

DEVELOPMENT OF A PHENOLOGICAL MODEL FOR THE DENVER BILLBUG IN CENTRAL OREGON BLUEGRASS SEED PRODUCTION

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Situation

The Denver billbug (*Sphenophorus cicatristriatus*) has occasionally been observed in central Oregon Kentucky bluegrass fields grown for seed. During insect sampling from 1996 through 2007 for sod webworm (*Chrysoteuchia topiaria*) and cutworms (*Protagrotis obscura*), the Denver billbug was collected at low levels in occasional fields, but has never been considered an important pest. During the fall of 2008 high levels of the billbug were found in one field, with moderate levels in two others. Sampling continued in 2009 to identify the timing of the four life stages: egg, larva, pupa, and adult. Billbugs do most of their damage while in the larval stage and can cause significant damage to grass seed fields. Left uncontrolled, populations tend to double annually. Pitfall traps and sod sampling were used for collection of the various life stages to develop a phenological model and control strategy for the Denver billbug in central Oregon.

Procedures

During the fall of the 2009 season three commercial bluegrass seed production fields showing billbug damage were selected for sampling. Eight pitfall traps were placed in each of the three fields on March 3, 2010 and checked on a weekly basis through July 6, when they were removed for harvest. Pitfall traps were not replaced in the fields following harvest.

Eight, 12-inch-diameter sod samples, 2 inches deep, were collected every 2 weeks from March 16 through June 22, 2010. These samples were taken within 3 to 5 ft from the pitfall traps and kept refrigerated while waiting for processing. Sod samples were processed for 4 days using Berlese funnels. Berlese funnels are used for extracting insects and other arthropods from soil and litter samples. Insects and other arthropods that live in soil will move away from a heat source that is drying out the soil. Therefore, a heat source above the soil samples is used to cause the insects to move downward, where they will fall through a screen holding the sod sample down a funnel and into a container for collection. Insects were collected, identified, and counted. In addition, samples were screened for any nonmobile adults or larvae.

Random samples of adult billbug and larvae were sent to Dr. Sujaya Rao at Oregon State University for DNA sampling. The objective of this portion of the study is to determine if molecular markers could be identified for separation of three billbug species, *Sphenophorus parvulus* (bluegrass billbug), *S. cicatristriatus* (Denver billbug) and *S. sayi* (currently no common name). The three species are indistinguishable as larvae and current species identification is based on adult characteristics.

Results

Adult billbugs were collected from pitfall traps weekly from March 3 through July 6, 2010. The first collection of adults began on May 17 and continued through July 6, 2010. The first two weeks of June saw the highest number of adults in pitfall traps, then steadily decreased through July 6 (Table 1).

Billbugs were collected from sod samples taken from March 16 to June 22, 2010, with adult numbers reaching a peak of 12 per field, and first appearing in significant number on May 6 (Table 2). Larvae were active during the entire collection period, with the highest numbers from May 17 to June 7. It appears from our sampling that the Denver billbug overwinters in both the adult and larval stages.

DNA analysis of adult billbugs by Sujaya Rao confirmed the presence of *S. cicatristriatus* (Denver billbug). Based on reports from other parts of the US, the bluegrass billbug and the Denver billbug have the potential to cause major economic damage to Oregon's grass seed industry. There are no reports of damage by the third species, *Sphenophorus sayi*. Presently, we are working to understand the life-cycle of these species in Oregon using molecular markers that allow identification at the larval stage. This process facilitates evaluation of the possible risks presented by each species to grass seed farmers in Oregon.

Summary

Numbers of adult Denver billbugs collected in pitfall traps peaked in late May and early June in 2009, and the first half of June in 2010. Adults collected from sod samples peaked from during June 9 to 22 in 2009 and from May 6 to June 7 in 2010. A second peak in adults was collected from pitfall traps from late September through October, 2009. Larval populations collected from sod samples peaked on June 22, 2009 and May 17 to June 7, 2010. A second peak occurred from

September 22 through October 23, 2009. Many small larvae were observed during mid-June 2009, indicating a new hatch of larvae during late spring.

Two years of data collected from Kentucky bluegrass seed fields in central Oregon will be used to develop a phenological model to show life stages of the Denver billbug throughout the calendar year. This will provide the basis for recommendations for control of this pest.

Table 1. Number of adult billbugs collected in pitfall traps from fields located on the Agency Plains near Madras, OR, 2010.

Field	Collection dates											
	March 3-23	April 5	April 14	April 20	May 6	May 17	May 24	June 7	June 14	June 22	June 28	July 6
	----- (Adults per field) -----											
1	0	0	0	0	0	2	1	5	2	4	2	1
2	0	0	-- ¹	0	0	1	0	2	3	0	2	0
3	0	0	0	0	0	3	2	8	5	6	7	3

¹ Traps not collected.

Table 2. Number of billbug adults and larvae collected from sod samples taken from fields located on the Agency Plains near Madras, OR, 2010.

Field	Collection Dates											
	March 16	April 5	May 6	May 17	June 7	June 22	March 16	April 5	May 6	May 17	June 7	June 22
	----- (Adults per field) -----						----- (Larvae per field) -----					
1	1	0	12	2	11	2	24	43	74	119	114	89
2	0	0	3	1	0	1	6	7	13	11	31	20
	0	1	1	1	1	0	0	0	0	4	0	6