The Influence of Cannabis Plant Tissue Type, Trichome Density and Cultivar on Cannabis Aphid (*Phorodon cannabis*) Behaviour

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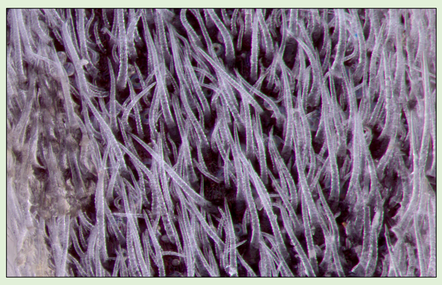
Cannabis Aphid, *Phorodon cannabis* (CA) is an important pest of drug-type Cannabis, decreasing the marketability of whole flower products. CA is a specialist species with no alternative hosts identified to date.
Early identification of CA is important for management due to parthenogenesis. Cannabis has evolved with multiple types and varying densities of trichomes, likely in response to pest pressure.

Objectives:

1. **Identify tissue preference of CA;**
2. **Understand the relationship between tissue preference and trichome density.**



Aphid Location Preference

- Which cannabis tissue types are preferred by Cannabis Aphid?

Experiment:

- Complete randomized block design of 6 “Bug Dorm” insect cages (Fig. 1).
- Cultivars used: French Mac, Cherry Bomb, Unicorn Poop, Crown Royal; supplied by JC Green Cannabis Inc.
- Cuttings were infested with CA at the start of the 1-week trial then left to move and reproduce freely (Fig. 2).
- Data collection assessed number of aphids on each of four tissue types
  - Expanded (mature) leaf, young growth, stems, petioles

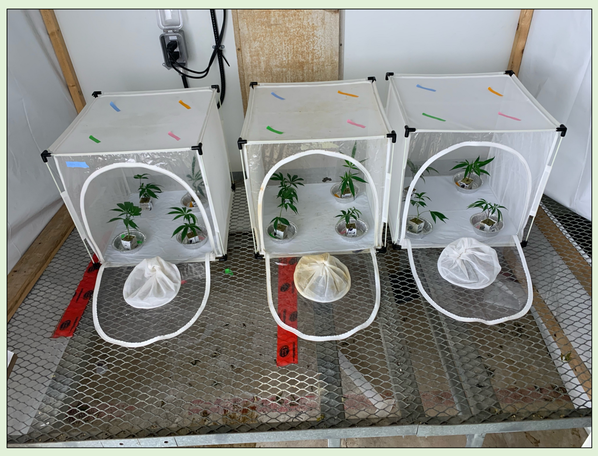


Figure 1. *Three insect cages arranged on a bench in the growth chamber. Complete random block design puts one cutting of each cultivar in each cage.*

Figure 2. *Standard cutting used for each of the trials. Three fully expanded leaves, two nodes of young growth.*

Results

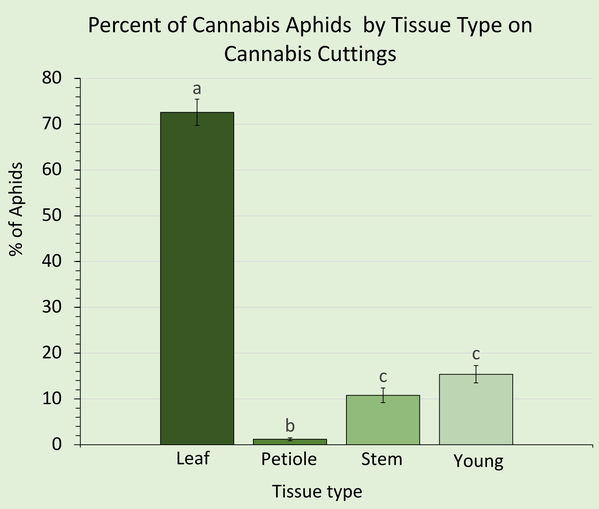


Figure 3. *Percentage of aphids present on each tissue type on cannabis plants. Data for this chart were pooled from four different cultivars.*

- Pooled results show strong preference for expanded leaf tissue, followed by young growth/stem, then petiole (Fig. 3).
- Significant differences between aphid presence was found for all tissue types, except stem and young growth (Fig. 3).

Trichome Density Study

- How does trichome density vary across different tissue types?

