Nematode Food-Web Analysis in Three Vegetation Zones of Peat Forest, KHG Tebing Tinggi, Riau

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Abstract
Peat forest is a unique ecosystem for having a large amount of organic matter and high water content on its floor, creating an anaerobic condition that leads to a low decomposition process necessary for soil nutrient availability. The decomposition process and nutrient availability rely on the actions of food-web decomposers, in which measuring nematode community is a method to reveal soil food-web conditions. We intended to record nematode composition to comprehend our understanding of the soil food-web in pole forest (PF), mixed forest (MF), and 6- month post-fire forest (FF) of peatland ecosystem in part of KHG Tebing Tinggi. We applied food-web indices and nematode profiles to our data to analyze nematode communities. The profile indicated more trophic linkages in PF and MF than in FF. A higher contribution of bacterivorous nematode to food-web was recorded in FF than in the other two zones. Channel index (> 50) was more significant in PF and MF than in FF, indicating a substantial contribution of the fungal decomposition pathway in pole and mixed forest zones. In summary, mixed and pole forests support more complex decomposer food-webs than the post-fire forest. The bacterial decomposition pathway develops after six months of a forest fire

Keywords: food-web analysis, nematode, peat forest, vegetation zones

Introduction

Peat forests are unique ecosystems characterized by high organic content and waterlogged conditions (Comas et al. 2015). These environments support a diverse range of organisms, including nematodes, which play vital roles in nutrient cycling and ecosystem functioning (Meehan et al. 2020). We intended to record nematode composition to comprehend our understanding of the soil food-web in pole forest (PF), mixed forest (MF), and 6- month post-fire forest (FF) of peatland ecosystem in part of KHG Tebing Tinggi.

Methods

Study Site and Sampling Design

The study was conducted in peatland ecosystem in part of KHG Tebing Tinggi Island, Riau (**Figure** 1). Samples were taken from each zone (pole forest: PF, mixed forest: MF, and 6- month post-fire forest: FF). As many as eight plots were assigned in every zone, to which four cores were retrieved from each plot (**Figure 2**).

Figure 1. The study site located in Tebing Tinggi Island, Riau

Figure 2. Visual view of the vegetation zone in the study site.

Nematode Extraction and Analysis

We applied Baermann Funnel to extract the soil nematodes. The collected nematodes were then identified based on their morphological characteristics according to Bongers (1994). The functional groups were referred to Ferris, Bongers, and De Goede (2001).

Data Analysis

The food-web indices and nematode profiles to analyze nematode communities were based on Ferris et al 2001, including Structure Index (SI), Enrichment Index (EI), Basal Index (BI), and Channel Index (CI). The PCA was applied to investigate the nematode composition.

Results

The nematode abundance and generic richness across the vegetation zones of peat forest [PF: Pole Forest, MF: Mixed Forest, FF: 6-month Post-Fire Forest] is presented in **Figure 1.** PF was the vegetation zone with the highest generic richness (38) and abundance (about 700 individuals in 10 gram peat soil).

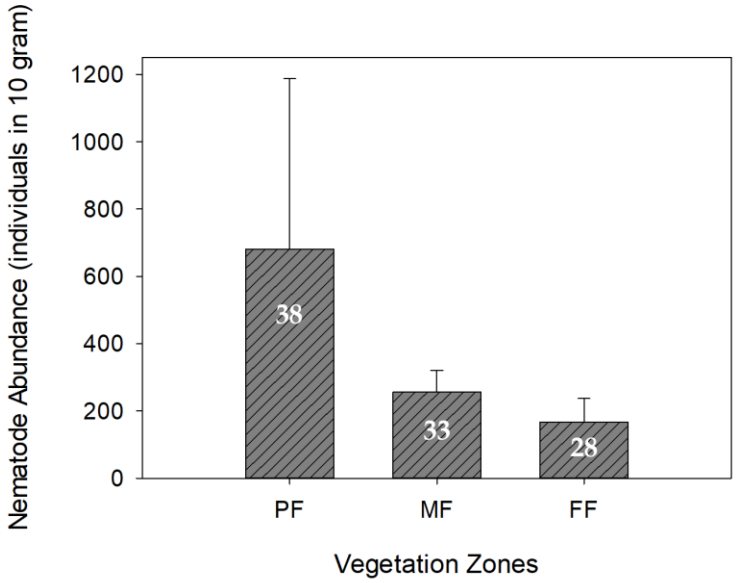

Figure 1. The nematode abundance and richness across three vegetation one

A higher contribution of bacterivorous nematode to food-web was recorded in FF than in the other two zones. Moreover, the nematode composition varied according to vegetation zones (**Figure 2**).

