Successional Pattern of Fungi Associated with Leaf Litter of *Bauhinia malabarica* Based Silvipasture System in Semiarid Region

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Introduction

Soil fungi are critical components of microbial communities in terrestrial ecosystems, where they play essential roles in many aspects of ecosystem development, functioning and stability. Leaf litter fungal decomposers, in particular, play an important biotic role in recycling ecosystem nutrients (Schneider *et al*., 2012).The extreme conditions due to changing climate of any ecosystems restrict primary producers to form symbiotic relationships that aid their establishment and survival (Khidir *et al*., 2010). Root exudates are known to attract and maintain symbiotic fungal communities that form mutualistic associations with plant roots and colonize surrounding soil. Studies suggested a strong correlation between fungal and plant diversity, due to fungal host specificity (Peay *et al*., 2013). The C available to soil microorganisms is derived from plant photosynthesis in term of aboveground input from litter and belowground input through the root. Symbiotic fungi received C directly from host roots while saprophytic fungi derive carbon from the decomposition of dead plant material. Litter fall provides substrate for leaf litter fungi such as saprotrophs, endophytes, parasitic and pathogenic fungi. Soil fungal diversity and composition affected by a wide range of biotic and abiotic factors (Hawkes *et al*., 2011) but determinates of their diversity and functional interactions are not well known. Understanding the response of fungal communities to different plant species leaf litter and their stage of decomposition will contribute to our understanding of how these influence fungal diversity and dynamism in an ecosystem which ultimately helps in nutrient cycling and long term sustaining the system. In this study, we evaluated the effects of plant litter diversity on fungal successive diversity and dynamics in Bauhinia based silvipasture system.

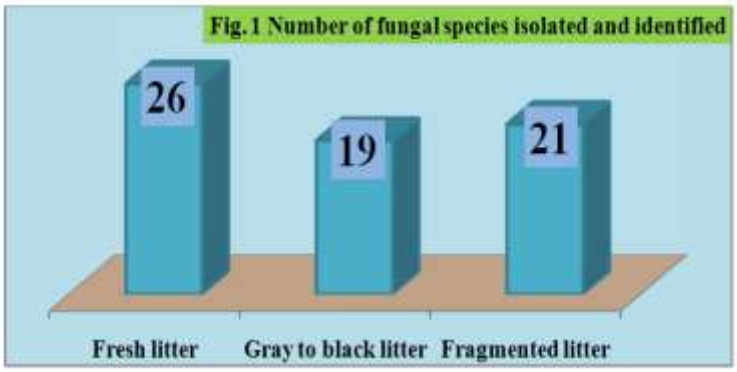
Materials and Methods

Samples of leaf litter from 10 years old established *Bauhinia malabarica* based silvipasture with under story grasses and legume *Cenchrus ciliaris*, *Chrysopogan fulvus* and *Stylosanthes hamata* at C R form of Grassland and Silvipsture Management Division of Indian Grassland and Fodder Research Institute, Jhansi, India were collected. Samples collection was started in the month of September 2014 to January 2015. These collected samples were categorised in three different grade *i.e.* fresh, partial decomposed and Greyish to fine fragment for studies. Fungi associated with different leaf litter were count in term of colony forming unit (cfu)/g of leaf litter following dilution plating and culturing methods. One g of the leaf litter sample was transferred into a conical flask containing 99 ml of sterile water which was regarded as the stock suspension, from which serial dilutions were prepared using sterile water. One ml of each dilution was plated in petri-plates containing Potato dextrose agar in triplicate. Inoculated petridishes were kept in incubator at temperature of 28 ± 2^{o}C for four days. Thus individual fungal colony was isolated and transplanted in new petridish and allow for sporulation. These isolated fungi were microscopically identified with help of manual and literature.

Results and Discussion

Fungi associated with different leaf litter stages of *Bauhinia malabarica* based silvipasture *i.e.* newly fallen leaves, partially degraded and fragmented leaves were isolate and microscopically identified. Observation showed that about twenty six fungal species were identified from fresh leaf litter and the leaf litter of gray to black, a total of 19 fungi isolated and identified while from fragmented leaf litter 21 fungal species isolated and identified (Fig 1). Higher species richness of fungi *Aspergillus* spp, *Curvularia* sp, *Rhizopus* sp and *Alternaria* spp were recorded on fresh leaf litter and in latter stage of leaf litter fungal species like *Penicellium* spp and *Trichoderma* spp were dominated. Maximum population of fungi *Curvularia lunata* with occurrence percent of 18 followed by *Alternaria* species (12-15 %), *Aspergillus* spp. (12-13 %) occurred. The frequency of occurrence was maximum 100 % of *Aspergillus* spp. The unidentified fungal population was occurred 5 percent. Very fine leaf litter showed that *Penicellium* and *Aspergillus* species were more dominant (Fig 2 A, B and C). It is evident from result that different *Alternaria* spp, *Curvularia* sp and *Aspergillus* species are strongly associated with freshly leaf litter which is might be due to its colonization ability to healthy leaf. *Curvularia* sp and *Alternaria* species has been reported to showed parasitic ability to few plants and weak parasitic ability against

