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Status of ArbusclularMycorrhizal (AMF) Fungal Association In*Chrysanthemumindicum*L.

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ABSTRACT

Chrysanthemumindicum is a perennial herb is an ornamental plant of Asteraceae with great variety flowers having different colours of cultivars of the same throughout the world along with some edible and much more medicinal uses. Arbuscularmycorrhizalfungal (AMF)having present in cortical cells of different plants which increases the minerals like phosphorus absorbing capacity of plants is also associated.*Chrysanthemumindium* found variation in % root colonization (58±2.01-89±0.12%) from tested sites.Types of root colonization like, vesicles andhyphal types are observed in all sites. Study carried out the large spore density (1052±2.11/100g soil) from Naldurg site followed byItkal(776±2.11/100g soil) and AM fungal propogulesi.e*Glomus*and *Acaulosporaare*found dominant.

Keywords*:Chrysanthemumindicum,*Root colonization spore density, AMF species

INTRODUCTION

Chrysanthemum isan ornamental and perennial herb with alternate compound leaves with toothed margin. Florets are of white, yellow, and red with a great variety of colours. Nature has given a wealth of wild flowers and ornamental plants and theseplants have served for human adornment for millennia. Flowers are showey with various colours and forms of heads which are decorative. It hasan about 140 cultivars and used in various exhibition. Exhibition varieties are not sturdy. Plants can be used to create amazing fans, hanging baskets, topiary, bonsai and cascades. Flowers are boiled to make tea called *Chrysanthemum* tea. Flowers may be added to dishes to increase the aroma. Plants are economically important as natural insecticides. Flowers containpyrethrins. Pyrethrin attacks nervous system of insects and inhibits female mosquitoes from biting, so used as insect repellent. Plants are biodegradable. Plants reduce indoor air pollution. Ornamental plants are plants that are normally grown for ornamental purpose and not expected to be used for their nutritional value. These plants have

enormous contribution towards horticultural industry and play important role in our daily life (Chandler, 2013).

Mycorrhizal symbiotic association is a highly evolved mutually beneficial relationship found between AM fungi and plants. The benefit of AM fungi to plants is mainly attributed to their ability to increase plant uptake especially phosphorus (P) and other non-mobile soil nutrients. Mycorrhizae establish symbiotic relationships with plants and play an important role in plant growth, disease protection and increasing soil quality (Muthukumar and Udaiyan, 2000).The P deficiency is widespread in tropical soils in existing soils and under such drought conditionsthe AM pays towards uptake ofP (Smith et al.,2003**).** The ArbuscularMycorrhizal Fungal (AMF) association is known to improve plant growth through better uptake of nutrients and tolerance to drought and salinity condition (Harley and Smith, 1997).AM fungi are a fungal biofertilizer and it is the most promising; it is extensively used to enhance the growth in different crop plants (Inchal and Lakshman 2006).This concept has been reported for field-grown crops as well as ornamental plants including basil (Gupta et al., 2000), marigold (Robert et al., 2003 and medicinal and aromatic plants (Hossein et al., 2009).Growth of Am fungihyphaeiscontrolled by host root exudates, therefore the present investigation was madeof AM fungal association in *Chrysanthemum indicum*L.

MATERIALS AND METHODS

Roots and soil samples were collected from 5 different study sites of home garden. By shaking the roots, rhizospheric soil was collected in polythene zip lock bag. Rhizospheric soil was put into a polythene bag and stored in a polythene bag till processing. Roots were washed gently and stored in Formalin Acetic acid Alcohol (FAA). (Kormanik etal., 1982)

Roots were thoroughly washed in water and boiled in 10% KOH, washed in distilled water, acidified with (1N) HCL and stained in 0.05% Trypan blue. Stained root segments were mounted in polyvinyl alcohol-lactic acid glycerol (PVLG) (Phillips and Haymann, 1970). Roots were observed under binocular microscope 400 × (Lawrence & Mayo LM-52-3621). The Root colonization was calculated by formula.(Giovannetti and Mosse, 1980)-

$$\% \text{ Colonization} = \frac{Total\ number\ of\ root\ segments\ colonized}{Total\ number\ of\ root\ segments\ examined} \times 100$$

