

Feeding effects of a systemic insecticide on ant workers and larvae

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Introduction

- **Neonicotinoids**, e.g. imidacloprid, are used in agro-ecosystems to control a variety of pest insects.^{1,2}
- These neurotoxins bind to nicotinic acetylcholine receptors in the central nervous system³ and cause receptor blockage, paralysis, and death.⁴
- However, pesticides can exert broad effects of **non-target invertebrates**^{5,6}, with exposure to sublethal concentrations potentially leading to behavioural and physiological changes.^{7,8}
- **Ants** (Formicidae) have a highly social lifestyle⁹ including division of labour, overlapping generations, and cooperative broodcare.¹⁰ Depending on food ecology and nutritional demand colonies can be affected in many different ways.¹¹ Despite their **important role in many terrestrial ecosystems**, no standardized test design for ants is available for exotoxicity testing.
- Here, we present a method to use queenless ant sub-colonies (workers and larvae) to test the **effects of imidacloprid** taken up via the diet on workers and larvae of the formicine ant *Camponotus maculatus*.



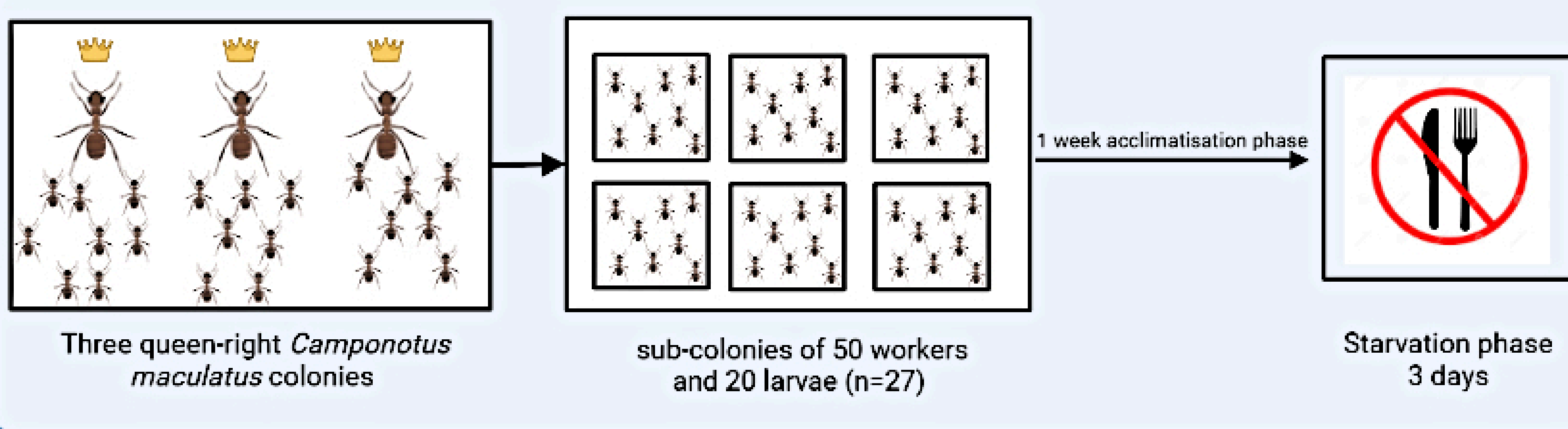
Camponotus maculatus sub-colony



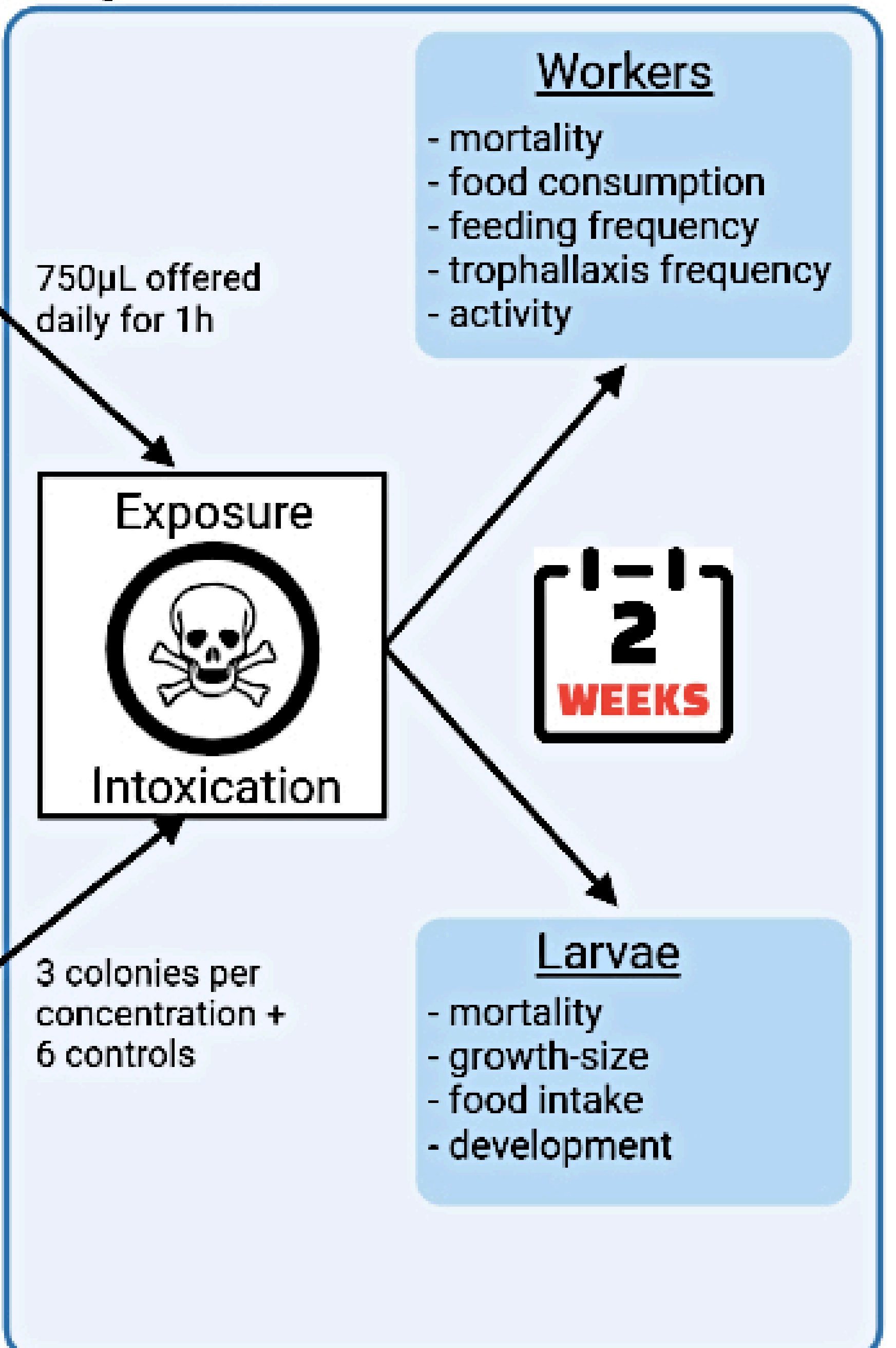
C. maculatus workers drinking a honey-water-imidacloprid solution

Experimental Setup

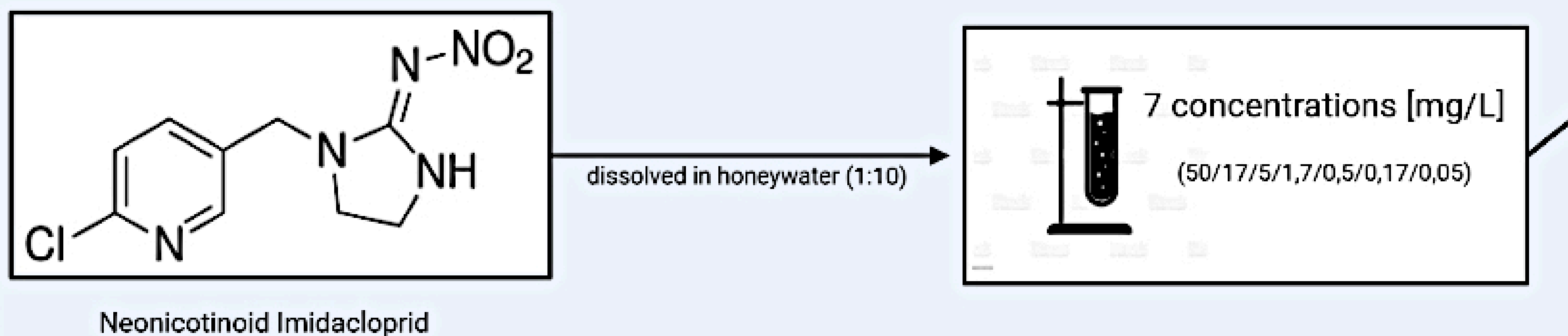
Ant colony preparation



Exposure



Imidacloprid concentrations



Results/Discussion

- Imidacloprid concentrations higher than 5mg/L have **strong lethal effects** on *C. maculatus* workers.
- **Larval survival did not show a monotonic response** to the imidacloprid concentration. However, mortality increased to above 30%. Reduced mortality at the highest concentration may result from a lower exposure due to high worker mortality (reduced larval feeding).
- Lower concentrations of imidacloprid seem to have strong **sublethal effects**, e.g. Worker mobility changes and show reduced larval care
- Results for **sublethal effects of larvae and workers** will be evaluated after completion of the currently ongoing experiment.
- The newly developed method is in principle suitable to support **hazard assessment** of active substances taken up by ants via the diet.



