



The effects of mesofauna abundance and diversity on organic matter degradation: a field study in arable soil

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Introduction

Functional soil food webs are essential to maintain vital biosystem function including nutrient cycling and biomass production. The mesofauna (i.e. collembola and acari) are a diverse, numerous group within these communities, but their functional role in preserving soil functionality is not well understood. This is particularly important in arable fields where soil food webs can be exposed to plant protection products which could result in adverse effects. In order to start addressing this topic we have conducted a field study testing the effects of insecticide application on mesofauna abundance and diversity and its potential knock on effects on organic matter degradation (OMD) a key parameter of functional soil food webs.

Materials & Methods

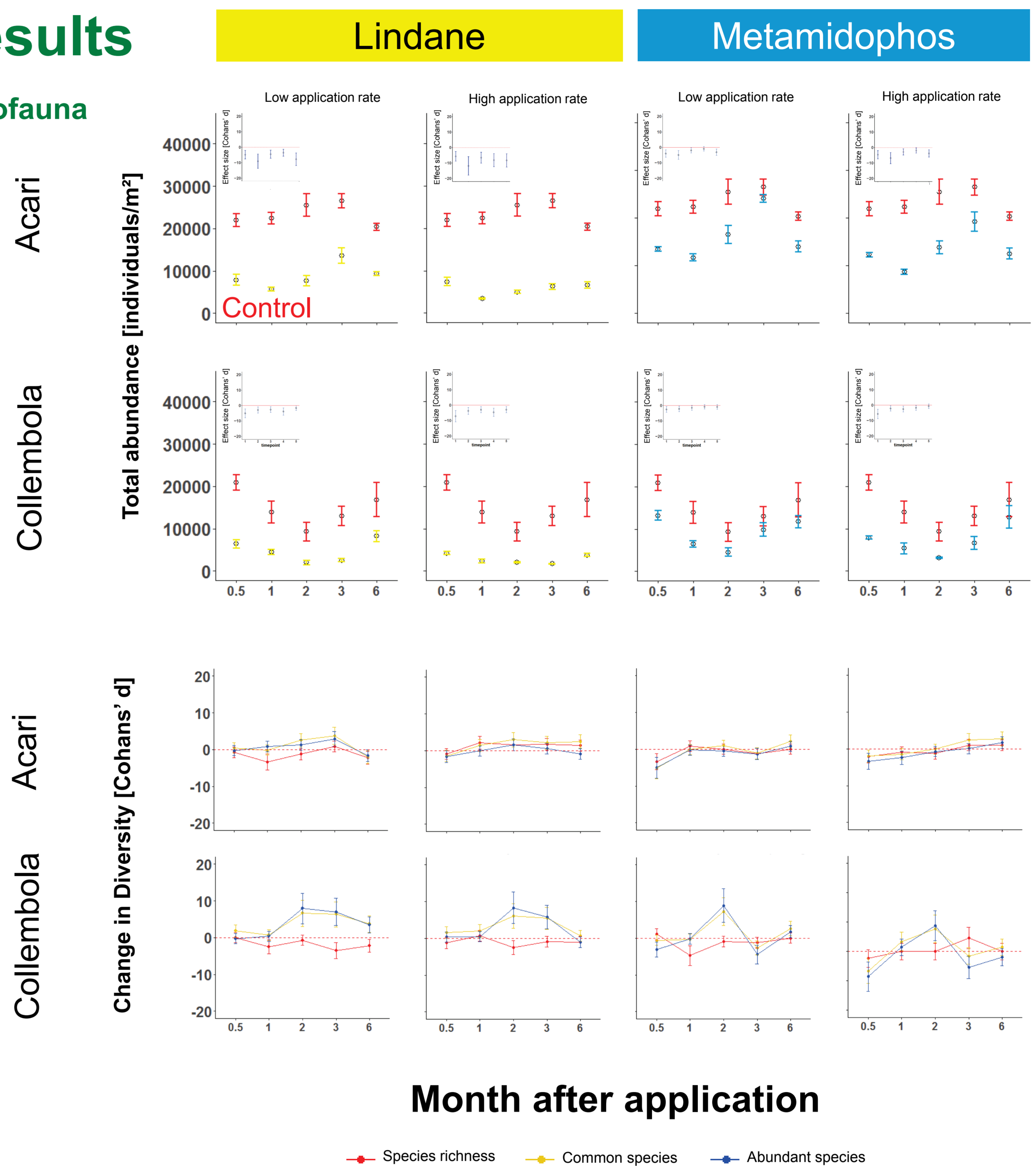
In 2014 we conducted a six-month field experiment in arable soils in Saxony, Germany. The experiment had five treatments (4 replicates) of two insecticides, Lindane (DT₅₀ in soil 42 – 390 days) and Metamidophos (DT₅₀ in soil <10 days), which were applied at two concentrations each (Lindane low 2.5 & high 7.5 kg ai/ha; Metamidophos low 0.6 & high 3 kg ai/ha) and a negative (water) control. All treatments were applied once in mid-May. During the 5 consecutive samplings (0.5, 1, 2, 3 and 6 months after application) the effects of treatment on mesofauna abundance (individuals), diversity estimates (Hill numbers: (q0, 1 & 2) species richness, common species, abundant species, see Chao 2014) and three endpoints for OMD were evaluated. We used a four mini container set-up (Eisenbeis 1999) to compare the treatment effects on degradation patterns of two substrates (straw and lucern) testing two mesh sizes (small mesh size = mesofauna excluded, large mesh size mesofauna included) each. In addition, we used bait lamina as a second proxy for OMD response to treatment. We present mean & 95%CI, Standardized Effect sizes [Cohans'd] R², Slope & 95% Confidence intervals.

Conclusions

1. High application rates of PPP had strong effects on mesofauna abundance but limited effect on biodiversity measures
2. Neither abundance nor biodiversity of mesofauna influenced organic matter breakdown

Results

Mesofauna



Results

OMD

Mini container

Bait lamina

