B08 - Structure and functioning of the decomposer system in lowland rainforest transformation systems

Valentyna Krashevska[1], Bernhard Klarner[1], Dorothee Sandmann[1], Rahayu Widyastuti[2], Yayuk R. Suhardjono[3], Mark Maraun[1], Stefan Scheu[1]

[1]University of Göttingen, [2] Bogor Agricultural University, [3]LIPI, Cibinong

Contact: valentyna.krashevska@biologie.uni-goettingen.de, bernhard.klarner@biologie.uni-goettingen.de

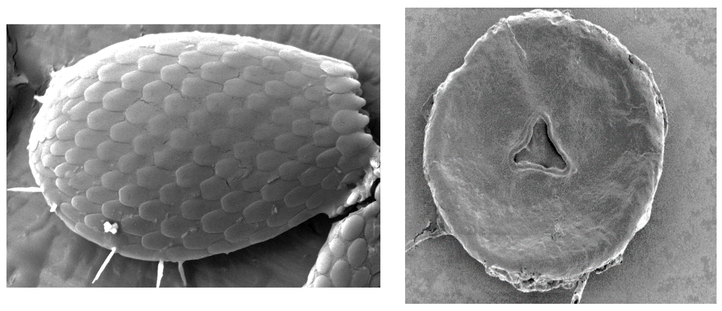
DFG Deutsche Forschungsgemeinschaft

Background & Aim: The decomposer system is responsible for major functions of terrestrial ecosystems, e.g. litter decomposition and mineralization of nutrients. The main pathways of nutrients during decomposition processes are bacterial and fungal decomposer channels. We investigated the microbial community, bacterial feeding microfauna, i.e. testate amoebae (protists), fungal feeding mesofauna, i.e. oribatid mites (Acari), and predatory mesostigmatid mites (Acari). We aimed at understanding changes in decomposer community structure with forest transformation, consequences for ecosystem functioning and the drivers behind these changes.

Changing land use from diverse forest systems to monoculture plantations shifts the structure of decomposer communities and results in decline of essential ecosystem functions

Decreasing density and diversity of different functional groups of soil fauna indicate negative effects of rainforest conversion on the overall structure of the decomposer community…

Microfauna



Mesofauna

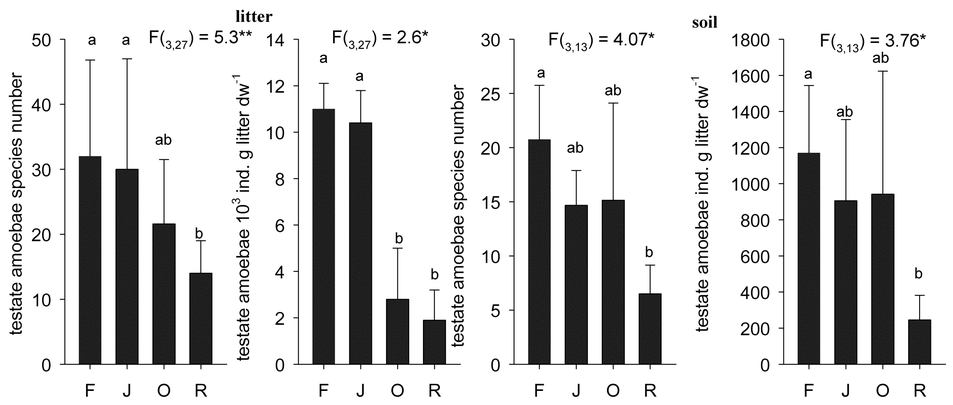


Fig. 1. Species number and density of testate amoebae in litter and soil of rainforest (F), jungle rubber (J), rubber (R) and oil palm (O); means with s.d. (n = 8).

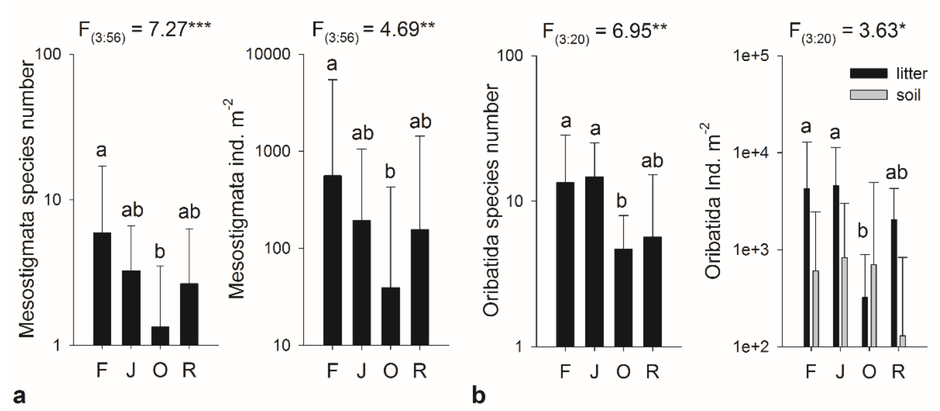


Fig. 2. Species number and density of (a) Mesostigmata and (b) Oribatida in rainforest (F), jungle rubber (J), rubber (R) and oil palm (O); means with s.d. (n = 8 for Mesostigmata, n = 4 for Oribatida).

