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STUDIES ON ARBUSCULAR MYCORRHIZA FUNGAL ASSOCIATIONS WITH MEDICINAL PLANTS FROM NAGAR TAHSIL OF AHMEDNAGAR DISTRICT

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Abstract- Present investigation dealt with the presence of ubiquitous AM fungal association with certain medicinal plants studied from Nagar Tahsil of Ahmednagar District. A total of 16 medicinal plants were investigated. The AM fungal association included presence of AM spores, root colonization, arbuscules, vesicles and extrametrical mycelium in different plants. All these stages are seen in different age groups of plants. Presence of mycorrhiza was also compared with the type of soil and pH of the soil. The occurrence of AM fungi was maximum in clayey loam soil. The neutral to alkaline soils were favourable for growth of AM fungi. The isolated AM fungal spores were represented by 2 species of Acaulospora, 5 species of Glomus and 1 species of Gigaspora. The root colonization was highest in Aloe vera (78%) and lowest in Psoralea corylifolia (20%). This indicates that the presence of AM fungal association was ubiquitous and is considered essential for the plants during their growth period. Plants with AM association showed better growth than others.
Keywords – Herbal medicinal plants ,Mycorrhizal association.

I. INTRODUCTION

The Arbuscular mycorrhizal fungi are important components of rhizosphere ecosystem, as they play an important role in establishment of plant community. They are mutually associated with the plants for getting water and minerals such as phosphorus from the rhizosphere soil. In return they get reduced carbon for their growth and development. They are also playing a critical role in influencing the nutrient cycle, soil structure stabilization, transfer of organic matter and its accumulation4,7,8. A symbiotic relationship developed by Mycorrhizal fungi with fibrous root system of living plants. The nutrient absorption in plants is enhanced by the network of extrametrical mycelium & also protects the plant from many diseases.These fungi promote the faster growth speeding transplant recovery and reduce the need for fertilizers and other additives. There are as many herbal medicinal plants which have active compounds. These plants grow well and luxuriantly due to many factors. One reason for growth includes their mycorrhizal associations. The present investigation was carried out to study the prevalence of AM fungi in few medicinal herbs growing in Ahmednagar city by determining the extent of root colonization, spore density in the rhizospheric soil.

II. MATERIALS AND METHODS

The medicinal plants, their roots and the soil samples of were collected randomly from different localities of Nagar Tahsil of Ahmednagar and temporarily preserved in polythene bags. The Soil was dried sieved properly and used for the study. The plants and their roots were dried for study.
The AM fungal spores were isolated from the collected rhizosphere soil of 16 medicinal herbs using a wet sieving and decanting method. The enumeration of spores / 50gm of soil was carried out by using Adholiya and Gaur2 method. The observations were recorded in Table –I.

Assessment of Arbuscular Mycorrhizal(AM) colonization in roots was carried out by using the method6. The mycorrhizal colonization in roots was examined under compound microscope.
Percent (%) colonization by AM fungi in the roots was calculated by the formula

$$\% \text{ Colonization} = \frac{\text{Number of roots colonized}}{\text{Total number of roots taken on slide}} \times 100$$

TABLE I: Medicinal Plant Species

Sr. No.	Name of the plant species	Soil type	pH of the soil	No. of spore/ 50 g	% colonization of roots	Mycorrhizal species
1.	*Aloe vera*L.	Clayey	7.5	22	78%	*A. appendicula, G. geosporum*, *G. heterosporum,*
2.	*Bacopa monnieri* (L.) Pennell.	Loam	7.0	28	50%	*G. aggregatum*,
3.	*Cynodon dactylon (L)*Pers.	Clayey loam	7.5	49	70%	*Gigaspora gigantea, G. geosporum*, *G. aggregatum*,
4.	*Datura metal* L	Clayey	7.9	39	55%	*Acaulospora, sps. Gigaspora gigantea*
5.	*Eclipta alba* L.	Sandy	6.5	12	20%	*G. heterosporum,* H. *G. fasciculatum.*
6.	*Hyptis suaveolens* (L.) Poit.	Loam	7.5	21	50%	A. *appendicula, Gigaspora aggregatum*, *G. fasciculatum.*
7.	*Ocimum basilicum* L.	Sandy loam	7.2	20	40%	*G. mossae*., *G. aggregatum*,
8.	*Oxalis corniculata* L.	Sandy loam	6.6	10	20%	*G. fasciculatum.*
9.	*Phyllanthus amarus* L.	Sandy loam	7.5	17	40%	*Acaulopsora sps., G. G. geosporum, Gigaspora gigantea*
10.	*Sida angustifolia* Lamm.	Sandy	6.7	15	35%	*G. aggregatum*, *G. fasciculatum*, *G. mossae*.
11.	*Tinospora cordifolia* (Thunb.) Miers.	Clayey	7.8	37	60%	*Aculospora sps., G. mossae*.
12.	*Tridax procumbens* L.	Sandy loam	7.0	20	40%	*G. geosporum*, *G. heterosporum,*
13.	*Vernonia anthelmintica* L.	Clayey loam	7.6	24	50%	*A. appendicula, G. mossae*.
14.	*Psoralea corylifolia L.*	Clayey loam	7.6	24	20%	*G. geosporum*, *G. heterosporum*

