

## Influence of Interactions of Microbiota Representatives Occurring in the Grain Agro-Coenosis on Infection Amount in the Soil

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### Abstract

Interaction influences of endophyte fungi living in the soil were studied in the article. At this, antagonistic properties of 5 active stocks of fungus *Trichoderma viride* in regard of 14 species of fungi belonging to fungi *Fusarium* classes were investigated. 5 score scale was used in the evaluation of antagonistic property of fungus *Trichoderma viride*. The more active strains have been determined through planting of fungi on the two sides of Chapek feeding medium in the Petri dish and measuring the diameters of their colonies in 5 and in 10 days after planting. The strongly antagonistic properties of 3, 4 and 5 strains of fungus *Trichoderma viride* in regard of fungi *Fusarium* classes were identified in the result of researches.

**Keywords:** *Trichoderma viride*, *Fusarium*, antagonistic, endophyte, phyto -pathogen, microorganism, fungus, strain.

### Introduction

Endophyte species are also exist together with phyto – pathogen species in the community of microorganisms living in the soil. Endophyte microorganisms are considered as the suprotroph fungi living in the association of mutualistic in the cell liquid and tissues of highest plants. Their positive effects on the host plants cause improving of resistance to water deficit, increasing of vitality, enhancing of photosynthesis, seed germination, acceleration of growth and improved adaptation to adverse conditions.

The sterile state of plants' meristem tissues were confessed for a long period of passed years. But recently, it was found that filled up of conducting tissues with microorganisms has been proved. All time existence of methilobacterias, pseudomonadas and fungi in the plant tissues was identified. The leaves of the most plants are eternal residential areas for fungi. These fungi are grown in the liquids between of cells and have a distinguished mutualistic cooperation with plant than phyto- pathogen species. The fungi living in the tissues of plant have such effect to host plant that it becomes resistant to lack of water, they grow rapidly and phytobag will be tolerant to insects. In its turn, the plant provides the fungus cell with necessary nutritious substances. These fungi are called endophytes. The fungi like *Aspergillus*, *Penicillium*,

*Trichoderma* involve in the range of endophyte fungi and they live in the soil and plant tissues via forming symbiosis with them.

Creating the opportunity in the presenting pathogen properties of biologic active substances formed by them is the reason of decreasing the amount of pathogen fungi in the soil in which these fungi spread.

*Trichoderma viride* fungus separated from the soil of grain field during the researchers in the Amudaria district of Karakalpak republic has been investigated in the lab condition by planting it in Petri dishes with artificial Chapeka food medium. It was defined that the growth of species belonging to *Fusarium* was inhibited by *Trichoderma viride* at different extent during the test of antagonistic properties in regard to *Fusarium* class fungi [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12].

### The object of research and methods

The antagonistic properties of 5 strains of fungus *Trichoderma viride* separated from grain agro- thynosis soil of Karakalpak republic in regard to 12 species and 2 sub-species separated from grain were studied in the Petri dishes with Chapeka food medium of lab condition. The species of *Trichoderma viride* and *Fusarium* in the Chapeka food medium of Petri dish were planted in the same day and was positioned in the thermostat at 25C° for growing. Growing speed and arising of antagonistic properties of fungi were accounted in 5 and 10 days (according to Belay, 1977).

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Following scales were used for assessment the antagonistic property of *Trichoderma viride*:

- 0 score – antagonistic property was not arose;
- I score - antagonistic property was partly;
- II score - antagonistic property was an average;
- III score - antagonistic property was strongly;

IV score - antagonistic property was too strong;

### The results of Research

The data about the presenting antagonistic property of studied strains of *Trichoderma* fungus are given in the table 1.

**Table 1** The antagonistic properties (identified on the base of 5 score scale) of *Trichoderma* fungus' strains in regard of Fusariosis disease causing agents in the grain occurring in the republic of Karakalpakstan

Number	Strains	<i>F.solani</i>	<i>F.culmorum</i>	<i>F.solani var argillacium</i>	<i>F.oxysporum</i>	<i>F.lateriteum</i>	<i>F.heterosporum</i>	<i>F.avenacium</i>	<i>F.javanicum var radicolola</i>	<i>F.graminearum</i>	<i>F.javanicum</i>	<i>F.moniliforme var lactis</i>	<i>F.moniliforme</i>	<i>F.oxysporum var orthocuras</i>	<i>F.sambucinum</i>
1	Tr№1	II	0	0	0	0	II	0	IV	0	IV	0	IV	III	0
2	Tr№2	0	0	0	IV	0	0	0	0	0	IV	II	0	IV	IV
3	Tr№3	III	0	III	0	0	III	II	IV	III	IV	III	III	IV	III
4	Tr№4	III	III	III	IV	III	IV	IV	III	IV	IV	IV	II	0	III
5	Tr№5	IV	IV	III	0	IV	IV	IV	IV	III	0	III	IV	III	II

It is obvious out of the table data that *Trichoderma vride* starin №1 doesn't present its antagonistic property in regard of species *F.culmorum*, *F.solani var argillacium*, *F.oxysporum*, *F.lateriteum*, *F.avenacium*, *F.graminearum*, *F.lactis*, *F.sambucinum*.

