Does mother know best?

Oviposition by the vine weevil (*Otiorhynchus sulcatus*) in relation to offspring performance on red raspberry (*Rubus* spp.) cultivars.

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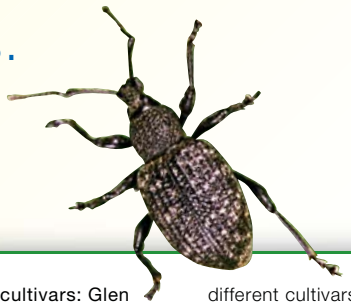

Introduction

The preference-performance hypothesis proposed by Jaenike in (1978)[1] states that adult phytophagous insects will select to oviposit on host plants that maximise the performance of their offspring which have limited or no capabilities to relocate themselves. To date, this hypothesis, sometimes called the "mother knows best debate", has been predominately studied where both the adult insect and associated offspring reside aboveground. Recently this debate has been extended to incorporate relationships where a portion of the insects' lifecycle is completed belowground. We investigated whether oviposition behaviour by adult vine weevils living aboveground was influenced by the potential benefits to offspring performance feeding on different raspberry cultivars.

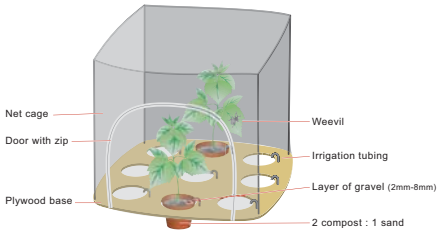

Figure 1 Schematic of cage setup for choice cultivar experiment.

Hypotheses

1. Vine weevil larvae will survive and perform better on some raspberry cultivars in comparison to others.
2. Adult vine weevils will commit higher numbers of eggs to cultivars that are beneficial for their offspring.
3. Adult vine weevils will preferentially lay eggs on cultivars that maximise the performance of their offspring in comparison to cultivars that are less beneficial.

Experiment

This study used nine raspberry cultivars: Glen Ample, Glen Rosa, Glen Moy, Glen Magna, Glen Clova, Tulameen, Octavia, Malling Jewel and a wild variety. Experiments were conducted at 22 ± 2°C, 16:8 hours L:D photoperiod.

Hypothesis One

Choice experiments were conducted to determine larval performance in relation to raspberry cultivar. Thirty viable vine weevil eggs were added to ten plants of each cultivar and left to develop on the plants for six weeks. After six weeks the root systems of the plants were harvested and both the number and mass of vine weevil larvae quantified.

Hypothesis Two

A no-choice experiment was conducted to ascertain the level of oviposition on the nine different cultivars. Ten plants from each cultivar were individually caged and a single vine weevil was introduced to the cage where they were left to feed and oviposit for three weeks. After three weeks, the number of eggs laid on or around each plant was quantified.

Hypothesis Three

A choice experiment was conducted to test the hypothesis that the adult vine weevil would preferentially lay eggs on a cultivar that maximised offspring performance. One raspberry plant of each cultivar was placed in one of fifteen specially designed cages that held nine plants (**Figure 1**). An individual vine weevil was added to each cage, where they were left to feed and oviposit for three weeks. After three weeks, the number of eggs was quantified.

Results

1. Survival rate of larvae did not differ on the nine cultivars. However, larvae grew significantly faster on Glen Rosa than the other eight cultivars (**Figure 2**).
2. The number of eggs laid by vine weevil in the no-choice tests was not significantly influenced by the raspberry cultivar that they were feeding on (**Figure 3**).
3. When presented with a choice of all nine cultivars, vine weevils did not show any preference between cultivars despite Glen Rosa being optimal for offspring development (**Figure 3**).

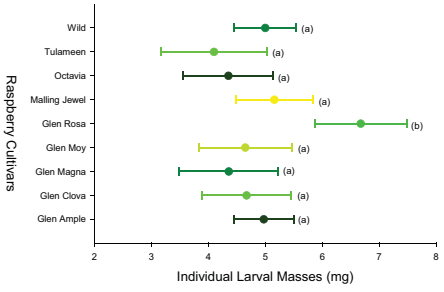

Figure 2 Mean with 95 % Confidence intervals of the individual larval masses of larvae recovered from the nine different raspberry cultivars. Significant differences between cultivars are indicated by lowercase letters in brackets. Analysis was conducted using an unbalanced ANOVA.

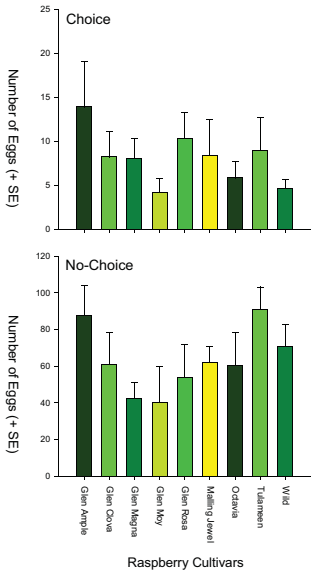

Figure 3 Mean (+ SE) number of vine weevil eggs oviposited upon different raspberry cultivar plants in the choice experiment and no-choice experiment. The effect of raspberry cultivar on the oviposition decision of the vine weevil was tested using a Poisson Generalised Linear Model with a log link function.

Conclusions

- Raspberry cultivar is significant in influencing the performance of vine weevil larvae.
- The belowground susceptibility in the cultivars and improved larval performance did not influence the oviposition behaviour of vine weevils.
- Other factors, including optimal foraging of maternal insects, could explain this disparity and will be further investigated.

References

[1] Jaenike, J. 1978. On optimal oviposition behaviour in phytophagous insects. *Theories in Population Biology* **14**:350-356.

Acknowledgements

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