**Abstract**

Type 2 diabetes is a chronic disease characterised by persistently high blood glucose levels, leading to the development of multiple health complications. The search for ever better treatment strategies for diabetes is currently one of the greatest challenges for diabetes specialists, as there is a lack of drugs that combine high safety of use, low cost of therapy and sufficient efficacy. Hence, there is a need to search for new substances that can improve diabetes treatment strategies, and plants containing bioactive compounds are natural sources of many substances with health-promoting effects, including antidiabetic effects. One such plant is stevia (*Stevia rebaudiana* Bertoni), whose glycosides – stevioside, rebaudioside A or their aglycone, steviol – have been extensively studied in this matter in recent years. In addition, there are many other biologically active substances that, through various mechanisms, exhibit carbohydrate-lipid-regulating effects. These include L-arginine and chromium(III).

The aim of this dissertation based on a series of publications is to evaluate the antidiabetic potential of steviol glycosides, individually and in interaction with L-arginine and chromium(III) using *in vitro* and *in vivo* models.

The *in vitro* studies confirm that steviol glycosides (stevioside, rebaudioside A) and steviol exert significant effects on glucose uptake, adipogenesis and lipogenesis, and insulin resistance in adipocytes of the 3T3-L1 cell line, with these effects being dependent on the type and concentration of the compounds tested.

The *in vivo* studies demonstrated that steviol glycosides improved the health condition of rats with induced type 2 diabetes. Although the intervention did not affect indices related to carbohydrate metabolism in a statistically significant manner, strong normalising effects on lipid metabolism were observed – with the hypolipidemic effects being dose-dependent rather than type-dependent. The addition of L-arginine and/or chromium(III) to the diets of rats with induced type 2 diabetes was also shown to enhance the antidiabetic potential of steviol glycosides, which was revealed under mild hyperglycaemic conditions – also through beneficial effects on blood glucose levels – with stevioside showing stronger effects in the presence of L-arginine and/or chromium(III).

In summary, the results obtained in the studies carried out as part of the dissertation allow us to conclude that steviol glycosides (stevioside, rebaudioside A) have significant anti-diabetic potential, which is most evident in the regulation of impaired lipid metabolism,

most likely due to their effect on the expression of genes regulating lipid metabolism. A stronger antidiabetic effect is provided by stevioside, compared to rebaudioside A, which in turn may be due to the higher steviol content in the compound molecule. Under mild hyperglycaemic conditions, the antidiabetic potential of steviol glycosides, L-arginine and chromium(III) is most evident in the improvement of certain indices of carbohydrate metabolism. Further research, including clinical studies, is warranted to further understand the mechanisms of action of these compounds and to verify their potential to support treatment of type 2 diabetes in humans.

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Keywords: *stevia rebaudiana*; steviol glycosides; steviol; stevioside; rebaudioside a; l-arginine; chromium(III); *in vitro*; *in vivo*; diabetes; rats