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### Seasonal Changes in *Arbuscular Mycorrhizal Fungi* Linked to Rhizosphere Characteristics and Soil Properties

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#### Abstract

This study investigates the seasonal influence of rhizosphere dynamics and soil chemical properties on the distribution, abundance, and diversity of *Arbuscular Mycorrhizal Fungi* (AMF) in wild plant species. A total of 11 rhizospheric soil and root samples were collected from various host plants during summer and winter seasons of 2024. These included *Senna italica*, *Cyperus laevigatus*, *Phragmites australis*, *Pelargonium peltatum*, *Zygophyllum simplex*, *Citrullus colocynthis*, *Malva parviflora*, *Zygophyllum coccineum*, *Calotropis procera*, *Solanum nigrum*, and *Salsola baryosm*. Among these species, *Phragmites australis* exhibited the highest AMF spore density, with 175 and 124 spores per 100 g dry soil in summer and winter, respectively. In contrast, *Calotropis procera* had the lowest spore counts (101 in summer and 63 in winter). Eight AMF species were identified: *Glomus ambisporum*, *Rhizophagus intraradices*, *Claroideoglomus etunicatum*, *Diversispora globifera*, *Funneliformis geosporum*, *Funneliformis mosseae*, *Rhizophagus fasciculatus*, and *Gigaspora* spp. Moderate variation in AMF diversity was observed among host plants. The Shannon diversity index ranged from 0.692 in *Zygophyllum simplex* to 0.653 in *Salsola imbricata*, while Simpson's index ranged from 0.498 to 0.461. *Phragmites australis* also exhibited the highest root colonization (90.5% in summer, 84.7% in winter), along with the greatest arbuscule (76%, 69.3%) and vesicle (36%) formation. In contrast, *Calotropis procera* showed the lowest colonization and symbiotic structure development. Soil chemical analysis indicated a general decline in nutrients Nitrogen (N), Phosphorus (P), Potassium (K), Magnesium (Mg), Calcium (Ca), Sodium (Na), Total Organic Carbon (TOC), and Organic Matter (OM) during summer, with increased levels in winter, likely to reflect seasonal variation in microbial activity and soil temperature. Overall, this study highlights the spatio-temporal patterns of AMF in relation to host plants, rhizosphere conditions, and soil nutrients, enhancing our understanding of plant-fungi-soil interactions across seasons.

**Keywords:** *Rhizosphere dynamics, Soil chemical properties, Wild plants, AMF*

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