*J. Phytol. Res.* 12(1-2) : 47-50, 1999

# OCCURRENCE OF VESICULAR-ARBUSCULAR MYCORRHIZAL ASSOCIATIONS AND SELECTION OF EFFICIENT VA MYCORRHIZAL FUNGUS IN *PROSOPIS CINERERIA* (LINN.)

**V.M. RAO and PRITI GUPTA**

Department of Botany, University fo Rajasthan, Jaipur-302004, Rajasthan, India.

Soil samples from the rhizosphere of *Prosopis cineraria* were collected from different localities of Rajasthan state and eight different types of vesicular-arbuscular mycorrhizal (VAM) fungi belonging to the genera : *Acaulospora, Gigaspora* and *Glomus* were isolated and used to study mycorrhizal preference. Among VAM fungi tested, *Glomus fasciculatum* showed preference for *Prosopis cineraria.*

***Keywords*** *:Glomus fasciculatum; Prosopis cineraria; Rhizosphere;* Vesicular-arbuscular mycorrhiza.

## Introduction

The tree legumes occupy a prestigious position in the nitrogen economy of soil and also in the nutrition of human beings and animals. It is known that the VAM mycorrhiza facilitates phosphorus uptake by the host in phosphorus deficient soils by solubilizing the inorganic phosphorus in the available organic phosphorus. Besides direct nutritional advantages, the mycorrhizae have also been accredited with other benefits to the host plants, such as increasing disease, drought and salt resistance. VAM are formed by non septate phycomycetes fungi of several genera of the family endogonaceae. They do not show host specificity per se but can exhibit certain preferences if screened against different host plants. Vesicular and arbuscular fungi show extremely wide host ranges[1]. Incidence of VAM fungal species depend upon the plant species which were colonized[2]. A majority of the VAM fungal species have been reported[3-8]. The endophytic fungi (mycorrhizal) are of 7 genera. Many of them may inoculate the same host. However their preference is variable and is dependent on the high percentage of infection of host roots. Many workers reported enhanced growth, increased percentage colonization in legumes by efficient (most preferred) VA mycorrhiza[8-11]. The present investigation was undertaken to select the most efficient (preferred) VA mycorrhizal fungus, naturally occurring in the rhizosphere of *P. cineraria.*

## Material and Methods

Soil samples from the rhizosphere of *Prosopis cineraria* were collected from the forest nurseries of 11 different locations of Rajasthan (Table 1). The 100g rhizosphere soil samples was used for spore isolation by wet sieving and decanting technique[12], characterized and identified by using Synoptic Key of Trappe, 1982 revised by Berch and Trappe, 1987. All the 8 different spores of VAM fungi isolated from rhizosphere soils were tested for their relative preference by the tree legumes *P. cineraria* in a pot culture experiment using sterilised soil and data were recorded for shoot and root length, dry weight of shoot and root, total plant protein[13], total chlorophyll[14], total N content by microkjeldhal method[15], total P content by Vandate molybdate method[16] and percentage mycorrhizal colonization of the roots were observed.

## Result and Discussion

8 different VAM fungi (3 genera and 8 species) were isolated from rhizosphere soil of *Prosopis cineraria* (Table 1) and have been observed that VAM fungi are

well distributed in the rhizosphere soil of all the localities involved. Of all the three genera *Glomus* was found to be most predominant followed by *Gigaspora* and *Acaulospora* in the root region of *P. cineraria*. Soil type and plant type were found to be more or less equally important factors contributing to such a predominance of *Glomus*. Our above observation is in confirmity with the findings of Schenck and Kinloch[2], Vyas and Srivastava[17] and Nalini *et al*[18]. In the present study, species of *Gigaspora* and *Acaulospora* were abundantly encountered in the sandy rhizosphere soil of Khatipura (Jaipur) locality. This observation is in keeping with the report of Neeraj *et al*[19]. Here a possible specificity of both *Gigaspora* and *Acaulospora* species to sandy soil can be expected.

Among species of *Glomus*, *Gigaspora* and Acaulospora, *Glomus mosseae*, *Gigaspora margarita* and *Acaulospora* elegans have been isolated from 10, 9 and 6 different rhizosphere soils of *P. ceneraria* respectively. Clayey rhizosphere soil of Pushkar (Ajmer) locality harboured spores of 7 out of a total 8 species of VAM fungi.

Almost all plants would be inoculated by endomycorrhizae[1]. However they preferred certain endomycorrhiza to others. In the present investigation wider variation in growth promoting efficiency of VAM fungi was observed. Among VAM fungi tested *Glomus fasciculatum* showed maximum root colonization in *P. cineraia* and hence stimulated maximum growth, total protein, chlorophyll, N and P contents (Table 2). These observations clearly demonstrate that the tree legume *P. cineraria* show maximum preference for *Glomus fasciculatum*. Similar observations have been earlier reported in other legumes[10, 11, 20, 21].

