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## BLACK CUTWORM (LEPIDOPTERA: NOCTUIDAE) FLIGHT ACTIVITY ON A GOLF COURSE IN CENTRAL ALABAMA

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Black cutworm, *Agrotis ipsilon* (Hufnagel), is a major agricultural insect pest that attacks a wide variety of cultivated plants (Crumb 1929). The insect is also a serious pest that feeds on creeping bentgrass, *Agrostis palustris* Huds., the predominant turfgrass species on golf course putting greens. Feeding damage by black cutworm, especially older larvae (i.e., 4–6th instars) creates sunken pock-marks or suppressions, resulting in the reduction of uniformity and smoothness of putting green surfaces (Vittum et al. 1999). Although there was no significant relationship between black cutworm adult population and larval infestation on golf course putting greens (Hong & Williamson 2004), monitoring adult population can provide some insight on potential larval activities on putting greens (Potter 1998). Black cutworm is a migratory species (Showers 1997). In Wisconsin, moths are active in May through late Aug or early Sep (Hong & Williamson 2004), which is similar to the flight pattern observed in other northern areas (Levine et al. 1982). However, there is no flight

activity during the winter in the northern United States. This is not surprising because generally black cutworm cannot overwinter north of Tennessee (Showers 1997). Of the few black cutworm flight activity studies on golf courses, most focused only on the northern areas. Thus, no references regarding black cutworm flight activity on a golf course are available for the southern United States where these insects overwinter and presumably have a longer flight period. The objective of our study was to investigate black cutworm flight activity on a golf course in the central Alabama.

Black cutworm adults were monitored at the Grand National Golf Course, Opelika, Alabama. Two sticky traps (TRECE Inc., Salinas, California) baited with cap-type synthetic sex pheromone (TRECE; BCW 3141-25) were installed in trees at ca. 1.5 m above the turf surface (Hong & Williamson 2004) on 7 Apr 2010. The location of traps was less than 20 m from the creeping bentgrass, a preferred host, on putting greens. The traps and rubber septa containing the synthetic phero-

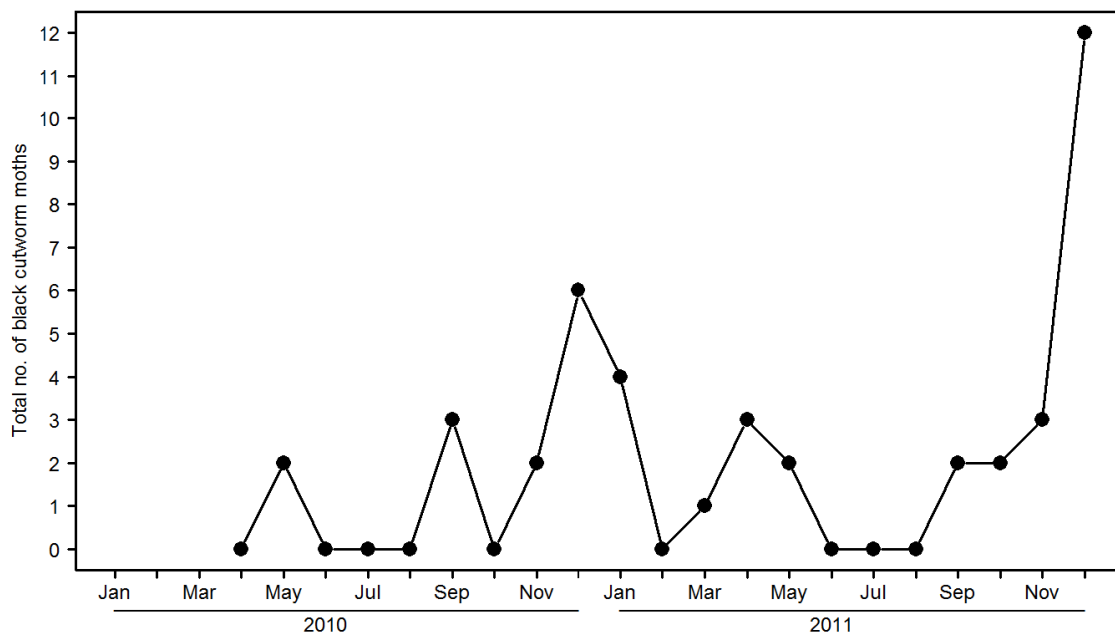


Fig. 1. Abundance of black cutworm, *Agrotis ipsilon*, adults in 2010 and 2011 at the Grand National Golf Course, Opelika, Alabama. Moths were captured in 2 sticky traps hung in trees at 1.5 m above the turf surface and baited with synthetic sex pheromone

