Study on AMF in rhizosphere of vetiver grass in field nursery

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Abstract: By sample examination on arbuscular mycorrhizal fungus (AMF) in rhizosphere of vetiver grass, at different time and different growing medium treatments, in field nursery, the results showed that AMF infection rate in rhizosphere of vetiver grass have no clear relationship with seedling source, but clearly relationship with growing medium. The infection of tissue culture seedlings, at 25 days after planting with the nature forest peat, was up to 93.33%, infection strength as class. With sterilized forest peat as growing medium, infection rate of the same seedlings was only 20% at 1 months after planting, infection strength as class, and at 20 months after planting, the infection was 53.33%, infecting strength as class. Infection rates of the offset plants from vetiver grass, at 3 months after planting in natural soil, was 56.67%, infecting strength as class, at 22 months after planting, infection rate attained most high peak, 80-83%, infecting strength as class, and at 33 months after planting, infection rate was no longer increased , but infection strength increased to be class .

Key words: Arbuscular mycorrhizal fungus(AMF) , rhizosphere, offset plant, tissue cultured seedlings

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1 INTRODUCTION

The vetiver grass is a special gramineous plant with an extremely strong ability to adjust to the environment appearing to be developing very well with its root system and growing rapidly. Now it's widely used and even named as the pioneer plant to control soil erosion, stabilize the slope and rehabilitate the ecology in South China, because of its high root tensile resistance and deep penetration. In the appliance and usage of the vetiver grass, we recently find that it could not only tolerate water submersion and wet condition but also endure a certain degree of drought; meanwhile it could absorb heavy metal so as to reduce the heavy pollution in soil to some extent. In order to explore the internal mechanism of these good characters of the vetiver grass and find out more plants with the ability to resist stress, we made the sample examination on arbuscular mycorrhizal fungus (AMF) in rhizosphere of vetiver grass to make a further study of its biological function in the restoration from the soil degradation and the dependent relationship with plants.

The AMF is an important part of the microbial flora. When it begins its dependent relationship with plants, it joins in the metabolism of many psychology and biochemistry, obviously helps the plants absorb more water and mineral element especially the P element in the soil and improves the plant's resistance such as drought resistance and salt resistance to enable plants grow and develop well. It plays an essential role in the composition of plant community and construction and balance of the diversity and stability of species in

ecosystem.

2 MATERIALS AND METHODS

2.1 The material collects time and location

Time: September ,2005-June ,2006

Location: Sample from the breeding base of Vetiver grass and pond slope in Baiyun District, Guangzhou.

2.2 Material sampling and processing

Take the fibres from root tip of Vetiver grass.Then wash, dry and cut them into 1cm long. Finally put them into the stationary liquid of FAA and get ready for use..

2.3 Sample dyeing

In order to observe the AMF more clearly through the microscope, dye the fibres preserved in the stationary liquid in the normal method of Hayman1970.

2.4 Infections

Use the method of accounting the infected fibres to observe them after treatments through the microscope. To choose 30 fibres from the samplings, 1cm long for each one, put them into the contain glass tidily and cover them by the cover glass. Observe the infection of AMF one by one under the condition of 100-400 times of the microscope. Count the infectious and calculate the infection rate.

Infection rate of arbuscular mycorrhizal fungus (%)= (the number of the infected roots/ the total number of the observed roots) _ 100%

The classification of AMF infection:

Class 1-the infection rate results 0-5%

Class 2- the infection rate results 6-25%

Class 3- the infection rate results 26-50%

Class 4- the infection rate results 51-75%

Class 5- the infection rate results 76-100%

The amount of the AMF and it's standard of infection strength:

Infect strength I_low-the amount of the fungi cluster or bubble bags in the root is very small with sparse distributing;

Infect strength II_ medium- the amount of the fungi cluster or bubble bags in the root is very large with equal distributing, but they are not inoculated in a crowd.

Infect strength III_high- the fungi cluster or bubble bags in the root distribute widely and they are inoculated in a crowd.

3 RESULTS AND ANALYSIS

3.1 Sample examination on arbuscular mycorrhizal fungus (AMF) in rhizosphere of tissue culture seedlings of vetiver grass at different time

Replant the tissue culture seedlings to the forest peat sterilized by the formaldehyde for 25 days,11 months and 22 months. Then take sample and test the infection rate(table 1).

Table 1 :Sample examination on arbuscular mycorrhizal fungus (AMF) in rhizosphere of tissue culture seedlings of vetiver grass at different time

Planting time(month)	1	11	22	1
Infection rate(%)	0	23.33	53_33	93_33
Infect strength	I	I	II	II
Growing medium	A	A	A	B

A: sterilized forest peat B: natural forest peat

The infection rate of the tissue culture seedlings of vetiver grass planted in the sterilized forest peat was 0 after 1 month with no mycelial; it was only 23.33% after 11 months with very few fungi cluster or bubble bags. There was almost no infection; It was only 53.33% after 22 month and the Infect strength was class II. When they were planted in the natural forest peat after 1 month,the infection rate reach to 93.33% and the infection strength was class _.It showed that the primary infection source of the arbuscular mycorrhizal fungus (AMF) in rhizosphere of vetiver grass come from the soil.

3.2 Sample examination on arbuscular mycorrhizal fungus (AMF) in rhizosphere of off plant of vetiver grass at different time

The vetiver grass has the ability to tiller. Take the tiller from the material plant,3-5 tillers for each slip,cut the root for 10cm. After all preparation was done, plant them in the natural soil and test their infection rate after 3 months, 5 months, 22 months and 33 months. The results were shown in table 2.

It was shown in table 2 that the offplants of vetiver grass planting in the natural soil in the same site were infected after 3 months and the infection rate was 56.67% with the infection strength class _;after 22 months, the infection rate rised to the peak as 80% and the infection strength was _; after 33 months, the infection rate rised no more while the fungi cluster or bubble bags in the root distributed widely and they were inoculated in a crowd. So the infection strength was up to class _. No matter where the offplants of vetiver grass were planted, the infection rate differed not greatly.

Table 2: Sample examination on arbuscular mycorrhizal fungus (AMF) in rhizosphere of off plant of vetiver grass at different time and different growing medium

Planting time(month)	3 months	5months	22 months	33months	22 months	22 months
Infection rate(%)	56.67	63.33	80.00	76.67	76.67	83.33
Infect strength	I	II	II	_	II	II
Location	C	C	C	C	D	E

Location: C: farmland ;D: the middle slope of the pond .E: the bottom slope of the pond

4 SUMMARY AND DISCUSSION

- The vetiver grass can be infected by the AMF in the natural condition.
- The AMF infection rate in rhizosphere of vetiver grass has no clear relationship with seedling source, but clearly relationship with growing medium. Planted in the farmland, the infection rate rised to 56_67 % after 3 months and it rised to

93.33%when planted in the natural forest peat after 1 month; while it was only up to 53_33% when planted in the sterilized forest peat after 22 months. It meant that the infection rate of the AMF in rhizosphere of vetiver grass had something to do with the density of the AMF spore in the soil.

- In the early days of the planting, the infection rate of the AMF in rhizosphere of Vetiver grass increased as the time goes by. The rate of infection reached to the highest with no increase after 2 years,but the infection strength was rising.
- The behaviors of the Vetiver grasss infected differently under adversity condition need to take a further study.

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A Brief Intruduction to the Fist Author

Lixia Gao,senior engineer of landscaping, master degree.In recent years mainly is engaged in the vegetation ecology to restore; soil erosion control;slope stabilization and Vetiver bioengineering .