In recent years, silicon, the element that is not included in the group of macro and microelements necessary for life, has become increasingly important in plant production. It has been observed that deficiency of this component in plants causes disorders of growth, development and reproduction, as well as increases sensitivity to toxic substances, pathogens and pests. Silicon may be supplied to plant organisms through roots, specific transporters or by diffusion (dicotyledonous plants). The uptake intensity correlates with the intensity of transpiration - the higher it is, the more silicon is absorbed by the plant. This element can be collected directly under the cuticle, forming an insoluble silicon-cuticular layer. Such reinforced cell walls create a natural barrier for pathogens or adverse weather conditions (drought). Hence, diatomaceous earth with high silica content (92% SiO_2, 43% Si) is **increasingly used in horticultures, and its positive effect on plants is observed especially in conditions of abiotic stress, e.g. water shortage, intense exposure to the sunlight or strong soil acidification.**

The purpose of the presented research project is to propose the use of biomass of some freshwater macroalgae species together with diatoms attached to them as a source of well-absorbed silicon for plants. One of the main reasons for addressing this topic is the concern for natural environment (management of waste macroalgae biomass and diatoms) and finding opportunities to improve plant resistance to environmental stress, with particular emphasis on drought. An additional advantage of the project is that macroalgae have a wide temperature tolerance and appear in the same habitats from spring to summer, and gradually disappear at the beginning of autumn. This allows access to a large amount of macroalgae biomass in two periods - spring and early autumn – which coincides with ongoing soil fertilization operations.

During the implementation of the project, the following questions will be particularly important: what is the impact of silicon on the morphology and synthesis of components important for the development of plants? Is the effect of this element (from diatoms) on the plant resistance to environmental stress important?

The project will also develop a method of selective de-encrustation of macroalgae thalli, i.e. "getting rid" of calcium carbonate crystals and diatoms from their surface, and then determining the silicon content in both diatoms obtained in this way and in "clean" algae seals. The impact of structure (surface, porosity) of individual diatom species, as well as physical and chemical factors (temperature, pH, etc.) on the bioavailability of silicon (silicic acid) for plants in hydroponic crops and then in pot and partly field cultures will be assessed. **Studies on the impact of silicon on the development and biosynthesis of ingredients will be carried out on selected plants (cucumber, cress, barley) with various growth, yielding and economic characteristics. Basic morphological and physiological parameters that determine the development of plants (e.g. assimilation dyes, spare materials - starch) will also be assessed, in silica-supplemented and control plants.**

The project will use collected freshwater green macroalgae, such as *Cladophora, Ulva* or *Oedogonium*, from lakes and rivers in northern Greater Poland. Their excessive growth is the result of eutrophication of water reservoirs and an important problem to be solved. Thick algae mats limit the availability of oxygen in the deeper parts of water column, thus threatening other species living there. Both the algae biomass and diatoms located on its surface contain many bioactive compounds (micro- and macroelements, dyes, amino acids, carotenoids, polyphenols, polysaccharides, phytohormones, etc.) and can be successfully used as raw materials for the production of bio-fertilizers or other environmentally safe agricultural products.

After analyzing the source materials, initial inspection of aquatic ecosystems in Wielkopolska and preliminary studies of epiphytic diatoms, the following project stages were formulated: (i) determining the date of occurrence of the thickest diatom layer on macroalgae; (ii) an indication of whether the surface and porosity of diatoms has an effect on the efficiency of Si uptake by plants; (iii) isolating the most important physical and chemical factors affecting the efficiency and mechanism of silicon absorption, and (iv) indicating the role of silicon (from diatoms) in plants growing in stressful conditions related to a lack of water.

The novelty and significance of the current project lies with its attempt to investigate the impact of silicon from diatoms found in freshwater macroscopic green algae biomass on the development of selected model plants. **The use of diatoms embedded in macroalgae as a source of plant-available silicon is a completely new, promising and innovative research in organic farming, allowing the use of unnecessary biomass as an effective biostimulator of plant growth under environmental stress in the future.**