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

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Abstract:

A group of secondry metabolites are encorporated 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 known as the promising tool in elimination of causes and effects of aging, skin damage (wounds and burns) and several diseases due to their origin and low toxicity. 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 plays a very significant role in humans in the defense against physical, chemical or biological factors. It is also helpful in regulation of water and electrolyte homeostasis and secretion. 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 dicreases 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 secondry 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 active residue like hydroxyl, methyl or acetyl replaces the hydrogen. In plants, these phenolic compounds posses more phenolic rings and known as polyphenols.

The flavonoids and non flavonoid compounds are classified bys most common classification of phenolic metabolites. Two aromatic rings linked with bridge having three carbons forms the chemical structure of flavonoid compounds which are divided into six sunclasses such as flavonols, flavones, flavanones, flavan-3-ols, isoflavones and anthocyanidins. Usually the flavonoids found in association with sugar in the physiological state as glycosides. The other class of plant phenolics is non flavonoids which posseses 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.

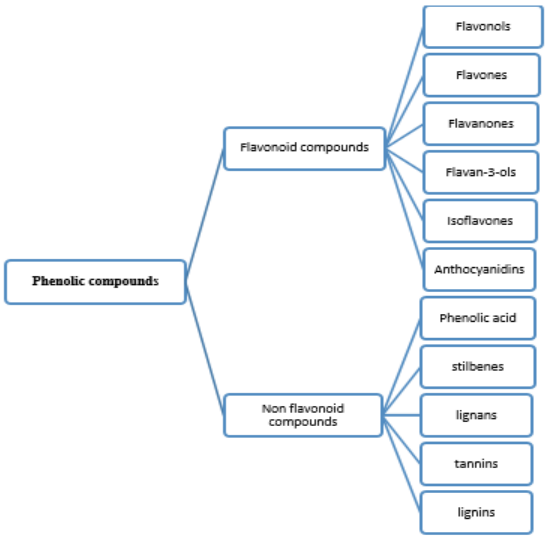

Figure 1: Classification of Phenolic Compounds

Fruits and vegetables are the main sources of flavonoids in diet. They can also be found in some grains, seeds, spices, and tea along with coffee, cocoa, wine and herbal essences. In plant tissues, hydroxycinnamic acids are 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 occurs in coffee, apples, potatoes, spinach lettuce, cabbage, olive oil, wine and tobacco leaves.

The other widely distributed phenolic compound in plants is tannins which may be found as hydrolysable tannins or condensed tannins. Secoisolariciresinol, lariciresinol, pinoresinol and matairesinol are the amin lignin compounds which are phenylpropanoid dimers and commonly found in the flax seed and sunflower seeds and also can be found in small amount in grains, vegetables, fruits, nuts, tea and coffee. There are the list of plant phenolic compounds occurs in human diet discussed below in the table.

Table 1: Phenolic Compounds in Human Diets

Phenolic Compounds		Occurrence in Plants
	Flavonols	Apples, Oranges, Grapefruits, Black Grapes, Black Elderberries, Blueberries, Cranberries, Cabbage, Lettuce, Broccoli, Radish, Chives, Onion Paprica, Chicory, Green Tea, Red Wine, Ginkgo Biloba Leaves, Morus Alba Leaves
	Flavones	Selery, Cayenne Pepper, Red Paprica, Parsley, Thyme, Lemon, Rose Hip and Peppermint

Flavonoids	Flavanones	Tomatoes, Mint, Nigella Seeds, Citrus Fruits (Mainly Oranges and Grapefruits)
	Flavanols	Tea, Red Wine, Chocolate, Apples and Kiwi
	Isoflavones	Soy, Soy Products and Legumes
	Anthocyanidins	Cherries, Strawberries, Grapes, Red Wine, Black Currant, Black Elderberries, Chokeberries, Blueberries, Red Cabbage, Rhubarb, Radish and Red Onion
Non flavonoids	Hydroxycinnamic acids	Apples, Pears, Plums, Cherries, Apricots, Peachs, Black Currant, Blueberries, Ginkgo Biloba And Morus Alba Leaves, Tobacco Leaves, Potatoes, Spinach, Lettuce, Cabbage, Bean, Radish, Potatoes, Broccoli, Curly Kale, Asparagus, Olive Oil, Wine, Coffee, Citrus Juice and Grains
	Hydroxybenzoic acids	Grapes, Black Currant, Blackberries, Lingon Berries, Strawberries, Raspberries, Onion and Tea
	Tannins	Green and Black Tea, Red Wine
	Stilbens	Grapes, Mulberries, Peanuts and Berries
	Lignans	Flaxseed, Sunflower Seeds, Sezame Seeds, Grains, Carrot, Onion, Chives, Apples, Cherries, Blueberries, Strawberries, Nuts, Tea and Coffee.

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 dietry 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 occurs is cardiovascular diseases in both developing and developed countries and these diseases includes atherosclerosis, coronary heart disease, arterial hypertension, and heart failure. The main reason behind the cardiovascular diseases is oxidative stress so this can be overcome with the help of antioxidants. Phenolic compounds are very demanding in research area due to its health promoting benefits, biological and pharmacological properties and especially the antioxidant activity. There is an important role of phenolic compounds in delaying the aging effect on skin and development of chronic diseases which includes cardiovascular diseases, cancer, inflammatory bowel syndrome 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) discusses the biochemical features and biological function of dietary phenols common in plant kingdom. This review provides new knowledge for the development of natural and derivative pharmaceuticals and agricultural chemicals with implications for significant benefits to human health and nutrition.

Saxena, Saxena and Pradhan, (2012) stated the significant examination of possible role of the flavonoids and phenolic acids in disease prevention. They found HPLC, HPTLC and UV spectrophotometric methods more effective for the qualitative and quantitative estimation 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 on a review of potential effects of pomegranate polyphenols in cancer prevention and therapy. Their review yields a comprehensive alalysis of known targets and mechanisms along with the critical evaluation of pomegranate polyphenols as future anticancer agents and found out that human exposure to genotoxic agents poses a risk at any level and the genotoxic effects reported for pomegranate raised certain concerns over its safety.

Husain and Gupta, (2015) worked on a review study of chemistry and distribution of phenolic compounds in plants, and their role in human health, 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 an overview of plant phenolics compounds and their importance in human nutrition and management of type 2 diabetes and summarized the biosynthesis process of phenolic compounds in plants includes the shikimate, pentose phosphate and phenylpropanoid pathways and said benefial to eat those plant foods which carries high antioxidant compounds.

Furue *et al.*, (2017) discussed about the antioxidants healthy for skin, and the role of aryl hydrocarbon receptors and nuclear factor erythroid 2 related factor-2. There is a precised mechanisms remains unknown and warrant future investigation by which these phytochemicals differentially affect the AHR and NRF2 system.

Conclusion

Phenolic compounds is found very effective in preveting and curing various diseases and also effective in healing the wounds and burns. Plant phenolics are very beneficial in the treatment of both serious diseases like cancer and minor skin problems. Phenolic compounds have the promising features of natural character and high effectiveness for developing novel topical formulations and dressings which may replace the hitherto remedies with its applications.

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