Rootworm Population Dynamics and Management

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Rootworms (southern corn rootworm and banded cucumber beetle) have emerged as increasingly serious pests in irrigated peanuts in Georgia in recent years. Chlorpyrifos was the only registered insecticide with proven efficacy against these species in peanut, and tolerances were revoked for all food uses in early 2022. The UGA Peanut Entomology program has been working for several years to identify alternatives to chlorpyrifos. The purpose of this project was to improve our understanding of rootworm biology in Georgia peanut production systems with the ultimate goal of developing new and effect management tactics. The objectives of our research were: 1) to determine the distribution and relative abundance of the two species to determine if increased populations of banded cucumber beetle could be responsible for the observed increases in rootworm injury, 2) to assess the potential role of corn as a source of rootworm infestation in peanut, and 3) to evaluate the efficacy of insecticide alternatives to chlorpyrifos against the rootworm complex.

The larval stages of rootworms feed on roots and developing pods of peanut and can cause serious economic loss when populations are high. The southern corn rootworm (SCRW), *Diabrotica undecimpunctata*, has long been known to infest peanut in Georgia, but little is known about the biology and pest status of banded cucumber beetle (BCB), *Diabrotica balteata*. Rootworm injury has increased in recent years along with an apparent increase in the relative abundance of BCB. Larvae of both species occur only in the soil and can survive only under conditions of relatively high moisture. Fields with heavy soil textures and irrigation are at greatest risk to infestations and injury. Nevertheless, rootworm infestations were reported each year since 2019 in irrigated fields with light textured soils, and the abundant rainfall in 2021 resulted in optimum conditions for rootworm development even in non-irrigated fields. A systematic evaluation of the rootworm population in Georgia peanut fields will provide baseline data regarding species distribution, composition, and injury. The data collected in 2020 and 2021 provide direction for future research efforts including the need for additional research to understand the biology of BCB. The reason for increased incidence of rootworm injury in Georgia peanut fields is unknown; this work clearly shows that BCB is now the most abundant species in many Georgia peanut fields. Though data analysis is on-going, results also suggest that soil type and proximity of alternate hosts likely influence infestations. The completion of laboratory bioassays was delayed as rearing protocols for the banded cucumber beetle were optimized, but results suggest that foliage applied insecticide might provide some benefit for BCB management in the field.

A monitoring program for rootworm adults was established in 32 commercial peanut fields in Terrell County, Georgia in 2021. Fields were selected such that 16 were adjacent to corn on at least one border while the other 16 were not directly adjacent to corn. Rootworm traps were placed in each field at 50, 100 and 200 meters from the field border beginning in June and continuing through September. Traps were replaced every two weeks, and rootworm adults were collected and transported to the Peanut Entomology lab where they were sorted and identified to species. Pods were collected from 3 plants at each trap location in each field and rated for rootworm injury in August and September. As in 2021, BCB was far

more abundant than SCRW at the test locations (fig 1). The distance from the field border did not affect the number of beetles captured or the incidence of pod injury (fig 2). Corn adjacent to peanut and soil type in peanut fields may have affected rootworm abundance and injury, but analysis is not complete.

