

RESEARCH ARTICLE**AMF status of naturally growing *Opuntia humifusa***Deotare PW^{1*}, Metkar SS¹, Maggirwar RC^{1*} and Khodke SP²¹*Mycorrhizal Biotechnology Lab, P.G. Department of Botany, Shri Shivaji Science College, Amravati, India.*²*Department of Botany, Vinayak Vidyan Mahavidyalaya, Nandgoan Khandeshwar, Amravati, India.**Corresponding author Email: prakash.deotare@gmail.com**Manuscript details:**Received: 5 December, 2013
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ISSN: 2320-7817 (Print)**Editor: Dr. Arvind Chavhan****Citation:** Deotare PW, Metkar SS, Maggirwar RC and Khodke SP (2014) AMF status of naturally growing *Opuntia humifusa*, *International Journal of Life Sciences*, 2 (1): 63-66.**Copyright:** © Deotare PW, Metkar SS, Maggirwar RC and Khodke SP, This is an open access article under the terms of the Creative Commons Attribution-NonCommercial- No Derivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.**ABSTRACT**

Arbuscular mycorrhizal fungal (AMF) status of *Opuntia humifusa* (Raf.) Raf. a desert plant, commonly growing throughout the Amravati region of Maharashtra, India was investigated. The rhizospheric soil and feeder root samples from various locations were collected to know the percent colonization, AMF and DSE (Dark septate endophyte) structures, spore densities and distribution of AM fungal species. All the collected plants were greatly colonized by AM fungi and dark septate endophytes. The percent colonization was ranged in between 82 to 91. Colonized roots were associated with vesicles, arum and paris type arbuscules, H-shaped hyphae, intraradical spores, hyphal coils, dark septate hyphae, grouped and linearly arranged microsclerotia. AMF spore count were 140-212 spores per 100g of soil and the highest spore densities were recorded from the plants growing in the cultivated fields. The extracted spores were morphologically identified and all the 18 species found belonging to only two genera as *Acaulospora* and *Glomus*. *Glomus* was recorded as the most dominant genus. The study reported was aimed to assess the influence of AMF on desert succulent plant growing everywhere in non desert region of Vidarbha.

Key words – AMF status, DSE, *Opuntia*.**INTRODUCTION**

Cacti are succulent plants that grow in arid and semiarid regions of the world. *Opuntia* grows naturally into clonal colonies which contribute to its being considered as a noxious weed in various places. In some places it is used as natural agricultural fencing which may quickly become a widespread invasive weed and converting farming land into an impenetrable green jungle of prickly pear (Griffith, 2004). Mycorrhizal associations are essential to the success of many plants in natural environment (Allen, 1991). The Cactaceae is a family that has been grouped as typically non mycorrhizal (Dhillon and Fries, 1994). Dhillon and Zak (1993), explored nine species of cacti and found that two species were non mycorrhizal. He also reported that *Opuntia humifusa* was moderately colonized. *Opuntia humifusa* (Raf.) Raf. commonly known as eastern prickly pear or Indian fig found growing everywhere in Amravati region (M.S.) but its mycorrhizal status is very little known from this region and India. Hence the study reported in this paper was aimed to assess the status of arbuscular mycorrhizal fungi in depth.

MATERIALS AND METHODS

Rhizosphere soil and feeder roots of *Opuntia humifusa* from the depth of 15 to 20 cm. were collected from six different sites of Amravati (M.S.), in the month of Jan 2013. The plants were found growing along road sides, in waste lands, in forest land, on farm fencing and in the cultivated fields. The Rhizosphere soil and actively growing roots were collected randomly in separate sterilized polythene bags by soil auger. Soil samples were air dried and stored at room temperature. The feeder roots were washed with distilled water and stored on 4°C in FAA.

Assessment of AMF Colonization

The staining of roots were carried out by root clearing and staining techniques given by Phillips and Hayman (1970). The grid-line intersect method was used to estimate the percent colonization given by Giovannetti and Mosse (1980). AMF structures such as H-shaped hyphae, vesicles, arbuscules, hyphal coils, intraradical spores and DSE structures as dark septate hyphae, microsclerotia etc. were observed under Labomade compound microscope.

Spore count

The intact and viable spores were extracted by the procedure described by Gerdmann and Nicolson (1963) as wet-sieving and decanting method and the spore

density per 100gm of each soil sample was done by the method given by Gaur and Adholeya (1994).

AMF Identification

The permanent slides of AMF intact spores were made and each spore was identified morphotaxonomically with the help of identification based on manuals, keys and INVAM website (Schenck and Perez, 1990; Morton and Benny, 1990, <http://invam.caf.wvu.edu>).

RESULTS AND DISCUSSION

All the plant roots of *Opuntia humifusa* collected from varied situations found to be colonized by arbuscular mycorrhizal fungi and dark septate endophytes. The percent colonization were almost the same and in between 82-91 in all the samples but the AMF spore count varies from 138-248 per 100gm of soil. The highest spore density was found in the samples collected from cultivated fields. AMF structures such as H-shaped hyphal connection, vesicles, two types of arbuscules (Arum and paris type-photoplate-II), intraradical spores, hyphal coils (photoplate-II) and DSE structures as dark septate hyphae, septate hyphal coils, grouped and linearly arranged microsclerotia (photoplate-II) were observed in the stained roots. Arum type arbuscule and linear microsclerotia were found more in number than others (Table No.1).

