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RESEARCH ARTICLE

STUDY ON THE DIVERSITY OF AM FUNGI IN CULTIVATED FIELD PLANTS OF THIRUVARUR DISTRICT

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ABSTRACT

The rhizosphere soils and ten dominant plant species in cultivated field were tested for the occurrence and distribution of vesicular and arbuscular mycorrhizal fungi and determined the impact of the physic chemical factors in relation to the quantitative and qualitative assessment of AM fungi in soils. The 12 species of AM fungi belonging to three genera viz., *Glomus*, *Gigaspora* and *Aculospora* were observed and conformed. Out of three, *Glomus* sp was noticed as a most dominant colonization in cultivated soils. In 10 plant species were selected from the study sites, all root are infected of AM fungi.

INTRODUCTION

Arbuscular mycorrhizae (often more conveniently called Arbuscular mycorrhizae, or AM), affect everything from nutrient uptake to inter-species communication in plants. Arbuscular mycorrhizae are the most common of a group of symbiotic fungi that infect plant roots. Because Arbuscular mycorrhizae are so common and so important, they have been rather intensely studied. Mycorrhizae are symbiotic associations essential for one or both partners, between a fungus (specialised for life in soils and plants) and a root (or other substrate-contacting organ) of a living plant, that is primarily responsible for nutrient transfer.

Mycorrhizae occur in a specialized plant organ where intimate contact results from synchronized plant-fungus development. AM fungi are members of the kingdom fungus and they are the most important component of natural resource and agricultural (Smith and Read, 2008; Tahat *et al*., 2010). Medicinal and aromatic plants (MAPs) are used in various systems of medicines in different parts of the globe. Mycorrhizae is considered as a fundamental part of the plant as 95% of all plant species could not survive without it (Frank Synder *et al*., 2001).

Mycorrhizas were traditionally classified into the two types: ectotrophic and endotrophic, a classification based on the location of the fungal hyphae in relation to the root tissues of the plant; *ecto* means outside the root, *endo* means inside. The major advantage that a mycorrhizal association confers to plant and fungus is the enhanced supply of nutrients that would not normally available to plant roots. Carbon, phosphorus and nitrogen are transferred in the largest quantities, and these are discussed in the nutrients section.

However, mycorrhizas also have other beneficial effects, especially for the plant partner. Mineral nutrients such as potassium, calcium, copper, zinc and iron are also assimilated more quickly and in greater amounts by mycorrhizal plants. The fungal sheath can also aid plants growing in soils with high concentrations of heavy metals. Zinc, cadmium and arsenic have both been found in high concentrations in fungal sheaths and it is thought that certain mycorrhizal isolates accumulate and immobilize heavy metals in hyphae of their fungal sheaths. In this way, metals are unable to reach plant tissues and the plant remains undamaged.

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MATERIALS AND METHODS

Three different localities of Thiruvarur district, Tamil nadu were selected for the study of mycorrizihal status of cultivated field. Selected sites were Idumbavanam, Thiruthuraipoondi and Manali. At each study sites, 10plants were selected individually for sample collection. At each site an area of $3m^2$chosen for sampling. All the study sites, the root samples and rhizosphere soils were collected. The soil samples were tested for physico-chemical characteristics by standard method (Jackson, 1973). The soil samples were examined for AM spore numbers after wet sieving and decantation method (Gerdermann and Nicolson, 1963). The root samples were cleared with 10% of KOH and stained with Tryphan blue in Lactophenol (Phillips and Hayman, 1970).Altogether, AM fungi were isolates brought in to pot culture experiment. After the plants were 90 days old, the spores and sporocarps were reisolated for identification (Schenck and Perez, 1988).The experiment was designed in completely randomized design with 3 replications. The experimental data were analyzed using SPSS software 21.0 version (SPSS Inc., Chicago, IL, USA).

RESULT AND DISCUSSION

The soil samples analyzed for physico-chemical properties of the soil at three sites (Thiruthuraipoondi, Idumbavanam and Manali) are presented in Table 1. The three soil localities were clay and sand respectively. The total soil element varied slightly and levels of the total N, available P and K were given by Anonymous (1988).

Table 3 Per cent root colonization, spore density of AM fungi in different plants root