This strain presents an average antagonistic property in regard of species *F.solani* and *F.heterosporum*. The sterilized zone between antagonist and pathogen makes of only 3 mm. This strain presents its strong antagonistic property in regard of *F.oxysporum* sub species. Sterile volume of 5 mm has originated between Pathogen and *Trichoderma vride*. This strain presents an extreme strong in regard of *F.javanicum var radicolola*, *F.javanicum* species. More than 6 mm sterile zone appears between species.

The strain №2 of *Trichoderma vride* does not present antagonistic property in regard of *F.solani*, *F.culmorum*, *F.solani var argillacium*, *F.lateriteum*, *F.heterosporum*, *F.avenacium*, *F.javanicum var radicolola*, *F.graminearum* species. This strain presents its an average antagonistic property in regard of *F.lactis* specie. This strain presents too strongly antagonistic property in regard of *F.oxysporum*, *F.javanicum*, *F.oxysporum var arthoceras* species. More than 6 mm sterile zone appears between species.

Strain №3 of *Trichoderma vride* does not represent antagonistic property in regard of *F.culmorum*, *F.lateriteum*, *F.oxysporum* species. This strain has an average antagonistic property in regard of *F.avenacium*. It presents a strong antagonistic property against to *F.lactis*,

*F.solani var argillacium*, *F.heterosporum*, *F.sambucinum*, *F.vertisilliodes* species. And it has the more strongly antagonistic property against *F.javanicum var radicolola*, *F.javanicum*, *F.oxysporum var orthoceras* species. The sterile zone more than 6 mm appears between species.

Strain №4 of *Trichoderma vride* does not present antagonistic property in regard of *F.oxysporum var orthocuras* species. This strain has an average antagonistic property in regard of *F.vartisilliodes* specie. It has a strong antagonistic property in regard of *F.solani*, *F.solani var radicolola*, *F.culmorum*, *F.lateriteum*, *F.sambucinum*, *F.javanicum var radicolola* species. And it has the more strongly antagonistic property in regard of *F.heterosporum*, *F.avenaceum*, *F.graminearum*, *F.javanicum*, *F.lactis* species. The sterile zone between species makes of more than 8 mm.

Strain №5 of *Trichoderma vride* does not present the antagonistic property in regard of *F.oxysporum*, *F.javanicum* species. This strain has an average antagonistic property in regard of *F.sambucinum* specie. It has a strong antagonistic property against to *F.solani var argillacium*, *F.graminearum*, *F.oxysporum var arthocuras*, *F.lactis* species. It has the very strong antagonistic property in regard of *F.solani*, *F.heterosporum*, *F.avenaceum*, *F.lateriteum*, *F.javanicum var radicolola*, *F.vartisilliodes* species. More than 7,5 mm sterile zone appears between species.

The data about the antagonistic influence of fungi strains belonging to *Trichoderma* order in regard of fuzariosis disease agents in 5 days after planting them into food medium given in table 2.

**Table 2** Antagonistic property of strains belonging to *Trichoderma* order against agents causing *fuzarious* disease in grain (5<sup>th</sup> day)

Number	Types	Colony size,sm	Tricho derma Strain № 1	Tricho derma Strain № 2	Tricho Derma Strain № 3	Trichoderma Strain № 4	Trichoderma Strain № 5
			Colony diameter, sm	Colony diameter, sm	Colony diameter, sm	Colony diameter, sm	Colony diameter, sm
1	<i>F.solani</i>	3,5	5	4,5	9	9,5	9,5
2	<i>F.culmorum</i>	2,4	9	6,5	7	7	7
3	<i>F.solani var argillacium</i>	2,7	9	8,5	8,5	7	7
4	<i>F.oxysporum</i>	2,3	7,5	7,5	7	6	7
5	<i>F.lateriteum</i>	3,8	6,5	4	7	6,5	7
6	<i>F.heterosporum</i>	2,4	7,5	8	7	7	7
7	<i>F.avenacium</i>	2,6	8	7	7	7	7,5
8	<i>F.javanicum var radiculicola</i>	2,8	8	5	7,5	7,5	8
9	<i>F.graminearum</i>	3,4	7	5	7	7	8
10	<i>F.javanicum</i>	2,4	7	7,5	6,5	7,5	7
11	<i>F.moniliforme var lactis</i>	2,8	8	7	7	6,5	7
12	<i>F.moniliforme</i>	2,0	8	7	8	7	8
13	<i>F.oxysporum var orthocuras</i>	2,6	7	6	8	6	7,5
14	<i>F.sambucinum</i>	3,5	6,5	7,5	7,5	7	7

