Research

Resistance to Tropical Sod Webworm in Cultivars of St. Augustinegrass

As the number of available pesticides diminish, our focus must be on developing pest-resistant cultivars.

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The tropical sod webworm, *Herpetogramma phaeopteralis* Guenee *(Lepidoptera: Pyralidae)* is an annual pest of turfgrass especially in the southern states of the U.S.A. and many islands in the Caribbean. This insect is a pest of all of our warm-season turfgrasses: St. Augustinegrass, *Stenotaphrum secundatum* (Walt.) Kuntze; bermudagrass, *Cynodon spp;* zoysiagrass, *Zoysia spp*; centipedegrass, *Eremochloa ophiuroides* (Munro.) Hack; carpetgrass, *Axonopus compressus* (Swartz.) and bahiagrass, *Paspalum notatum* Flugge grown in these regions. The larvae of this insect can reach population levels of more than a 100 per 0.1 m^2 on highly fertilized turf and can seemingly defoliate a turf planting almost 'overnight.' Population levels of 50 to 75 larvae per m^2 will severely damage a residential lawn and much lower populations will severely injure the appearance of highly manicured turf on golf greens and tees, and sports fields. A related species, the lawn webworm, *H. licarsisalis* (Walker), is a pest in Hawaii, Australia and other parts of the world (Tashiro et al. 1983, Wozniak 1996). When St. Augustinegrass is defoliated, it can take up to three weeks for the turf to recover, unlike damage on bermudagrass which can recover in three to four days.

Figure 1—Petri dish used as test chamber of the evaluations of grasses for resistance to tropical sod webworm. Note the heavy feeding on this susceptible St. Augustinegrass cultivar.

The use of a host resistance grass is an economical and environmentally sound strategy for pest management of insects and other pests in turfgrass. The development of pest resistant cultivars has been widely neglected in turfgrass, compared to the emphasis on abiotic traits including aesthetics. The continual reliance on pesticides has preempted the development of resistance cultivars for most of our turfgrass pests. This has also led to the development of resistance to pesticides as our turf pests are exposed to continual pesticide applications (Reinert 1982). Host resistant turfgrass cultivars have been used successfully as a means of insect control. >Floratam> and >Floralawn> St. Augustinegrass cultivars were released with southern chinch bug, *Blissus insularis* Barber, resistance and Floratam was widely deployed for chinch bug management until the resistance broke down. Additionally, 'Cavalier' zoysiagrass has been deployed widely for its abiotic and biotic stress resistance including resistance to tropical sod webworm, fall armyworm, tawny mole cricket and hunting billbug (Reinert et al., 2004). Resistance has also been documented to several cultivars of bermudagrass ('U-3,' 'Tiffine,' 'Santa Ana,' 'Tuffy,' 'Ormond,' 'Tufcote'). Reported here are tests to identify and characterize the resistance potential of commercially available cultivars of St. Augustinegrass and experimental hybrids of both St. Augustinegrass and Zoysiagrass to the tropical sod webworm (Reinert and Busey, 1983; Reinert et al., 1989).

Methods:

The turfgrass cultivars and hybrids used in

Figure 2: Tropical sod webworm on St. Augustine cultivars: Mortality at Pupation

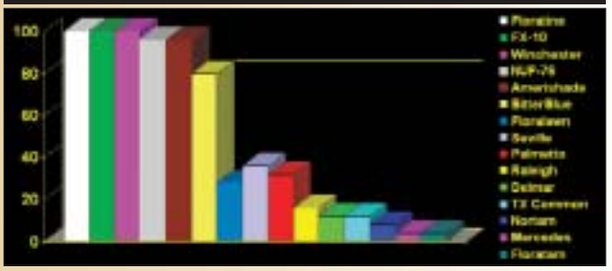

Figure 2—Resistance in St. Augustinegrasses; Expressed as the mean mortality of the larvae that reach pupation on each of the cultivars.

Figure 3: Tropical sod webworm on St. Augustine cultivars: 15-d Larvae weight (mg)

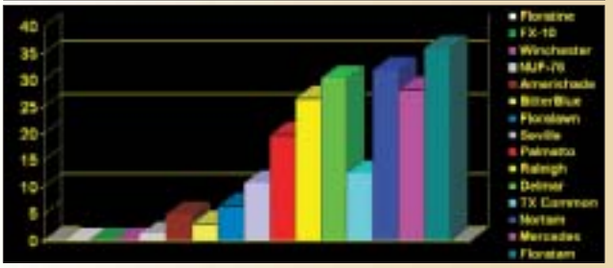

Figure 3—Resistance in St. Augustinegrasses; Expressed as the weight (mg) of larvae after they had fed on clippings of each cultivar for 15 days.

Figure 4: Tropical sod webworm on St. Augustine hybrids: 15-d Larvae weight (mg)

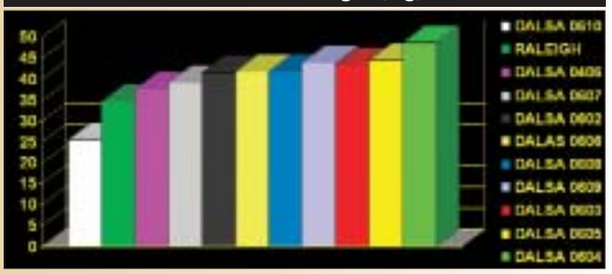

Figure 4—Resistance in St. Augustinegrasses; Expressed as the weight (mg) of larvae after they had fed on clippings of each hybrid for 15 days.

