

The flavonoid group encompasses compounds with a C6-C3-C6 structure: flavanones, flavones, flavonols, flavan-3-ols, dihydroflavonols, anthocyanidins, isoflavones and proanthocyanidins. The nonflavonoids group is comprised of xanthones, chalcones, lignans, stilbenes and secoiridoids; and are classified according to the number of carbons and comprises the following subgroups, such as simple phenols, benzoic acids, hydrolyzable tannins, acetophenones and phenylacetic acids, benzophenones, coumarins, cinnamic acids, chalcones, xanthones, stilbenes, lignans and secoiridoids.

Phenolic acids, such as caffeic, ellagic and ferulic acids, are commonly found in fruits, vegetables, tea and wine; many are present in foods in the form of glycosides. Ellagic acid is generally found in high concentrations in fruits and nuts, specifically blackberries, raspberries, strawberries, pecans and walnuts (Hollman and Venema 1993). Green tea, grapes, wine, berries, citrus fruits, apples, whole grains and peanuts are rich source of polyphenols.

The most common group of plant phenolics are the flavonoids, which are named based on the structure of flavones, comprised of two benzene rings linked through a three-carbon γ -pyrone ring. The common classes of flavonoids include flavones, isoflavones, flavonols, anthocyanins, catechins (flavanols) and flavanones. More than 4000 different types of flavonoids have been reported; and except for catechins (Aherne and O'Brien 2002), most flavonoids occur as glycosides in nature.

Flavonoids. Flavonoids are the most diverse group of phytochemicals. Research suggests that flavonoids, a vital phytochemical group, may contribute to the actions such as inhibiting xanthine oxidase and arachidonic acid metabolism. These are found in fruits, vegetables, coffee, tea and wine. The flavonols quercetin, kaempferol and myricetin are widely available in fruits and vegetables. Berries, tomatoes, potatoes, broad beans, broccoli, Italian squash, apples, kale and onions are rich in quercetin (Hollman and Artz 2000; Aherne and O'Brien 2002). Vegetables such as radishes, horseradishes, endive and kale are relatively high in kaempferol (Hertog et al. 1993). Citrus fruits are comprised of various flavanoids such as naringenin (a flavanone), rutin (a flavonol glycoside) and tangeretin (a methylated flavone).

The health-promoting properties of flavonoids are believed to be based on their antioxidant activity wherein they act as the hydrogen donating free radical scavengers (Rice-Evans et al. 1996; Prior and Cao 2000). The primary target of free radicals are proteins (including enzymes), lipids (related to the induction of heart disease), DNA (responsible for the occurrence of cancer) and RNA. Though, the most frequently occurring oxidative event inside the body is the oxidation of the unsaturated fatty acid components of the phospholipid cell membranes forming lipid peroxides. Many researchers have shown that the lipid peroxides and reactive oxygen species formed during oxidation are held responsible for the development of a variety of diseases, including cancer, atherosclerosis, heart disease, kidney damage and also accelerated aging (Ames et al. 1993; Yu 1996). Flavonoids also acts as metal chelators that binds to metals, such as copper and iron, which catalyze lipid oxidation.

Yang et al. (2001) reviewed the carcinogenesis inhibition by dietary polyphenolic compounds and questioned the association between the antioxidative and anti-carcinogenic properties, asserting that polyphenols may inhibit carcinogenesis by impinging the molecular events at the initiation, promotion and progression stages