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Study of Phytotoxic Properties of Pathogenic Fungi in Eggplants

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Abstract

The article studied the negative effect of phytotoxins formed by pathogenic fungi on the eggplant plant, on them by artificially damaging plant seeds. According to the research results, it was found that all 15 mushrooms have a negative effect on the germination and growth of eggplant seeds. Among these fungi are strain A. terreus 4/13, strain F. verticillioides 3/4, strain Fusarium sp. It was found that mushrooms of strain 4/5 have the strongest phyotoxic properties. Due to the strong phytotoxic properties of these mushrooms in relation to eggplant seeds, the seeds have lost their edibility.

Keywords: *Eggplant, lily, phytotoxin, root, stem, alternariosis, late blight, fusarium white rot, gray rot.*

Introduction

Potatoes, bell peppers, hot peppers, eggplants, tomatoes from their crops belonging to the ituzumdosh family are vitamin-rich crops that are among vegetable crops. In these cultures, mainly fungal diseases are found with anthracnose, alternariosis, late blight, fusarium of white and gray rot. As a result, the defeat of these diseases during the growing season of agricultural crops leads to a decrease in yield and a violation of the quality of the crop. Among the fungi that infect crops, there are also secondary pathogens that can mainly populate the plant in mechanically damaged areas, causing the plant to show signs of disease with various manifestations. But these microorganisms are not considered the main pathogen of the plant. In vegetable crops, the main pathogens affect the plant due to their phytotoxic properties. Therefore, it is very important to study the phytotoxic nature of fungi to determine whether they are pathogenic species in relation to the plant.

According to most scientists, fungophytotoxins affect the chemical composition of plants, metabolism, leading to disruption of physiological processes (Bilay, 1977), (Bilay V.Y *et al*., 1971), (Gubanov, 1962), (Kalmikova, 1975), (Patyka *et al*., 1978), (Runov, 1970). Cornatoxins play a key role in the morbidity of agricultural plants. In their struggle for food, phytotoxins play an important role in the parasitic lifestyle, acting as a weapon (Gorlenko, *et al*., 1972).

Phytotoxins destroy plant tissues or alter the level of endurance, reducing its immune properties. As a result, the metabolism in the plant leads to a violation of physiological processes and an increase in the pathological process (Sadikova *et al*., 2022), (Sheraliev *et al*., 1977), (Sheraliev *et al*., 1998), (Sherkulova *et al*., 2022).

Poisons of phytopathogenic fungi act differently on living organisms, being one of the chemicals belonging to different classes. Among them: peptides, polysaccharides, amino acids, terpinoids, steroids, fatty substances, peridine and quinols (Bilay V.Y., *et al*., 1971).

In the conditions of the republic, the degree of morbidity of these crops in greenhouses and in open fields has been studied very little. This, in turn, causes the need to determine the level of morbidity of the culture, as well as the need to study pathogens. On this basis, studies were conducted to study the degree of eggplant morbidity in various soil and climatic conditions of the republic. The research was carried out mainly in greenhouses and open fields in the conditions of the Tashkent, Kashkadarya and Ferghana regions. Diseases of plants and fruits were studied from the period of germination of crop seeds to the end of the growing season (Sadikova *et al*., 2022). During the research, fungi were identified that provoke the disease with total anthracnose, alternariosis, late blight, fusarium of white and gray rot (SEZD).

Materials and methods

The object of the study are microorganisms common in eggplants and their host plants belonging to the

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ituzumdosh (Nightshade) family Tashkent, Kashkadarya and Ferghana regions.

Biological, chemical and physical methods are used to study phytotoxins. With the help of chemical methods, certain toxic substances can be extracted and their individual effects can be studied. But in nature, its biological significance is fully revealed when many toxic substances act together. Therefore, the use of the biological method in the study of phytotoxins gives the correct result.

