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FALL TERMINATION OF AESTIVATION AND FIELD DISPERSAL OF THE ALFALFA WEEVIL (COLEOPTERA: CURCULIONIDAE) IN ILLINOIS[1]

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ABSTRACT

Emergence traps, flight traps, sweeping, and egg sampling were employed to determine fall termination of aestivation of the alfalfa weevil, *Hypera postica*, and patterns and timing of field reentry, and subsequent fall oviposition. Adult alfalfa weevils were found to terminate aestivation in wood edge field borders in mid-late October. Field reentry began in late October as a gradual process, starting at wooded field borders, with the field population equally dispersed by mid-November.

Attempts to control the alfalfa weevil, *Hypera postica* (Gyllenhal), with fall insecticide applications have met with varying degrees of success (Armbrust et al., 1966; Dorsey, 1966; Steinhauer and Blickerstaff, 1967). A means of determining the location of aestivating weevils, field reentry, and subsequent oviposition is needed to accurately time an insecticide application.

Prokopy et al. (1967) suggested that alfalfa weevils aestivate in woods bordering fields. This study identified the time of termination of alfalfa weevil aestivation, pattern of field reentry, and subsequent fall oviposition in Washington County, southern Illinois. This information can be integrated into a pest management program for control of the alfalfa weevil.

MATERIALS AND METHODS

This study was conducted in Washington County, southern Illinois, where there are many wooded field borders which serve as aestivation sites for alfalfa weevils. The study field was 100 m × 240 m (24 acres) and bounded on the north by soybeans, on the south by corn, on the west by a road and corn, and on the east by woods. Four sampling methods were employed: emergence traps, flight traps, sweeping, and egg samples.

The emergence traps were pyramidal in design and constructed to cover a 0.093 m^2 (1 ft^2) area (Roberts et al., 1978). Any active organisms were collected into an inverted jar at the apex of the pyramid, as used by Musick and Fairchild (1970). The jar was fitted with an inverted paper drinking cup with a ring of Stickem Special® (Michel and Pelton Co., Emeryville, CA.) to prevent any organisms from leaving the jar. The bottoms of six emergence traps were inserted in the ground in the wooded field border along the alfalfa field. The "Stickem" was checked periodically and any alfalfa weevils caught were removed, recorded, and discarded.

The flight traps consisted of a rectangular box supported in the middle by a single galvanized metal pipe (Roberts et al., 1978). A sheet of clear plexiglas was positioned 30° forward of vertical above the box to deflect any flying organisms into a layer of ethylene

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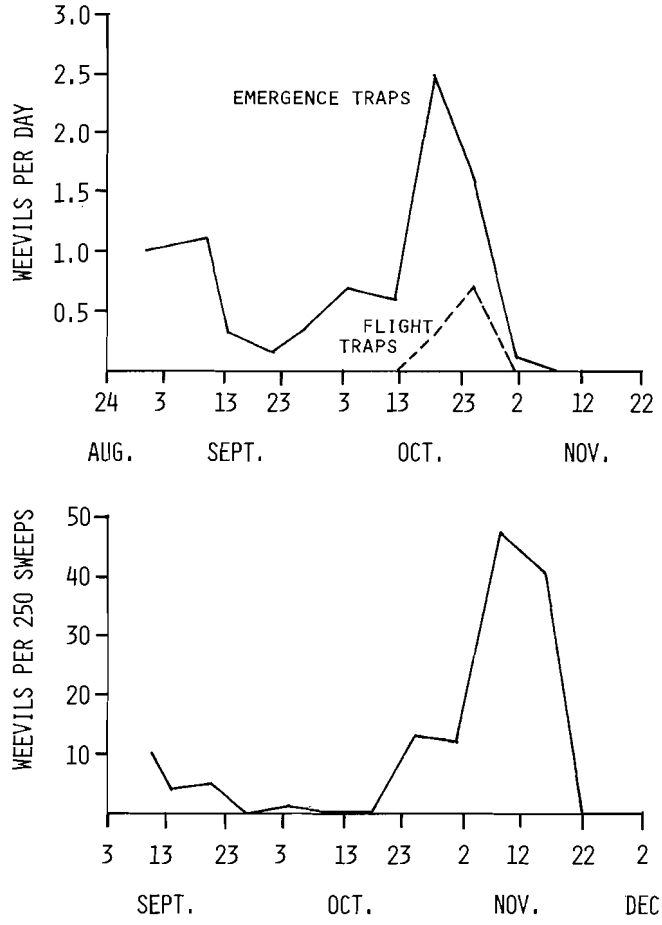

Fig. 1. Relationship of adult alfalfa weevil (a) emergence and flight activity, and (b) field population by sweeping, with time during fall of 1977, southern Illinois.

glycol contained in the box. Four traps were located in the alfalfa field 15.2 m (40 ft) from the wooded field border. The flight traps faced the field border to detect the movement from the aestivation sites. The traps were checked periodically and any alfalfa weevils were removed with an aquarium dip net, recorded, and discarded.

A standard 37.5 cm (15 in) diameter sweepnet was swung across the top portion of alfalfa in a pendulum type motion. One sweep was equal to one pass of the net, with the return pass counted as the second sweep. Five sets of 50 sweeps were taken at five evenly spaced intervals across the alfalfa field. The first set was near the wooded border of the field (east) with the fifth set coming at the west end near the road. The number of adult alfalfa weevils was counted for each set every sampling date.

Each egg sample consisted of a 232 cm^2 (0.25 ft^2) area of alfalfa, removed with a knife, and placed in a plastic bag. The alfalfa was ground in a blender, and washed through a series of screens (10-30-80 U.S. Bureau of Standards) to locate the alfalfa weevil eggs. Five egg samples were collected at each of the five previously mentioned

locations where the sweeps were taken. The egg samples were collected until the average daily temperature was below the threshold of development for the alfalfa weevil, 8.89°C (48°F) (Koehler and Gyrisco, 1961).