C. maculatus queen with 2 minor worker and pupae

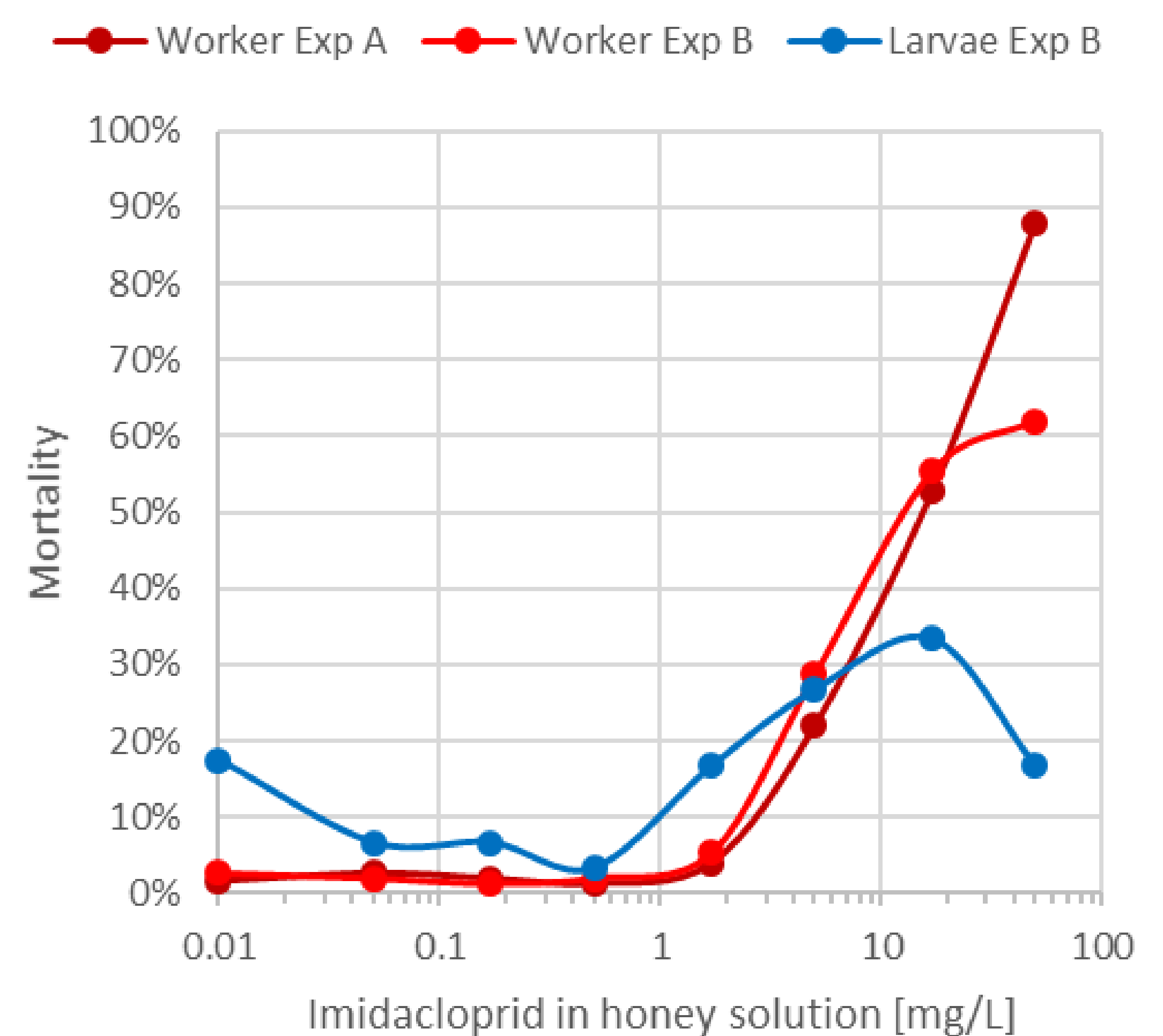


Fig 1. Cumulative mortality of workers and larvae exposed to different imidacloprid concentrations. Experiment A (dark red) workers only, Experiment B (light red, blue) workers and larvae.

References

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