COMPARISON OF TWO PLANT TERMINATION RULE STRATEGIES FOR DETERMINING LAST EFFECTIVE INSECTICIDE SPRAYS FOR LEPIDOPTERAN-RESISTANT (BT) COTTON

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Abstract

The baseline premise of this study was that the percentage of bolls susceptible to insect damage decreases as cotton matures and bolls harden, and at some point in the season, further insecticide sprays would not protect enough fruit to offset cost. Different termination points based on the number of nodes above white flower (NAWF) and number of accumulated heat units (HU) were selected to determine the last effective spray date for Virginia cotton. Results support a recommendation of termination of insecticide sprays at or around NAWF 5 plus 200-250 heat units.

Methods

Research was conducted at the Tidewater Agricultural Research and Extension Center in Suffolk, Virginia, in 2006 and 2007. In 2006, 'DP 434 RR' was planted in plots four rows by 35-ft long (36-inch row centers), arranged in a four-replicate randomized complete block design. Twelve termination points based on two strategies (physiological maturity and heat unit accumulation) were evaluated and compared to a season-long control (Table 1). Baythroid and Centric applications were initiated at first flower and repeated weekly to control Lepidopteran and Hemipteran pests. Three 1-m sections of row were marked in randomly selected areas of each plot. Nine plants in those 1-m sections were tagged—the tag placed on the main stem above the uppermost first position bloom on the node appropriate for that treatment. Lint from plants in the 1-m sections of row were hand-harvested from the following three zones on each plant: *zone 1*—first position bolls above the termination point, *zone 2*—first position bolls below the termination point, and *zone 3*—non-first position bolls including all 2nd and 3rd position bolls and bolls from vegetative branches. Samples from each zone, from each 1-m section were pooled for weighing and ginning. To determine yield potential for the test field, cotton was harvested with a spindle picker from eight randomly selected areas. Treatment lint yields were compared using PROC GLM (LSD). Methods were similar in 2007, except 4 termination rules treatments in three varieties ('PHY 370WR', 'DP 455BG/RR', 'ST 5599BR') were evaluated (Table 1). The termination rules were selected based on results in 2006, which showed that NAWF 5 + 250 was a likely termination point.

Table 1. Termination points. NAWF = nodes above white flower; LEFD = last effective flower date; HU = heat units.

2006	2007	
NAWF=7	PHY 370WR	NAWF = 5
NAWF=7 + 250 HU		NAWF = 5 + 100 HU
NAWF=7 + 350 HU		NAWF = 5 + 200 HU
NAWF=6		NAWF = 5 + 300 HU
NAWF=6 + 250 HU	DP 455BG/RR	NAWF = 5
NAWF=6 + 350 HU		NAWF = 5 + 100 HU
NAWF=5		NAWF = 5 + 200 HU
NAWF=5 + 250 HU		NAWF = 5 + 300 HU
NAWF=5 + 350 HU	ST 5599BR	NAWF = 5
LEFD (August 15)		NAWF = 5 + 100 HU
LEFD + 250 HU		NAWF = 5 + 200 HU
LEFD + 350 HU		NAWF = 5 + 300 HU
Full season control		

Results

Yields with the spindle picker were 796 lb lint/acre in 2006, and 1647, 1669, and 1754 lb lint/acre for ST 5599BR, DP 455BG/RR, and PHY 370WR in 2007. In the hand-harvested termination point plots, approximately 70 and 75

percent of the lint came from first position bolls (*zones 1* and *2*, combined) in 2006 and 2007, and about 30 and 25 percent came from *zone 3*, the non-first position and vegetative branch bolls (Figs. 1 and 2). For this study, it was assumed that any first position bolls above the termination point (those in *zone 1*) would have been left unprotected with insecticide and vulnerable to any late season insect damage and thus unharvestable. In 2006, lint from *zone 1* represented nearly 49, 38 and 15 percent of the total yield at the NAWF 7, 6 and 5 termination points, respectively. With 250 additional heat units, contribution was reduced to only 8, 12 and 2 percent at NAWF 7, 6 and 5, respectively; and with 350 heat units, contribution was further reduced to 7, 5 and zero percent. Contribution at the last effective flower date termination point was only 1.5 percent, and zero with additional heat units. In 2007, lint from *zone 1* was not different among the varieties for the different termination points. Combined across varieties, lint from the NAWF 5, +100 HU, +200 HU, +300 HU termination points was 30, 11, 2, and < 1 percent of the total yield, respectively. In viewing calendar date, contribution of *zone 1* bolls dropped below 5 percent of total yield with any terminations points after August 11 in 2006, and below 4 percent after August 3 in 2007.

