MONITORING CORN EARWORM SUSCEPTIBILITY TO PYRETHROIDS USING ADULT VIAL TESTS

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Introduction

Corn earworm (CEW) is a pest of cotton and many other cultivated crops grown in Georgia and the southeast. Corn earworms reproduce on many wild host plants and have a short generation time, about four weeks, allowing CEW populations to build up large populations relatively quickly. Corn earworms also have the capacity to disperse and move long distances in a short time period. Single gene Bt cotton provides good control of CEW but supplemental treatment with insecticide may be needed in some situations. Pyrethroid insecticides are typically viewed as the standard for control of CEW in cotton.

During recent years, susceptibility of CEW to pyrethroid insecticides has declined in some areas of the US. Reduced field control of CEW with pyrethroids in sweet corn grown in the Midwest has been measured. Elevated LD50s (the lethal dose to kill 50 percent of a population) of some CEW collections have been observed in LA and TX during recent years. During 2005, less than optimal control of CEW in some parts of southwest Georgia was observed when two or more applications of pyrethroids were applied to Bt cotton. Subsequent collections and testing of surviving CEW populations from problem fields during 2005 indicated elevated LD50s or increased tolerance to the pyrethroid cypermethrin compared with previous years (Ottens et.al. 2006).

Due to concerns relative to the susceptibility of CEW to pyrethroids, monitoring efforts on the susceptibility of CEW to pyrethroids were expanded in southwest Georgia.

Methods

Pheromone traps baited with a CEW lure were established in four southwest Georgia counties to capture moths for pyrethroid susceptibility monitoring purposes;

1. **Coastal Plain Experiment Station in Tift county**
2. **Stripling Irrigation Research park in Mitchell county**
3. **grower cooperator fields in Seminole county**
4. **grower cooperator fields in Macon county**

Traps were monitored periodically and when adequate CEW captures were attained, moths (captured the previous night) were assayed using the Adult Vial Test (AVT) procedure. AVTs were performed using 20 ml scintillation vials coated with an acetone solution of technical grade cypermethrin with dosages of 5 or 10 µg/vial and an acetone treated check. Vials were obtained from two sources, Russ Ottens at the University of Georgia and Greg Payne at West Georgia College. Individual moths were placed in treated and untreated vials and survival was checked after 24 hours. Only moths which were able to fly in a normal manner were considered alive. Percent mortality in the treated vials was corrected for mortality in the untreated. If survivorship in the untreated vials was below 80 percent, the test was discarded.

Results

Initial CEW moth captures occurred during late March and early April, but adequate numbers of moths were not collected for conducting AVTs until late April. Moth captures were high in traps during June and July but declined significantly in August and September.

Figure 1 illustrates percent survival of CEW at 5 and 10 µg/vial by date. A total of 742 moths were tested at the 5 µg/vial dose and 666 moths at the 10 µg/vial dose. Mean survival for all dates at the 5 µg/vial dose was 12.4 percent compared with 6.8 percent at the 10 µg/vial dose. Increased survivorship in treated vials suggests increased tolerance or reduced susceptibility in the field. During the last 10 days of July, survival tended to increase, especially at the 5 µg/vial dose. It is important to note that survivorship only exceeded 30 percent at the 5 µg/vial dose on four dates, late April, early May, and twice in late July. During 2005, survival at the 5 µg/vial dose was 31 and 44 percent near known problem fields.

Mean survivorship at the 5 µg/vial dose is illustrated in Figure 2 for succeeding periods of four and two weeks. Mean survival was 20 percent during April and the first half of May. Moths tested during this time were likely moths from pupae which had overwintered. From mid-May to mid-July, survivorship was 8-10 percent. Populations tested during this time were from the first field generation. These data suggest that tolerance from the previous year is being diluted during May and June (i.e. little pyrethroid use during this time and thus no selection of tolerant individuals). However during the last two weeks of July survivorship increased to 19 percent. Pyrethroid use was more common during mid and late July and the increase in survivorship is likely a result of selecting more tolerant individuals. Survivorship tended to decline during August and September, perhaps due to a reduction in pyrethroid use as populations for most insect pests were unusually low.

