

# DEVELOPMENT OF A PHENOLOGICAL MODEL FOR THE DENVER BILLBUG IN CENTRAL OREGON KENTUCKY BLUEGRASS SEED PRODUCTION, 2009

M.D. Butler, G.C. Fisher, S. Rao, L.L. Samsel and K.J. Marling

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. There are four life stages: egg, larvae, 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 will provide the data needed to develop a phenological model and control strategy for the Denver Billbug in central Oregon.

Five commercial bluegrass seed production fields showing moderate to severe billbug damage were selected for sampling during the 2009 season. Eight pitfall traps were placed in field number 4 on April 10, 2009 and eight traps were placed on May 11, 2009 in field numbers 1, 2, 3, and 5. The traps were checked on a weekly basis from April 10, 2009 to June 30, 2009 when they were removed for harvest and placed back into four of the five locations September 25, 2009. Weekly sampling resumed through November 12, 2009.

Eight, 12 inch diameter sod samples, 3 inches in depth, were collected every two weeks from May 26, 2009 through November 24, 2009. Sod samples were not taken during the months of July and August due to harvest. These samples were taken within three to five feet from the pitfall traps and kept refrigerated while waiting for processing. Sod samples were processed for four days using Berlese funnels. Insects were collected and identified. The samples were screened for any non-mobile adults or larvae.

The number of adult billbugs collected in the pitfall traps ranged from 0 to 27 per trap from April 10 thru June 30, 2009. The last week of May and the first week of June saw the highest activity of adults in the pitfall traps, then tapered off through the summer and into the fall (Table 1). With the exception of one field adult numbers for the fall dates were very low compared to the spring numbers (Table 2).

The number of billbug larvae collected from sod samples taken from May 26, 2009 to November 24, 2009 ranged from 0 to 56 per field (Tables 3 & 4). Mid- June saw a high number of small larvae from four locations indicating a newly hatched generation of billbugs. One field showed higher numbers of small larvae during late May and early June. The location of

this field is at a lower elevation which may explain why the larvae count was higher earlier in the season compared to mid-June for the other locations. Because of the lower elevation and higher temperatures insect development was one to two weeks ahead of the other locations. It appears that the Denver Billbug overwinters both as adults and larvae.

Random samples of adult billbug and larvae were sent to Sujaya Rao for DNA sampling. The results for the 12 adult billbugs show they were of the Denver Billbug species. The objective of the study was to determine if molecular markers could be identified for separation of three billbug species, *Sphenophorus parvulus* (Bluegrass Billbug), *Sphenophorus cicatristriatus* (Rocky Mountain Billbug) and *Sphenophorus sayi* (currently no common name). The three species are indistinguishable as larvae and current species identification is based on adult characteristics. Based on reports from other parts of the US, the Bluegrass Billbug and the Rocky Mountain 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, little is known about the life-cycle of these species in Oregon. Hence, molecular markers that allow identification at the larval stage will facilitate studies on evaluation of the possible risks presented by each species to grass seed farmers in Oregon.

Table 1. Number of adult billbugs collected in pitfall traps from fields located on the Agency plains near Madras, Oregon, during the spring of 2009.

Field	Collection dates								
	April 20	April 27	May 18	May 21	May 27	June 8	June 16	June 22	June 30
----- (Adults per field) -----									
1	-- <sup>1</sup>	--	1	3	9	14	7	2	1
2	--	--	1	1	14	17	7	2	0
3	--	--	1	0	6	2	1	4	3
4	0	0	5	--	17	27	4	8	12
5	--	--	6	0	1	3	2	4	--

<sup>1</sup>Traps not collected.

Table 2. Number of adult billbugs collected in pitfall traps from fields located on the Agency plains near Madras, Oregon, during the fall of 2009.

Field	Collection dates						
	Sept. 18	Sept.25	Oct. 2	Oct. 8	Oct. 15	Oct.23	Nov. 5
----- (Adults per field) -----							
1	1	0	0	0	0	0	0
2	-- <sup>1</sup>	--	--	--	--	--	--
3	1	0	0	--	--	0	0
4	--	6	9	7	10	6	2
5	0	1	1	0	1	0	--

<sup>1</sup>Traps not collected due to field being removed after harvest.

Table 3. Number of billbug adults and larvae collected from sod samples taken from fields located on the Agency plains near Madras, Oregon during the spring of 2009.

Field	Collection dates							
	May 26	June 9	June 22	July 7	May 26	June 9	June 22	July7
----- (Adults per field) -----				----- (Larvae per field) -----				
1	1	0	2	1	1	0	18	7
2	3	6	4	-- <sup>1</sup>	17	9	8	--
3	1	1	3	0	0	0	28	0
4	0	6	3	10	37	19	7	16
5	4	0	1	--	2	3	6	--

<sup>1</sup>Sample not collected.

Table 4. Number of billbug adults and larvae collected from sod samples taken from fields located on the Agency plains near Madras, Oregon during the fall of 2009.

Field	Collection dates									
	Sept. 22	Oct. 8	Oct. 23	Nov. 5	Nov. 24	Sept. 22	Oct. 8	Oct.23	Nov.5	Nov. 24
	----- (Adults per field) -----					----- (Larvae per field)-----				
1	1	4	6	3	3	53	56	34	20	11
2	-- <sup>1</sup>	--	--	--	--	--	--	--	--	--
3	3	0	0	0	0	12	19	19	16	6
4	10	9	7	4	2	16	2	8	12	1
5	2	1	--	--	--	4	14	--	--	--

<sup>1</sup> Sample not collected due to field being removed after harvest.