Eupeodes americanus : a new biocontrol agent for aphid management in minimally heated greenhouses

AUDREY CÉCYRE[1], MARC FOURNIER[1], GENEVIÈVE LABRIE[2] & ÉRIC LUCAS[1]

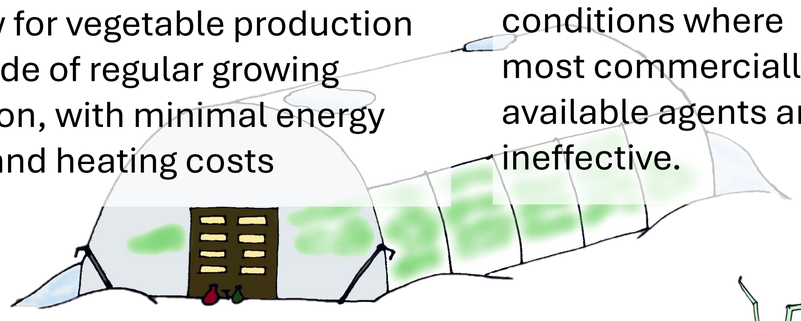
[1]Université du Québec à Montréal, Québec, Canada, [2]Centre d'expertise et de transfert en agriculture biologique et de proximité (CETAB+)

Dessins: Audrey Cécyre

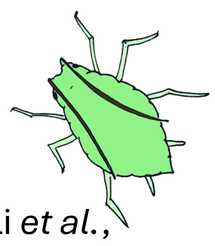
Context

Minimally heated and unheated winter greenhouses: allow for vegetable production outside of regular growing season, with minimal energy use and heating costs

Pest management : challenging in conditions where most commercially available agents are ineffective.



Green peach aphid *Myzus persicae*



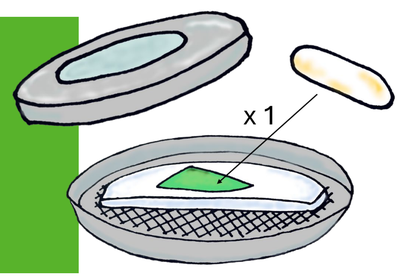
Polyphagous and virus vector (Ali *et al.*, 2023)

Known to develop resistance to insecticides (Ali *et al.*, 2023)

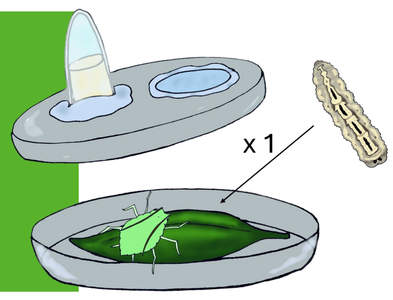
Minimal thermal threshold: 2,5°C (Davis *et al.* 2006)

Methodology

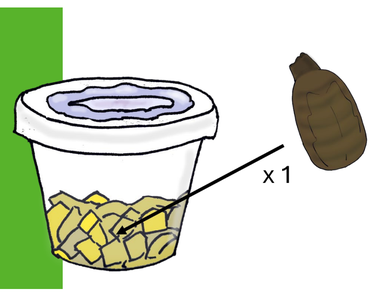
Eggs development
Hoverfly eggs isolated in Petri dishes were checked every day for hatching.
→ 30-31 eggs per temperature (4°C, 8°C, 12°C and 24°C)



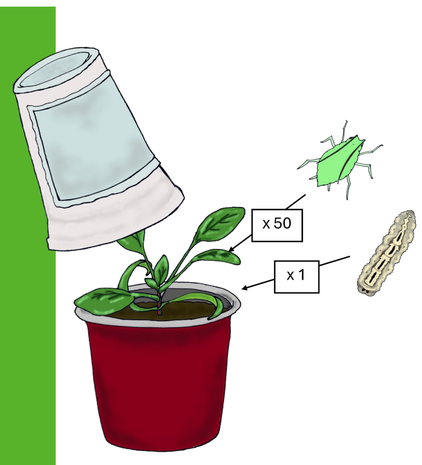
Larval development
Aphids were provided *ad libitum*. Third instar larvae were checked everyday for pupation.
→ 17-19 larvae per temperature (4°C, 8°C, 12°C and 24°C)



