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DIVERSITY OF AM (ARBUSCULAR MYCORRHIZAL) FUNGI IN RHIZOSPHERIC SOIL OF WHEAT FIELDS OF PARNER TAHSIL

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ABSTRACT:
AM (Arbuscular mycorrhizal) fungi are important components of biodiversity in the agricultural fields in India. To study their diversity the soil samples from different localities were collected to find out abundance of specific species of mycorrhiza in rhizospheric soil and analyzed for the study of soil parameters as well as isolation of spores, microscopic observation and identification of AM spores of wheat field. AM spores were isolated, collected and quantified. Different species of *Gigaspora, Glomus and Scutellospora* were identified from soil in the present study. The *Glomus mosseae* species was dominant than other observed species of *Glomus* as well as all the species of *Gigaspora and Scutellospora*.

Keywords : *AM fungi, Diversity, Wheat, Parner Tahsil*

INTRODUCTION:

Arbuscular mycorrhizal fungi (AMF) belong to class Zygomycetae under order Glomales. They show symbiotic association with roots of terrestrial plants belonging to approximately 80% of plant families worldwide. Remarkable work has been done in India on the distribution of AM fungi in agricultural fields, forest soil and many other horticultural fields (Kulkarni, 2007). Mycorrhizae are primarily categorized into two types, ectomycorrhiza and endomycorrhiza, based on the type of fungi involved and changes in the morphogenesis of fungi and roots (Harley and Smith, 1983). Endomycorrhiza type basically falls in three categories (Wilcox, 1991): (i) Ericaceous mycorrhizae, (ii) Orchidaceous mycorrhizae, (iii) Arbuscular mycorrhizal fungi. Arbuscular mycorrhizal fungi are characterized by the presence of intracellular hyphae in the primary cortex which form vesicles and arbuscular later on. Vesicles are thin-walled or thick-walled globose to subglobose, irregular shaped structures. Earlier, the name Vesicular Arbuscular Mycorrhizal (VAM) fungus was used, but since not all the groups produce vesicles, the term AMF is preferred (Friberg, 2001). Some of the important genera of AMF are *Glomus, Acaulospora, Gigaspora, Scutellospora, Enterophospora* and *Sclerocystis*. In India, 106 species of 6 dominant genera of AMF have been reported which are more abundant in cultivated than in non-cultivated lands. They are found in all kinds of soil but more where chemical fertilizers are not used. These fungi are represented by 60 species of *Glomus,* 14 species of *Acaulospora,* 12 species of *Gigaspora,* 15 species of *Scutellospora,* 3 species of *Entrophospora,* 2 species of *Sclerocystis* (Gupta and Mukerji, 2001).

The presence of AM fungi increases the overall absorption capacity of roots, mobilization and transfer of nutrients and tolerance of roots to soil born pathogen. The most important benefits of mycorrhizae are the increase in the phosphorus uptake by the plant. It is evident from their effects upon soil health and host plant growth that AM fungi are an important part of sustainable agricultural systems. The general process of phosphorus uptake consists of three sub-processes; (i) absorption from soil by AMF hyphae, (ii) translocation along the hyphae from external to

internal (root cortex) mycelia, (iii) the transfer of phosphate to cortical root cells (Barea, 1991). The extensive extrametrical hyphae of AMF extend out into the soil for several centimeters so that it bridges the zone of nutrient depletion.

AMF associated plants have increased nitrogen content in shoots. The hyphae of AMF have the tendency to extract nitrogen and transport it from the soil to plants. AM improves growth, nodulation and nitrogen fixation in legume-*Rhizobium* symbiosis. AMF hyphae improve nitrogen transfer in communities, since the network of AM mycelia links different plant species growing nearby and helps overlap the pool of available nutrients for these plants. AMF are able to alter plant physiological and morphological properties in a way by which plant can handle the stress (Miransari *et al.*, 2008). AM fungi facilitate better survival of plants under stress conditions through a boost up in uptake of nutrients particularly P, Zn, Cu and water. Thus AMF make the host resilient to adverse conditions created by unfavorable factors related to soil or climate. This study aims improving and understanding the distribution and diversity of AM fungi in different wheat growing fields of Parner Tahsil.