S. No	Plant name	Study sites	% of root colonization	AMF spore No/100g of soil
1	*Aerva lanata L. A.L.Juss*	S 1	29±1.4	335±6.6
		S 2	20±1.0	367±5.4
		S 3	32±1.4	304±4.8
2	*Acalypha indica L.*	S 1	62±2.8	415±4.9
		S 2	55±1.4	382±6.7
		S 3	45±1.4	311±5.8
3	*Abutilon indicum L. Sweet.*	S 1	65±2.8	498±8.3
		S 2	42±1.1	485±6.0
		S 3	60±1.1	528±7.7
4	*Eclipta prostrata L.*	S 1	83±1.4	660±2.9
		S 2	80±2.9	710±8.8
		S 3	75±1.7	627±4.6
5	*Biophytum sensitivum L.*	S 1	45±1.1	392±3.5
		S 2	42±1.0	530±4.4
		S 3	40±1.7	395±4.4
6	*Mimosa pudica L.*	S 1	45±1.4	405±2.9
		S 2	56±1.5	480±5.8
		S 3	38±2.4	302±3.5
7	*Cynodon dactylon L. Pers.*	S 1	42±1.4	389±4.7
		S 2	40±2.0	475±4.4
		S 3	35±1.1	403±7.2
8	*Phyllanthis amarus L,. pers.*	S 1	42±1.1	488±3.7
		S 2	-	-
		S 3	40±2.3	403±8.0
9	*Croton bonplandianus Bail.*	S 1	42±1.1	408±3.8
		S 2	55±1.4	518±3.7
		S 3	38±1.1	360±2.9
10	*Cardiospermum halicacabum L.*	S 1	52±1.0	451±5.5
		S 2	60±1.7	490±6.0
		S 3	-	-

S 1 Thiruthuraipoondi, S 2- Idumbavanam, S 3 Manali

Table 1 Physico chemical characteristics of cultivated soils of three different sites at Thiruvarur District

Study site	Soil type	pH	Ecs(dsm^{-1})	OM(%)	OC(%)	N(Kg/ac)	P(Kg/ac)	K(Kg/ac)	Zn(Kg/ac)	Cu(ppm)	Fe(ppm)	Mn(ppm)	Exchangeable base(C. Mole $Proton^{+}$/kg)			
													Ca	Mg	Na	K
S I	Clay	7.25	0.34	0.5	0.25	106.4	6.5	125	0.89	0.75	4.58	2.36	15.5	7.9	1.45	0.26
S II	Sand	7.25	0.38	0.52	0.26	98.7	3.78	163	1.26	0.84	4.21	2.19	14.6	7.4	1.25	0.24
S III	Sand	7.32	0.34	0.56	0.28	109.6	4.09	120	10.15	0.75	4.18	2.41	17.2	8	1.23	0.24

S 1 Thiruthuraipoondi, S 2- Idumbavanam, S 3Manali

Note: **General nutrient status of the soil (Anonymous, 1988)

N	P_2O_5	K_2O	
low	<140	<24.2	<140
Medium	141-280	24.3-32.2	140.8-281.6
High	>280	>32.3	>281.6

Table 2 List of plants collected from different sites of Thiruvarur district

S .No	Plant Species	Thiruthuraipoondi	Idumbavanam	Manali
1.	*Aerva lanata L. A.L.Juss*	+	+	+
2.	*Acalypha indica L.*	+	+	+
3.	*Abutilon indicum L. Sweet.*	+	+	+
4	*Eclipta prostrata L.*	+	+	+
5.	*Biophytum sensitivum L.*	+	+	+
6	*Mimosa pudica L.*	+	+	+
7	*Cynodon dactylon L. Pers.*	+	+	+
8.	*Phyllanthis amarus L,. pers.*	+	-	+
9.	*Croton bonplandianus Bail.*	+	+	+
10.	*Cardiospermum halicacabum L.*	+	+	-

(+) Present (-) Absent

Total 10 plants were selected from three different study sites (Table 2). The spore density and AMF root colonization significantly differ between the study sites. The percentage of root colonization in plants ranged from 20 to 83 respectively. The maximum root colonization was observed in *Eclipta prostrata* (83%) plant collected from Thiruthuraipoondi and minimum percent root colonization noted in *Aerva lanata* (20%) plant of Idumbavanam study sites. The spore number varied from 302 to 720 per 100 g of soil (Table 3).

The different AM fungal species associated with the study plants. The colonization of AM fungal species isolated from the study sites belonging to three genera viz., *Acaulospora*, *Glomus* and *Gigaspora*. The dominant species isolated from the *Glomus* sp in the soil. G.fasciculatus was the predominant symbionts such dominant AM species have also been reported in agricultural soils.

Table 4 Studies on species richness of AM fungi in different plants of rhizosphere soil

S.No	Study sites	Associated AM fungal species	Positive for AM fungi in roots
1	Thiruthuraipoondi	ABRT, ASCB, LAGR, LABS, LDST, LMSS, GMRG	*Gigaspora margarita*
2	Idumbavanam	LABS, LAGR, LDST, LFSC, LMSS, GMRG	*Glomus fasciculatum*
3	Manali	ABRT, ASCB, LAGR, LABS, LMSS, GMRG, LDST	*Glomus mosseae*

ABRT- *Acaulospora bireticulata*, ASCB- *Acaulospora scrobiculata*,
LAGR- *Glomus aggregatum*, LABS- *Glomus ambisporum*,
LDST- *Glomus deserticola*, LMSS- *Glomus mosseae*,
GMRG- *Gigaspora margarita*, LFSC- *Glomus fasciculatum*

It is concluded that the *Glomus* is more dominant AM fungal species in agricultural soil. It effectively in uses the growth and biomass of crop plants.

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