

Occurrence and population dynamics of vesicular arbuscular mycorrhizae in the Indian orchards of litchi (*Litchi chinensis* Sonn), aonla (*Phyllanthus emblica* L.) and banana (*Musa paradisiaca* L.)

R. P. Singh^{1*} and V. Prasad²

¹Department of Soil Science, N. D. University of Agriculture & Technology, Kumarganj, Faizabad (U.P.), India

²Crop Research Station Mosodha, Faizabad (U.P.) India

(Accepted : June, 2006)

Soil samples were collected from the rhizospheres of litchi, aonla and banana orchards to evaluate the population dynamics of VA mycorrhizae. Maximum colonization and spore population of VAM fungi were observed in litchi and aonla orchards planted in Basti and Pratapgarh. However, moderate colonization and spore population were also recorded in Faizabad and Sultanpur districts. Almost same pattern of population dynamics of VAM fungi was also observed in banana orchards of Faizabad and Sultanpur Districts. These VAM fungi were identified as species of *Glomus*, *Endogone*, *Gigaspora*, *Rhizophagus* and *Acaulospora* and population dynamics of VAM fungi was in order of *Glomus* > *Gigaspora* > *Rhizophagus* > *Acaulospora* > *Endogone*. Physico – chemical properties of the soil especially pH, organic carbon, exchangeable sodium and calcium affected the population dynamics and colonization of VA mycorrhizae in the orchards.

Key words : Mycorrhiza, Litchi, Aonla, Banana.

INTRODUCTION

ROOT system in most of the plants form a symbiotic relationship with certain types of fungi and these association are called mycorrhizae. These fungi colonize roots intercellularly (Ecotomycorrhizae) or intracellularly (Endomyeorhizae). Endomycorrhizae are classified into three groups such as vesicular, arbuscular, orchidaceous and ericaceous. Vesicular arbuscular mycorrhizae (VAM) represent the association between fungi and majority of forest trees, agricultural crops and horticultural plants.

In VA mycorrhizae, the fungal hyphae develop special organs, called vesicles and arbuscles within the root cortical cells. These vesicles are food storage organs of the fungus. However, the arbuscles are more or less equivalent to the haustoria of the fungus but are believed to function in bi-directional transfer of nutrients. Mycorrhizal fungi benefit the plant by promoting nutrient uptake and water transport. The phosphorus is absorbed and converted into polyphosphate granules in the hyphae and translocated to the arbuscles for ultimate transfer to host plant (Ganinazzi et al.1979). VA-mycorrhizae stimulate uptake of zinc, copper, sulfur and potassium by the plant, enhanced nodulation in legumes, control the root rots disease caused by fungal pathogens and also check the larval development as well root penetration of nematodes. (Lambert et al., 1979). The association and importance of VAM fungi in agriculture and horticulture is well documented by Gerdemann (1968), Mosse (1973) and Smith & Read (1997). The beneficial effect of mycorrhizal associations have also been reported in citrus (Menge et al., 1978 and Nemecek 1978), Litchi (Pandey & Misra 1971) and banana (Declerereck et al., 1995). In this paper, the occurrence and population dynamics of VAM fungi in the rhizospheres of litchi, aonla, and banana have been studied in Indian orchard of eastern Uttar Pradesh.

MATERIALS AND METHODS

Survey was conducted to collect the mycorrhizal fungi from the districts of Faizabad, Sultanpur, Basti and Pratapgarh of Eastern Uttar Pradesh to evaluate the natural status and existing population of VAM- fungi in the rhizospheres of litchi, aonla and banana orchards. Soil samples (containing soil and fine roots) from

rhizospheres of above fruit plants were dugout with the help of trowel to a depth of 20-25 cm after scraping away the top soil up to 1-2 cm. Samples of the entire root system were obtained (3-4 different sites of the single plant) and mixed together to get single sample for each plant. The samples were collected in polythene bags and stored at 2°C till their processing.

To assess the colonization of VAM-fungi, clearing and staining of root segments were done as the procedures of Phillips and Hayman (1970). The per cent colonization of VAM-fungi was determined under microscope (100 root segments) as suggested by Giovannetti and Mosse (1980). Mycorrhizal spores were isolated by wet sieving and decanting technique (Gerdemann and Nicolson, 1963). These spores were mounted in lactophenol and examined under stereo/ research microscope for their counting and morphological features for identifications. Sizes of spores were measured with the help of ocular and stage micrometer.

Soil samples of different orchards of litchi, aonla and banana were analysed for their physical and chemical properties (Jackson, 1970) and presented in Table-1

RESULTS AND DISCUSSION

Total 107 samples (litchi-23, aonla-60 and banana-24) were examined and out of these only 81 samples (litchi-19, aonla-48 and banana-14) were found infected with VAM-Fungi (Table-2). In the case of litchi, all the samples collected from Pipera and KVK Research farm Basti have maximum infection /colonization (57.5 to 65.43 %) whereas spore population varied from 1113-2010/ 100g soil. Out of 8 samples collected from Horticulture farm NDUAT, Kumarganj, Faizabad only 4 samples showed 33 to 35 % colonization with 326 to 575 spores / 100g soil. In the case of aonla plants, the maximum colonization was observed in Pratapgarh and Basti whereas sample collected from Horticultural Farm NDUAT campus and Sultanpur district showed moderate colonization. The samples of aonla plant collected from Pratapgarh having maximum colonization (70.18%) with 1072-2708 spores / 100 g soil. Samples collected from two places of Basti, KVK Research Farm and Government Research Farm having more or less similar colonization and spore population (60.00 and 62.32 % with 973- 2364 and 1177- 2496 spores/ 100g soil). While very poor colonization and spores population of VAM fungi were

* Author for Correspondence