Hundred grams of soil sample was taken in 1000 ml distilled water in a conical flask. Suspension was shaken and after 5 min floating spores were collected by wet sieving and decanting method (Gerdemann and Nicolson, 1963). Spore density was studied from different places of study region. Identification of AM fungal spores was carried out based on morphotaxonomic criteria using INVAM International Collection of Vesicular ArbuscularMycorrhizal (http://invam.wvu.edu/the-fungi) and available manuals (Schenck and Perez, 1990; Rodrigues and Muthukumar, 2009). The voucher specimens of AM fungi were

deposited in Department of Botany, Arts, Science and Commerce College Naldurg, Maharashtra, India.

All data were statistically analyzed and the significance of differences was determined by using book (Mungikar, 1997**)**.

RESULTS AND DISCUSSION

Roots and soil samples were collected from 5 different study sites and revealed the data (Table 1 & Fig 1) .In the present study, *Chrysanthemum*, showed varied degree of mycorrhizal colonization from all tested sites. The high root colonization may be due to ecological conditions. *Chrysanthemum indium* found variation in % root colonization (58-89%) from tested sites. The highest root coolonization was found in Naldurg sites i.e89±0.12% followed by Itkal (77±3.01%). Types of root colonization like, vesicles and hyphal types are observed in all sites, but arbuscles are found from Naldurg sites. Study carried out the large spore density (1052±2.11/100g soil) from Naldurg site followed by Itkal(776±2.11/100g soil).AM fungal propogulesi.e*Glomus*and *Acaulospora*arefound dominant from all tested sites.

Table 1.Status of AMF root colonization and spore density of *Chrysanthemum indicum* from different localities.

Study Site	Location	Root Colonization (%)	Type of Root colonization	Spore Population/ (100gm soil)	AM fungal Genera
Naldurg	17.82^0 N,76.30°E	89±0.12	H,V,A	1052±2.11	*Glomus, Acaulospora*
Andur	16.60° N, 73.94° E	69±2.11	H,V	698±4.21	*Glomus, Acaulospora*
Solapur	17.65° N, 75.90° E	63±1.99	H,V	602±4.11	*Glomus, Acaulospora*
Itkal	17.76^0N,76.14^0E	77±3.01	H,V	776±2.11	*Glomus, Acaulospora*
Jalkot	17.82° N, 76.33°E	58± 2.01	H,V	522±2.00	*Glomus, Acaulosporass*

