

Pesticide mixture: how to obtain more using less

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Pesticide mixture: how to obtain more using less

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Meio Ambiente



Introduction

- Pesticides are
 - commonly used in agro systems to protect plants from pests
 - frequently used in combination with other pesticides and/or metals
 - sprayed manually or mechanically from land (or from air using planes)
 - responsible for changes in
 - soil communities of non-target species
 - water communities from nearby water bodies (e.g. direct spraying, run-off, drifting)



Pesticides' use

- Amount and frequency depend mostly on:
 - type of pest
 - pest resistance
 - culture value
 - climate conditions

Potato Blight

(*Phytophthora infestans*)



Mancozeb/Cymoxanil (e.g. Curzate M 68)

Mancozeb

5.5 g/L of spray solution

1360 g/ha

250 L spray solution/ha

Cimoxanil

0.36 g/L of spray solution

90 g/ha

250 L spray solution/ha

- Recommended dose (0.5-2 kg/ha)
- Application can be distributed weekly for up to 6 weeks



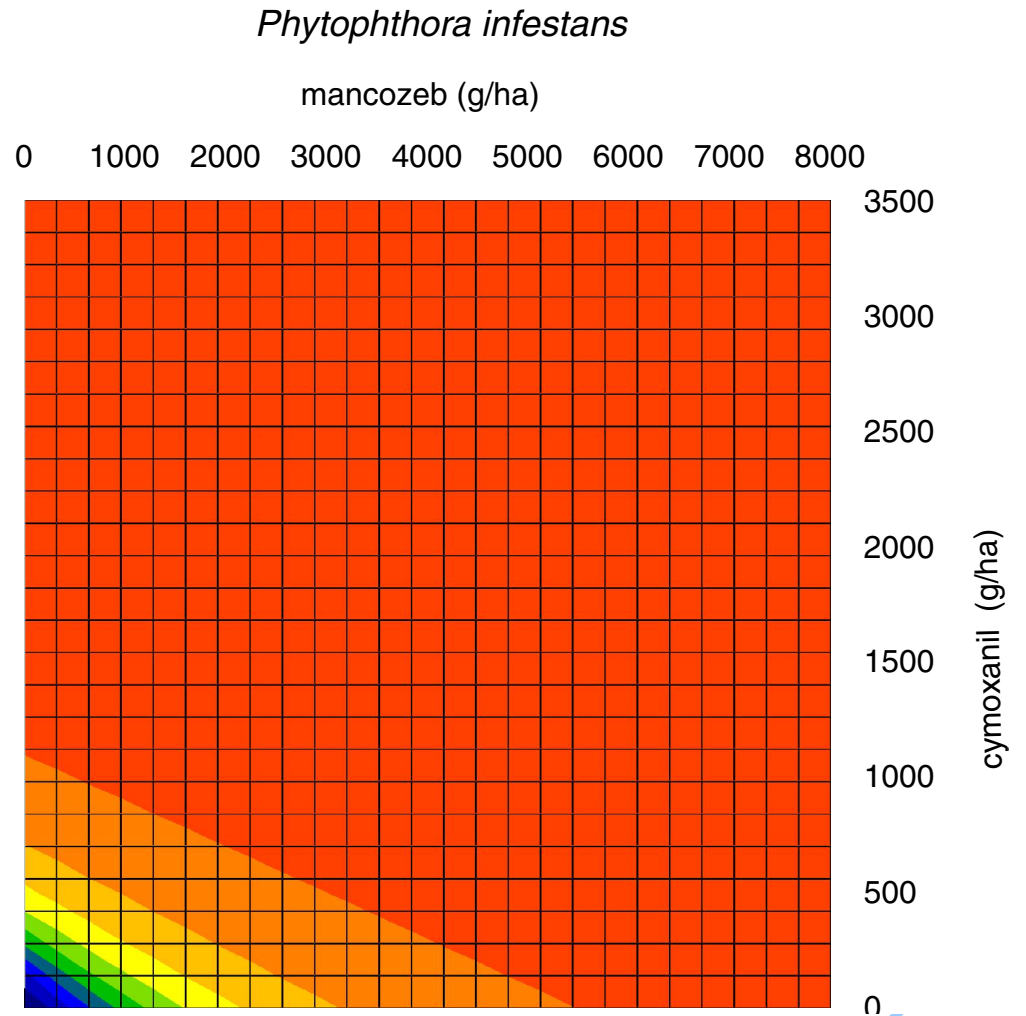
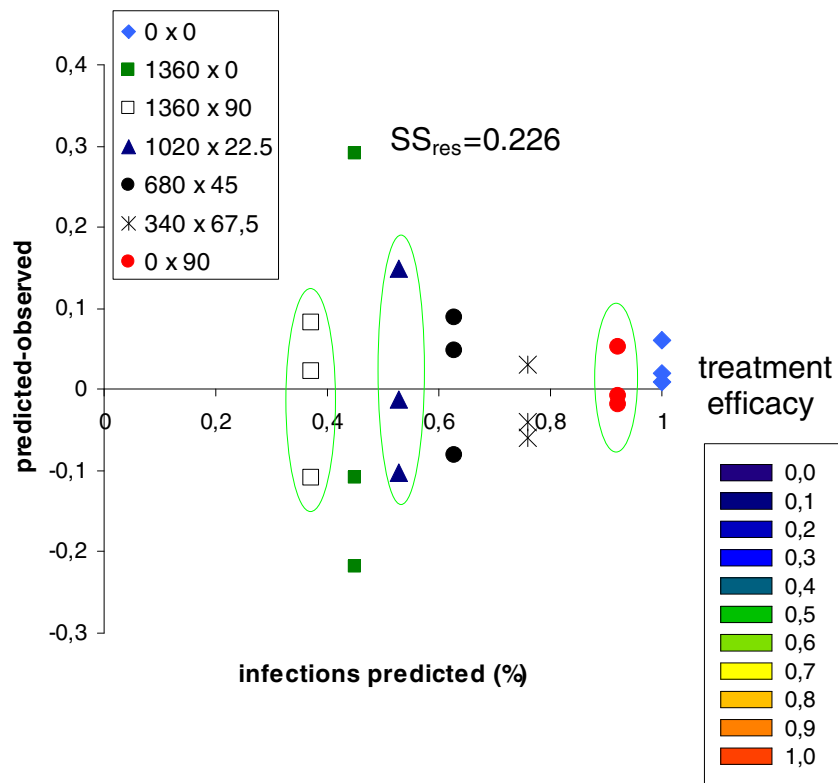