Experiment:

- Images were taken using Leica M205C microscope equipped with Leica DMC5400 camera
  - 5 pictures of each tissue type (expanded leaf, young growth, stem, petiole) per cultivar (Fig. 4).
- ImageJ software was used to convert the images to 32-bit type then color thresholding was used to quantify trichome density (Fig. 5).
  - Leaf area covered by trichomes was used as a proxy for trichome

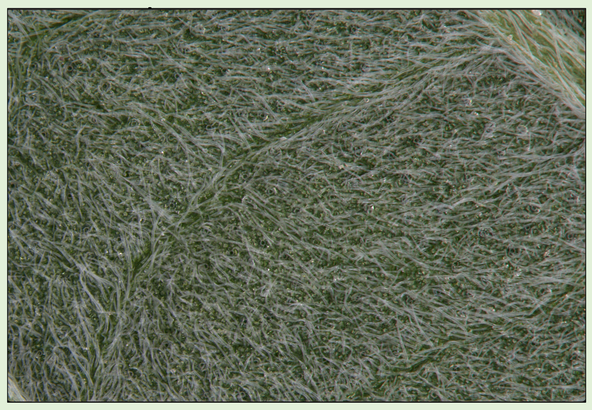


Figure 4. *Example of a raw image used in trichome density analysis. Cultivar French Mac – expanded leaf tissue.*

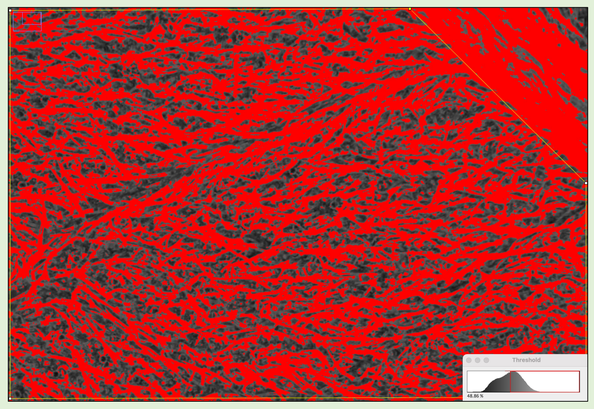


Figure 5. *Same image as Fig. 4 after processing in ImageJ. 48.86% of leaf area is covered by trichomes in this image.*

Results

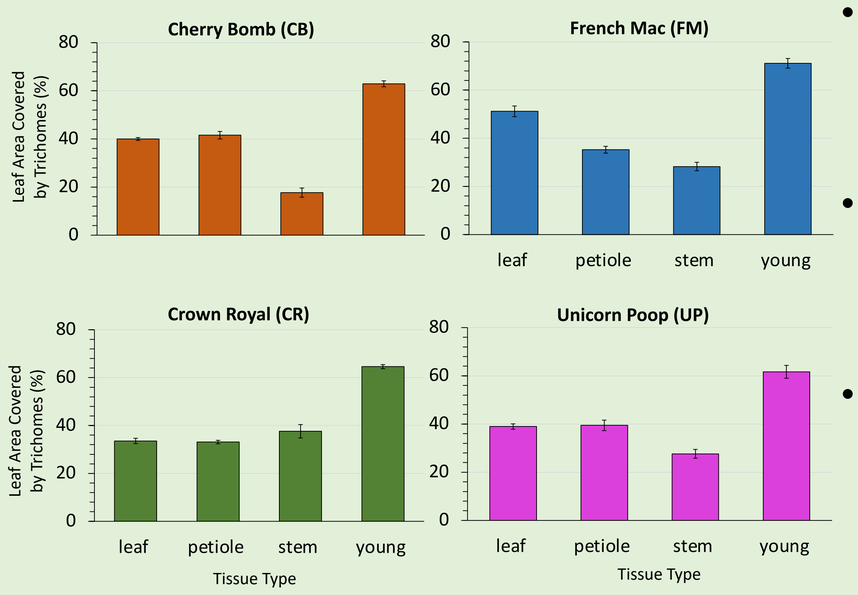


Figure 6. T*richome density for four different tissue types on four cultivars of cannabis. Trichome density was measured as a percentage of leaf area covered by trichomes.*

- All tissues had significant variation besides leaf - petiole tissues (Fig. 6).
- Young growth consistently had the highest trichome density (Fig. 6).
- Significant differences in trichome coverage were found between CR and FM cultivars leaf tissue, and CB and CR stem tissue.

Discussion

- Aphid preference for fully expanded leaves may relate to morphological traits, such as trichome density.
- Results from this trial agrees with our observations from aphid infestations on our mother plants.
- Further research is needed to draw stronger conclusions.
  - Analysis of tissue type by cultivar is necessary for location study to determine if the percentage of aphids on each tissue type differed between cultivar
- The fewest aphids were found on French Mac and Unicorn Poop, two cultivars with the greatest trichome coverage.
- Key morphological traits: **trichome density**, cuticle thickness, physical space/aphid density.
- Trichomes don’t just affect the movement of aphids, but also their ability to reach the leaf surface with their head/stylets.
- The trichome density study provides a novel way to quantify trichome density.

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