VA MYCORRHIZAL FUNGI ASSOCIATED WITH SOME PULSES FROM PUNE DISTRICT

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ABSTRACT

A survey of VA Mycorrhizal fungi in the root zone of some pulses was carried out . The pulses selected for VAM survey were Cow Pea (*Vigna anguiculata* L.) , green gram (*Vigna radiates* L.), black gram (*Vigna mungo* L.) and Chick pea (*Cicer arietinum* L.). Random soil samples and roots were collected after every 30 days and VA Mycorrhizal spores isolated . The spores were identified up to species level based on the revised synoptic key by Berch and Trappe(1989).
This study reports the extent of root colonization and the density and distribution of VAM spores in the rhizosphere and non-rhizosphere soil. All the pulses examined invariably showed a high percentage (55% - 80%) of root colonization .Species of Acaulospora , Glomus , Gigaspora, Sclerocystis and scutilospora were isolated. The spore density ranged from 30 – 90 spores /25 g soil. The intensity of root colonization and spore density varied not only from genus to genus with in a family but also for the same plant species at different sites. Comparative studies of VAM associated with different pulses from different localities showed that, there were a several species which were common in the rhizosphere of a few plants indicating that they were not host specific.

Kea words : cow Pea (*Vigna anguiculata* L.) , green gram (*Vigna radiates* L.), black gram (*Vigna mungo* L.) chick pea (*Cicer arietinum* L.)., VA Mycorrhiza.

INTRODUCTION

The leguminosae is a large family of plants with about 600 genera and 18000 species. (Lern and Burton,1982) The family Leguminosae is wide spread in both tropical and temperate regions and contains many useful crop and forage plants.

Pulses are significant in agricultural systems since they provide grains rich in proteins and herbage which add to soil fertility. This is manly because they have the advantage of harbouring two symbionts, the rhizobia and the VAM fungi. The eukaryotic fungus supplies the excess phosphorous required for nitrogen fixation, along with water and other nutrients which increase nitrogen fixation, Ahire et.al.,(2001).

Till 1987(Schenck and Perez,1987) only 120 species belonging to six genera were described and were grouped in a single family Endogonaceae of the order Endogonales. A large number of VAM species have been reported from India. (Singh and Verma, 1980, Verma et.al 1981, Bhattacharjee et.al.1982). Bagyaraj and Verma (1988) reported that all the known species have been found widely distributed throughout India. Reddy and Bagyaraj (1990) reported four species of *Glomus* associated with Pigeon pea.

MATERIAL AND METHODS

The pulses selected for VAM survey were Cow Pea (*Vigna anguiculata* L.) , green gram (*Vigna radiates* L.), black gram (*Vigna mungo* L.).) and Chick pea (*Cicer arietinum* L.). Plants were selected at random and rhizosphere soil samples along with feeder roots were collected after every 30 days and the composite samples made were used for analysis. For the isolation of VAM spores, wet sieving and decanting method of Gardemann and Nicolson (1963) was used. Assessment of Mycorrhizal infection and percentage root infection were measured by Phillips and Hayman,s(1970) method.

RESULTS AND DISCUSSION

From the composite mixture 25 g soil samples were used for the isolation of VAM spores from the rhizosphere and non-rhizosphere soil of different pulses. The average of three values were taken and recorded in Table 1 to 5.

The pulses selected for VAM survey were Cow Pea (*Vigna anguiculata* L.) , green gram (*Vigna radiates* L.), black gram (*Vigna mungo* L.).) grown during rainy season (Kharif Crop) While Chick pea (*Cicer arietinum* L.) is Rubi crop grown during winter. During July when the plants were 30 days old an average of 87 spores were present in rhizospere soil of Cow Pea (*Vigna anguiculata* L.) were as the non-rhizosphere had 79 spores. The number of spores reduced to 76 in the rhizosphere during August and in the non- rhizosphere the spore count remained the same (81). The decrease in the number of spores in the rhizospheres was because the spores were in the vicinity of the roots and when the root system established in soil. Some of the spores germinated and initiated infection. The number of spores in the non- rhizosphere soil was almost the same during July and August since there is no roots of plants and the spore remains dormant. In September the number of spores increases to 106 in the rhizosphere and 92 in the non- rhizosphere. It went up to 128 in the rhizosphere. However, in the non- rhizosphere soil during October the number decreased to 87. The spore count during October (128) was the highest number of spores observed during the

present study. During October there was warm temperature and sufficient moisture preserved around the root system which helped in the proliferation of VAM spores (Table -2) The reduction in the number of spores in the non-rhizosphere must be due to lack of ecological niche provided by the root system of the plants. Another important factor was the age of plant. During this period (October) the plants were in its active growing stage. At this stage root system exuded more substances into the soil around it. The stages of root development, root exuded and moisture held up by roots enhanced proliferation of VAM spores in soil as reported by Saif,S.R.(1977). Hence the number of VAM spores was maximum. When the plant started fruiting, the number of VAM spores decreased slightly and was 122 in the rhizosphere soil. This decrease in the spore number in the rhizosphere soil was mainly due to climatic and edaphic factors like temperature, pH, and moisture.

