IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Phenolic acids: Natural protean molecule with promising salutary application

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Abstract:

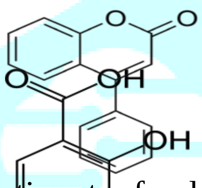
Nature offers freely with a variety of herbs (eg Thyme, oregano, rosemary, sage, mint, and basil) rich in many polyphenols and other phenolic compounds that have strong antioxidant properties and -biochemical. , carnosic, ferulic, Gallic, ip-coumaric, rosmarinic, vanillic) and rest provide an overview of their most common plant sources. A summary of the recently reported antioxidant activities of phenolic acids in o / w emulsions are also offered as in vitro lipid - the basis of the model. Assessing the surface action between phenolic acids can help eliminate their health properties against oxidative stress conditions of biological agents (such as lipoproteins). Finally, this review reports on recent literature evidence regarding specific biological aspects of phenolic acids.

Keywords: phenolic acids, Emulsions, Antioxidants, Health properties.

Introduction:

With "plantphenolics", we refer to a wide range of natural species (e.g., Anthocyanin's, flavonoids, phenolic acids etc.) With various structural properties that balance their antioxidant activity with their subsequent health and biological ale act

Phenolic acids, in particular, provide an important group of naturally occurring chemicals with high lipid content and water Solubility that can prevent oxidative degradation when they are felt as active ingredients in emulsion model systems. Research studies in this program have focused on the free radical potential of phenolic acids and more especially on large extinctions that can be accurately measured by kinetic parameters. Over the past decade, the food industry has largely focused on the use of natural phenolic antioxidants as a viable strategy to restore oxidative



degradation to food-based systems and to maintain its emotional properties. In emulsified foods, (e.g., dressing, sauces, soups, and desserts) lipid oxidation can occur more quickly due to its large surface area which is complex and completely incomprehensible compared to most fats. In addition, the antioxidant activity in the interface can be important not only in the development of dietary applications but also in further exploring their health properties that are characterized by important biological factors.

Membranes (e.g., lipoproteins) are prone to oxidative damage when they are attacked by singlet oxygen and free radicals. A common example of a bio-interfacial system is equipped with plasma lipoproteins, which are complex compounds of lipids and proteins that make hydrophobic lipids accessible to body fluids and where active forms of oxygen are possible. These harmful chemical processes lead to in vivo oxidative damage to biomolecules and ultimately improve critical health conditions such as aging, carcinogenesis, and cardio vascular diseases. Edible and well-known botanicals. In addition, the authors provide a summary of the available research results regarding the antioxidant activity of each phenolic acid tested in o / w emulsion stems. Overall, in vitro studies of oxidative toughness and antioxidant effects of phenolic acid in model emulsions can provide effective background information and information on healthy eating habits to support in vivo clinical trials. Over the past few years, more and more clinical research has focused on the potential effects of phenolic acid in the fight against cancer, heart disease, and other health diseases (such as skin diseases, ambitions, infections, etc.). The main purpose of this publication is to provide in Section 3 a comprehensive overview of the latest literature evidence on the health benefits of tested phenolic acids.

Structure of Phenolic Acids

Phenolic acids in plants: Phenolic chemicals are found mainly in edible andinedible plants, and have been reported to be rich in organic matter, including

Antioxidant activity:

Crude extraction of fruits, herbs, vegetables, grains, and other plant-based products in phenolic (Table 1) (Manachetal., 2004) is increasingly popular in the food industry because they restore lipid degradation of lipids and thereby improve the quality of nutritional food and nutrition. .These phenolic compounds can be divided into different groups as a function of the amount of phenol rings they contain and the structural elements that bind these rings. Thus it is distinguished between phenolic acids, avonoids, stilbenes, and lignans.

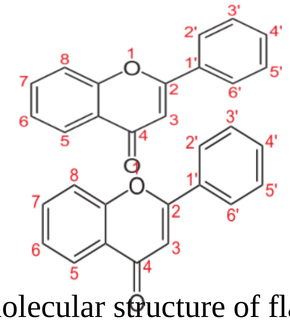
Application of Phenolic Acids:

Phenolic acids, readily absorbed through intestinal tract walls, are beneficial to human health due to their potential antioxidants and avert the damage of cells resulted from free radical oxidation reactions. On regular eating, phenolic acids also promote the anti-inflammation capacity of human being.

Properties of Phenolic Acids Polyphenols In Plants:

a) Flavonoids:

Flavonoids (or bioflavonoids; from the Latin word flavus, meaning yellow, their color Environment) is the second phase of polyphenol metabolites found in plants, and thus is commonly used in food.



Specific molecular structure of flavone (2-phenyl- 1,4-benzopyrone)

Isoflavan structure

Neoflavonoids structure

Chemically, flavonoids have a 15-carbon bone structure, consisting of two phenyl rings (A and B) and a heterocyclic ring (C, a ring containing oxygen included) This carbon structure can be shortened to C6-C3-C6.

