

Plant Phenolic Compounds as Antioxidants Helpful in Prevention of Diseases and Human Health

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Abstract:

A group of secondary metabolites are incorporated with the phenolic compounds having the significant functions in plants. Phenolic metabolites also exhibits a number of biological properties that promotes the human health along with the beneficial effects on the plants. It is evidentiary proven that people gets the benefit from the phenolic compounds of plant in reference with the diet or skin applications because of its property of inhibiting the development of many chronic diseases and skin disorders. Phenolic compounds are regarded as an aid in elimination of causes and symptoms of aging, skin damage (wounds and burns) and several diseases as they are less toxic. In this review, it is tried to discuss about the role of phenolic compounds in disease prevention and in human health with phenolic compounds treatments.

Keywords: Phenolic Compounds, Anti-Aging Properties, Skin Diseases, Antioxidant

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Introduction

In past few years, the area of prevention of disease with phenolic compounds is very much developed and plays an important role in controlling different human diseases and in anti aging. Skin is regarded as the First Line of defence, it acts as a barrier against any kind of foreign invader. It also maintains homeostasis of the body. Any types of disease or disorder of such an important organ or body part is a serious risk to person or his life. Phenolic compounds is very effective with reference to the skin disorders or diseases as it decreases the skin disorder symptoms and have been published in many research papers. Since, Phenolic compounds participates in the morphological development, physiological processes and reproduction, therefore it is the most significant group of plant secondary metabolites. Molecular structure of the phenolics have broad spectrum of biological properties. At least one phenol ring forms the main core of phenolic compounds where more volatile residue like hydroxyl, methyl or acetyl replace hydrogen. In plants, these phenolic compounds contain more than one phenolic ring and known as polyphenols.

The flavonoids and non flavonoid compounds are classified under the most common classification of phenolic metabolites. Two aromatic rings linked with bridge having three carbons forms the chemical structure of flavonoid compounds which are further categorized into six subclasses viz.

1. Flavonols
2. Flavones
3. Flavanones
4. Flavan-3-ols
5. Isoflavones
6. Anthocyanidins

Usually the flavonoids found together with sugar in the physiological state are glycosides. The other end of plant phenolics are non flavonoids which possesses different subgroups such as phenolic acid (hydroxybenzoates C6-C1, hydroxycinnamates C6-C3), lignans (C6-C3)₂ and stilbenes C6-C2-C6. Non flavonoids also have 2 other subclasses which includes tannins and lignins.

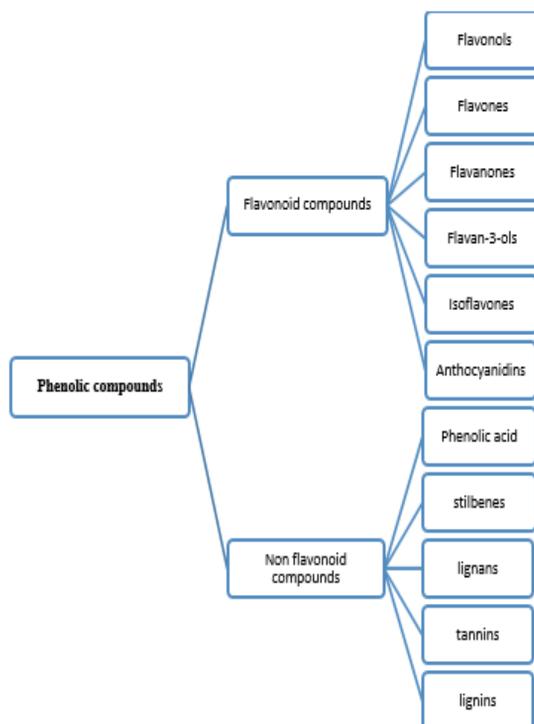


Figure 1: Classification of Phenols

Main source of phenols in a regular diet are fruits and vegetables. They can also be found in some grains, seeds, spices, and tea along with coffee, cocoa, wine and herbal essences. In plant tissues, hydroxycinnamic acid is one of the most common phenolic acid which includes caffeic acid, chlorogenic acid, o-, m- and p-coumaric acids, ferulic acids, and sinapic acids among which caffeic acid is most widespread hydroxycinnamic acid generally found in coffee, apples, potatoes, spinach lettuce etc.

