

## NOTE

### First Report of the Western Bean Cutworm, *Richia albicosta* (Smith) (Lepidoptera: Noctuidae), in Minnesota Corn<sup>1</sup>

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The western bean cutworm, *Richia albicosta* (Smith) (Lepidoptera: Noctuidae), formerly *Loxagrotis albicosta* (Smith), is a pest of bean, *Phaseolus vulgaris* L. and corn, *Zea mays* L. in the west-central U.S. (Douglass et al. 1957, Blickenstaff 1979, Blickenstaff & Jolley 1982). To date, the western bean cutworm has been observed in Arizona, Idaho, Kansas, Nebraska, Iowa, Utah, Colorado, New Mexico, Texas, South Dakota, Wyoming, and Oklahoma (Appel et al. 1993; Keaster 1999). However, in some states the cutworm is only rarely observed. For example, in Iowa, where *R. albicosta* is not typically reported, corn fields in the northwestern portion of the state were heavily infested in September, 2000 (Rice 2000).

Although *R. albicosta* has been described as polyphagous (Douglass et al. 1955), Blickenstaff and Jolley (1982) conducted extensive feeding trials and concluded that the only suitable hosts were corn and bean. Deleterious effects of the cutworm on corn include the formation of misshapen ears and subsequent yield loss (Hagen 1962; Appel et al. 1993). Additionally, feeding damage aids in the introduction of disease pathogens and other insect pests (Hagen 1962). In this paper we document the incidence of several late-season infestations of *R. albicosta* in experimental sweet corn plots in southern Minnesota during 1999.

Research was conducted in 1999 at five University of Minnesota Agricultural Research and Outreach Centers in Minnesota. Sentinel plots of transgenic and non-transgenic sweet corn hybrids were planted as part of a larger study to monitor the frequency of surviving late-instar European corn borer, *Ostrinia nubilalis* (Hübner), and corn earworm, *Helicoverpa zea* (Boddie) (Bolin et al. 1998; Venette et al. 2000). The transgenic sweet corn hybrid, 'GH-0937', provided by Novartis Seeds Inc., Nampa, Idaho, expressed a protein toxin Cry1Ab derived from the bacterium *Bacillus thuringiensis* var. *kurstaki* (i.e., Bt corn), using 'Event BT11' (Lynch et al. 1999; Burkness et al. 2001). Plots were planted at

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Becker (25 Jun), Lamberton (16 Jun), Morris (20 Jun), Rosemount (9 and 15 Jun), and Waseca (16 Jun). Plots of 'GH-0937' and its non-Bt isolate, 'Bonus' were arranged in a randomized complete block design and replicated 4 times. Each plot was 23 m square (30 rows wide and 23 m long) with 0.77 m row spacing; plots were separated by 1.5–3.0 m alleys. The seeding rate was 64,220 seeds/ha for both varieties at all locations.

Each sweet corn hybrid was evaluated for insect damage by examining 200 to >8000 primary ears per sample date (50 to >2000/replicate). Ears were harvested at maturity (~90 d after planting, Sept. 1999) for both Bt and non-Bt varieties at all locations. Ears were hand-harvested, placed into burlap sacks, and taken to a field edge for immediate evaluation. Ear evaluation included removing the husks and examining for the presence of lepidopteran larvae; the presence of larvae and feeding damage were noted (e.g., Bartels and Hutchison 1995). Confirmation that plant tissue was expressing Bt was made using the Gene Check strip test (Monsanto 1995) on selected ear samples. Larval specimens were identified as *R. albicosta* by three characteristic short, dark stripes on the first segment behind the headcapsule (e.g., Keaster 1999). *Richia albicosta* larvae were transported to the University of Minnesota and maintained on artificial diet until all locations had been sampled. A total of 5 larvae were shipped to the University of Nebraska, Lincoln, for confirmation of identification as *R. albicosta*.