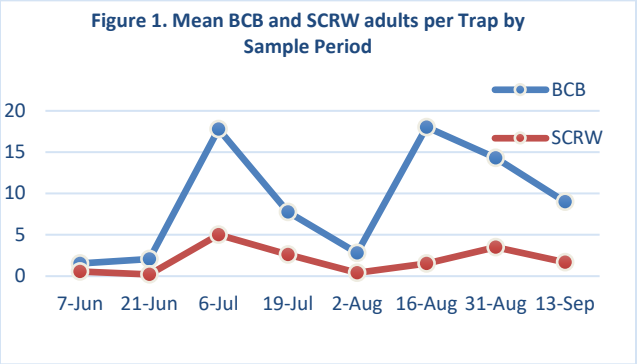

Figure 1. Mean BCB and SCRW adults per Trap by Sample Period

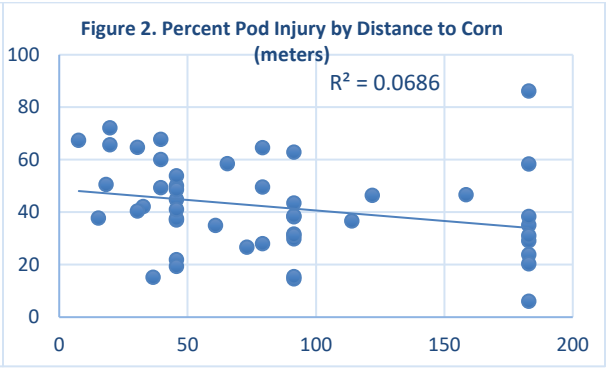

Figure 2. Percent Pod Injury by Distance to Corn (meters)

Though insecticide assays were delayed due to complications related to laboratory rearing, preliminary results suggest that the growth regulator diflubenzuron applied to foliage could reduce the number of viable eggs laid by female BCB (fig 3). Additional laboratory testing demonstrated adult BCB mortality was possible up to 10 days after a foliar application (in the field) of indoxacarb and 6 days after an application of bifenthrin (fig 4). These results are preliminary, and should be viewed with caution. Nevertheless, the loss of chlorpyrifos leaves growers with no proven effective treatment for rootworm, and the materials tested are legal and might provide benefit. Laboratory rearing protocols have been optimized, and lab/greenhouse-based research is continuing.

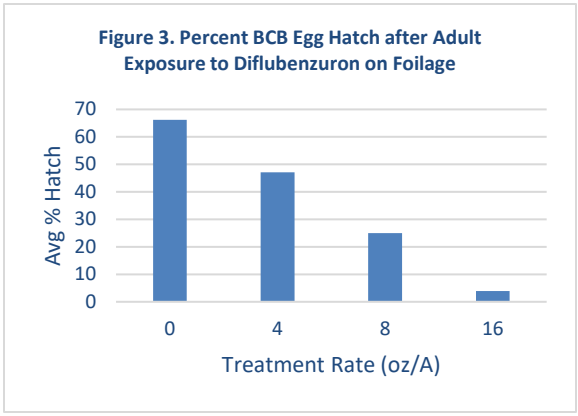

Figure 3. Percent BCB Egg Hatch after Adult Exposure to Diflubenzuron on Foilage

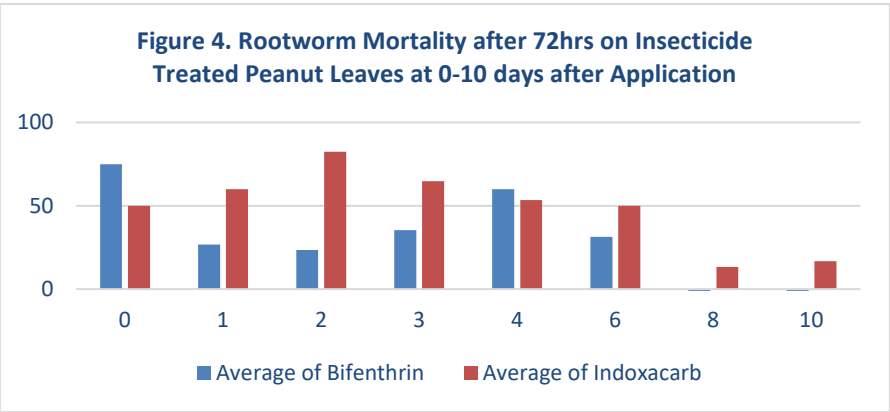

Figure 4. Rootworm Mortality after 72hrs on Insecticide Treated Peanut Leaves at 0-10 days after Application

Banded cucumber beetle is not native to the southeastern US, but the data reported here suggest that it has become the dominant rootworm species in peanut in Georgia. Compared to the southern corn rootworm, little is known about the biology or pest status of banded cucumber beetle in peanut. Reports of rootworm injury in peanut have increased in recent years. It is likely that adequate rainfall during this time contributed to conditions that favor rootworm development, but the increased abundance of banded cucumber beetle may also play a role. Continued research efforts will seek to answer additional questions about rootworm biology and develop effective control tactics that are critically needed in the absence of chlorpyrifos.