According to the IUPAC nomenclature, they can be classified into:

flavonoids or bioflavonoids ,isoflavonoids, derived from 3-phenylchromen-4-one(3-phenyl-1,4-benzopyrone) structure neoflavonoids, derived from 4-phenylcoumarine(4-phenyl-1,2-benzopyrone) structure.

The three flavonoid classes above are all ketone-containing compounds and as

Terms flavonoid and bioflavonoid have also been more loosely used to describe non-ketone polyhydroxy polyphenol compounds, which are more specifically termed flavanoids. The three cycles or heterocycles in the flavonoid backbone are generally called ring A, B, and C. Ring A usually shows a phloroglucinol substitution pattern.

Biosynthesis:

Flavonoids are the second metabolite composed mainly of plants. The typical structure of flavonoids is 15-carbon bones, which contain 2benzenerings connected by a 3-carbon chain. Therefore, they have been identified as C6-C3-C6 compounds. Depending on the chemical structure, the oxidation rate, and the interaction of the binding chain (C3), flavonoids can be divided into different groups, such as anthocyanin's, chalcones, flavonols, flavanones, flavan-3-ols, flavanonols, flavones, and isoflavonoids. In addition, flavonoids can be found in plants formulated with glycoside-free and free aglycone. The glycoside-bound form is the most common form of flavone and flavonol consumed in flavonoids in plant extracts Flavonoids are still widely distributed in plants, performing many functions.Flavonoids are the most important flowering plants, producing yellow or red / blue leaves on the leaves designed to attract pollinators. In high-quality plants, flavonoids are involved in UV filtration, symbiotic nitrogen fixation, and flower pigmentation. They can act as chemical agents, body regulators, and cell cycle inhibitors. Flavonoids hidden by the root of the plant they carry help Rhizobia in the stage of infection in their relationship to legumes, vegetables, beans, sauces.

Ground Rhizobia is sensitive to flavonoids and this causes the secretion of Nod substances, which are also known to the host plant and can lead to root hair changes as well as several cellular responses such as ion fluxes and root nodule formation. In addition, some flavonoids have the function of inhibiting the pathogenesis of plant diseases, e.g. Fusariumoxysporum

b) Flavones

Flavones (from Latin *flavus* "yellow") are a class of flavonoids based on the backbone of 2-phenylchromen- 4-one(2-phenyl-1-benzopyran-4-one) (as shown in the first image of this article).Molecular structure of the flavone backbone with numbers.

Flavones are common in foods, mainly from spices, and some yellow or orange fruits and vegetables. Common flavones includeapigenin(4',5,7-trihydroxyflavone), luteolin(3',4',5,7-tetrarahydroxyflavone),tangeritin(4',5,6,7,8-pentamethoxyflavone),chrysin(5,7-dihydroxyflavone),and 6 hydroxyflavone.

Drug interaction

Flavones have effects on CYP (P450) activity which are enzymes that metabolize most drugs in the body.

c) Flavonols

Flavonols are a class of flavonoids with 3-hydroxyflavone backbone (IUPAC name: 3-hydroxy-2- phenylchromen-4-one). Their differences from different positions of phenolic groups - OH. They are different from flavanols (with "a") like catechin, another class of flavonoids.

Flavonols are present in a variety of fruits and vegetables. For Western people, the average daily diet is 20-50 mg per day for flavonols. Each person's diet varies according to the type of food eaten. Dual fluorescence (due to intramolecular proton transfer or ESIPT) is caused by flavonol (glucosides) tautomerism and may contribute to the protection of UV protection and flower color.

In addition to being a subclass of flavonoids, flavonols are elevated by the study of cranberry juice to play a role with proanthocyanidins, in the ability of the juice to inhibit bacterial attachment, which is shown by suppressing the fimbria of E.Coli bacteria in the urine area the ability of those bacteria to survive and initiate infection. Flavonol aglycones in plants are powerful antioxidants that work to protect the plant from active oxygen species (ROS).

Drug interactions:

Flavonoids have effects on CYP activity (P450). Flavonols are inhibitors of CYP2C9 and CYP3A4, which are enzymes that digest many drugs in the body. Utilization of technology A 2013 study showed that it is possible to calculate the quantity of flavonol in another fruit and thus filter the fruit according to the quality of the fruit and the strength of the storage.

Use of technology:

A 2013 study showed that it is possible by calculation methods to measure the concentration of flavonol in another fruit and thus classify the fruit according to the quality of the fruit and the strength of the storage.

d) Flavan-3-ols

Flavan-3-ols (sometimes called flavanols) are derived from flavors with a 2-phenyl-3,4-dihydro-2H- chromen-3-ol.These compounds include catechin, epicatechin gallate, epigallocatechin,epigallocatechin gallate, proanthocyanidins, thelavins. Thearubigins. Flavanols (with "a") should not be confused with flavonols (with "o"), a class of flavonoids that contain a ketone group. The single-molecule (monomer) catechin, or isomer epicatechin (see diagram), adds four hydroxyls to flavan-3-ol, forming blocks of synthetic polymers (proanthocyanidins) and high-density polymers (anthocyanidins). which means four diastereoisomers appear on each of them.

