UPDATE ON PEST MANAGEMENT OF THE
BANDED SUNFLOWER MOTH IN NORTH DAKOTA

JANET J. KNODEL¹, LAURENCE D. CHARLET², & MIKE HUTTER³

¹Department of Entomology, Hultz Hall
North Dakota State University, Fargo, ND 58105
²USDA, ARS, Northern Crop Science Laboratory
1307 18th St. N, Fargo, ND 58105
³Northern Ag Management
Westhope, ND 58793

Introduction

The banded sunflower moth, Cochylis hospes Walsingham (Lepidoptera: Tortricidae), has been a consistent pest of sunflower in the northern Plains and also has been increasing in numbers in the central Plains. Adults begin to emerge from the soil about mid-July and are present in the field until mid-August. Adults tend to congregate in field margins on weeds or adjacent crops during the day, and then move into the crop in the evening. Eggs are deposited on the outside of the bracts of the sunflower head. Larvae feed in the florets, developing seed, and also destroy mature seeds. After feeding to maturity, larvae drop to the ground and spin cocoons in the soil to overwinter (Charlet and Gross 1990, Charlet et al. 1997). The primary management strategy for control of banded sunflower moth has been the use of insecticides, although research has also shown that delayed planting can reduce feeding damage. In addition, crop management programs relying primarily on insecticide usage can be detrimental to both parasitoid diversity and activity. There are several parasitoid species attacking the banded sunflower moth (Charlet 1999, Charlet 2001). In most years the control exerted by these parasitoids is inadequate to maintain banded sunflower moth populations below economic injury levels. Understanding the population dynamics of the pest and integration of cultural and chemical control strategies will provide valuable information that could improve control of the banded sunflower moth in cultivated sunflower. The integration of different strategies has the potential to provide more effective control with reduced input costs for the sunflower grower.

The goal of this project was to investigate the integration of management strategies to reduce both input costs and overall feeding injury caused by the banded sunflower moth in commercial oilseed and confection sunflower fields. Our objective was to compare the effectiveness of treating oil and confection sunflower fields in reducing economic losses from banded sunflower moth in early and late planted sunflower fields. The discovery of the most effective combination of control tactics to manage banded sunflower moth will enable producers to reduce yield loss and save money by lowering insecticide treatment costs. Cooperation from a certified crop consultant ensured that commercial sunflower producers could readily adapt results.
Materials and Methods

In 2006, commercial fields were selected from both confection and oilseed sunflower that were either treated or untreated, and planted early (prior to mid-May) or late (late May to mid-June). There were three replicates of the following treatments: (1) early planted, sprayed, oilseed fields; (2) late planted, sprayed, oilseed fields; (3) early planted unsprayed, oilseed fields (only two fields sampled); (4) late planted, unsprayed, oilseed fields; (5) early planted, sprayed, confection fields; (6) late planted, sprayed, confection fields; (7) early planted unsprayed, confection fields; and (8) late planted, unsprayed, confection fields. Fields were sprayed by air using 3 GPA, and the insecticide Asana (esfenvalerate, E. I. du Pont de Nemours and Co., Wilmington, DE, USA) applied at 9 fl oz per acre or the insecticide Baythroid XL (beta-cyfluthrin, Bayer Crop Sciences, RTP, North Carolina, USA) applied at 2.8 fl oz per acre. Applications were made at the 10% ray petal stage (or when early instar larvae of banded sunflower moth were present). A total of 23 fields was sampled on 25-26 September 2006. Ten randomly selected sunflower heads were collected at distances of 5 m (edge), 40 m, and 150 m from two sides of each field for a total of 60 heads per field. The heads were bagged individually, labeled, and returned to the USDA, ARS Northern Crop Science laboratory at Fargo. For evaluation, each head was dried, threshed and subsamples of 100 seeds were examined for damage by banded sunflower moth.

The effect of treated and untreated sunflower fields, planting dates and sunflower type were compared by determining the percent of damaged seed within each sunflower field. Data also were evaluated at different sampling distances from the field edge. Data were analyzed using ANOVA and Fisher’s Protected LSD to separate means at the 5% significance level. Before analysis, banded sunflower moth data for larvae and damaged seeds were square root transformed due to non-normal distributions of residuals and non-homogeneity of variance.

Results and Discussion

Due to the high populations of banded sunflower moth, the whole field was treated. Some years, only field edges need to be sprayed when moth populations are lower. There were significantly lower percent of banded sunflower moth damaged seed in treated fields compared to the untreated fields for both confection (F = 88.78, df = 1, 60, P =< 0.0001) and oilseed (F = 10.54, df = 1, 60, P = 0.0019) sunflower (Table 1). There were no significant differences for head diameter between untreated and treated field regardless of sunflower type. Results indicated that field spraying was successful in reducing damaged seed when populations of banded sunflower moth were moderate to high.

Table 1. Effects of spraying sunflower fields on head diameter and percent seed damaged by banded sunflower moth in confection and oilseed sunflowers in 2006.

| Location | Confection | | Oilseed | | |
| --- | --- | --- | --- | --- |
|  | Head diameter (cm) | % Damaged Seeds |  | Head diameter (cm) | % Damaged Seeds |
| Treated | 18.2 a | 2.3 a | | 17.8 a | 2.3 a |
| Untreated | 17.6 a | 10.6 b | | 17.7 a | 3.1 b |

Means within a column followed by the same letter are not significantly different (P≤ 0.05), Fisher’s Protected LSD.
Data transformed using square root, untransformed means presented.

