Effect of mycorrhizal inoculation on plant growth and medicinal properties of fruits in *Opuntia ficus-indica*

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ABSTRACT

Opuntia ficus-indica (prickly pear) is a drought-tolerant cactus species valued for its nutritional fruits rich in antioxidants and medicinal compounds. This study explores how arbuscular mycorrhizal fungi (AMF) influence the growth and phytochemical characteristics of Opuntia ficus-indica. A greenhouse experiment was conducted using two treatments: non-inoculated controls and plants inoculated with a consortium of Glomus intraradices and Rhizophagus irregularis. Key growth indicators, including plant height, number of cladodes, and biomass, were assessed, along with evaluations of fruit yield and quality. Phytochemical assays were performed to quantify total phenolics, flavonoids, betalains, and antioxidant activity using standardized colorimetric methods. Results indicated that AMF-treated plants showed significant improvements in growth metrics, fruit yield, and bioactive compound concentrations compared to controls. Specifically, inoculated plants exhibited up to 60% higher flavonoid levels and 40% greater antioxidant activity. These findings suggest that AMF symbiosis not only enhances nutrient uptake and plant development but also stimulates the biosynthesis of health-promoting metabolites in prickly pear fruits. This research highlights the potential of mycorrhizal biotechnology as a sustainable practice to boost both the agronomic and medicinal value of cactus crops, particularly under conditions of environmental stress.

Keywords: Antioxidants, biofertilizer, phytochemicals, Sustainable agriculture,Symbiosis.