PREFACE

Procyanidins are phenolic compounds from plants and they are abundand in our diet. The research studies on procyanidins have shown that these have many health benefits especially as preventive agents for cancer, cardiovascular diseases and diabetes. High concentration of procyanidins can be found in plants and foods such as red wine, grapes, grape seeds, cocoa, berries and apples and so the first chapter of the book reviews the occurrence and the structure of these compounds. Their structures are comprised of repeating monomeric units, (+)- catechin and/or (-)- epicatechin, and can exist in various degrees of polymerisation. Their structures are very diverse, depending on the numbers of subunits, the type of linkage and the different lengths of chains.

The structural diversity of procyanidins, their chemical properties or the complexity of the matrix contributes to the high diversity analysis methods like extraction, separation and detection. Since the extraction method is considered a critical step in procyanidin analysis the second chapter describes the various methods used in the literature so far with reference to the most important factors influencing the extraction. Further, the common separation and detection methods like high performance liquid chromatography and mass spectrometry are presented in order to give the complex image of the existing methods described so far.

These principles of procyanidin fingerprinting are reflected further in studying the seed shells of the Japanese horse chestnut (*Aesculus turbinata* BLUME), discarded as waste materials after the preparation of edible seeds. The highly polymeric proanthocyanidins from the Japanese horse chestnut were tested for their health benefits and this is also presented in chapter 3. The isolated polyphenolic polymers showed more potent antioxidant activities for a series of the initiation and propagation of radical reaction than monomeric

flavan-3-ols. These polyphenolic fractions had the capacity to alleviate the side effect of methotrexate, a pro-oxidant, to cause intestinal injury in rats. Alternatively, the isolated fraction of proanthocyanidins with higher degree of polymerization was found to be more effective to attenuate α-amylases from saliva and pancreas. These polyphenols also inhibited intestinal α-glucosidases including maltase and sucrose as well. An oral starch tolerance test in mice revealed that the total polyphenolic fraction blocked the elevation of blood glucose. Besides, these fractions effectively inhibited pancreatic lipase due to the presence of doubly linked A-type bonds as well as higher degree of polymerization. In addition, an oral fat tolerance test confirmed the inhibition of fat digestion in mice by these polyphenols. Moreover, the polyphenolic polymers from the seed shells showed anti-obesity effects in obese mice fed high-fat diets when those fractions had been administered as a drink for 19 weeks.

The above exposed benefic effects depend largely, as for all the bioactive substances, on their bioavailability at the target tissue. As the interest for antioxidant compounds increased due to their actions, the interest in studying their bioavailability increased too. In the context of controversy surrounding the studies on procyandins' absorption and metabolization, the next chapter tries to present different points of view related to this matter.

Several applications of procyanidins in food systems are reviewed in chaper five, including: co-encapsulation of green tea catechins on probiotic bacteria viability during simulated gastrointestinal digestion, stability of polyphenolic compounds on alginate and chitosan microcapsules and procyanidins effectiveness after incorporation into food edible films.

The final part investigates the procyanidin structure-activity relationship and mechanisms of cardiovascular diseases because the intake of procyanidins has been associated with reduced CVD risk by epidemiologic studies. The beneficial effect of procyanidins, especially procyanidin B2, can be explained by modulation of several key mechanisms such as vasorelaxation, attenuation of atherosclerotic events and reduction of ischemia/reperfusion injuries. Interventional studies with sources of procyanidins have also revealed that increased intake of procyanidins reduce or attenuate deleterious effects of cardiovascular diseases events and modulate important markers related to increase general health.

The expertise of the authors contributing to this book is useful for graduates studying food science and technology, nutrition, pharmacy and health and for researchers, scientists, policy makers and professional from

food, pharmacy, nutrition and biotechnology industries working on procyanidins' characterization, antioxidant properties and health benefits.

ACKNOWLEDGMENTS

This work was supported by funds from the National Research Project PN-II-RU-TE-2012-3-0048 granted by the UEFISCDI of Romanian Ministry of Education.

The editor wishes to thank Mr. Sergiu Moise, artist, for the encouraging and inspirational conversations during the time in which the book was edited.