Mode of action

- **Mancozeb** is a **contact fungicide** that acts as a non-specific thiol reactant, **inhibiting respiration**. It controls a broad spectrum of fungal diseases (e.g. blight, leaf spot, rust) in a wide range of crops.
- **Cymoxanil** is a **foliar applied fungicide** that **inhibits sporulation**. It has a relatively short persistence and is mostly used in combination with protective fungicides like Mancozeb in order to improve its period of action.



Effect of pesticide on pest



[derived from data on Evenhuis et al (1996). Potato Res.]

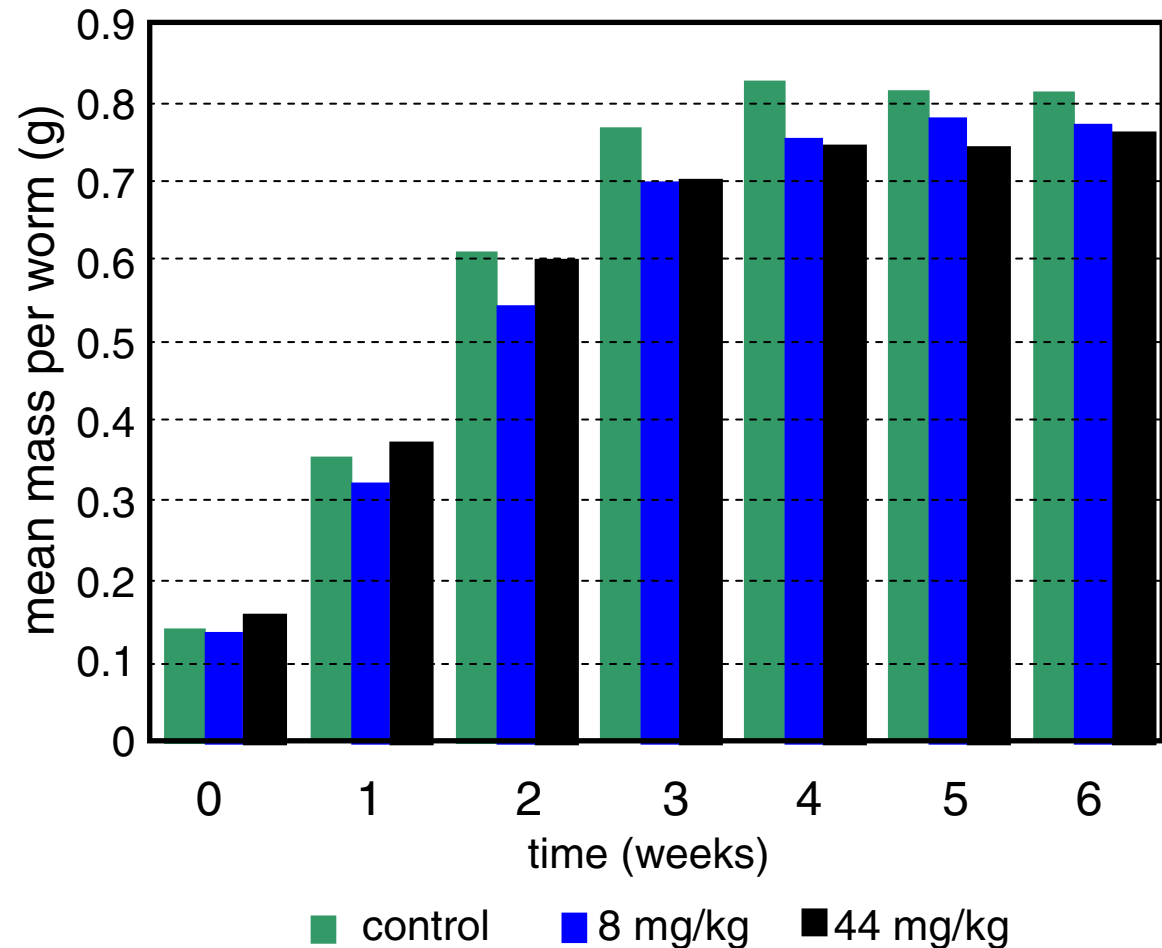
Eisenia fetida: chronic exposure to mancozeb



