IJPS INTERNATIONAL JOURNAL OF PLANT SCIENCES
Volume 7 | Issue 1 | January, 2012 | 32-34

RESEARCH ARTICLE

Seasonal variation in the occurrence of am fungi determined in the soils of Khedgaon and adjacent regions associated with potato (*Solanum tuberosum* L.)

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SUMMARY

Three sites in and around Pune were selected for occurrence of AM fungi. Soil samples were collected at intervals of 30 days from August 2009 – July 2010. The soil samples were analyzed for spore count per 100 g soil sample and roots for per cent root infection. Besides this the biodiversity was estimated. A total of 4 genera and 22 species were isolated and identified. Spore count was seen to be maximum in the month of July for all the three sites whereas minimum was seen in the month of May for site 1 and site 3, but it was minimum in April for site 2. Per cent root infection was maximum in the month of September and December. It was cent per cent for site 2, 90 per cent and 95 per cent for site1, respectively and 95 per cent for site 3.

Key Words **:** AM Fungi, Occurrence, Seasonal variation, Potato

How to cite this article **:** Khanna, Manjusha and Shinde, B.P. (2012). Seasonal variation in the occurrence of am fungi determined in the soils of Khedgaon and adjacent regions associated with potato (*Solanum tuberosum* L.) . *Internat. J. Plant Sci.*, **7** (1) : 32-34.

Article chronicle **: Received :** *15.07.2011;* **Sent for revision :** *05.08.2011;* **Accepted :** *28.10.2011*

Mycorrhizal fungi are normal root symbiotinhabitants which aid plants primarily in uptake of water and mineral nutrients. The degree of exchange between the cortical cells of the host root and fungal endophyte depends largely on the amount of exchange surface and on the inherent efficiency of the endophyte (Biermann and Linderman, 1980). Obligately mutualistic AM fungi have been studied extensively at a global scale, not only on account of their ability to help plant to withstand various kinds of abiotic and biotic stresses but also with their new found role in evolution, ecosystem dynamics and plant community establishment (Manoharachary *et al.*, 2005). The capacity of AM fungi to act as biofertilizers, bioregulators and bioprotectors has repeatedly been demonstrated by Mulongoy *et al.,* 1992; Lovato *et al.,*1994 and Linderman *et al.,* 1992. Thus, they play a key role in sustainable conservation of tropical gene pool and diversity (Herrera, 1970).

To understand the behavior and importance of AM fungi in a particular area, it is necessary to ascertain the quantity and the type of propagules in the soil and also the increase of root infection in the plants and the variation of both parameters with time (Lopez and Honrubia, 1992). The seasonal variation of the mycorrhizal inoculums is an important factor to be taken into account in the practical application of inoculums (Gemma and Koske, 1988). Hence, we choose to estimate the biodiversity and composition of AM fungi present in the soil of the worlds 3rd most important crop – Potato.

MATERIALS AND METHODS

Sample collection and field work:

Three sites were selected in and around Pune for study. Soil samples were collected from all three selected sites:

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Malegaon, Rajgurunagar and Peth. Collection of the soil samples was done after every 30 days from August 2009 – July 2010. Soil samples were preserved in polyethene bags and roots were taken in vials and fixed in FAA. Each collection sample was labeled by preparing codes specific to the site, date of collection, month of collection crop number and stage of plant.

Laboratory work :

The mycorrhizal spores were extracted from the soil samples by wet-sieving and decanting method (Gerdemann and Nicolson, 1963). The sieving were transferred onto Whatman filter paper number 1. The slides were prepared by picking mycorrhizal spores under binocular dissection microscope. Different spore types were mounted on the slide in PVLG (Poly Vinyl alcohol Lacto Glycerol) and preserved for identification and future reference. Isolated AM fungal spores were identified up to species level by using the manual for the identification of VA mycorrhizal fungi (Schenck and Perez, 1990). Assessment of root infection was carried out by Phillips and Hayman (1970) method.

All plant roots were analyzed for per cent root infection in 10 per centKOH by slide± method (Giovannetti and Mosse, 1980). Soil samples were analyzed for spore count per 100 g by making 16 equal sections of Whatman filter paper number 1. All these observations were carried out every 30 days.

All slides were observed under Olympus Trinocular light microscope (CH-20iTR model). Spores were photographed using Digital camera (Canon A 640 model).

RESULTS AND DISCUSSION

A total of 4 genera and 22 species were isolated and identified from the selected sites. The spore count of all the three sites was seen to be maximum in the month of July. Out of which maximum spore count was observed in Site 2 (*i.e.* Malegaon), while minimum was observed in Site 1 (*i.e.* Rajgurunagar).

In Site 1 maximum spore count, *i.e.* 800 spores/100 g soil was observed in the month of July, whereas minimum spores *i.e.* 205 spores/100 g soil was observed in the month of May. In Site 2 the maximum spore count *i.e.* 1300 spores/100g soil was observed in the month of July, whereas minimum *i.e.* 400 spores/100g soil was observed in the month of April. In Site 3 the maximum spore count *i.e.* 843 spores/100g soil was observed in the month of July, whereas minimum spore count *i.e.* 200 spores/100g soil was observed in the month of May.