Applying these percentage losses to spindle picker yields showed that loss of *zone 1* bolls would have resulted in a loss of 392 to zero lb lint/acre in 2006, and 499 to 16 lb lint/acre in 2007, depending on termination point (Figs. 3 and 4). In this scenario, if cotton value was estimated at $0.50/lb and insecticide plus application cost was estimated at $15/acre, the break-even loss point would have been 30 lb/acre. The 30 lb lint/acre break-even loss point occurred on August 11 in 2006 and August 3 in 2007, and coincided with NAWF 5 + 200-250 in both years. These results indicate that the amount and value of lint protected after these termination points will not offset treatment costs.

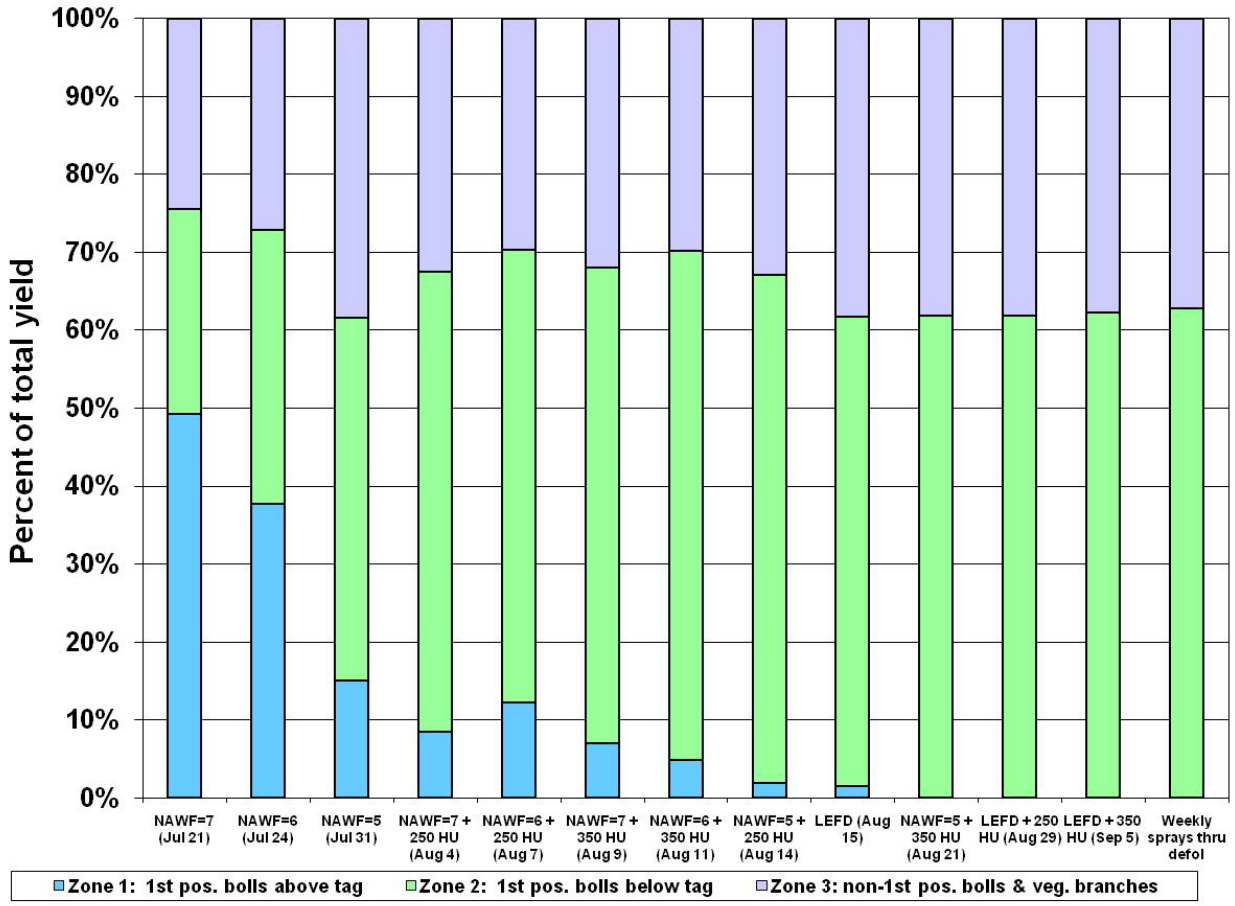

Fig. 1. Percent contribution of bolls from 3 zones to lint yield, with different NAWF and heat unit termination points, 2006.