5-10% reduction
relative to controls

effects more evident
after 3rd week

No significant
differences between
treatments with 8
and 44 mg/kg



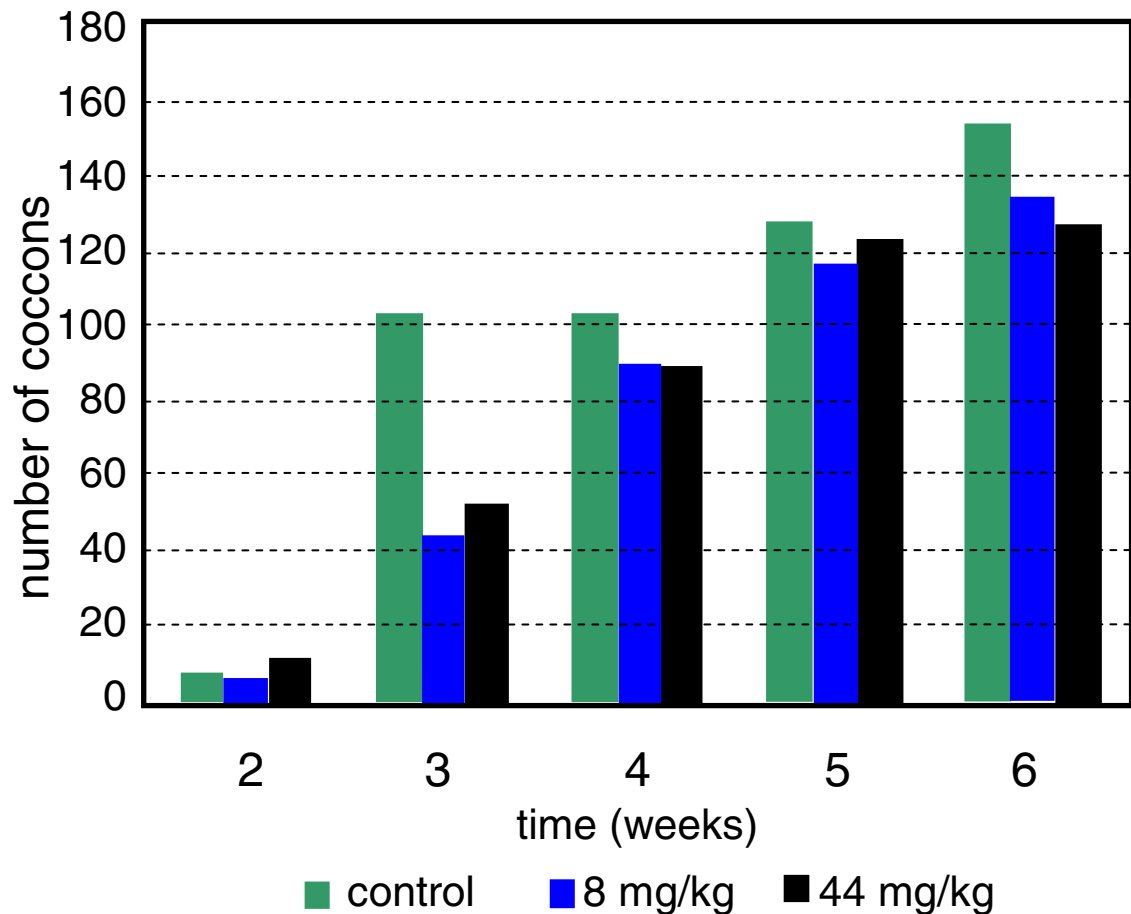
[data from Vermeulen et al. (2001). Ecotox. Env. Saf.]

Eisenia fetida: chronic exposure to mancozeb



up to 25% reduction in reproduction (number of cocoons)

