A Field Scouting Strategy for the Red Sunflower Seed Weevil

Michael J. Weiss and **Gary J. Brewer**

The red sunflower seed weevil (RSSW), *Smicronyx fulvus* LeConte, reduces yields of commercial sunflowers in the Northern Great Plains. Females deposit eggs in the pericarp and larvae consume a portion of the kernel, reducing seed weight (Oseto and Braness 1980, Gednalske and Walgenbach 1984). Adults do not cause damage but are used as predictors of larval damage. An average of 12-15 RSSW adults per head on a 25 head sample per field is the generalized insecticide treatment guideline for oilseed sunflower.

Oseto and Braness (1980) developed an insecticide treatment threshold based on control cost, market price of the crop, and larval damage. Since this threshold is based on an absolute or total number of weevils per head, in order to use it in a reliable manner, the absolute number of weevils must be known. However, current sampling methods do not provide the absolute number of RSSW adults but rather only a portion of one absolute number.

Two sampling methods producers use are visually counting without disturbance and a visual county after spraying the head with a commercial formulation of mosquito repellent. Data has not been available on the reliability and counting efficiency of these two methods under field conditions. The objective of our study was to determine the counting efficiency of these two methods and, if necessary, provide a correction factor which would allow more reliable estimates of the absolute populations of RSSW adults.

Methods and Materials

The study was conducted during the growing seasons of 1986 and 87. Commercial sunflower (Hybrid Interstate 893) was planted at 30-inch row spacing with a population of 23,000 plants per acre. Other management practices for commercial sunflower were followed through the course of the study (McMullen, 1985). Samples were taken throughout the flower period, beginning at the onset of flowering. Field counts were taken using two methods, visual search and visual search after the head was sprayed with Cutter Insect Repellent Spray with 32% diethyltoluamide (DEET). Each head was held over a plastic bag during counting, and after counting the head was placed in the bag, sealed and taken to the laboratory to determine the absolute number of RSSW adults. To simulate a practical field scouting program, field counting was limited to 45-60 seconds per head. During 1986, samples were taken both in the morning and afternoon of the same day. In 1987, flowering stage (5.1-6.0) was recorded for each head. A total of 177 heads were sampled using the spray and 165 without the spray.

Results and Discussion

Several factors influence the reliability of estimates of insect populations under field conditions. One factor is the efficiency of the searching or sampling method, which is dependent on the behavior of the insect and on the ability of the sampler. If the insecticide treatment threshold is based on an absolute number of insects, sampling efficiency must be defined in order to obtain a reliable estimate of this absolute number.

In our study, we did not detect any difference in sampling efficiency between a.m. and p.m. counts in 1986. Additionally, flowering stage did not influence sampling efficiency in 1987.

The percent efficiency of field counts using the spray was 60.4 ± 35.0 (Mean $\pm$ C.L.$_{95}$) and 54.2 ± 44.0 (Mean $\pm$ C.L.$_{95}$) without spray over the two years of the study. In order to increase accuracy, samples were grouped by the observed number (field counts) of RWWS adults for further analysis.

When a spray was used, sampling efficiency was more consistent over different RSSW populations than when the spray was not used (Table 1). Using the spray, the sampling efficiency was over 50 percent for all RSSW population groups. However, the sampling efficiency for heads not sprayed with the repellent ranged from about 28 to 59 percent.

Table 1. Counting efficiency of two methods for estimating red sunflower seed weevil populations in the field. 1986-87. Mapleton, ND.

Number counted in the field	Counting efficiency (Mean percent ± S.D.) Counting Method: Without spray	With spray
1-5	61.6 ± 43.7	69.0 ± 38.3
6-10	59.3 ± 30.5	56.3 ± 27.3
11-15	32.9 ± 17.7	56.3 ± 24.9
16-20	44.3 ± 25.8	54.7 ± 28.0
21-25	28.1 ± 12.3	54.6 ± 34.6
26-35	50.1 ± 21.9	57.4 ± 28.6
35	46.7 ± 16.3	50.1 ± 20.3

Weiss and Brewer are assistant professors, Department of Entomology.

We suggest that to increase the accuracy of sampling for the RSSW under field conditions, producers should spray the head with a commercial formulation of mosquito repellent and correct for sampling efficiency. Corrected estimates are provided in Table 2.

We recommended that sunflower producers who are producing **oilseed sunflower** use the following steps for RSSW management.

Step 1. Calculate the number of RSSW needed before an insecticide should be applied using the treatment threshold of Oseto and Braness (1980) illustrated below.

Economic gain = insecticide cost per acre (\$/acre)/market price of crop (\$/lb)
Insecticide treatment threshold (absolute number of RSSW adults per head) = [economic gain/plant population (plants/acre)] × 3563.9

Step 2. Sample each field in a Z-pattern beginning at least 75 feet from the field margin. At each of five locations in the field, sample five sunflower heads, spraying each head with a commerical formulation of mosquito repellent before counting. The total number of sunflower heads that should be sampled for each field should be at least 25 (McMullen, 1985).

Step 3. Correct each count (number of RSSW per head) for sampling efficiency using the corrected estimate in Table 2.

Step 4. If the corrected estimated average (total corrected estimates/25) is equal to or exceeds the insecticide treatment threshold from Step 1, an insecticide application should be considered.

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Table 2. Estimation of total red sunflower seed weevil adults when sampling using a commercial formulation of mosquito repellent.

Number counted in the field	Estimated number	Number counted in the field	Estimated number
1	1.44	16	29.25
2	2.90	17	31.08
3	4.35	18	32.91
4	5.80	19	34.73
5	7.25	20	36.56
6	10.66	21	38.46
7	12.43	22	40.29
8	14.21	23	42.12
9	15.99	24	43.96
10	17.76	25	45.79
11	19.54	26	45.29
12	21.31	27	47.04
13	23.09	28	48.78
14	24.87	29	50.52
15	26.64	30	52.26