

ASSESSMENT OF FLAVONOIDS AND THEIR HUMAN BIOLOGICAL IMPLICATIONS

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Abstract

Due to the wide range of health benefits flavonoids from plant sources have been shown to have in numerous epidemiological studies, there has been an increase in interest in their research. Since flavonoids are closely linked to dietary components and human health, it is important to assess how structure and function are related. The arrangement, quantity, and substitution of functional groups around the nuclear structure of flavonoids affects their bioavailability, metabolism, and biological activity. Along with tea and wine, fruits and vegetables are the main dietary sources of flavonoids for people. The majority of recent studies have concentrated on flavonoids' effects on human health. Many flavonoids have been demonstrated to have antioxidative activity, the ability to scavenge free radicals, the ability to prevent coronary heart disease, the ability to protect the liver from damage, the ability to reduce inflammation, and the ability to combat cancer. Flavonoids function as growth regulators and antioxidants in plant systems. Microbial biotechnology has made it possible to produce several types of flavonoids in large quantities at low cost for therapeutic uses. The structural characteristics of flavonoids, their favourable effects on human health, and their importance to both plant and microbial production are highlighted in this review.

FLAVONOIDS AND THEIR BIOLOGICAL IMPORTANCE

Numerous studies have suggested that eating vegetables and fruits is essential for maintaining health and preventing chronic diseases including cardiovascular illness and disease. This protective effect has been attributed to the foods' notable concentrations of various types of flavonoids, which are present in such plant-based foods. For instance, Peterson et al. identified eight different types of flavanones, including didymin, eriocitrin, hesperidin, naringin, narirutin, neoeriocitrin, neohesperidin, and poncirin, which are present in citrus fruits including grapefruit, lemons, and limes in amounts ranging from 17 to 27%. Flavonoids are class of polyphenolic common items containing two benzene rings (A and B) linked with a heterocyclic pyran ring C (Figure 1).

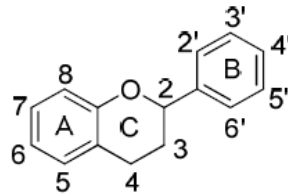


Figure 1 Basic flavonoid structures

Albeit more than 4000 one of a kind types of flavonoids have been distinguished.

Flavonoids are a diverse class of compounds found in fruits, vegetables, and grains that have been shown to have a range of health benefits. They are commonly consumed in the diet and have been found to possess antioxidant, anti-inflammatory, and anti-cancer properties. This assessment will focus on the biological implications of flavonoids in human health.

Antioxidant Properties: Flavonoids are potent antioxidants that can scavenge free radicals and prevent oxidative damage to cells. Oxidative damage is a potential cause of aging, chronic diseases, and cancer. Therefore, flavonoids can help prevent or slow down the progression of these diseases.

Anti-inflammatory Properties: Inflammation is a natural response to injury or infection in the body, but excessive and chronic inflammation can lead to various diseases like arthritis, heart disease, and cancer. Flavonoids can help reduce chronic inflammation by regulating the activity of inflammatory cells and cytokines.

Anti-cancer Properties: Flavonoids have been shown to have anti-cancer properties, including the ability to inhibit tumor growth and induce cancer cell death. There is evidence to suggest that consuming flavonoids may reduce the risk of certain cancers, including breast, colon, and prostate cancer.

Cardiovascular Health: Flavonoids have been shown to improve cardiovascular health by lowering blood pressure, reducing cholesterol levels, and improving blood vessel function. These effects can lead to a reduced risk of heart disease and stroke.

Brain Health: Flavonoids have also been shown to have neuroprotective effects, which means they can preserve and protect brain function. Some studies suggest that flavonoids may help prevent age-related cognitive decline and neurodegenerative diseases like Alzheimer's.

NEURAMINIDASE INHIBITION EFFECT

The Orthomyxoviridae are a group of RNA infections, which incorporates five genera: Influenza infection A, Influenza infection B, Influenza infection C, Influenza infection D, and Thogoto infection. Flu infection A, B and C can cause flu in feathered creatures, people and some different warm blooded animals and among them, type A infections are the most destructive human pathogens. Flu A is additionally arranged to subtypes like H1N1, H2N2, H3N2, H5N1, H7N7, H1N2, H9N2, H7N2, H7N3 and H10N7. H and N stand for hemagglutinin (H) and neuraminidase (N) which are proteins on the surface of the flu infection strain (Figure 2). Hemagglutinin is in charge of the attachment of the infection to the host cells and causes agglutination of red platelets. Neuraminidase is a protein which is responsible for the start of the flu disease by advancing the arrival of the infection from the host cell.