Asana (9 fl oz per acre) or Baythroid (2.8 fl oz per acre) was applied during 10% ray petals by air using 3 GPA, whole field spray application.

Comparison of early versus late-planted sunflower fields indicate that early planting dates had a significantly higher percent of damaged seed ($F = 20.15$, df = 1, 60, $P < 0.0001$) than late planting dates for oilseed sunflower in 2006 (Table 2). There were no significant differences in head diameter between the two planting dates regardless of the sunflower type.

**Table 2.** Effects of early versus late planted sunflowers on head diameter and percent seed damaged by banded sunflower moth in confection and oilseed sunflowers in 2006.

<table>
<thead>
<tr>
<th>Location</th>
<th>Confection</th>
<th></th>
<th>Oilseed</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Head diameter (cm)</td>
<td>% Damaged Seeds</td>
<td>Head diameter (cm)</td>
<td>% Damaged Seeds</td>
</tr>
<tr>
<td>Early planted</td>
<td>18.2 a</td>
<td>6.6 a</td>
<td>17.9 a</td>
<td>3.6 a</td>
</tr>
<tr>
<td>Late-planted</td>
<td>17.6 a</td>
<td>6.5 a</td>
<td>17.5 a</td>
<td>2.0 b</td>
</tr>
</tbody>
</table>

Means within a column followed by the same letter are not significantly different ($P < 0.05$), Fisher’s Protected LSD.

Data transformed using square root, untransformed means presented.

Edge samples in 2006 had significantly higher percent damaged seed than the 40 m and 150 m samples for both confection ($F = 8.12$, df = 2, 60, $P = 0.0008$) and oilseed ($F = 5.25$, df = 2, 60, $P = 0.0080$) sunflower (Table 3). There were no significant differences among sampling locations for head diameter. When data for untreated or treated confection or oilseed sunflower fields were analyzed separately (results not presented), results were identical to the combined analyses. The 2006 results were identical to results in 2005 and further support that field edges have higher numbers of banded sunflower moth than the samples collected in the field interior.

**Table 3.** Effects of sampling locations from combined (treated and untreated) sunflower fields on head diameter and percent seed damaged by banded sunflower moth in confection and oilseed sunflowers in 2006.

<table>
<thead>
<tr>
<th>Location</th>
<th>Confection</th>
<th></th>
<th>Oilseed</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Head diameter (cm)</td>
<td>% Damaged Seeds</td>
<td>Head diameter (cm)</td>
<td>% Damaged Seeds</td>
</tr>
<tr>
<td>Edge</td>
<td>18.0 a</td>
<td>9.5 a</td>
<td>17.5 a</td>
<td>3.5 a</td>
</tr>
<tr>
<td>40 m</td>
<td>17.5 a</td>
<td>5.7 b</td>
<td>17.7 b</td>
<td>2.0 b</td>
</tr>
<tr>
<td>150 m</td>
<td>18.2 a</td>
<td>5.3 b</td>
<td>18.0 a</td>
<td>2.6 b</td>
</tr>
</tbody>
</table>

Means within a column followed by the same letter are not significantly different ($P < 0.05$), Fisher’s Protected LSD.

Data transformed using square root, untransformed means presented.

**Summary**

Since the early 1980s, cultivated sunflower fields in North Dakota, Minnesota and South Dakota have had frequent economic damage caused by banded sunflower moth (Charlet and Busacca 1986, Charlet and Glogoza 2004). Insecticide spraying decisions are based on sampling for eggs.
or adults of banded sunflower moth in fields during mid to late July (Knodel et al. 2008, Knodel and Charlet 2007). Banded sunflower moths and seed damage were found to be more concentrated in the field edge compared to the field interior. Knodel et al. (2007) found edge spraying was effective in controlling banded sunflower moth because populations of banded sunflower moth were found to be concentrated in field edges. However, edge spraying was only effective in controlling banded sunflower moth when population levels were low to moderate (Knodel et al. 2007). Since populations of banded sunflower moth were high in 2006, whole field spraying was required to control banded sunflower moths. Manipulating planting dates to avoid oviposition minimized damage caused by banded sunflower moth. Late planting sunflower fields into June could provide producers with a cultural control tactic to mitigate banded sunflower moth damage. Oseto et al. (1989) also reported that sunflower planted late (early June) in southeastern North Dakota had fewer damaged seeds than sunflower planted early (first week in May).

In summary, this research supports the concept of integrating cultural control and insecticide control, which together can be used effectively to reduce banded sunflower moth damage in cultivated sunflowers in North Dakota.

Acknowledgments

We thank Theresa Gross and Bruce Goren (USDA, ARS, Fargo, ND) for their assistance in laboratory and field. The National Sunflower Association provided partial financial support for this project.

References Cited


Charlet, L. D. and J. D. Busacca. 1986. Insecticidal control of banded sunflower moth, Cochylis hospes (Lepidoptera: Cochylidae), larvae at different sunflower growth stages and dates of planting in North Dakota. J. Econ. Entomol. 79: 648-650.