Figure 5: Tropical sod webworm on Zoysiagrass cultivars: 15-d Larvae weight (mg)

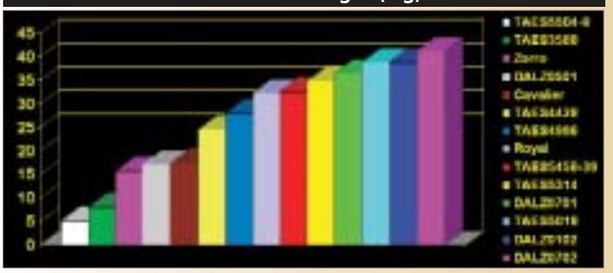

Figure 5—Resistance in Zoysiagrass; Expressed as the weight (mg) of larvae after they had fed on clippings of each hybrid for 15 days.

these studies were cultivated in the greenhouse. Clippings were harvested from each grass and evaluated in no-choice tests in the laboratory to evaluate resistance. For each test, neonate (newly hatched) larvae were introduced into 9-cm diameter x 20-mm plastic Petri dishes. Each dish was provided with two water saturated filter paper discs and water was added to the filter paper as needed to keep it saturated to maintain the grass clippings. Each dish was provided with a small amount of fresh leaf tissue (ca. 3 g) of the respective grass. Grass was added or replaced daily or every other day throughout the experiment so that turgid fresh grass was always available to the developing larvae in the dishes.

For these studies, a colony of tropical sod webworms was maintained. Adults were caged on susceptible plant material to capture eggs. Eggs were easily harvested from this grass by clipping leaves with eggs to be held in covered dishes for later use in the feeding studies. Mortality was recorded throughout the experiment when the larvae were fed. Larvae were weighed after 15 days of feeding which was just a few days before the larvae began to pupate. Pupa were weighed within one day after pupation and the days to pupation and adult emergence were recorded.

Results and Discussion:

St. Augustinegrass

Commercial cultivars and hybrids of St. Augustinegrass were evaluated for resistance to the tropical sod webworm. Fifteen cultivars, listed in Fig. 2 and 3, were evaluated in the lab for resistance to this pest. 'Amerishade,' 'Floratine,' 'FX-10,' 'NUF-76' and 'Winchester' each provided near 100 percent mortality by pupation of larvae that were introduced into feeding chambers and allowed to feed only on the respective cultivar in a no-choice experiment in the laboratory. Additionally, 'BitterBlue' produced 80 percent mortality of the confined larvae. 'Delmar,' 'Floralawn,' 'Floratam,' 'Mercedes,' 'Nortam,' 'Palmetto,' 'Raleigh,' 'Seville' and 'Texas.'

Common were each susceptible hosts and no more than 40 percent mortality was recorded on any of them. Mortality of only four percent was recorded on both Floratam or Mercedes. Even though some larvae did survive on several of the resistant cultivars, they were very small at 15 days when all larvae were weighed, compared to those on the susceptible cultivars. The larvae that survived on NUF-76 and Amerishade weighed 1.1 and 4.8 mg, respectively, and larvae surviving on Bitter Blue weighed an average of 3.2 mg each. Additionally, even though 64 percent of the larvae were alive on Floralawn, they were small and weighed an average of only 6.4 mg. On susceptible cultivars, however, larvae were much larger [i.e. Floratam (36 mg); Delmar (30 mg)]. Among the elite hybrids from the Dallas St. Augustinegrass breeding program, none provided a significant level of larval mortality. However, the larvae on DALSA0610 were significantly smaller than larvae on all of the other hybrids when they were weighed after 15 days of feeding.

Zoysiagrass

In the test with zoysiagrass hybrids, none of the grasses provided a significant level of mortality of the confined larvae in the no-choice lab test. However, larvae weighed after 15 days of feeding on TAES3588, TAES5504-9 and Diamond were all very small (8.1, 5.2 and 7 mg, respectively) (Figure 5). Additionally, the larvae feeding on Zorro, Cavalier and DALZ0501 were about twice as large as these, but still significantly smaller than those feeding on the rest of the hybrids (range of 24.5 to 41.3 mg) that were susceptible. The same resistant hybrids and cultivars provided another level of resistance. Larvae developing on TAES3588 required 31.8 days to pupate while the larvae feeding on TAES5504-9,

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Diamond, Zorro, Cavalier and DALZ0501 required 30.5, 28.9, 26.5, 25.7 days, respectively (Figure 6). On many of the susceptible hybrids, it only took only 21 to 22 days from egg hatch to pupation. Larvae that require much longer to pass through their growth stages will be smaller, consume less leaf tissue and even more importantly, they are available over a much longer period of time and available to parasitism and predation by their natural enemies and pathogens.

Figure 6: Tropical sod webworm on Zoysiagrass cultivars: Days to Pupation

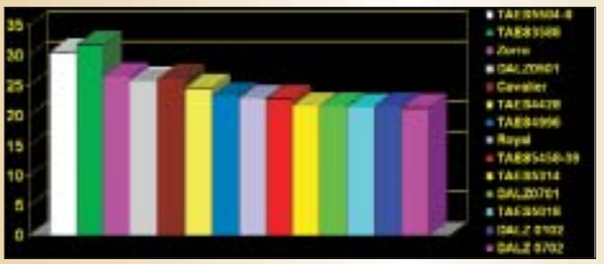

Figure 6—Resistance in Zoysiagrass; Expressed as the time (days) required for larvae development from neonate to pupation.

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