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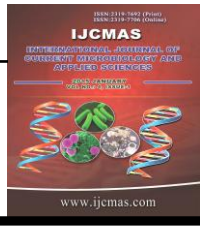

Original Research Article

Infectivity and Effectiveness of VAM on sesame and Sorghum plants

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A B S T R A C T

Application of soil amendments or specific biological can suppress soil-borne pathogens through manipulation of the physiochemical and microbiological environment. There is a global impact for organic farming through recycling of organic waste for persistent agriculture as well as for a pollution-free environment. The use of vermicompost is expanded in such a way that it degrades organic wastes from domestic wastes as well as industrial wastes. The present study reveals that the use of vermicompost in sesame and sorgam plants growth under controlled condition. The results indicated that there was a significant improvement in plant growth due to vermicompost amendments. The length and leaf surface area are considerably increased in the vermicompost treated plants. The growth response of these plants showed superior which in turn enhanced soil nutrients and microbial population. The present study also established that the association of VAM fungi with sesame as sorgam enhanced the growth when compared with control.

Keywords

Vermicompost, VAM, Sesame, Sorgam, Growth response, soil nutrients

Introduction

Arbuscular Mycorrhiza *Fungi*is a type of mycorrhiza in which the fungus penetrates the cortical cells of the roots of a vascular plant. Vesicular Arbuscular Mycorrhiza (VAM) is a potential biofertilizer. Mycorrhizal fungi that grow into the root cortex of the host plant and penetrate root cells to form two kinds of specialized structures, arbuscules and vesicles. Mycorrhizal Fungi is specifically designed to reduce transplant stress while improving soil hydration and fertility. Mycorrhizal fungi serve as a secondary root system to 99% of the earth's plants.

It extend themselves far out into the soil to extract nutrients and water for their host plant. For instance, mycorrhizal association is responsible for up to 80% of the total P uptake by plants (Marschner and Dell, 1994). One of the strongest effects of Arbuscular Mycorrhizal Fungi inoculation is an increase in the development of the host plant, which is attributed to an increase in nutrient uptake, particularly those that have low soil mobility and low concentration in the soil solution. The VAM fungus, *Glomus fasciculatum* (Giguspora Species) is known to symbiotically associate with

Plants and enhance the nutrient content in the plant. Vesicular Arbuscular Mycorrhiza (VAM) is the most abundant kind of mycorrhiza described as ‘a universal plant symbioses. They are found in practically every taxonomic group of plants and the list of species not

infected is probably far shorter than the infected ones. Studies on VAM fungi conducted during last few decades envisaged their occurrence in a wide variety of hosts, different habitats and variability in quality and quantity.

Sesame indicum

The major contributing countries (68%) are the world productions of Sesame are India, Sudan, Myanmar and China. Sesame seed is highly nutritive (50% oil and 25% protein) which are traditionally used for direct consumption and as a source of oil of excellent quality because of the presence of natural antioxidants such as sesamin and sesamol. Sesame seeds also contain a high amount of the anti-nutrientphytic acid. The increasing economic importance for food, oil and medicine the yield potential of sesame is not impressive due to its cultivation in sub marginal lands and unavailability of high yielding varieties and inbuilt resistance to biotic and abiotic stress. The hybridization procedures and cross breeding of this cultivar varieties was mostly unsuccessful due to the operation of high degree of crossability barriers. Production of high yielding variety with disease resistance is the present need for the sesame crop improvement. The family Pedaliaceae shows sensitivity to irradiation.

The phenotyphical variations among the cultivars are the main source of resistance for these diseases.

