Under natural conditions we often observe the impact of multiple stressors occurring simultaneously or sequentially. The primary objective of the study within the project is to identify the regulation of biosynthesis of signal molecules in plant response to the interaction of abiotic and biotic stress factors. It is important to recognize this regulation at the molecular, physiological and biochemical levels in edible pea (*Pisum sativum* L. Cysterski), at varying lead concentrations, i.e. at a low concentration inducing the metabolic status of the plants, potentially causing the hormesis effect, and at a high concentration leading to the toxic effect, and during the infestation of phytophage with piercing and sucking mouthparts, i.e. the pea aphid (*Acyrthosiphon pisum* (Harris)). The application of two lead concentrations will make it possible to determine differences in the nature of the plant defence response of pea to *A. pisum* infestation. It needs to be stressed that in contrast to other mobile elements, lead is accumulated in roots and may be transported to leaves after a threshold level is exceeded. The selection of lead as a heavy metal in this study is significant, since at a low concentration of this element in the medium we may obtain plants containing no lead/a low level in leaves and thus we may infer on the nature of the defence response by transduction of the signal from the root to leaves. In this case, the elevated generation of signaling molecules such as phytohormones and free radicals in the roots, resulting from the transition of lead to root cells, will affect defence responses in leaves. This will modulate the biosynthesis of flavonoids, including pisatin as an important pea phytoalexin, and in consequence the colonization of seedlings by the herbivore. Recognition of this regulation at the molecular, proteomic and metabolomic levels in edible pea (*Pisum sativum* L. Cysterski), in the context of the influence of lead and during *A. pisum* feeding, will provide new information for contemporary plant biology. At the application of these two lead concentrations we may expect differences in the intensity of generation of signal molecules, sequence/during generation, the expression of selected genes encoding enzymes of the biosynthesis of these molecules and changes in signal transduction from the roots to leaves and in the triggering of defence responses. Differences in the period and intensity of the generation of signal molecules resulting from the effects of the above stressors will affect the flavonoid biosynthesis mechanism. The planned research will provide contemporary science with new information on the regulation of biosynthesis of signal molecules/flavonoids, including pisatin, in the defence mechanism of pea in the system: an abiotic factor (lead at varying concentrations: the hormesis and toxic effects) – plant (signal network) - phytophage (insects with piercing and sucking mouthparts). Moreover, the applied toxic lead doses will make it possible to directly determine the effect of this element on the behaviour and bionomics of phytophage feeding on phloem sap of plants, as well as the efficiency of the defence system in plants.