effects more pronounced after 6th week

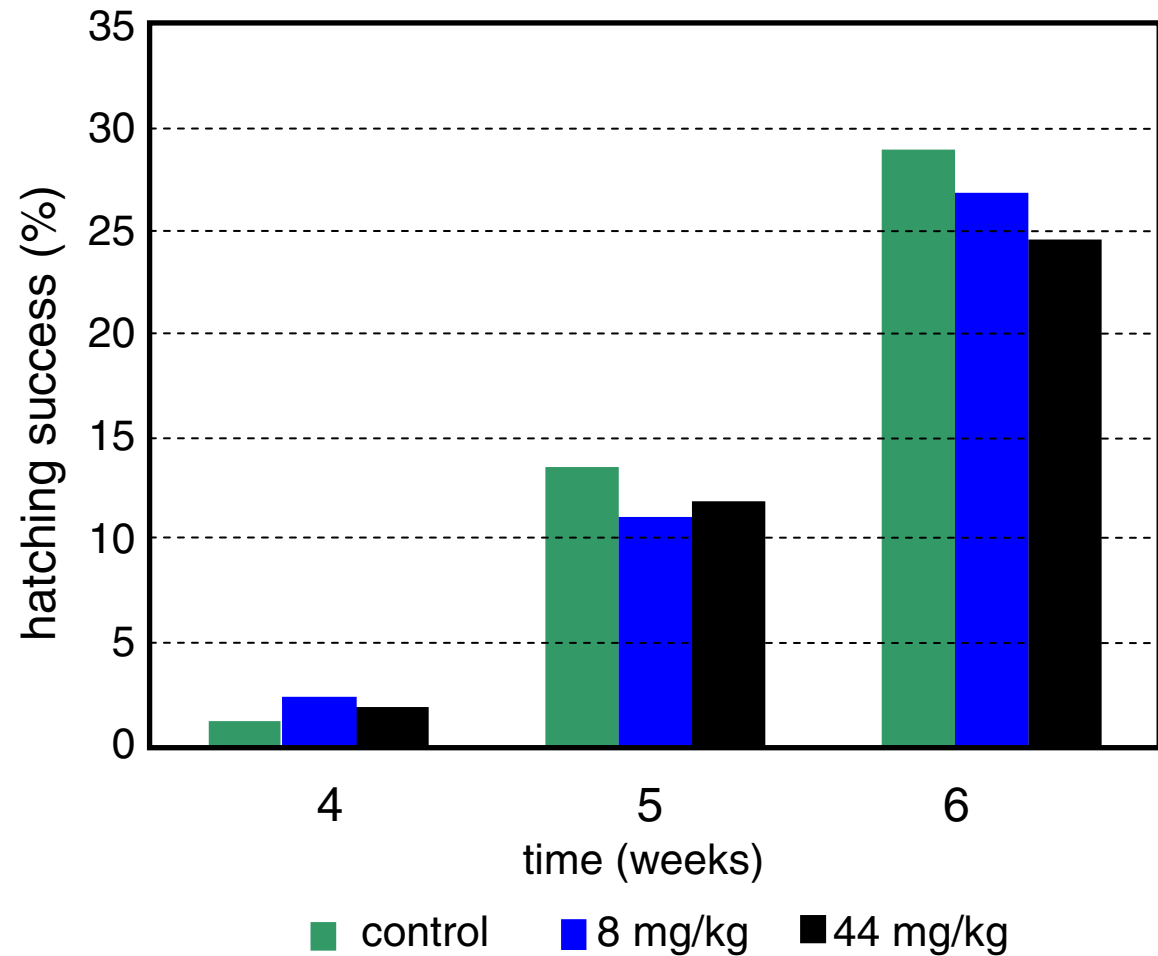


[data from Vermeulen et al. (2001). Ecotox. Env. Saf.]

