Representatives of the buckwheat (*Fagopyrum*) genus are dicotyledonous plants that belong to the Polygonaceae family. The genus includes 26 species, both annual and perennial, which grow mainly in the Eurasian highlands. The two most important cultivated species are common buckwheat (*F. esculentum*) and Tartary buckwheat (*F. tataricum*). Because of the recent vogue for a healthy lifestyle, one of the trends is an increasing interest in the consumption of so-called healthy foods. *F. esculentum* and *F. tataricum* can play an important role in a wide range of natural products that act beneficially on the human body. This is primarily due to its high content of various phenolic compounds in this plant, which includes rutin, and also quercetin and the C-glycosylflavones such as orientin, isoorientin and vitexin. The positive therapeutic and/or dietary action of these biologically active compounds is due to their strong antioxidant properties, which have a beneficial effect on blood vessel elasticity and help to prevent the cardiovascular diseases that are currently one of the most serious diseases of affluence. Compared to the buckwheat species that is widely grown in Poland, *F. esculentum*, *F. tataricum* contains more phenolic compounds in each part of the plant and at various stages of its life cycle. The protein content in buckwheat is higher and its quality is better than in the cereals that belong to the grass family such as wheat, rice, maize and sorghum. *F. esculentum* is an obligate cross-pollinating, heterostylous species and *F. tataricum* is a self-pollinating, homostylous species. The heterostylous self-incompatibility in *F. esculentum* is associated with distinct variations in its floral features such as the style length, stamen length, pollen size and intramorph incompatibility and is considered to be one of the causes of grain harvest instability and makes breeding this culture difficult. In contrast to *F. esculentum*, *F. tataricum* is a homostylous species with flowers that have anthers and stigmas that are the same height. There is no research that provides a detailed epigenetic and proteomic analysis for the vegetative-to-reproductive transition and homo- and heterostylous flower formation.

A callus is a shapeless mass of undifferentiated and rapidly dividing cells. It can be derived from almost every plant tissue by treating it with a mixture of plant hormones (for example, auxins and cytokinins). Our rich experience working with tissue cultures has demonstrated that *F. esculentum* and *F. tataricum* are good systems. **The main goal of this project is to perform a comprehensive analysis of the reprogramming of cells during the formation of the callus, somatic embryo and regenerants as well as during the vegetative-to-regenerative transition and flower formation.**

This project will be realised in collaboration with an institutions in France and Czechia. The primary rationale for the international research collaboration under this proposal is to combine our expertise with *F. esculentum* and *F. tataricum* tissue cultures with the unique expertise of Dr Elisabeth Jamet's group in the area of cell wall proteomics (the large-scale study of proteins) and prof Ales Kovarik's group in bioinformatic analyses. Another important point of this collaboration is the opportunity to use the unique proteomic facility that is located in Toulouse and Paris, France. This proteomic facility is unique and has extensive experience in analysing plant proteins. No such facility exists in Poland. The mutual complementary experience and skills of the research teams in Katowice, Cracow and Toulouse creates the intellectual, methodological and infrastructural foundation that is required to successfully conduct the planned research and also provides opportunities for future fruitful cooperation.