COMPARATIVE STUDY ON THE GROWTH OF THE TRANSGENIC AND CONVENTIONAL GENOTYPES OF THE SOYBEAN PLANTS CULTIVATED IN ROMANIA

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***Abstract**: Degradation of natural ecosystems resulting from antropic activities is also associated with the degradation of soil properties. In recent years, several studies have shown that associations between soil and plant plays an important role in sustainable agriculture and organic. Following these assumptions, the paper work proposes to conduct a comparative study in the development of soybean plants wich were inoculated with mycorrhiza in both of soybean genotypes: transgenic (S2254RR and 9191RR) and conventional (variety AVILA). For comparison and determination of cultural characteristics concerning the development of the soybean plants which were inoculated with mycorrhiza were pursued the following stages: soybeans were inoculated with mycorrhiza from Glomus genus, was studied the degree of sprouting in the presence and absence of mycorrhiza, and after one week the germinated seeds have been transferred into the glasses with soil and the plant development was monitorized for the both, genetically modified plants as well as conventional ones. Comparative analysis on the development of the plants inoculated or not with mycorrhiza was made after the plant growth and the occurrence of the second trifoliate leaves. The results obtained revealed that soybeans seeds, either transgenic or conventional variety, which were inoculated with mycorrhiza had a higher and faster germination than those germinated in the absence of mycorrhiza. Concerning the plant growth and development has been observed that the roots of plants inoculated with mycorrhiza had an fistulous increase with numerous side branches in compared with plant roots without mycorrhiza whose root is type pivoting or fistulous but with few side branches. Can be also observed that to the roots of plants with mycorrhiza has adhered a larger amount of soil In terms of leaf surface, following linear measurements, results that soybean varieties inoculated with mycorrhiza the leaf surface is much larger than to the varieties without mycorrhiza inoculum.*

***Key words:** transgenic soybean, mycorrhiza, cultural characteristics*

INTRODUCTION

For decades, the botanists and mycologists have shown that most terrestrial plants live in symbiosis with the soil fungi MOSSE (1956) and in 1880, A: B: FRANK describes for the first time relations established between woody species of trees and some fungal strains in soil. The superior plants, grows in the same natural environment with the microorganisms and it is normal to appear some interrelationships between them. So, between soil microorganisms and plant roots there are some reports of compatibility or synergistic. These synergistic relationships are categorised by STERIC (1971), SANDERS AND TINKER (1971), BOLAN (1991) in relationships of comensalism, mutualism and symbiosis. An important role in plant nutrition is conducted by mycorrhizal association, established between fungi and plant roots. The presence of michoryza is highlighted on the the root surface by the appearance in the lateral roots of the host plant by short and branched growths, which replace the hair root and forms a felting of the fungal mycelium. The extraroot absorption mechanisms are identical to those of root absorption.

MATERIAL AND METHODS

To determine and compare the cultural characters have been used soybean seeds of: Avila, 9191RR and S2254RR. In the seed of the same genotypes was inoculated the mycorrhiza from the genus Glomus. The experiment was installed in cups of 500 ml with soil and was observed: the type, length and weight of root as well length and weight of plant. For the leaf area determination of the legumes for grain, we applied the linear equation LAZAROV (□UMĂLAN R. 2000).

RESULTS AND DISCUSSIONS

Determining the character of transgenic and conventional soybean plant development which were inoculated or no inoculated with mycorrhiza pointed out the fact that are big differences regarding the germination, figure 1., and development of plants in the presence of mycorrhiza in compared to those that mycorrhiza is absent.

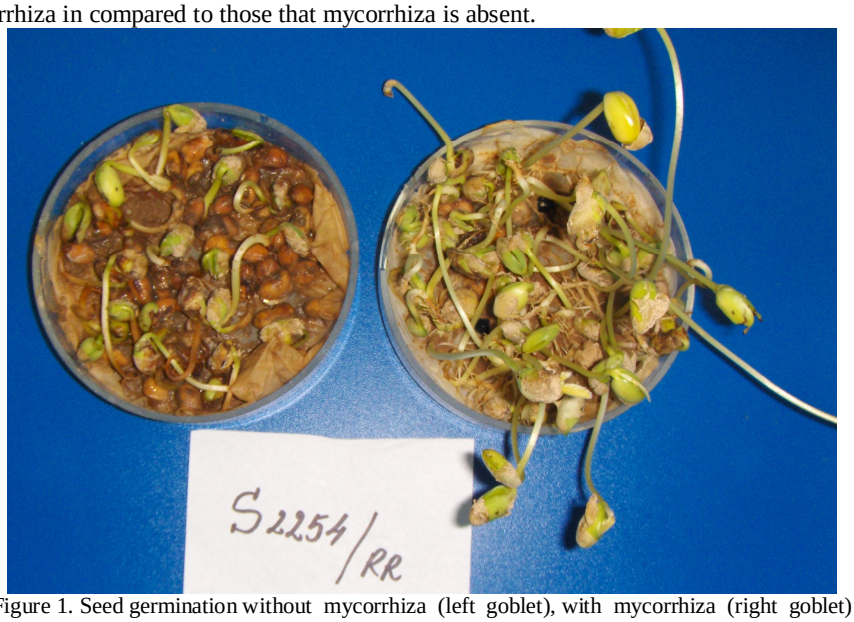

Figure 1. Seed germination without mycorrhiza (left goblet), with mycorrhiza (right goblet)