… decreasing litter decomposition rates and disturbance of the soil microbial communities with land use intensification indicate a reduction of ecosystem functions provided by the decomposer system.

Litter decomposition rates

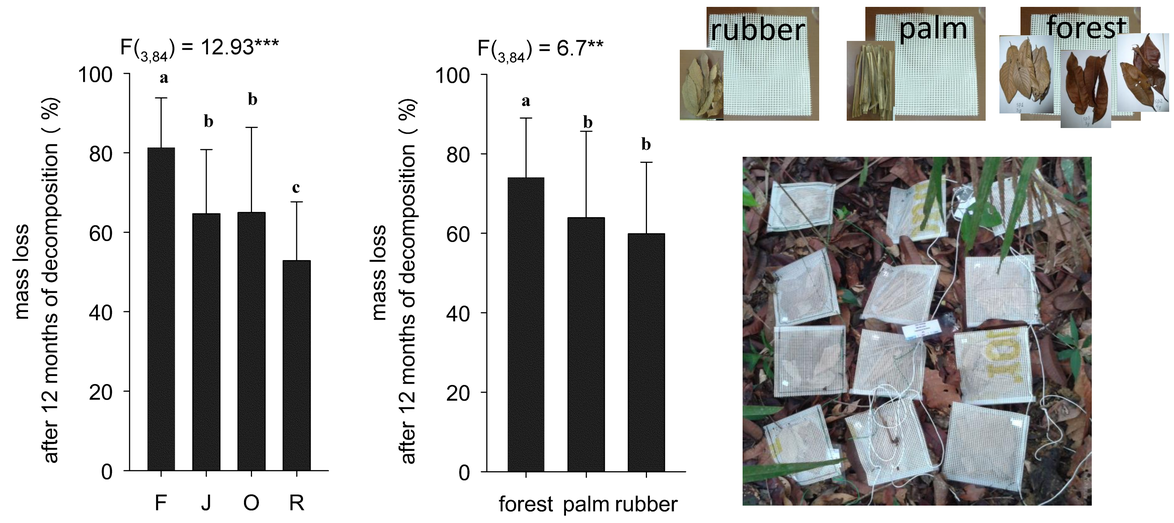


Fig. 3. Mass loss after 12 months in rainforest, jungle rubber, rubber and oil palm (left) and mass loss of forest oil palm and rubber litter (right).

Microbial community structure

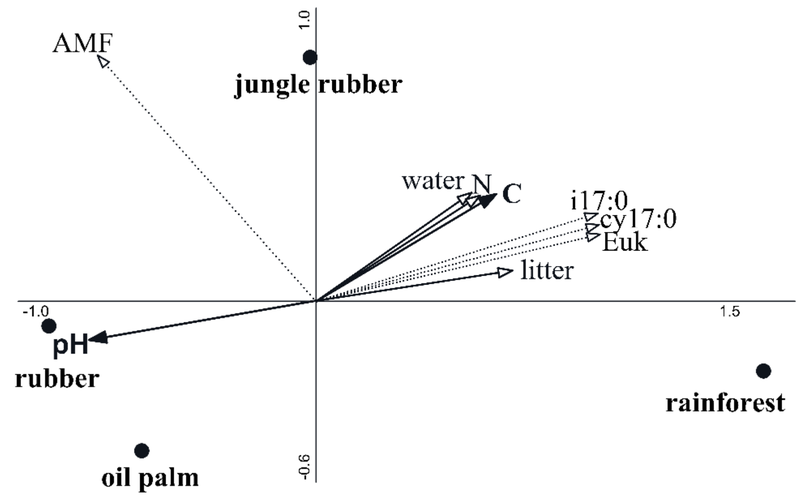


Fig. 4. RDA ordination of litter microbial markers and environmental factors [water content (water), pH, carbon concentration (C), nitrogen concentration (N), amount of litter (litter), fatty acids PLFA cy17:0, an indicator of Gram-negative bacteria, PLFA i17:0, an indicator of Gram-positive bacteria, sum of eukaryote PLFAs (Euk), arbuscular mycorrhizal fungi (AMF)] in rainforest, jungle rubber, rubber and oil palm (included as passive variables, n = 8). Axes 1 and 2 explained 47.6% and 10.9% of the total variation of the microbial data.