MATERIALS AND METHODS

Soil analysis of different localities

Rhizosperic soil samples were collected from four places like, Kanhur Pathar, Loni Haveli, Nighoj and Supa village of Parner tahsil, Ahmednagar district. AM fungal spores of the collected soil samples were isolated by following method.

Isolation of AM spores

A. Wet sieving and decanting method (Gerdemann and Nicolson, 1963)

Mixed 50 g of soil in 200 ml of water in a large beaker until all the soil aggregates dispersed to form a uniform suspension. Allowed the heavier particles to settle down. Decanted most of the suspension through different sieves like 1 mm, 250 µm, 75 µm and 45 µm consecutively. Wash each sieve and collect the debris on filter paper. Most of the spores were collected from 100 um and 75 um sieves.

B. Mass collection of VAM spores (Mertz *et al.*, 1979)

Chemical used 30% sucrose solution. Collected soil expected to contain large number of mature spores and stored at 4^0c. Wet-sieved and decanted bulk amount of soil with cold water. Collected the spore fraction with debris between 425 µm and 250 µm sieves. Removed subsequently the debris by decanting. Gently took the debris in water in wax coated (on sides) petri plates. Due to gravity, debris got settled and spores floated on the surface. Decanted the supernatant water and collected the spores in cold water. These spores were used for inoculum production.

C. Estimation of VAM spores (Adholeya and Gaur, 1994)

A filter paper (Whatman No. 1, 11 cm diameter) was taken and given a horizontal fold followed by a second vertical fold. The filter paper was opened. Two lines were drawn do divide the filter paper into four equal quadrants. Vertical lines were drawn to divide the filter paper into four equal quadrants. Vertical lines were drawn on one half on the filter paper so as to divide it into approximately twenty columns, each column about 0.5 cm. Each column was numbered and the direction of counting marked. Soil suspension was filtered and the spores were collected only on the marked surface of the filter paper and rest of the filter paper was retained without spores. This filter paper with the sample spores was spread on a bigger petri plate. Care was taken that spores

did not go off the filter paper during spreading. Spores were counted from each column under a binocular and the sum total of all columns was made given in the 'Manual for identification of VAM fungi' by Schenck and Perez (1987, 1990) as well as 'Revised Synoptic Key' of Berch and Trappe (1991). Standard transparencies of Hall and Abbott (1981) were also used in aiding identification. Photomicrographs were taken by using Magnus compound microscope and eye piece mount camera (Pearl AB-14 B).

RESULT & DISCUSSION:

Diversity of AM fungi

The AM fungal species present in agricultural fields are constantly subjected to human intervention. In the present study different species of *Glomus* (*Glomus aggregatum*, *G. australe*, *G. claroides*,and*G.mosseae*); *Gigaspora* (*Gigaspora decipens* and *G. candida*) and *Scutellospora* (*Scutellospora dipapillosa*, *S. calospora* and *S. gilmorei)* were identified in the rhizospheric soil of *Triticum aestivum* collected from four different localities. The photographs of representative AM fungal species observed in rhizospheric soil are depicted in Figure 1. The *Glomus mosseae* species was dominant than other observed species of *Glomus*, as well as all the species of *Gigaspora* and *Scutellospora*.

There are about 34 different species were reported from 11 wheat growing agro-climatic regions of India (Singh and Adholeya, 2013). During the present research work under genera *Glomus*, *Gigaspora* and *Scutellospora* , only eleven AM fungal species were isolated from the rhizospheric soil samples. The possible explanation for the observed reduction in number of mycorrhizal species found may be that the cultural practices probably exert strong selective pressure on AM fungal communities. Among the observed species, *G. mosseae* is found to be dominant species. These finding were similar to the findings of Damodaran *et al.* (2010) which reported spores of all these species present in rhizospheric soil of cotton cultivars. Recently Sarkar *et al.* (2016) identified and recorded close association of different species of *Glomus*, *Acaulospora*, *Gigaspora* and *Scutellospora* with the roots of *Citrus* plant.

