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Isolation of VAM/AM fungi from rhizosphere soil of medicinal plants grown under foot hills of Himalayas

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Abstract
The present investigation was carried out at HNB Garhwal Central University, Srinagar Garhwal to evaluate the mycorrizal association of VAM/AM fungi with different medicinal plants. Twenty nine medicinal plants were selected at two experimental sites i.e., Srinagar and Chauras for the experiment. Spores of VAM/AM fungi were isolated from the soil of the selected plants and counted under the binocular microscope. Occurrence of sporocarp, peridium, size and shape of spores was also examined. The experimental findings demonstrated that number of spores per 10 gram of soil was maximum (83) under soil rhizosphere of *Allium cepa*; whereas, the soil rhizosphere below *Cassia fistula* and *Mentha longifolia* had the minimum number of spores (20) per 10 gram of soil.

Keywords: VAM/AM fungi, rhizosphere soil, medicinal plants

Introduction
Mycorrizal association of fungal hyphae with plant roots alter the phenomenon of plant response to various biotic and abiotic aspects. Vesicular-arbuscularmycorrhiza (VAM) is formed by the symbiotic association between certain phycomycetous fungi and angiosperm roots. VAM particularly dominate warmer and drier soil, temperature and tropical latitudes with higher turnover of organic material. VAM fungi are worldwide distributed and mostly found in cultivated soils, non-cultivated soils, moist forests, scrub, savannah, heaths, grassland sand dune, semi desert and anthracite. Plants with VAM display improved growth in comparision to non-mycorrizal ones through increase in uptake of water, phosphorus and other minerals. It has been reported in recent years that the VAM fungi confer on host plants several other benefits in addition to enhancement of phosphate uptake. These benefits are biological control of root diseases (Shonbeck, 1979) [5], nodulation and nitrogen fixation in legumes (Mosse *et al*., 1976), hormone production (Allen *et al*., 1980) [1], drought resistance (Powell and Bagyaraj, 1984) [4] and increased uptake of several elements such as N, K, Zn, Mg, Ca and S (Hayman, 1982) [2].VAM also provides resistance against soil born root pathogens. The co-symbionts used along with VAM leads to synergistic effect with nitrogen fixating bacteria. Positive and significant effect of VAM on growth and survival of forest and agricultural crops have been reported by many scientists. Moreover, the primary seedling establishment, survival and biomass production indicates the potential of VAM fungi to reduce the fertilizers requirements of trees in the degraded lands. Keeping in view the above factors under consideration, the present experiment was conducted to study the association of mycorrizal VAM/AM fungi with roots of different medicinal plants.

Material and Methods
The experiment was carried out at HNB Garhwal University, Srinagar Garhwal. For the experiment, soil samples were collected from different sites of Srinagar (Bilkedar and Birla campus) and Chauras Campus of Tehri Garhwal in Garhwal University. The samples were collected at the depth of 5-15 cm around the root zone of medicinal plants and were brought to the laboratory for isolation of VAM/Am fungi. Spores of VAM/Am fungi were isolated by wet sieving and decanting technique, as mentioned by Gerdman and Nicolson (1963). The spores were collected from the upper most layer of the soil, which were further observed under microscope and were mounted in lacto phenol on slide. Further, such slides were observed under binocular microscope. Presence or absence of sporocarp, peridium occurrence, size and shape of spores along with their colour and orientation was studied during the course of experiment.

Result and Discussion

The table 1 shows the number of spores of VAM/AM fungi associated with rhizosphere region of soil in different medicinal plants. Among the 29 medicinal plants under study, *Allium cepa* in Srinagar locality had the maximum number of spores (83) per 10 gram of soil; whereas, the number of spores/ 10 gram of soil was minimum (20) under *Cassia fistula* and *Mentha longifolia*.

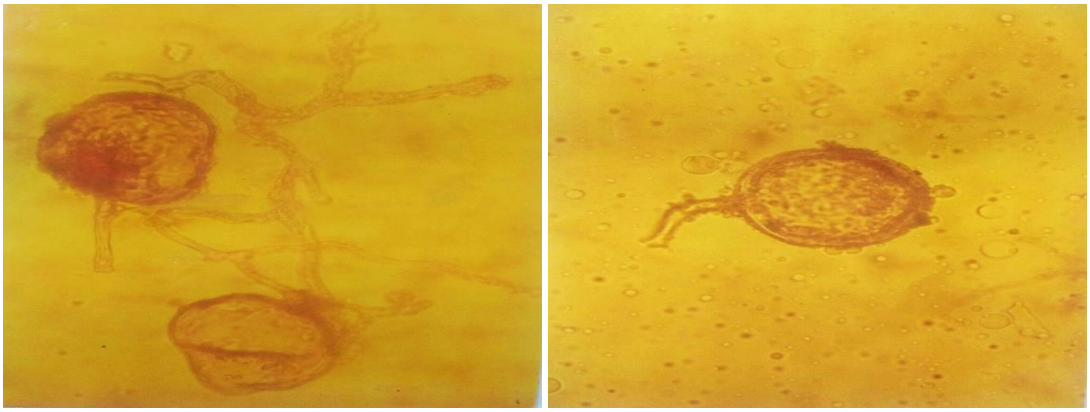

Fig 1: Mycorrizal spores of VAM/AM fungi isolated from the rhizosphere soil

Table 1: Number of different VAM/AM fungal spores in medicinal plants from rhizosphere soil of different localities

Sl. No.	Medicinal plants	Locality	Number of spores/10 g of soil
1.	*Aegle marmelos*	Srinagar	60
2.	*Azadiracta indica*	Srinagar	70
3.	*Cassia fistula*	Chauras	20
4.	*Datura stramonium*	Srinagar	45
5.	*Emblica officinalis*	Srinagar	43
6.	*Mentha arvensis*	Chauras	80
7.	*Mentha longifolia*	Chauras	20
8.	*Ocimum sanctum*	Chauras	29
9.	*Ricinus communis*	Srinagar	70
10.	*Apagus spp.*	Chauras	55
11.	*Atropa acuminate*	Chauras	45
12.	*Butea monosperma*	Chauras	47
13.	*Picrorhiza kurouia*	Chauras	58
14.	*Allium sativum*	Srinagar	76
15.	*Allium cepa*	Srinagar	83
16.	*Solanum spp.*	Srinagar	57
17.	*Artimisia spp.*	Srinagar	54
18.	*Amaranthus viridus*	Chauras	59
19.	*Terminalia chebula*	Chauras	81
20.	*Terminalia belerica*	Srinagar	31
21.	*Azadiracta indica*	Chauras	37
22.	*Ocium sanctum*	Srinagar	54
23.	*Aegel marmelos*	Chauras	68
24.	*Melia azadiracta*	Chauras	30
25.	*Juglans regia*	Chauras	56
26.	*Allium sativum*	Chauras	52
27.	*Cassia fistula*	Chauras	39
28.	*Ocium sanctum*	Srinagar	48
29.	*Terminalia belerica*	Srinagar	68

Conclusion

From the above study, it can be concluded that spores of VAM/AM fungi in the rhizosphere soil vary with the plant species and play a vital role in functioning of plant roots and widely recognized as enhancing plant growth on several disturb sites.

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