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ARBUSCULAR MYCORRHIZAL FUNGAL DIVERSITY AND ROOT COLONIZATION OF SOME PLANTS RHIZOSPHERIC SOIL OF NORTH AREAS OF SOLAPUR, MAHARASHTRA

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Abstract: **The status of the arbuscular mycorrhizal fungi of some species from North areas of Solapur, Maharashtra was analyzed. All the species selected from study areas shows presence of percentage of root colonization with all types of infection as hyphal, vesicular and arbuscular type. Percentage of root colonization shows variation with the infection to the selected plant species. The percentage of root colonization ranged from 20% to 80%. The maximum root colonization found in *Heteropogon contortus* L. (80%) followed by *Euphorbia heterophylla* L.(70%), all other plant species shows presence of root infection with varied ranges. Arbuscular mycorrhizal spore population present between 100 to 600 in 50 gm of rhizospheric soil collected from site. The highest sporulation was found in Commelina *erecta* L (600/50gm soil) belonging to the family Commelinaceae and lowest in *Cassia auriculata* L(100/50gm soil) belonging to the family caesalpinaceae . The pH of the soil was also recorded which ranges between 6.4 to 7.0 which have impact on sporulation.**

Keywords: *Arbuscular, Colonization, Infection, mycorrhiza*

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I INTRODUCTION

The term Mycorrhiza coined by the German Botanist Frank (1855). Mycorrhiza is symbiotic association between the fungal species and roots of the plants. The mycorrhizal fungi are the specie of fungi which remains associate with the roots of plant to form mutuality association, like the plants provides nutrition, sugar to the fungi and in return the fungal species supply nutrients like phosphorous to the plants. Mycorrhiza forms the non- pathogenic relationship between fungi and the roots of higher plants. The complete symbiotic association is considered as functionally active in distinct organ mainly for the uptake of nutrients from the soil. The mycorrhizal association found more than 80% of plant species belonging to the 90% of families (Wang *et al.*, 2006). The key benefit of mycorrhizal association is enhanced soil exploration with increasing uptake of N, P, K, S, Mg, Ca, and Cu .Those members which involved in this relationship are the fungus belonging to the kingdom Basidiomycetes, Ascomycetes and Zygomycetes and generally all vascular plants. Due to presence of mycorrhiza, the host plant forms highly branched root system and the hyphae of mycorrhiza grow from root to soil which enable the roots to remains in contact with increased area of soil surface, that's why the mycorrhizal plants have an enhanced ability for the absorption of nutrients like P, N, K, Ca, Mg, Zn, Cu etc and mycorrhizal plant also enhances the tolerance capacity of plants to drought, salinity, production of growth promoters.

II MATERIAL AND METHODOLOGY

Study area-

The study area selected for present investigation was North areas of Solapur, Maharashtra. Northern area of Solapur is most famous for presence of great vegetation particularly in *The Great Indian Bustard* Sanctuary, Nannaj. The maximum temperature is 43^0c and minimum temperature is 16^0c with 450 to 600 mms average rainfall. Geographically the latitudinal range 17022'17" to 18054'42"N and longitudinal range 74023'34" to 76015'01" E.

Collection Of the roots and rhizospheric soil samples-

Collection of the plant samples with their roots and rhizospheric soil samples was done from study area. After bringing it into laboratory the roots were separated and

analysed for its root infection. Collected air dried, soil stored in bags for further processing. The pH of soil sample was calculated with the help of pH meter.

Estimation of Root Colonization-

According to Phillips and Hayman, 1970, the root samples were stored in FAA was washed with water continuously to remove the FAA. These washed root samples were surface covered with 1% HCL for about 5-10 min. at last HCL was removed and roots were washed with water and then root samples were stained with cotton blue for overnight. The percentage of Arbuscular mycorrhizal root colonization were calculated by using the formula,

$$\text{Percentage of root colonization} = \frac{\text{Number of infected root pieces}}{\text{Number of root pieces screened}} \times 100$$

Separation and Quantification of Spore-

The spores of Arbuscular mycorrhizal fungi from rhizospheric soil can be collected and separated by the wet sieving and decanting method proposed by Gerdemann and Nicolson method, 1963. Air dried 50gm of rhizospheric soil was taken and mixed with four times volume of water. Such suspension was stirred properly, till the larger particles settle down at the bottom. The suspension decanted through series of sieves like 710µ, 210µ, 150µ, 75µ, 45µ 0.025µ. the residues of each sieve were collected in separate petridishes and spores were observed under dissecting microscope.

III RESULT AND DISCUSSION

Table 1. Root colonization and spore density of some plants from North Solapur, Mahsrashtra

Sr. No.	Name of the plant species	Habit	Soil pH	Type of Infection	% of Infection	Spore density per 50 gm soil
1	*Azadirachta indica* A. Jus.	Tree	6.7		60	200
2	*Ziziphus mauritiana* Lamk	Tree	6.4	HA	20	200
3	*Cassia auriculata* L.	Shrub	6.9	HA	20	100
4	*Agave Americana* L.	Shrub	7.0	HV	60	400
5	*Bauhinia racemosa* Lam	Tree	6.9	HA	40	200
6	*Indigofera linifolia* L.	Herb	6.0	HA	40	200
7	*Commelina erecta* L.	Herb	6.1	H	20	600
8	*Heteropogon contortus* L.	Herb	6.7	HV	80	400
9	*Commelina banghalensis* L.	Herb	6.8	HA	60	200
10	*Euphorbia heterophylla* L.	Herb	6.7	HV	70	400

