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Edited by

Atta-ur-Rahman, FRS

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PREFACE

Frontiers in Natural Product Chemistry presents recent advances in the chemistry and biochemistry of naturally occurring compounds. It covers a range of topics including important researches on natural substances of plants, microbes and animals. The book is a valuable resource for pharmaceutical scientists and postgraduate students seeking updated and critically important information in natural product chemistry. The chapters are written by authorities in the field and are mainly focused on isolation, structure, biosynthesis, biological activity, and chemistry of the major groups of natural products. The contents of the present volume represent exciting recent researches ranging from horizontal gene transfer (HGT) for the production of secondary metabolites to natural products used against neglected tropical diseases.

I hope that the readers will find these reviews valuable and thought provoking so that they may trigger further research in the quest for the new and novel therapies against various diseases. I am grateful for the timely efforts made by the editorial personnel, especially Mr. Mahmood Alam (Director Publications), and Mr. Shehzad Naqvi (Senior Manager Publications) at Bentham Science Publishers.

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Bioactive Phenols in Small Fruits and Berries

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Abstract: Bioactive compounds are extra nutritional constituents occurring naturally in plant foods in small amounts, however in quantities enough to produce bioactive effects. Among bioactive compounds the phenolic compounds are a very large set of molecules, which include several groups such as for example flavonoids, phenolic acids or tannins. Small fruits and berries include a wide diversity of fruits, like grapes, strawberries, blackberries, blueberries, raspberries, cherries, hardy kiwi, gooseberries, cranberries, currants (black, white, red), physalis, crowberries, açai, elderberries, dates or goji berries, and these have frequently been reported as having particularly high concentrations of phenolic compounds with antioxidant activity. Hence, the objective of this chapter is to review the literature about the type and content of different phenolic compounds present in small fruits and berries, as well as their bioactive properties, including antioxidant capacity. All the fruits and berries investigated in this chapter were particularly rich in bioactive compounds, including phenolic compounds that provide the fruits with high antioxidant properties. The most relevant health promoting effects include anti-cancer, anti-inflammatory, neuro protective, cardio protective or anti-diabetes, thus indicating that these foods are a valuable resource to prevent and treat diseases.

Keywords: Anthocyanins, Antioxidant activity, Flavonoids, Health, Phenolic acids, Phenolic compounds.

INTRODUCTION

Currently there is great interest in studying antioxidant compounds, since they are substances that in small quantities can prevent and treat diseases caused by free

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radicals [1]. Free radicals of oxygen or, more generally, reactive oxygen species (ROS) are products of the normal metabolism of the cells that are associated with processes such as power generation, phagocytosis, regulation of cell growth, intracellular signalling and synthesis of important biological substances. However, when in excess, they have harmful effects, such as peroxidation of membrane lipids and attack to tissues and membranes proteins, enzymes, carbohydrates and DNA [2 - 4].

The most common ROS include superoxide anion, hydrogen peroxide (H_2O_2), peroxy ($ROO\cdot$) radical and reactive hydroxyl ($OH\cdot$) radicals [3]. These reactive species play an important role in pathogenesis of diverse diseases related to oxidative stress, such as carcinogenesis, cardiovascular diseases, rheumatoid arthritis, ulcerative colitis and neurological degenerative diseases. The reduction of the risk of developing chronic diseases and the prevention of disease progression is possible by either enhancing the body's natural antioxidant defenses or by supplementing with dietary antioxidants. Antioxidants offer resistance against oxidative stress by scavenging the free radicals, inhibiting the lipid peroxidation and by many other mechanisms and thus prevent disease progression [3, 5].

Among the various types of natural antioxidants, phenolic compounds are those who have received more attention. The phenolic compounds are very abundant in the plant kingdom and correspond to simple or more complex structures. Up to the present about 10000 phenolic structures have been identified, thus evidencing their number and variety. These compounds are represented in almost all classes of secondary metabolites, being of considerable importance in physiology and morphology of plants. They are essential in growth and reproduction, in addition to being responsible for defense mechanisms of the plant against external stress factors, such as infections, injuries, ultraviolet radiation, among others. Additionally, they contribute to pigmentation and sensory characteristics such as flavour and astringency of fruits and vegetables [6 - 11].

The phenolic compounds are the major class of antioxidants found in plants, and in particularly high concentrations in fruit and vegetables [12, 13]. They inhibit lipid oxidation and, because of their capacity to neutralise free radicals, they offer protection against oxidative stress-related diseases, fighting cellular aging [13 - 15]. Moreover, phenolic compounds have demonstrated an extensive variety of