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SIGNIFICANCE OF VAM/AM MYCORRHIZAL ASSOCIATION WITH MEDICINAL PLANTS: AN OVERVIEW

TAMAL MONDAL

ASSISTANT PROFESSOR, DEPARTMENT OF BOTANY,NETAJI MAHAVIDYALAYA,ARAMBAGH, HOOGHLY,WEST BENGAL

tamalmondal1@gmail.com

ABSTRACT:

Symbiotic association between fungus and the roots of medicinal plants are very much significant in terms of nutrition supply, plant protection, and hence the growth and yield of the medicinally important biochemical's of these plants. The interactions between the two symbionts are very interesting field of research for scientists in recent times. The research on significance of their symbiosis is not only for the economical purpose, but also a great importance in ecology and environmental point of view.

KEY WORD: *Mycorrhizal association, Medicinal plants, Symbiosis, Environment.*

INTRODUCTION:

"Mycorrhiza"- the term used to describe the symbiotic association between a fungus and a root of higher plant (Frank, 1885). Both of the host plant and fungal member, benefited potentially from this association (Powel and Bagyaraj, 1984).There are almost seven types of Mycorrhizae (Reeves and Redente, 1991). Near about 80% of all terrestrial plant species form endomycorrhiza *i.e.* Vesicular Arbuscular Mycorrhiza (VAM) or Arbuscular Mycorrhizal (AM) symbiosis (Smith and Read, 1997). Different AM fungi can simultaneously colonize a single root segment, and that the species are functionally diverse (Merry and Fitter, 1998; Smith *et al.*, 2000). Arbuscular mycorrhizal fungi that specifically colonize roots of a plant species are therefore likely to be of great relevance of function and their identification is important to understand the ecology of plant fungus interaction in natural ecosystems (Hegalson *et al.*, 2002 Vesicular arbuscular mycorrhizal fungi (VAM) or arbuscular mycorrhizal fungi (AM) are ubiquitous in their distribution and occur abundantly. Majority of flowering plants have the dynamic association of VAM fungi. It represents one of the nature's best gifts to the mankind.

IMPORTANCE OF MEDICINAL PLANTS:

It is an established fact that medicinal plants play a great role in our life. A major part of the total population in developing countries still uses traditional folk medicine obtained from plant sources (Farnsworth, 1994 and Srivastava *et al.,*1996).Medicinal plants represent a rich source of antimicrobial

agents .Plants are used medicinally in different countries are source of many valuable and powerful drugs (Srivastava, J. *et.al*.,1996).The use of traditional medicine and medicinal plants in most developing countries , as a normative basis for the maintenance of good health ,has been widely observed (UNESCO,1996). And an increasing reliance on the use of medicinal plants in the industrialised societies has been traced to the extraction and development of several drugs and chemotherapeutics from these plants as well as from traditionally used rural herbal remedies (UNESCO,1998).In India the use of different parts of several medicinal plants to cure specific ailments has been in vogue from ancient times (Bhattacharjee,S.K.,1998).As medicinal plants are very important source of medicine ,now a days a number of countries grant financial supports for the research on medicinal plants (Hoareau,L., and DaSilva,J.,E.,1999).The important role of medicinal plants are endless to describe, as regularly new findings and discoveries discloses. And that knowledge enriches our society day by day.

IMPORTANCE OF VAM / AM FUNGI:

Results of the experiments shows that AM fungi absorb N,P,K,Ca,S,Cu and Zn from the soil and translocate them to associated plants(Tinker and Gildan,1983).The most important nutritional effect of AM fungi is the improved uptake of immobile nutrients, specially P, Cu, and Zn(Pacovsky 1986, Manjunath and Habte 1988).AM fungi associated with enhanced chlorophyll levels in leaves and improved plant tolerance of diseases, parasites, water stress, salinity and heavy metal toxicity(Bethlenfalvay,1992). Hyphal networks of AM fungi contribute significantly to the development of soil aggregates and hence to soil conservation(Miller and Jastrow,1992).Hyphae may increase the availability of nutrients like N or P from locked sources by decomposing large organic molecules(George et al.,1995). Extra radical AM hyphae augment the uptake of nutrients from up to 12cm away from the root surface(Cui and Caldwell,1996).AM fungi absorb non-mobile nutrients from the soil and translocate them to host plants ,beside this they sequester potentially harmful heavy metal ions, facilitate inter plant transfer of nutrients and beneficially modify plant water relations(Smith and Read,1997).In unfavourable drought conditions NO_3 – ,the highly mobile nutrient uptake can also be enhanced by mycorrhizal associations(Azcon *et al*.,1996; Subramanian and Charest,1999).By this association Improved P nutrition has been shown in infertile and P fixing soils of the tropics (Dodd,2000).