During the study, the property of fungi isolated from an infected eggplant plant to form phytotoxins was studied... the variety was studied by determining the effect of eggplant seeds on germination and development. Chapek mushrooms were grown in a liquid nutrient medium for 15 days. To determine the formation of substances in the culture fluid that may exhibit the property of toxicity to plants, conidia and mycelium were isolated by filtration (Pimenova *et al*., 1971).

To study the biological effect of phytotoxins on plant seeds, eggplant seeds were infused for 24 hours in the culture liquid of mushrooms. For each variant, 50 large and 100 small seeds were used. Non-fungal sterilized liquid nutrient medium of Chapek was used for control.

For 24 hours, the crushed seeds were placed for germination in wet chambers in a Petri dish. The property of the fungus to form phytotoxins was determined by the fact that the seeds have a reduced ability to germinate, and the grass and root lag behind in growth. Among the phytotoxin-producing species, species were introduced that reduce the ability of seeds to germinate by 30% compared to the control, leaving growth behind.

Results

Cytotoxic properties of pathogenic fungi in eggplants were studied in the experiment (Table 1).

Table 1 The negative effect of corn phytotoxins on the growth and development of eggplants

T/p	Strain No.	Total number of eggplant seeds planted, pieces	From this sprout hatched seeds, pieces	From this, unpeeled seeds germinate, %	The length of the rod for control relative to, mm	The length of the root relative to the control, mm	Indicator of pathogenicity of fungi
1.	Control	10	10	-	23	24.5	-
2.	A. flavus 6/7	10	3	70	4	3	Aggressive
3.	A. terreus 4/13	10	-	100	-	-	Aggressive
4.	F. culmorum 1/6	10	1	90	0.2	-	Aggressive
5.	A. alternate 4/11	10	4	60	0.4	-	Aggressive
6.	Fusarium sp. 1/13	10	1	90	0.2	-	Aggressive
7.	Aspergillus sp 2/5	10	-	100	-	-	Aggressive
8.	F. verticilloides ¾	10	-	100	-	-	Aggressive
9.	A.tenuis 4/12	10	3	70	0.3	-	Aggressive
10.	Fusarium sp. 1/4	10	1	90	0.3	1	Aggressive
11.	F. solani 1/8	10	3	70	-	0.3	Aggressive
12.	Fusarium sp. 4/5	10	-	100	-	-	Aggressive
13.	C.herbarum 4/9	10	3	70	0.1	1.3	Aggressive
14.	F. solani 1/5	10	3	70	0.4	0.3	Aggressive
15.	F.oxysporium 3/1	10	2	80	-	0.2	Aggressive
16.	P.chrysogenum 2/7	10	2	80	-	0.2	Aggressive

From the information in this table, we can see that during the growing season of eggplants, when corn phytotoxins isolated from plants and fruits infected with fungi were planted in damaged areas, they caused enormous damage to germination, as well as germination of this seed. That is, in the control variant, when the water-soaked seeds were sown, all the seeds completely germinated, and the stem length was a total of 23 cm on 10 plants, while the root length was 24.5 cm. This pointer has a very low seed capacity in the experimental version, that is, the length of the stem with 4 sprouts and the root part that has not grown is only 0.4 cm in 4 plants. In the experiment, we named strains with phytotoxins up to 30% of the degree of damage to the germination and growth of eggplant seeds as non-pathogenic species. But we identified strains that negatively affected germination and growth by more than 70% as aggressive strains. In this experiment, it was proved in experiments that all strains are aggressive species compared to this type of culture, since almost 70% of the germination and growth of eggplant seeds are damaged.