Figure 2. Developing of plants without mycorrhiza (left goblets), with mycorrhiza (right goblets)

After plant growth until the emergence of the second trifoliate leaves formed in the third week were compared considering: type, length and weight of the root and length and weight of the plant (table 1.).

Table 1

Quantitative analysis of soybean plants

Plant	Root type	Root length (cm)	Root weight with soil (g)	Root weight without soil (g)	Plant length (cm)	Weight green plant (g)	Nr. leafs
Avila without mycorrhiza	swivel to fistulous	12	1,19	0,22	18	0,92	2 trifoliate, 2 unifoliate
Avila with mycorrhiza	Fistulous, swivel with secondary branches	16	1,53	0,49	30	1,41	2 trifoliate, 2 unifoliate
9191RR without mycorrhiza	Fistulous with secondary branches	11,5	1,14	0,26	25	1,2	2 trifoliate, 2 unifoliate
9191RR with mycorrhiza	Fistulous with secondary branches and adhering soil	13	3	0,63	42	1,58	2 trifoliate, 2 unifoliate
S2254RR without mycorrhiza	Fistulous with secondary branches	16	0,98	0,43	24,7	1,07	2 trifoliate, 2 unifoliate
S2254RR with mycorrhiza	Fistulous with many secondary branches and adhering soil	21,5	4,84	0,91	39,2	1,52	2 trifoliate, 2 unifoliate

The analyse of roots of plants studied shows that roots of plants without mycorrhiza have an swivel root or fistulous type with few secondary branches, compared with those inoculated at the root is fistulous and numerous side branches. Can also be observed as to the roots with mycorrhiza has adhered a higher quantity of soil than those without mycorrhiza figure 3.

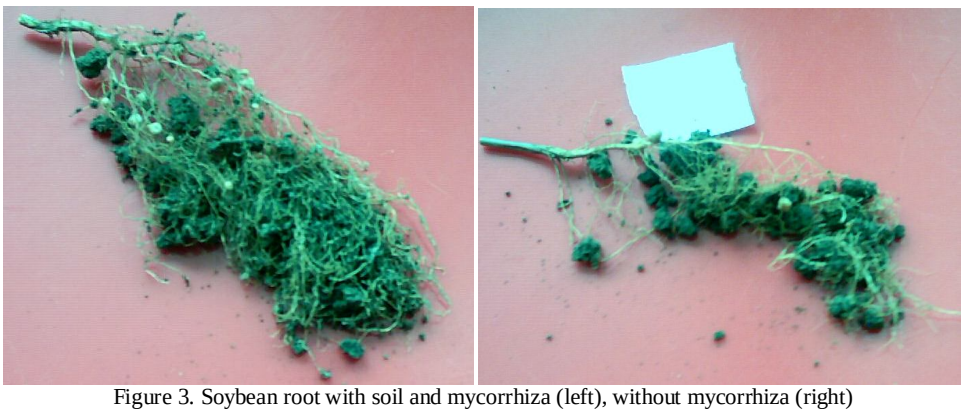

Figure 3. Soybean root with soil and mycorrhiza (left), without mycorrhiza (right)

Plants inoculated with mycorrhiza have a greatest length of the roots for both transgenic plants and for the non transgenic, figure 4. Root length for plants without mycorrhiza is: Avila - 12cm, 9191RR - 11.5 cm and S2254RR - 16cm, and to the plants inoculated with mycorrhiza, the length of the root is between: 16cm - Avila, 13cm - 9191RR and 21.5 cm - S2254RR.

The weight of the roots without soil to the plants without mycorrhizae is: Avila - 0,22 gr, 9191RR – 0,26 gr, S2254RR – 0,98 gr., and plant weight which have mycorrhizae is significantly higher: Avila – 0,49 gr., 9191RR – 0,63 gr., iar S2254RR – 0,91gr.

