Initial identification of the sex pheromone of *Coleophora deauratella* (Lepidoptera: Coleophoridae), a new pest of clover in the Peace River

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Introduction

• The red clover casebearer, *Coleophora deauratella* (Lepidoptera: Coleophoridae) was discovered as a 'new' pest of red clover (*Trifolium pratense* L.) in the Peace River Region in 2006 (Fig. 1).

• *C. deauratella* was earlier introduced to eastern North America including Ontario (Landry 1991; Landry and Wright 1993) where it has resulted in significant seed losses (Ellis and Bjørnson 1996).

• In Alberta, field plot trials in 2006 and 2007 showed high yield losses up to 99.5% in second-year stands of red clover.

Figure 1. *Coleophora deauratella* A) adult; B) case-bearing larva

• Adult *C. deauratella* lay eggs on red and alsike clover. Larvae chew through the corolla to access the ovule (Fig. 2). The initial three larval instar stages are concealed in the floral structures making them difficult to sample and control.

• Fourth-instar larvae build and carry a case and overwinter among leaf litter (Fig. 1). Pupation occurs within the case in early spring and moths begin to fly in the Peace River Region in mid-June. The flight period lasts about 6 weeks.

Objectives

1. Identify the female-produced sex pheromone of *C. deauratella*
2. Field test pheromone components individually and in blends to identify an attractive blend that can be further developed to monitor *C. deauratella* populations.

Figure 2. *Coleophora deauratella* feeding damage on red clover A) florets; B) and seeds

Methods

• Overwinter debris from red clover fields in the Peace River Region was collected between 7-21 May, 2008 and placed in bins in the laboratory for *C. deauratella* emergence.

• Adults were collected individually and shipped to Simon Fraser University for dissection and analysis of pheromone gland contents by coupled gas chromatographic-electroantennographic analysis detection (GC-EAD) using a Hewlett Packard 5890A equipped with a DB 210 column (32 m long, 0.32 ID).

• Synthetic copies of candidate pheromone components were loaded into grey rubber septa lures and shipped to Beaverlodge Research Farm for field testing.

• The trapping study followed a Randomized Block Design at 8 commercial red clover (cv. Altaswede) fields in the Peace River Region (Fig. 3).

• Trap catch was recorded at bi-weekly intervals over a 6-week period. A subsample of trapped individuals was separated by sex.

• Sweep net samples were collected to determine background levels of other *Coleophora* species at each site.

Figure 3. Pheromone trap positioned ~35 cm above the ground. One trap containing each treatment was positioned along a linear transect at each site. Traps were separated by 25 m.

Results

• Using GC-EAD, components that eluted between 7-10 minutes and elicited an antennal response were: (Z)-7-dodecenyl acetate (*Z*7-12:OAc), (Z)-5-dodecenyl acetate (*Z*5-12:OAc), and (Z)-7-dodecen-1-ol (*Z*7-12:OH) (Fig. 4).

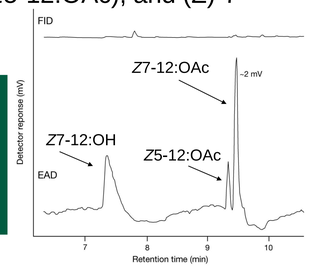

Figure 4. Flame ionization detector (FID) and electroantennographic detector (EAD: male *C. deauratella* antenna) response to pheromone gland extract of female *C. deauratella*.

Results

• The field trapping study demonstrated that two of the three compounds identified from female gland extracts make up the pheromone signal (Fig. 5).

• *Z*7-12:OAc is the main pheromone component but it is only attractive in combination with the minor component, *Z*5-12:OAc

• Sweep net samples of larvae and adult *Coleophora* species at our sites showed that 95.4% of samples were *C. deauratella* and only 4.6 % were *C. mayrella*. No *C. trifolli* were found at our sites.

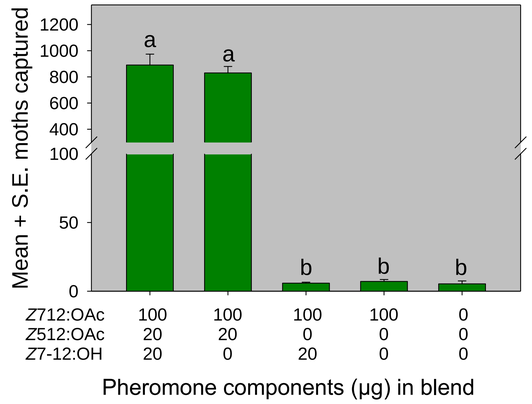

Figure 5. Mean +SE *Coleophora deauratella* adults captured in traps baited with various pheromone components from 11-July to 18-August, 2008.

Conclusions

1. The sex pheromone of *C. deauratella* contains *Z*7-dodecenyl acetate as a major component and *Z*5-dodcenyl acetate as a minor component.
2. The major component is not attractive alone.
3. *Z*7-dodecen-1-ol is found in female gland extracts but is not part of the pheromone signal.

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