Pupal development
Hoverfly pupae were buried in vermiculite. Cups were checked everyday for adult presence.
→ 52-59 pupae per temperature (4°C, 8°C, 12°C and 24°C)



Aphid suppression on spinach
Fifty same-age aphids and one second instar hoverfly larvae were isolated on a spinach plant, under a plastic cup with muslin windows. Remaining aphids were counted after 24h and after the time needed for the accumulation of 30 degree-days by the aphid (12°C: 3d and 4h, 8°C: 5d and 11h, 4°C: 20d).
→ 20-22 reps per temperature (4°C, 8°C and 12°C)



Results

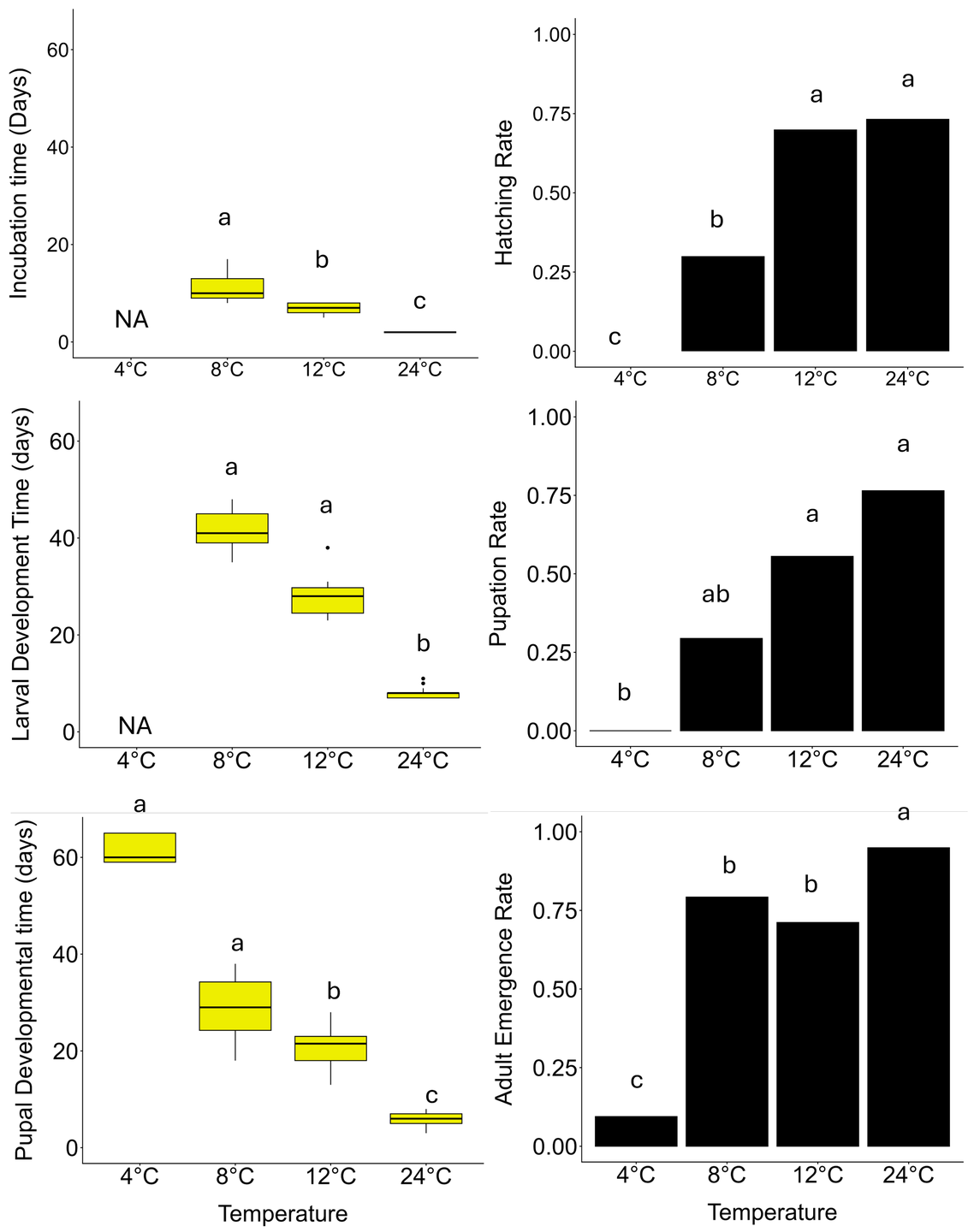


Figure 1. Survival rate and development time of *Eupeodes americanus* eggs (a, d), larvae (b, e) and pupae (c, f) at low temperatures. Same letter = no significant difference (α = 0,05). Developmental time: Kruskal-Wallis and Dunn's test, hatching, pupation and emergence rates: fisher's exact test.