Catechins are separated from the yellow flavonoids, which contain ketones such as quercitin and rutin, called flav nols. The original use of the term bioflavonoid was improperly used to insert flavanols, which are separated by a lack of ketones. Catechin monomers, dimers, and trimers (oligomers) are colorless. High-order polymers, anthocyanidins, show a reddish tinge and become tannins.

Sources of catechism

Cucumbers are full of tea from the tea plant Camellia sinensis, as well as other coconuts and chocolates (made from Theobroma's ancestral seeds). Catechins are also found in the diet of fruits, vegetables and wine, and are found in many other plant species.

Other uses:

Recent research has examined the mechanisms used to bind nanoparticles to iron oxides in the blood. These particles allow for the detection of vessels - and especially cancerous tissue in mice - on an MRI scan. Nanoparticles would form without the cover of a curtain.

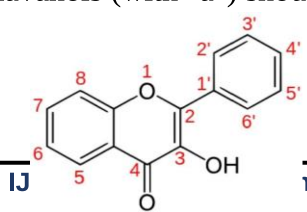
Recent study tested catechins employed to coat nanoparticles of iron oxides in the blood. These particles allow visualization of vessels – and especially cancer tumors in mice – in an MRI exam. The nanoparticles would clump together without the catechin coating.

e) Isoflavones

Isoflavones are substituted for isoflavone, a type of naturally occurring isoflavonoids, many of which act as phytoestrogens in mammals. Isoflavones are produced almost exclusively by members of the bean family, Fabaceae (Leguminosae). Although isoflavones and closely related phytoestrogens are marketed as dietary supplements, there is little scientific evidence for the safety of long-term supplementation or health benefits from these compounds. [3] Some studies have found potential risks from high intake of isoflavones, such as women with a history of breast cancer, but these concerns have not been supported by high-quality clinical research.

Organic chemistry and biosynthesis

Isoflavones for healthy eating are found instead of isoflavone, which are related to the parent by incorporating two or three hydrogen



atoms into hydroxyl groups. Parental isoflavone does not care about healthy eating.

Isoflavone, numbers. Genistein (5-OH, 7-OH, 4'-OH) or daidzein (7-OH, 4'-OH) are e. g. members of the isoflavone family. Isoflavone differs from flavone (2-phenyl4H-1-benzopyr-4-one) in the phenyl group. Isoflavones are produced by a branch of the generic phenylpropanoid that produces flavonoid compounds in high plants. Soybeans are the most common source of isoflavones in the human diet; The major isoflavones in the soybean are genistein and daidzein. The phenylpropanoid pathway starts from the amino acid phenylalanine, and the central mechanism of action, naringenin, is converted sequentially into isoflavone genistein by two legume-specific enzymes, isoflavone synthase, and dehydratase. Similarly, some central naringenin chalcone is converted to isoflavone daidzein by a sequence of three legume-specific enzymes: chalcone reductase, type II chalcone isomerase, and isoflavone synthase. Plants use isoflavones and other derivatives such as phytoalexin compounds to protect against fungi that cause disease and other infections. In addition, soybeans use isoflavones to stimulate soil-microbe rhizobium to form root nodules to fix nitrogen.

f) Anthocyanidins:

Anthocyanidinsare are common plant colors, peer-free anthocyanins. They are based on the cation of flavylium, oxonium ions, and various groups have been replaced by their hydrogen atoms. They usually change color from red to purple, blue and green as a result of pH activity.

Molecule in 3D of anthocyanidin cyanidin

Anthocyanidins are an important component of polymethine dyes and flavonoids. Flavylium cation is a chromenylium cation with a phenyl group replaced by 2; and chromenylium (also called benzopyrylium) is a bicyclic version of pyrylium. Good charging can surround the molecule. At least 31 anthocyanidin monomeric is appropriately identified in organisms, especially as key anthocyanins. The latter are loaded with red, purple, blue, or black fruits of many fruits (such as grapes and berries), flowers (like roses), leaves (like purple cabbage), and root crops (likeradishes and purple yam). They are also found in other animals.

Effect of pH

The stability of anthocyanidins depends on the pH. At low pH (acidicconditions), colored anthocyanidins are present, and at high pH (basic conditions)colorless chalcones from available.

Natural Resources and Antioxidant Functions of Phenolic Acids in Food Emulsions

This section provides a summary of the most important natural resources of a few common - ecological and food - phenolic acids listed and their chemical composition in Table 1. Similarly, the authors conducted a literature study on each in vitro antioxidant activity tested for phenolic acid against systemic oxidation of emulsion based.

g) Caeic Cid (CA)

CA is a hydroxycinnamic acid formed by the formation of active groups of phenolic and acrylic, the output of which is naturally trans. It is found in high doses in other herbs, especially in South American herbal medicine (1.5 g / kg), and thyme (1.7 mg / kg). In fruits (such as berries, apples, and pears) CA was measured in high concentrations, representative and p-coumaric acid 75–100% of the total hydroxycinnamic acid. Also, CA can be found in the bark of Eucalyptus globulus and has been identified as the main source of phenolic in coee and coee oil. Boke et al.Analyzed samples of Cephalaria species using highly effective chromatography associated with tandem mass spectrometry (HPLC-MS / MS) and CA classified as high phenolic acid.

