Phenology and Density of *Haplaxius crudus* (Homoptera: Cixiidae) on Three Southern Turfgrasses[1]

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ABSTRACT

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Field populations of *Haplaxius crudus* (Van Duzee) were studied on St. Augustinegrass, *Stenotaphrum secundatum* (Walt.) Kunze; bahiagrass, *Paspalum notatum* Flugge; and bermudagrass, *Cynodon dactylon* (L.) Pers. and *C. X magenissii* Hurcombe, from July, 1974, to July, 1975, in Ft. Lauderdale, Florida. *Haplaxius crudus* completed development on all 3 species of grasses. Significantly higher numbers ($P < 0.01$) of adults and nymphs were collected on St. Augustinegrass; however, populations fluctuated less throughout the year on bahiagrass. *H. crudus* had a sex ratio of 1.7♀: 1♂ in this study. The sex ratio was biased toward males during the population peaks of adults.

Haplaxius crudus (Van duzee) is considered to be a possible pathogen vector of lethal yellowing disease of coconut palms, *Cocos nucifera* L. (Reinert 1977, Tsai and Kirsch 1978). Since discovery on the mainland of Florida in 1971, the pathogen has killed an estimated 350,000 coconut palms (Gwin 1978) and large number of other palm species as well. Thomas (1974, 1979) and Parthasarathy (1974) have observed the suspected causal agent, a mycoplasma-like organism, in the phloem sieve elements of diseased tissue from 23 additional palm species which were believed to have died from this disease.

Haplaxius crudus is a phloem feeding insect (Fisher and Tsai 1978, Waters 1977), and its adults are the most common planthopper associated with coconut palms and 40 other palm species in Jamaica and Florida (Johnson 1973, Woodiel and Tsai 1978, Howard 1978).

Haplaxius crudus nymphs have been found in the thatch and roots of several grasses including St. Augustinegrass, *Stenotaphrum secundatum* (Walt.) Kunze; bahiagrass, *Paspalum notatum* Flugge; and bermudagrass, *Cynodon dactylon* (L.) Pers. (Reinert 1977, Tsai and Kirsch 1978), and have killed St. Augustinegrass under greenhouse culture (Reinert 1977), nevertheless, they are not considered a turfgrass pest.

Since *H. crudus* has been implicated as a possible vector of lethal yellowing and because of its potential status as a pest of southern turfgrasses, the present study was initiated to determine its phenology on the most commonly planted turf and pasture grasses (St. Augustinegrass, bahiagrass, and bermudagrass) in the South.

Materials and Methods

The study was conducted on the landscape and experimental turfgrass plots at the Univ. of Florida, Agric. Research Center in Fort Lauderdale. Populations of *H. crudus* were sampled from 3 plots of each of the 3 aforementioned turfgrasses from July, 1974, to July, 1975. Plots ranged in area from ca. 115 to 800 m^2. No pesticides were applied to any of the plots during the study period. Two plots of 'Bitter blue' St. Augustinegrass and one plot of 'Pensacola' bahiagrass were marked off from landscape lawns and received water 2 or 3 times/week. The remaining plots (1-'Floratam' St. Augustinegrass, 2-'Pensacola' bahiagrass, 2-'Common', (*C. dactylon*) and 1-'Tifway' (*C.* X *magenissii* Hurcombe) bermudagrass were irrigated nightly with overhead sprinklers.

Haplaxius crudus adults were collected bi-weekly by making ten 180° sweeps (one sweep/walking step) with an insect sweeping net (36 cm diam) near the center of each of the test plots. Specimens from each plot were hand separated from debris and stored in 80% ethanol and identified with the aid of a dissecting microscope.

Nymphs also were sampled biweekly by taking core samples (20.3 cm diam and ca. 10 cm deep) of grass, thatch, and soil in each test plot. Samples were taken with a plugger at random in a ca. 6×6 m area near the middle of each plot. Each plug was then placed upside-down into Tullgren's modification of the Berlese funnel so that the grass rested on a double layer of cheese cloth in the bottom of each funnel and the soil was exposed to a 40-W incandescent bulb. This was done with the assumption that the nymphs present could escape through the soil surface and thatch more easily than they could through deeper soil layers. After 14 days in the Berlese funnels, planthoppers were collected and preserved in 80% ethanol.

Results and Discussion

The mean numbers of *H. crudus* adults and nymphs from each of the 3 southern turfgrasses for the test period are shown in Fig. 1.

St Augustinegrass

Significantly higher ($P<0.01$, F test) numbers of *H. crudus* adults were collected from St. Augustinegrass than from bermudagrass or bahiagrass. Large adult populations occurred on Jan. 3, Apr. 1, and June 5 with lesser peaks on Aug. 15 and Oct. 16. The seasonal mean number of adults from this grass was 4.7±13.6/collection date/10-sweep sample. The mean nymphs per collection date per core sample on this grass was 8.1±23.3 with peak populations from June to mid-Sept. Nymphs were uncommon during the rest of the year. The overall nymphal population on this grass was significantly higher ($P<0.01$, F test) than on the other 2 grass species.

