Fungal community structure of fast decomposing and slow decomposing leaf litter at the upper montane rain forest, Sri Lanka

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ABSTRACT

Michelia nilagirica (Magnoliaceae) and *Semecarpus coriaceae* (Anacardiaceae) are two common tree species, which are the major litter contributors in the lower elevation of the Hakgala natural forest. Leaves of *Michelia nilagirica*, a fast decomposing species requires 9-10 months to show an 80% decomposition whereas leaves of *Semecarpus coriaceae*, a slow decomposing species requires about two and half years even for a 38% decomposition. The return of nutrients to the soil from the litter via decomposition represents an important link in plant nutrient cycling. The availability of these nutrients to plants will vary with the rates of decomposition, which are regulated by both abiotic (climate) and biotic (substrate quality, microbes and fauna) factors. The microbial decomposition of leaf litter is carried out mainly by fungi. Therefore, a comparative study of the fungal community structure and its changes during leaf litter decomposition for the two leaf species was carried out. Freshly fallen leaves of both species were initially collected in large nets. Thereafter litterbag technique was applied for *Michelia* leaf litter and the bags were sampled at 3,6 and 9 months after placement in the field representing the decomposition stages 1,2 and of the leaf litter respectively. The analogues decomposition stages for *Semecarpus* leaf litter were selected from the forest floor. Fungi were isolated from the leaf litter of 4 decomposition stages *i.e.* freshly fallen, stages 1,2 and 3 of both leaf species using the washing and plating method (Harley and Waid, 1955). A total of 120 litter particles (1 mm) from each decomposition stage of both leaf types were placed on 2% MEA suplemented with 0.01% streptomycin sulfate (one particle per petri dish). After 7 - 10 days of incubation, fungi that grew from each litter particle were separated into pure cultures and identified using keys (Barron, 1983 and Domsh and Gams, 1993). The percentage frequency of isolation of

each fungus and the percentage frequency of occurrence of fungi isolated in the leaf particles were calculated to each decomposition stage of both leaf species. Shanon Weiner diversity index was also calculated for each leaf decay stage of both leaf types separately. The ability of the fungi isolated at higher frequencies of utilizing substrates such as cellulose, starch, chitin, pectin and lignin was tested by plate assays.

Different fungal species were isolated at low frequencies from the freshly fallen stage of both leaf species and their distribution within the replicate samples was heterogeneous. *Acremonium strictum, Cylindrocarpon magusianum, Broomella acuta* and *Penicillium variabile* were common to both leaf species. The fungal species common to the 1st decomposition stage of both leaf species were *Broomella acuta, Trichoderma viride* and *Acremonium* sp. 1. Many fungi isolated from this stage were able to utilize cellulose, starch and lignin. In the 2nd and the 3rd decomposition stages of both leaf species, the percentage frequencies of occurrence of the fungal species and the percentage frequencies of cellulose and lignin utilizers increased in both leaf types with the advancement of decomposition. *Trichoderma piluliferum* were common to the 2nd decomposition stage of both leaf species and the common species of the 3rd decomposition stage of both leaf species were *Trichoderma viride, Trichoderma piluliferum, Cladosporium cladosporioides, Broomella acuta* and *Cuvularia lunata*. In both leaf species *Broomella acuta* appeared in every decopmposition stage but in higher frequencies in the latter stages. *Trichoderma* sp. was isolated from the 1st decomposition stage of both species.

The present study showed common as well as different fungal sp. in the analogues decomposition stages of both leaf species. Higher frequencies of cellulose and lignin decomposers were isolated from both leaf types at the latter stages of decomposition. Therefore the difference of the decomposition rates between the two leaf types might not be mainly due to the occurrence of different fungal communities but may be due to the substrate quality (physical) of the two types of leaves and its utilization by different fungal species (as shown by another experiment).

References:

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