A few researchers have reported a clear anti-oxidant CA in various Tween-based regimens prepared with linoleic acid or other vegetable oils such as corn, flaxseed, and sunflower oils. Sorensen et al. (2007) noted that CA exhibits clear antioxidant activity in Citrem- and Tween-stabilized emulsions where there are enduring tocopherols but acts as a proxidantant with no tocopherols. The authors have suggested that the observed detection of antioxidant eciency consisting of different emulsifiers (with and without or without endocrine tocopherols) is due to the combination of emulsifier-antioxidant and the combination of antioxidant-antioxidant emulsions.

h) Gallic Acid (GA)

GA (also known as 3,4,5-trihydroxybenzoic acid) is the main phenolic acid in tea but is also found in high amounts in chestnut and several berries. It is encountered in many plants around the world, such as the Cynomorium coccineum, the aquatic plant Myriophyllum spicatum, and the blue alga Microcystis aeruginosa. Recently, Souza et al. (2020) separated gallic acid from black tea extraction in a filter at around 0.8 mg / kg.

There is some conflicting evidence in the literature on the eect of GA with the degradation of an oxidative emulsion. Bou et al. (2011) did not detect any ect of GA-astonishing statistics following its incorporation into the central sunflower o / w emulsion. Alavi Rafiee et al. (2018) reported that GA used high antioxidant activity in many oils but showed low activity in o / w emulsions, highlighting the critical role of the carboxyl group and the elect level of lipid retention in GA function antioxidant. Di Mattia et al. (2009) reported that GA was involved in colloidal reinforcement of o / w emulsion systems, while showing low activity leading to secondary oxidation. Zhu et al. (2019) , however, identified explicit ectectic antioxidants - depending on the peroxide values and hexanal-content of GA and its alkyl esters in o / w emulsions respectively: propyl gallate> lauryl gallate> octyl gallate> gallic acid> stearyl gallate. In a study by Wang et al. (2019) GA or its alkyl esters are added in combination with tocopherol in o / w emulsions. The results showed that all the tested gallate esters (propyl, octyl and dodecyl gallate) perform antioxidant activities associated with tocopherol, and propyl gallate, which has a very short alkyl chain, with very high interacting action. Some researchers have also seen improvements in the antioxidant activity of double-stranded products of GA emulsions through the use of encapsulation.

i) Rosmarinic Acid (RA)

RA is an este of caeic acid, introduced as a major component of phenolic in several members of the Lamiaceae family including among others: Rosmarinus ocinalis, Origanum spp., Perilla spp., And Salvia ocinialis. A few researchers report RA as the main phenolic acid of various herbal remedies (oregano, thyme sage, and rosemary) in concentrations varying between dry weight of 0.05 and 26 g / kg. Furthermore, the results of Tsimogiannis et al. show a total of 19.5 g / kg in pink savory leaves (Satureja thymbra L.)Some studies have reported the antioxidant activities of RA (depending on hydroperoxides and volatiles formation) in o / w emulsions based on

(i) corn oil and fortified with various emulsifiers;

(ii) Intermediate emulsions prepared with linoleic acid or soybean oil. Bakota et al. (2015)

Incorporated both pure RA and RA-rich extract (from the leaves of Salvia ocinalis), where it is filtered30 mg / g, in o / w emulsions and found that both therapies were effective in reducing lipid oxidation.

j) Carnosic Acid (CarA)

Car Aisalabdane-type deterrence present in plant species of the Lamiaceae family, suchasrosemary and common salvia species. CarA is commonly found in dried sage leaves in concentrations of 1.5 to 2.5%.

CarA is used as a barrier to food and non-food products, e.g. Toothpaste, mouthwash, and chewinggum, because they have been given antioxidative and antimicrobial properties. Through the pioneer work of Frankel et al. (1996), CarA has been reported to show the activity of antioxidant emulsions enhanced at pH 4-5. In subsequent years, a few studies used extracts from rosemary and other herbs of the family Laceaceae emulsions and claimed that their antioxidant activity was mainly CarA and carnosol. Recently, Lei et al. (2019) improve

A tocopherol-based microemulsion aimed at improving CarA's antioxidant strength and thus set the modeling system for potential applications in bioactive compounds.