The lag in the growth of the eggplant plant in relation to control under the influence of phytotoxic properties of mushrooms

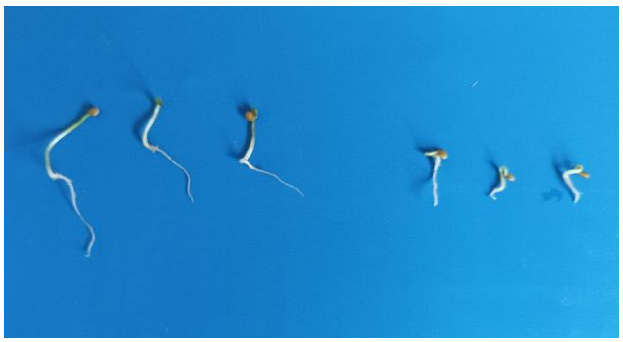

Fig. 1. The figure on the right side in the control version shows seeds soaked in water, on the left side F. solan, I 1/5 planted seeds damaged by the strain of the fungus phytotoxin

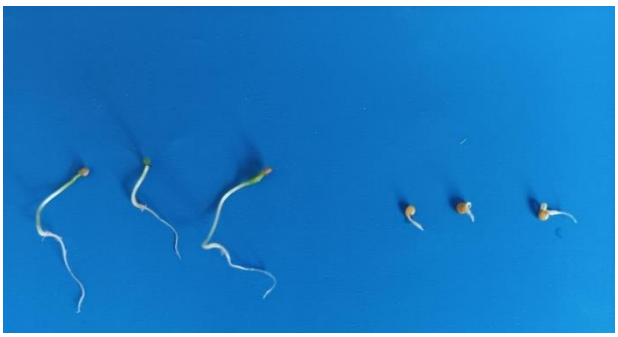

Fig. 2. In the figure on the right, in the control variant, seeds soaked in water, on the left side of A.tenuis, 4/12 planted seeds damaged by a strain of phytotoxin of the fungus

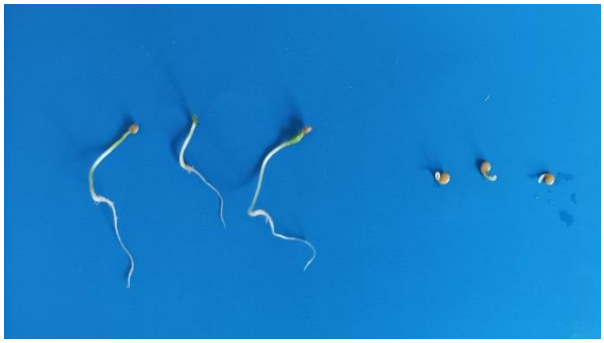

Fig. 3. The figure on the right in the control version shows seeds soaked in water, on the left side of F.oxysporum, planted seeds damaged by phytotoxin of fungi strain 3/1

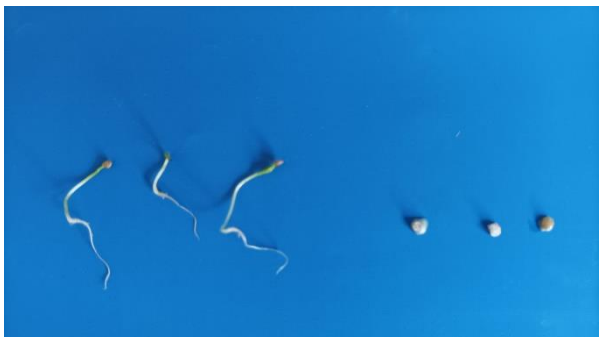

Fig. 4. The figure on the right in the control version shows seeds soaked in water, on the left side of F. verticillioides, planted seeds damaged by phytotoxin of fungi of 3/4 strain

These images show that under the negative influence of phytotoxins of pathogenic fungi, the germination and growth of eggplant seeds relative to control occur very slowly. In the experiment, we can see that 10 seeds were sown in each variant, of which there were a maximum of 3 seeds, and that those that grew also formed only roots (Fig. 1, 2). We observed that the studied phytopathogenic fungi completely suspended seed germination as a result of their extremely high phytotoxic properties (Fig. Thus, based on the results obtained as a result of the research, it was found that all fungi from 15 species tested in the experiment had a high phytotoxic property, and it was concluded that all strains are aggressive strains.

