



REVIEW OF RESEARCH

ISSN: 2249-894X

IMPACT FACTOR : 5.2331(UIF)

UGC APPROVED JOURNAL NO. 48514

VOLUME - 7 | ISSUE - 6 | MARCH - 2018



THE MYCORRHIZAL ASSOCIATION OF FUNGI

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ABSTRACT

German Botanist Frank (1885) coined the term *mycorrhizae* for the first time to designate the symbiotic relationship between the fungi and plant roots. Since then, scientists started exploiting them for the welfare of mankind. The term 'mycorrhiza' in its broadest sense is the non-pathogenic association of fungi and the roots of higher plants. The root-fungus association is symbiotic and the whole association is being considered as a 'functionally distinct organ' involved in mineral nutrient uptake from the soil (Kar, 1993).



KEY WORDS: symbiotic relationship, roots of higher plants, fungi and plant roots.

1. INTRODUCTION

The mycorrhizal association has been characterized into seven categories.

i. Ectomycorrhiza (ECM)

They are characterized by the presence of hyphae between the cortical cells (intercellular), producing a net like structure called 'Hartig net'. The Hartig net is named after a forest biologist Robert Hartig. This is formed after 2-4 days when roots contact the fungus. The majority of fungi form ectomycorrhizal association are Basidiomycota, with some Ascomycota and a few Zygomycota (Molina et al., 1978). Ectomycorrhizae are found on woody plants ranging from shrubs to forest trees. Many of the host plants that harbor ECM belong to the families Pinaceae and Myrtaceae. Ectomycorrhiza are absent in monocots.

ii. Endomycorrhiza or arbuscular mycorrhiza (EM/AM)

Endomycorrhiza is an association between fungus and plant root in which the fungus grows intracellular i.e. within the root cells and it forms the distinct fungal tree shaped (arbuscules), short lived structure that develops in plant root cells. Earlier, AM fungi more known as VAM but since not all mycorrhizal fungi produce vesicles so the term AM fungi is preferred (Friberg, 2001). Gallaud (1905) named these 'Arbuscules' because they looked like trees. Families such as Brassicaceae, Chenopodiaceae, Cyperaceae and Polygonaceae are rarely from mycorrhizal association (Gerdemann, 1975; Gupta and Mukerji, 1996).

iii. Ectendomycorrhiza

Ectendomycorrhiza forms a typical ECM structure, except mantle is thin or lacking and hyphae may penetrate root cortical cells. Both AM fungi and ECM association occurs on the same plant *Alnus*, *Salix*, *Populus* and *Eucalyptus*.

iv. Ericoid mycorrhiza

A true mantle is not formed but a loose weft of hyphae grows over the root surface and there is an extensive growth of fungal hyphae within the inner cortical cells. These ericoid mycorrhizae are associated with many septate ascomycetous fungi. Fungi found in ericaceous plants generally present in acidic and peat soil. These also occur in cold and wet soils in which decomposition and mineralization processes are inhibited (Bajwa and Read, 1985).

v. Arbutoid mycorrhiza

This association involves septate fungi belonging to the class Basidiomycota. The hyphae of compact fungal sheath ramify between the cortical cells of the root from Hartig net, infecting the root. The fungi forming arbutoid mycorrhiza include *Amanita*, *Cortinarius*, *Lactarius* and *Boletus* (Largent *et al.*, 1980).

vi. Monotropoid mycorrhiza

In family Monotropaceae achlorophyllous plants, the mycorrhizal fungi colonize to produce Hartig net and mantle. The same fungi also form EM association with trees and thereby form a link through which carbon and other nutrients can flow from the autotrophic host plant to heterotrophic, parasitic plant. The fungal peg (haustorium) does not penetrate the epidermis but its wall invaginates and encloses the peg. The tip of the peg, when it is mature, bursts and the contents are released into the sac enclosed by plasmalemma and the fungal partner is Basidiomycota.

vii. Orchid mycorrhiza

The term orchid mycorrhiza is used to describe mutualistic plant fungus association that can be established shortly after germination or either with embryo of minute orchid seeds or with the chlorophyllous or achlorophyllous roots of orchid species as well as with protocorms. In the host cell, the fungal hyphae penetrate and form an intracellular hyphal network called Peloton coils (Hadley, 1975). These peloton coils lose turgor only after a few days and the nutrient contents are absorbed by the developing orchid. The mycorrhizal infection in orchid differs from all other mycorrhizal infection in that the main role of fungus is to supply carbohydrate to achlorophyllous plants.

CONCLUSION

Since then, scientists started exploiting them for the welfare of mankind. The term 'mycorrhiza' in its broadest sense is the non-pathogenic association of fungi and the roots of higher plants.

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