PLATE -I

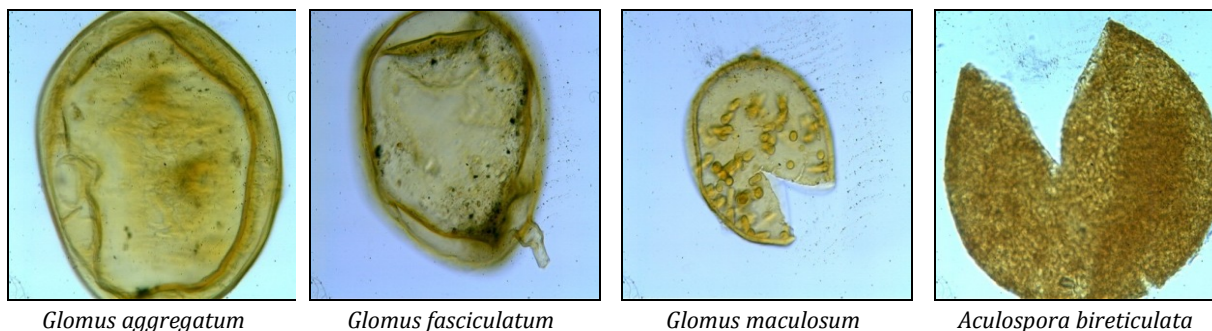


PLATE II

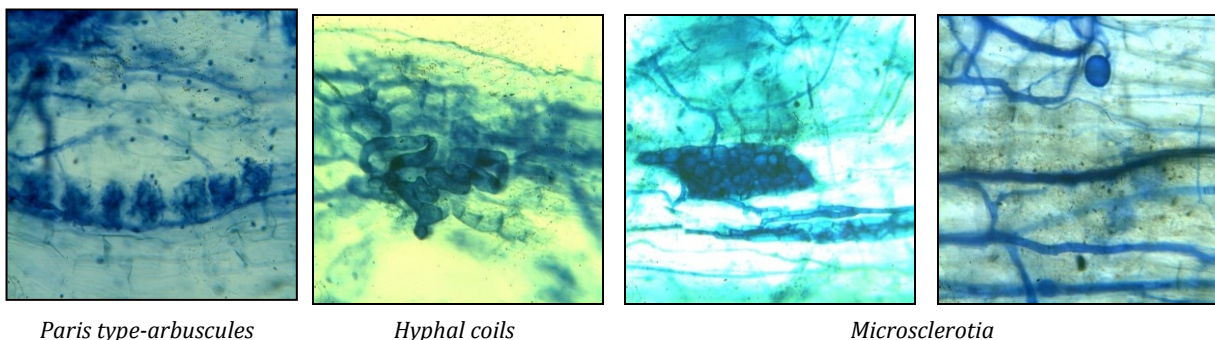


Table 1: AMF and DSE Colonization in *Opuntia humifusa*

Site Name	% AM colonization	AMF spore count	AMF and DSE Structures per 100 root bits							
			H-shaped connections	Vesicle	Arbuscule		Intra-radical spore	Hyphal coils	Microsclerotia	
					Arum	Paris			Group	Linier
Road side	91	140	75	48	37	30	51	53	2	2
Barren Land	82	148	60	40	19	17	56	35	17	29
Cultivated field	87	212	72	41	34	13	52	56	12	4
Forest soil	84	168	68	38	26	11	44	54	9	12
Fencing	89	138	81	56	38	18	61	45	11	17
Garden	86	248	69	42	21	19	45	43	8	22

Table 2: 2 AMF Species in rhizosphere soil of *Opuntia humifusa*.

Sr. No.	AMF Species	Site					
		1	2	3	4	5	6
1	<i>A.bireticulata</i>			√			
2	<i>A. elegans</i>						√
3	<i>A.mellea</i>		√				
4	<i>G. fasciculatum</i>	√	√	√	√	√	√
5	<i>G. aggregatum</i>	√		√	√		√
6	<i>G. deserticola</i>	√	√		√	√	√
7	<i>G. botryoides</i>			√			
8	<i>G. caledonium</i>	√					
9	<i>G. claroides</i>		√		√		
10	<i>G. clarum</i>		√	√	√		
11	<i>G. etunicatum</i>	√	√		√		
12	<i>G. geosporum</i>			√	√		
13	<i>G.globiferum</i>			√			
14	<i>G. maculosum</i>		√	√			
15	<i>G. magnicaulis</i>					√	
16	<i>G. microaggregatum</i>					√	

In all eighteen different AM fungal species were recovered and taxonomically identified. Out of eight genera of AMF, only two were found associated with all different rhizospheric soils. *Acaulospora* (photoplate-I) with three and *Glomus* (photoplate-I) with fifteen different species were identified. The most dominant species were that of *Glomus* as *G. fasciculatum* and *G. aggregatum*. The maximum number of species was recovered from cultivated field soils (Table No.2).

DISCUSSION

Most of the naturally growing plants are now proved to be mycorrhizal dependent for their natural growth and development hence the efforts was made to understand the mycorrhizal dependency of desert plant *Opuntia humifusa* growing in non desert region of Amravati. The results of this study clearly indicated that population of *Opuntia humifusa* growing in the region of Amravati were highly colonized by arbuscular mycorrhizal fungi and dark septate endophytes both. The percent colonization was found to be higher than previous studies conducted by Kiran Bala (1989); Rao and Tarafdar (1990); Dhillon and Fries (1994); Whitcomb (2000). Wide variations in colonization were not detected from all the locations. AMF and DSE colonization go parallel to each other and no any

adverse effect were noted. The samples from cultivated field have shown the highest rate of spore density, percent colonization and maximum number of AMF species. This could be due to the high rate of spore germination because of favourable conditions (Koske, 1987; Dodd, 2000). Dominancy of *Glomus* proved that the edaphic and climatic conditions are suitable for growth development and colonization of their species in *Opuntia humifusa* growing luxuriantly and naturally in non desert region.

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