Fungi of the genus *Trichoderma* (teleomorph *Hypocrea*) are free-living organisms and are widespread in the environment. They occur in all climate zones and colonize different ecological niches. Their main habitat is rotting wood, soil, and especially the rhizosphere. Fungi of this type are the producers of a plurality of metabolites which have a key role in their interaction with plants or other microorganisms. Via hyperparasitism, competition and antibiosis, *Trichoderma* spp. have effect on pathogenic oomycetes (*Oomycota*), bacteria, viruses, and in particular pathogenic fungi. They also have the ability to reduce the toxins produced by fungi of the genus *Fusarium*. Previous studies also show that *Trichoderma* has a positive impact on the growth and development of plants, manifesting itself in increased wet and dry weight and length of roots and shoots. *Trichoderma spp*. may cause induced systemic resistance (IRS) both in monocots and dicotyledonous as a result of biotic and abiotic stress. Thanks to all these properties, they are classified as biological control agents (BAC) and are used commercially for the production of pesticides such as a biopesticides and biofertilizers. Fungi of the genus *Trichoderma* produce multiple biologically active compounds such as enzymes, antibiotics, volatile compounds, acids and plant hormones. It has been shown that some of these compounds have the ability to interact with plants.

In the literature available to us, however, there is little information about the changes taking place in the roots of plants subjected to the influence of fungi of the genus *Trichoderma*. There are no comprehensive data on studies involving changes at the tissue and cellular level.

This will be the first example of an investigation of the effect of *Trichoderma* species/strains, on the wheat roots growth and development. The novelty of this project will be the comprehensive studies on the morphological and anatomical changes of wheat roots induced by *Trichoderma* spp. In this respect, the impact of *Trichoderma* on plants has not yet been studied in detail. There is limited knowledge about the interactions between *Trichoderma* and wheat, particularly on the basis of such an approach. In contrast, the current work of our team on the fungi *Trichoderma,* including the preliminary studies for the project, indicates that there is no uniform response from the plant (wheat) to the presence of various species / strains of *Trichoderma*. The impact on plant strains of *Trichoderma* with proven ability toward antibiosis and hyperparasitism in terms of fungal pathogens of wheat (*Fusarium* spp.), which are efficient producers of volatile metabolites (including 6 PAP) and glucanolytic enzymes, is different than is the case with strains that have high cellulolytic and xylanolytic activities, and poor potential for the production of volatile metabolites. Pilot studies into the impact of these strains on wheat seedlings have shown that some species adversely affect root growth resulting in substantial shortening and abnormal appearance compared to control roots. However, other *Trichoderma* species show a positive effect on the growth of wheat roots as compared to the control. Therefore, the aim of this project is to understand the changes occurring in the roots of wheat (*Triticum aestivum* L.) as a result of interaction with fungi of the genus *Trichoderma* of differing lifestyles. Two species / strains of *Trichoderma* differing significantly in terms of the production of 6PAP and cellulolytic enzymes were selected for the study: *T. atroviride* – an efficient producer of 6PAP; and *T. cremeum* – an efficient producer of cellulases and xylanases. These are unique, and were selected on the basis of years of research into genetic, molecular and biochemical *Trichoderma* strains that have been isolated from different habitats in Poland.

The performance of the proposed research project and the explanation of the reaction of wheat plant roots to the fungus *Trichoderma* present in their rhizosphere seems important not only from a scientific point of view, but it will also help to raise awareness of the use of *Trichoderma* fungi in the biological control of plants or as bio-stimulators. It is over 50 years since the development of bio-pesticides based on *Trichoderma* with varying effects of action. A basic knowledge about the effects of *Trichoderma* fungi on plants and a description of the specific interaction between these strains and species of plants (in this case wheat) will allow appropriate selection of strains of *Trichoderma* and their conscious, deliberate (conditional on their properties) use in developing bio-pesticides, biofertilizers, growth enhancers and stimulants of natural resistance.