The impact of thiamethoxam exposure on feeding and locomotor activity of *Abax parallelus*

Lara Ivanković Tatalović, Lucija Šerić Jelaska

Department of Biology, Faculty of Science, University in Zagreb

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Introduction

- Predatory Carabids (Coleoptera: Carabidae) – important in biocontrol of pest species in agroecosystems

- Thiamethoxam - insecticide in the class of neonicotinoids (neuro-active insecticides similar to nicotine). Neonicotinoids are the most used insecticides within the last 20 years

- Exposure to neonicotinoids can cause lethal and sub-lethal effects on behavior and physiology, which can impact predation efficiency

- Study goal: to test the impact of thiamethoxam on the feeding and locomotion of predatory ground beetles

Figure 1. Ground beetle (eorganic.org)

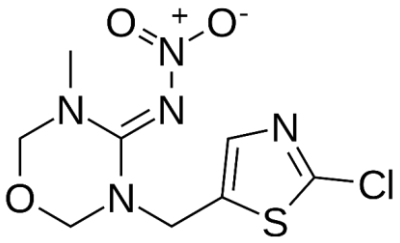

Figure 2. Structural formula of thiamethoxam (www.sigmaaldrich.com)

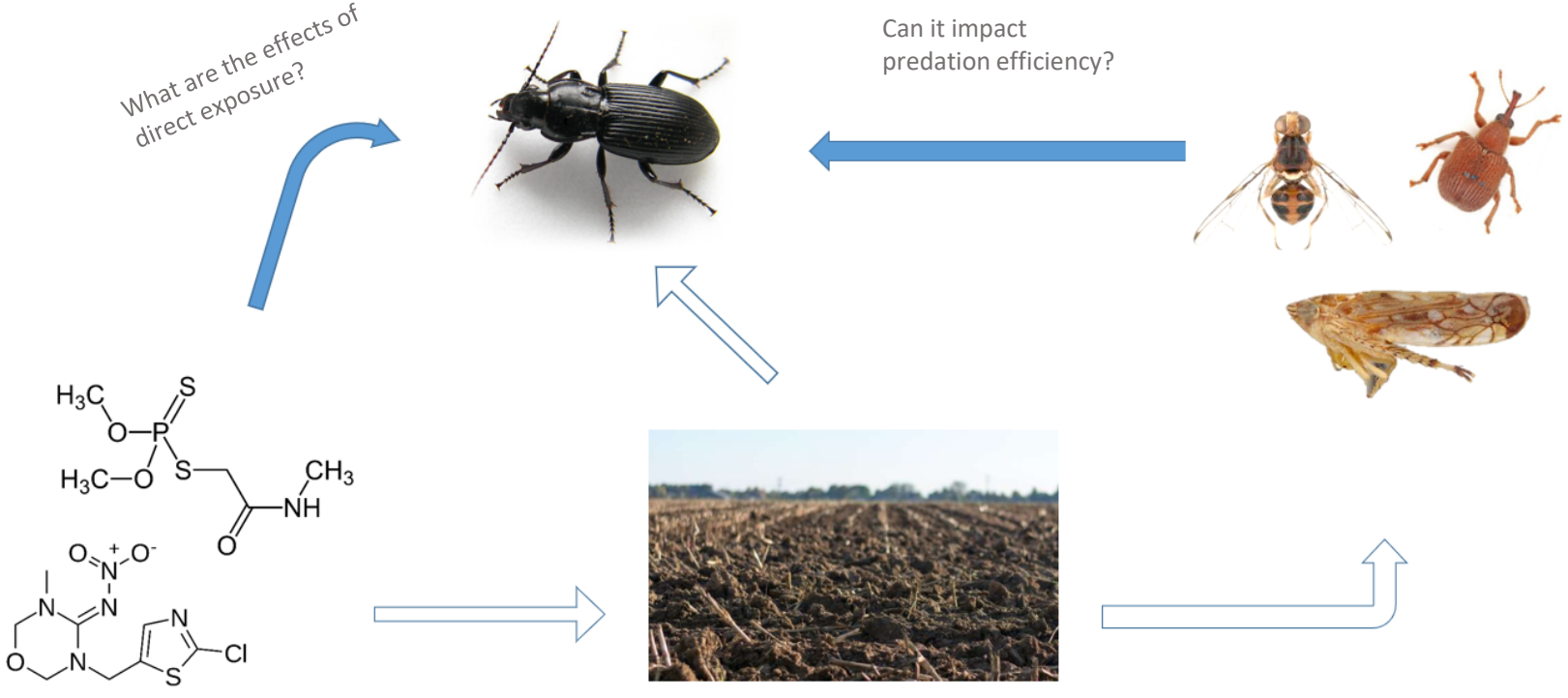

Figure 3. Different ways of pesticides exposure in predatory invertebrates (eorganic.org.; icr.org.; sigmaaldrich.com.; phys.org)

Materials and methods

- Studied organism – *Abax parallelus* (Coleoptera, Carabidae)→ predatory ground beetle
- Sampling – by hand and pitfall traps in the deciduous, pristine forests in continental Croatia, May-June 2020.