Eisenia fetida: chronic exposure to mancozeb

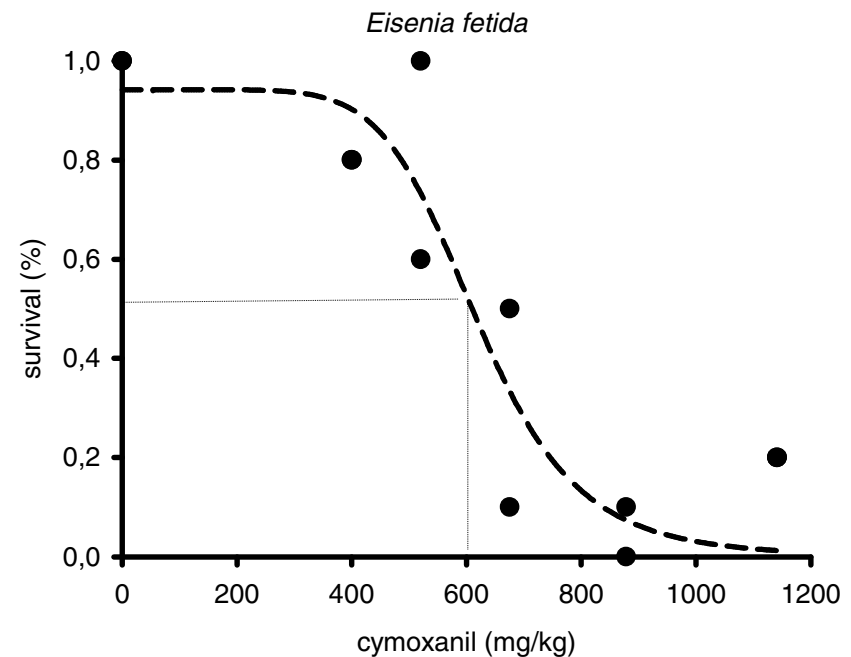
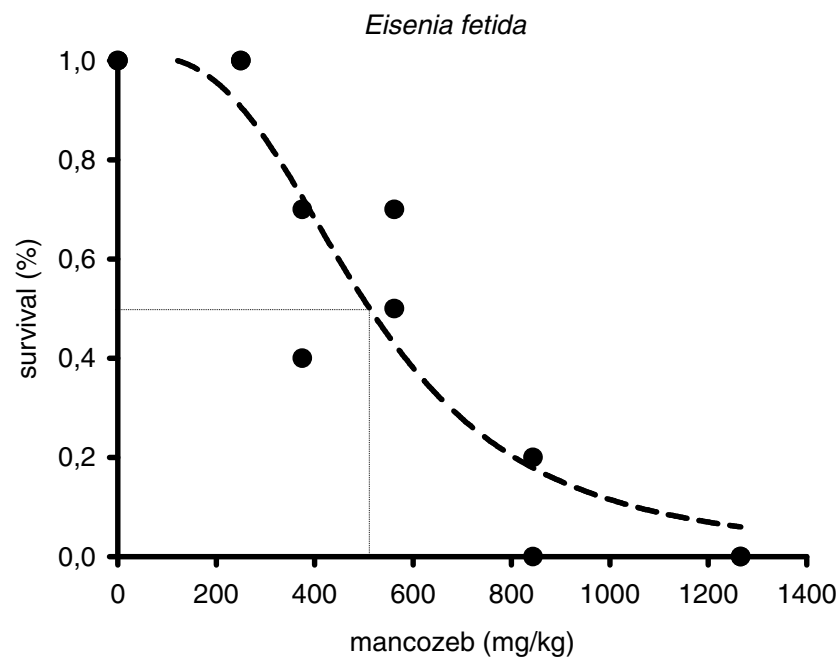


