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TWO TRAPPING SYSTEMS TO DETERMINE INCIDENCE AND DURATION OF MIGRATION OF ADULT ALFALFA WEEVILS, *HYPERA POSTICA* (COLEOPTERA: CURCULIONIDAE)¹

S. J. Roberts, R. D. Pausch, E. J. Armbrust, and R. J. Barney²

ABSTRACT

Emergence and flight traps were used to study the pre- and post-diapause movements of the alfalfa weevil, *Hypera postica*. The emergence traps proved to be an excellent tool in determining the time of diapause termination and in providing an accurate accounting of the number of weevils per unit area in aestivation sites. The flight traps showed when diapause flights to and from alfalfa fields took place. Both trapping systems can be utilized in a pest control program to locate more closely where the alfalfa weevil aestivates and when diapause related movements occur.

For the past two years our research on the alfalfa weevil, *Hypera postica* (Gyllenhal), has focused on aspects of regional populations. Adequate methods of monitoring adult migratory behavior during these studies were of primary importance. Of particular interest was the timing of adult emergence from aestivation and their departure from aestivation sites. Newly designed flight and emergence traps were used to measure these adults movements over selected periods of time. Several objectives were fulfilled by employing both flight and emergence traps. Migratory behavior, in terms of accumulative emergence/ft² (0.093 m²), emergence rate of beetles/day, and the incidence of flight activity was determined. Both traps are described herein along with their respective field data.

MATERIALS AND METHODS

The emergence traps were pyramidal in design, having a base of 1 ft² (0.093 m²) and a height of approximately 18 inches (45.7 cm) including the base (Fig. 1). Bronze screening was used in fabricating the pyramid while galvanized sheet metal was used to make the bottom frame and top plate. The screening was cut long enough to allow a 1 inch (2.5 cm) overlap for soldering to the inside of the galvanized square base and top plate. A four-sided pattern limited the soldering on the sides of the screening to only one seam. A wide mouth[†] canning jar lid was inverted and glued to the top plate for use with a wide mouth collecting jar similar to that used by Musick and Fairchild (1970).

The collecting jar, as used by Musick and Fairchild (1970), was screwed onto the ring and examined daily for insects. This method did not provide for one-way entry. One-way entry was accomplished by cutting the apex from conical drinking cups having a 3½ inch (8.5 cm) wide mouth, placing a narrow band of Stickem Special® (Michel & Pelton Co., Emeryville, CA) midway around the cup and inverting it (mouth down) into the canning jar lid.

Flight traps used in these studies were a modification of the commonly used

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window-pane trap. Our traps (Fig. 2) consisted of a shallow, rectangular box, supported by a single galvanized metal pipe screwed into an attached floor flange, and a sheet of clear plexiglas hinged to the rear of the box. The plexiglas was positioned approximately 30° forward of vertical so that any insects striking it would bounce downward into the collecting trays below. The supporting pipe, threaded at one end, was driven into the ground to the desired depth, and the trap, which was approximately 1.5 m above the ground, was threaded onto the pipe by means of the floor flange which was attached to the exact bottom center of the box.

To reduce the effect of turbulence from air currents entering the trap and rebounding from the plexiglas, triangular wooden frames covered with window screening were placed on the sides of each trap. This positioned the plexiglas at the appropriate angle and allowed incoming air currents to pass out and around the sides of the trap but still retain incoming insects. For ease of maintenance, heavy aluminum foil cooking pans were used as the collecting trays. These were placed in the box of the trap and filled to a depth of approximately 1.5 cm with ethylene glycol. Insects falling into the collecting trays became mired, quickly drowned, and sank to the bottom of the tray where they were visible enough to count and identify in situ. The transparency of the plexiglas was gradually reduced by an accumulation of dust on the surface. An occasional wiping with a damp cloth restored original clarity.

The number of alfalfa weevils captured was determined weekly. After the weekly count, the collecting trays were cleaned by passing an aquarium dip net through the ethylene glycol which removed all the collected insects.

Because we were interested in sampling only those insects coming from one particular direction, our traps were constructed so as not to rotate in the wind. If, however, wind oriented collections were desired, the trap design could possibly be altered with a bearing replacing the floor flange and a fin attached to the rear of the trap.