Values are Means of three replications,± Standard Error

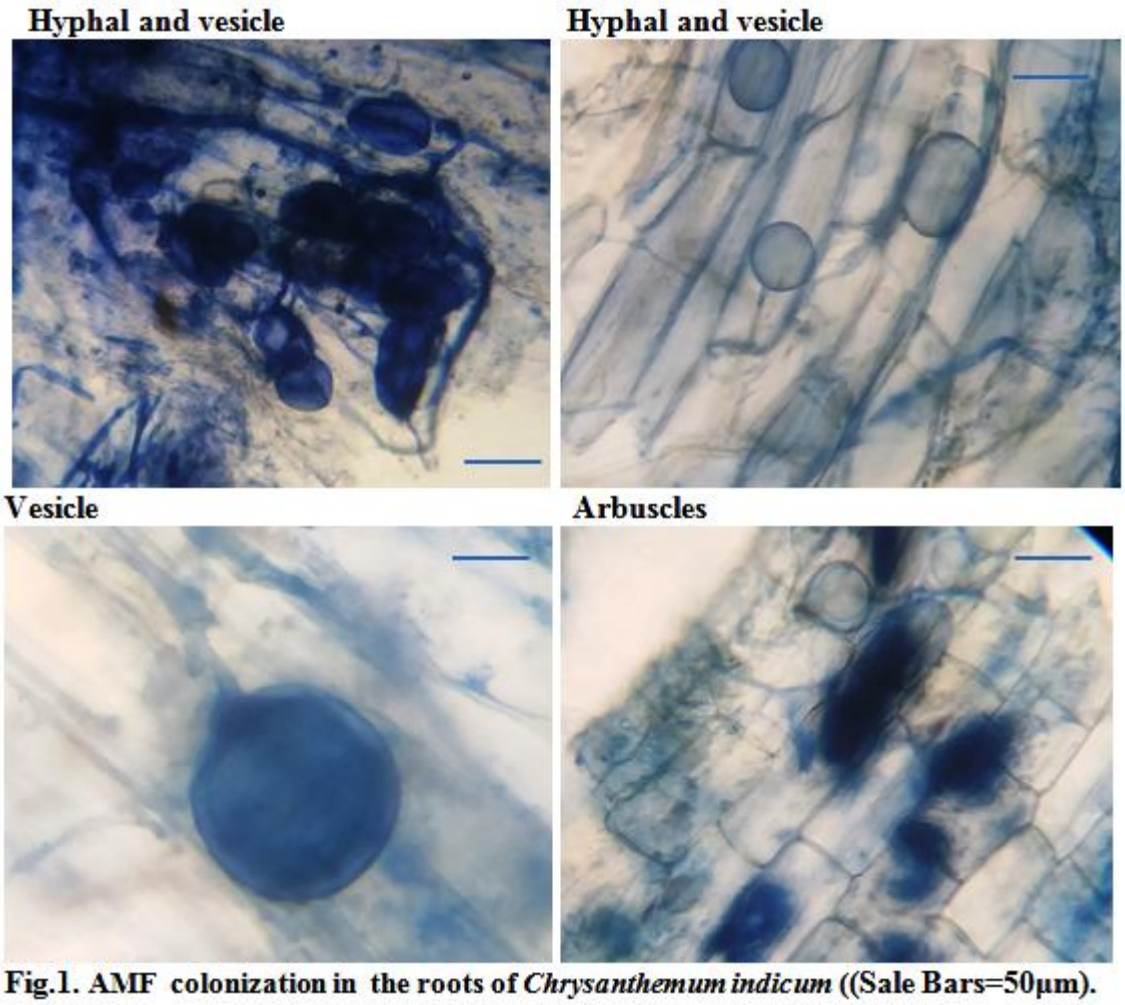

Fig.1. AMF colonization in the roots of *Chrysanthemum indicum* ((Sale Bars=50µm).

The presence of AM roots at all the study sites and root colonization intensity reveals that the AM association is naturally established as reported in earlier studies. It was investigated roots of 107 medicinal and aromatic plants from the Western Ghats region of Southern India for Arbuscularmycorrhizal (AM) and darkseptateendophyte (DSE) association and found significant results (Muthukumaret al.2006). It was not much is known whether*Petunia*sp form mutualistic association with AM fungi was reported by many earlier workers (Gaur et al., 2000; Shamshiri et al., 2012; Reddy et al., 2009).Study results were also supported by results of Burni and Hussain (2011) in families like *Alocasiaindica* (100%), *Cynodondactylon* (50%), *Cymbopogon*sp(50%), *Euphorbia milli* (100%), *Senegaliasenegal* (80%), *Gardenia jasminoides* (75%) and *Cesturnumnocturnum* (100%). Our results matched with the results of Silva and Yapa (2010), who have reported maximum root colonization in *Asparagus racemosus*. It was investigated thatArbuscularMycorrhizal Fungi (AMF) spore population and root colonization in 25 different ornamental families (35 species) collected

from District Charsadda, at early winter and summer seasons andthe spore density of AMF ranged from 23-80% and root colonization from 0-100% was recorded.Mosthorticultural plants are colonized by AMF whosepresence can enhance the growth of the host plant (Ortas and Verma, 2008).

CONCLUSION

It is concluded from the results that the level of AM fungal association in *Chrysanthemum indicum*was higher in Naldurg samplesthan other sites.*Glomus*and*Aculospora* was found dominant. When spore numbers were high, the percentage colonization was also low but as spore number began to let-down when the colonization increased. Flowering stage showed highest intensity of AM colonization and spore population, it means the successful interaction of the plants with AM fungi.

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