

The non-target effects of azoxystrobin on the structure and function of microbial communities.



communities.

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1. Introduction

- Regulatory bodies use **broad-scale** analyses (e.g. Biomass and respiration) to determine the environmental risk from pesticides.
- Whilst these techniques could provide an indication of **net community responses**, they may mask changes which may be subtle but nonetheless ecologically significant.
- This research aims to combine both **broad-** and **fine-scale** techniques to determine the impacts of the fungicide **azoxystrobin** on the **resistance** and **resilience** of soil microbial communities.

2. Materials and Methods

- Azoxystrobin applied to a sandy loam soil.
- "Broad-scale"** assays performed: Respiration, dehydrogenase, and biomass.
- The structure of microbial communities was determined using **18S** and **16S rRNA terminal restriction fragment length polymorphism (T-RFLP)**.
- HPLC** was used to monitor the degradation of azoxystrobin.

3. Results

- Biomass was **unaffected** by pesticide application.
- A concentration-dependant decrease in dehydrogenase was recorded after **1** and **2 months**, with a recovery observed by **3 months** (Figure 1).

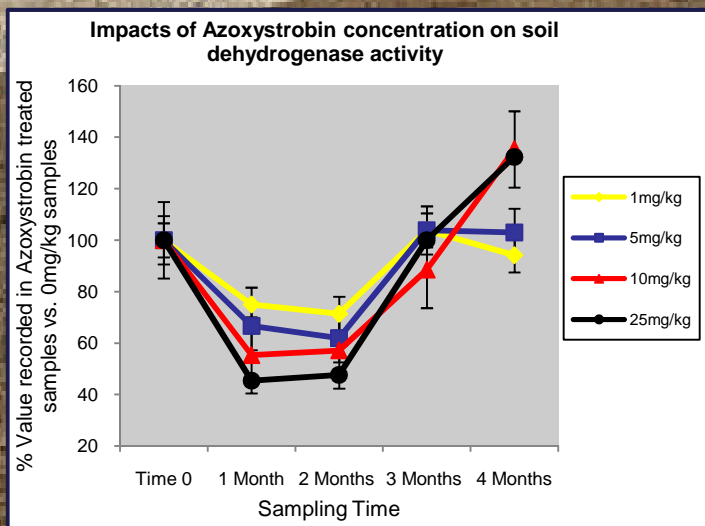


Figure 1.

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Figure 2. Major changes in TRF structure following azoxystrobin application.

¹Denotes peaks appearing or disappearing after 1 month

²Denotes peaks appearing or disappearing after 4 months

	Fungi	Bacteria
TRFs that appeared with pesticide application	434bp ¹ 467bp ¹	814bp ²
TRFs that disappeared with pesticide application	84bp ¹ 592bp ¹	42bp ¹

- A 2-way ANOVA of fungal TRFs (terminal restriction fragments) showed that **time** had a significant effect on community diversity ($p = 0.0009$), but pesticide concentration didn't ($p = 0.452$).

- ANOVA analysis of bacterial TRFs didn't produce significant p values for **time** or **pesticide concentration**.

- Non-metric multidimensional scaling (**NMDS**) showed changes in community structure at the **highest azoxystrobin concentration** only for bacterial and fungal populations.

- Analysis of peak data showed the apparent appearance and disappearance of specific TRFs in fungal and bacterial traces in response to azoxystrobin application (Figure 2).

- Analysis of pseudomonad TRFs indicated little or no changes in peak presence or absence as a result of azoxystrobin application.

4. Conclusions

- Biomass**, and **dehydrogenase** analyses gave **contradictory indications** of pesticide impacts on microbial communities.

- These results suggest that both **broad-scale** and **fine-scale** techniques should be used together for a **full assessment** of the eco-toxicological impacts of pesticides.

5. Future Work

- RNA** extraction, **RT-PCR**, and **T-RFLP** will be used to try and solve the problem of the contradictory **dehydrogenase** and **DNA** data.

- T-RFLP analysis of **nematode**, and general **protozoan** communities will attempt to determine the impacts of azoxystrobin at a **different trophic level**.