

# Biology and Management of Cannabis Aphid: An emerging pest challenging cannabis production in Ontario

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Cannabis aphid (*Phorodon cannabis*) (CA) is a major pest of *Cannabis sativa* grown in controlled environments and has no other recorded host plants. Cannabis aphids reproduce asexually, giving birth to live offspring that are clones of their mother (Fig. 1). Due to the previous legal status of cannabis, very little is known about the biology of CA, and effective management strategies are lacking.

## Objectives

1. Determine the life history & fecundity of cannabis aphid.
2. Evaluate the effects of aphid feeding on cannabis potency & identify parasitoids that can effectively manage cannabis aphid.



Figure 6: Cannabis infested with cannabis aphid sampled to determine the effects of aphid feeding on potency.

## 1. Cannabis Aphid Biology

- Life history parameters for CA such as time to reproductive maturity and fecundity are unknown.

### Experiments

- 50 <24 hour old CA were placed on cannabis leaf sections and checked daily until reproduction began (Fig. 2).
  - 100 adult CA (50 winged +50 wingless) of a random age were placed on leaf sections and offspring were counted once after 24 hours.
  - 60 4<sup>th</sup> instar (pre-reproductive) CA were placed on leaf sections. Offspring were counted and removed every 24 hours for the duration of the initial aphid's lifetime.
- Trials were conducted at 24°C & 16:8 L:D.



Figure 2: Example of a cannabis leaf section used for aphid fecundity trials. 30 mL cups were filled with 15 mL of 1% agar and a 2 cm x 2 cm piece of cannabis leaf was placed abaxial side up. Cups were stored upside down to mimic the leaf's normal orientation.

### Results

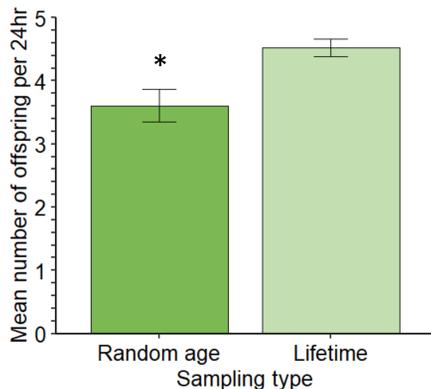


Figure 3: Mean number of offspring (+ SE) produced by random aged adult cannabis aphid in 24 hour compared to the mean number of offspring produced every 24 hours over the course of an aphid's life (n = 625).

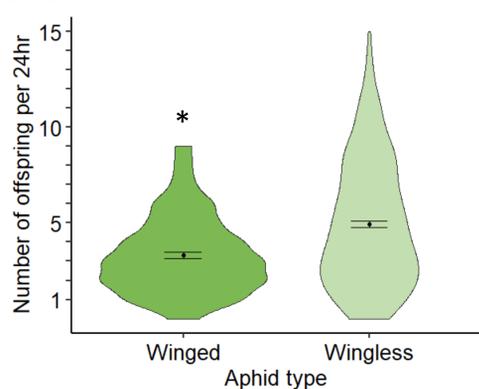


Figure 4: Mean number of offspring produced every 24 hours by winged and wingless cannabis aphids displayed as violin plots. The mean is represented by the black dot with standard error bars. The shape of the plot represents the distribution of the data, like a kernel density plot (n = 525).

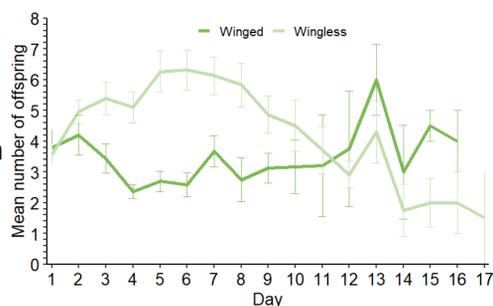


Figure 5: Mean number of offspring (+ SE) produced by day after reaching reproductive maturity for winged and wingless cannabis aphids (n = 100).