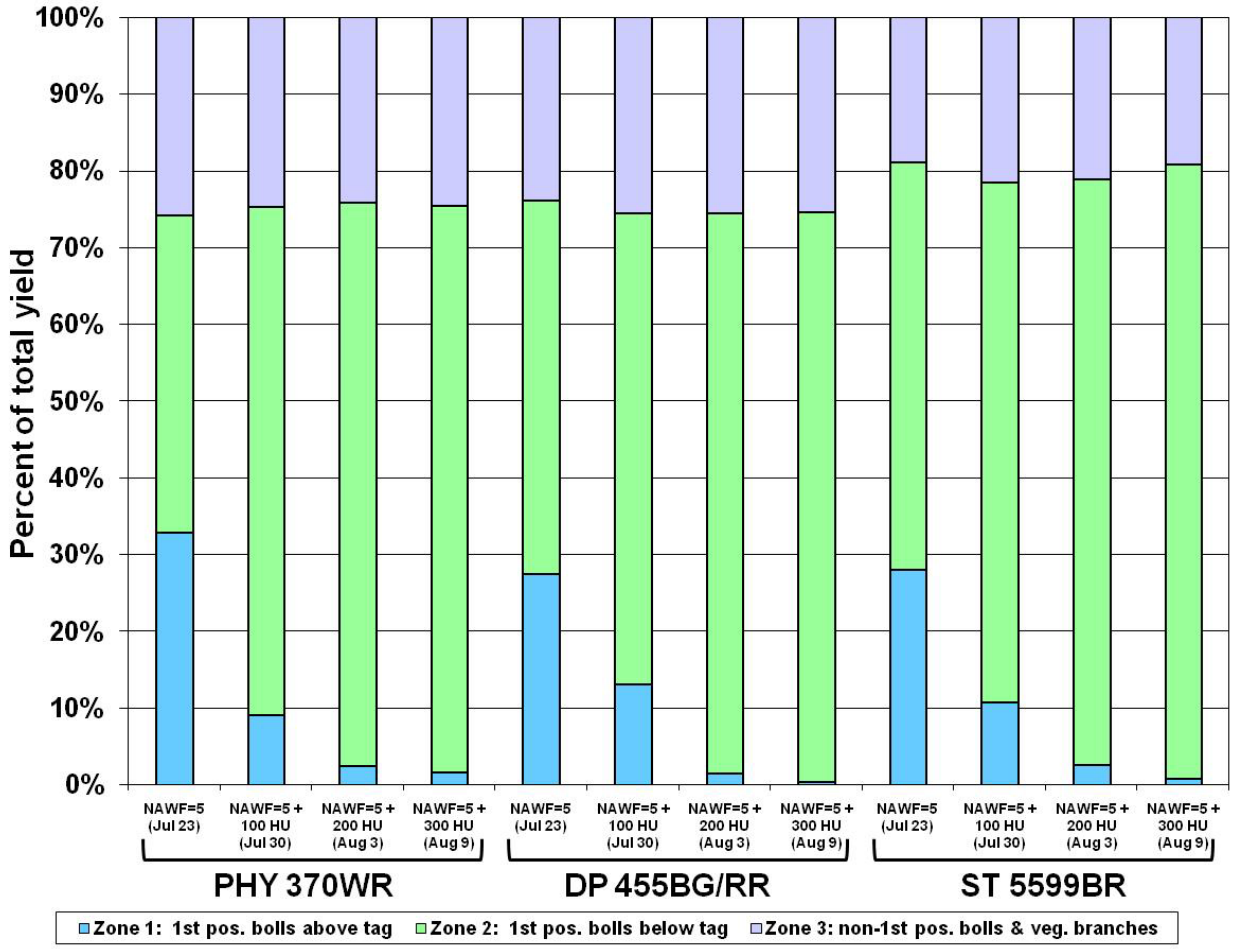

Fig. 2. Percent contribution of bolls from 3 zones to lint yield—3 varieties with different heat