up to 10% reduction in the number of successful hatches



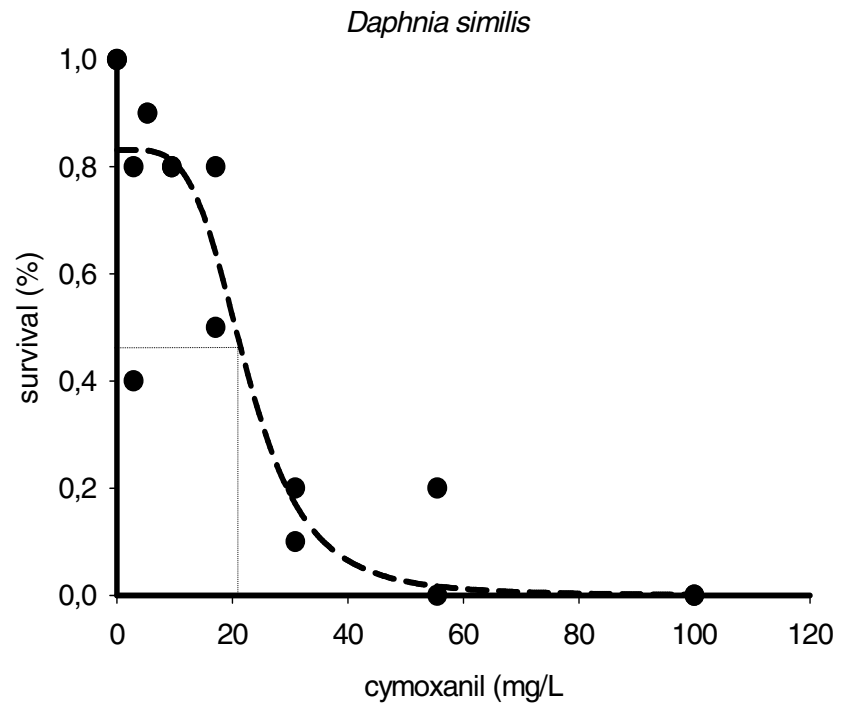
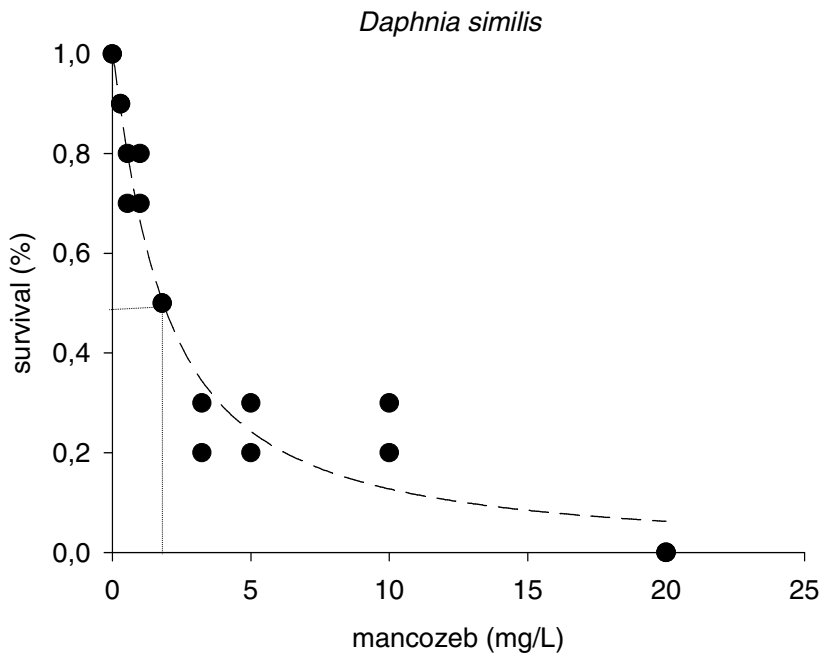
[data from Vermeulen et al. (2001). Ecotox. Env. Saf.]

Eisenia fetida: acute exposure to mancozeb and cymoxanil



[results in agreement with data from Vermeulen et al. (2001). Ecotox. Env. Saf.]

Daphnia similis: acute exposure to mancozeb and cymoxanil



Derivation of conversion factor based on realistic scenarios



- Conversion of application rates (g a.i./ha) into soil concentrations (mg/kg)
 - soil density: 1.5 g/cm³
 - soil depth: 15 cm
 - soil mass of relevant layer: 2,250,000 kg/ha
 - conversion factor
 - 1 g/ha = 0.0027 mg/kg