many plants. Species of *Penicellium* and *Aspergillus* are well known the saprophytic behavior and grown on many dead organs of plant. Several studies showed that several microorganism including fungi such as *Trichoderma* sp., *Penicillium* sp., and *Aspergillus* spp. used to produce cellulolytic enzymes in organic waste degradation process (Gautam *et al*., 2010). Varying in successional pattern in fungi of different grade observed indicate that colonization and succession varying with plant species dependent litter and climatic and edaphic factors. The succession of fungi started with phylloplane mycoflora followed by litter mycoflora and then soil mycoflora. The dominance of different fungi with different grade of leaf litter varied with ecosystem might be due to the vegetation types and climatic factors. This study indicated that phycomycetes are pre dominant at early stage of litter decomposition and secondary colonizer were those fungi which have ability to utilize lignin and cellulose for their growth.



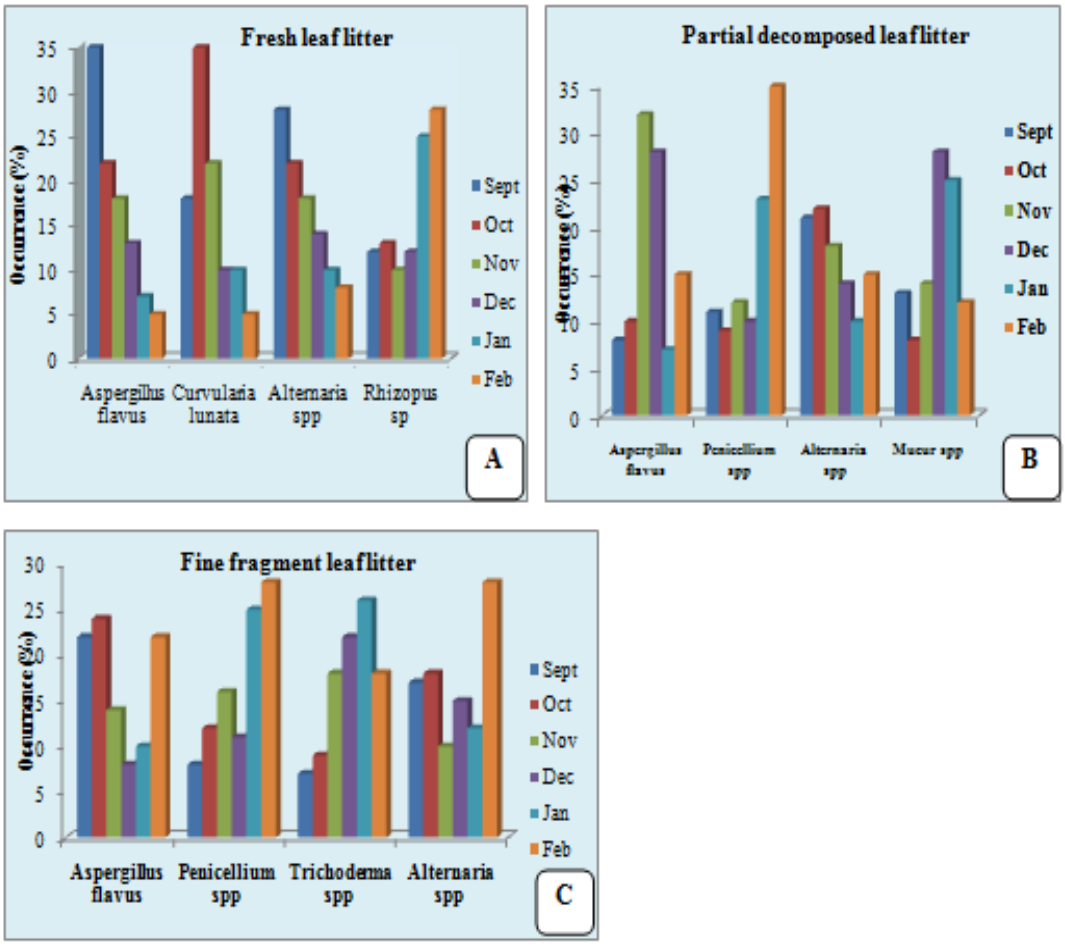


Fig. 2 Seasonal pattern of most dominated fungi associated with leaf litter of *Bauhinia malabarica* based silipasture

Conclusion

It is concluded from this study that leaf litter mycoflora varying with types of vegetation and climatic factors of their habitat. In general fungi belong to class phycomycetes are predominant in leaf litter decomposition. Leaf litter decomposition is dependent very much on seasonal condition. Initially weak parasitic and phylloplane mycoflora are responsible for decomposition and secondary colonizers are lignin and cellulose utilize for their growth. Litter decomposition is continuous process of grassland ecosystem and mycoflora involved in this process are playing significant role in nutrient dynamics of an ecosystem for their long term sustainability. Fungal population of any ecosystem can be used as a tool for health monitoring of the production system.

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