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Arbuscular Mycorrhizal Fungi

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Short Communication
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Abstract

Arbuscular mycorrhizal fungi (AMF) are a type of symbiotic fungi that form mutually beneficial relationships with the roots of most plants. These fungi belong to the phylum Glomeromycota and are ubiquitous in terrestrial ecosystems. The symbiotic association between AMF and plant roots is known as arbuscular mycorrhiza.

Keywords: Arbuscular Mycorrhizae; Glomeromycota; Symbiosis; Root Colonization; Arbuscules

Short communication

VAM fungi are diverse hosts which are not host specific [1-3]. suggested that the Arbuscular Mycorrhizal (AM) fungi are known as common mycorrhizal species with a wide range of hosts. Vesicular *Arbuscular Mycorrhizae* (VAM) have a wide range of hosts and geographic location and are most abundant [4-7]. They have been found associated with plant roots in arctic, temperate, and tropical regions and are distributed among all angiosperm families [8,9]. They have been isolated from forests, open forests shrubs, savannahs, meadows, grasslands, sand dunes, desert areas and bituminous coal vegetation [10-12]. Many plant species of economic families have been described as mycorrhizal [13,14]. It have the great power to provide unavailable resources to plants, increase the solubility of phosphorus, increase the supply of P, N, Ca, S, K, Mg and Mn and modify soil fertility to support plant development and nutrients to participate.Crops benefit from mycorrhizal associations because they better absorb nutrients and water from the soil [15,16]. The importance of AMF in improving plant growth and plant resistance to soil-related diseases and in the rehabilitation of disturbed soils is well known [17,18]. Traditional methods to investigate the presence of AMF in ecosystems are based on wet sieve techniques to extract spores from the soil and the classification of taxa based on their morphology. A distribution type of AMmushrooms is found in India. Bakshi [19] first described 14 types of spurs: *Glomus Macrocarpum Tul* and *Tul var*, *G.geosporum*, *G.mosseae*, *Glomus sp.,*Sclerocystis *coremioides*, *Sclerocystis sp., Gigaspora, Calospora, Acaulospora, Endogone gigantea, E. Microcarpum, Endogone 1*, *Endogone 2*, *Endogone 3*. Gerdemann and Bakshi [20] reported two new species, *Glomus multicaule* and *Sclerocystissinuosa*. Zhang, et al. [21] investigated taxa of AM fungi (species abundance) in tropical and natural forests of Dujiangyan subregion.

Muthukumar and Udaiyan [22] investigated the status of *Arbuscular Mycorrhiza* (AM) of plants growing in the Western Ghats region of southern India. Among the 329 species, there were 174 species, 35 species belonging to *Acaulospora* and species belonging to *Gigaspora, Glomus, Sclerocystis* and *Scutellospora*. Muthukumar and Udaiyan [22] investigated the control of Reddy, et al. [23] reported 15 fungal AMs collected at five different locations and 4,444in the rhizosphere soil of three *Solanaceae* plants, namely tomato, pepper and eggplant. The genus is the most abundant fungus, followed by *Acaulospora, Sclerocystis, Gigaspora* and *Entrophospora.* Sixteen AMF strains were found in the potato fields of Meghalaya belonging to the genera *Acaulospora, Gigaspora, Glomus, Pacispora* and *Scutellospora.* Ruhling and Tyler [24] reported that soil moisture content and organic matter were the most important factors controlling the distribution of mycorrhizal and non-mycorrhizal macro fungi in Swedish forests. Opik et al. [25] suggested that the distribution in these forests, it is closely related to the distribution of host plants but is more influenced by edaphic conditions. Kernaghan and Harper [26] observed similar trends in the relationship between plant type diversity and EM diversity with increasing elevation through tree line in the Canadian Rocky Mountains. Edap-controlled soil rhizosphere AM spores in distribution and weather conditions. According to Khaliel [27], pH is the only edaphic factor that determines the abundance of AM fungi. However, Bergan and Koske [28] reported no effect of pH on spore density and mycorrhizal frequency. Oehl, et al. [29] studied 16 regions with different intensity of agricultural land use in Central Europe and concluded that land use intensity and soil type significantly influence the presence and spread of many AM fungi, including AMF community structure. Barraclough and Olsson [30] reported that slash-and-burn soil chemistry practices increased nutrients available for growth and reduced AM fungi in soils with Didiereamadagascariensis is determined by soil properties. There is considerable evidence indicating the importance of soil conditions in regulating mycorrhizal fungal communities [31,32]. A comprehensive report on the distribution and diversity of mycorrhizal fungi in disturbed soil environments has been published. Singh, et al. [33] reported that breeding populations, species abundance and diversity of VAM fungi were significantly reduced in *jhum* drought fields even after 5 years of recovery period as were drought fields after clear cut agriculture and burning compared to natural forest areas. They play an important role in the biology and ecology of forest trees, influencing growth, water and nutrient uptake, and protection from pathogens. Mycorrhizal fungi are hallmarks of forest and cultivated ecosystems [34]. Soil microbial communities, of which mycorrhizal fungi are particularly important, are critical to soil fertility and can influence crop yield and safety [35]. Hayman [36] reported that AMF populations are heterogeneous. And their distribution is influenced by many factors, including soil, host plants, environmental conditions, and agricultural practices. Changes in the population and diversity of AMF are strongly influenced by changes in soil conditions, environmental conditions, host specificity and destruction conditions [37-39]. Regarding the characteristics of household destruction, Johnson, et al. [40] showed that intensive land use, such as land subsidence, can alter soil properties and degrade AMF species and diversity. Mohammad, et al. [41] reported that the lower spore density in their study was due to low carbon sequestration and microbial activity. Other researchers have found that humidity reduces AMF colonization and AMF spore density [42,32]. Thompson [43] reported that reduction of AMF populations in soil due to prolonged incubation period could be ameliorated by AMF inoculation. Sieverding [44] also reported that AMF populations and diversity are increased in natural ecosystems compared to agricultural ecosystems. This is due to the greater diversity of plant communities and management practices in agro ecosystems can negatively affect AMF population [45].

