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STUDIES ON AM FUNGAL ASSOCIATION WITH CERTAIN MEDICINAL PLANTS

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ABSTRACT

The present investigation was carried out to study the prevalence of AM fungi in certain medicinal plants growing in and around Ahmednagar College by determining the extent of root colonization, spore density in the rhizospheric soil.

In all 10 medicinal plants, hosts were screened for the presence of AM fungi. All the 10 medicinal plant hosts from different families were found to be mycorrhizal. The colonization was observed in the form of mycelium, arbuscules, vesicles and chlamydospores. The arbuscular mycorrhizal fungi, spores isolated from different sites were represented by 1 species of *Acaulospora*, 1 species of *Gigaspora*, 8 species of *Glomus* and 2 species of *Scutellispora*. In the present investigation maximum plants showed mycelia-root colonization and the formation of vesicles. Out of 10 plants 2 plants showed mycelial colonization (60 %) and 4 plants showed formation of vesicles (50 %) and remaining plants showed colonization 30%. This colonization of roots by AM fungi was correlated with the number of spore propagules found in rhizosphere soil. It has been observed that *Cyperus indica* showed maximum number of spores (110/25g of soil) followed by *Synedrella* (62/25 g of soil).

Figure : 00 References : 12 Table : 01

KEY WORDS : Arbuscular mycorrhizal fungi, Medicinal plants

Introduction

Arbuscular mycorrhizal fungi are one of the important components of rhizosphere ecosystem, because they play an important role in establishment of plant community. They help plants in getting water and minerals such as phosphorus from the rhizosphere soil. In return they take reduced carbon which is required for their growth and development. They are also playing a critical role in influencing the nutrient cycle[6], soil structure stabilization[7, 11], transfer of organic matter and its accumulation[10]. Mycorrhizal fungi have developed a symbiotic relationship with fibrous root system of living plants. Extramatrical network of mycorrhizal mycelium enhances nutrient absorption and protects the plant from many diseases.

These fungi promote the faster growth, speeding transplant recovery and reducing the need for fertilizers and other additives. There are as many as 7 types of mycorrhizal fungi currently recognized but the present study focuses on vesicular *Arbuscular Mycorrhizal Fungi* (VAM) and its association with certain medicinal plants.

Material and Methods

Soil samples were collected from different medicinal plants selected for the present investigation. The roots of different medicinal plants available in Ahmednagar College campus were collected and temporarily preserved in polythene bags. AM Fungal spores were isolated from the field soil collected from rhizosphere soil of 10 medicinal host plants using a wet sieving method[4]. In each batch, 50 g of soil was suspended in 1.5 l of tap water and left for 2–3 hours to let the heavier

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fractions settle. AM spores contained some lipid bodies within the AM Fungal spores they were expected to float in the water column or be trapped in the meniscus and froth at the water surface. The liquid fraction was decanted through two stacked sieves of decreasing pore size of 500 ìm and 45 ìm. The 500ìm sieve catched large pieces of floating debris and AM Fungal sporocarps. The second sieve of 250ìm sieve to catch smaller pieces of floating organic debris and sporocarps, whereas smaller sieve was used to capture AM spores of more than 100ìm size. The fine particles were then washed with tap water, at low pressure to avoid disrupting the spores. The enumeration of spores/ 50g of soil was carried out[1]. Estimation of Arbuscular Mycorrhizal (AM) fungal spores was carried out by using a filter paper(Whatman No.1.,size 11cm diameter. The first fold was given right in the middle followed by a second fold. The filter paper was reopened and two lines were drawn to divide the filter paper in four equal quadrants. Vertical lines were drawn on one half of the filter paper so as to divide it into approximately fifteen columns with each column about 0.5 mm apart. Each column was numbered and the direction of counting marked. The filter paper was then folded in such a way that the marked portion became the reveiving surface for the sample during filteration. Thus, the spores were collected only on the marked surface of the filter paper and the rest of the filter paper was retained without spores.The filter paper with the sample spore was spread on a bigger petri-plate and were observed under stereomicroscope and by moving the petri-plate the spore were counted in every space between the lines numbered. The observations were recorded in Table– 1.

Assessment of Arbuscular Mycorrhizal (AM) colonization in roots was carried out[8]. The hair sized roots were taken in water and heated at 90ºC for 2 hr in 10% KOH. The KOH solution helped to clear host cytoplasm and nuclei and readily allowed stain penetration. Poured off KOH and rinsed the root segments in tap water until no brown colour appeared in the rinse water. 1 N HCl was added in the test tube and soaked the root segments for 3 – 4 minutes and then poured off the solution. The root segments were stained in 0.05% cotton blue and kept it overnight. The root segments were mounted in PVLG and sealed the slide edges with DPX. The mycorrhizal colonization in roots was examined under compound microscope.

