Arbuscular Mycorrhizal Association and Its Influence on *Arachis Hypogea* L

Rangnath Aher

***Abstract*—**Present investigation conducted on *Arachis hypogea* Linn to study the association of VAM and its influence on vegetative parameters. Among various oil seed crops Arachis *hypogea*, L is an important crop. Seedling growth and vigor of various oil seed crops raised in pots were evaluated after inoculating nursery soil with four cultures of vesicular arbuscular mycorrhizal fungi. Four VA mycorrhizal fungi were tested for their ability to increase the growth, biomass by colonization of roots. Among the four VA mycorrhizal fungi (*Glomus fasciculatum, Glomus geosporum, Scutellispora nigra* and *Scutellispora* Sp.) *Glomus fasciculatum* was most effective in increasing the shoot and root growth, dry weight, % infection over control. VA-mycorrhizal fungi inoculated seedlings grew faster and healthier than uninoculated seedlings. Eighteen types of AMF spores belonging to four genera, namely *Acaulospora, Glomus, Gigaspora,* and *Scutellispora.* Out of these *Glomus* and *Scutellispora* were commonly found in rhizosphere soil.

Keywords*—Arachis hypogea, Glomus, Scutellispora,* VAM, Vegetative parameters.

I. Introduction

MYCORRHIZA is symbiotic association between fungi and plants. AM fungi are important symbionts in terrestrial plants, by infecting plant roots and extending hyphae into the soil they increase the absorptive area of the root system and the delivery of nutrients to the plant. Frank (1887) described the mutualistic association of plant roots and fungus for which the term "Mycorrhiza" he has coined. The involvement in mineral uptake from soil, they referred as 'phosphorus gathering fungi'.

Mycorrhizal fungi are well distributed in every environmental condition and do not show physiological specialization. Now a days lot of problems appears in the agriculture like soil pollution, plant diseases, low productivity etc. therefore to solve these problems the VAM fungi plays an important role in sustainable agriculture. Hence this project taken for the present investigation.

The oil seed crops consist of groundnut, castor, linseed, mustard, sunflower, safflower etc. The total annual production of oilseed is about 11 million tons, accounting for about 10% of India's agricultural economy. *Arachis hypogea*, L. this is the most important oilseed crops in India covering nearly half of area under oil seeds. Being a legume it is also valued for its nitrogen fixing capacity through the root nodule crop rotations followed all over the country.

Importance of the AM fungi has received considerable attention in the recent years owing to their beneficial response in improving crop productivity (Abdel-Fattah, 1997; Raverkar and Tilak, 2002; Delfin, Paterno, Ocampo, *et.al.* 2003; Klironomos, Mc Cune, and Moutoglis, 2004; Goswami, Jamaluddin, and Dadwal, 2005). Hence in the present investigation, an extensive survey on distribution of various AM fungi in rhizosphere of different groundnut cultivars being grown in the Parner region of Maharashtra State has been made so as to study the AM fungi diversity in the groundnut cropping fields and its influence on vegetative parameters.

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II. Materials And Methods

Root samples along with rhizospheric soil of groundnut cultivars, of the Parner (M.S.) region were collected during the *Rabbi* season 2006-07. Roots and rhizospheric soil samples were brought to the laboratory in polythene bags and stored at 4^0C and at room temperature, respectively.

Roots of groundnut were washed in water, cleared with 10% KOH, acidified with 1 N HCl, and stained in 0.05% trypan blue in lactoglycerol (Phillips and Hayman, 1970). Quantification of root colonization of the AM fungi was carried out using the slide method (Giovannetti and Mosse, 1980).

Spores of the AM fungi were extracted from rhizospheric soil using wet-sieving and decanting method (Gerdemann and Nicolson, 1963). Quantification of the AM fungal spore density was carried out using the method given by Gaur and Adholeya (1994). Identification of the AM fungi was done using relevant literature (Morton and Benny 1990; Schenck and Perez 1990).