Another phenolic compound present in plants is Tannin which may be found as hydrolysable tannins or condensed tannins. Secoisolariciresinol, lariciresinol, pinoresinol and matairesinol are the amine lignin compounds which are phenylpropanoid dimers and commonly found in the flax seed and sunflower seeds and also can be traced in small amount in grains, vegetables, fruits etc. There are the list of plant related phenolic compounds that are present in human diet discussed below in the table.

Table 1: Phenolic Compounds in Human Diets

Phenolic Compounds		Occurrence in Plants
Flavonoids	Flavonols	Apples, Oranges, Grapefruits, Black Grapes, Black Elderberries, Blueberries, Cranberries, Cabbage, Lettuce, Broccoli etc.
	Flavones	Selery, Cayenne Pepper, Red Paprica, Parsley etc
	Flavanones	Tomatoes, Mint, Nigella Seeds, Citrus Fruits etc
	Flavanols	Tea, Red Wine, Chocolate etc.
	Isoflavones	Soy, Soy Products and Legumes
	Anthocyanidins	Cherries, Strawberries, Grapes, Red Wine, Black Currant etc.
Non flavonoids	Hydroxycinnamic acids	Apples, Pears, Plums, Cherries, Apricots, Peaches, Black Currant, Blueberries, Ginkgo Biloba etc.
	Hydroxybenzoic acids	Grapes, Black Currant, Blackberries, Lingon Berries, Strawberries, Raspberries, Onion and Tea
	Tannins	Green tea, Black Tea, Red Wine etc.
	Stilbens	Grapes, Mulberries, Peanuts and Berries
	Lignans	Flaxseed, Sunflower Seeds, Sezame Seeds, Grains, Carrot, Onion etc.

Phenolic compounds as antioxidants protection against human disease

In India, the need for the antioxidants are different from the developed western countries just because of the differences in nutritions. Number of dietary supplements are tested for the efficacy of the antioxidants. Many researches are going on in the laboratories for the effectiveness of the antioxidants derived from the natural sources (plants) on the treatment of the damaged cells or diseases. According to these studies, carotenoids, curcumin from turmeric, flavonoids and phenolic acids are the compounds having potent antioxidant activity. Flavonoids are therapeutically used extensively in various diseases since centuries therefore phenolic compounds are considered as the important component in human diet. In current scenario, the principle cause of death is generally cardiovascular diseases and these diseases may contain atherosclerosis, coronary heart disease, arterial hypertension, and heart failure. Oxidative stress is the main reason for cardiovascular ailments. This can

be overcome with the help of antioxidants. Phenolic compounds are very demanding in research area due to its health promoting benefits. There is an important role of phenolic compounds in delaying skin aging and development of chronic abnormalities which includes, cancer, inflammatory bowel and Alzheimer's disease. Some of the effects that promotes health such as of flavonoids and phenolics, sometimes interacts with the key enzymes. The signaling of cascades basically involves transcription and cytokines factors or antioxidant systems.

Review of Literature

Oksana et al., (2012) discussed the various functions of phenol both biochemically and biologically. This review provides new horizons for the development and improvement of natural and derivative medicinal and agricultural importance for mankind.

Saxena, Saxena and Pradhan, (2012) stated the role played by the flavonoids and phenolic acids in

the prevention of diseases. They found HPLC, HPTLC and UV spectrophotometric methods more effective for the quantitative and qualitative determination of flavonoids and phenolic acids. It is serious challenge for the chemist to measure the phenolic acids and flavonoids rapidly and systematically.

Turrini, Ferruzzi and Fimognari, (2014) studied about the probable impacts of polyphenols found in pomegranate in cancer inhibition and treatment.

Husain and Gupta, (2015) worked on a review study of chemistry and dispersal of phenolic compounds in plants and their importance in mankind, and found that the therapeutic and health promoting actions of the phenolics is quite remarkable and their structural diversity owes to the dietary and medicinal values of phenolic compounds.

Lin et al., (2016) studied about phenolics compounds found in plants and their significance in human diet and nutrition. Summarized the synthesis of phenolic compounds in plants that comprise the shikimate, pentose phosphate and phenylpropanoid pathways and said beneficial to eat those plant foods which carries high antioxidant compounds.

Conclusion

Phenolic compounds is found very effective in preventing and curing various diseases and also effective in healing the wounds and burns. Plant phenolics are very beneficial in the remedy of certain diseases like cancer and minor skin issues. Phenolic compounds have the promising features of natural character and high effectiveness that might replace the traditional way of treatment.



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