Table 2 The negative effect of corn phytotoxins on the growth and development of tomatoes

TT /p	Strain No.	Tomato seeds in jam, pcs.	From this sprouted seed, pieces	Seeds that did not germinate from this, %	The length of the rod in relation to the control, mm	The length of the root relative to the control, mm	Indicator of pathogenicity of fungi
1.	Control	10	10	-	58	76	-
2.	4/11	10	6	40	28	47	Strong pathogen
3.	2/5	10	5	50	19	25	Average pathogen
4.	4/13	10	5	50	21.5	15	Aggressive

5.	4/5	10	6	40	18.5	23.5	Strong pathogen
6.	3/4	10	4	60	12	20	Aggressive
7.	6/...	10	5	50	29	39	Strong pathogen
8.	3/1	10	5	50	14	17.5	Aggressive
9.	1/5	10	5	50	19.5	31	Average pathogen
10	1/8	10	5	50	18.5	36	Average pathogen
11	2/7	10	7	30	21.5	43	Weak pathogen
12	4/9	10	4	60	15	22	Aggressive
13	1/4	10	5	50	19.5	34	Average pathogen
14	1/6	10	5	50	24	40	Weak pathogen
15	1/13	10	6	40	22	32	Average pathogen

In this table, all 10 seeds were germinated in the control variant, when the tomato plant was planted by isolating pathogenic fungi during the growing season and infecting the seeds of the plant with fungophytotoxins. In the experimental variants, it was found that the strains are aggressive. When determining the aggressiveness of these strains, it can be seen that the sown seeds lost up to 70% of their germination, and the growth rate of roots and stems formed in sprouted seeds increased very slowly compared to the control. 14 studied strains were identified as 1 strong pathogen, 5 medium pathogenic and 4 weak pathogenic fungi from fungi. This was studied by analogy with the fact that seeds planted with phytotoxins of these fungi, even with low resistance to ultraviolet radiation, their growth and development are close to control.

Fungal fungi phytotoxinlik characteristic affected tomatoes weisimligining Control relative to orcada mold

Fig.1. The figure on the right side in the control version shows seeds soaked in water, on the left side F. solan, I 4/11 planted seeds damaged by a strain of the fungus phytotoxin

Fig.2. In the figure on the right, in the control variant, seeds soaked in water, on the left side of A.tenuis, 1/6 seeds planted with a damaged strain of phytotoxin fungus

Fig. 3. The figure on the right in the control version shows seeds soaked in water, on the left side of F.oxysporium, 4/5 seeds planted with a damaged strain of phytotoxin fungus

Fig. 4. The figure on the right in the control version shows seeds soaked in water, on the left side of F. verticillioides, 4/13 seeds that were planted damaged by a strain of phytotoxin fungus

These pictures show that tomato seeds have low germination and growth under the influence of phytotoxins of fungi.

Table 3 The negative effect of corn phytotoxins on the growth and development of hot pepper

T/p	Strain No.	Tomato seeds in jam, pcs.	From this sprouted seed, pieces	Seeds that did not germinate from this, %	The length of the rod in relation to the control, mm	The length of the root relative to the control, mm	Indicator of pathogenicity of fungi
1.	Control	10	9	10	19	32.5	-
2.	4/5	10	5	50	11	15.5	Strong pathogen
3.	4/2	10	2	80	10	12.5	Aggressive
4.	4/11	10	4	60	14	15	Strong pathogen
5.	1/6	10	6	40	6.5	20	Average pathogen
6.	3/4	10	1	90	2	5	Aggressive
7.	1/13	10	5	50	2.4	3	Aggressive
8.	3/1	10	5	50	11.7	18	Average pathogen
9.	4/13	10	5	50	10	15.5	Strong pathogen
10.	6/...	10	6	40	12	18	Average pathogen
11.	1/4	10	4	60	6.5	12	Aggressive
12.	2/7	10	3	70	9	12	Aggressive
13.	1/5	10	4	60	5.5	11	Aggressive
14.	2/5	10	3	70	9	12	Aggressive
15.	4/9	10	3	70	8	19	Average pathogen

The data from the table shows that the germination and growth of plants under the influence of phytotoxins of phytopathogenic fungi isolated from the plant is relatively slow to control. The experiment showed a negative effect on the germination and growth of hot pepper seeds under the influence of phytotoxins of the studied fungi. In this case, it was found that out of the 14 studied species, 7 masub fungi are aggressive strains, 3 are highly pathogenic strains and 4 are moderately pathogenic.

