Emergence Phenology of Adult *Apanteles polychrosidis* (Hymenoptera: Braconidae)

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Figure 7. Emily and her plastic emergence containers.

Figure 8. Public enemy number one… ash leaf cone roller moth.

Introduction

Problem

Ash leaf cone roller (ALCR), *Caloptilia fraxinella* (Lepidoptera: Gracillaridae) (Fig. 8), infests nearly every ash tree (*Fraxinus* spp.) in Edmonton and its leaflet mining (Fig. 1) and leaflet rolling (Fig.2) destroys the cosmetic value of these trees.

Possible solution?

A parasitoid wasp, *Apanteles polychrosidis* (Hymenoptera: Braconidae) lays its eggs inside the body of ALCR larvae. Eggs hatch and the wasp larvae devour the ALCR larvae from the inside and bursts out through the cuticle of its host (Fig.6), killing the ALCR larvae and acting as a natural biocontrol agent.

Background

Little is known about the life history of this wasp including the chemical signals involved in mate finding. Mating happens immediately when males and females are introduced (Wist, unpublished data). Male gypsy moth parasitoids emerge before female wasps and can determine, through volatile chemicals if a gypsy moth pupa contains a female or a male parasitoid (cited in Gries, 2009). Thus, males will wait at a parasitized gypsy moth pupa so they can mate as soon as the female wasp emerges.
Field observations of *A. polychrosidis* indicate that males visit rolled ash leaflets after emergence suggesting that they also can determine if ALCR pupae contain female wasps.

Figure 1. Ash leaflet mined by ash leaf cone roller larvae (arrows).

Figure 2. Green ash with leaflets cone rolled by ash leaf cone roller.

Objectives

1. Discover if male *Apanteles polychrosidis* emerge before females.
2. Create a laboratory colony of *A. polychrosidis* for future experiments.
3. Future Objectives: Discover if male *A. polychrosidis* can detect females within ALCR pupa within cone rolled leaflets.

Hypothesis 1

Male *A. polychrosidis* emerge before females.

Hypothesis 2

***A. polychrosidis* can be reared in a colony.**

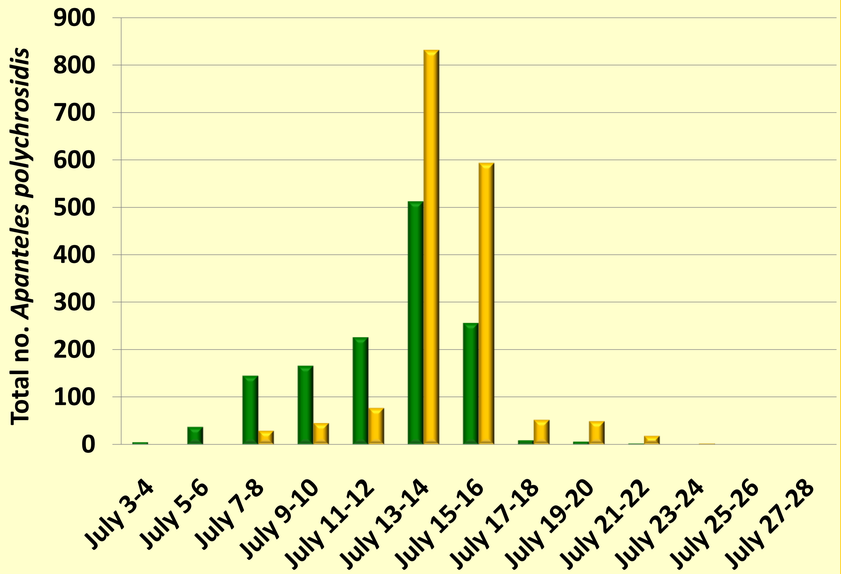
Materials & Methods

- Collected hundreds of randomly selected cone rolled leaflets from green ash (*F. pennsylvanica*) at seven different sites in the Edmonton area.
- Cone rolled leaflets without windows contained the parasitoid wasp because the parasitoid kills its host before it makes its emergence "window" in the top of the cone rolled leaflet.
- The cone rolls containing the parasitoid wasps were separated and divided into 40 rolls per 500 ml plastic container (Fig. 7).
- Containers were checked at least once ever 48 hours and any emergence was recorded, live wasps were transferred to the main colony housed in a BugDorm ™ insect tent and fed 10% honey water.
- *A. polychrosidis* accepts Oblique banded leafroller (OBLR), *Choristoneura roseceana* (Lepidoptera: Tortricidae) as a host and both insects can be kept in a colony (Cossetine *et al.* 2005) (Fig. 4.).

Figure 4. Female *A. polychrosidis* attacking OBLR.

Results

Figure 3. Emergence phenology of *Apanteles polychrosidis*



Apanteles polychrosidis Emergence

- Emergence began, on the 3rd-4th of July with five **males** (Fig. 3.).
- **Males** dominated the first ten days of emergence with females beginning to emerge by July 7th-8th.
- **Females** dominated emergence by July 13th-14th where they peaked at 831, while males peaked at the same time period with 512 individuals then decreased during the next two days to nearly zero (July 17th-18th , Fig. 3).
- **Female** emergence continued for eight days following its peak.

Apanteles polychrosidis colony

- After emergence from field collected, cone rolled leaflets, wasps successfully mated (Fig. 5.).
- When introduced to OBLR hosts, mated females attacked larvae (Fig. 4.).
  - The first OBLR larvae sacrificed to *A. polychrosidis* were newly hatched, first instar neonates, which often got stuck on the wasp's ovipositor.
  - Older 1st instar and 2nd instar OBLR larvae were more suitable host (Fig. 4.)
- The first generation of parasitoids emerged from the attacked OBLR 19 days after attack (July 9th-28th 2009).

Figure 5. Male and female *A. polychrosidis* mating.

Figure 6. Dead ALCR larva (above) with emerged *A. polychrosidis* larva.

Conclusions

1. The data supports our emergence hypothesis, that male *A. polychrosidis* emerge before females.
   - From the emergence data we collected it clearly shows the distinction that the males start emergence and the females follow.
2. Oblique banded leafroller proved to be a suitable host for *A. polychrosidis,* and it seems likely that a sustainable colony of *A. polychrosidis* will be successfully established.
   - Female *A. polychrosidis* attacked OBLR larvae.
   - One generation of *A. polychrosidis* emerged from OBLR larvae.
   - First instar (neonate) OBLR larvae were too small to be suitable for attack by *A. polychrosidis* attack, however, *A. polychrosidis* did emerge from some of the attacks on neonate OBLR larvae. Larger, second instar larvae were more suitable for initial attack.

Future Directions

These findings are the first step to understanding the chemical volatiles that mediate the mating behaviour of *A. polychrosidis.* Future experiments will determine if males are capable of detecting female *A. polychrosidis* within ALCR pupae and discover the chemical signals (pheromone?) that mediate mate finding.

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