As seen in Fig. 1. Out of the 4 Genera and 22 species, *Glomus* was most in abundance with 72.7 per cent occurrence. It was followed by *Scutellospora* with 13.64 per cent and *Acaulospora* with 13.64 per cent abundance. *Gigaspora* was found least with 4.55 per cent abundance.

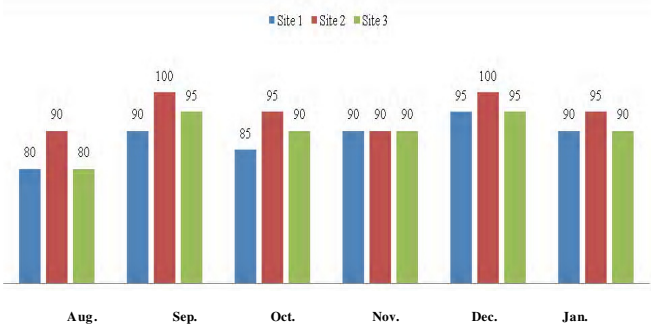

Fig. 1 : Per cent root infection from August 2009 to January 2010 at 3 different sites

Sixteen species of *Glomus* were found in the selected sites which, include *Glomus aggregatum, G. albidum, G. caledonium, G. claroides, G. constrictum, G. dimorphicum, G. fasciculatum, G. geosporum, G. intraradix, G. maculosum, G. microaggregatum and G. mosseae, G. dussii, G. sinuosum* and *G. microcarpa and G. rubiformis. Glomus* spores were found maximum in all soil samples. The spores isolated were in different developmental stages. Three species of *Scutellospora* were reported which include *Scutellospora arenicola, S. heterogama* and *S. pellucida.* All three species were equally abundant in the collected soil samples. Three species of *Acaulospora* found were *Acaulospora foveata, A. dialata* and *A. spinosa*. Out of which *Acaulospora foveata* was most abundant and *Acaulospora dilata* was least abundant. A single species of *Gigaspora* was reported. It was *Gigaspora albida.*

The per cent root infection as shown in Fig. 2 shows a maximum value in the month of September for *Kharif* season (Site1-90%, Site2- 100% and Site3-95%) and December for *Rabi* season (Site1-90%, Site2-100% and Site3-90%).

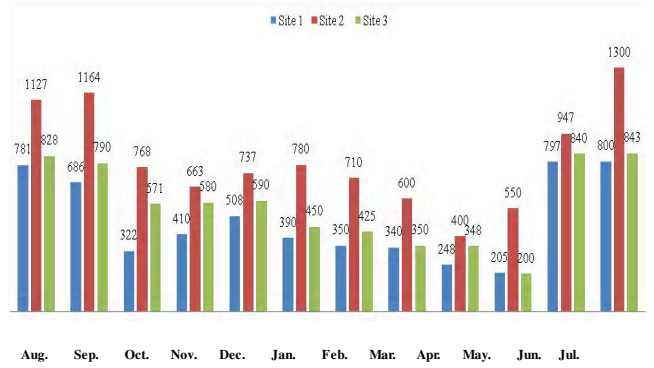

Fig. 2 : Number of AM spores per 100g soil from August 2009 to July 2010 at 3 different sites

Our results show similarity with Lopez and Honurubia (1992), who concluded that the spore density was high during flowering and fruiting condition and later on reduced. Bajwa *et al.* (2001), also performed a similar study and got concurrent results. They observed maximum spore count in the spring

season and consistent decrease in the following seasons. Duin *et al.* (2003), observed similar results while working with halophytes of Dutch salt marsh. Similar results were observed by Sanchez and Honrubia (2003), who studied ecological and seasonal study of VAM in plant species available as forage plants. Also our results showed similarity with the results of Chatterjee *et al.* (2010), when they surveyed three species of *Cassia* for presence of VAM.

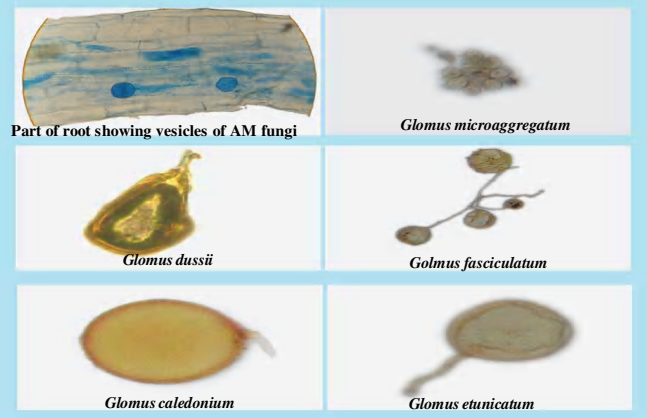

Fig . 3 : Photoplate showing some species of *Glomu*

Conclusion:

Among the soil samples maximum spore count and per cent root infection was observed in Site 2. A total of four genera and 22 species were isolated from the rhizosphere soil of potato plants of the three selected sites. Out of all the genera *Glomus* was most abundant and the occurrence of *Glomus aggregatum* was maximum.

Maximum spore count was observed in plants under flowering condition. Amongst the two crop collections maximum spore count was observed in the first crop *i.e.* the autumn crop than the second crop *i.e.* winter crop. Hence, it can be concluded that maximum spore count was observed in autumn as compared to the colder months.

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