Slowing down the growth of the bitter pepper plant in relation to control under the influence of phytotoxic properties of mushrooms

Fig.1. The figure on the right side in the control version shows seeds soaked in water, on the left side F. solan, I 4/13 planted seeds damaged by a strain of the fungus phytotoxin

Fig. 2. In the figure on the right, in the control variant, seeds soaked in water, on the left side of A.tenuis, 1/6 seeds planted with a damaged strain of phytotoxin fungus

Fig. 3. The figure on the right in the control version shows seeds soaked in water, on the left side of F.oxysporum, planted seeds damaged by phytotoxin of fungi strain 3/1

Fig. 4. The figure on the right in the control version shows seeds soaked in water, on the left side of F. verticillioides, planted seeds damaged by phytotoxin of fungi of 3/4 strain

In these images, we can see that the germination and growth of hot pepper seeds is slow compared to the control caused by the action of corn phytotoxins.

Table 4 The negative effect of corn phytotoxins on the growth and development of sweet pepper

T/p	Strain No.	Tomato seeds in jam, pcs.	Tomato seeds in jam, pcs.	Seeds that did not germinate from this, %	Seeds that did not germinate from this, %	The length of the root relative to the control, mm	Indicator of pathogenicity of fungi
1.	Control	10	9	10	24	39.5	-
2.	4/13	10	8	20	19	54.5	Not pathogenic
3.	1/6	10	8	20	14.5	32	Weak pathogen
4.	6/...	10	8	20	13.7	30.5	Weak pathogen
5.	2/5	10	8	20	17	31	Not pathogenic
6.	4/12	10	7	30	5.6	15.5	Aggressive
7.	4/5	10	4	60	4	11	Aggressive
8.	¼	10	5	50	6.5	18.5	Average pathogen
9.	2/7	10	8	20	6.7	19.8	Aggressive
10.	4/11	10	8	20	12.5	42.5	Not pathogenic
11.	¾	10	5	50	7.5	23.5	Aggressive
12.	1/8	10	6	40	5.3	11.5	Aggressive
13.	1/13	10	5	50	10	25	Average pathogen
14.	1/5	10	4	60	4.6	12.5	Aggressive
15.	3/1	10	7	30	6.6	19.5	Strong pathogen
16.	4/9	10	7	30	15.5	39	Not pathogenic

When the data in the table examined the phytotoxic properties of phytopathogenic fungi on sweet pepper seeds, it was found that 15 species in the experiment represented 6

Slowing down the growth of the bitter pepper plant in relation to control under the influence of phytotoxic properties of mushrooms

Fig. 1. The figure on the right side in the control version shows seeds soaked in water, on the left side F. solan, I 4/11 planted seeds damaged by a strain of the fungus phytotoxin

Fig. 2. In the figure on the right, in the control variant, seeds soaked in water, on the left side of A.tenuis, 1/6 seeds planted with a damaged strain of phytotoxin fungus

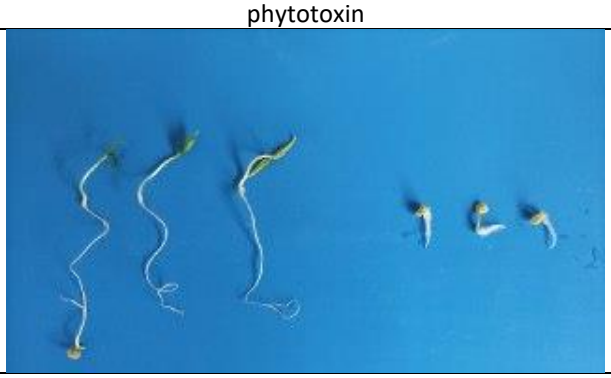

Fig. 3. The figure on the right in the control version shows seeds soaked in water, on the left side of F.oxysporum, planted seeds damaged by phytotoxin of fungi strain 3/1