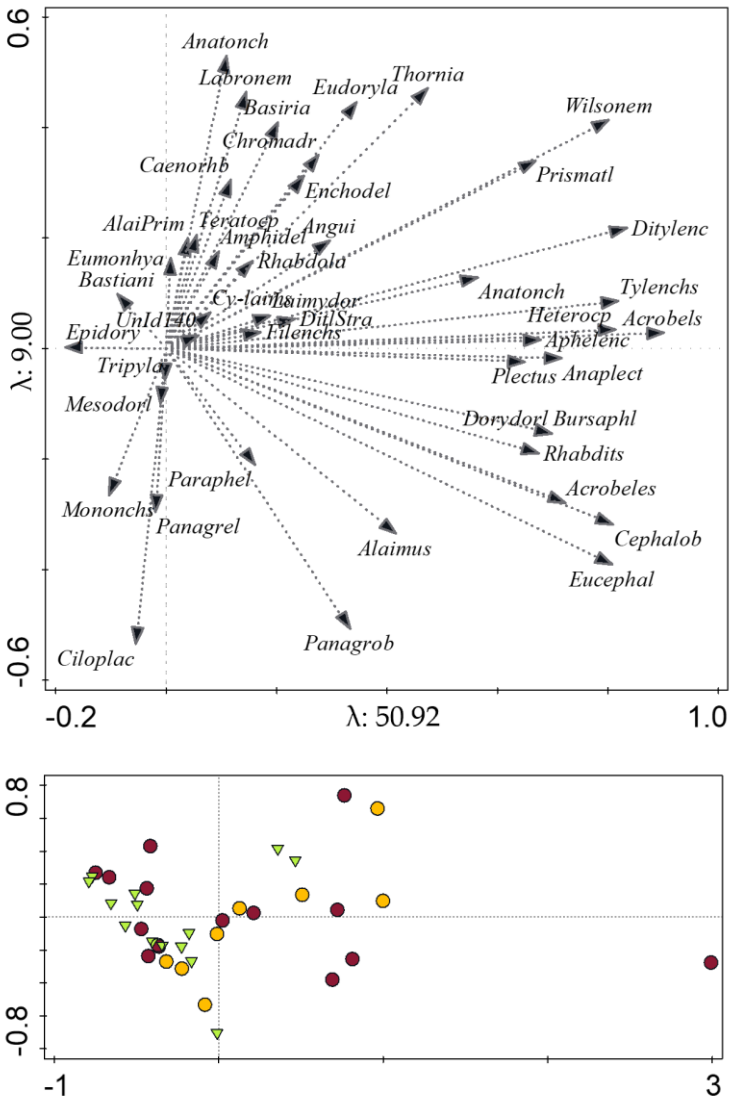

Figure 2. The nematode distribution (above) and their composition (below) across the vegetation zones in the peatland of Tebing Tinggi Island

The nematode profiles in **Figure 3** showed more trophic linkages in PF and MF than in FF. Channel index (> 50) was more significant in PF indicating substantial contribution of the fungal decomposition pathway in pole forest zones, whereas Basal Index was prominent in FF (**Figure 4**).

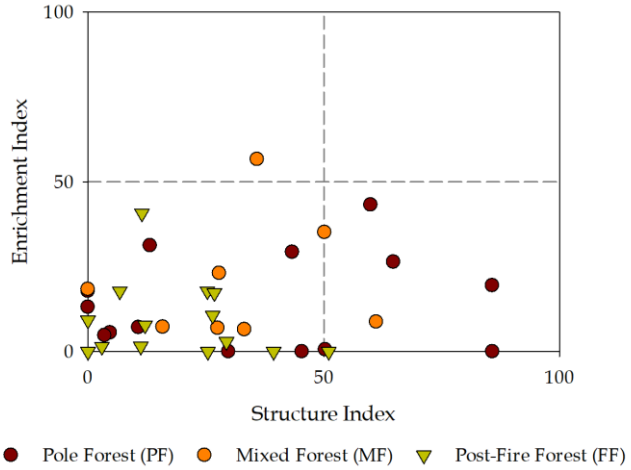

Figure 3. The nematode profile presented in their structure and enrichment indices across the vegetation zones.

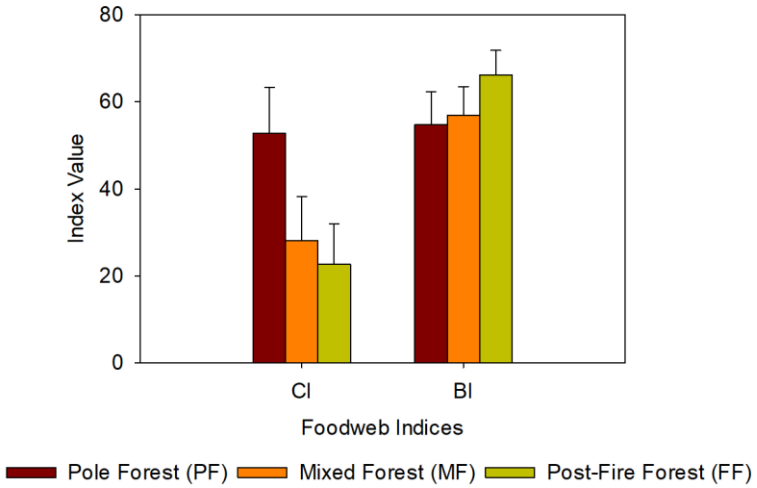

Figure 4. Comparison on CI and BI in three vegetation zones of the peatland in Tebing Tinggi Island.

Conclusion

Mixed and pole forests support more complex decomposer food-webs than the post-fire forest. It is demonstrated that the bacterial decomposition pathway has developed after six months of a forest fire.

Acknowledgements

We grateful for the fund granted by the Badan Restorasi Gambut Indonesia.

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