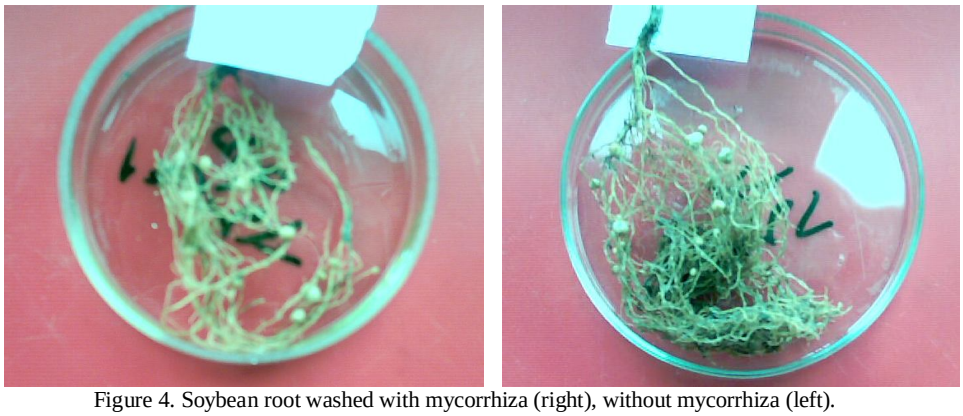

Figure 4. Soybean root washed with mycorrhiza (right), without mycorrhiza (left).

From the table 1 it can be seen that the length and weight of the plants inoculated with fungi is almost double toward the plants were not inoculated.

Concerning the leaf area obtained using the linear measurements figure 5 results in the following: to the plants inoculated with mycorrhiza leaf surface is between 69.3 for Avila variant and 99.9 for variant S2254RR. In the case of plants which were not inoculated with mycorrhiza the leaf surface is between 44.9 for variant Avila and 81,1 for variant S2254RR. figure 6.

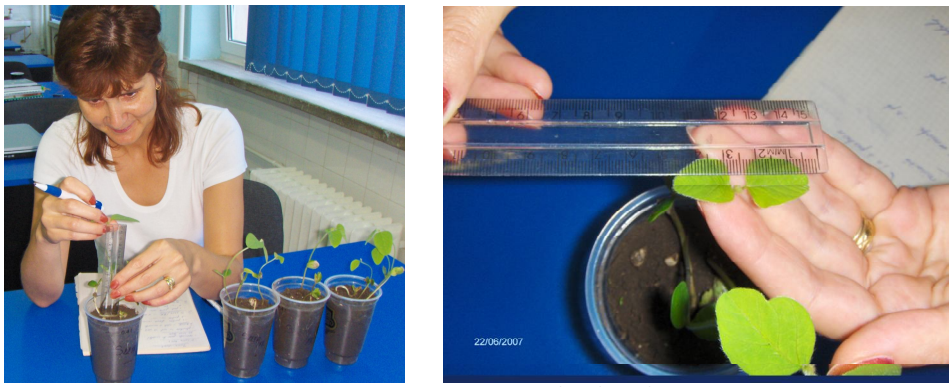

Figure 5. Linear measurement of leafs surface

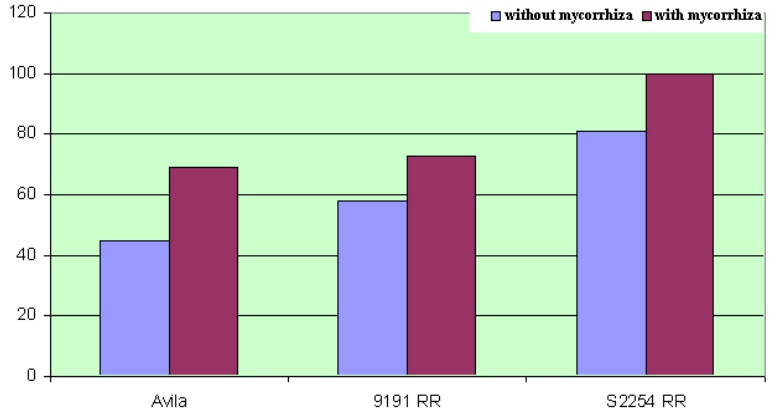

Figure 6. Comparative leaf surface in three variants

CONCLUSIONS

The seeds of soybean (genetically modified or unmodified) germinate faster if has been treated with mycorrhiza fungi. Inoculated plants develop a root system most extensive and most branched than those uninoculated.

The quantity of soil adhering to the roots is higher for the plants inoculated with mycorrhiza fungi, which also shows that the rhizosphere of the soybean plant in this conditions the produce a greater quantity of mucilaginous substances.

Plantele provenite din semințe inoculate cu fungi micoriza dezvolta o suprafață mai mare frunză cu 35% pentru soiul Avila, cu 20% pentru soiul 9191 RR şi 19% pentru SS soiul 2254 RR, comparativ cu plantele martor.

These data indicate an increase of photosynthetic accumulation after inoculation with mycorrhiza fungi.

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