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Effects of a Wide-area Application of ULV Malathion on Leafhoppers[1] in Alfalfa[2]

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Abstract

Beginning in 1968, a 16 (4×4) mi² area of Dawson County, Nebraska, was sprayed in August for 3 consecutive years with ULV malathion. Leafhoppers in alfalfa were monitored as nontarget organisms. *Scaphytopius acutus* (Say) was suppressed from one growing season into the next. All other major species, *Aceratogallia uhleri* (Van Duzee), *Balclutha neglecta* (DeLong and Davidson). *Empoasca fabae* (Harris) and *Macrosteles fascifrons* (Stål) recovered within 2–4 wk following treatment.

In 1968, a project was initiated to determine the effectiveness of a wide-area spray program for suppression of the western corn rootworm, *Diabrotica virgifera* LeConte (Pruess et al. 1974). Reported here are the results of extensive sampling to determine the effects of this wide-area spray on the leafhopper population in alfalfa.

Materials and Methods

Two contiguous areas, each 16 (4×4) mi² in Dawson County, Nebraska, were selected for the study. Both areas were nearly uniform in topography, soil, and cultural practices. Field corn (45.5%) and alfalfa (43.5%) were the major crops, comprising 89% of the acres in the study. One area served as a control; the other area was treated with 8.0 fl oz/acre of ULV malathion (9.7 oz AI/acre) for 3 consecutive years. Dates of application were Aug. 22–24, 1968, Aug. 14–16, 1969, and Aug. 10–12, 1970. Application was by aircraft at an altitude of 50 ft, airspeed of 80 mph, and swath width of 100 ft.

Leafhopper populations were monitored by sweeping. Using a standard 15 in. net, 50 sweeps/field were taken each sampling date. Fields were sampled from May through October, with 4 prespray samples in 1969, 5 in 1970, and 3 postspray samples in 1969 and 1970. In 1971, fields were sampled in June and July; in 1972, sampling was in July. Field size varied from 10 to 160 acres; 32–55 fields/area were sampled.

Results and Discussion

Aceratagallia uhleri (Van Duzee) (64.9%), *Macrosteles fascifrons* (Stål) (15.8%), *Balclutha neglecta* (DeLong and Davidson) (7.6%), *Empoasca fabae* (Harris) (3.8%), and *Scaphytopius acutus* (Say) (3.6%) composed 95.7% of the total leafhopper population in the check area during the period 1969–72. The remainder of the leafhopper population (4.3%) was grouped together and listed as "other spp."

ULV malathion reduced the total leafhopper population in the treated area during 1969 and 1970. The percent reduction 3 days postspray, adjusted for concurrent population changes in the control area, varied with species and year. The percent reduction for each species in 1969 and 1970, respectively, were *A. uhleri* 90.0, 86.6; *B. neglecta* 65.1, 54.5; *E. fabae* 96.6, 98.0; *M. fascifrons* 46.7, 82.5; *S. acutus* 98.6, 95.7; and "other spp." 80.5, 92.3. Similar reductions from the 1968 treatment were likely, but leafhoppers were not monitored at that time. The percent reductions given should not be taken as the maximum control attained. In limited sampling in 1969, maximum population reduction was 1 day after treatment, with some recovery 2 days postspray.

For *A. uhleri*, *B. neglecta*, *M. fascifrons*, and "other spp." significant differences between population means in the treated and control areas in 1969–72 were found only in the samples taken 3 days after treatment in 1969 and 1970. *E. fabae* populations also were significantly reduced 3 days following the 1969 treatment but remained lower for 2 wk postspray in 1970.

S. acutus was the only species affected for longer than 2 wk postspray. In 1969 and 1970, *S. acutus* never recovered to its prespray numbers in the treated area. Differences in population means remained until fall, when the population of *S. acutus* had naturally declined in the control area to the population level in the treated area. Although not monitored in 1968, carryover effects from both the 1968 and 1969 treatments were suggested by differences in the prespray population means in 1969 and 1970.

The treatment date in 1969 occurred when *S. acutus* adults were near peak numbers of the 2nd generation. These adults lay dispausing eggs in which the species is believed to overwinter (Palmiter et al. 1960). During this period of egg laying in late summer of 1969, the treated area population mean of *S. acutus* was significantly less than the control area. This could have resulted in more eggs laid in the control area by *S. acutus*, accounting for the significant difference between adult population means in the treated and control areas the following spring on May 27, 1970. There was a significant correlation in the control area ($r = 0.716$) between populations of *S. acutus* adults near the peak of the 2nd generation (Aug. 12, 1969) and the 1st generation adults the following spring (May 27, 1970) in the same fields. There was no significant correlation ($r = 0.105$) between the population of *S. oculus* in fields in the treated area sampled on these dates. In 1971 and 1972, any carryover

effects from the 1970 treatment were obscured by low populations of *S. oculus* in both treated and control areas.

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Notes

1. Hemiptera (Homoptera): Cicadellidae.
2. Contribution no. 384, Department of Entomology, University of Nebraska. Published with approval of the Director as paper no. 3869 in the Journal Series, Nebraska Agricultural Experiment Station, Lincoln. Received for publication October 11, 1974.
3. Graduate student and Associate Professor of Entomology, respectively.

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