Effect of Substrate Quantity on Resilience

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Introduction Soil resilience, the recovery after stress as in Fig.2, can be important property related to soil quality. As part of a larger study into the interplay between biological and physical resilience, we were interested whether functional resilience was affected by substrate quantity.

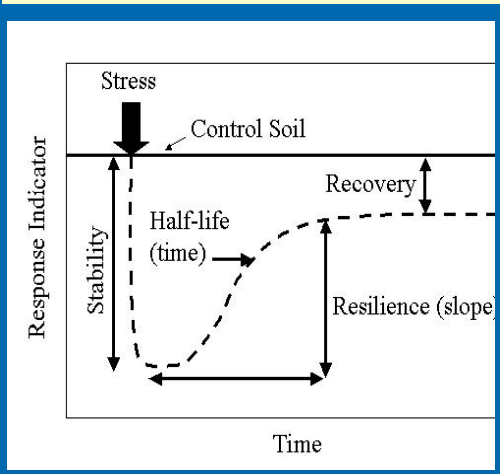


Fig. 2. Quantifying the stability and resilience of a system.

Fig. 1. Samples collected from field of spring barley at Teagasc-Oak Park

Objectives

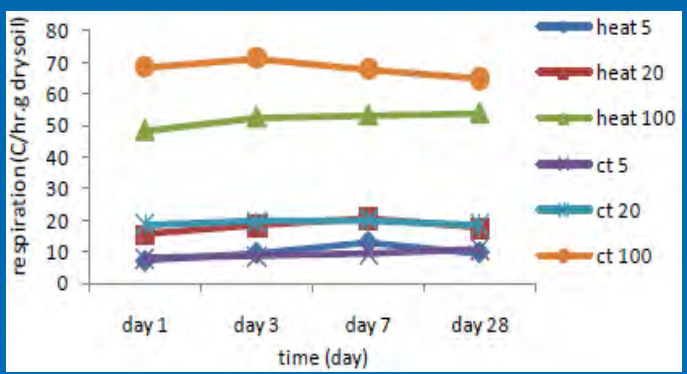
- To find out if the concentration of substrate affected resilience.
- To see the relationship between microbial biomass and resilience.

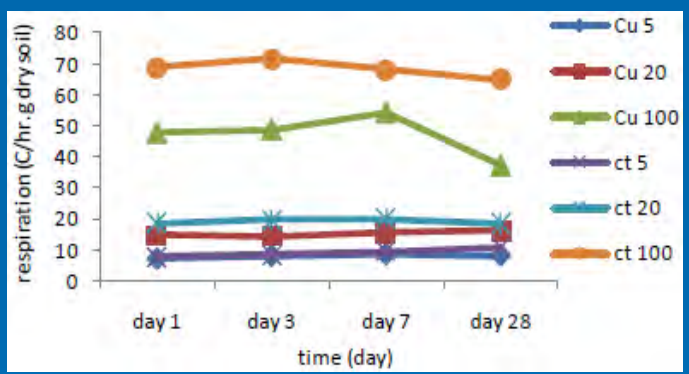
Methods

Stresses: Heat (transient), Copper (persistent).
Treatments: Substrate amendment (0.5, 2, 10mg green barley powder /g soil)
Measurements: Respiration of added substrate, Microbial biomass (CFIM)

Results

Amount of added substrate had a significant effect on soil resilience (Figs. 3 & 4). While there was no difference in respiration between stressed and unstressed soils with 0.5mg of barley powder amendment there was a great difference when higher amounts of substrate were added.





Figs. 3 & 4. Recovery (short-term decomposition as percentage of control) of substrate amended soils (with 5, 20, 100mg of Barley powder) after heat or copper stress

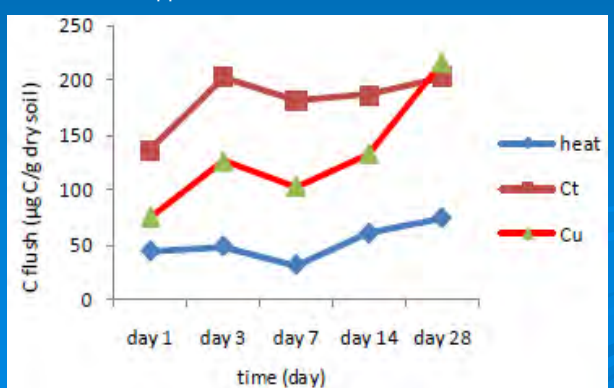


Fig. 5. The flush of Total Organic Carbon (TOC) in stressed and unstressed soils fumigated for 24h

The results of chloroform fumigation (Fig. 5) showed that there was a strong recovery after copper stress, but less so after heat. This is being confirmed by independent measurements (PLFA).

Conclusion

These results indicate that any effects of biodiversity or biomass or environmental change on soil functions may only be evident when the system is working at full capacity.

Griffiths et al. 2008. Functional resilience of soil microbial communities depends on both soil structure and microbial community composition. Biol. Fertil. soils, 44:745-754

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