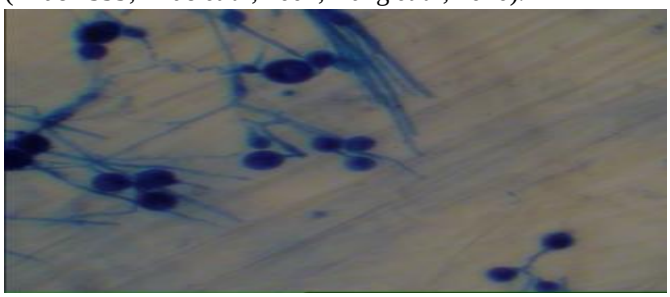
(H- Hyphal, V- Vesicles, A- Arbuscle)

The arbuscular mycorrhizal fungi have been considered as milestone as it forms symbiotic association in an ecosystem (Aditya kumar *et al.*, 2010). All the selected plant species for present work showed arbuscular mycorrhizal fungal association as well the root colonization and varied spore density in their rhizospheric soil. The present investigation gives first hand information regarding the percentage of root colonization with the type of infection which was depicted in Table 1. The percentage of root colonization ranges between 20% to 80%. In above selected plant species maximum root infection were observed in *Heteropogon contortus L.*(80%) while minimum were found in all other plant (20%). All the selected plants showed varied type of root infection as hyphal,in figure 1. B. vesicles in figure 1c. And arbuscular. The Table 1 also revealed about spore population which ranges between 200 to 600 from species to species. The maximum sporulation was found in Commelina erecta (600/ 50gm of soil) belongs to the family Commelinaceae while the minimum were (200/50 gm of soil) in other plants.

Seasonal variation has great impact on the spore population. Generally maximum spore population was found during monsoon season while minimum in summer season as during summer season all the vegetation dies off due to high temperature, scarcity and low rainfall causes the lowest sporulation. During the present work presence of number of spores get varied from plant to plant.

The rhizospheric soil pH showed major effect on the variation of arbuscular mycorrhizal fungal spore density in an ecosystem (Porter *et al.*, 1987). The selected rhizospheric soil samples shows pH ranges between 6.4 to 7.0 and normal soil characters. Mycorrhizal diversity found minimum in summer season, medium in winter season and maximum in monsoon season. Same observation was also found by (Muthuraj et *al.*, 2014). Maximum spore population was found in rainy season and very lowest in summer season, same was observed by Prasanthi *et al.*, 2016) in *Cassia auriculata* L. and *Calotropis procera* L. Same result also found by (Sharma *et al.*, 2005) as in rainy season Tectona grandis and Dendrocalamus strictus plantsshows maximum sporulation. During rainy season spore population were found highest may be due to the better root growth which may provides high entry points to VAM fungi (Bhaskaran and Selvaraj , 1997; Allen *et al*, 1998). Accordint to (Bever

et al, 1996), variation in spore population may be due to the different ability of ANF specie to sporulate. There were number of reports which showed variation in spore density with plants to plants (Chaurasia *et al*, 2005; Shi 2007; Susana *et al*, 2008). The variation in spore population depends on different factors like season, climatic factor, soil and host (Zhao 1999; Zhao *et al*, 2001; Yang *et al*, 2010).



A: Vesicles

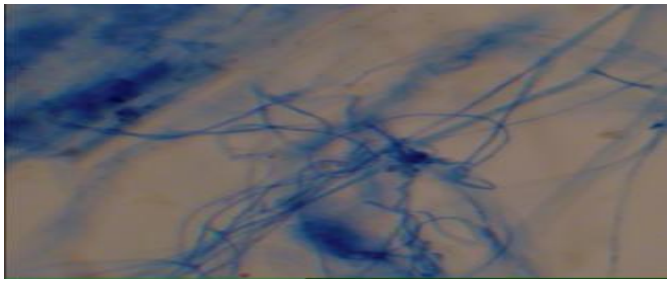


Fig. 1. B:Hyphal

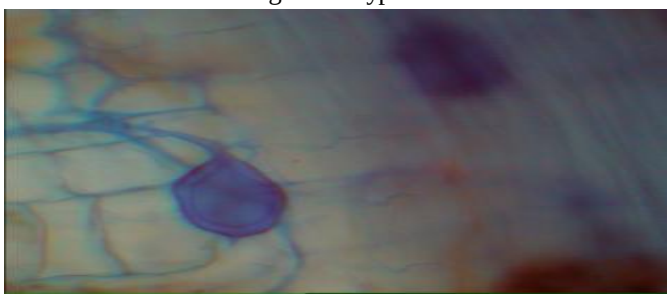


Fig. 1. C: Vesicles

Figure 1: Arbuscular mycorrhizal fungal root colonization

IV CONCLUSION

The present study mainly reveals the presence of arbuscular mycorrhizal root colonization in the selected plant species of Northen areas of Solapur. The mycorrhiza has a great impact on the host plant species even in any environmental conditions. Mycorrhizal association increases an uptake of nutrient along with disease resistance ability, stress resistance, productivity of plants. Such mycorrhizal association will defiantly increase great scope to manipulate the mutualistic association in conserved areas.

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