CARP AG# 94-08

Estimating the Abundance of Lygus in Canola Fields

FINAL REPORT - MARCH 1994

Scientific Abstract

Lygus bugs can be important pests of canola in western Canada. An economic threshold and control strategy is being developed for these pests, but an efficient sampling scheme is required if producers are to use the control strategy effectively. A variety of sampling methods were used in a large experimental plot and in 15 commercial fields in Manitoba. A sweep net proved to be the most effective sampling tool and was used to estimate the abundance of lygus in various parts of canola fields. Lgyus bugs were relatively evenly distributed in canola fields so that their densities could be estimated at the edges of fields. At a density near the economic threshold of about 1.5 lygus bugs per sweep, 12 twenty-sweep samples are required for accurate estimates. If densities are higher or lower than the threshold, fewer samples are required and rules are being developed to minimize the number of samples. A single sample of twenty sweeps can be completed in about 2 minutes so that sampling of a field to make a control decision can be completed in 30-45 minutes. The method will allow producers to efficiently assess the risk of lygus damage in their fields and allow them to minimize yield loss and control costs.

Summary Suitable for Producer Newsletter

Lygus bugs are a newly recognized pest of canola in western Canada. They feed on the growing points of canola plants and can cause damage to canola particularly when they attack pods and feed directly on developing seeds. This damage is usually invisible to the producer, but may result in a lower than expected yield. Although there is no doubt that lygus bugs can be damaging to canola, it has been difficult to estimate how many lygus bugs it takes to cause economic losses. One aspect of this study was to estimate an economic threshold for lygus in canola. Producers also need a method to efficiently assess their crop to determine whether the threshold is exceeded and control is required. Based on work supported by the canola producers of western Canada, a sampling method for lygus in canola has been developed. To determine whether or not lygus densities have exceeded the economic threshold, producers need to use a sweep net to sample the edges of their fields when the crop has almost finished blooming. A sequential sampling scheme has been developed to minimize the number of samples required. We estimate that up to 12 twenty-sweep samples (usually fewer) are required per field. The sampling method should take no more than 30-45 minutes to complete, and could result in yield savings of up to about 20% in some fields. The economic

threshold and sampling methodology will soon be detailed in technology transfer publications.

Report

Role of Matching Funds

The Canola Council Grant CARP AG# 94-08 awarded $10000 for this one year project. As a result of this grant, matching funds were also awarded for the same period: $10000 from the Pest Management Alternatives Office and $10000 from the Matching Funds Program of Agriculture and Agri-Food Canada. These additional funds allowed us to expand the research in two directions: development of an economic threshold for lygus bugs in canola and exploratory research on the possibility of using crop resistance to reduce the impact of lygus on canola. The additional research resulting from the matching funds will not be described in this report, but will be integrated with the results of our Canola Council project when the technology is transferred to canola producers. As a result of the matching funds, the Canola Council Grant has benefitted our research and ultimately will also benefit the canola producers to an extent that exceeds the $10000 invested by producer groups.

Expenditure of CCC Funds

The funds were used to cover part of the cost of a summer assistant to help us conduct the field work. Most of the remainder was used for part-time assistance with data entry and organizing the various parts of the computerized data sets so that they can be analyzed efficiently.

Objectives

1. To determine where lygus bugs occur on canola plants at various stages of growth;
2. To determine whether lygus bugs are distibuted evenly from the edge to centre of canola fields;
3. To compare the efficiency and accuracy of four sampling methods (i.e. vacuum, sweep net, beating tray, absolute counts);
4. To devise an efficient method for producers or pesticide applicators to estimate lygus abundance in canola and determine whether control is necessary. Our goal was to devise a sequential sampling scheme that provides sufficient accuracy, can be completed with minimal equipment, and requires about 1 hour to complete per field;
5. To devise a precise method for researchers to estimate abundance and sample lygus in experimental plots.

Research Conducted - 1 May 1994 to 1 March 1995

1. A single large plot of canola was seeded at our experimental farm at Glenlea, Manitoba. This plot was sampled

weekly by sweeping to determine when lygus enter the crop, when the various age classes appear, and what type of sampling devices would be effective. Sweep sampling proved to be much more effective for assessing all stages of lygus bugs in the crop than searching individual plants. The younger stages of lygus bugs occurred at lower levels in the crop and were more difficult to sample. This should not interfere with accurate sampling of fields by producers because at the time sampling and control are appropriate, most lygus have reached a stage that can be sampled.