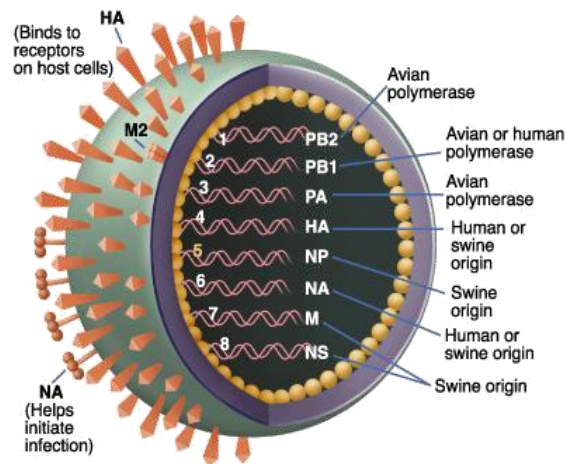


Figure 2 Structure of the influenza virion

In spite of the fact that there are distinctive sorts of H and N proteins, the ones that regularly cause flu amid influenza seasons are H1N1 (swine and fowl influenza) and H3N2 (Hong Kong influenza). The most well-known reason for human influenza in 2009 (Pandemic H1N1/09 infection) was the swine birthplace subtype H1N1 infection which tainted more than 1.6 million individuals with 19,633 passing cases around the world (Figure 2.4). The 2009 influenza outbreak in Malaysia began in August 2009 with imported cases from influenced nations like United States America and Australia took after by

neighborhood transmission in June 2009 with 12,210 aggregate number of contaminated cases and 92 demise cases. Albeit, yearly, flu have been accounted for being caused various of mortality and grimness and hospitalizations, however the overall outbreak of the new strain of the infection that rose in 2009 reason a worldwide frenzy.

ANTI-VIRAL EFFECTS

A number of studies have been directed on the counter popular impact of flavonoids. Calophyllumcoumainins and Baicalin have been accounted for to have hostile to HIV-1 action. Thus, disengaged flavonoids from Geranium carolinianum L have been appeared to have sensible hostile to viral movement against hepatitis B infection. Flavonoids like Glaranine and 7-O-methylglabranine were additionally answered to repress dengue viral development. Tan et al. as of late announced that panduratinAn and its subordinates to display great aggressive inhibitory exercises towards dengue 2 infection NS3 serine protease. In another examination, Rajkumar and colleagues announced segregated flavonoids from Poncirus trifoliolate, for example, Poncirin, rhoifolin, naringin and marmesin to be genuinely powerful mosquito repellent.

ANTI-OXIDATIVE EFFECTS

Oxygen metabolism is the most well-known explanation behind the creation of responsive oxygen and free radicals in the human body which can cause cell film harm, cell passing and tissue harm. The nearness of free radicals in the body in the long run can bring about numerous sicknesses and difficulties, for example, liver malady, disease, asthma, and diabetes. Cell reinforcement operators can restrain or defer the development of free radical oxygen species by controlling the oxidation procedure of an oxidisable source. Flavonoids particularly polyhydroxylatedflavonols and catechins, can enable the body to neutralize the impact of these free radical oxygen through different components like searching of the free radicals, extinguishing of the singlet oxygen by hydrogen gift and chelation of metal particles associated with free radical creation.

ANTI-INFLAMMATORY EFFECTS

Inflammatory responses are regularly caused by the arrival of abundance measure of various arbiters by initiated macrophages. For instance, nitric oxide can cause edema, encourage leukocyte development in vessels and deliver cytokine. Flavonoids like fluorinated chalcones are accounted for to keep the nitric oxide age from the nitric oxide synthase. Arrival of arachidonic corrosive by other ace inflammatory specialists like cyclo-oxygenase (COX) and 5-lipoxygenase can be avoided by Quercetin.

ANTI-CANCER EFFECTS

Flavonoids, for example, chromone and xanthone subordinates have been accounted for to be powerful inhibitors for aromatase protein. Aromatase is the key protein associated with hormone-based bosom growth. Abyssinone II and its subsidiaries, a gathering of regular flavanones, were assessed as aromatase inhibitors and have indicated palatable inhibitory action. Substituted quinolones have demonstrated cytotoxic and against tubulin impacts to different human tumor cell lines like lung carcinoma (A-549), bosom malignancy (MCF-7), and renal growth (CAKI-1), and melanoma disease (SKMEL-2) in vitro. Thiochromones and thiochroman-4-ones were screened on CF1 male mice and effectively restrain tumor development. Likewise, it has been accounted for that flavonoids have antitumor action to the human kidney carcinoma cells TK-10 in vitro.

CONCLUSION

It is well recognised that phytochemicals, particularly flavonoids, can be used to prevent and treat disease. Flavonoids can be found naturally in fruits and vegetables. The many flavonoids found in nature each have unique physical, chemical, and physiological characteristics. Flavonoids' structure-function link is a prime example of important biological functions. Numerous flavonoids have proven medical value as antibacterial, hepatoprotective, anti-inflammatory, anticancer, and antiviral medicines. The use of these substances is more widespread in underdeveloped nations. Specific biochemical assays must be used to confirm the therapeutic usage of novel substances. It is now possible to generate flavonoids on a big scale via genetic changes. Additional developments will yield fresher understandings and undoubtedly usher in a new era of pharmaceuticals based on flavonoids for the treatment of numerous infections and degenerative diseases. Conflict of Interests The authors declares that they do not have any conflict of interests.

In conclusion, flavonoids are a diverse class of compounds found in many foods that can provide significant health benefits, including antioxidant, anti-inflammatory, anti-cancer, cardiovascular, and neuroprotective effects. Consuming a diet rich in flavonoids can help protect against chronic diseases and improve overall health.

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