A Sampling Strategy for the Barley Thrips on Spring Barley

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The barley thrips, *Limothrips denticornis* Haliday, was first detected damaging barley in North Dakota in the 1950s. Post (1955) found that infestations of this insect could reach 1.5 million thrips per acre and demonstrated a yield reduction with a decrease in kernel plumpness and protein percentage. The insect overwinters as a female in shelterbelt and roadside sod. It infests spring barley in early June and will produce a single generation. In mid-July, females produced in the summer seek overwintering areas and emerge the following spring. The adult is torpedo-shaped, black to brown in color, and about one-eighth inch long. Most of the adults are found between the top three leaf sheaths of the stem.

The current sampling program for the barley thrips suggests that the field scout sample 50 plants in an X-pattern in the field prior to the completion of the boot stage. If the average number of adult thrips equals or exceeds 7.5 per stem, an insecticide is recommended to prevent economic yield loss. Insecticides applied after heading have not provided an increase in yield. This sampling procedure is time consuming and of questionable accuracy in assessing the field population. The objective of our study was to develop a sequential sampling plan which would significantly reduce the sampling time and improve prediction accuracy.

The benefit of a sequential sampling plan is the reduced amount of time needed to make a decision without a loss in accuracy. A sequential sampling program sets limits for the number of samples needed to make a decision. For example, if the population being sampled exceeds a set number after the required number of samples are taken, an insecticide should be applied. On the other hand, if the number does not exceed a set number after the required number of samples have been taken, an insecticide should not be applied. Another facet of a sequential sampling program is that the number of samples required is limited. If the population being sampled continues to fall within a set range of numbers when the sample limit is reached, a decision cannot be made and the scout should re-sample after a period of time.

METHODS AND MATERIALS

In 1987, two fields and in 1988, three fields ranging in size from 40 to 120 acres in northeastern and east central North Dakota were selected for the study. Fields were sampled twice a week in 1987 and every other day in 1988. Each field was divided into nine equal sections and 10 stems were chosen from each section on each sample date for a total of 90 stems per sample date. Adult thrips were counted in the field by removing the leaf sheaths. In 1987, a total of 1,300 plants were examined and in 1988 a total of 1,800 plants were sampled.

The two methods used to develop the sequential sampling plan for barley thrips were Taylor's power law (Taylor 1961) and Iwao's patchiness regression (Iwao 1968 and 1975).

RESULTS AND DISCUSSION

Both Taylor's power law and Iwao's patchiness regression described relationships between the mean number of adults and its associated variance. However, Iwao's method required a lower number of samples. In addition, Iwao's method accurately estimated the mean number of adults when the mean was greater than six.

For sampling purposes, we recommend that scouts divide the field into nine roughly equal sections, and sample one stem from each section for a total of nine stems per field. Count the number of adult thrips on the top two leaf sheaths by gently removing the leaf sheaths. Record the total number of adults on each stem. After taking nine stems, one from each section, sum the numbers of adults from each stem. If the total number is less than 34 adults, an insecticide treatment is not recommended. However, if the number exceeds 87 adults, an insecticide application is recommended. If the number of adults ranges from 34 to 87, a decision cannot be made and another nine stems must be taken in the same manner as the previous nine. If the number of adults continues to fall on or between the numbers shown in Table 1, the field has to be re-sampled until a decision is reached or the total number of stems taken equals 63. If a decision still cannot be made, we suggest the field be re-sampled within the next one to two days. We believe that only a small percentage of fields will require sampling more than 18 stems before a decision can be made. Post (1958) demonstrated that insecticide treatment after heading was not economical. Therefore, we also suggest that sampling be initiated when the second node is visible and continue until completion of the boot stage. Because thrips colonize barley over a long period of time, samples should be taken at least once a week until the boot stage is completed.

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Table 1. Sampling limits for cumulative counts of adult barley thrips.

Number of stems sampled	No treatment if the total number of adults less than	Treatment if the total number of adults more than
9	34	89
18	84	161
27	136	230
36	189	299
45	244	366
54	299	432
63	354	498

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