**Acknowledgement**

The authors are thankful to Head, Department of Botany for providing

**Table 1.** Occurrence of VAM fungi from the rhizosphere soils *Prosopis cineraria* Linn. from different localities

| Localities | *Acaulospora elegans* | *Acaulospora tuberculata* | *Gigaspora calospora* | *Gigaspora margarita* | *Glomus albidum* | *Glomus fasciculatum* | *Glomus mosseae* | *Glomus radiatum* |
|---|---|---|---|---|---|---|---|---|
| Ramgarh (Jaipur) | – | + | + | – | + | + | + | + |
| Jhalana (Jaipur) | – | + | – | + | + | – | + | + |
| Galtaji (Jaipur) | – | – | + | + | – | + | – | + |
| Khatipura (Jaipur) | + | + | + | + | – | + | + | – |
| Durgapura (Jaipur) | + | + | + | + | + | – | + | + |
| Chamnpura (Jaipur) | + | – | + | – | – | + | + | + |
| Alwar | + | – | – | – | + | + | + | – |
| Kota | + | – | + | + | – | + | + | – |
| Bundi | – | – | – | + | – | + | + | + |
| Bharatpur | – | – | + | + | – | – | + | – |
| Mount Abu (Sirohi) | + | – | – | + | – | + | – | – |
| Pushkar (Ajmer) | – | + | + | + | + | + | + | + |
| Total Occurrence% | 50 | 41.6 | 66.67 | 75 | 41.6 | 75 | 83.3 | 50 |

**Table 2.**Preference of VA mycorrhiza by *Prosopis cineraria* Linn. (Values are mean± standard deviation of 15 replicates)

| Treatment | Shoot length (cm) | Shoot dry weight (g) | Root length (cm) | Root dry weight (g) | Total plant protein (mg/g) | Total plant chlorophyll (mg/l) | N-content (%) (dry wt.) | P-Content (%) (dry wt.) | Mycorrhizal root colonization (%) |
|---|---|---|---|---|---|---|---|---|---|
| *Uninoculated control* | 17.5±1.4 | 0.34±0.04 | 20.6±5.3 | 0.85±0.17 | 71.85±1.37 | 0.93±0.02 | 1.02±0.02 | 0.13±0.00 | Zero |
| *Acaulospora elegans* | 23.8±2.1 | 0.43±0.08 | 29.3±5.1 | 1.12±0.14 | 78.64±1.56 | 0.97±0.02 | 1.06±0.03 | 0.15±0.00 | 24.60±4.35 |
| *Acaulospora tuberculata* | 18.3±2.0 | 0.35±0.05 | 24.3±2.0 | 0.93±0.01 | 71.93±1.33 | 0.96±0.01 | 1.03±0.01 | 0.13±0.00 | 12.50±1.76 |
| *Gigaspora calospora* | 25.8±2.3 | 0.62±0.08 | 38.0±3.7 | 1.18±0.14 | 82.58±1.78 | 1.09±0.03 | 1.09±0.03 | 0.22±0.00 | 28.30±4.78 |
| *Gigaspora margarita* | 24.7±2.9 | 0.51±0.06 | 34.7±6.1 | 1.15±0.18 | 82.55±1.34 | 1.07±0.03 | 1.06±0.03 | 0.17±0.00 | 24.70±4.26 |
| *Glomus albidum* | 18.5±2.5 | 0.36±0.08 | 25.7±2.5 | 0.96±0.03 | 72.33±1.46 | 0.96±0.02 | 1.03±0.02 | 0.13±0.01 | 13.40±2.23 |
| *Glomus fasciculatum* | 28.8±2.9 | 0.67±0.05 | 39.0±5.0 | 1.31±0.09 | 85.73±2.18 | 1.13±0.04 | 1.27±0.04 | 0.33±0.01 | 38.20±6.16 |
| *Glomus mosseae* | 27.0±2.0 | 0.65±0.04 | 40.5±2.8 | 1.25±0.11 | 84.82±1.68 | 1.11±0.03 | 1.45±0.04 | 6.33±0.01 | 34.50±5.78 |
| *Glomus radiatum* | 19.0±2.0 | 0.38±0.06 | 25.5±2.0 | 1.00±0.04 | 74.5±2.00 | 0.97±0.02 | 1.06±0.03 | 0.14±0.00 | 17.00±3.55 |

necessary laboratory facilities.

## References


1. Moose 1973, *A Rev. Phytopath.* **II** 171
2. Schenck M C and Kinloch R A 1980, *Mycologia* **72** 445
3. Singh and Varma 1980, *Trans. Mycol. Soc.* Japan **21** 93
4. Bhattacharjee and Mukerjee 1982, *Trans. Brit. Mycol. Soc.* **78** 184
5. Varma A K and Singh K 1985, *Trans. Mycol. Soc.* Japan **26** 39
6. Mohan Kumar V and Mehadevan A 1987, *Angern. Bot.* **61** 255
7. Mathew J, Shankar A, Neeraj and Verma A 1991, *Trans. Mycol. Soc.* Japan **32**
8. Bhardwaj S and Dudeja SS 1998, *Indian Journal of Microbiology* **35**
9. Abbott L K and Robson A D 1977, *Aust. J. Agric. Res.* **28** 639
10. Bagyaraj D J and Manjunath A 1980, *Plant and Soil* **55** 490
11. Reddy C N and Bais R S 1990, In : Jalai B L and chan H *Current Trends in Mycorrhizal Research* 103
12. Gerdemann J W and Nicolson T H 1963, *Trans. Brit. Mycol. Soc.* **46** 235
13. Lowry O H, Rosebrough A L farr and Randall R J 1951, *J. Biol. Chem.* **193** 265
14. Arnon D J 1949, *Plant Physiol* **24** 1
15. Bremer J M 1960, *J. Agric. Sci.* **55** 11
16. Chapman H D and Pratt P E 1961, *Plants and Waters* 169
17. Vyas A and Srivastava H P 1986, *Indian Phytopath.* **39** 146
18. Nalini P A, Grya Reddy M S and Bagyaraj D J 1988, *In: Mycorrhiza Round Table*. Proc, of work shop New Delhi 13-15 march 1987.
19. Neeraj, Mukerji K G, Sharma B C and Varma A K 1993, *World Journal of Microbiology and Biotechnology* 9(3) 291
21. Hall I R 1976, *Trans. Br. Mycol. Soc.* **67** 409
22. Krishna K R and Dart P J 1984, *Plant and soil* **81** 247