Sorghum bicolor

Sorghum is a genus of numerous species of grasses, one of which is raised for grain and many of which are used as fodder plants either cultivated or as part of pasture. The plants are cultivated in warmer climates worldwide. Species are native to tropical and subtropical regions of all continents in addition to the South West Pacific and Australasia. Sorghum is in the subfamily Panicoideae and the tribe Andropogoneae (the tribe of big bluestem and sugar cane).Sorghum has been, for centuries, one of the most important staple foods for millions of poor rural people in the semi-arid tropics of Asia and Africa. For some impoverished regions of the world, sorghum remains a principal source of energy, protein, vitamins and minerals. Sorghum grows even in harsh environments and it can be grown without application of any fertilizers or other inputs by a multitude of small-holder farmers in many countries. In the present study, the percentage of infection and various growth parameters such as the number of shoots, number of roots, leaf length and other parameters were observed and confimed with mycorrhizal and non-mycorrhizal infected plants. Biochemical analysis for the Mycorrhizal plants are analysed to study the effect of Mycorrhizae for the nutrient uptake for cultivated plants.

Materials and Methods

Preparation of inoculam

The Pure culture of *Glomus fasiculatum* was maintained and multiplied with

Sorgum in shade house. After three months of growth, aerial parts were cut-off from the soil level and discarded. The root portion which are colonized with G. fasiculatum was cut down into small pieces and mixed into soil and shade dried.

Seeds of *Sesamum indicum* and Maize were collected and inoculated with VAM fungi. Mycorrizal Plants Growth parameters such as plant length, number of roots and number of leaves were observed and statistically analysed with non mycorrizal plants. Mycorrizal dependency (MD) was calculated as per the formula of plenchette *et al.,* (1983).

Biochemical Analysis

Chlorophyll Test

Chlorophyll is a natural pigment found in green plants. It is the primary pigment that absorbs light energy from the sun for photosynthesis. Chlorophyll content was tested by using (Moran and Porath Method 1980). 0.5gram (W) of fresh leaves were collected and smashed with 80% Acetone.

Then 5ml (V) filtrate was collected and chlorophyll content such as chlorophyll A, chlorophyll B, total chlorophyll and carotenoid pigments were estimated (optical density-OD) under UV spectrometer at various wavelength (480nm, 647nm, 666nm).

Staining for colanization

Staining of the roots or measure the amount of mycorrhizalcolonization, Selected fibrous roots for staining. The roots were cleared in 10% KOH at 90ºC for 15 min. (Philips and Haymen, 1970). After the cleaning, the root samples were stained in 0.05% typanblue in lactoglycerol at 90ºC for 5 min. from each of sesame and Sorghum plants 1 cm segments was taken for the staining. All the segments were examined for the presence of fungal structures (eg. Vesicles, arbuscles and hyphae) at 200-400 x magnification using Phase contrast microscope (Carl Zeiss, Germany).

Results and Discussion

Effect of growth parameters VAM inoculated plants showed good results when compared with Non-Mycorrizal plants.

Although a few studies have been conducted on tropical trees, the results are encouraging as the growth of seedlings and productivity was found to be enhanced. The use of VAM fungi in forestry appears to be more important than in agriculture because in countries like India no large scale provisions exist to irrigate, fertilize and protect the plantation. The practical use of VAM fungi seems to be more appropriate as they are effective in overcoming the stress conditions like draught, disease incidences and deficiency of nutrients.

In the present study VAM colonization was found in the root samples. The length and leaf surface area are considerably increased in the VAM infected plants. From the literature on the interactions between VAM- fungi and terrestrial plants, it is clear that VAM is mainly involved in facilitating nutrient uptake (Khan, 1975) although it has been shown that VAM is mainly involved in phosphorous uptake and that its role in uptake of nitrogen or other nutrients is less clear (Smith and Read, 1975).

Table.1 Effect of growth parameters Sesamum plant in the VAM treated soil

S.No	Full length of the plant	Number of leaves	Number of roots
1	4.4±0.35	2±0	1±0
2	4.96±0.37	2±0	1.2±0.4
3	4.62±0.23	2.4±0.8	1.2±0.4
4	4.88±0.37	2.8±0.97	1.4±0.48
5	4.6±0.38	3.2±0.97	1.6±0.8
6	5.48±0.24	3.6±0.8	1.8±0.74
7	**7.64±0.36**	**4±0**	**2±0.63**