unit termination points, 2007.

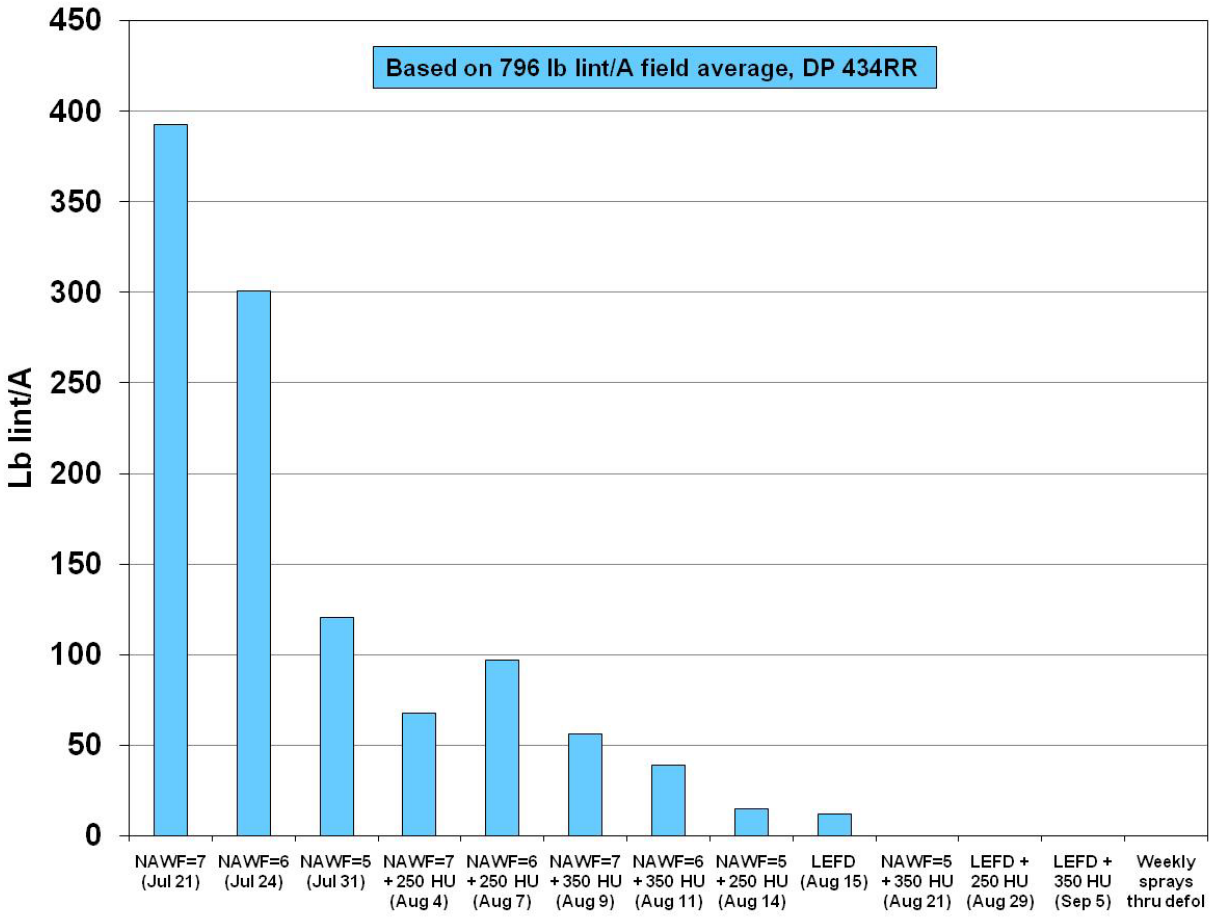

Fig. 3. Potential lint loss at different termination points, 2006.

