



## Phenolic Compounds as Health Promoters

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Natural-based products have been used since ancient times to treat various ailments, such as colds, pain, gastrointestinal disorders, and hypertension. It is not surprising that this trend continues to increase worldwide [1]. Epidemiological studies show that a high consumption of fruits and vegetables is associated with a lower risk of major chronic diseases [2-4]. In addition to vitamins, minerals, and dietary fibre, phenolic compounds, particularly flavonoids, have attracted considerable interest in recent years as possible contributors to these protective effects [5,6].

Phenolic compounds are a large class of plant secondary metabolites that are ubiquitous in the plant kingdom. They are widely distributed in various plant organs such as vegetables, spices, cereals, legumes and nuts [1,7-9], but their distribution depends on the part of the plant/tissue. More than 10,000 phenolic compounds have been identified in plants [10]. They all have an aromatic ring bearing one or more hydroxyl groups. They are usually water-soluble and classified as non-flavonoids (phenolic acids, stilbenes and lignans) or flavonoids (flavonols, flavones, flavanones, flavan-3-ols, proanthocyanidins, anthocyanidins and isoflavones) depending on their chemical structure [1,11-13]. Phenolic compounds protect plants from ultraviolet radiation, pathogens, poor soil fertility, and climatic fluctuations, and also act as attractants for pollinators, antifeedants, and phytoalexins [14]. They also possess great antioxidant capacity, and prevent or mitigate some diseases, by maintaining normal cellular metabolism and protecting cells from oxidative damage [15].

Despite their low to moderate bioavailability, current literature suggests that long-term consumption of foods rich in phenolic compounds protects against certain cancers, cardiovascular diseases, type 2 diabetes, osteoporosis, pancreatitis, gastrointestinal problems, lung damage, neurodegenerative diseases, and gut microbiota, especially due to their antioxidant activity [2-4,13,16-18].

Several studies have shown that oxidative stress plays a key role in the development of many different diseases, including cancer, inflammatory and metabolic diseases, which are triggered by the excessive production of reactive oxygen and nitrogen species (ROS/RNS), and can cause oxidative damage to DNA, lipids, and proteins [19,20].

Phenolic compounds are the most important antioxidants in human diet, because their radical scavenging activity is related to the substitution of hydroxyl groups in the aromatic rings of phenolics. In addition, phenolics can suppress the formation of ROS/RNS by several mechanisms, such as inhibition of some enzymes like xanthine oxidase, which are responsible for the production of superoxide ions; chelation of trace elements such as metals, e.g., free iron and copper ions, which are involved in the formation of radicals, and scavenging radical species by hydrogen donation [20].

There is ample evidence that certain polyphenols benefit health status, particularly in the prevention and treatment of certain

chronic diseases. The ability to realise these benefits is limited by the current understanding of mechanisms, dosing requirements, and potential adverse effects. Potential adverse effects for some subgroups should be investigated, and additional human studies are needed to confirm the biological mechanisms and public health implications of phenolic compounds. The large number of phenolic compounds with different structures, pathways, and physiological functions makes it difficult to fully explore their short- and long-term health effects.

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