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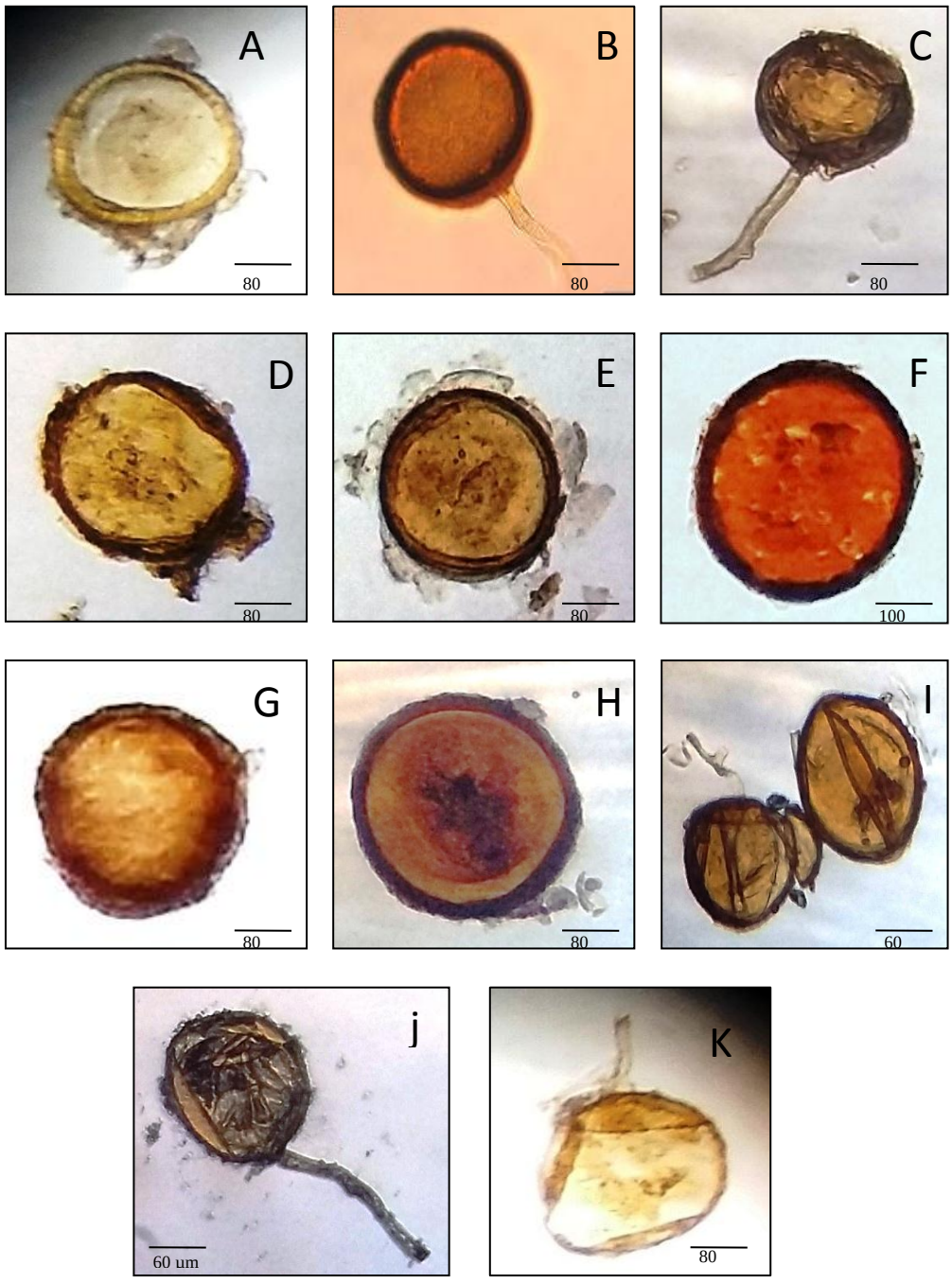

Figure 1: Representative of AM fungal species observed in rhizospheric soil. (A) *Glomus australe; (B) Glomus mosseae*; *(C) Glomus aggregatum*; (D) *Glomus* spp. (E) *Glomus claroides*; (F) *Gigaspra* spp.; (G) *Gigaspora decipens*; (H) *Gigaspora candida*; (I) *Scutellospora dipapillosa*;(J) *Scutellospora calospora*; (K) *Scutellospora glmorei*.