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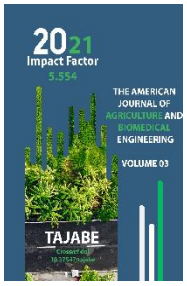

The Effect Of The Trichoderma Fungus On The Fertility Of Plants

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ABSTRACT

Trichoderma, a soil fungus, is widespread in nature and is noted as a microbiological object that is easily separated, has a very rapid biomass formation and has a high level of biological activity against phytopathogenic fungi without harming the plant. Therefore, it is recommended to widely use the results of modern studies of metabolites of the producer Trichoderma Pers.: Fr, which exhibits several fungicidal actions, especially in the process of hyperparasitism in agriculture.

KEYWORDS

Trichoderma, microbiological diseases, environmental degradation, pests, fungi, biologically active substances.

INTRODUCTION

It is known that the Republic of Uzbekistan is a country specializing in the agricultural sector, with favourable climatic conditions suitable for high yields of almost all types of crops. In the absence of large losses in the process of cultivation and storage of agricultural products, this amount of land would be enough to provide the population of the Republic with food and technical raw materials and to export some of the products. During the cultivation of agricultural products in our country, as a result of various pests and microbiological diseases, 20-30% of crops are lost. Practical experience shows that the yield

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of crops is lost from 10% to 50% as a result of the development of some highly harmful microorganisms [1,2]. Such large losses in agriculture are also caused by pests and diseases that occur in crops.

The fact that more than 220 species of pests have been reported to be infested by insects and diseases in the growth and development of cotton also indicates the urgency of combating these pests. Such highly harmful organisms can be infested by pests such as locusts, tapeworms, spiders. Scientific sources state that more than 150 pests damage organisms during the cultivation of cereals.
In particular, many studies have shown that the yield of a single grain is lost from 5% to 50% under the influence of pests during storage. In the territory of the Republic of Uzbekistan, harmful weeds are growing and causing significant damage to grain crops, especially wheat in the Fergana Valley, Tashkent, Samarkand, Jizzakh, Syrdarya, Bukhara, Navoi and Surkhandarya regions. It is known that the germination of seed grain obtained from areas affected by weeds is reduced by up to 50 per cent. Also, the quality of flour made from damaged grain is causing huge problems in the food industry.

The deterioration of the ecological situation, soil microflora, its physicochemical composition, pollution of water bodies, which in recent years has become one of the most pressing problems, resulting in severe adverse effects on humans and warm-blooded animals, limits the use of chemicals. Such problems pose challenges to scientists, such as the development and practical application of alternative methods of pest and disease control. One of the 6 alternative methods is pest and disease control based on microbiological drugs. This method has several advantages over the chemical method, including environmental friendliness, non-accumulation in the soil, ease of preparation, storage, transportation and application, economic efficiency, and relative safety, especially in warm-blooded animals.

MATERIALS AND METHODS

Trichoderma, a soil fungus, is widespread as a microbiological object that is easy to separate cleanly produces biomass very quickly, has a high biological activity against phytopathogenic fungi without harming plants, and can synthesize biologically active substances that control plant growth. is recorded. Therefore, it is advisable to use the results of modern research on metabolites of Trichoderma Pers.: Fr, which exhibits a range of fungicidal action, especially the process of hyperparasitism in agriculture and the possibility of synthesizing plant growth control agents.

Therefore, in our subsequent research, we tried to study the phytohormone synthesis property of the Trichoderma fungus. We believe that this will allow us to create a new generation of bio preparation in the future. Because the hyperparasitic property of the Trichoderma fungus has been widely used by scientists until now, data on their metabolites that control plant growth are rare in scientific sources. The main goal of these studies was to study the factor that accelerates the growth of the amaranth plant of the fungus Trichoderma. We, therefore, aimed to analyse the composition of the metabolic substances produced by the Trichoderma fungus to control plant growth. In scientific sources, data have emerged that the dry biomass of the plant *Vaccinium corymbosum L.* inoculated with the strain of *Trichoderma harsianum Rifai* increased by 2–3-fold [3].

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Complex effects are required to stimulate plant growth and development, including auxins produced by fungi that also have a significant effect on plants [4,5,6]. Auxin - indolyl-3-acetic acid (IAA) - is also very important in this, participating directly in the symbiosis of plants and bees with several enzymes and secondary metabolites that it produces [7, 8]. It should be noted that the ability to synthesize IAA varies from tens of times to hundreds of times in different fungi, even strains [9]. Also, fungi synthesize IAA using tryptophan as a derivative [4].

Therefore, their formation of auxins has a significant effect on the amount of release of this amino acid in the plant host. Therefore, in our studies, we aimed to study the amount of IAA produced by the Trichoderma fungus to control plant growth and the effect of the amino acid L-tryptophan on its formation. The research work was carried out in the following order, photocalometric screening was performed to study the indole-3-acetic acid synthesis properties of the strains. Strains were transplanted into Chapek nutrient media with L-tryptophan and grown at 7 °C for 7 days. The cultured cultures were filtered, 2 ml of supernatant was obtained, mixed with 8 ml of Salkovsky reagent (50 ml, 35% $HClO_4$; 1 ml of 0.5 M $FeCl_3$) and left for 20-30 minutes. Samples with IAA produce a reddish-pink colour. Then, the optical density was checked using a green light filter at a wavelength of 530 nm FEK - KFK-2 (Russia) [10]. The amount of IAA in the samples was calculated based on a standard curve.