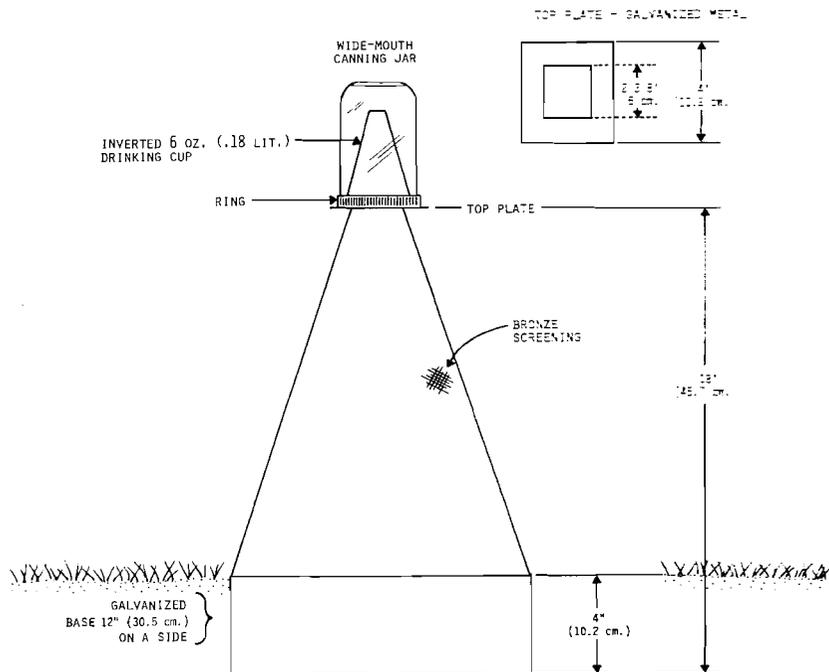


Fig. 1. Diagram of emergence trap used to study diapause termination of alfalfa weevil, Washington County, Illinois, 1977.

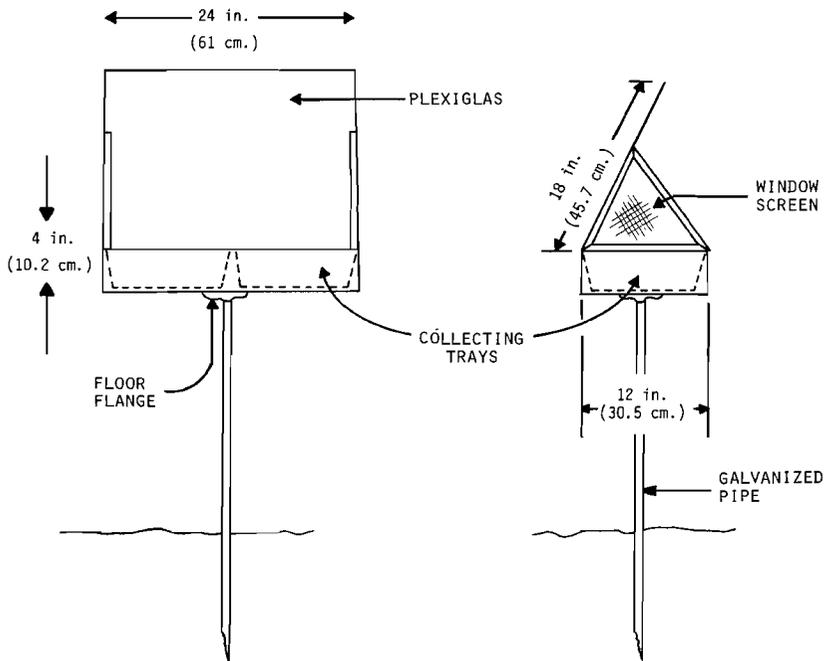


Fig. 2. Diagram of trap used in determination of alfalfa weevil flight movement. Washington County, Illinois, 1977.

RESULTS AND DISCUSSION

Thirty-six emergence traps were placed in the wood edge of our study area in Washington County, Illinois. Our studies have shown that alfalfa weevils are most concentrated in these wood edges during the time of aestivation, and variation in number of adults per square foot is sometimes fairly high making it desirable that the traps be placed as randomly as possible. Our results indicated, however, that our placement of traps was biased inasmuch as we obtained populations in the emergence traps that were three times higher than were measured previously during the summer by absolute densities samples. This, however, did not detract from the overall function of the emergence traps as indicators of approximate diapause termination, and did provide an accurate account of accumulative emergence of beetles/ft² (0.093 m²) and emergence rate in terms of beetles/day as given in Figure 3. The emergence traps worked equally well in obtaining adults of clover root curculio, *Sitona hispidula* (Fabricius), and the clover leaf weevil, *Hypera punctata* (Fabricius). The emergence traps were installed 18 August, 1977 and the weekly trap counts were taken thereafter and are shown as mean/ft² (0.093 m²) \pm SE for all three species in Table 1. This year all three species of weevils were collected on the first observation (24 August). This was much earlier than we had anticipated. Preliminary data involved with supplementary studies in the fall of 1976 showed the first emergence of clover root curculio on 14 September, clover leaf weevil on 22 September, and the alfalfa weevil on 29 September. Traps used in these studies were placed in the field as early as 26 August, 1976. In this latitude (Washington County, IL 38°20'N) the weevil is generally thought to return to alfalfa from aestivation in late September or October (Prokopy et al., 1967). Our emergence trap data and adult sweepnet counts taken in areas bordering wood edges indicated that some weevils began

