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STUDIES ON MYCORRHIZAL STATUS OF SOME PLANTS OF THE ASTERACEAE FAMILY IN AZAMGARH (UP) INDIA

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ABSTRACT

Mycorrhiza is a mutualistic association between fungi and higher plants. The term 'Mycorrhiza' in its broadest sense in the non-pathogenic association of fungi and the roots of higher plants. It has been observed that VAM fungal inoculatia provides beneficial results in the plant growth both in controlled and open field condition. Asteraceae is large and extremely variable family, which includes 1620 genera and 23600 species, cosmopolitans in distribution and they are most abundant in tropical regions. In India the family is represented by about 193 genera and 999 species. The present study survey was conducted in Azamgarh district where the plants are growth throughout the year to observe VAM fungal genera that are associated with 16 plants.

KEYWORDS: VAM Fungi, Family, Asteraceae, Azamgarh

Mycorrhiza is a mutualistic association between fungi and higher plants (Menge 1983). Frank (1885) coined the term mycorrhizae. The Term 'mycorrhiza' in its broadest sense is the non-pathogenic association of fungi and the roots of higher plants. The root fungus association is symbiotic, and the whole association is considered as a 'functionally district organ' involved in mineral nutrient uptake from the soil (Kar 1993).

Asteraceae is large and extremely variable family, which includes 1620 genera and 23600 species, cosmopolitan in distribution except in the Arctic region, but they are most abundant in the tropical regions. In India, the family is represented by about 193 genera and 999 species, mostly in the tropical and subtropical. Some members of this family, viz. *Ageratum conyzoides*, *Ambrosia artemisiifalia*, *Bindensi bipinnata*, *Dahlia pinnata*, *Calendula officinalis*, *Echinops echinatus*, *Eclipta prostrara*, *Helianthus annus*, *H. debilis*, *Lactuca sativa*, *Launaea procumbens*, *Parthenium hysterophorus*, *Sonchus aspera*, *Tagetes erecta*, *Tridex procumbens* and *Vernonia elaeagnifolia* are multipurpose plant species commonly found in the state of Uttar Pradesh. Hence, a study survey was conducted in Azamgarh district, where the vesicular plants are grown throughout the year to observed vesicular arbuscular mycorrhizal (VAM) fungal genera that are associated with 16 plants.

MATERIALS AND METHODS

Azamgarh district has an area of 4054 square Kilometers. The district lies between the Ganga and Ghaghara, Azamgarh district is surrounded by the districts of Mau in East, Gorakhpur in the North, Ghazipur in the South East, Jaunpur in the South West, Sultanpur is the West and Ambedkar Nagar in the North West.

The average wind speed in Azamgarh district UP (India) is 2.7 m/s with the maximum wind speed of aound 10 m/s. The average ambient temperatures remain 25.4^{0}C, varies from 7.1^{0}C to 41.1^{0}C. The average relative humidity remain around 69.3%, varies from 16.1% to 100%. The station pressure varies from 100 hpa to 982 hpa, average around 1016 hpa. The average rain fall all of district is 1031 cm. The selected co-ordinates i.e. lateral; 26^0 3' 0" N, longitude 830 13' O" E is found within the limit of Azamgarh district, in the state Uttar Pradesh, India.

Collection of different plants with their roots and soil were done randomly around Azamgarh in three replications. Root samples were washed in tap water and cut into one centimeter pieces in length. Root samples were cleared and stained using Phillips and Hayman (1970) technique. Root colonization was measured according to the Giovannetti and Mosse (1980) method. Hundred grams of rhizosphere soil samples were analyzed for their spore isolation by wet sieving and decanting method Gerdmann and Nicolson (1963). Identification of VAM fungal genera up to species level was done using the Manual for Identification by Schenck and Perez (1990).

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RESULTS AND DISCUSSION

Plants species along with their VAM fungi characterizations are presented in the Table-1. All the tested plants were colonized by VAM fungi. The percentage of colonization was highest in *T. procumbens* (94%), than other plants whereas, lowest percentage found in *C. officinalis* (35%). Hyphal and vesicular types of colonization were found in roots of different plant. Hyphae were almost common in all tested plants. Maximum number of spores (309) was observed in rhizosphere soil of *T. procumbems*. Minimum number of spores (20) was observed in rhizosphere soil of *C. officinalis*. Four genera were observed, viz. *Acaulospora* spp, *Glomus* spp, *Scutellospora* spp, and *Gigaspora* spp. Highest number of VAM fungal genera and species were associated with *L. sativa* while the lowest number was associated with *V. elaeagnifolia*. Among VAM fungal species, *Acaulospora* spp were found dominating followed by *Glomus* spp; *Scutellospora* spp and *Gigaspora* spp were found poorly distributed.

