



Seasonal Variation of Indigenous Arbuscular Mycorrhizal Morphotypes associated with *Adiantum Lunulatum*

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ABSTRACT

*A field survey of Mount Abu (Sirohi-Rajasthan) was undertaken in rainy and winter season to evaluate the presence of Arbuscular Mycorrhizal fungi with the fern *Adiantum lunulatum*. Four genera were isolated and identified from the rhizosphere of *A.lunulatum*. A high population of AM fungi was documented in the rainy season as compare to winter season. Three genera of AM fungi were extracted from the rhizosphere of *A.lunulatum* viz., *Glomus*, *Gigaspora*, *Acaulospora* and Among the isolated genera *Glomus* was the dominant genera with species *G. deserticola*, *mosseae*, whereas occurrence of vesicles was high in winter season and lesser in rainy season.*

Keywords: AM fungi, Glomeromycota, Adiantum lunulatum, Glomus, Gigaspora, Acaulospora, winter and rainy season.

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INTRODUCTION

Arbuscular mycorrhizal fungi cover the broad ecological range (watery to desert environment) according to mosse (1981), they are associated with 80 % terrestrial plant species [1] and 95 % vascular plants. AM fungi belong to the *Glomeromycota* phylum [2]. AM fungi are restrict symbionts, act as a key that tie-up plants and rhizospheric nutrients. They serve minerals and nutrients to the host plant and in return plants give carbon assimilates to the fungi produced via process of photosynthesis. Not only AM fungi provide mineral supplement to the plant as well as also improve drought and salinity resistance [3] and protection against pathogen [4] AM fungi also directly affect the ecosystem by improving the soil qualities [3,5] and also operate the function of bioremediation of heavy metals which are toxic to the ecosystem. The survey of Arbuscular Mycorrhizal fungi in the area Mount Abu was done during rainy and winter seasons to observe the association between AM fungi and Fern *Adiantum lunulatum*, this fern is used as a medical purpose by many tribble people in India. The rhizome of this fern is used as antidote against snake bite. The present work has done to carry out the relationship of AM fungi in the fern *Adiantum lunulatum*.

MATERIAL AND METHODS

SOIL AND ROOT SAMPLE COLLECTION-The rhizospheric soil with root samples of *Adiantum lunulatum* were collected from the different sites of Mount Abu, Sirohi District (Rajasthan) in the month September (rainy season) and November (winter season). Soil samples were placed in polythene bags and labelled them. Root samples were cut into small 1 c.m. pieces and preserved in formaldehyde and acetic acid solution [6].

Isolation of AM fungal spores-Isolation of spores has done by the method of wet-sieving and decanting technique proposed by Gerdemann and Nicholson in 1963. All the sand particles is removed by the help of different sieves. The AM fungal spores were collected on the What man's filter paper (No. 1) and then observed under Binocular microscope. Spores were isolated with help of needle and were mounted in glycerin on slide.

IDENTIFICATION OF VAM / AM FUNGI- The VAM / AM fungal morphotypes were identified by the manual of Schenck, 1990.

RESULTS

Table 1. Presence of AM fungal spore in the fern *Adiantum lunulatum* soil samples-

Ser. No.	AM Fungal Species	Spore Population per 500gm of soil sample (Rainy and winter season)	
		A	B
1	<i>Sclerocystisceremoides</i>	153	95
2	<i>Glomus deserticola</i>	136	99
3	<i>Glomus fasciculatum</i>	110	63
4	<i>Gigaspora margarita</i>	98	59
5	<i>Acaulosporaleavis</i>	103	93
6	<i>Acaulosporamorrowiae</i>	97	57
7	<i>Funneliformismosseae</i>	107	87

Note :- A Rainy season (July to September) ; B Winter season (October to February)

