Dynamics of Soil Microarthropod Populations Affected by a Combination of Extreme Climatic Events in Tropical Home Gardens of Kerala, India

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Introduction

- Extreme climate events (drought and floods) impact flora and fauna on a regional scale
- The change in climate has an effect on soil invertebrate fauna like microarthropods
- Each group of soil microarthropods shows different response to floods
- 25 home gardens (19 flooded, 6 non-flooded) were studied from Kerala, India to understand the effect of drought followed by flash flood event on soil microarthropods

Materials and Methods

The following shows a home garden in the study area (Fig. 1) and an overview of materials and methods (Fig. 2)

Fig. 1. A rural home garden in Chengamanad, Kerala, India without intensive soil management

Fig. 2. An overview of materials and methods

Results

- Total microarthropod abundance was reduced during drought and showed further decrease following floods (Fig. 3).
- The groupwise soil microarthropod faunal abundance showed varied response to floods and recovery after floods (Fig. 4).
- There was change in relative number of home gardens with highest EMI- before flood (April 2018) and after flood (August 2018) as the EMI of microarthropods namely Acari, Hymenoptera, Araneae, Coleoptera, Collembola and Cicada were lost in 50% home gardens
- Blattarian EMI was not affected by flood, but reduced during drought
- During November 2018, the euedaphic forms of Coleoptera, Hymenoptera, Blattaria, Cicada, Diptera and Hemiptera were seen in larger numbers, hence high EMI
- In 2018, QBS-ar is best explained by plant species richness, drought and flood and tree cover was more important than grass cover
- Addition of organic carbon through plant litter and roots due to increased plant species richness and cover may have led to an increase in euedaphic microarthropod forms in August 2018 in non-flooded home gardens
- The restoration of QBS-ar values faster than the microarthropod population follows the ecological theory that ecosystem properties can be stable at higher diversity than higher abundance

Conclusion

- There is negative impact of the combination of a severe summer drought followed by a major flood event on soil microarthropods
- The microarthropod population can recover after a natural catastrophe provided there is enough vegetation and litter to support their survival
- The recovery potential of soil microarthropods varies based on microarthropod groups
- There is recovery potential provided by agrobiodiversity, especially the tree diversity in tropical Home gardens.
- The plant diversity in home garden agrosystems, are very important and have to be maintained as they can mitigate the disastrous consequence of severe climate events in a region.

References


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