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VESICULAR ARBUSCULAR MYCORRHIZAL (VAM) FUNGI OF SOME PLANTS OF THE FAMILY EUPHORBIACEAE IN AZAMGARH (U.P.) INDIA

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ABSTRACT

Mycorrhiza in a muteralistic association between fungi and root of higher plants. This type of association in considered as a "functionally distinct organ" involved in mineral nutrient uptake from the soil. Family Euphorbiaceae is a large and variable family, which includes 300 general and 5000 species, cosmopolitan in distribution. In India the family is represented by about 61 genera and 336 species mostly in the tropical and subtropical region of East India. Hence, a study survey was conducted in Azamgarh district, where the plants are grown throughout the year to observe vesicular-arbuscular mycorrhizal (VAM) fungal genera that are associated with 16 plants. The study suggests that the colonization percentage and number of VAM fungal spores differ between 16 plants. In conclusion occurrence or distribution of VAM fungi varies with host ranges.

KEYWORDS: VAM Fungi, Plants, Soil, Euphorbiaceae, 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 distinct organ' involved in mineral nutrient uptake from the soil (Kar 1993).

Euphorbiaceae is large and extremely variable family, which includes 300 genera and 5000 species, cosmopolitan in distribution, except in the Arctic region, but they are most abundant in the tropical 61 genera and 336 species mostly in the tropical regions. In India, the family is represented by about subtropical Himalayas and the mountains of South India. Some members of this family (viz. *Acalypha indica*, *Chrozophora prostrate*, *C. rottlei*, *Croton bonplandianum*, *Euphorbia geniculata*, *E. caducifolia*, *E. dracunculoides*, *E. hirta*, *E. Laciniata*, *E. prostrate*, *E. pulcherrima*, *Jatropha curcas*, *J. glandulifera*, *J. gossypifolia*, *Phyllanthus acidus*, and *P. amarus*) are multipurpose plant species commonly found in the state of Uttar Pradesh. Hence, a study survey was conducted in Azamgarh district, where the plants are grown throughout the year to observe vesicular arbuscular mycorrhizal (VAM) fungal genera that are associated with 16 plants.

MATERIALS AND METHODS

Azamgarh district occupies 4234 sq. Km of Uttar Pradesh district. It is located between 25° 38" and 26° 27' North of latitude and the meridians of 82° 40' and 83° 52' East of longitude. It is bounded by Mau on the east, Gorakhpur on the north, Ghazipur on the South East, Jaunpur on the South West, Sultanpur on the West and Akbarpur on the North West. Azamgarh experiences a humid subtropical climate with large variations between summer and winter temperatures. Summars are long, from early April to October with monsoon seasons, and are also extremely hot. The temperature ranges between 22°C to 46°C in summers. Winters in Azamgarh see very large diurnal variations, with warm days and downright cold nights. Cold waves from the Himalayan region cause temperatures to dip across the city in the winter from December to February and temperatures below 5°C are not uncommon. Fog is common in the winters which hot dry wind (loo) in the summers. The average rainfall is 1110 mm (44 in).

Collection of different plants with their roots and soil were done randomly around Azamgarh in three replications. Roots 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 analysed 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 Identificatio*n by Schenck and Perez (1990).

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RESULTS AND DISCUSSION

Plant 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 *J. curcas* (90%) than other plants whereas, lowest percentage found in *C. rottleri* (35%). Hyphal and vesicular types of colonization were found in roots of different plants. Hyphae were almost common in all tested plants. Maximum number of spores (300) was observed in rhizosphere soil of *J. curcas*. Minimum number of spores (20) was observed in rhizosphere soil of *C. rottleri*. 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 *J. gossypifolia* while the lowest number was associated with *C. bonplandianum*, Among VAM fungal species, *Acaulspora* spp were found dominating followed by *Glomus spp*, *Scutellospora* spp and *Gigaspora* spp were found poorely distributed.

Table 1: Percentage of root colonization and spore population in plants of Euphorbiaceae

S. No.	Plant species	Colonization (%)	Spores population	VAM fungal genera
1	*Acalypha india* L.	43	57	*Glomus* spp *Acaulospora* spp
2	*Chrozophora prostrata* Dalz.	53	70	*Glomus* spp *Acaulospora* spp *Gigaspora* spp
3	*Chrozophora rottleri* (Geis.) Juss. Ex Spreng.	35	20	*Glomus* spp *Acaulospora* spp
4	*Croton bonplandianum* Bail	77	231	*Acaulospora* spp
5	*Euphorbia geniculata* Orteg.	43	130	*Glomus* spp *Acaulospora* spp *Gigaspora* spp
6	*Euphorbia caducifolia* Haines	76	132	*Glomus* spp *Acaulospora* spp
7	*Euphorbia dracunculoides* Lamk.	50	164	*Glomus* spp *Acaulospora* spp
8	*Euphorbia hirta* L.	80	128	*Glomus* spp *Acaulospora* spp
9	*Euphorbia laciniata* Panigrahi	37	70	*Glomus* spp *Acaulospora* spp
10	*Euphorbia prostrata* Ait.	55	83	*Glomus* spp *Acaulospora* spp *Gigaspora* spp
11	*Euphorbia pulcherrima* Willd. Ex Klotzsch	38	234	*Glomus* spp *Acaulospora* spp
12	*Jatropha curcas* L.	90	300	*Glomus* spp *Acaulospora* spp *Gigaspora* spp
13	*Jatropha glandulifera* Roxb.	79	135	*Glomus* spp *Acaulospora* spp
14	*Jatropha gossypifolia* auct.	36	153	*Glomus* spp *Acaulospora* spp *Gigaspora* spp *Scutellospora* spp
15	*Phyllanthus acidus* (L.) Skeels	52	173	*Glomus* spp *Acaulospora* spp
16	*Phyllanthus amarus* Schumach. & Thonn.	55	128	*Glomus* spp *Acaulospora* spp

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 Mohan and Nataranjan (1988), Raja *et al*. (1991), Raghupathy *et al*. (1988), and Parameswaran and Augustine (1988). 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 (Table 1). 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, viz. *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 contrasts with the report by Sarwade *et al*. (2012) that *Glomus* species is dominant.

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 the root colonization varied from plant to plant (Table-1). Variations in extent of medicinal plant species were observed and confirm earlier findings of Muthukumar and Udaiyan (2000).

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 *J. curcas* indicated that these plant 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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