Effects of a realistic multiple low dose pesticide exposure scenario on aquatic communities in stream mesocosms

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Introduction

The current EU risk assessment for pesticides refers to effects of single substances, which derives a regulatory acceptable concentration (RAC) for each pesticide. However, combinations of pesticides, which are commonly used in agriculture, are not considered in the risk assessment.

Here, we studied a realistic pesticide spray scenario for a apple crop protection on aquatic communities in stream mesocoms.

Material & methods

Realistic scenario

- 4 control & 4 treatment mesocosms
- 9 fungicides, 4 insecticide & 4 herbicides
- application of RAC for each pesticide
- At 19 days in total 36 pesticide application

Measured parameters (selection)

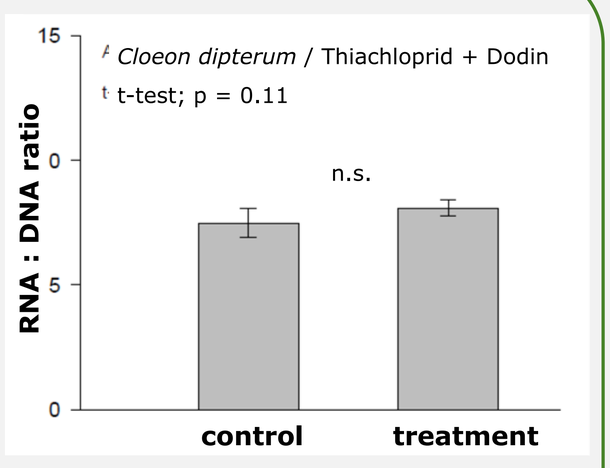
- Drift of invertebrates (Berghahn et al. 2012)
- RNA:DNA ratio as proxy for fitness and growth (Wagner et al. 2001)
- Stable isotope analysis of $\delta^{15}N$ & $\delta^{13}C$ for trophic level [TL] (see Brauns et al. 2012)
- Floating leaves of *Potamogenton natans* (cf. Berghahn et al. 2007)

First results

Event-driven effects

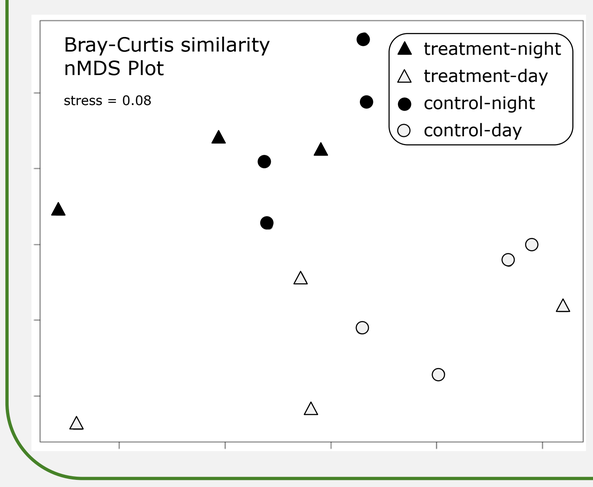
1. RNA:DNA of caged invertebrates

No significant difference between control and treatment mesocosms. Test were done at four events with different tested taxa.



2. Drift - day/night - of invertebrates (4 fungicides)

a. *No significant difference* in community drift behavior in control and treatment.



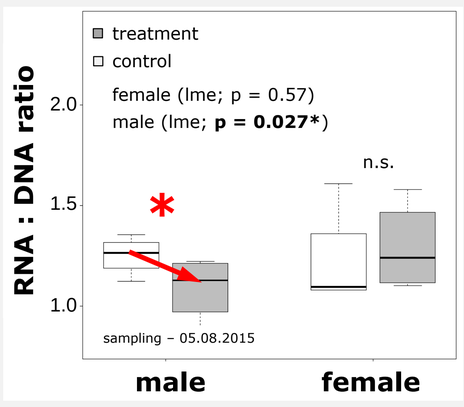
b. *Significant differences* on taxon scale (only night drift).

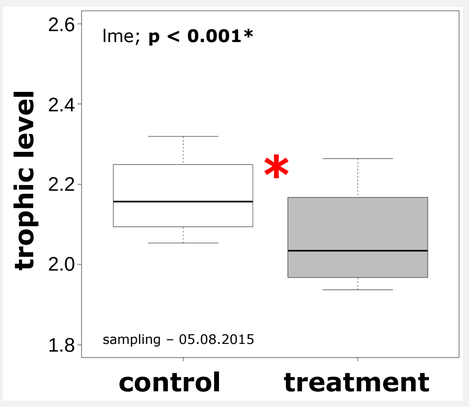
	lme	treatment
Tanypodinae	**p = 0.03***	↑
Orthocladiinae	p = 0.62	
Beatidae	**p = 0.03***	↓

Long-term effects

1. Trophic level and RNA:DNA of *Gammarus roeselii*

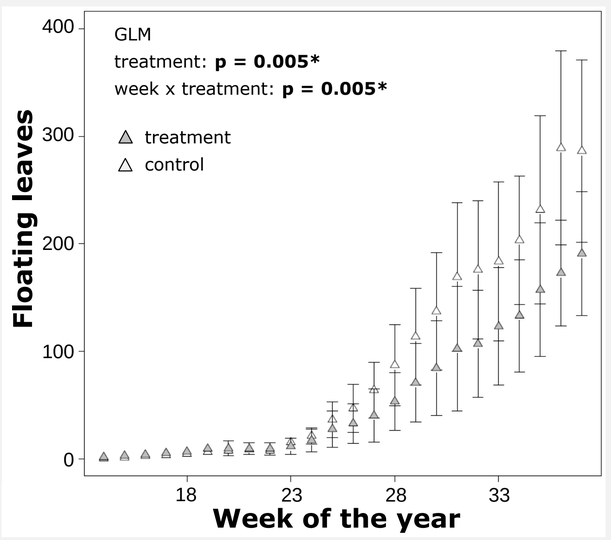
Significant difference in in both parameter at the end of the experiment => higher TL and fitness in control.





2. Floating leaves of *Potamogeton natans*

Significant more leaves in control mesocosms indicate higher primary production, also supported by a lower K^+ water concentration.



Preliminary conclusion

Event-driven effects

- ✓ Realistic mixtures (RAC) of pesticides had no short-term effects (exception: single drifting taxa).
- ✓ Gives the impression of safety of RAC mixtures on a short time scale.

Long-term effects

- ✓ Complete spray scenario resulted in a reduction of fitness and primary production of considered taxa.
- ✓ Cumulative effects also of RAC possible on a longer time scale.

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