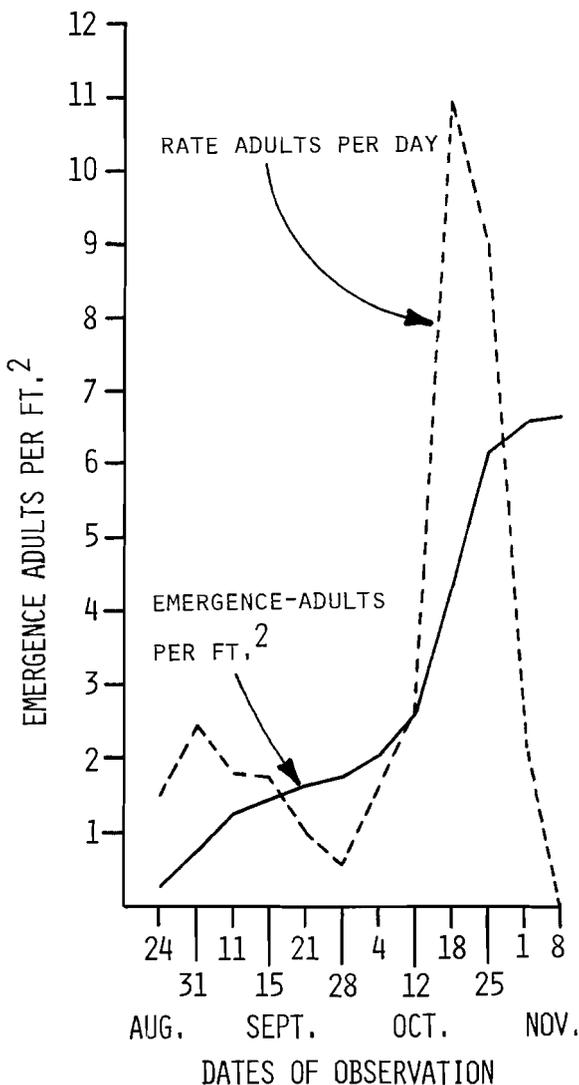


Fig. 3. Accumulative emergence of adult alfalfa weevils/ft² (0.093 m²), and rate of emergence expressed as beetles/day.

fall migration earlier than was generally thought. The majority of adults (74%) did migrate in October, however, as was evidenced by both the emergence and flight traps.

The flight traps performed well in indicating migratory flight behavior of the alfalfa weevil. Although peak migration time was established, low densities may have gone undetected because of the relatively small surface area of each trap. Using a larger number of traps would lessen this problem. In the spring of 1977 we had only eight such traps, whereas in the fall we had a total of 16. Table 2 shows the flight trap data for the spring and fall of 1977. Since flight is somewhat passive (Prokopy and Gyrisco, 1965) and dependent on wind speed, for the spring sampling we attempted to face the traps

Table 1. Mean number/ft.² (0.093 m²) ± SE of *Hypera postica*, *Sitona hispidula* and *H. punctata* captured in emergence traps. Washington County, Illinois, August-November, 1977.

Sampling Date	<i>H. postica</i>	<i>S. hispidula</i>	<i>H. punctata</i>
24/8	.25 ± .12	1.64 ± .43	.14 ± .06
31/8	.47 ± .14	3.17 ± .78	.11 ± .05
11/9	.56 ± .26	1.56 ± .50	.17 ± .08
15/9	.19 ± .08	.11 ± .07	.11 ± .05
21/9	.17 ± .08	.11 ± .05	.19 ± .09
28/9	.11 ± .07	.08 ± .05	.06 ± .04
4/10	.28 ± .12	.08 ± .06	0
12/10	.58 ± .17	0	0
18/10	1.81 ± .38	0	0
25/10	1.75 ± .24	0	0
1/11	.44 ± .12	0	0
8/11	.03 ± .03	0	0
Total	6.64	6.75	.78

Table 2. Total number of *Hypera postica* and *Sitona hispidula* captured in flight traps, Washington County, Illinois, Spring and Fall, 1977.^a

	Facing alfalfa at wood edge			Facing wood edge in alfalfa	
	<i>H. postica</i>	<i>S. hispidula</i>		<i>H. postica</i>	<i>S. hispidula</i>
19/5	0	2	16/9	0	1
25/5	6	1	21/9	0	2
26/6	20	1	28/9	0	1
8/6	0	0	4/10	0	0
14/6	1	0	12/10	0	1
25/6	1	4	18/10	7	0
6/7	0	2	25/10	15	0
13/7	0	0	1/11	1	0
20/7	0	2	10/11	0	0
27/7	0	10			
4/8	0	0			

^aFigures are trap totals for eight traps in spring, 19 May-4 August, and for 16 traps in the fall.

toward alfalfa and toward the direction of the prevailing winds south and west. In late summer, 10 September, 1977, the traps were placed in the alfalfa fields and faced toward the woods, which included all compass points except south. Peak flight from the alfalfa fields occurred between 25 May and 2 June in the spring and to the alfalfa fields between 18 October and 25 October in the fall. There were only two clover leaf weevils recovered (14 June and 21 September) from the flight trap counts.

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