Fig. 4. The figure on the right side in the control version shows seeds soaked in water, on the left side F. verticilloides, 1/5 seeds that were planted damaged by a strain of phytotoxin of the fungus

Conclusions

In these images, the negative effect of sweet pepper seeds on germination and growth in relation to nasoarate under the influence of phytotoxins was studied by comparison.

These fungi, which were used in the study, can subsequently be used as the main objects of research in the search for antagonists against them and in the development of effective biological control measures.

References

[1]. Berestetsky O.A. Study of the phytotoxic properties of fungi// Methods of experimental mycology. Kyiv: Science thought. 1973. S. 165-175.

[2]. Bilay V.I. Fusaria. Kyiv: Science thought. 1977. P. 439.

[3]. Bilay V.Y., *et al*., Morphology of microconidia of species of the section Elegans. – In the book: Metabolites of soil fungi. K., "Naukova Dumka", 1971a, p.184

[4]. Gorlenko M.V. Seeds as a source of spread of diseases of agricultural plants // Influence of microorganisms and dressing agents on seeds. –M.: Science. 1972. 11-15 p.

[5]. Gubanov G.Ya. On the occurrence of phenolic compounds in wilt-affected cotton // Plant Physiology. 1962. T. 9. Vўp. 5. 170-180p.

[6]. Goyman E. Infectious diseases of plants. M.: Publishing House of the Academy of Sciences of the USSR. 1954. P. 390.

[7]. Kalmikova N.A. Fungi - producers of phytotoxic substances as a factor in the toxicity of chernozem soil // Systematics, ecology and physiology of soil fungi. Kyiv: Science thought. 1975. S. 174-177.

[8]. Patyka V.F., Goncharova L.V., Grab T.A. Microorganisms and biological toxicity of soil // Republican scientific - theoretical conference of young scientists microbiologists. Tashkent: Fan. 1978. C. 195

[9]. Runov V.N., Borodin G.I. Physiology and biochemistry of causative agents of cotton wilt. Tashkent: Fan. 1970. 158 p.10. Sadikova S., Azimova N., Khaitbaeva N., Sherkulova J., Kodirova R. Distribution of the main diseases of vegetable crops grown in different soil and climate conditions of Uzbekistan / Agro science, No. 6 (85). 2022 32-33 p.

[10]. Sheraliev A., Azimdzhanov I. Phytotoxic properties of fungi of the genus Fusarium Lk.ex Fr., affecting mulberry in Uzbekistan (in Ukrainian)// Journal of Microbiology. 1977.V.39. Issue. 5. P. 668-669.

[11]. Sheraliev A., Azimdzhanov I. Formation of fusaric acid F.oxysporum Schecnt emend.Snyd.et Hans, F.monilforme Sheld affecting mulberry in Uzbekistan// Abstracts of reports. II Res. scientific-theor. Conf. of young scientists-microbiologists. Tashkent: Fan. 1978. S.165-166.13.

[12]. Sheraliev A., Zuparov M., Kholmurodov Ch. Features of phytotoxin production of fungi found in weeds in vegetable fields// Stability-development basis of Uzbekistan. Tashkent. (Collection of scientific works. ToshDAU). 1998. p. 69-71.

[13]. Sherkulova J.P., Azimova N.Sh., Kahromonova O.N. Fusarium oxysporum Schltdl detected in potato nodules. Isolation of a pure culture of the fungus // Bulletin of the Khorezm Ma'mun Academy. Khiva, 2022 -6/1, 107-109b.