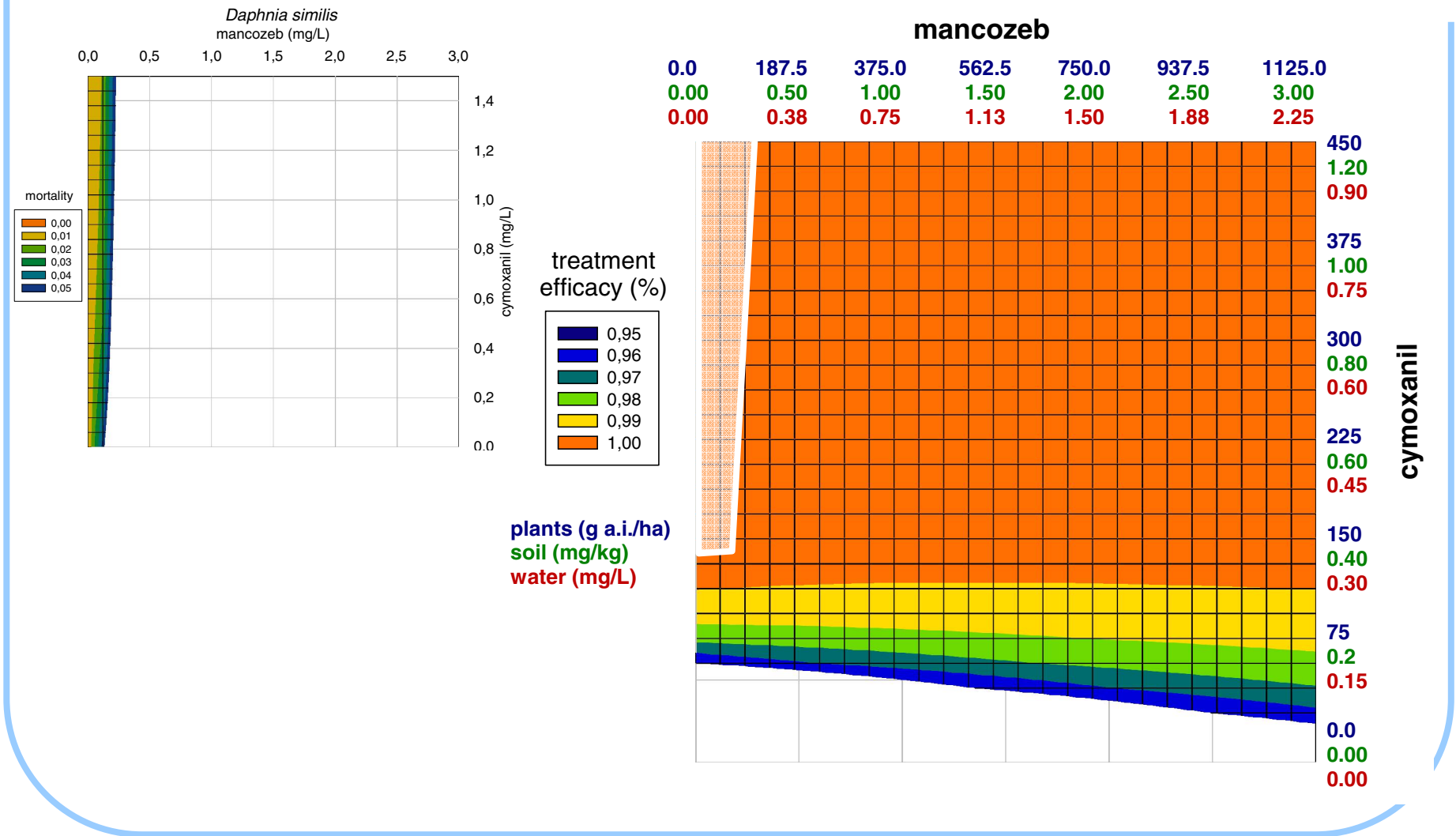
Derivation of conversion factor based on realistic scenarios



- Conversion of application rates (g a.i./ha) into water concentrations (mg/L)
 - water depth: 30 cm
 - soil mass of relevant layer: 3,000m³/ha
 - conversion factor
 - 1 g/ha = 0.0020 mg/L



Integration of effects on target and non-target species





Discussion

- Mixtures can be used to maximize effects on target species while reducing effects on non-target species
- Doses and application rates must take in consideration ecologically relevant scenarios
- Recommended procedures should be derived from trade-offs between effects on target and non-target species



Conclusions

- The present study suggests that the same effect on the fungus can be optimized manipulating the mixture
 - reducing the amount of mancozeb in the mixture
 - increasing the amount of cymanoxil
 - reducing the number of applications
- Environmental side effects of the mixture on non-target species will be reduced



Acknowledgements