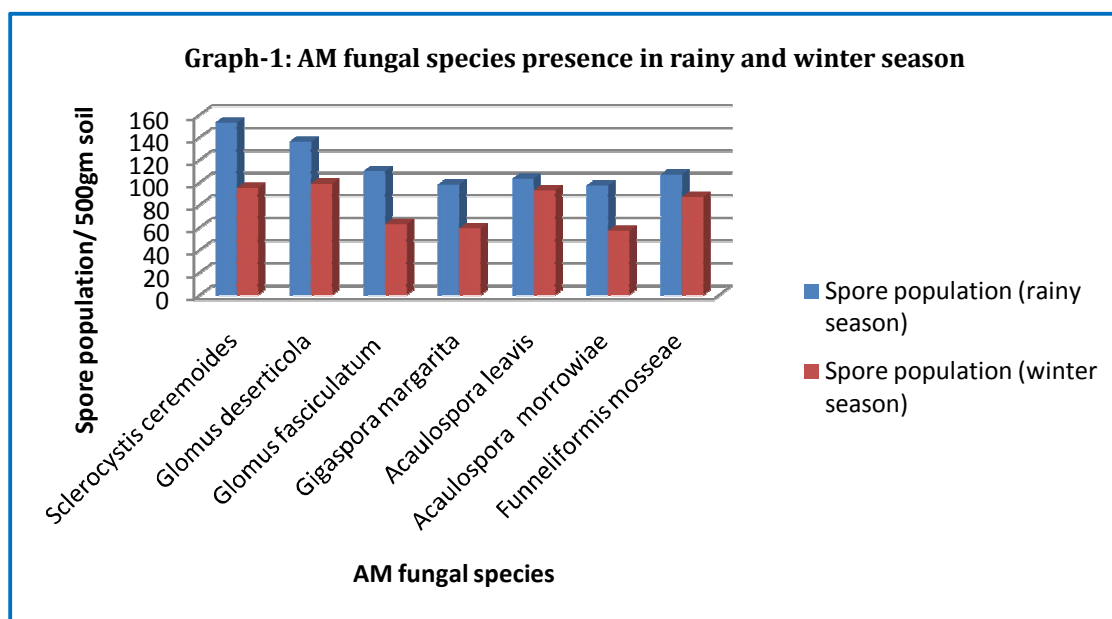
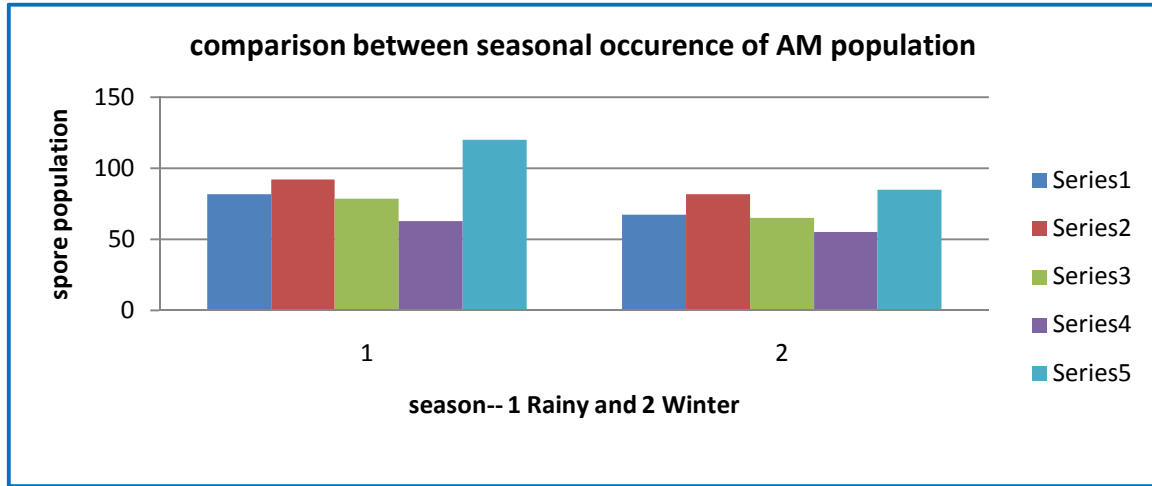


Table 2. AM Fungal biodiversity in the rhizosphere of fern *Adiantum lunulatum* at different collection sites-Rainy Season Winter Season

Collection site	Rainy Season		Winter Season		
	Spore no.	Presence of Vesicles	Collection site	Spore no.	No. of vesicles
1	81.66 + 7.02	+	1	67.33 + 10.50	+++
2	92.33 + 5.03	+	2	82 + 4.58	+++
3	78.66 + 6.65	-	3	85 + 11.53	++
4	63 + 8	-	4	55.33 + 12.66	++
5	120 + 20	+	5	85 + 5.56	+++



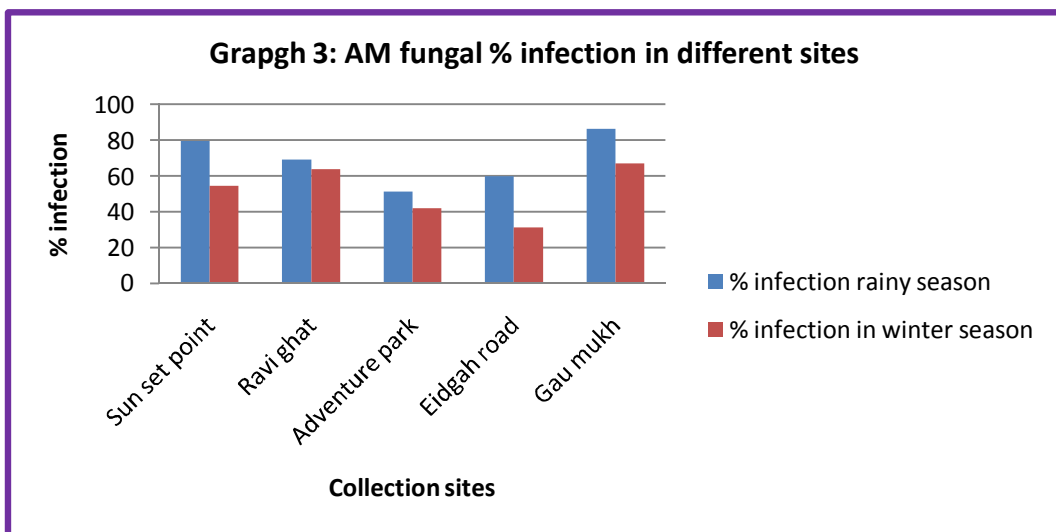
Graph 2. Series- 1-Sun set point, 2- Ravi ghat, 3-Adventure park, 4- Eidgah road, 5- Gaumukh

