Section VI.
Forage & Seed Insects

USING DEGREE DAY ACCUMULATIONS TO PREDICT LYGUS HATCHES IN ALFALFA SEED

B. C. Simko and M. Palmer
Malheur County Extension Office
Oregon State University
Ontario, Oregon 97914
541/881-1417
simkob@oes.orst.edu

Introduction

Numerous publications have described degree day or physiological time requirements for lygus bug development. However, little work has been done to test degree day models for lygus development in the context of the Northwest alfalfa seed IPM system. The objective of this study was to validate a published degree day model for lygus development in Malheur County seed production fields and to explore whether this tool has utility as a pest management decision aid for fieldmen and growers. This project was initiated in 1995 and observation carried out for two consecutive seasons. This report provides data from the 1996 study and summarizes results for both seasons.

Methods

Four fields were monitored for lygus population trends and in particular for peak onset of egg hatch. The fields were located in major seed production districts of the county including Adrian, Sunset Valley, Cairo and Oregon Slope. Standard 180° sweep samples were taken from fields on a weekly or semi-weekly basis. Sweep samples were preserved in glass jars containing ~70% ethanol solution and returned to the lab. The samples were analyzed and detailed counts of all adult and nymphal instars of lygus recorded. Sampling began in mid-April and continued through mid-August. At all four sites baseline population levels were observed prior to clean up (prebloom) insecticide treatments. Population trends and especially surges of 1st and 2nd nymphal emergence were observed during the course of the season. Cooperating growers reported all insecticide applications including active ingredients, rates, treatment dates, and application methods. Physiological time or degree day accumulations were measured using Datalogger Omnidata Biophenometers. Each biophenometer was placed in a small instrument shelter located at the edge of the study field. For each biophenometer the lower threshold of development was set at 52°F. Published lygus developmental requirements for egg hatch and peak emergence of 1st instar has been reported at 252 degree days. This value was used to correlate with observed hatches in the field. For the first spring

prebloom hatch the biofix was set at January 1. For subsequent hatches during the bloom period the biofix was set at the date of the first insecticide (cleanup) treatment. Observations were then carried out to determine if using degree day accumulations accurately predicted observed hatches of lygus bugs.

Results/Conclusions

Based on the data from three fields monitored in 1995 and four fields monitored in 1996 the following observations can be drawn.

1. Using a January 1 biofix, the accumulation of 252 degree days (egg development requirement) consistently predicted the first hatch of lygus bugs. This event occurred about mid-May in both seasons (Figure 1 and 2).

2. A 252 degree day accumulation did not consistently predict the second, bloom period, hatch of lygus when setting the biofix at the first insecticide treatment date.

3. The observed first hatch in 1996 was ~10 days earlier than the first hatch of the 1995 season. This season to season difference was predicted by the recorded degree day accumulations (Figure 3).

4. Subtle differences in observed hatches at the four fields seemed to be related to subtle differences in degree day accumulation at the four sites (Figure 4).

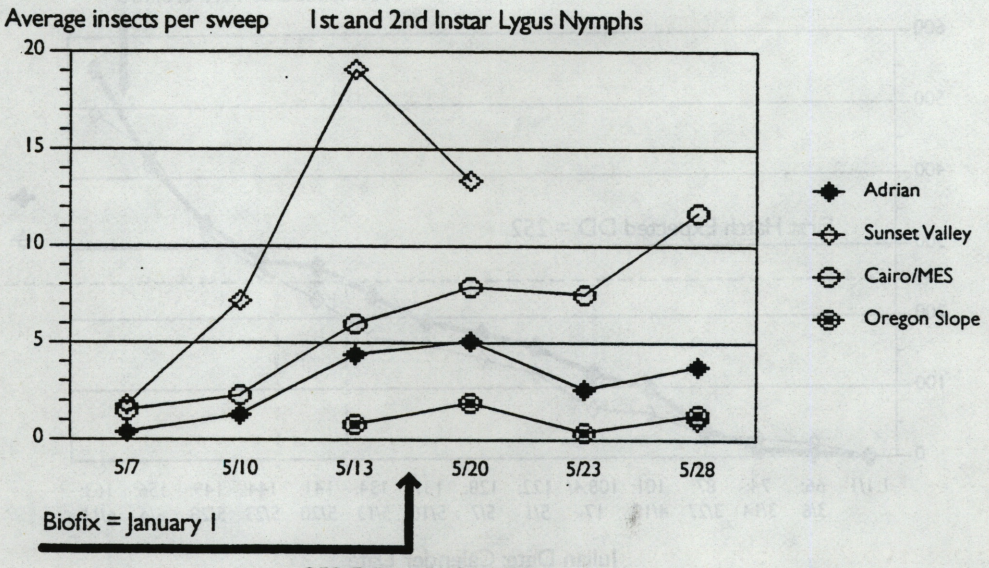
5. The use of biophenometers appeared to be a simple and user friendly method of tracking physiological time for lygus populations.

Based on these preliminary observations, the use of degree day accumulations may have some potential as an IPM management tool for control of lygus populations in alfalfa seed. Monitoring the egg development time (252 DD) may be helpful to predict the first nymphal hatch and optimize sampling and treatment schedules during the prebloom period. It is unclear if alternate management techniques for the first hatch will mitigate subsequent hatches of lygus or reduce insecticide costs during the bloom period. Further research is required to fully explore this IPM technology.

