ABSTRACT

Iron and copper are trace elements involved in many essential processes in the human body. Copper plays an important role in human metabolism, primarily as a cofactor of many metalloenzymes, like superoxide dismutase and ceruloplasmin. Copper is also essential for iron homeostasis. Iron is incorporated into many biomolecules like heme or enzymes, and is hence vital for cellular processes like oxygen transport, energy production and DNA synthesis. In biological systems, copper is present in both the oxidised form of cupric (Cu^{2+}), and the reduced form as cuprous ion (Cu^{+}). Iron as well exists in two stable oxidation states as ferrous (Fe^{2+}) or ferric ion (Fe^{3+}). Due to their strong redox potential, both elements can be potentially toxic to the body. Iron accumulates in vital organs such as the liver, heart and kidneys. Wilson´s disease is an example of copper overload disease resulting from pathogenic mutations in gene *ATP7B*. The iron excess in the body is usually associated with iron overloading conditions, such as hereditary hemochromatosis or repeated treatments with blood transfusions (e.g. in thalassemia). In such cases, drugs with chelating or reducing effect are convenient for clinical use.

The aim of this thesis was to compare the interaction of the chelating and reducing efficacy of two substances from the group of anthocyanins, specifically cyanidin and cyanidin-3-glucoside. Spectrophotometric methods using indicators: ferrozine for iron, hematoxylin and bathocuproinedisulphonic acid disodium salt (BCS) for copper were chosen.

Experiments showed a very strong reducing activity against Cu^{2+} ions in both substances tested, which was approximately complete in the stoichiometry 1:1 under all pH conditions. There was no significant difference between these substances. Both substances were less effective in reducing Fe^{3+} ions than Cu^{2+} ions. In this case, cyanidin was more effective than its glucoside. Cyanidin showed chelating activity against ferric ions at pH 7.5 with stoichiometry 3:2, while cyanidin-3-glucoside formed a complex with a stoichiometry of 2:1. As the pH decreased, their chelating ability decreased. The assessment of Cu^{2+} chelation with hematoxylin showed, that both substances were able to form stable complexes with Cu^{2+} ions at all pH conditions with corresponding stoichiometry of 2:1. However, based on the assessment of their copper-chelating abilities in a more competitive BCS method, it appears that both substances are mildly active copper chelators. In conclusion, both substances are able to chelate and reduce copper and iron, and therefore from the results, it is not possible to infer their biological effects.