AMF Bio-Fertilizer

AMF Bio-Fertilizer is a combination of natural compounds to increase soil fertility. This fertilizer is very good for soil health and plant growth [46]. Over the past 2444 years, various scientific tests on AMF have shown many benefits of AMF on soil quality and crop yield. Therefore, it is conceivable that AMF could be considered as a substitute for organic fertilizers in the near future. Because the application of *mycorrhizae* reduces the doses of chemical fertilizers, especially phosphorus [47]. Adverse effects on food security, crop health, air and water systems caused by synthetic fertilizers, herbicides and fungal diseases have led to many environmental, plant and human health problems due to their continued use [48]. AMF is committed to optimal agriculture Reduce the use of chemical fertilizers by up to 50% to improve production. However, this calculation depends on the diversity of plant species and their spread in harsh environments. To achieve sustainable agriculture, AMF as a bio fertilizer will be more important. Because the proper treatment of these fungi can significantly reduce the use of pesticides. Inoculation of AMF propagules (inoculum) in prepared soil is the main method for this purpose. Unfortunately, AMF is an obligate species and cannot reproduce without growth in pure culture. Large-scale development of AMF inoculum is very difficult and challenging due to these limitations. There are three main characteristics of AMF inoculum: First, AMF soils contain colonized root segments, AMF spores and hyphae, so they can be used as inoculum in the root zone of plants. However, without accurate knowledge of plant abundance, species and disease, soil conditioners are ineffective and run the risk of spreading weed seeds and pathogens. Spores extracted from the soil can be used as starting material for the development of the inoculum. Adequate alkalinity for AMF growth can be obtained by growing known AMF species with twin plants (i.e. plants capable of multiple AMF species). This is the type of stressor used for large-scale seeding because it usually contains a more balanced collection of the same types of cells in the soil seed. Finally, only fragments of contaminated roots of AMF hosts isolated from trap cultures can be used as inoculum. Although new mass processing methods [49] and seed coating technologies [50] have been developed, large-scale inoculum development for AMF and is very challenging [51]. A major challenge with AMF inoculum is the inevitable symptomatic behavior of AMF, i.e. the need to expand host facilities and complete life cycles. This means that the breeding process must include garden time and space using plants guests "As a result, the establishment of the AMF reference collection consists of 4,444 methods that are significantly different and more restrictive than other microbiological collections. Furthermore, the lack of rapid methods to determine when and how often AMF colonizes host plants often poses a threat to AMF and its operations. Controlling the high required for large-scale use is also a difficult task. However, cultivation of AMF is easier for plant-based systems than during transplantation because less inoculum is required. "Vaccination methods at first appear to be ineffective and financially burdensome." If AMF diversity is well maintained and developed, and AMF-friendly management, such as tropical mulching [52] and conservation tillage [53] the AMF population can grow without damage before or after planting, overabundance of mycorrhizal biodiversity in the future. It is understood that the network of the organism remains unchanged and dies. Of the experiments conducted to study the effectiveness of AMF as a bio fertilizer, alone or in combination with other soil microorganisms, almost all were: - The amount of grain yield of *Triticum aestivum* at the level of individuals recorded when inoculated with Pseudomonas *striata*. Followed by *Glomus Fasculatum* [54]. Rajendran and Jayasree [55] have investigated the effect of bio fertilizers such as Rhizobium, AM fungi, etc. on *Acacia Nilotica* and also showed significant improvement in growth length and biomass compared to the control. In the combination of Rhizobium + AM + *Azospirillum*, the highest growth and biomass were reported in the treatment group, which was 156.8% higher than the control group. Bioengineers have been studied to prevent collar rot in clams [56]. The best disease reduction was observed in the combination of Rhizobium and *AM* compared to the control (100% plant death). Each modification improved different crop parameters by controlling disease and reducing shoot mortality. "The effects of one and two vesicular *Arbuscular Mycorrhizal* fungi (VAM) of *Gigaspora rosea, Glomus intraradices + Gigaspora rosea, Glomus etunicatum + Glomusintraradices* were studied on *Medicago sativa* plant and nutrient uptake (NPK), there was a significant increase Na. Shoot and root dry weight [57]. Effect of phosphate solubilizing bacteria (*Glomusintraradices, Pseudomonas Putida, Pseudomonas Alcaligenes, Aspergillus Awamori*) and *Rhizobium sp*. on seedling growth, nodule yield and root rot in investigated field conditions Barzana, et al. [58])". The number of nodules per root system was significantly higher in plants treated with *Rhizobium sp.*

Then the Control Plant

In a temperate environment, Bhat, et al. [59] investigated the effects of Rhizobium fungi and *Arbuscular Vesicular Mycorrhizae* on Green gram [59]. Rhizobia and VAM had significant effects on nodule nitrogen levels, yield parameters, NPK content of grain and straw, and grain protein content. The introduction of VAM is advantageous because it is cheap, easy to administer and promotes plant growth and seed quality. Chick Pea (*Cicer Arietinum*) and *Rhizobium sp.* Growth and response to inoculation. The VAM has been studied [60]. These research results showed that in the pot test, total weight increased by 10.83% and germination increased by 9.0% compared to the control.

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