- Pesticide application - dipping method

  - thiamethoxam solution (in the gradient of four concentrations)

  - control group treated by dH_2O

- Locomotor activity – in the period of 48h beetles were observed for the signs of intoxication (irregular or slowed movement, paralysis, death)

- Feeding - treated beetles offered dipteran larvae as food

  - mass of consumed prey per mass of the beetle's body calculated for each individual

1. Beetles starved prior to the treatment
2. Each beetle was weighed
3. Beetles submerged in thiamethoxam solutions (15 per concentration)
4. Left to rest
5. Offered fresh, previously weighed dipteran larvae as food. Larvae remains were weighed again after 12 hours

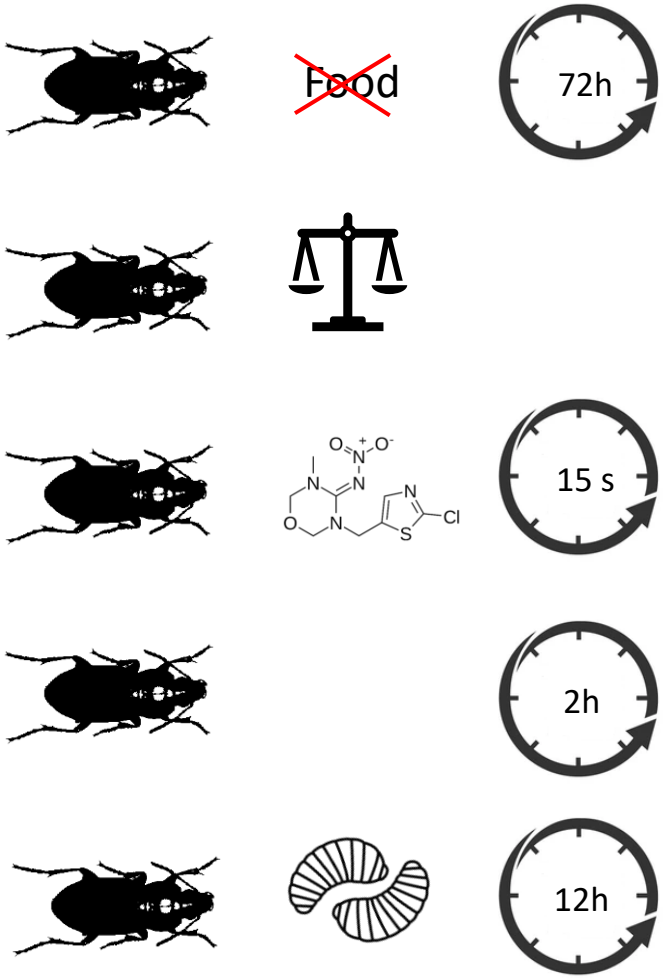

Figure 4. The experimental design

Results

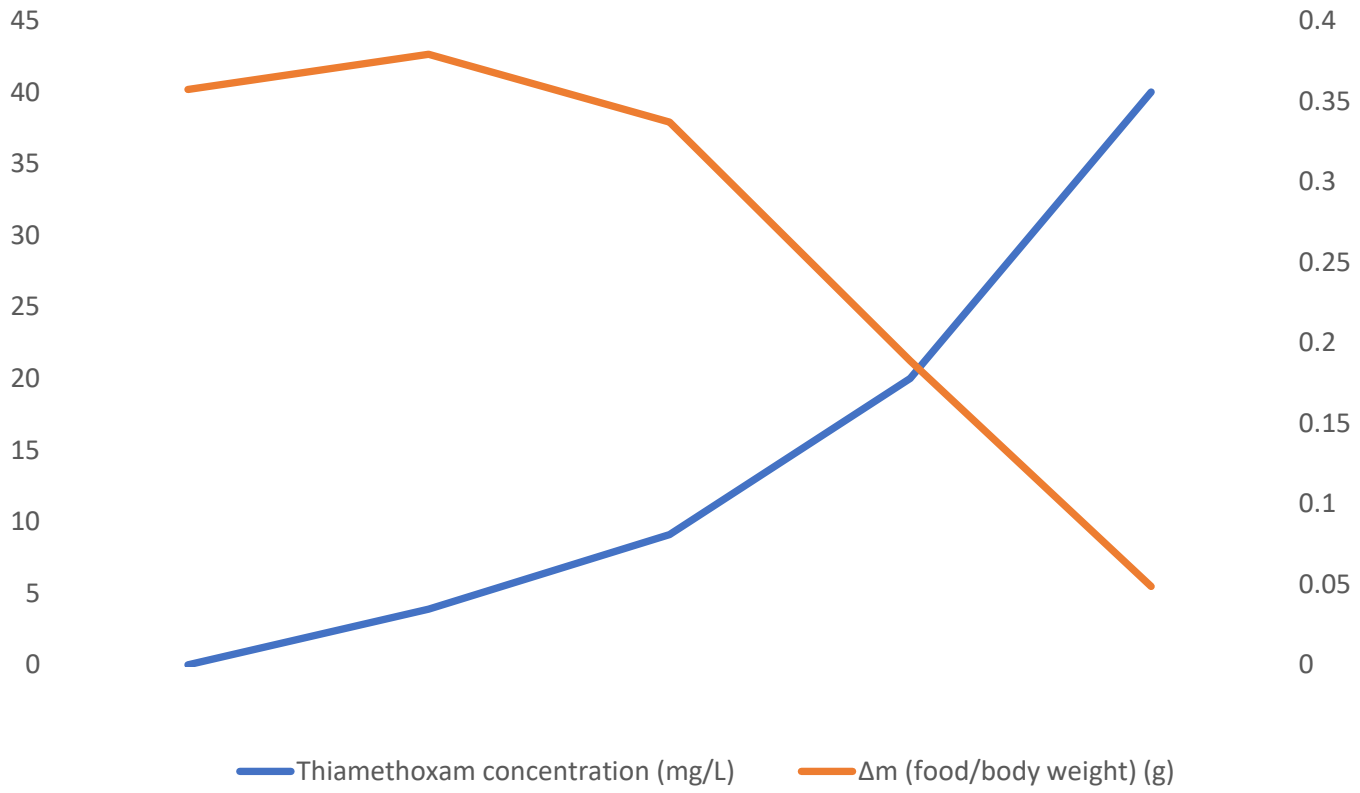