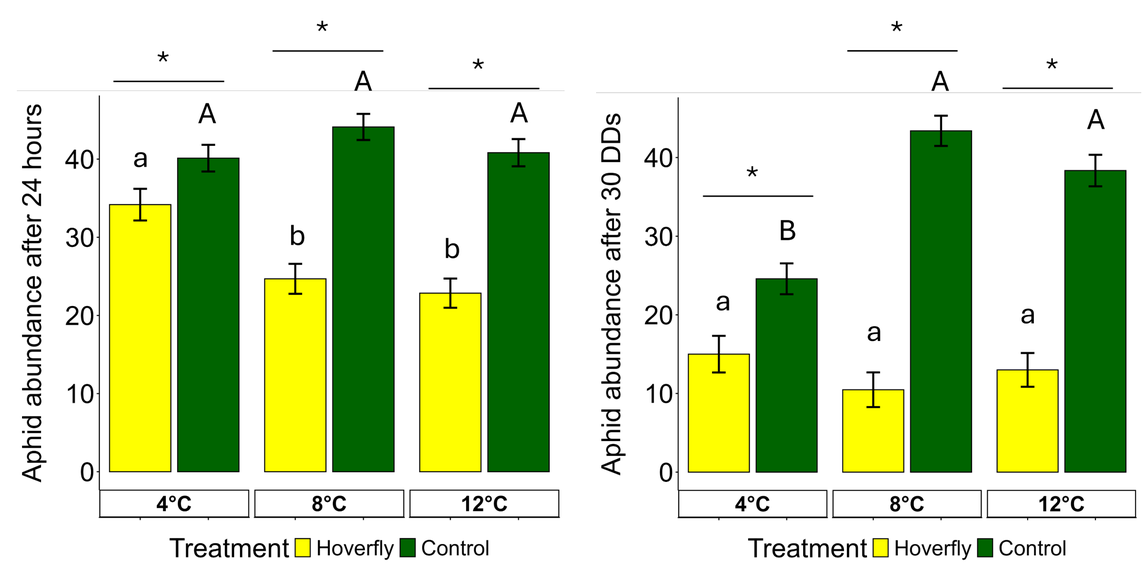


Figure 2. Impact of *Eupeodes americanus* larvae on aphid abundance after a: 24 hours and b: 30 aphid degree days. Same letter = no significant difference and asterisk (*) = significant difference between species (Anova and estimated marginal means contrasts, α = 0,05)..

Conclusions

From 4°C : Larvae that are on the culture could reduce aphid abundance

From 8°C : Adult can emerge from pupae; some eggs and larvae can complete their development

From 12°C: Most egg hatch and most larvae complete their development

Future research
Assessing the influence of temperature on adult flight and oviposition
Confirm the efficacity of aphid management in commercial winter greenhouses



Acknowledgments

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