- CA started to produce offspring after 7.5 days (± 0.95).
- Random aged aphids produced significantly fewer offspring in 24 hours than the mean daily production (3.6 ± 0.25 and 4.5 ± 0.14) (Fig. 3).
- Winged CA produced significantly fewer offspring than wingless CA (3.4 ± 0.18 and 4.9 ± 0.18) (Fig. 4).
- Wingless aphid offspring production peaks at day 6 (Fig. 5).

## 2. Cannabis Aphid Management

- How CA affects cannabis potency is needed to develop action thresholds.
- Four species of aphid parasitoids can complete their lifecycles on CA, but which species is most effective at managing this pest is unknown.

### Experiments

- Cannabis infested with CA (Fig. 6) was sampled prior to harvest to determine differences in the concentration of  $\Delta^9$ -tetrahydrocannabinol (THC) compared to uninfested cannabis.
  - 20 mated female parasitoids were placed in arenas (Fig. 7) with cannabis cuttings infested with 10 CA and allowed to forage for 24 hours. Arenas were inspected daily for parasitized aphids.
- Parasitoids: *Aphidius matricariae*, *A. ervi*, *A. colemani*, and *Aphelinus abdominalis*.
  - Naïve parasitoids were received directly from the supplier. Experienced parasitoids were reared on cannabis aphids for one generation prior to the trial.



Figure 7: Arena used to evaluate the performance of parasitoids to manage cannabis aphid.

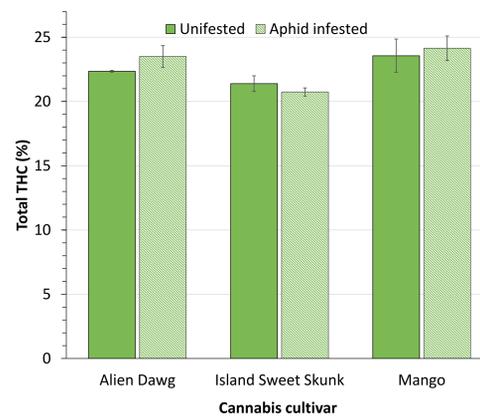


Figure 8: Mean concentration of  $\Delta^9$ -tetrahydrocannabinol (THC) in various cultivars of *C. sativa* under high cannabis aphid pressure compared to uninfested plants (n = 28).

### Results

- Total THC % in three cannabis cultivars was not affected by CA feeding (Fig. 8).
- Aphidius matricariae* parasitized the most CA in 24 hours (Fig. 9).
- Aphelinus abdominalis* failed to parasitize CA in this experiment.
- Experience with CA did not consistently affect parasitoid performance (Fig. 9).
- Sex ratios of parasitoid offspring were female skewed for all species (Fig. 9).

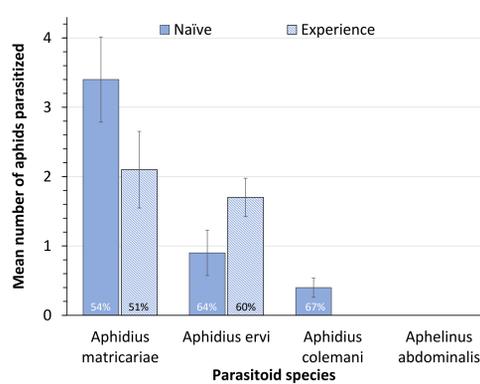


Figure 9: Comparison of the mean number of cannabis aphids parasitized in 24 hours by a mated female of four commercially available aphid parasitoid species. The number in the bar indicates the percentage of the emergent parasitoids that were female (n = 120).

## Research Summary

- Cannabis aphid has a high reproductive capacity, producing approximately 4 offspring per day after 7.5 days.
- Wingless aphids produce more offspring than winged aphids and peak at day 6.
- Cannabis aphids feeding does not affect the concentration of THC in cannabis.
- Aphidius matricariae* is the most effective parasitoid of cannabis aphid.

