GENETICALLY ENGINEERED MYCORRHIZAL FUNGI FOR REFORESTATION[1]

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Abstract: With the increasing demand on forest products and increased and tighter regulations for harvesting trees from public land, there is more need for commercial farming of forest trees. This means one needs to utilize all the available commercial land whether or not it is ideal for optimal growth of forest trees species. In addition, excessive use of forest lands for mining has produced vast regions unsuitable for natural reforestation. Mycorrhizal fungi play an important role in reforestation by providing the plant several benefits that are critical for its survival and growth in a nutrient poor and water deficient environment. Reclaimed mine sites are chemically, physically, and biologically altered and often lack the necessary quality and quantity of mycorrhizal fungi to sustain a tolerant plant community.

Although the use of naturally occurring mycorrhizal fungi dates back to several decades, efforts to genetically engineer them for expanded use in agriculture, forestry and horticulture have just begun. The mycorrhizal fungi are ubiquitous in nature and interact with a wide variety of plants. They are closely associated with roots and, in the case of ectomycorrhizal fungi, form a mantle around the root surface. This type of physical association and symbiotic interaction makes them excellent candidates to be genetically engineered for use in a variety of situations where suboptimal conditions exist for growth and survival of the host plant. The fungi can be utilized as biological factories to provide the plant beneficial factors required for its growth, protection from pests, and relief from stress conditions such as acidity and heavy metal toxicity. For example, ectomycorrhizal fungi expressing specific insecticidal proteins will be able to protect seedlings from root damaging insects. This is just one example, but the scope is very broad. This novel technology, once developed, has the potential to be adapted for handling a variety of problems associated with forest decline and decrease in biomass. In addition, this type of technology could be the beginning of many further research endeavors that will utilize mycorrhizal fungi to manipulate the plant host in many physiological and ecological ways. The system developed can be used as a part of Integrated Pest Management programs along with traditional management and control methods.

Additional Key Words: mycorrhizal fungi, reclamation, genetic engineering.

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