

Occurrence and Enumeration of Arbuscular Mycorrhizal Fungi in *Glycine max* (L.) Merr.

N. B. Mane¹, P. D. Sagare², C. J. Khilare³

Department of Botany, Yashvantrao Chavan Institute of Science, Satara (Autonomous)

Corresponding author: [nbmane123\[at\]gmail.com](mailto:nbmane123[at]gmail.com), [sagarepooja157\[at\]gmail.com](mailto:sagarepooja157[at]gmail.com), [cjkprincipal\[at\]rediffmail.com](mailto:cjkprincipal[at]rediffmail.com)

Abstract: Arbuscular Mycorrhizal Fungi is used for crucial importance for their efficient use in environmental conservation and sustainable agriculture. Present research work showed occurrence and enumeration of AMF in *Glycine max* (L.) Merr. We surveyed rhizospheric soil samples from Tasgaon area of Sangli District of Maharashtra state India. Screening of soil samples depicted nine AM fungal taxa belonging to 3 genera based on spore were isolated from *Glycine max*. The dominant was present *Glomus*, *Acaulospora* and *Scutellospora*. AM fungi were isolated *Glomus geosporum* (Nicol. & Gerd.) C. Walker, *Glomus multicaulis* Gerd. & B. K. Bakshi, *Glomus macrocarpum* Tul & C. Tul., *Glomus constrictum* Trappe, *Glomus crenatum*, *Glomus* spp., *Acaulospora laevis* (Walker & Sanders), *Scutellospora* spp Walker & Sanders., *Acaulospora scrobiculata* Trappe forming predominant species. Maximum population occurred at 90 days plant than vegetative 30 days plant.

Keywords: Arbuscular Mycorrhizal Fungi, Rhizospheric soil, *Glomus*, *Acaulospora*

1. Introduction

The soybean (*Glycine max* L.) belongs to the family Leguminosae and sub-family Papilionoidae. Soybeans and corn have a range of soluble carbohydrate protecting the seed's cell viability. Since the early mycorrhiza screening trails of Mosse (1973), become more and more obvious that had wide host range, and host preference and their efficiency of improving the nutrition is varying with hosts (Wilson, 1984; Lakshman, 1996). The Vesicular Arbuscular Mycorrhizal (VAM) association with most of the terrestrial plants is perhaps as old as the evolution of terrestrial flora (Tayler et al. 1995). They are ubiquitous in distribution from tropical (Chaurasia and Khare, 2000, 2005). The mycorrhizal association is a beneficial association between the roots of plants and fungi. The occurrence of arbuscular mycorrhizal fungi influences the composition and diversity of the plant community. *Glycine max* is one of the most common crops produced in nurseries. Producing and consuming more soybeans improves the situation of malnutrition as it can provide a nutritious combination of both calorie and protein. Large number of microorganisms inhabits the rhizosphere layer of soil. These microorganisms carry out various types of activities, which are very helpful to plants as well as to the organisms, hence they live in symbiotic association with plants. The most prevalent and widespread type of association is 'Mycorrhizal. Maximum mycorrhizal propagules are concentrated in the rhizosphere. In the present study screening of soil samples was depicted in Tasgaon grown area of Sangali District of Maharashtra state. Ten AM fungal taxa belonging to 3 genera based on spore were isolated from *Glycine max*.

2. Material and Methods

Roots and rhizosphere soil samples were collected and in each samples three replicates were taken from *Glycine max*. Soil samples were brought in laboratory and screening the samples for its physicochemical properties like pH, Moisture content, organic content and macro and micronutrients analysis. Root samples were washed in tap water and cut in

to fine pieces up to 1 cm long. Root samples were cleared and stained with Philips and Hayman technique (1970). Percent root colonization was measured with the help of formula given by Givannetti and Moss (1980) method. 50 gram rhizosphere soil was analyzed for their isolation of AM fungal genera with wet sieving and decanting method Gerdemann and Nicolson (1963). Identification of AM spores was carried with the help of manual of Scenck and Perez (1990), Techniques in Mycorrhizae of Bukhari and Rodrigues (2006), manual of identification of Rodrigues and Muthukumar (2009) and INVAM.

3. Result and Discussion

The physico-chemical characteristics of the soil of study area Tasgaon Dist Sangali of Maharashtra state is recoded pH (6.2) lowest at 60 days, while 8.1 highest at 30 days plant. Moisture content was depicted more (9.13 %) at 30 days plant while (7.9%) less in 90 days. The study of organic carbon was recorded maximum (1.20 %) in 60 days plant and (1.10%) minimum was found in 30 days plant.

The physico - chemical properties of soils varied considerably among the samples particularly with macronutrients were N (0.95-0.20kg/acre), P (3-23 kg/acre), K (60-126 kg/acre) and also with other micronutrients such as Zn (0.35-0.86 ppm), Cu (2.21-3.21 ppm) and Fe (0.21-11.26 ppm). The data of percent root colonization (hyphal, arbuscular and vesicle, soil physico- chemical properties and isolated AM fungi were mentioned in Table no 1 and 2, Fig no 1. The results are depicted in Table no 1 and 2 and fig no 1 showed Maximum (46%) arbuscular colonization was observed in (60) days plant while minimum (6%) hyphal was found in 30 day plant. The minimum total frequency (11%) of colonization was occurred at 60 days plant and maximum (51.9%) was highlighted in 90 days plant. AM fungal population were recorded (67) highest in 90 days and lowest (53) at 30 days plant. The occurrence of Arbuscular Mycorrhizal fungi *Glomus geosporum*, *Glomus multicaulis*, *Acaulospora laevis* recorded at 30 days, *Glomus macrocarpum*, *Glomus constrictum*, *Glomus crenatum*,

Glomus spp at 60 days and after 90 days resulted *Scutellospora spp* and *Acaulospora scrobiculata*. Table no. 2.

