

DESCRIPTION FOR THE GENERAL PUBLIC

Recently, there is a growing appreciation of the fact, that food we consume may not only have nutritional value, but also prevent diseases, provide health and longevity. The numerous studies have demonstrated, that diet rich in fruits and vegetables, constituting a source of natural polyphenols, is connected with reduced risk of civilisation diseases, including the circulatory system disorders and diabetes. However, the data on the molecular mechanism of this activity, justifying the application of certain plant products in prevention and auxiliary treatment of diseases, are often lacking or are only fragmentary. One of such plant is rowan (*Sorbus aucuparia* L.), whose fruits apart from culinary application (jams, marmalades, meat accompaniment, liqueurs) are also used in traditional medicine, e.g. in diabetes and prevention of its complications, as an anti-inflammatory, vasoprotective and vitamin agent. The main activities linked with rowan fruits are the antioxidant properties and the regulating influence on digestion process, in particular, the absorption and metabolism of carbohydrates (documented inhibitory effect on α -amylase and α -glucosidase activity, the enzymes hydrolysing the complex carbohydrates). However, due to the insufficient evidence for that activity obtained from biological models, their therapeutic application is limited. Moreover, the available data regarding composition and activity of the fruits are incomplete and often contradictory, possibly due to the variability caused by genetic factors or environmental conditions.

Diabetes and its cardiovascular complications, are the leading chronic disorders, the treatment of which is often expensive and usually also not sufficiently effective. During the chronic hyperglycaemia, the correlated processes of oxidative stress, enhanced protein glycation and chronic inflammation of vasculature are resulting in structural and functional changes of endothelial proteins and lipids, macro- and microcirculation disorders, haemostatic disorders, atherosclerosis, hypertension and multi-organ dysfunction.

Taking the abovementioned premises and the fragmentary but promising data on the chemical composition and activity of rowan fruits into account, the aim of the presented project is the evaluation of rowan fruits as a source of polyphenolic compounds with potential health promoting properties in the context of circulatory system disorders and cardiovascular complications of diabetes. The research will include the assessment of the antioxidant, anti-inflammatory, anti-glycation activity and the evaluation of the influence on haemostasis in complementary chemical, enzymatic and biological *in vitro* models, selected based on the previous research result on *S. aucuparia* fruits, the activity profile of polyphenols and fundamental molecular mechanisms of the aforementioned diseases. Additionally, the project will include a comprehensive characteristic of polyphenolic profile as well as the analysis of the composition variability in fruits harvested in Polish climate.

The plan of the study is divided into three parts that include the phytochemical analysis (LC-MS/MS profiling, structural identification of polyphenols and the analysis of the environmental variability of the fruits in Poland from at least 18 localisations representative for all regions) and two-phase *in vitro* activity studies. In the first phase, the extracts, fractions and model compounds (representatives of three main groups of bioactive compounds present in rowan fruits) will be evaluated in terms of their antioxidant activity towards the oxidants involved in pathology of cardiovascular system disorders (superoxide anion, hydrogen peroxide, hydroxyl radical, nitric oxide, peroxynitrite, and hypochlorous acid) and their protective influence on protein and lipid components of human plasma under induced oxidative stress conditions. In the second phase the model compounds, the most active extract and fractions thereof will be subjected to additional analyses in terms of the anti-inflammatory activity (in models of pro-inflammatory enzyme inhibition – phospholipase A2, cyclooxygenase-2, lipoxygenase and hyaluronidase), the influence on fibrinogen and the plasma haemostasis parameters (thrombin activity, plasma clotting times) and the influence on the non-enzymatic protein glycation. The cellular safety of the extracts and fractions will be evaluated in the viability tests of selected blood cells.

The realisation of the project will broaden the knowledge on the chemical composition and biological activity of rowan tree and provide scientific foundation for wider application of rowan fruits as a food and functional product. The positive results will allow in the future for introducing the appropriate products in the prophylaxis and auxiliary treatment of circulatory system disorders, diabetes and its complications, that belong to the most serious health issues of the modern societies.