Table.2 Effect of growth parameters Sesamum plant in the in the normal soil

S.No	Full length of the plant	Number of leaves	Number of roots
1	5.18±0.58	2±0	1.2±0.4
2	5.2±0.316	2.4±0.8	1.4±0.48
3	4.82±0.39	2.4±0.8	1.6±0.8
4	5.04±0.50	2.8±0.9	1.6±0.48
5	5.3±0.34	2.8±0.97	1.8±0.74
6	5.72±0.34	3.2±0.97	2±0.89
7	6.3±0.26	3.6±0.8	2.2±0.74

Table.3 Effect of growth parameters of Sorghum plant in the VAM treated soil

S.No	Full length of the plant	Number of leaves	Number of roots
1	15.8±0.70	2.4±0.48	3.4±1.01
2	19.6±1.00	2.8±0.74	3.6±1.01
3	26.1±0.66	3±0.63	4.2±1.16
4	28.3±0.48	3.2±0.4	4±1.14
5	33.06±0.71	3.2±0.74	4.2±1.46
6	38.08±0.67	3±0.89	5±1.41
7	**40.36±0.46**	**3.4±0.48**	**5.6±1.01**

Table.4 Effect of growth parameters of Sorghum plant in the normal soil

S.No	Full length of the plant	Number of leaves	Number of roots
1	11.1±0.46	2±0.63	2.8±0.74
2	21.8±0.37	2.2±0.74	2.6±0.8
3	24.94±0.7	2.4±0.8	3.4±1.01
4	23.36±0.58	2.8±0.4	3.6±1.01
5	25.26±0.69	3±0.63	3.8±0.74
6	27.97±0.51	3.2±0.74	3.8±1.16
7	33.04±0.58	2.8±0.4	4.4±1.49

Table.5 Chlorophyll test optical density values at different wavelength

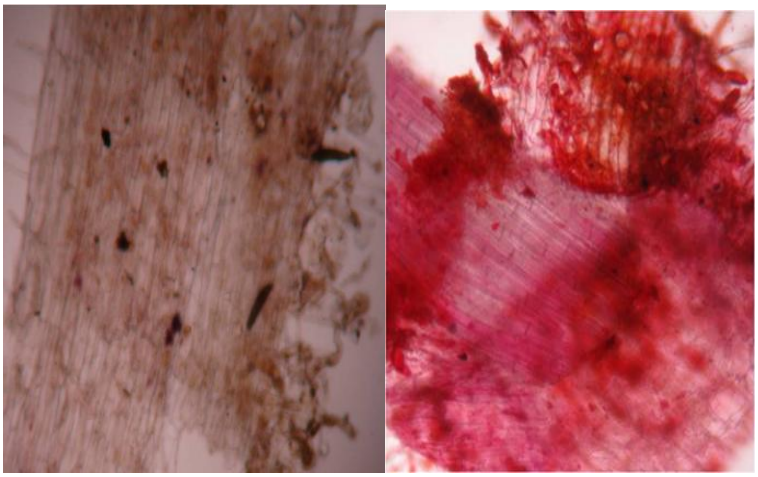
Wavelength	Sesamum		Sorghum	
	With vam	Without vam	With vam	Without vam
666nm	1.240	0.713	0.704	0.573
647nm	0.892	0.494	0.480	0.413
480nm	2.947	1.695	1.874	1.649

Table.6 Chlorophyll content values

Content	Sesamum		Maize	
	With VAM	Without VAM	With VAM	Without VAM
Chlorophyll A	13.259	7.678	7.601	6.124
Chlorophyll B	12.735	6.931	6.683	5.694
Total chlorophyll	25.986	14.603	14.280	13.221
Carotenoid	0.352	0.204	0.187	0.201

Fig.1 Sorghum plant growing in Normal and VAM applied soil

Fig.2 The presence of Vesicle forming in Sesame plant root and Sorghum plant root respectively



The cultivators of Maize and Sesemum require more amount nutrients in their early stage of development of plant system completely based on the development and performance of roots (Cheung *et al.,* 1987). The VAM fungal synbiosis were proved to play a vital role in such stress conditions by supplying the nutrients to the host plant. The present study also established that the association of VAM fungi with Sesame as Maize enhanced the growth when compared with control.

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