Result and Discussion

Mycorrhiza colonizes the plant roots to form symbiotic association in which the fungi supply nutrients, water and protection against phytopathogens to the plant in return for food in the form of carbon. Diversity of Mycorrhizal fungi is important to maintain the crop vigor and soil fertility. They play an important role in plant nutrient and water uptake, ecosystem establishment, plant growth and the productivity of plants. Hence, the study of mycorrhizal diversity in relation to medicinal plants is needed to understand the roles of the various species of mycorrhizal fungi in a growth and secondary metabolite production in medicinal plants.

The present investigation was carried out to study the prevalence of AM fungi in some medicinal plants growing in and around Ahmednagar College by determining the extent of root colonization, spore density in the rhizospheric soil.

Medicinal herbs are known as source of phytochemicals, or active compounds that are widely sought after worldwide for their natural properties. As many medicinal plants selected for this study have pharmaceutical and industrial importance for example, *Ocimum sanctum* is a great source of essential oil and has been utilized for a long time in the perfumery, cosmetic industry as well as food and pharmaceutical industry. The studies on association of the AM fungi with the native medicinal plant have great importance. They are also responsible to increase the plant vigour; drought resistance and more production of secondary metabolites in the growing medicinal plants.

In the present investigation, all 10 medicinal plant hosts were screened for the presence of AM. All 10 medicinal plants, many hosts from different families were found to be mycorrhizal. (Table-1). The colonization was observed in the form of mycelium, arbuscules, vesicles and chlamydospores. In all 10 medicinal plants, hosts were screened for the presence of AVM fungi. The arbuscular mycorrhizal fungi, spores isolated from different sites were represented by 1 species of *Acaulospora*,1 species of *Gigaspora,* 8 species of *Glomus* and 2 species of *Scutellispora.*

In the present investigation the mycorrhizal mycelium–root associations and formation of vesicle were common than the formation of arbuscule and chlamydospore .The soil collected

TABLE-1 : Plants with number of spores and % colonization

Sr. No	Name of the plant species	No. of spore/ 50 g	% colonization of roots
1.	*Aloe vera*	49	40%
2.	*Ciprus rotundus*	110	60%
3.	*Cymbopogon flexuosus*	56	50%
4.	*Eclipta alba*	45	30%
5.	*Mentha arvensis*	50	50%
6.	*Ocimum santum*	40	40%
7.	*Rheo bicolor*	58	50%
8.	*Ruta graveloens*	48	50%
9.	*Soncus oleraceus*	48	40%
10.	*Synendrella nodiflora*	62	60%

from all the locations was neutral to alkaline. In this soil, *Glomus* spp was the most dominant genus and frequently observed. The dominance of *Glomus* species in alkaline soil was also reported by many workers. They claimed that the number of plants possessing vesicles was higher than plants bearing arbuscules. These results suggested that roots of majority of the plants colonized were mature as vesicles are storage organs and generally produced in the older region of the infection. Our result correlates with their results.

In the present investigation most of the plant showed mycelia-root colonization and the formation of vesicles. Out of 10 plants, 2 plants showed mycelial colonization (60 %) and 4 plants showed formation of vesicles (50 %) and remaining plants showed colonization 30%. This colonization of roots by AM fungi was correlated with the number of spore propagules found in rhizosphere soil. It was observed that *Cyperus rotundus* showed maximum number of spores (110/50g of soil) followed by *Synedrella* (62/50 g of soil). The remaining medicinal plants showed the range of spores between 30 to 50 spores (Table –1). The level of AM fungal association depends on root morphology, metabolism and rate of plant growth[12] as well as on specific soil plant system in term of chemical nature of root exudes[9]. In addition to these factors, pH of the soil may also play important in controlling AMF root colonization and spore population but it was found to be ineffective in the present investigation as the pH remained within narrow range of 5.0 to 8.5. The maximum spore population in the present investigation was observed during rainy season which coincides with flowering time of the all three plants. It might be correlated with the fact that during this period most photosynthatase is allocated to roots and rhizomes, which helps fungal symbiont to produce more spores[3].

Mycorrhizal colonization in roots occupying a defined volume of soil will depend on a balance between root and fungal activity[5] which is influenced by several factors including soil properties, root phenology, predation, local disturbance and propagule availability. It is also apparent that rainy season may be considered as the best season for the propagation of medicinal plants by the application of AM fungi as bio-inoculants particularly for plants under threat.

Conclusion

Based on this preliminary, investigation it was not possible to assess the host specificity in detail of medicinal plants to AM fungi colonization. There is a bright scope for further detailed study for understanding the host specificity of AM fungi species on medicinal plants and their effect on enhancement of secondary metabolites active principles.

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