Aphids are phytophagous insects considered serious pests of fruit trees, crops, and ornamental plants. **A large number of generations during the growing season, high fecundity of females, and parthenogenetic reproduction contribute to the rapid spread of aphids to many host plants.** In addition, due to global warming in recent years, there has been an increase in the number of aphid generations per year and an extended period of colonization of host plants, which makes the fight against aphids a real challenge. **Chemical plant protection products are effective in the battle against aphids, but due to their toxicity, they pose a significant threat to the environment and human and animal health. That is why reducing pesticides and introducing biopreparations into agriculture is essential.** Biological methods of plant protection against insects use their natural enemies and microorganisms. So far, biopreparations containing bacteria have been used mainly to control the population of caterpillars and fly larvae. The main advantage of using bacteria as a plant protection product is that they are not harmful to humans and pollinators because they have no contact effect. This means that they are a safe alternative to pesticides.

The defense mechanisms of aphids against microorganisms are poorly understood, but the data so far indicate that the response of aphids to bacterial infections is poorer than in other insects. One of the potential reasons for reducing aphids' defense mechanisms against bacterial infections may be that these insects are hosts for intracellular symbionts that produce and provide them with essential amino acids and vitamins absent in the food taken and protect them against natural enemies, e.g., parasitic Hymenoptera. However, using bacteria as a biopreparation to control aphid populations requires a better understanding of the response of these insects to bacterial infections.

In the proposed project, we will focus on understanding the defense mechanisms of three economically important species of aphids (*Aphis pomi, Myzus persicae, Macrosiphum rosae*) in response to infections with various strains of *Bacillus subtilis*. Bacteria of the genus *Bacillus* are common in the environment and do not harm human and animal health. Previous studies have shown their effectiveness in combating pathogenic fungi that cause plant diseases; some also produce insecticidal substances, which increases their use in biological pest control.

The aim of the proposed project is: (1) to analyze the potential ways of infection of aphids by *B. subtilis* and the course of colonization of their tissues, (2) to study the impact of *B. subtillis* on the dynamic of obligate and facultative aphids symbionts populations, (3) to understand the defense mechanisms of aphids against bacterial infection, (4) identification of insecticidal substances produced by different strains of *B. subtilis*, (5) examination of whether infection with *B. subtilis* affects the way and time of feeding of aphids on the host plant, (6) determination of the *B. subtilis* potential in aphids control.

The project results will contribute to a better understanding of the defensive reactions of aphids to bacterial infections. Because aphids as pests of plants and vectors of plant viruses cause significant losses in agriculture and horticulture, the obtained results can be practically used and will create new opportunities in planning biological plant protection.