

REVIEW

Fungal Endophytes in Plant Health

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Endophytes are the microorganisms, which colonize symptomless the living plant tissue without causing any immediate, overt, negative effect on the plant. Endophytes as the fungi that live internally and remain asymptomatic for at least part of their lifecycle. But they can also be aggressive saprophytes or opportunistic pathogens. There has been considerable interest in screening the endophyte for bioactive compound. A large number of compounds (secondary metabolites) have been extracted, isolated and characterized from endophytic microbes. Endophytes produce toxins that discourage insects and other grazing animals. Endosymbionts may escape all the deleterious infections that might occur on the surface of the plant. There are endophytes which are beneficial to their hosts, the best known in this group are the *Neotyphodium* and *Epichloë* species which can provide antiherbivore defense, as well as drought tolerance and improved nutrient use to their plant hosts. Fungal endophytes enhance plant immunity against chewing insects by promoting endogenous defense responses mediated by the jasmonic acid (JA) pathway. Some endophytic species may induce plant defense mechanisms which counteract pathogen attack, others produce antibiotic substances which inhibit pathogen growth, competition for plant space and resources may also occur between resident endophytes and incoming pathogens; finally, some parasites of plant pathogens are known to behave as endophytes. Endophytic fungi serve as a source of novel biologically active secondary metabolites. Endophytic fungi isolated from plants screened for biological activities. The structures of the biologically active compounds are determined. Liquid extracts from endophyte cultures have been found to inhibit the growth of several species of plant pathogenic fungi. The protection against a pathogen could be the result of direct competition among endophytes already present in leaves and the pathogen.

The outcome of some pathogen attacks may be dependent on the endophytic mycobiota associated to a host plant. Endophyte may promote plant growth by secreting different hormonal substances. Endosymbionts produce auxin, which enhanced the vegetative growth of the endophyte infected plants. The distribution of growth-promoting hormones produced by endophytic microorganisms towards plant tissues positively promotes plant growth. Endophytes possess vital ability to mobilize insoluble phosphate and provide nitrogen to their host plants. Microbial endophytes colonize plant tissues without symptomatic behaviour and consequently they compete with other microbial pathogens on the same ecological niches. Mechanism of endophyte mediated plant disease resistance induction of plant resistance is that fungal endophytes induced ISR associated with the expression of pathogenesis related genes.

Key words: Diversity, bioactive compounds, abiotic and biotic stress, defense and growth promotion