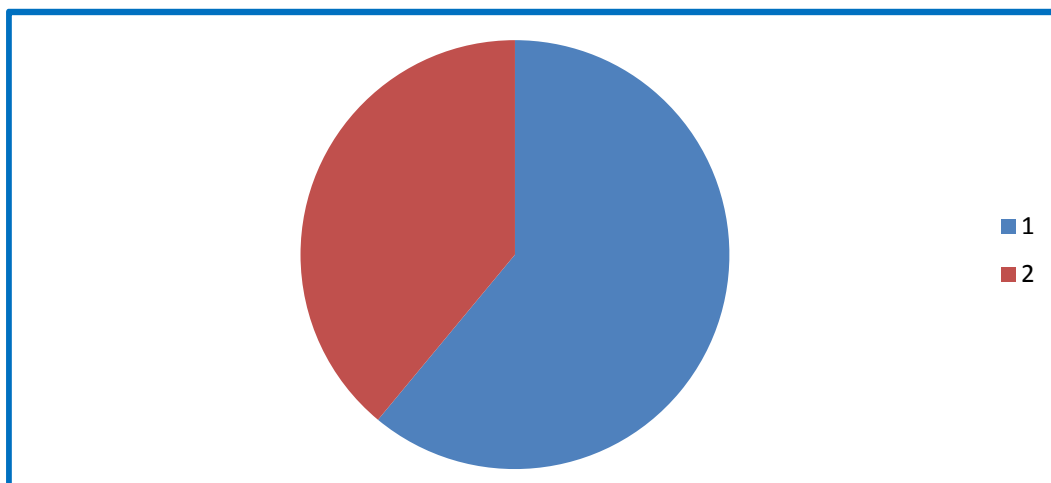
Evaluation of Arbuscular Mycorrhizal infection in roots- For the assessment of AM fungal infection in the roots of fern, the method proposed by Giovannetti and Mosses was used. All the root samples were washed under tap water, cut into 1 cm. long pieces and boiled in 10% KOH solution followed by staining with tryphan blue to observe fungal root colonization [7,8]. The stained root pieces were observed under light microscope to inspect hyphae ,arbuscules and vesicles. These root pieces were temporarily mounted in lactophenol solution and covered it with cover slip and fixed with nail pant. The percentage of root colonization was investigated by this formula[9].

$$\% \text{ of AM fungal infection} = \frac{\text{No. of infected root pieces}}{\text{Total no. of samples examined}} \times 100$$

Table 3. Incidence of AM fungal infection in fern observed during rainy and winter season at different localities-

Collection sites	Presence of Hyphae	% infection (rainy season)	% infection (winter season)
Sunset point	++	79.66 ± 4.50	54.33 ± 10.06
Ravi Ghat	+	69.33 ± 4.04	63.66 ± 5.03
Adventure park	+	51.33 ± 3.21	42 ± 6.08
Eldgah Road	-	60 ± 10	31.33 ± 3.21
Gaumukh	+++	67 ± 13.11	86.33 ± 5.50





Graph 4. Blue area is indicating the vesicles presence in winter season while red area is showing the presence of vesicles in rainy season.

DISCUSSION

The soil samples were collected from the rhizosphere of the *Adiantum lunulatum* for the assessment of Arbuscular Mycorrhizal fungi. The AM fungi were identified up to the species level as revealed in the table 1. The AM fungal morphotypes were *Glomus fasciculatum*, *Glomus deserticola*, *Sclerocytis ceremoides*, *Acaulospora leavis*, *Gigaspora margarita*, *Acaulosporamorrowiae* and *Funneliformismosseae*. Extracted AM fungal species belong to three genera viz., *Glomus*, *Gigaspora*, and *Acaulospora*. Among the above mentioned genera *Glomus* species were the most dominant as compare to others. In the present investigation more mycorrhizal spore number and root colonization observed at the time of rainy season as compare to winter season because the development and growth of roots become active in rainy season and roots act as effective point at multiple sites for the infection of AM fungi where as the vesicles are most frequently present in winter season.

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