



# The effect of different AMF inoculated-seedlings on the growth, yield and nutrient quality of Asparagus after transplanting in plastic greenhouse

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## INTRODUCTION

The mycorrhizal technology were described as a possible complement for chemical fertilizers, GMO plants and unconventional revegetation and plant production systems. In recent 20years, the Arbuscular mycorrhizal fungi (AMF) in wild plants, horticultural crops, degraded grassland, saline soil, islands, spoil and polluted soil, long term fixed fertilization, Mountain vegetation, urban ecosystems were isolated and identified. AMF can absorption water and nutrient for plants and plants can provide carbohydrates for fungi, which may improve plant salt resistance, low temperature resistance, thus increase the plant production. *Glomus mosseae* (GM) is a wide-type ecological Arbuscular Mycorrhiza Fungus in *Glomus* of high adaptability to environment with extensive application range. Through field experiments, the effect of inoculation AMF on asparagus seedling mycorrhizal infection as well as yield and secondary metabolites colonization in greenhouse asparagus was studied.

## MATERIALS AND METHODS

### Plant materials and AMF inoculums

Arbuscular mycorrhizal fungi (AMF) inoculums including *Glomus mosseae*(GM), Inoculum of vegetables use (VM), and mixed inoculum( MF) were applied to inoculate Asparagus Jersey Knight during seed sowings. GM are mixture of *G.mosseae* and *G.irregulare*, provide by Hungary Academy of Sciences. VM are mixture of *G. Claroideum*, *G. mosseae*, *Diversispora spurcum* and *G. irregulare*; MF are mixture of *G. irregulare*, *G. irregulare* (BEG140), *G. aggregatum* BEG, *G. claroideum* (BEG 210), which were provide by Czech Academy of Science.

### Experiment design

Seedlings substrate were the mixture of peat, vermiculite, according to the volume ratio 2:1 mixed evenly, and sterilized with air dry oven under 160 °C for 2 h, after natural cooling then sterilized again under 160 °C for 2 h before sowing. Asparagus seedlings were sowed on July 1<sup>st</sup>, 2012 with 4 treatments, CK,GM,VM and MF, 30 plants for each treatment. The AMF seeds were sowed in plastic pots, 5 g inoculum were used for each seedling. 50 day seedlings were transplanted into soil of plastic greenhouse in Beijing, China, and the AMF infection rate of roots were measured.

### Data measurement and statistical analysis

Root AMF infection ratio were measured after stained with trypan blue. Plant height, the shoot numbers, dry weight and fresh weight asparagus yield were measured. The nutrient quality of shoots and nutrient atom content were analyzed. Data figure were made by Microsoft Excel and statistical analysis by DSP software.

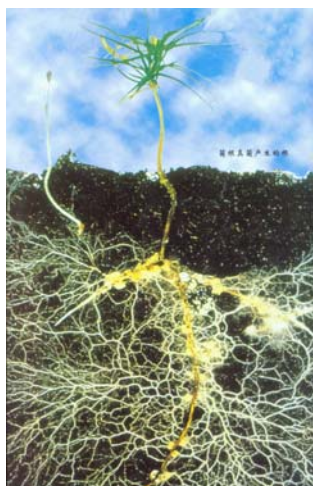


Fig.2 (a) Asparagus with AMF inoculum; (b) Asparagus without AMF

Fig.1 AMF connect with root and soil

## RESULTS

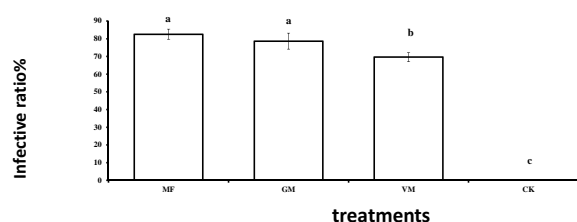


Fig.3 The effect of inoculation with AMF of asparagus seedling on root infection percentage  
 Note: The different letters represent significant difference by LSD test ( $P < 0.05$ ), the same below.

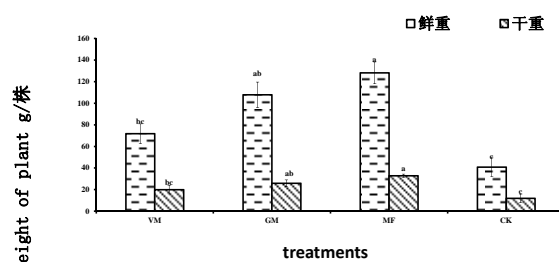


Fig.4. The effect of AMF inoculation of asparagus seedling on shoot biomass of plants.

Table 1. The effect of inoculation with AMF of asparagus seedling on element uptakes

Treatments	N mg/plant	P mg/plant	K mg/plant	Mg mg/plant	Zn mg/plant	Mn mg/plant	Cu mg/plant
CK	323.54 c	59.05 c	233.71 b	58.93 b	2.15 b	1.67 b	0.60 b
VM	646.88 b	114.68 b	487.60 ab	94.97ab	3.58 a	3.19 a	0.80 b
GM	810.75 b	124.45 b	513.82 b	139.69 a	3.10 ab	4.13 a	1.29ab
MF	1125.68 a	168.54 a	670.23 a	171.49a	5.25 a	4.92 a	2.30 a

Table 2. The effect of AMF inoculation of asparagus seedling on yield and spear nutritional quality

Treatments	Soluble protein %	Crude fiber %	Nitrate mg/kg	Soluble sugar %	Yield Kg/hm <sup>2</sup>
CK	2.02 ± 0.06b	0.83 ± 0.04b	151.74 ± 8.78c	1.93 ± 0.06c	3075b
VM	2.11 ± 0.04ab	0.92 ± 0.03b	232.99 ± 7.65a	2.11 ± 0.42b	3488b
GM	1.89 ± 0.07c	1.05 ± 0.05a	206.29 ± 2.80b	2.14 ± 0.05b	3476b
MF	2.22 ± 0.09a	1.02 ± 0.06ab	243.36 ± 6.42a	2.38 ± 0.18a	4994a

## CONCLUSIONS

The results indicated that, compared with the control, all three AMF could significantly promote the uptakes of nitrogen, phosphorus, zinc, manganese and other nutritional elements, increased the Asparagus yield and improved nutrient quality. While MF and GM had a better performance in infective ratio than VM, MF showed the highest biomass, yield and the best quality. The conclusion is AMF inoculation can significantly promote plant growth, absorption of nutrition, increase yield and improve quality, MF(mixed inoculum) is the best AMF treatment for spear production.