Overall, although this lipid-soluble compound is known for its high antioxidative properties, (which has led to many industrial uses in food and beverages), its mechanism of action against the oxidation of emulsions has not been fully elucidated.

k) Ferulic Acid (FA)

CarAisalabdane-type diterpene present inplant species of the Lamiaceae family, suchasrosemary and common salvia species. CarA is commonly found in dried sage leaves in concentrations of 1.5 to 2.5%. CarA is used as a barrier to food and non-food products, e.g. Toothpaste, mouthwash, and chewinggum, because they have been given antioxidative and antimicrobial properties. Through the pioneer work of Frankel et al. (1996), CarA has been reported to show the activity of antioxidant emulsions enhanced at pH 4-5. In subsequent years, a few studies used extracts from rosemary and other herbs of the family Laceaceae emulsions and claimed that their antioxidant activity was mainly CarA and carnosol. Recently, Lei et al. (2019) improve

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l) p-Coumaric Acid (p-CA)

A large number of natural plant sources have been reported to be rich in p-CA such as fungi, peanuts, sea beans, tomatoes, carrots, basil, and garlic [60]. The p-CA has a lot of fruit (especially pears and berries) and grains [20,61], as well as honey in the concentration range 1.7–4.7 mg / kg. Kannan et al. (2013), using HPLC analysis, reported that the release of Halodule pinifolia and Clytra rotundata has a positive effect on p-CA, a fact that can report their high biological activity. The same authors have noted that p-CA is present in high concentrations in a few species of mushrooms. In addition, a few researchers have noted that p-CA is present in extracts extracted from Amaranth leaves and stem at a concentration level of 28-44 mg / kg. Oh et al. (2015) identified p- CA as the main phenolic component present in barley extract (Hoerdeum vulgare L.).

In addition, the latest body of research evidence focuses on the antioxidant activities of p-CA and its identific ... al sources. Recently, P ... cted HPLC and NMR ... d ethanolic extracts of ... fied p-CA, VA, and FA ... compounds.

The authors reported that the extracts extracted from the rice boat, rich in p-CA, were protected from oxidative degradation of o / w emulsions, at 60 C.

m) Vanillic Acid (VA)

VA is based on dihydroxybenzoic acid which is widely used as a flavoring agent. It is found in several fruits, olives, and whole grains (e.g., whole wheat), as well as wine, beer, and cider. Kim et al. (2019) performed the identification of key phenolic properties in potato samples (Solanum tuberosum L.) and the estimated VA at concentrations between 0.02 and 0.04 g / kg. Espinosa et al. (2015) analyzed the release of red propolis and reported VA as a major phenolic compound. VA was also found in extracting the fruit of the açaí palm (Euterpe oleracea) and was identified by Zhao et al. root of Angelica sinensis (traditional Chinese medicine) at concentrations between 1.1 and 1.3 g / kg. In addition, Radmanesh et al. (2017) [reported that VA exists in a variety of plant sources including Juglans regia L., Chenopodiastrum murale, fruit grass, and Melilotus messanensis.

Keller et al. (2016) observed a strong antioxidant characteristic of VA during the automation of Tween 40-based o / w systems, at pH 3.5. Moreover, Vishnu et al. (2017) [78] examined the antioxidant activity of VA supplemented with chitosan (Va-g-Ch) during microencapsulation of polyunsaturated fatty sardine oil rich in o / w emulsions. After four weeks of storage, a decrease in peroxide levels showed good oxidative intensity and encapsulation exigency of Va-G-h.

PROPERTIES OF POLYPHENOL IN A FOOD SOURCES:-

Antioxidant effect of polyphenols and natural phenols

A polyphenol antioxidant is a type of antioxidant compound that contains a polyphenolic composition and was studied in vitro. Counting more than 4,000 different species mainly from plants, polyphenols may have antioxidant activity in vitro, but are unlikely to be antioxidants in vivo hypothetically, which can affect cell-to-cell signaling, receptor sensitivity, activity - an enzyme for inflammation or genetic control, although advanced clinical research has not confirmed any of these possible human effects from 2020

Blackberries are a source of polyphenol

Sources of polyphenols

The main source of polyphenols is food, because they are found in many types of chemical-containing foods. For example, honey; many legumes; fruits such as apples, berries, blueberries, cantaloupe, pomegranate, cherries, cranberries, grapes, pears, plums, raspberries, aronia berries, and strawberries (berries they usually have a high content of polyphenol and vegetables such as broccoli, cabbage, legumes, onions and parsley are rich in polyphenols. Red wine, chocolate, black tea, white tea, green tea, olive oil and many grains are the sources. The introduction of polyphenols occurs by eating a wide variety of plant foods.

APPLICATIONS FOR POLYPHENOL ARTICLE

a) Antioxidant capacity tests

Oxygen radical absorbance capacity (ORAC) Ferricyanide reducing power 2,2-diphenyl-1-picrylhydrazyl radical scavenging activity

There is no clear evidence that active oxygen species play a role in the aging process of the skin.The skin is exposed to a variety of exogenous sources of oxidative stress, including ultraviolet rays with spectral elements that can target an external type of skin aging, sometimes called Photo aging. Long-term controlled studies on the effectiveness of low weight antioxidants in preventing or treating skin aging in humans are lacking.

Step	Small Molecule Antimicrobial Agents	Antimicrobial polymers
(1) Initial adsorption	Weak	Strong
(2)Diffusion past the cell wall	Strong	Weak
(3)Binding in to the membrane	Weak	Strong
(4)Disruption and disintegration of the membrane	Weak	Strong

A combination of antioxidants in vitro.