III. Results And Conclusion

The finding of the present investigation bring out clearly indicated that *Arachis hypogea*, L. respond well to mycorrhizal inoculation under pot culture. During the present investigation, the proportion of AMF spores per 50 g. of soil were recorded it is in between 36 to 62. Variable mycorrhizal infection i.e. 60 to 72% was recorded. Eighteen types of AMF spores belonging to four genera namely *Acaulospora*, *Glomus*, *Gigaspora* and *Scutellispora* have been identified. Of these Glomus and *Scutellispora* were commonly found in rhizosphere soil. Seedling growth and vigor of groundnut raised in pots were evaluated after inoculating nursery soil with four cultures of VA-mycorrhizal fungi. Four VA mycorrhizal fungi were tested for their ability to increase the

growth, biomass by colonization of roots. Among the Glomus *fasciculatum*, *Glomus geosporum*, *Scutellispora nigra* and *Scutellispora* Sp. mycorrhizal fungi *Glomus fasciculatum* was most effective in increasing the shoot and root growth, dry weight and % infection over control (Table 2). VA-mycorrhizal fungi inoculated seedlings grew faster and healthier than uninoculated seedlings. A series of closely related processes is presented, by which arbuscular mycorrhizal (AM) fungi contribute to the formation of relatively stable aggregate structures. Fibrous roots and AM fungal hyphae can be viewed as a "sticky-string bag" that contributes to the entanglement and enmeshment of soil particles to form macroaggregates, a basic building block of soil structure. Amongst the identified genera, Glomus and Scutellispora was the most dominant genus. In the present study, two species of Acaulospora, two of Gigaspora, eight of Glomus, and six of Scutellispora were identified (Table 1).

Prasad et.al. (2006) observed distribution of AM fungi in soybean. The treatment of GF showed good effect on shoots and root lengths, compared to the control. This is because of the ability of mycorrhizal plants to utilize the available nutrients efficiently than the non- mycorrhizal plants and mycorrhizal fungi are known to control the root topology in response to soil conditions (Hetrick et al., 1988). Soil pH, moisture and organic carbon were higher in A. hypogea rhizosphere. Soil pH showed positive correlation with colonization. Root colonization was maximum during winter, followed by summer and monsoon. Sporulation of AM species varied with season and age of plant. Increased temperature and moisture level had negative impact on spore populations. Moisture and organic carbon may play a major role in arbuscular mycorrhizal colonization but low temperature and moisture are the main factor for sporulation for most of AM species especially Glomus and Scutellispora (Aher et al., 2012). Kanade and Bhosale (2013) also observed the positive influence of VAM on vegetative and reproductive parameters of *Dolichos lablab*, L.

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TABLE I
INFLUENCE OF VA MYCORRHIZAL FUNGI ON THE GROWTH OF *ARACHIS HYPOGEA*, L.

Treatment	***VAM Spores/50g. soil**	***Percentage infection**	***Fresh weight (S & R) (g)**	***Dry weight (S & R) (g)**	***Height (Cm.)**
Soil + *Glomus fasciculatum*	70	72	28.18	20.88	11.88
Soil + *Glomus. geosporum*	56	64	26.88	18.16	11.0
Soil + *Scutellispora. nigra*	54	58	25.10	19.12	10.60
Soil + *Scutellispora*. Sp.	60	52	26.08	18.98	10.60
Control (Sterile soil)	-	12	24.10	17.88	10.4

S & R – Shoot and Root * Average value

TABLE II
ASSOCIATION OF ARBUSCULAR MYCORRHIZAL FUNGAL SPORES IN RHIZOSPHERIC SOIL

AM fungal species	
Acaulospora foveata *Acaulospora laevis* *Glomus albida* *Glomus fasciculatum* *Glomus geosporum* *Glomus aggregatum* *Glomus constrictum* *Glomus macrocarpum* *Glomus intraradices* *Glomus epigacium*	*Gigaspora gigantean* *Gigaspora margarita* *Scutellispora nigra* *Scutellispora auriglobosa* *Scutellispora heterogama* *Scutellispora gilmorei* *Scutellispora dipapillosa* *Scutellispora corolloidea* *Scutellispora minuta*