2. Two 100 m transects were designated in each of 12 commercial fields of canola in early August. These were oriented at right angles to the edge of the field. Sweep sampling was conducted from these transects by four samplers working at distances of 0, 10, 20, 50 and 100 m into the fields. These data allowed us to compare the efficiencies of different samplers, and to determine how much variation we might expect among samplers. Most importantly, these samples allowed us to determine that lygus bug populations are sufficiently evenly distributed throughout fields that they can be estimated by sampling the edge of the field. This result assures that a cost-effective sampling scheme for lygus bugs in canola can be developed for canola producers.

3. Beating trays and bag samples of individual plants quickly proved to be inadequate for lygus bugs and were abandonned. Vacuum sampling is effective but impractical for producers. We used a combination of insecticide applications, vacuum sampling and hand searching in large experimental plots to compare sweep sample estimates with absolute abundance of lygus. These data suggest that sweep sampling collects about one-half of the lygus present in the sampled area, and that the age distribution of the lygus bugs are similar in sweep and absolute samples.

4. Replicated sampling was conducted along the edges of 15 commercial fields using sweep nets. The beating tray method was abandonned as ineffective. The time taken to collect and count samples was recorded for 40 of the samples. Analyses show that an adequate estimate of the lygus bug population could be conducted in 30-45 minutes in one commercial field by one sampler.

Field data collected this summer were entered on the computer and most analyses of the data have been completed. In addition, sampling data collected in previous years in Manitoba from about 100 commercial fields and many experimental plots are being incorporated into the data set. Also, data from northern and central Alberta have been made available to us by Dr. R.A. Butts, Lethbridge Research Center, and are being included in the analyses. This large data base is allowing us to develop an effective and well-verified sampling scheme that producers can use efficiently to assess the threat to their canola crop from lygus bugs. Analyses of these data sets began in December and we expect them to be completed in May of 1995. Work to date shows that an accurate estimate of the density of lygus can be made with 12 or fewer

groups of sweep samples. A single group of 20 sweeps can be completed and counted in about 2 minutes, assuring that sweep sampling will be practical for canola producers. The sequential scheme that is currently being developed will assure that only the minimum number of sweeps need be taken. The number of required sweeps is lower when lygus densities are very low or very high, so that a control decision can usually be reached quickly with a minimum of effort.

5. It proved to be more difficult than we expected to devise a highly precise method for researchers to use when estimating the abundance of lygus in experimental plots. Fortunately, The more important objective of developing an efficient method for producers was achieved. The absolute method described in Item 3, above, appears to be the only practical method for researchers, although it is quite time consuming. We want to confirm the calibration of the relationship between sweep counts and absolute counts in the summer of 1995, so that researchers can also use sweep sampling, but with a more precise understanding of the proportion of lygus collected in a sweep sample. This aspect of the work will be completed as part of other projects we expect to be undertaking in 1995.

Technology Transfer

The CCC funds have so far assisted us in preparing one scientific paper and reports in the farm press. These are summarized below:

Turnock, W.J., G.H. Gerber, B.H. Timlick, R.J. Lamb (1995) Losses of canola seed from feeding by Lygus species (Heteroptera: Miridae) in Manitoba. Can. J. Plant Sci. (accepted for publication)

Lygus bugs in canola. Manitoba Cooperator, July 1994, articles on lygus bug damage in canola consisting of about one half of one newspaper page. The articles were based on telephone interviews with R.J. Lamb.

The CCC funds are assisting us to prepare two scientific papers. One defines the economic threshold for lygus bugs in canola as a function of lygus density and precipitation during the flowering period of canola. This paper will also describe the optimum time to sample and control lygus bugs in canola. The second paper will describe the spatial properties of lygus bugs in canola fields and present a sequential sampling scheme that producers can use to make control decisions. We expect these two papers will be submitted for publication in 1995. When they are submitted for publication, the papers will also be forwarded to Provincial Entomologists and extension officers to assist them in preparing their recommendations for producers. At the same time, we will prepare summaries of the two papers for publication in the farm press. All published material will be sent to the Research Co-

ordinator of the Canola Council of Canada.

Date: March 16, 1994

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