

### Vesicular Arbuscular Mycorrhizal Association with Parthenium

Nita Gupta\*, A.K. Pandey, S.P. Gautam and U.S. Patel

\*Department of Microbiology, Mata Gujari College for Women,  
Jabalpur 482 001 (M.P.) India

Department of Biological Sciences, Rani Durgavati University,  
Jabalpur - 482 001 (M.P.) India

#### Abstract

VAM association with *P. hysterophorus* was examined during January to June, 2006 in Rani Durga University Campus. Ten species belonging to five genera *Acaulospora*, *Gigaspora*, *Glomus*, *Sclerocystis* and *Scutellospora* were found associated with roots quantifying 80% to 100% colonization. The spore density in the rhizosphere soil ranged between 33 to 119/50g of soil sample. All ten fungal species constitute new record for India.

**Key words:** Host/ new records/ inoculum potential/ symbiotic.

#### Introduction

*Parthenium hysterophorus* L. is a member of the family Asteraceae (=Compositae) and popularly known as Gajarghas (in Hindi) or *Parthenium*. It is a native of West Indies, central and North America but introduced into India along with food grains imported under PL-480 scheme. Its occurrence in India was first reported by Rao<sup>1</sup>. This weed require about four weeks to reach the flowering stage and is an extremely prolific seed producer with an estimated 5,000 to 20,000 seeds per plant<sup>2,3</sup>. The life span is usually of about 100-130 days, however, there is report that in India the weed continually produces flowers and fruits even up to eight months period<sup>4</sup>. It has a profusely branched and easily clearable root system in KOH and is a potential host for perpetuation and inoculum production of Vesicular Arbuscular Mycorrhizal fungi.

Jabalpur is situated between 23°9' north latitude and 79°58' east longitude at an altitude of 411.78 meters above the mean sea level. The climate of the region is typically semi humid and tropical with dry hot summers and dry cool winters. The annual rainfall ranges from 1,000 - 1,500 mm and major portion of rainfall is mainly received between mid-June to first week of October through south west monsoon. However, there is occasionally a very low rainfall (about 100 mm) during winter and summer seasons.

Minimum temperature goes down to a limit of 2° C for a few days during the month of December-January in the region, while maximum temperature rises as high as 46° C during the month of May-June. The relative humidity of the region ranges between 15 to 30, 60 to 75 and 80 to 90% during summer, winter and rainy seasons respectively. These conditions are congenial for the occurrence and colonization of VAM fungi with *Parthenium* as symbiotic partners.

#### Materials and Methods

Soil samples (10- 30 cm below the surface) together with fine feeder roots from ten sites (Map 1) of the R.D. University campus were collected in polythene bags and partially shade dried to evaporate excess water present in the soil. Large pieces of organic matter and debris were manually removed from the soil. Spores were recovered from the soil by wet sieving (700-45 µm pore size) and decanting method<sup>5</sup> followed by density gradient centrifugation<sup>6</sup> and filtering over a gridded ordinary filter paper and counted under a dissecting microscope and expressed as spores/50 gm soil sample. Intact spores were picked up using a wet dissecting needle. Three slides (first for intact spore, second for broken spore and third for Melzer's reagent treatment) for each spore type were prepared. Spore characters were noted in water and in lactophenol/polyvinyl lactic acid under a compound microscope for intact and broken spores. Spores were broken by gentle pressure on the cover slip of slide.

*Self attested  
Nita Gupta*



Table 1. Physico-chemical analysis of soils, spore density and species.

Soil site no.	Water holding Capacity (%)	pH	Ecms/cm	Organic matter (%)	N <sub>2</sub>	P	K	Ca	Na	Spore Density/50gm soil	Species richness
1	30.73	6.67	0.103	2.07	376	6.00	129	2029	24.8	119	1,3,6,7,9
2	32.81	6.72	0.102	0.98	252	5.00	120	1515	23.3	73	2,7,8
3	38.76	6.55	0.098	2.90	312	4.00	94	1931	24.0	31	2,3,9
4	36.60	6.62	0.110	1.97	246	5.00	103	2866	24.2	101	1,5,4,9
5	35.76	6.78	0.078	1.39	298	6.00	120	1743	24.0	33	6,8,9,10
6	34.40	6.56	0.081	3.56	445	3.00	68	2206	37.2	94	7,9
7	37.70	6.71	0.112	1.34	298	4.00	129	2413	32.0	50	6,8,10
8	38.20	6.81	0.089	0.41	445	7.00	77	1684	31.7	53	5,8,9
9	33.31	6.69	0.092	3.31	298	5.00	43	1665	28.4	84	1,8,9
10	30.36	6.66	0.064	3.15	124	6.00	138	2206	37.2	76	2,7,9

1= *A. appendiculata*, 2= *A. foveata*, 3= *A. rehmi*, 4= *Gl. margarita*, 5= *Gl. aggregatum*, 6= *Gl. fasciculatum*, 7= *Gl. geosporum*, 8= *Gl. mosseae*, 9= *Scl. coremioides*, 10= *Scut. nigra*.

The collected roots were washed in sieve and cut into 1-2 cm pieces and stored at room temperature in individual vials containing formallin, acetic acid and alcohol (FAA) solution. Clearing and staining of roots was done using method of Philips and Hayman<sup>7</sup>. Stained roots were mounted in clear lactophenol solution on microscope slide and percentage root infection was calculated using gridline intersecting method<sup>8</sup>.

$$\% \text{ root infection} = \frac{\text{Total no. of infected segments}}{\text{Total no. of segments observed}} \times 100$$

Fungi were identified on the basis of morphological characters specially of spore using Manual for the Identification of Vesicular Arbuscular Mycorrhizal Fungi<sup>9</sup>.

### Results and Discussion

A total of ten species viz. *Acaulospora appendiculata* Spain, Sieverding & Schenck, *A. foveata* Trappe & Janos, *A. rehmi* Sieverding & Toro, *Gigaspora margarita* Becker & Hall, *Glomus aggregatum* Schenck & Smith emend Koske, *Gl. fasciculatum* (Thaxter) Gerdemann & Trappe, *Gl. geosporum* (Nicolson & Gerd.) Walker, *Gl. mosseae* (Nicol. & Gerd.) Gerd. & Trappe, *Sclerocystis coremioides* Berk. & Broome, *Scutellospora nigra* (Redhead) Walker &

Sanders, belonging to five genera were identified. *Glomus* with four species was the richest genus in respect of species number found, and *Acaulospora* with three species was the second common in position while *Gigaspora*, *Sclerocystis* and *Scutellospora* were represented by one species each. None species was common in all the ten sites (Table 1). However, *Sclerocystis coremioides* was the most common species as it was recorded in eight out of ten sites sampled, followed by *Glomus mosseae* in five sites. The highest spore density was at site number one and lowest at the site number five, while lowest species richness was at site number six. Physicochemical properties of the soil samples are given in the table 1, no co-relationship with soil properties and spore density as well as species richness was found. *Parthenium hysterophorus* L. showed 80% to 100% root colonization with an average of 90%. Therefore, this obnoxious weed may be exploited as a potential host for production of VAM fungi inoculum and its perpetuation as it grows throughout the year. All the above species constitute new host record for India<sup>10,11</sup>.

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