Physico-chemical analysis of rhizosphere soils, Dominant AM sps. Spore count and percentage root colonization of *Glycine max*

Table 1: Physico-chemical properties of study sites

| Days | Soil Characters | | | | | | | | |
|------|-----------------|------------|--------------------|-------------------------|----|-----|-----------------------|------|-------|
| | pH | Moisture % | Organic Carbon (%) | Macronutrients, Kg/acre | | | Micronutrients in ppm | | |
| | | | | N | P | K | Zn | Cu | Fe |
| 30 | 8.1 | 9.13 | 1.10 | 0.95 | 7 | 126 | 0.35 | 3.21 | 11.26 |
| 60 | 6.2 | 8.9 | 1.20 | 1.30 | 23 | 60 | 0.86 | 2.21 | 5.16 |
| 90 | 7.6 | 7.9 | 1.19 | 0.20 | 3 | 109 | 0.54 | 2.25 | 0.21 |

Table 2: Percent root colonization, frequency and AM fungi occurred in *Glycine max* at 30, 60 and 90 days plant

| Days | Root colonization % | | | Frequency % | Spore population | List of AM fungi Occurred |
|------|---------------------|------------|-----------|--------------|------------------|--|
| | Hyphal | Arbuscular | Vesicular | | | |
| 30 | 6±1 | 0 | 0 | 12.73± 0.578 | 53 | <i>Glomus geosporum</i> , <i>Glomus multicaule</i> , <i>Acaulospora laevis</i> |
| 60 | 6±1 | 46±1 | 0 | 11.49± 0.23 | 59 | <i>Glomus macrocarpum</i> , <i>Glomus constrictum</i> , <i>Glomus crenatum</i> , <i>Glomus spp.</i> , |
| 90 | 43±1 | 21±1 | 32±1 | 51.9± 0.32 | 67 | <i>Scutellospora spp</i> , <i>Acaulospora scrobiculata</i> |

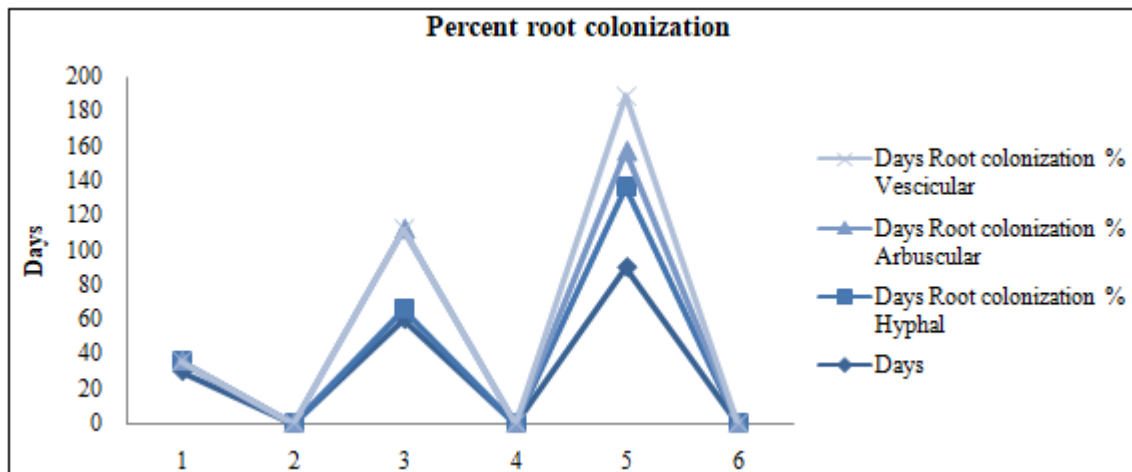


Figure 1: Percent root colonization, occurred in *Glycine max* at 30, 60 and 90 days plant

4. Discussion

Nine AM fungal taxa belonging to 3 genera based on spore were isolated from *Glycine max*. Among all AM fungal species *Glomus* was dominant followed by *Acaulospora* and *Scutellispora* were found poorly distributed. Most plant species were typically mycorrhizal with 4/5 of all land plants forming AM associated (Molloch et al., (1980), Sarvade and Bhale (2011), because of greater efficiency nutrient uptake from soil. Draft and Nicolson (1966). Mycorrhizal symbiosis in terrestrial ecosystems has effect on organic and inorganic plant nutrition acquisition, plant water relation and carbon cycle in plants (Cui and Nobel, 1992. Khade and Rodrigues (2003) studied occurrence of arbuscular mycorrhizal fungi in tree species from Western Ghats of Goa, India and reported a possible reason for small number of arbuscules could be that most of the roots were in an inactive stage at the time of sampling. Arbuscules being ephemeral structures, may be absent if the roots are inactive (Brundrett 1991). In addition, co-existing plants in natural communities may avoid competition for the nutrients by having roots that are active at different times of the year (Veresoglou & Fitter 1984,

Fitter 1986). The present study of *Glycine max* was positive for AM fungal colonization in the roots in study sites. This work also reported by Koske (1987) and reported colonization percentage depend upon environmental condition.

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