Saffron, the dried stigmata of *Crocus sativus* L., constitutes a traditionally used herbal remedy since millennia and is used in modern phytotherapy within preliminary clinical investigations for treatment of depression. A still missing link to a successful introduction of saffron as a new herbal medicinal product is the investigation of potential bioavailability of relevant compounds.

In the first step of this study an effective isolation protocol of *trans*-crocin-1 reference compound from saffron was established, using fast centrifugal partition for chromatography of a hydroethanolic extract (water/ethanol = 8/2). *Trans*-crocin-1 was obtained in 93 % purity (UHPLC, λ = 440 nm) in yields of 56 %. Using an enzymatic approach with complex enzyme preparations (Röhm®Enzyme, Rohament®CL) *trans*-crocetin reference compound was prepared from the hydroethanolic saffron extract, followed by preparative purification by MPLC on reversed phase stationary phase (MCI®-gel), yielding 4 % (Röhm®Enzym) respectively 7.3 % (Rohament®CL) *trans*-crocetin with a purity of approximately 91 % (UHPLC, λ = 440 nm).

Simulated gastric and intestinal fluids were used to evaluate the stability of crocins during gastrointestinal passage. These experiments exhibited a loss of apocarotenoids of 35 % during simulated gastrointestinal passage, which implies that these water-soluble compounds might be bioaccessible to a high amount.

Protein extracts from homogenates of murine intestine as well as murine faeces were employed for investigation of potential intestinal deglycosylation of crocins. The results indicated that the specific deglycosylation of crocins is mainly attributable to enzymes bound to the intestinal membrane rather than to microbial digestion.

Potential intestinal absorption characteristics of *trans*-crocin-1 (carrying 4 glucose moieties) and *trans*-crocetin (aglycon of crocin) were investigated by the use of the validated Caco-2 cell model. The results clearly displayed that glycosylated crocins are not absorbed in relevant amounts (1000 µM, $P_{app} = 2.1 \pm 0.8 \times 10^{-7}$ cm/s), whereas the aglycon crocetin permeates the *in vitro* system with a high velocity (10 – 114 µM, $P_{app} = 2.6 \pm 0.6 \times 10^{-5}$ cm/s). By modification of the *in vitro* assays the mechanism of absorption

was elucidated. *Trans*-crocetin is absorbed by passive transcellular diffusion and it is suggested that this compound serves as a substrate for P-gp efflux pumps.

The transition of *trans*-crocetin into the central nervous system (CNS) was examined by two different *in vitro* models of the blood-brain barrier (primary porcine cells of blood capillaries endothelial cells (BCEC): 27 µM, P_{app} = 1.5 ± 0.1 × 10^{-6} cm/s and primary porcine cells of the choroidal plexus (BCSFB): 50 µM, P_{app} = 3.9 ± 0.2 × 10^{-6} cm/s, 100 µM, P_{app} = 3.7 ± 0.3 × 10^{-6} cm/s). Results obtained indicated that *trans*-crocetin is permeating this barrier system.

From these data it can be concluded that after oral ingestion of saffron, crocins will reach the small intestine to a high extend, where these compounds are partially deglycosylated by intestinal, but not by microbial enzymes, to the aglycon *trans*-crocetin, which is rapidly absorbed into the systemic compartment. When *trans*-crocetin reaches the capillaries of the CNS it is slowly, but constantly absorbed over the blood-brain barrier.

The second part of this thesis is dedicated to procyanidins from Hawthorn leaf and flowers. The phenylpropan-substituted procyanidin cinchonain IIb was isolated for the first time from this herbal material and characterized concerning its structural features. A newly developed approach for glucosylation of procyanidin B2 was established by using a protein extract from red lentil seeds (*Lens culinaris* Medik.) and UDP-glucose. Both compounds, chinchonain IIb as well as the glucosylated procyanidin B2, were investigated concerning their *in vitro* permeation behavior in the Caco-2 model.

Results obtained clearly indicate, that the conducted structural modifications of procyanidin B2 did not lead to an increased intestinal absorption. Neither the glucosylation nor the modification of the procyanidin B2 structure by phenylpropan-substitution as it is given in chinchonain IIb had an influence on the intestinal absorption.