

MONITORING FOR THE RED CLOVER CASEBEARER MOTH (*COLEOPHORA DEAURATELLA*) IN RED CLOVER SEED CROPS OF NORTHEASTERN OREGON

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Introduction

The red clover casebearer moth, *Coleophora deauratella* (Lepidoptera: Coleophoridae), is a native European species first reported in 1989 to be a pest in eastern Canada red clover (*Trifolium pretense* L.) seed production (Landry, 1991). *C. deauratella* (CBM) later spread to red clover seed production in the Peace River region of Alberta in western Canada and since 2006 has become a pest of economic concern (Otani, unpublished).

CBM adults lay eggs on newly set red clover heads, and developing larvae feed on developing seed within individual florets. First- to third-instar larvae continue feeding by moving around to other florets until fourth-instar larvae construct a portable case, while continuing to feed on florets, pods, and developing seed. The mature larvae then crawl to the ground during harvest, where they overwinter in sealed cases on the soil surface in crop residue.

A field-based monitoring program was conducted in 2013 and 2014 in Oregon's Willamette Valley, the primary growing region for clover seed in the United States, in response to initial detection of CBM in 2012. As a result, CBM was detected in at least five western Oregon counties (Anderson et al., 2014). Clover seed production in northeastern Oregon occurs on limited acreage, and, due to CBM damage potential, growers indicated a priority need in 2018 to conduct a preliminary pheromone-based monitoring program to determine the presence/absence of CBM east of the Cascade Mountains.

Materials and Methods

On May 25, 2018, sex-pheromone-baited (Evenden et al., 2010) traps were placed in two commercial red clover seed production fields to attract male moths. A 1-year-old stand and a 2-year old stand were selected due to close proximity (< 0.25 mile). One green UniTrap was placed in each field at least 100 feet from the field edge and at crop canopy height. A gray septa baited with the pheromone was placed in each trap and replaced once after 30 days had elapsed. An insecticide vapor strip was placed in the bottom of each trap to euthanize captured moths and was replaced after

30 days. Traps were monitored weekly for 10 weeks, and all monitoring efforts ended on August 3, 2018.

Weekly monitoring activities included: (1) collecting moth specimens from traps for identification and quantification, and (2) evaluating red clover heads for larvae presence and/or damage. Moths were collected from each trap, identified, and counted. Specimens were placed in containers, which were placed in a freezer until identification confirmation could be completed.

Beginning in late June, destructive head samples were collected along a curved arc through the middle section of each field (sixth center pivot tower from the center). The field was split into the north half and south half, and approximately 25 heads were collected from each half. Newly set heads (pink/red) and mature heads (brown) were collected weekly to determine whether larvae and/or damage were present. Two additional red clover seed production fields were also monitored for seed head damage but at limited levels: Site 3 in Union county and Site 4 in Baker County.

Results and Discussion

Moths collected in 2018 have been preliminarily identified as *C. deauratella* due to the pheromone being highly species-specific to *C. deauratella*, as found in studies resulting in a > 99% capture rate in areas where populations of *C. mayrella* and *C. trifolii* also exist (Evenden et al., 2010). Adult moth identification was confirmed by J. Otani, entomologist with Agriculture and Agri-Food Canada, Beaverlodge, Alberta.

Second-year red clover

The pheromone trap collected a total of 1,575 CBM male moths during the 10-week monitoring period. Peak moth capture rates ranged from 114 to 419 moths/week, with peak activity occurring between June 22 and July 20 (Figure 1). Only 3 CBM larvae were collected from destructive sampling of 333 red clover heads from late June through early August. Only 2.7% of the heads (9 heads) exhibited feeding damage, and only 97 florets were damaged out of the total 333 heads evaluated for larvae presence and damage (Table 1). The majority of the damaged heads/florets were identified on the more mature (brown) heads compared to the newly set (red/pink) heads.

First-year red clover

Compared to the second-year red clover stand, CBM adult moths were captured at low numbers (season total = 83 moths) from early June through mid-July. Peak moth capture rates ranged from 4 to 20 moths/week from June 8 through July 13. A total of 154 red clover heads were evaluated for CBM larvae and/or damage, with zero larvae recovery and zero heads/florets exhibiting feeding damage (Table 1).

Site 3, Union County

The grower and his family monitored the Site 3 red clover seed production field for CBM larvae and/or feeding damage on July 13, July 17, and July 20. A total of 72 heads were collected and evaluated (Table 1). No CBM eggs or larvae were found. However, 12 damaged florets were detected during the destructive sampling efforts.

Site 4, Baker County

On August 14, 60 red clover heads were collected and evaluated for CBM larvae and/or feeding damage. No CBM eggs or larvae were found. However, 10 damaged florets were detected during the destructive sampling efforts.

Conclusion

Preliminary monitoring efforts were successful in detecting CBM adult moths at high population levels in well-established red clover seed production fields in the Grande Ronde Valley of northeastern Oregon. Preliminary observations indicate that

in 2018 the frequency and severity of seed head damage was very low, at 2% of collected seed heads. CBM is strongly suspected to be present in Baker County, based on characteristic larvae feeding damage to florets, although no larvae were detected in red clover seed head collections. The potential impact of CBM on red clover seed yield and/or quality is not well understood in the Oregon clover seed industry, but recent reports of red clover seed yield loss in the Willamette Valley are causing concern among growers and seed industry representatives.

A priority need to increase pheromone-based monitoring efforts has been identified to further delineate CBM distribution, population dynamics, and potential impact on seed yield in eastern Oregon clover seed production. The greatest challenge is to use monitoring data toward development of an effective CBM management program that protects pollinator populations and mitigates against loss of clover seed yield and quality.

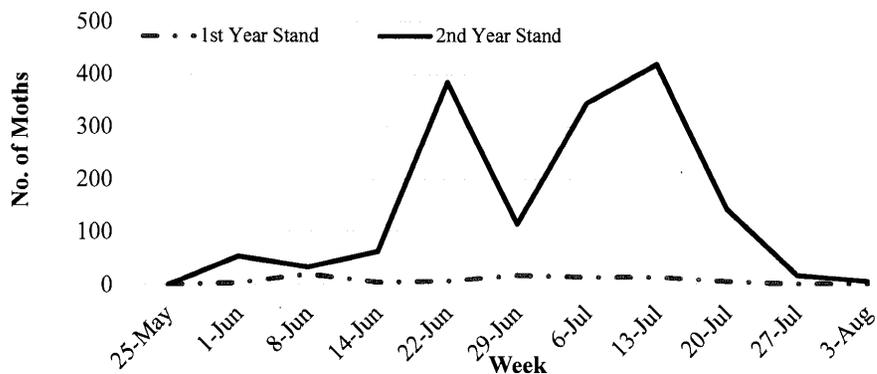


Figure 1. Number of male *C. deauratella* moths collected per week in first-year and second-year red clover seed production fields in the Grande Ronde Valley of northeastern Oregon, 2018.

Table 1. Summary of *C. deauratella* damage level assessments in red clover seed production fields in the Grande Ronde Valley of northeastern Oregon, 2018.

	Heads	---Red clover heads with---			Damaged	Larvae in
	evaluated	Eggs	Damage	Larvae	florets	heads
----- (no.) -----						
2-year stand (N half)	257	0	9	2	97	2
2-year stand (S half)	76	0	0	1	0	1
1-year stand	154	0	0	0	0	0
Site 3, Union County	72	0	3	0	12	0
Site 4, Baker County	60	0	2	0	10	0
Total	623	0	14	3	119	3

References

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