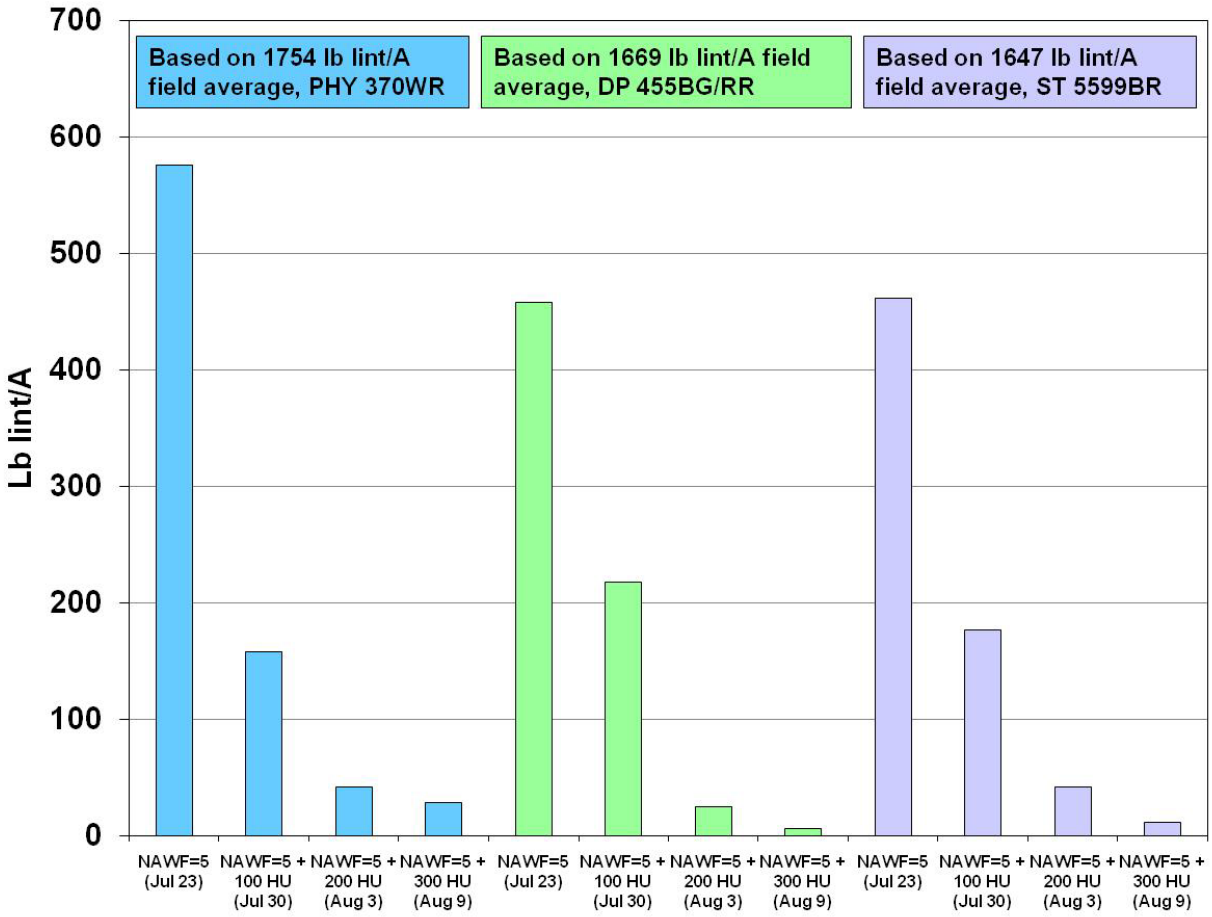

Fig. 4. Potential lint loss at different termination points, 2007.