The infection of the root cortical tissue also showed similar results. Maximum percentage infection was during October (78.30) when the climate was cool and warm with sufficient aeration in soil. The plants were in open arise and hence the question of shading did not arise. Gardemann (1968) reported that shading reduced colonization, spore production and plants response to VAM. The stimulatory effect of light on development of VAM was shown by Furlan and Fortin (1977). VAM colonization of root cortex was found to coincide with the active growth stage of the plant. This was because, during it's active growth and metabolism, the plant provided maximum nutrients to the endophyte. Thus the endophyte and the host, compliment each other as regards supply of nutrients are concerned. During this period the number of VAM spores also increased. This tallies with the report of Mosse and Bowen (1968) that VA mycorrhiza was found more in cultivated than in virgin soil. The observations were confirmed when the results of non-rhizosphere soil showed much lesser number of spores. This increase was because the root exudates provided sugars, amino-acids, vitamins, growth regulators and several other unknown substances in the form of leakages , secretions, lysates, mucilage etc.

Roots and soil samples of rhizosphere and the non- rhizosphere of green gram, black gram was collected during *kharif* to investigate the vesicular arbuscular mycorrhizal fungi. Correlation studies was also worked out among different parameters including root colonization and VAM spore count, which was found to coincide with the active growth stage and age of the plants. The spore count during September (113) in black gram and (96) in green gram was the highest number of spores observed during the present study. Similar results were observed in the infection of the root cortical tissue. Seasonal variation had profound influence on the number of VAM spores present both in rhizosphere and non-rhizosphere soil, since green gram and black gram was a short duration kharif crop. Abbott and Robson (1977) also showed that distribution of VAM fungi was affected by climatic and edaphic factors. These effects were more evident in non-rhizosphere soil. Chick pea (*Cicer arietinum* L.) is Rubi crop grown during winter. VAM colonization and VAM spores present in rhizosphere and non-rhizosphere soil of Chick pea were reduced as compared to other pulses. These results were in accordance with the reports of Black and Tinker (1979), that mycorrhizal development was slow in temperate compared to tropical soil. Park et.al.,(1983), and Gray (1991) showed that aeration and warm soil conditions were necessary for VAM proliferation in soil.

Table-1 : Number of VAM spores and percentage infectivity of Cow Pea (*Vigna anguiculata* L.)

Month	Age of Plant in days	No. Of spores Per 25 g Rhizospher soil	No. Of spores Per 25 g Non-rhizospher soil	Percentage infectivity
July	30	87.00 ± 4.81	79.66 ± 1.69	35.63 ± 4.71
August	60	76.33 ± 2.90	81.37 ± 0.94	46.66 ± 6.23
September	90	106.00 ± 3.24	92.33 ± 1.69	63.16 ± 8.49
October	120	128.60 ± 4.32	87.37 ± 2.05	78.30 ± 4.71

± indicate standard deviation

Table- 2 Correlation between physical properties of soil and VAM spores in rhizospher and percentage infectivity of Cow Pea (*Vigna anguiculata* L.)

Month	Age of Plant in days	Moisture (%)	Soil Temp. (^{0}C)	No. Of spore Per 25 g Rhizospher soil	Percentage infectivity
July	30	34	32	87.00 ± 4.81	35.63 ± 4.71
August	60	29	28.2	76.33 ± 2.90	46.66 ± 6.23

September	90	30	31.5	106.00 ± 3.24	63.16 ± 8.49
October	120	30	32.7	128.60 ± 4.32	78.30 ± 4.71

± indicate standard deviation

Table-3 Number of VAM spores and percentage infectivity of Green gram

Month	Age of Plant in days	No. Of spores Per 25 g Rhizospher soil	No. Of spores Per 25 g Non-rhizospher soil	Percentage infectivity
July	30	69.26 ± 4.81	78.42 ± 1.59	41.26 ± 3.61
August	60	73.62 ± 2.90	81.33 ± 1.24	58.61 ± 4.13
September	90	96.22 ± 2.25	84.23 ± 1.49	71.26 ± 5.39

± indicate standard deviation

Table - 4 : Number of VAM spores and percentage infectivity of Black gram

Month	Age of Plant in days	No. Of spores Per 25 g Rhizospher soil	No. Of spores Per 25 g Non-rhizospher soil	Percentage infectivity
July	30	79.30 ± 2.54	71.27 ± 1.26	42.52 ± 3.62
August	60	84.23 ± 1.85	83.23 ± 1.34	63.56 ± 4.13
September	90	113.25 ± 2.34	94.21 ± 1.45	69.37 ± 3.19

± indicate standard deviation

Table-5 : Number of VAM spores and percentage infectivity of Chick pea

Month	Age of Plant in days	No. Of spores Per 25 g Rhizospher soil	No. Of spores Per 25 g Non-rhizospher soil	Percentage infectivity
November	30	58.43± 2.33	49.57± 2.23	48.25± 2.43
December	60	77.15 ± 2.35	46.70 ± 3.80	56.58 ± 3.20
January	90	87.62 ± 3.24	45.21 ± 2.67	68.65 ± 4.23
February	120	93.50 ± 2.56	38.58 ± 2.13	73.27 ± 3.54

± indicate standard deviation

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