traps were replaced every 4 wk. The number of male moths per each respective trap was counted monthly from Apr 2010 through Dec 2011.

During the study period, a total of 42 adult moths were collected. Hong & Williamson (2004) reported male moth captures in sticky traps that were greater than in the present study. Seasonal and environmental differences may explain the difference in moth abundance. Larval predation, however, mainly from imported fire ants, *Solenopsis invicta* Buren, may be greater in the south (Hong et al. 2011) resulting in lower overall populations where these 2 species occur.

In the 2 yr study in Alabama (Fig. 1), there was a consistent pattern of 3 peaks of black cutworm flight activity in Jan, Apr-May, and Sep-Oct. However, adult moths were not active during summer, from Jun through Aug, in both years. In Wisconsin, black cutworm moths are active, generally from May through Oct with 3 peaks in late May, Jul, and Aug (Hong & Williamson 2004). There are 2 possible explanations for the absence of adult activity during the summer in Alabama. First, adult flight activity is temperature dependent, typically occurring between 3 and 45 °C. Male flight response peaks between 15 and 25 °C, but wanes when temperature exceeds 30 °C (Broersma et al. 1976). In Alabama most moths were captured in December whereas the highest peak of black cutworm (54 adult moths for 2 yr) in Wisconsin was in Jul (Hong & Williamson 2004). Air temperatures during summer in Alabama typically exceed 30 °C, however, air temperatures are near the peak for male flight response during winter (i.e., late Nov through Jan). Secondly, air temperatures during summer may affect adult activity and fecundity. Black cutworm fecundity is greatest between 20 and 27 °C whereas many females failed to lay fertile eggs at 34 °C (Archer et al. 1980). However, high temperature (i.e., 34 °C) increases larval developmental rate. In central Alabama, the day time temperature in summer is often above 30 °C. This suggests that eggs laid at this time may not be fertile, thus resulting in low population of adult moths during summer.

The published literature from North America on the flight period of black cutworm is dominated by studies conducted in the northern United States (Hong & Williamson 2004; Levine et al. 1982; Showers 1997). The flight period presented herein best represents areas within southern states where black cutworms can overwinter (Showers 1997). Unfortunately, most black cutworm management recommendations are based on published flight periods based on the arrival of migrants to northern states. For example, in northern states insecticides are typically applied repeatedly from May through Sep on golf course putting greens and tees (Williamson 2001; Potter 1998). The typical application timing is 2 or 3 wk after a peak in moth flight activity (Potter 1998). In the south, there is a

significant black cutworm flight activity in the winter. However, females lay fewer fertile eggs at 13 °C (Archer et al. 1980). This may explain why larval damage is fairly uncommon during the winter in the south despite the abundance of adult moths. This study suggests that monitoring and management of black cutworms in the south should focus on protecting creeping bentgrass mainly in fall (Sep-Nov) and spring (Feb-May). Although we didn't sample larval populations, caterpillars infesting creeping bentgrass greens and tees during summer in the south are not likely black cutworms. Fall armyworm, *Spodoptera frugiperda* J. E. Smith, another generalist noctuid, also feeds on creeping bentgrass (unpublished data) and may likely be the source of summer damage.

#### SUMMARY

Two yr of monitoring black cutworm adults with pheromone traps on a golf course in central Alabama revealed that the moth flight activity was quite different from that in northern United States. Adult moths were absent during the summer mo (early Jun-late Aug). Peaks of moth activity occur in spring and fall, and suggest a different timing for monitoring and management of black cutworm in the southern United States.

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