Figure 5. Relation between the concentration of the applied thiamethoxam and the average mass of consumed dipteran larvae per body mass of the beetle

- Only individuals treated with higher concentrations (20 mg/L and 40 mg/L) of thiamethoxam showed signs of intoxication
- First signs were noted 12h after the treatment

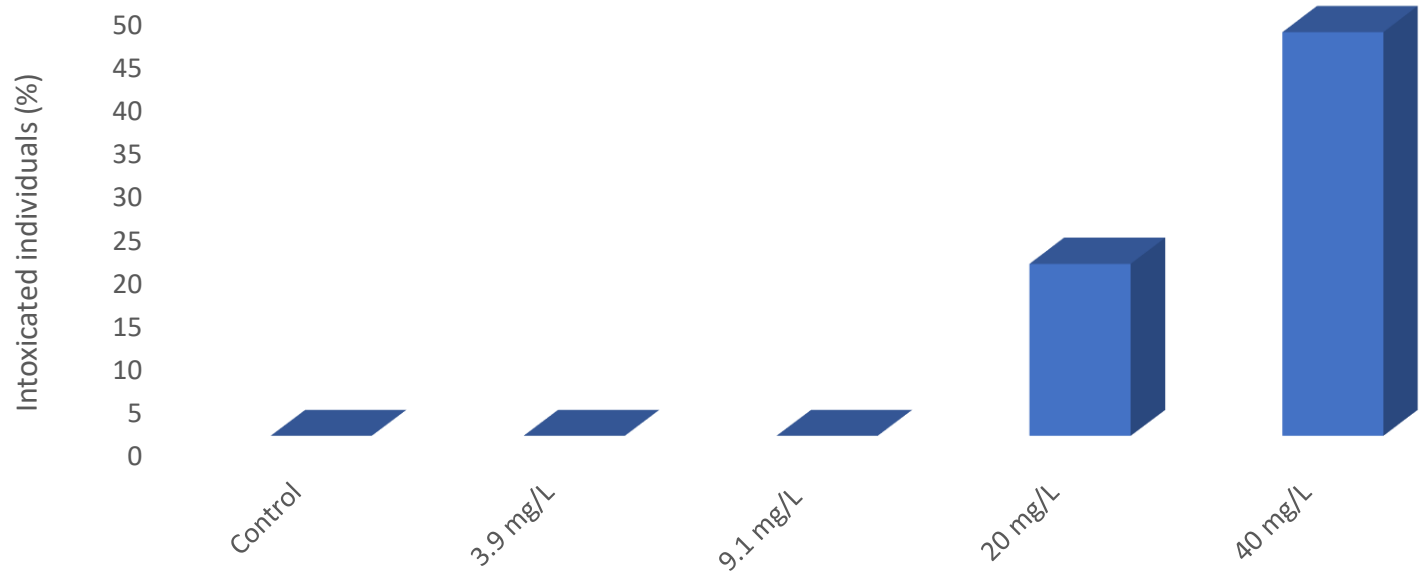

Figure 6. The percentage of individuals who showed signs of intoxication (disordered or slowed movements, paralysis, death) within 48h from the treatment

Conclusions

- Short-term exposure to thiamethoxam can result in negative sub-lethal effects
- These effects include decreased food consumption and disordered locomotion, which may affect their predatory behavior
- Effects of long-term exposure to lower doses requires further *in situ* research

Thank you for your attention!

Acknowledgements

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