Linoleic acid tests based on 2, 2'-azobis (2-amidinopropane) oxidation induced by dihydrochloride containing various compounds of phenolics suggest that binary compounds may lead to synergetic or antagonistic effects. Antioxidant purification levels of anthocyanin were significantly higher than expected with anthocyanin content indicating the effect of anthocyanin mixing.

b) Antimicrobial polymers

Antimicrobial polymers, also known as polymeric biocides, are a class of polymers that have antimicrobial activity, or the ability to inhibit the growth of microorganisms such as bacteria, fungi or protozoans. These polymers are designed to mimic antimicrobial peptides used by the body's immune system to kill germs. Typically, antimicrobial polymers are produced by attaching or attaching an active antibacterial agent to the polymer core with an alkyl or acetyl linker.

Antimicrobial polymers can improve the efficiency and selection of currently used antimicrobial agents, while minimizing environmental hazards.Process

Scheme of how an antimicrobial polymer kills a bacterial cell Antimicrobial agents kill bacteria in different ways depending on the type of bacteria. Most antiseptics too

Disinfectants kill bacteria as soon as they come together by causing a bacterial cell to explode, or by eliminating the food supply of germs that inhibit bacterial production, since antimicrobial polymers are generally less stable and chemically stable. This makes it ideal for use in pharmaceuticals as a means of fighting infection, in the food industry to prevent contamination, and in sanitation to prevent the growth of germs in drinking water known as bacterial contamination. Antimicrobial polymers usually kill bacteria in this initial way, accomplished by a series of steps, First, the polymer must advertise on the bacterial cell wall. Many bacterial areas are poorly charged, so extraction of polymation cations has proven to be more effective than extracting polymeric anions. The antibacterial agent must disperse the cell wall and the adsorb enters the cytoplasmic membrane. Small molecules of antimicrobial agents do well in the dispersion stage due to their low molecular weight, and adsorption extraction is best achieved with antimicrobial polymers. Disruption of the cytoplasmic membrane and subsequent leakage of cytoplasmic elements leads to cell death.

Comparison of small molecule antimicrobial agents and antimicrobial polymers are shown in the following

Table: [1]

Factors that Affect Antimicrobial Activity Molecular Weight

Polymer molecular weight

Is probably one of the most important factors to consider when determining antiviral properties because antimicrobial activity is highly dependent on molecular weight. It was determined that good performance was obtained when polymers with molecular weight in the range of 1.4x104 Da to 9.4x104 Da. Weights heavier than these sections indicate a decrease in activity.

This weight dependence can be caused by a sequence of steps required for biocide action. Hundreds of polymers weighing very large will have trouble spreading to the bacterial cell wall and cytoplasm. So much effort has been put into controlling the weight of the polymer molecules.

Counter Ion

Many cell walls called bacterial cells are badly charged, so most antimicrobial polymers should be well charged to facilitate the adsorption process. The structure of the counter ion, or ion-associated polymer to balance charge, also affects antimicrobial activity. Counting ions form a strong ion-pair with a polymer that interferes with antimicrobial activity because counter ions will prevent the polymer from interacting with bacteria. However, ions form an open ion-pair or easily separate from the polymer, showing a positive effect on this activity because it allows the polymer to interact freely with bacteria.

Spacer Length / Alkyl Chain Length

The length of the space or alkyl chain length refers to the length of the carbon chain that encompasses the polymer core. The length of this series has been investigated to determine whether it affects the antimicrobial activity of the polymer. The results often show that long alkyl chains have led to high performance. There are two main explanations for this effect. First, long chains have the most active sites available for adsorption through the cell wall of the bacterium and the cytoplasmic membrane. Second, long chains are attached

Unlike short chains, it can also offer better adsorption methods. However, the length of short chains varies easily.

Requirements for an antimicrobial polymer for an antimicrobial polymer to be an effective means of widespread distribution and use there are a few basic requirements that must be met first:

Polymer bonding should be simple and inexpensive. Manufacturing on an industrial scale the manufacturing route should use well-developed strategies.

The polymer should have a long shelf life, or be stable for a long time. It must be able to be stored at the intended temperature.

If the polymer is to be used to extract liquid, then it should not occur in water to prevent toxic effects (as is the case with other current small molecules that fight germs).

The polymer should not decompose during use, or remove toxic residues. The polymer should not be toxic or irritating to them during treatment.

Antimicrobial activity should be able to regenerate with loss of function.

Antimicrobial polymers should be biocide in many broad pathogenic species in short-term interactions.

Applications

1. Water treatment

Polymeric disinfectants are ideal for the installation of hand-held water filters, ground coverings, and fibrous disinfectants, as they can be made with a variety of techniques and can be soluble in water. Unstable antimicrobial formulations are required that can prevent, kill, or remove targeted microorganisms by contact without removing any active agents from the bacterial population. Chlorine or anti-soluble-disinfectants have problems with residual toxins, even if small amounts of the substance are used. Toxic residues can concentrate on food, water and the environment. In addition, because free chlorine *ions and other related* chemicals can react with organic matter in water to produce analogues of the trihalomethane that is suspected to be carcinogenic, their use should be avoided. These problems can be solved by removing microorganisms from water containing insoluble substances.

