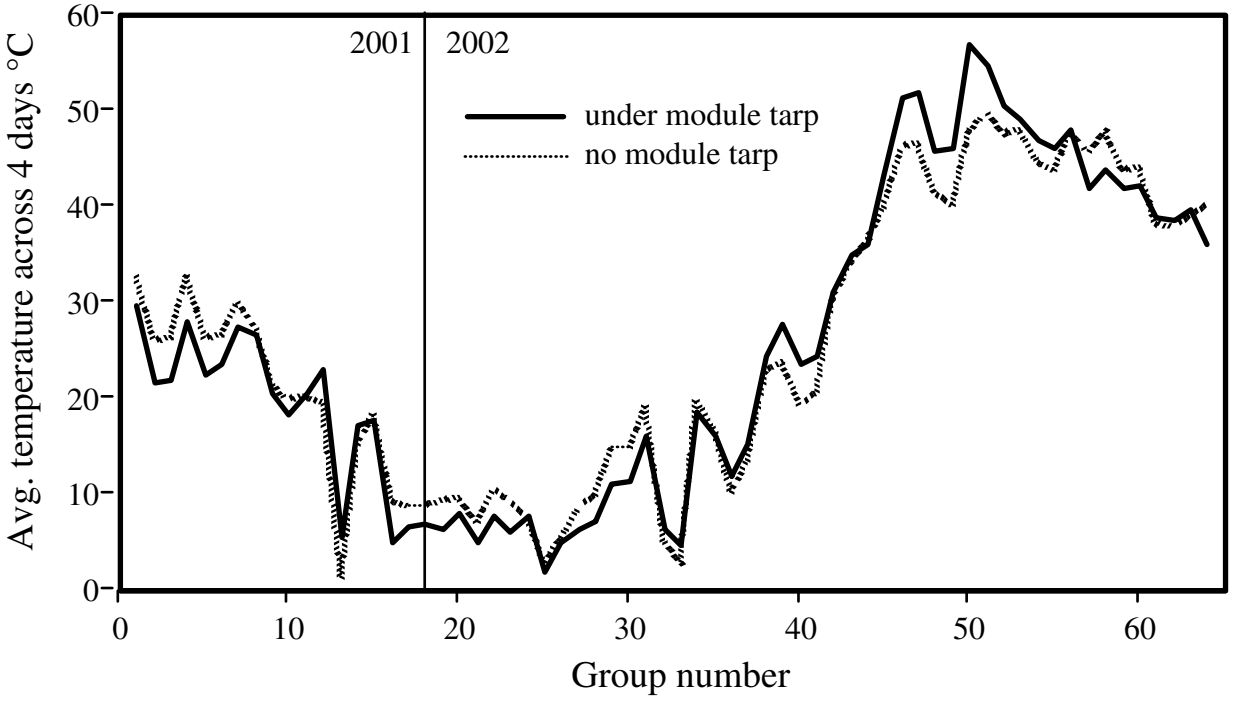

Figure 7. Average temperature on the upper surface of a cotton module, both under a module tarp and in an un-tarped area. Plotted values are averages for the 4-day period during which the mortality of each group of weevils was measured.