It is obvious out of table data that if the measures of colony formed by the species belonging to *Fuzarium* order in 5 days of terms in food medium growth consist of 2,0 – 3,8 cm of diameter, while the colony formed by the strains of *Trichoderma vride* has 4 up to 9,5 cms diameter. And some strains of *Trichoderma vride* fungus cover above the colony formed by *Fuzarium* fungus. The strains presenting antagonistic nature are

included into the range of the very active strains in study of antagonistic nature of *Trichoderma vride* fungus when the evaluation carried out according to the its clean surface from infection between antagonistic and pathogen with the antagonistic presence at the amount of III, IV, V scores.

The antagonistic attributes between species of fungus and strains entirely retain even in 10 days (table 3).

**Table 3** Antagonistic properties of fungi belonging to *Trichoderma* order in regard of grain fuzarious disease causing agents (in 10 days)

Number	Types	Colony size, sm	Tricho derma Strain № 1	Tricho derma Strain № 2	Tricho Derma Strain № 3	Trichoderma Strain № 4	Trichoderma Strain № 5
			Colony diameter, sm	Colony diameter, sm	Colony diameter, sm	Colony diameter,sm	Colony diameter,sm
1	<i>F.solani</i>	3,5	9,5	9	9,5	9,5	9,5
2	<i>F.culmorum</i>	2,4	9,5	9	9	9	9,5
3	<i>F.solani var argillacium</i>	2,7	9,5	9	9	8	9
4	<i>F.oxysporum</i>	2,1	9,5	9,5	9	9,5	9,5
5	<i>F.lateriteum</i>	3,7	9	7	9	9	9,5
6	<i>F.heterosporum</i>	2,3	9,5	10	9,5	9,5	9,5
7	<i>F.avenacium</i>	2,5	9	9	9	9,5	9,5
8	<i>F.javanicum var radiculicola</i>	2,1	9,5	9	9,5	9,5	9,5
9	<i>F.graminearum</i>	3,4	9	7	9	8	9,5
10	<i>F.javanicum</i>	2,0	9,5	9	9,5	9,5	9,5
11	<i>F.moniliforme var lactis</i>	2,6	10	9	9,5	9,5	9,5
12	<i>F.moniliforme</i>	1,8	10	9,5	9,5	9	9
13	<i>F.oxysporum var orthocuras</i>	2,6	9,5	9	9,5	8	9,5
14	<i>F.sambucinum</i>	3,1	9,5	9,5	8,5	8	10

Inhibition and holding of the growth of their mycelium due to *Fuzarium* fungus species antagonistic property was observed. It results the generation of colonies' volumes like 1,8 cm by the *F.verticilliodes*, 2,1 cm by the *F.oxysporum*, *F.javonicum*, *F.javonicum var radicola* species (photos 1, 2, 3, 4). *F.sambucinu*, *F.graminearum*, *F.lateriteum*, *F.solani* are the exemplary species out of *Fuzarium* fungus in the forming of the very largest colonies.

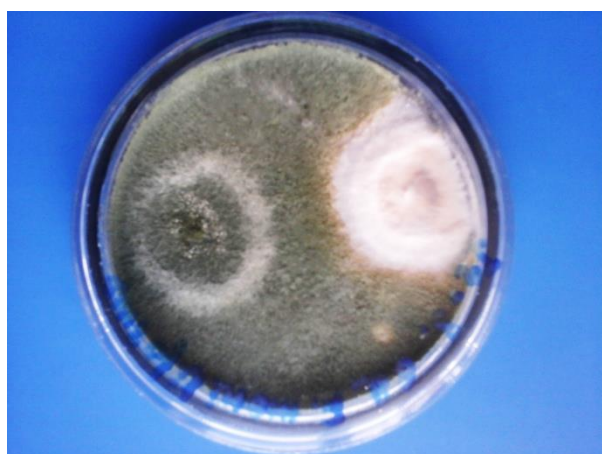
The amount of colonies formed by these species will make of 3,1 to 3,7 diameters.

So, the abrupt reduction of their pathogen colonies' amount in the result of effect on their morphological properties is the first sign in the arising of pathogen attributes of *Trichoderma* fungus.