2. Applications for food

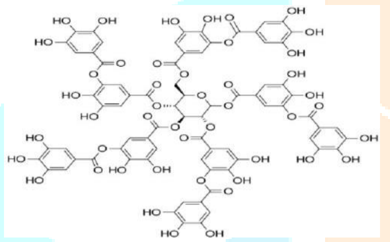
Antimicrobials packaged in packaging materials can control bacterial contamination by reducing the growth rate and growth rate. This is done by expanding the lagphase of the target microorganism or by activating untreated microorganisms. One of these applications is to extend the shelf life of the food and promote safety by reducing the rate of bacterial growth when the package comes in contact with solid food sources, for example, meat, cheese, etc. Second, antimicrobial packaging has significantly reduced the duplication of products used and facilitated the treatment of contaminants. For example, soluble packaging may eliminate the need for peroxide treatment in aseptic packaging. Antimicrobial polymers can be used to cover the surface of food preparation equipment as a self-sanitizer. Examples include filter gaskets, conveyors, gloves, clothing, and other personal hygiene equipment. Some polymers contain antimicrobials and are used in films

and clothing. Cationic polymers such as chitosan promote cell adhesion. [29] This is because charged amino acids are associated with negative effects on cell membranes, and can cause leakage of intracellular elements. Chitosan has been used as a dressing and appears to protect fresh vegetables and fruits from fungal damage. Although the antimicrobial effect is due to the antibacterial properties of chitosan, chitosan is likely to act as a barrier between the nutrients in this product and the bacteria.

Polyphenols

Polyphenols are a large family of naturally occurring compounds separated by phenols. They are abundant in plants and vary in their composition. Polyphenols include flavonoids, tannic acid, and ellagitannin, some of which have been historically used as dyes.

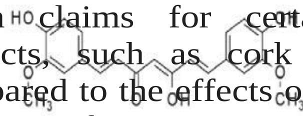
Plant-derived polyphenol, tannic acid, formed bygallic acid esterification of ten equivalents of the- derived phenylpropanoid monosaccharide (glucose) corefrom primary Metabolism



Turmeric, a bright yellow component of Curcumin (Curcuma longa) is a well-studied polyphenol.

Chemical properties:

Polyphenols are a form of oxidation, which is why they are described as antioxidants in vitro. Use some polyphenols are traditionally used as dyes. In the Indian subcontinent, for example, pomegranate peel, which is high in tannins and other polyphenols, or its juice, is used in the manufacture of raw materials. Polyphenols, especially tannins, are traditionally used to tan the skin and even today and as precursors of raw chemistry specifically to produce plastics or fractions by applying polymerization with or without the use of formaldehyde or adhesive particleboards. Targets usually use plant residues from grapes, olive (called pomaces) or pecan shells left over after processing. Pyrogallol and pyrocatechin are among the oldest photo developers. Potential health effects Although health effects may be caused by dietary polyphenols, the wide metabolism of polyphenols in the intestines and liver, as well as their unexplained extraction as metabolites are rapidly excreted in the urine, prevents the interpretation of their natural effects. Because the metabolism of polyphenols cannot be tested in vivo, no Dietary Reference Intake (DRI) standards have been established or recommended. In the US, the Food and Drug Administration (FDA) has issued a label for manufacturers that polyphenols cannot be labeled as antioxidant components unless there is evidence of physical activity to confirm such a stem and a DRI value has been established. In addition, since health claims made on certain foods containing polyphenols remain prohibited, health statements regarding polyphenols on product labels are not approved by the FDA and EFSA. However, during the 21st century, the EFSA recognized certain health claims for certain polyphenol products, such as cork and olive oil. Compared to the effects of polyphenols in vitro, vivo functions remain unknown due to



lack of certified biomarkers; long-term studies fail to show results in terms of performance, sensitivity and specificity or efficiency as well invalid requests to focus on high-level, non-physical experiments in in vitro studies, which would no longer be of design importance

In vivo testing.

POLYPHENOL COMPOUNDS LIVING STRUCTURES

Extensive research is being done on a variety of chemicals that can control tooth decay. However, only a limited number of products were obtained from natural products due to their performance, aroma, taste, economic viability and sustainability (Llorach et al., 2010). The effects of polyphenols were tested in both in vitro and in vivo studies. Other studies have been conducted on the effect of polyphenols against mutans streptococci and in vivo studies in animals and humans (Luczaj et al., 2005; Milgrom et al., 2000). Because of their antimicrobial action, Polyphenol compounds occurring in tea, coffee and cocoa may play a role in protecting cariogenic processes. The studies of Milgrom et al. (2000) in cocoa polyphenol pentamers found that it significantly reduces biofilm formation and acid production by Streptococcus mutans and S. sanguinis. Similarly, trigonelline, caffeine and chlorogenic acid found in roasted and raw coffee disrupt S. mutans adsorption of saliva-covered saliva beads. Research into black, green and oolong tea shows that tea polyphenols make an anti-ulcer drug using an antibacterial method. In addition, it was found that galloyl esters of () -epicatechin, () -epigallocatechin and () -gallocatechin exhibit increased antibacterial activity. However, the anti-cariogenic effects against haemolytic streptococci exhibited by polyphenols from tea, coffee and cocoa