Transport and absorption of N from NH4+ can also increase biomass production in soils with low Potassium, Calcium and Magnesium (Liu *et al*., 2002).

VAM / AM ASSOCIATION IN MEDICINAL PLANTS:

In the earlier research Arbuscular mycorrhizal fungi mostly found from rhizomes (Taber and Trappe,1982). After that Nazim (1990), Udea *et al.*,(1992), Gautam and Sharma (1996), Rani and Bhaduria (2001), Muthukumar *et al.* (2001), Panwar and Tarafdar (2006) , Gupta *et al*., (2009), Sarwade *et al.,* (2010 and 2011), Kumar *et al.,* (2010), clearly mentioned the occurrence of medicinal and aromatic

plants from India. In a survey, forty two AM fungal species of five genera namely, *Glomus, Acaulospora, Scutelllospora, Gigaspora,* and *Ambispora* were discovered from the rhizosphere soil, associated with thirty selected medicinal plant species ,among the AM fungal colony , *Glomus* was found to be the most dominant genera, and the most dominant AM fungal species is *Glomus fasciculatum* (Radhika and Rodrigues, 2010). In a survey on VAM association in three different species of *Cassia viz., Cassia alata, Cassia sophera and Cassia occidentalis* by Chatterjee *et al.,*(2009) it was found that all of the three species possess VAM association under natural condition. All the three species of *Cassia* showed mycorrhizal colonization and a wide range of variations was exhibited in root colonization percentage among different species which might be due to the effect of rhizosphere soil that favored the growth of AM fungi. AM fungal colonization percentage was higher in *C. alata* (68-71%) followed by *C. occidentalis* (45-57%) and *C. sophera* (24-30%). Spore count per 10 gm of dry soil in the rhizosphere ranges from 19-106 and it was recorded to be the maximum in *C. alata* (86-106). Spores and vesicles of mycorrhizal fungi in the *cassia* species exhibited a great deal of variations in their morphology. The VAM fungi found here were identified by using standard manual and the synoptic key of Schenck and Perez (1997). It has been noticed that soil phosphorus content influences VAM colonization percentage in a greater extent and an increase in available pool of phosphorus in the soil profoundly decreases the root infection and root colonization percentage by the AM fungi as evidenced in the present study. Furthermore, a phosphorus deficient condition in the soil favoured mycorrhizal colonization in the roots. However, soil pH has no marked effect on root colonization by the AM fungi though in the present study it remained within a very narrow range (6.8-7.3). It is conclusive from the results that summer season is the best for efficient growth and root colonization by AM fungi in the field followed by spring. The results are corroborative with the findings of Setua *et al.* (2001) who observed maximum number of AM spores in Mulberry during summer than winter. It might be due to better symbiosis between the mycorrhizal fungi and the host roots under congenial environment. It might be due to the fact that higher temperature during summer affects the pre-infection stage of the establishment of mycorrhizal symbiosis and increases the number of entry points in the host root. Higher light intensity in summer may well be a causative factor for enhanced development of infection peg which in turn may lead to the development of an increased number of arbuscules.

CONCLUSION:

The significance of VAM in augmenting food production is increasingly appreciated. Despite the multidimensional importance of mycorrhizae in agriculture and forestry, little work has been done regarding their distribution, diversity and association with the host plants in India. The enhancement of growth and vigour and increasing in production of bioactive compounds of the medicinal plants is

desirable which may be achieved by inoculation of the roots with arbuscular mycorrhizal fungi. There is a steady increase in the cultivation of medicinal plants to maintain a steady supply to support the increasing demand but corresponding researches of VAM fungi and their association in medicinal plants have received very little attention as compared to the studies on forest species and field crops. So a vast research on this field is necessary for a better tomorrow.

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