The main objective of the project research will be compare and obtain completely new knowledge about the characteristics of dynamics changes in *Arabidopsis thaliana* wild-type (Col-0) and several knockout mutants of respiratory burst oxidase homologs D or F (*rbohD, rbohF* and *rbohD/F*) infected with *Turnip mosaic virus* (TuMV). TuMV is one of most dangerous viral pathogens as well as model virus to investigation plant-virus interactions. The research in planned project will be carried out on *Arabidopsis thaliana* plants with significantly differ resistance level to TuMV infection (susceptible Col-0 and *rbohD* plants and resistant *rbohF* and *rbohD/F*). Understanding of the nature of cell wall changes in the plant response to biotic stress is fundamental for understanding the complexity of pathogenesis in plant cells. The current state of knowledge in this area is definitely insufficient and unsatisfactory. Moreover, the recent literature on the dynamics of changes accompanying plant-pathogen interactions has mainly focused on the effects of pathogens actively penetrating and causing destruction of the cell wall near the "first contact point" of the pathogen with the infected plant (such as fungi, nematodes or bacteria). In contrast to these pathogens, plant viruses do not have the ability to actively penetrate the cell wall. As a result, for many years the role of the cell wall in the response of plant cell susceptibility or resistance was underestimated or ignored. Recently, our new preliminary data indicated involvement and activation of a number of elements directly or indirectly related to the cell wall during viral infection. Currently, the availability of a variety of new modern and impressive research techniques makes it possible to characterize biological, molecular and ultrastructural effects of plant-virus interactions. Therefore, the planned project will combine use of innovative molecular biology techniques and modern and complex microscopical analyses – fluorescence, transmission electron microscopy with electron tomography analysis as well as 3D modeling of the cell wall to describe and explain multilevel changes in the apoplast of cells infected with this dangerous viral pathogen.

Detailed understanding of the changes in the relative expression levels of genes encoding the major elements involved in the multilevel remodeling of the apoplast (in the cells of *Arabidopsis thaliana* plants with different susceptibility to TuMV) will be valid. Moreover, it will also show the correlation between the changes in genes expression and type of interaction. In addition, the precise and complex localization of selected elements related to the modification of the cell wall at the anatomical, and ultrastructural level will allow the precise spatial distribution and identification plant cell compartments along with their changes during the infection.

The results of the project will provide a clear answer how the dynamics of apoplast changes are remodeled in plants with defects in respiratory burst oxidase homologues D or F in *Arabidopsis thaliana* plants. Based on the results of gene expression and microscopic locations, it will be possible to precise select areas for exposition to electron tomography (ET) to show for the first time the three-dimensional structure of the cell wall during the response of plant cell immunity and susceptibility to the virus.