Larvae of *R. albicosta* were collected from four of the five University of Minnesota Agricultural Research and Outreach Centers surveyed (Table 1). The greatest number of larvae were observed in southwestern Minnesota at the Lamberton site, Sept. 8–9 Sept. Larvae were also collected at Rosemount (Sept. 16–17), Waseca (Sept. 14 and 30) and Morris (Sept. 21–22). To our knowledge, this is the first documented occurrence of *R. albicosta* in Minnesota. Neither adult nor larval specimens of *R. albicosta* exist in the Insect Museum, Department of Entomology, University of Minnesota. In addition to *O. nubilalis* and *H. zea*, the primary species of interest for resistance monitoring in Bt corn, the only other lepidopteran we recovered was variegated cutworm, *Peridroma saucia* (Hübner), a common species in Minnesota (Noetzel & Ostlie 1986).

Larvae of *R. albicosta* were observed feeding on kernel tissue of both Bt and non-Bt sweet corn hybrids, 'GH-0937' and 'Bonus,' respectively (Table 1). More larvae (227 of 234) were found on Bt sweet corn because more Bt ears were sampled (36,120 versus 1,405 non-Bt sweet corn ears). Across all locations, mean cutworm densities ( $\pm$  SD) of 0.0080 ( $\pm$  0.018) larvae/ear in the Bt sweet corn and 0.0050 ( $\pm$  0.013) larvae/ear in the non-Bt sweet corn were not significantly different ( $t = 0.35$ ,  $df = 11$ ,  $P = 0.73$ , Table 1).

The widespread distribution of *R. albicosta* from west-central to southern Minnesota during 1999 may reflect an expansion of the cutworm's range, or may simply be due to unusual, temporary weather patterns that facilitated migration into Minnesota. When incorporating field observations for 2000, potential expansion of the cutworm's range remains unclear. Although one northwestern Iowa farm reported >95% of ears affected with *R. albicosta* larvae or damage (Rice 2000), sampling in southwestern Minnesota (near Lamberton) revealed fewer larvae in 2000 than in 1999. Continued monitoring will be necessary to determine the extent to which this cutworm may have expanded its range in the Midwest.

Our detection of a low-density infestation of *R. albicosta* also suggests that the BT11 event (Cry1Ab toxin) does not appear to provide significant control of this

Table 1. Number of western bean cutworm, *R. albicosta*, larvae in Minnesota sweet corn, Sept. 1999.

Location	Harvest Date	Bt corn					Non-Bt corn		
		No. Ears	Small	Medium	Large	Total No./ear	No. Ears	Large	Total No./ear
Becker	23 Sep	6821	0	0	0	0	200	0	0
Lamberton	08 Sep	3875	8	60	120	0.0485	200	7	0.035
Morris	21 Sep	8184	0	3	2	0.0006	200	0	0
Rosemount	03 Sep	4488	0	0	0	0	205	0	0
Rosemount	16 Sep	6102	0	12	0	0.0020	200	0	0
Waseca	14 Sep	4978	1	5	15	0.0042	200	0	0
Waseca	30 Sep	1672	1	0	0	0.0006	200	0	0
Total	—	36,120	10	80	137	0.0080	1405	7	0.005
Mean/ear ( $\pm$ SD)	—	—	—	—	—	0.008 ( $\pm$ 0.018) <sup>y</sup>	—	—	0.005 ( $\pm$ 0.013) <sup>y</sup>
Mean/100 ears	—	—	—	—	—	0.80	—	—	0.50

<sup>y</sup>Means were not significantly different, Student's t test ( $t = 0.35$ ,  $df = 11$ ,  $P = 0.73$ ).

cutworm. Failure to control *R. albicosta* is not surprising given the known differential susceptibility of Lepidoptera to *B. thuringiensis* toxins and that Bt corn was developed primarily for *O. nubilalis* (e.g., Ostlie et al. 1997). These data also suggest that *R. albicosta* would not be an economic concern in dent corn at current infestation levels in Minnesota (Appel et al. 1993). In addition, densities of <1.0 larva/100 ears (Table 1) would not likely be a concern to most sweet corn producers. However, late-instar infestations approaching 5% of ears infested, such as those for Lambertson, would be an economic concern for both fresh-market sweet corn growers and processors (Bartels & Hutchison 1995, Bartels 1998). As with the black cutworm, *Agrotis ipsilon* (Hufnagel), or the common stalk borer, *Papaipema nebris* (Guenée), *R. albicosta* is another lepidopteran pest that growers should be aware of in both Bt and non-Bt corn, particularly in states where the cutworm is a more prevalent pest (Keaster 1999).

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