Results from AVTs conducted during 2006 did not indicate any major problems with CEW tolerance or resistance to pyrethroid insecticides. However, these data do suggests that some level of tolerance exists in CEW populations and that selection for those tolerant individuals is occurring. County agents, consultants, growers, and the

industry as a whole should monitor performance of pyrethroids closely. Pyrethroids continue to be the treatment of choice for control of CEW, but should be used at high rates.

Figure 1. Percent survival by date of corn earworm moths 24 hours after exposure to cypermethrin in Adult Vial Tests conducted in Tift, Mitchell, Seminole, and Macon counties, Georgia, 2005.

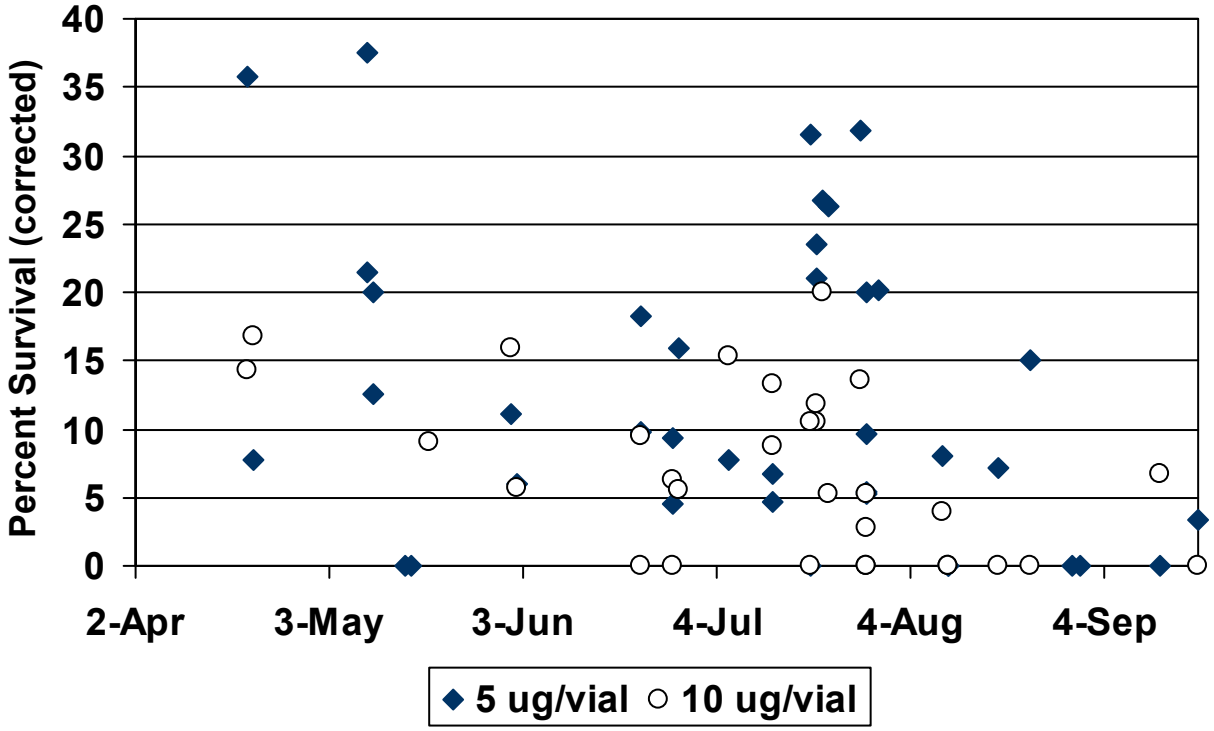

Figure 2. Percent survival 24 hours after exposure and number of corn earworm moths tested (x) in Adult Vial Test using 5 µg/vial of cypermethrin, Tift, Mitchell, Seminole, and Macon counties, Georgia, 2005.