VAM association is the most frequently observed symbiosis found in nature because of their broad association with plants and cosmopolitan distribution (Harely and Smith 1983). Occurrence of VAM fungi in Euphorbiaceae plants has been reported earlier by Raja *et al.* (1991). Recently, Mulani and Prabhu (2002) and Gaikwad *et al.* (2013) reported the occurrence of VAM fungi in Euphorbiaceae plants from India. VAM spore population also showed variation in the rhizosphere soils of selected plants. Variations of spore number have been reported recently by Sarwade *et al.* (2011) and recorded difference in spore numbers between plant species.

Present study revealed the occurrence of four VAM fungal genera vis., *Glomus*, *Acaulospora*, *Gigaspora*, and *Scutellospora*, *Acaulospora* were most dominant with plants growing in soils of Azamgarh. Recently, it has been confirmed by Sarwade *et al.* (2011). This contrast with the report by Sarwade *et al.* (2012) that *Glomus* species is dominant.

Table 1: Mycorrhizal status of root colonization, spore population and VAM fungal genera in plants of family Asteraceae

Sr. No.	Botanical Name	Local Name	Colonization (%)	Types of colonization	Spore population	VAM fungal genera
1.	*Ageratum conyzoides* L.	Goat Weed	48	H	57	*Glomus spp Acaulospora spp*
2.	Ambrosia artemisiifolia L.	Common Ragweed	64	H	80	*Glomus spp Acaulospora spp Gigaspora spp*
3.	*Bidens bipinnata* L.	Spanish Needles	35	H	20	*Glomus spp Acaulospora spp*
4.	*Dahlia pinnata* Cav.	Dahlia	87	HV	281	*Acaulospora spp*
5.	*Calendula officinalis* L.	Calendula	53	HV	134	*Glomus spp Acaulospora spp Gigaspora spp*
6.	*Echinops echinatus* Roxb.	Indian Globe Thistle	87	HV	142	*Glomus spp Acaulospora spp*
7.	*Eclipta prostrara* L.	Bhangaro	56	HV	184	*Glomus spp Acaulospora spp*
8.	*Helianthus annus* L.	Sunflower	85	H	138	*Glomus spp Acaulospora spp*
9.	*Helianthus debilis* Nutt.	Cucumber leaf, Sunflower	34	H	84	*Glomus spp Acaulospora spp*
10.	*Lactuca sativa* L.	Lettuce	65	HV	93	*Glomus spp Acaulospora spp Gigaspora spp*
11.	*Launaea procumbens* Roxb.	Bangobhi	38	HV	234	*Glomus spp Acaulospora spp*
12.	*Parthenium hysterophorus* L.	Carrot Grass	94	HV	309	*Glomus spp Acaulospora spp Gigaspora spp*
13.	*Sonchus aspera* L.	Wight's Sow Thistle	89	HV	145	*Glomus spp Acaulospora spp*
14.	*Tagetes erecta* L.	Merigold (Genda)	38	HV	163	*Glomus spp Acaulospora spp Gigaspora spp Scutellospora spp*
15.	*Tridox procumbens* L.	Coat Buttons	54	HV	183	*Glomus spp Acaulospora spp*
16	*Vernonia elaeagnifolia* DC.	Hurhur	57	H	138	*Glomus spp Acaulospora spp*

The root colonization by VAM fungi is a dynamic process. The results obtained from the present study suggest that all the test plants showed good colonization. However, percentage of root colonization varied plant to plant (Table 1). Variation in extent of medicinal plant species were observed and confirm earlier findings of Muthukumar and Udaiyan (2000).

CONCLUSION

The study suggests that the colonization percentage and number of VAM fungal spores differ between 16 plants. Highest number of mycorrhizal spores and root colonization of indicated that these plants species might be considered good host for VAM fungi under natural conditions. In conclusion, occurrence or distribution of VAM fungi varies with host ranges. Studies on distribution and mycorrhizal status of plants should enable us to understand the influence of these mycobionts on plant species diversity and distribution.

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