Chemical Properties of Polyphenols

Polyphenols are molecules due to their UV / V-absorbing properties for fragrant purposes and large composite systems of pi-electron Polyphenols: Structures, Occurrences, Food Content and Potential Consequences Fig.Configuration of the chemical structure of Tellimagrandin II. In addition, they have auto-fluorescence properties, especially lignin and the phenolic component of suberin (Force, 2013). At present, polyphenols are the most effective types in dealing with oxidation reactions. On the other hand, 2, 2'-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) as

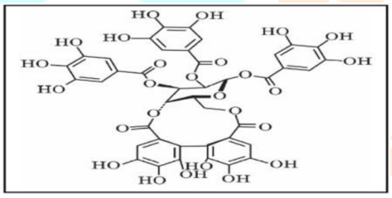


Fig Tellimagrandin II chemical structure

Described by Osman et al. (2006) can be used to differentiate polyphenol oxidation products. In addition, polyphenols have an important binding relationship of chemical proteins. This factor can lead to the formation of soluble and insoluble structures of the protein polyphenol (Papadopoulou and Frazier, 2004) described by Osman *et al*. (2006) can be used to characterise the products of polyphenol oxidation. In addition, polyphenols possess a significant binding affinity for proteins compounds. This characteristic can lead to the formation of soluble as well as insoluble protein polyphenol complexes (Papadopoulou and Frazier, 2004).

Polyphenols content in food.

The diet, in general, contains complex compounds of polyphenols (D'Archivio et al., 2010). According to Mennen et al. (2005) The most important sources of polyphenols in food products are widely used including fruits, vegetables, black tea, green tea, coffee, chocolate, red wine, olives, and virgin olive oil all rich in polyphenols. Nuts, spices, herbs and algae may also be important in providing certain polyphenols. Other dietary polyphenols (phloridzin incles, flavanones in citrus fruits, soy isoflavones). Others, including quercetin, are found in all plant products such as fruits, vegetables, tea, wine, cereals and legumes (D'Archivio et al., 2010). Some polyphenols are considered anti-nutrient in the diet. Such chemicals interfere with the absorption of essential nutrients, including iron and other metals.

These compounds bind to digestive enzymes and other proteins, especially in ruminants (Mennen et al., 2005). Miglio et al. (2008) studied the effects of various cooking methods on the nutritional and physicochemical properties of selected vegetables, reported that phenolic and carotenoid compounds with antioxidant properties in vegetables would be better preserved by cooking hotter than frying (Miglio et al., 2008). It was also reported that Polyphenols in beer, wine, various alcoholic beverages can be completely eliminated at the expense of money, items that are usually added or near the end of the brewing process.

APPLICATIONS:

Chemical Use of Polyphenols

Some polyphenols compounds are traditionally used as dyes. For example, in India, pomegranate peel, or its juice, contains many tannins and other polyphenols employed in the manufacture of non-synthetic fabrics (Jindal and Sharma, 2004). Traditionally, polyphenols, especially tannins, were used to tan skin. Today, polyphenols are still used as a precursor to raw chemistry (Olshettiwar and Varma, 2008). The objectives are to use plant extracts from olive (called pomaces), grapefruit or pecans left over Procesing. For example, Cashew nut liquid (CNSL) is an important source of phenolic material rich in cardol, cardanol and anacardic acid. Strictly speaking, it is mainly used in polymer-based industries for contrasting paints, linings, adhesives, varnishes, rubber adhesives, surfactants, polyurethane-based polymers, epoxy frames and wood preservatives (u Edoga et al., 2006).

Biological Role Polyphenols in Plants

It should be noted that both natural phenols and polyphenols play an important role in the ecosystem of many plants. The effect of phenols and polyphenols on plant tissues can be categorized as follows (Lattanzio etal., 2006):

Depression and release of growth hormones such as auxin.

Provides color (or color plant) and UV screens to protect against ionizing radiation"Sensitive Structures": Decreased vegetation.Use as Phytoalexins: Prevention of Infectious Diseases (Huber et al., 2003).

"Signing molecules": Maturity and other growth processes

Conclusion: - The main sources of polyphenols for fruits and beverages such as tea, red wine and coffee, but vegetables, legumes, and beans are also good sources. Beneficial effects of polyphenols given their strong antioxidant activity i.e., their ability to absorb oxygen radicals and other active compounds. These factors make phenols an potential source of effective food formulation or treatment that may be protected against certain diseases. The health effects of polyphenols depend on both their availability and their availability, which can vary greatly. Many genetic, environmental, and technological factors can affect the concentration of polyphenol in the diet, some of which can be controlled by increasing the polyphenol dietary content. One of the potential for increased phenolic acidity in fruit juices would be the choice of fruit crops, as crops vary greatly in their phenolics content. Strength is strong and can be a self-processing technology that should be considered.

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