Berries are a valued food product, not only because of their sensory qualities, but also because of their high biological value. These fruits are an excellent source of polyphenols, ascorbic acid, fibre and minerals. Unfortunately, berry fruits have limited durability, which results from both the high susceptibility of the fruit to infections with microorganisms causing spoilage and decay, but also the excessive accumulation of reactive oxygen species after harvest. The occurrence of oxidative stress causes oxidative modifications of cell components, worsening their functioning, which in effect leads to their death. In the context of maintaining good fruit quality, oxidative stress causes a decrease in the biological value of fruits, loss of turgor, leads softening of fruits and increases their susceptibility to mechanical damage and infections of microorganisms.

Sirtuins are among the NAD+ dependent enzymes that catalyse the post-translational processing of proteins. Many studies have shown that overexpression of sirtuins-coding genes resulted in extended life of many model organisms, including by deacetylation of transcription factors that regulate genes for resistance to oxidative stress. However, of all eukaryotic organisms, studies so far have focused more on yeast and mammalian sirtuins than on plant sirtuins, and there is little data on the role of sirtuins in regulating plant cell function. In addition, there are no scientific reports on the role of sirtuins in biochemical changes taking place after the harvest of fruits and shaping their quality, as well as the biochemical characteristics of these enzymes in berries. Since post-harvest loss of fruit quality is associated with increasing levels of oxidative stress, it seems reasonable to investigate the role of sirtuins in the course of biochemical pathways involved in the defence of cells against oxidative stress and, consequently, the impact on fruit quality. Therefore, in this project, an answer will be obtained to the question of whether a change in sirtuins expression in berries will determine a change in the course of selected biochemical pathways involved in shaping the quality of berries after harvest, i.e. metabolism of low molecular antioxidants, energy metabolism, sugar metabolism. The implementation of the project will also allow us to determine whether a change in the expression of enzymes involved in the above pathways results from a change in the expression of selected transcription factors and whether the activity of sirtuins will be determined by the availability of NAD^+ in the cell. Moreover, the effect of edible biofilms containing a natural activator (resveratrol) or sirtuin inhibitor (nicotinamide) applied to berries (including those exposed to ozone stress) on the course of specific biochemical pathways, fruit quality and shelf-life will be determined.

The obtained results of the project will enrich the existing knowledge in the field of biochemical transformations taking place in post-harvest fruit and explain the mechanisms conditioning the resistance of the fruit to stress factors, thus providing the basis for seeking storage technologies based on modification of sirtuins activity in fruits, in order to maintain high quality of the fruit for the longest possible period of storage.