RESULTS AND DISCUSSION

Alfalfa weevils did not terminate aestivation uniformly. Two distinct peaks of activity were indicated by the emergence traps (Fig. 1a). A small cohort of weevils appeared in the traps in early September, while the majority were found during mid-late October. There were over 300 total acres of alfalfa in the area surrounding the study field, thus forcing growers to cut much of their alfalfa before the optimum time. Poinar and Gyrisco (1962) suggested that cutting an alfalfa field in the spring, which results in much higher ground temperatures than otherwise, may initiate alfalfa weevil migration from the alfalfa into aestivation sites. This early initiation of aestivation by a minority of weevils may result in an early termination of aestivation by these same weevils, possibly explaining the emergence in early September.

The flight traps revealed alfalfa weevil dispersal from aestivation sites to follow peak emergence by one week (Fig. 1a). However, the small number of weevils trapped may indicate the flight traps were insufficient in number or placed at an incorrect height and distance from the field border. Another explanation may be that weevil field reentry consists of short flights or simply walking which would not be detected by the flight traps.

The sweeping data demonstrated a large population of adult weevils in the field three weeks after emergence in aestivation sites (Fig. 1b). Once the alfalfa weevils terminate aestivation in wooded borders and initiate field reentry, a feeding period at the edge of the alfalfa field may be necessary before complete field dispersal. Sweeping the field at five locations resolved the method of field reentry. Figure 2a shows that field reentry was indeed a gradual process beginning at the wooded field border. In late October over 50% of the alfalfa weevils were located nearest the wooded border. By mid-November the population was equally dispersed throughout the alfalfa field. Prokopy and Gyrisco (1963) in New York and Pamanes and Pienkowski (1965) in Virginia also found fall migration to occur in late October-early November.

The data retrieved from the egg samples demonstrate the same gradual method of field dispersal (Fig. 2b). On 1 November almost 60% of the weevil egg population was located along the woodedge. The egg density was uniform throughout the field by mid-November.

In summary, the majority of adult alfalfa weevils terminated aestivation in wooded field borders in mid-late October. Timing of termination may depend on time of initiation of aestivation. Field reentry began in late October nearest the wooded field border. Field dispersal was a gradual process with complete dissemination by mid-November.

Termination of adult alfalfa weevil aestivation and the pattern of field reentry may be different for various areas of the alfalfa weevil's range due to availability of aestivation sites, timing of spring alfalfa cutting, and climatic conditions. Local information is necessary to predict accurately the time for fall application of insecticides in a pest management program.

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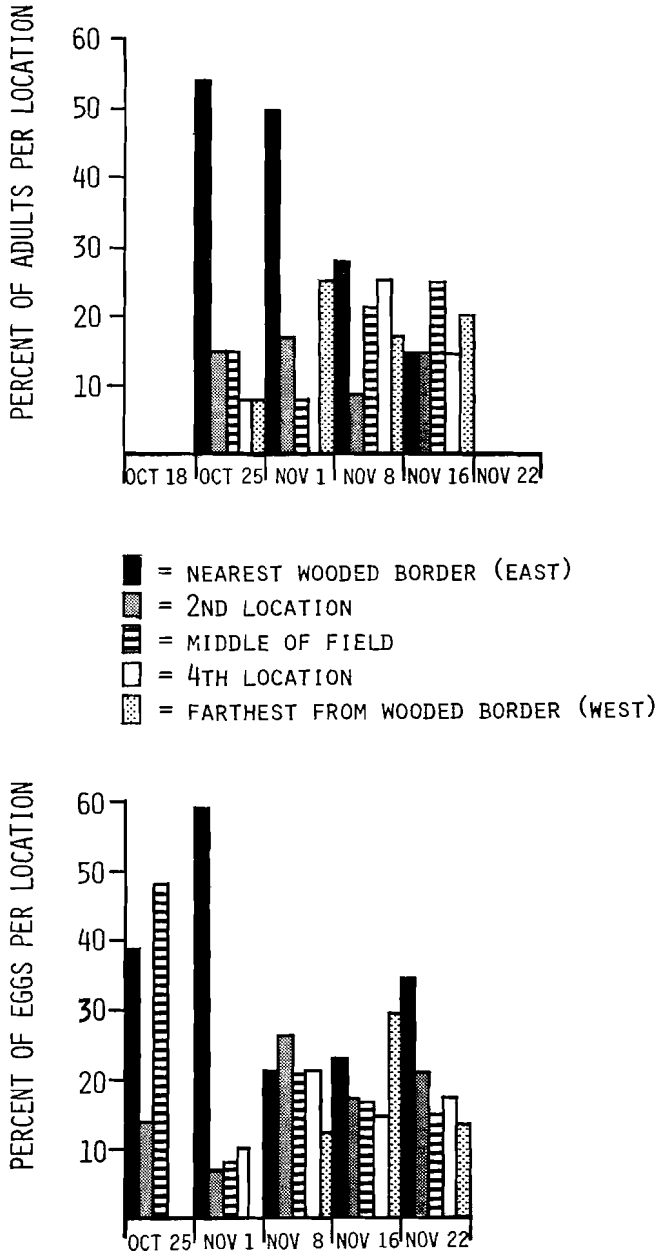

Fig. 2. Gradual field reentry from wooded field border by adult alfalfa weevils as evidenced by (a) sweeping, and (b) egg samples, taken at five locations across an alfalfa field during fall of 1977, southern Illinois.

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