15.	*Psidium guajava L.*	Clayey loam	7.6	24	50%	G. *mossae, G. fasciculatum, G. aggregatum*
16.	*Solanum nigrum*	Clayey loam	7.6	24	60%	*Acaulospora sps. , G. fasciculatum, G. aggregatum*

RESULTS

Medicinal herbs are known as source of different medicinal properties, or active compounds. In all, 16 medicinal herbs of pharmaceutical and industrial importance were screened for the presence of AM fungi from nagar tehsil of Ahmednagar district and all of them showed the mycorrhizal symbiotic association. The colonization of AM fungi was observed in the form of mycelium, arbuscules, vesicles and chlamydospores.

The studies were undertaken during the month of July 2017 to September 2017 (Late rainy season) during which the mycorrhizal colonization and plants showed maximum growth. The AM fungi was more prevalent in older roots than new roots.

The AM fungal spores were represented as three different genera which included 2 species of Acaulospora one of them was A. appendicula, 1 species of Gigaspora namely G. gigantea, 5 species of Glomus namely G. aggregatum, G. fasciculatum, G. geosporum, G. heterosporum, G. mossae. Glomus species was recorded as dominant root symbiont. The dominance of Glomus species in alkaline soil was also reported by many workers1. The spores were identified on the basis of their structure and hyphal attachment referring to the standard slides and photographs.

The table represents the type of soil, pH conditions, number of spores and % colonization of AM fungi for different studied herbs (Table -1). The soil types ranged from clayey loam to sandy loam. The pH of the soil also ranged from neutral to alkaline. In the present investigation the mycorrhizal mycelium–root associations and formation of vesicle were common. These results correlates with the previous reports 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.

Out of 16 plants investigated, the root colonization ranged from 20 -70% depending on the soil type, climatic conditions and the plant. The maximum root colonization by AM fungi was observed in Aloe vera ((78%) while minimum was observed in Oxalis and Eclipta (20%). The maximum spore population was seen in Cynodon dactylon (49 / 50g of soil) while the minimum was observed in Oxalis (10/50 g of soil).

IV.CONCLUSION

These preliminary studies on the medicinal herbs indicate that mycorrhizal colonization is universal and play a beneficial role in the growth of the plants. There is increase in overall content of the plant thus the plants with mycorrhizal associations, look healthier and grow luxuriantly. Therefore, the mycorrhizal association help in uptake of nutrients and help to maintain the general plant vigour under adverse ecological conditions.

Based on the investigations, it was not possible to assess the host specificity of medicinal herbs to AM fungal colonization in details. Therefore there is a bright scope for further studies for understanding the host specificity, secondary metabolite production of medicinal herbs under mycorrhizal colonization.

REFERENCES

1. Abhijit Kulkarni .Studies On Am Fungal Association With Certain Medicinal Plants. Flora Fauna 21(1): Pp. 103-106. 2015.

2.Adholiya A. And Gaur .Estimation Of Am Spores In Soil, a Modified Method. Mycorrhiza News 6(1) : Pp.10-11. 1994

3.Gerdmann J.W And Nicolson T. H . Spores Of Mycorrhizal Endogone Species Extracted From Soil By Wet Sieving And Decanting Method. Trans. Brit. Mycol.Soc. 48 (2) : Pp. 235-244. 1963.

4.Landis Fc, Fraser Lh A New Model Of Carbon And Phosphorus Transfers In Arbuscular Mycorrhizas. New Phytol177: Pp. 466–479. 2008.

5.Liang Z, Drijber Ra, Lee Dj, Dwiekat Im, Harris Sd And Wedin Da .A Dgge-Cloning Method To Characterize Arbuscular Mycorrhizal Community Structure In Soil. Soil Biol Biochem 40: Pp. 956–966. 2008.

6.Philips J. M And Hayman D.S . Improved Procedures For Clearing Roots And Staining Parasitic And Vesicular Arbuscular Mycorrhizal Fungi For Rapid Assessment Of Infection Trans. Brit. Mycol.Soc. Vol. 55(1) : Pp. 158-161. 1970.

7. Sangita Kulkarni & Abhijit Kulkarni. Studies On Endomycorrhizal Associations Of Casuarina From Maharashtra. International Journal Of Researches In Biosciences, Agriculture And Technology I J R B A T, Vol. Vi (Special Issue 2: Pp. 97-99). 2018.

7.Thiet Rk, Frey Sd, Six J . Do Growth Yield Efficiencies Differ Between Soil Microbial Communities Differing In Fungal: Bacterial Ratios? Reality ,Check And Methodological Issues. Soil Biol Biochem 38: Pp. 837–844 2006.

8.Tisdall Jm .Fungal Hyphae And Structural Stability Of Soil. Aust J Soil Res. 29: Pp. 729–743. 1991.