Significantly more of the collected specimens ($P=0.01$, F test), 82% of the adults and 78% of the

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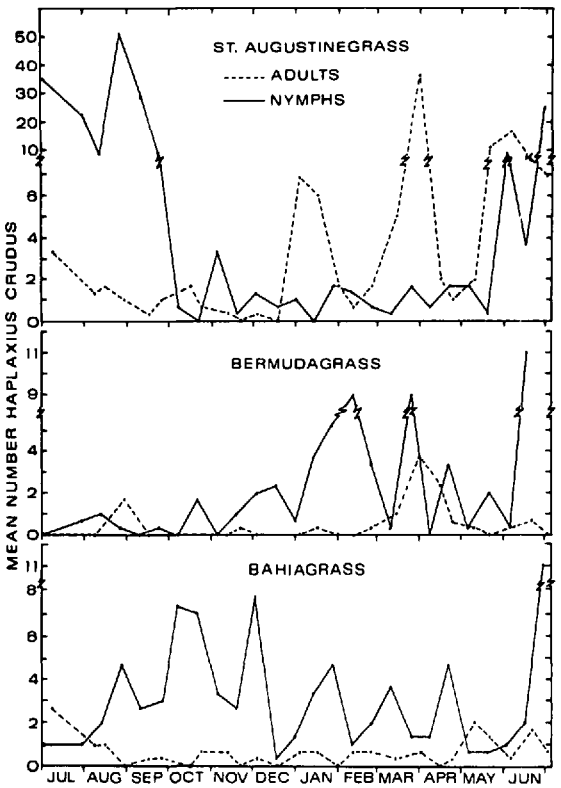

FIG. 1.—Mean numbers of *Haplaxius crudus* adults and nymphs collected from 3 southern turfgrasses in Florida from July, 1974, to July, 1975. Note: adults = mean number collected per ten 180° sweeps with an insect sweep net per plot; nymphs = mean number extracted per 20.3 cm diam soil core sample per plot.

nymphs, were taken from the Floratam plot. This cultivar has a much coarser texture than Bitter blue. The highest number of nymphs, 105/core sample, was taken from the Floratam plot on Aug. 26. This is a 6× higher density than the maximum (49/0.09m^2) reported previously by Tsai and Kirsch (1978) on St. Augustinegrass. In previous studies, Reinert (1977) found that *H. crudus* prefers the coarser selections of St. Augustinegrass. Population peaks occurred on the same sample dates from the Bitter blue plots but at a lesser magnitude.

The higher populations of planthoppers on the Floratam plot compared to the Bitter blue plots may be the result of more frequent irrigation. This may have prevented the thatch and roots from drying out making the Floratam grass more favorable for planthopper development.

Bermudagrass

Fewer than one ($\bar{x}=0.8\pm1.3$) adult were caught/collection date/10-sweep sample on bermudagrass, except on Aug. 29 and Apr. 1. Nymphs were present all year ($\bar{x}$ = 2.5± 5.5/collection date per soil core). Nymphs occurred most abundantly from Dec. to Apr. and again in June. Significantly greater numbers ($P<0.05$, F test) of adults were collected from the Common bermudagrass plots, but in contrast, a significantly greater number of nymphs (68%) ($P<0.01$, F test) were taken from the Tifway plot, indicating that *C.* X *magenissii* may be a better developmental host than *C. dactylon*.

Bahiagrass

Adults remained low throughout the year ($\bar{x}=0.7\pm1.2$) on bahiagrass with peak populations on July 8 and May 10–June 16. Unlike the populations on St. Augustine and bermudagrass, nymphs were abundant on bahiagrass and remained high throughout the year ($\bar{x}$= 3.2 ±4.8/sample date). Populations were not significantly different ($P<0.05$, F test) for the 3 sample sites even though plots were differentially irrigated. Adults and nymphs were equally abundant on bermudagrass and bahiagrass ($P<0.05$, F test).

Sex Ratio

A total of 449 (280 ♀, 169♂) adults was collected during this study with a sex ratio of 1.7♀:1♂. This contrasts with that reported by Tsai and Kirsch (1978) (1:1) based upon 83 field collected adults and 54 adults reared from lab cultures. These authors also reported that females live longer than males which could explain the high percentage of females collected in this study. Samples from many of the collection dates consisted mostly of females. However males constituted 54, 48 and 37% of the adults collected on Jan. 3, Apr. 1, and June 5, respectively, when adults were most abundant. It appears that the sex ratio approximates 1:1 when adults first appear, but only when large numbers are present, since males disappear much faster than females. Other alternative explanations for the biased sex ratio are; genetic, differential migration of the sexes, and sampling error.

Females constituted 57, 74, and 87% of the seasonal population on St. Augustinegrass, bermudagrass, and bahiagrass, respectively. Based on these samples, it appears that the females either live longer than the males especially on bahiagrass and bermudagrass, or they migrate to these grasses after reaching the imaginal stage.

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