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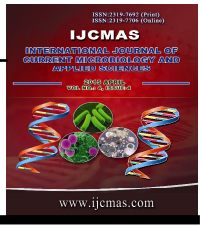

Original Research Article

Vesicular – Arbuscular Mycorrhizal Fungus Diversity in the Agricultural Soil Sample of Banda District (U.P), India

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Keywords

Vesicular – Arbuscular Mycorrhizal, Biodiversity of VAM, Soil samples

A B S T R A C T

The present paper deals with the biodiversity of VAM Fungi in soil samples of Banda district. Banda district is one of the seven administrative constituent of Bundelkhand division. Banda District is an important agriculture based area of Bundelkhand region of U.P. The main crops of this district are rice, wheat, arhar, mung, gram, masoor, sugarcane etc. The soil samples were collected from natural and artificial plantations, agricultural field and grassland during summer (March-June), monsoon (July-mid October) and winter (mid Oct.-Feb) season. In artificial plantation, the lowest frequency of the spores was recorded during all the three seasons. In case of natural plantation the maximum spore frequency was recorded in winter. In case of natural plantation the maximum spore frequency was recorded in winter. In case of agricultural fields and grassland the maximum spore frequency also showed gradual increase from summer through Monsoon to winter. The studies were conducted to record the diversity of VAM fungal spores in the different soil types at season in agricultural soils of District. The higher number of spores records from all the soil samples, collected in the month of November while the spore number was found to be lowest in the month of August in all types of soil. It was found at silt loam soil had the highest spore population compared with the other soil types. The lowest spore population was observed in sandy loam soil. The spore population density decreased in a descending order from November to August in all types of agricultural soil of District. The Genus Glomus was well distributed in agricultural soils and occupied more than 50% of total VAM spore population present in all types of soil.

Introduction

Banda district is one of the seven administrative constituent of Bundelkhand division. Banda district [24 53’ and 25 55’ N latitude and 79 59’ and 81 34’ E longitude] is an important agriculture based area of Bundelkhand region of Uttar Pradesh. The soil of this district are ”Parua”, “Mar”, “Kaber” and “Ranker”. The well known rivers of the Banda district are Ken, Baghain and Paisuni. Yamuna flows on the northern border of the district. Soil were sampled to a depth of 0–15 cm and taken from 8–12

places from each site. Vesicular Arbuscular Mycorrhizae are associated with almost all plants in nature (Hayman, 1982). The host plant benefits by this association being able to absorb phosphate and other plant nutrients more efficiently. VAM fungal association has been reported from time to time in different host plants growing in phosphorus deficient soil (Bagyaraj, 1986) and plays a major role in nutrient acquisition. Diversity of VAM are affected by a number of factors such as soil type, fertility level, light, temperature, rainfall, humidity and the plant population of an area. In the present investigation besides analyzing these factors, an attempt is made for a qualitative estimation of VAM associated with agricultural plants which would be useful for their exploitation in agriculture.

Materials and Methods

The soil samples were collected from selected sites for the study of diversity of VAM fungus in Banda district. The sites were identified on the basis of land uses (Table 1). The collection of soil samples from different sites were carried out at different sampling intervals. Rhizosphere soil samples from different selected sites were collected at a depth of 5–15 cm below the ground level. The physic chemical analysis of the collected soil samples were carried out and given in (Table 2). The physic chemical status of soil indicated that pH of soil was slightly acidic to neutral besides being deficient in phosphorus and other nutrients. The soil samples made air dried and 250 gram of each air dried sol sample were used for mycorrhizal spore collection. VAM spores were extracted using the wet sieving and decanting methods (Gerdemann and Nicolson, 1963). The roots were examined for root colonization by VAM fungi employing Philips and Hayman method (Hayman, 1970). The extracted fungal spores were identified with the keys provided by Schenck and Perez (1999). The isolated spores were counted by using stereoscopic binocular microscope. The meteorogical data were collected from Meteorogical department, District Banda U.P. (Table 3).