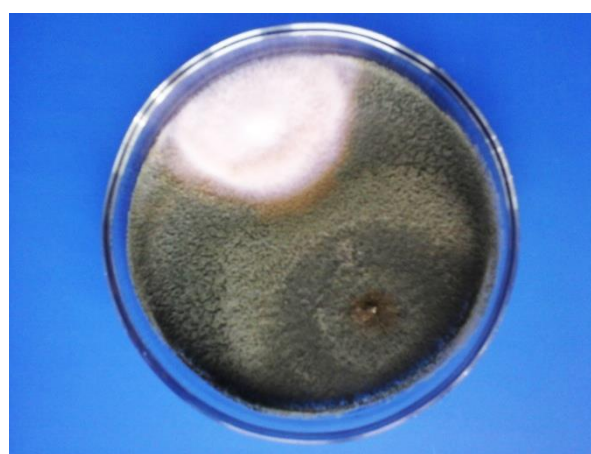
The forming of a pure surface volume above the food medium, which is free out of infections under the effect of metabolites, produced by the strains of *Trichoderma vride* fungus is considered as the second sign of its antagonistic attribute.

The metabolites generated by the *Trichoderma vride* fungus in the pure surface out of infection will be the reason in the forming of mycelium lysis in this zone. Growth and development of mycelium generate unique variations.

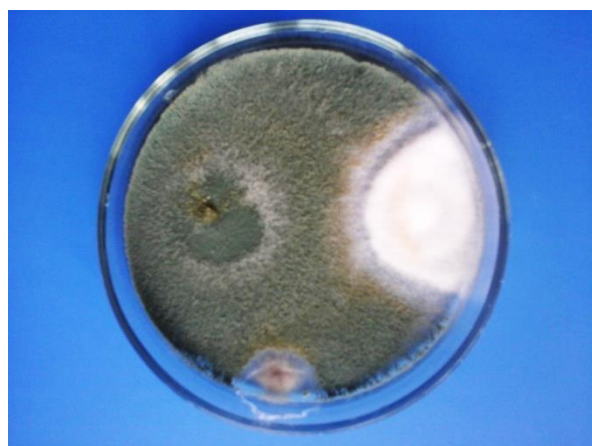
**The data about the morphological variations of *Fuzarium* fungus species are collected by the microscope monitoring**



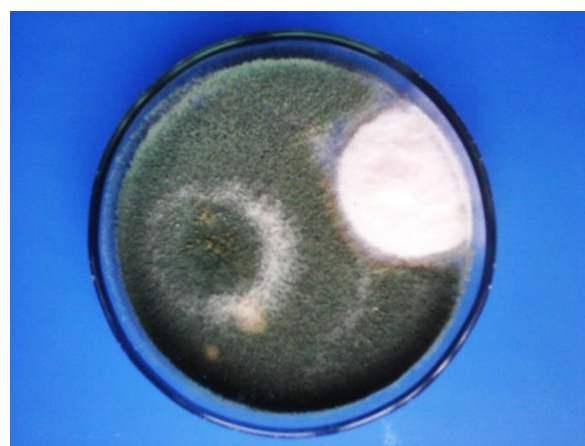
of *Trichoderma vride* №5 strain of *F.oxysporum* pathogen (after 10 days)



Antogonizm of *Trichoderma vride* №5 strain of *F.solani* pathogen (after 10 days)



Antogonizm of *Trichoderma vride* №5 strain to *F.sambucinum* pathogen (after 10 days)



Antogonizm of *Trichoderma vride* №5 strain to *F.lateriteum* pathogen (after 10 days)

So, together with arising of unique genetic variation in the adaptation to adverse ecological condition of plants grown in the soil where existed endophyte fungi, also accelerate their growth and development. It emphasized

that study of biochemical, physiologic and genetic variations taking place in them is necessary at the determining of causes in the appearing of such kind variations on the plants of grain.

## Conclusions

Endophyte fungi existing in the vegetative organs of plants growing in the extreme climatic condition of our republic belong to the species of *Penicillium*, *Aspergillus*, *Trichoderma* and they have a great importance at the adaptation of plants to adverse condition. Endophyte fungi are living mainly in the roots of natural plants, less in the stem and leaves and at least in the seeds and fruits. Biologic active substances produced by the endophytes get reach up to leaves through uptake movement due to their solubility in the water.

In general, endophyte fungi live in the soil and in the association with plant generate biodiversity suitable to the certain zone.

Applying of endophytes to the soil without endophytes has a major role in their growth, development and adaptation to adverse condition.

Planting of seeds treated with prepared bio-preparations of strains 3, 4 and 5 which present a strongly antagonistic property of *Trichoderma vridae* out of endophyte fungi in regard pathogens has a good impact to growth and development of plants.

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