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In scientific sources, data have emerged that the dry biomass of the plant Vaccinium corymbosum L. inoculated with the strain of Trichoderma harsianum Rifai increased by 2–3-fold [3]. Complex effects are required to stimulate plant growth and development, including auxins produced by fungi that also have a significant effect on plants [11-14]. Auxin - indolyl-3-acetic acid (IAA) - is also very important in this, participating directly in the symbiosis of plants and bees with several enzymes and secondary metabolites that it produces [15-17]. It should be noted that the ability to synthesize IAA varies from tens of times to hundreds of times in different fungi, even strains [18-19]. In addition, fungi synthesize IAA using tryptophan as a derivative [4].

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For the identification of IAA, studies were performed using the method of thin-layer chromatography (TLC). To do this, the ethyl acetate fraction was instilled into silica gel plates (Silica gel G *f* 254, thickness 0.25 mm). It was then treated with ethyl acetate: chloroform: formic acid (55:35:10) or benzene: butanol: acetic acid (70: 25: 5) [18-24]. It is known that a homogeneous Rf value with a standard IAA indicates that an IAA is present in the supernatant. Table 1 shows that the amount of tryptophan has a significant effect on the synthesis of indole-3-acetic acid (IAA) when Trichoderma fungi are grown in a liquid medium in different ways.

Table 1. The effect of tryptophan on the synthesis of indole-3-acetic acid (IAA) when growing the fungus Trichoderma in a liquid nutrient medium by various methods

The amount of tryptophan in the feed, mM	The amount of IAA in the culture fluid when shaken, mkM	The amount of IAA in the culture fluid at stationary cultivation, mkM
0	18.2	15.2
0.5	18.4	24.2
1.0	22.6	22.4
1.5	28.6	26.6
2.0	30.2	26.8
2.5	32.2	41.2
3.0	32.6	46.4
3.5	33.4	54.2
4.0	34.2	58.3
4.5	34.4	58.6
5.0	34.4	60.2

In this case, the method of cultivation was carried out under two different conditions: in the usual way the culture medium was shaken, and the liquid medium was carried out in a stationary state. The results showed that when the amount of tryptophan was 2.5 mM, 32.2 µM IAA was produced in the liquid culture medium, while in the same amount of tryptophan, 41.2 µM IAA was produced in the culture fluid when grown in stationary conditions. Interestingly, when tryptophan levels were determined from 4.0 mM to 5.0 mM, it was noted that IAA formation did not change after 34.2–34.4 µM under conditions in which the liquid nutrient medium was cultured. The opposite was observed in the second growing condition. In particular, when tryptophan was added to the culture medium in the amount of 4.0-5.0 mM,

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the formation of IAA by the method of stationary cultivation increased from 58.3 µM to 60.2 µM.

Therefore, it is advisable to pay attention to the growing conditions and the amount of tryptophan in the preparation of a bio preparation that controls the growth of plants from the fungus Trichoderma in the form of culture fluid. In our subsequent studies, the possibilities of IAA formation of fungal biomass in a nutrient medium were considered (Table 2).

Table 2. Effect of tryptophan content on IAA synthesis of Trichoderma fungal biomass in a nutrient medium

The amount of tryptophan in the feed, mM	The auxin-forming activity of mycelial mass, mkg IAA/g biomass
0	189.6
0.5	225.2
1.0	268.4
1.5	275.8
2.0	300.6
2.5	336.2
3.0	362.4
3.5	392.6
4.0	466.4
4.5	520.4
5.0	525.2

The results show that in this case, too, the amount of tryptophan in the nutrient medium was noted as a major factor. During the study, it was observed that the amount of tryptophan in the nutrient medium remained quantitatively unchanged in the range of 4.5-5.0 mM, the formation of IAA (520.4-525.2 mcg IAA/g biomasses). Therefore, during the preparation of a bio preparation in the liquid state based on the fungus Trichoderma, it is necessary to use stationary growing conditions and to achieve the content of L-tryptophan amino acid in the amount of 4.5-5.0 mM in the liquid nutrient medium. Then it will be possible to prepare the desired amount of IAA-containing bio preparation.

CONCLUSION

Trichoderma, a soil fungus, is widespread and is noted as a microbiological object that is easy to separate cleanly, has a very fast biomass formation, and has a high level of biological activity against phytopathogenic fungi without harming the plant. Therefore, it is advisable to make extensive use of the results of modern research on metabolites of the producer Trichoderma Pers.:Fr, which exhibits a range of fungicidal action, especially the process of hyperparasitism in agriculture. In the preparation of a bio preparation to control the growth of plants in the liquid state based on the fungus Trichoderma should use the conditions of the stationary culture of the culture and achieve the presence of L-tryptophan amino acid in the liquid medium in the amount of 4.5-5.0 mM. Then it will be

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