Grower Impacts

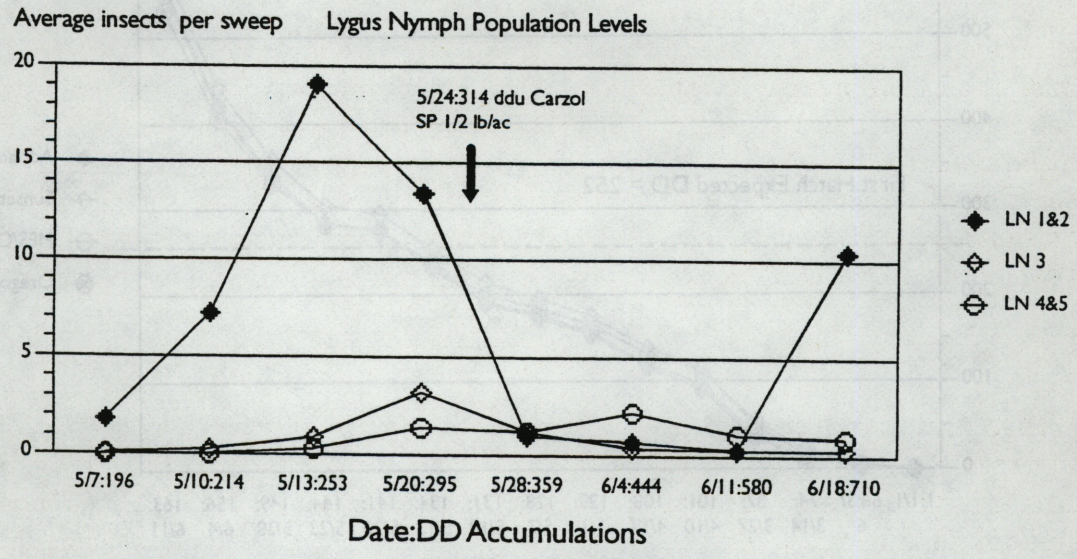
This method needs further study under controlled conditions. Researchers and selected growers/seed company agronomists are encouraged to test this technique at other sites and production regions. At this time the cost effectiveness of using biophenometers is not firmly established and widespread grower adoption is not recommended by the principle investigator.

Figure 1 Comparison of Lygus hatches with accumulated degree days (DD) required for egg development (252 DD) at four locations in Malheur County, Oregon - 1996*



* Lower Threshold = 52° F: DD accumulations using a biophenometer

Figure 2 Comparison of a prebloom lygus hatch with accumulated degree days (DD) required for egg development (252 DD) in a commercial alfalfa seed field, Sunset Valley, Oregon - 1996*



* Lower Threshold = 52° F: Biofix = January 1: DD accumulations using a biophenometer

Figure 3 Comparison of Lygus degree day (DD) accumulations in a commercial alfalfa seed field for 1995 and 1996 Cairo, Ontario, Oregon

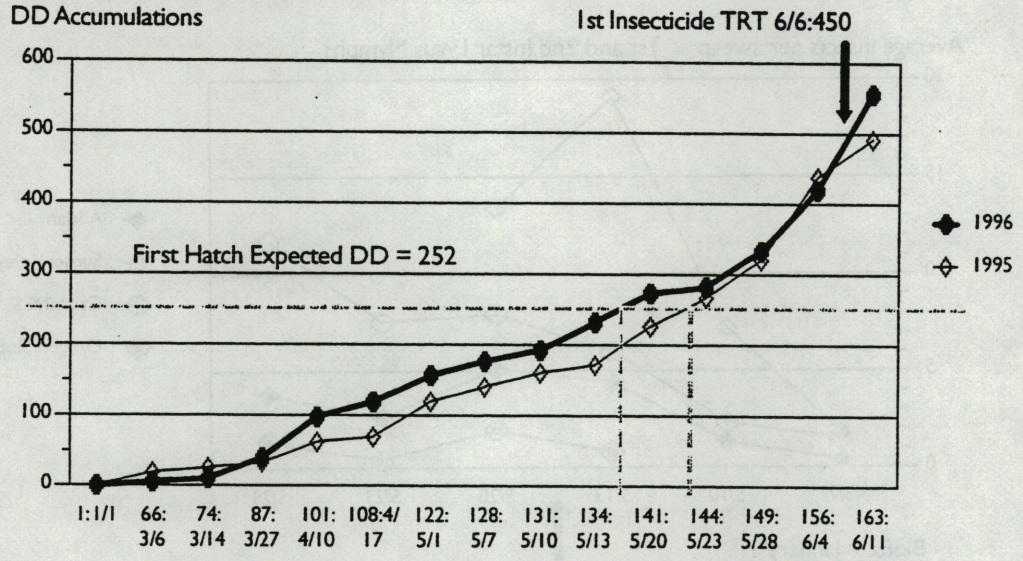


Figure 4 Comparison of lygus degree day (DD) accumulations at four sites in Malheur County, Oregon 1996