Results and Discussion

The diversity in the Glomus spore frequency in natural and artificial plantations, agricultural fields and grasslands during three seasons has been observed. In case of artificial plantation the lowest frequency of the spores during all the three seasons was recorded. In case of natural plantation the maximum spore frequency was recorded in winter. The spore frequency in agricultural field also showed gradual increases from summer to monsoon to winter. Thus variability in the frequency of Glomus spore in different habitats has indicated the significance of edaphic, climatic and also the host factors in its occurrence. The distribution of VAM spores varies according to the soil types and environmental conditions. The studies were conducted to record the VAM fungal spores in the different soil types at different seasons. The studies were conducted in 4 types of soil (clay loam, sandy loam, sandy clay loam and silt loam. The number of VAM spores obtained from different types of soil were counted and given in (Table 4). The study revealed that the number of VA Mycorrhizal spores observed from different types of soil ranges from 150-1850. Interestingly the higher number of spores was recorded from all the soil samples collected in the month of November while the spores' number was found to be lowest in the month of August in all soil types. The population density of the spores in all the soil types decreases in the order of November, February, May & August.

The generic level of distribution of VA mycorrhizal spores is also critically analysed according to Trappe (1982) on the basis of different morphological characters of vesicular-arbuscular mycorrhizal spores. The spore population of VAM spores (*Glomus species, Gigaspora species, Acaulspora sp*.) was studied. It was found that *Glomus* species was the most dominant genus. The physico-chemical properties and the number and type of vesicular arbuscular mycorrhizal fungal spores were analysed and observed that the spore number in the genera were *Glomus* > *Gigaspora* > *Acaulspora*. Maximum percentage of *Glomus* species was observed in sandy clay loam type. *Acaulspora* sp. was recorded next to *Glomus* species in distribution. There were some brown and yellow types of spores of confusing morphology were also recorded in the soil types also play significant role of distribution pattern of VA mycorrhizal spores in agricultural land of Banda district. The physic-chemical relationships effecting the distribution of VA mycorrhizal spores may influence it. Various sol factors may also influence the distribution of VAM spores (Powell and Sithamparanathan, 1977, Sujan Singh, 1999).

Table.1 The sites investigated for evaluating the diversity of VAM Spores

Site	**Major Plant Species**
Agricultural Land	*Cajanus cajan, Phaseolus radiates, Oriza sativa, Triticum aestivum*
Natural Plantation	*Bahunia variegata, Acacia arabica, Acacia catechu, Zizyphus jujube*
Artificial Plantation	*Bahunia variegata, Dalberagia sissoo, Eucalyptus peniculata*
Grassland	*Gramineae and cyperacease*

Table.2 Physico-chemical analysis of the soil samples

Site/Analysis	**A**	**B**	**C**	**D**
pH	7.3	8.5	6.3	7.7
Moisture(%)	15	16	17	14
Nitrogen(kg/ha)	120	134	124	121
Phosphorous(kg/h)	8	10	9	7
Sand(%)	74	70	71	72

Site A Agricultural Land Site C Artificial Plantations
Site B Natural Plantations Site D Grassland

Table.3 Meteorogical Data from September 2012 to October 2013 [Mean pooled data]

Season	Temprature (°C)		Relative Humidity	Total Rain
	Maximum	Minimum	(%)	
Summer (March-June)	44.30	33.5	35.8	38.61
Monsoon (July-Mid October)	34.21	29.45	81.24	210.05
Winter (Mid October-February)	24.87	11.56	76.11	15.00

Table.4 VA mycorrhizal spores population in different types of Agricultural soil of Banda District

Type of soil	Feb. 15th	May 15th	Aug. 15th	Nov. 15th
Clay Loam	595	480	1550	1444
Sandy Loam	390	155	625	454
Sandy Clay Loam	315	230	774	600
Silt Loam	875	770	1865	1526

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