

Flavonoids are natural antioxidants

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DOI: <https://doi.org/10.33545/26646536.2021.v3.i2a.27>

Abstract

Studies have shown that flavonoids are phenolic compounds that are widely synthesized in most plants. However, the antioxidant activities of flavonoids attract more attention. Oxidative damage is one of the main causes of premature aging and a number of diseases (such as cardiovascular disease and cancer). Consumption of foods rich in flavonoids is important in the prevention of such diseases. This protective effect of fruits and vegetables depends on the flavonoids which they contain. A number of plant extracts were obtained, the flavonoid content was studied and the results were reflected in the article. The spectra of the extracts were taken using a Hitachi U-2900 UV-VIS spectrophotometer, the flavonoid content was determined and an important flavonoid compound quercetin was detected.

Keywords: extract, plant, flavonoid, spectrum, phenolic compound

Introduction

Recently, there has been a growing focus on antioxidants that prevent the possible harmful effects of free radicals on the human body, prevent the breakdown of fats and other fatty foods, and increase the resistance of many drugs and biochemicals. Flavonoids are phenolic compounds that are widely synthesized in most plants. Many studies have shown that flavonoids are biologically active substances. However, the antioxidant activities of flavonoids are more noteworthy. Because they reduce the formation of free radicals and have anti-radical effects. The relationship between the antioxidant properties and chemical structures of flavonoids has been investigated [3].

Scientific evidence collected over the last decade has shown that plant polyphenolic compounds have antioxidant properties. This group of substances: phenols, phenolic acids, flavonoids, tannins and lignans are present in almost all edible plants. The flavan nucleus forms the basis of the chemical structures of flavonoids [2].

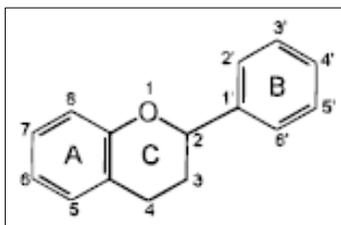


Fig 1: General structure of flavonoids

Flavonoids are a large group of polyphenolic compounds synthesized by plants. One of these compounds, rutin, is a flavonoid with strong bioactive antioxidant properties. Among flavonoids, flavonoids and flavonols, catechins, leucoanthocyanidins and flavanones have been found to be effective in the treatment of capillary permeability. They affect the formation of erythrocytes and the number of leukocytes. It also has properties such as strengthening the heart and

normalizing the pulse. Flavonoids also affect liver function, bile secretion and have diuretic properties. Increases the activity of the intestines and has a positive effect on digestion. The study of flavonoids has increased since the 1970s. As a result of detailed studies, flavonoids have been shown to have numerous biochemical and pharmacological activities. It has high antioxidant, antimicrobial and anti-inflammatory effects [4]. Of the flavonols, quercetin and campherol predominate in fruits and vegetables, and they are mainly found in the peel of fruits. Isoflavones are more common in legumes, especially soybean. Black clover, three-leaf clover and sunflower seeds also contain isoflavones. Flavan oligomers (proanthocyanins) are found in apples, grapes, some berries, dates, currants and barley grains. Anthocyanins and their glucosides are also found in various berries and red grapes. In addition to the physiological role of flavonoids in plants, they are considered an important component of human nutrition [1].

A number of studies show that the consumption of fresh fruits and vegetables has a protective effect against cancer, heart and other diseases, as well as aging. In general, the abundant consumption of fruits and vegetables is a key factor in maintaining a healthy body and increasing resistance to chronic diseases. It is likely that the flavonoids in fruits and vegetables also play a role in this protective effect. These observations have been confirmed by some *in vivo* and *in vitro* studies on animals. Unfortunately, the information about the role of flavonoids in the human body is not very detailed [6]. Some studies have also shown that flavonoid products have a protective effect against coronary heart disease. Sources of flavonoids in these studies have been fruits, vegetables, red wine and tea. For this reason, based on epidemiological evidence, it has been found that flavonoids in the diet have certain protective roles. In addition to their antiradical activity (neutralizing free radicals), flavonoids can also neutralize radicals involved in oxidation processes [7].

In recent years, *in vitro* and *in vivo* studies have been conducted in various countries around the world to determine the

antioxidant activity of natural compounds, especially flavonoids, and to investigate the relationship between their chemical structure and antioxidant activity. Research has shown that plants are a major source of flavonoids, which are natural antioxidants [5].

Material and methods

Extracts from plant samples were obtained at 70°C with 80% ethanol. Selective liquid-extraction method, adsorption column chromatography from silica gel and polyamide sorbents, paper and thin layer chromatography, stepwise crystallization methods were used for purification of the extract, fractionation and separation of individual flavonoids. The spectra of the extracts were performed using a Hitachi U-2900 UV-VIS spectrophotometer, and the chromatographic analysis was performed using a DC-fertigfolien ALUGRAM SIL G / UV 254 thin layer.

Results

Several plants were selected for analysis, extracts were obtained and flavonoid content was studied. In ultraviolet spectroscopy, flavonoids form two bands. II- B band at 300-550 nm, II- 240-285 nm A band. Flavones and flavonols 240-285 nm, flavanones 270-295 nm. Flavones and flavanones show absorbance at 303-304 nm and 3-hydroxyflavonols at 352 nm.

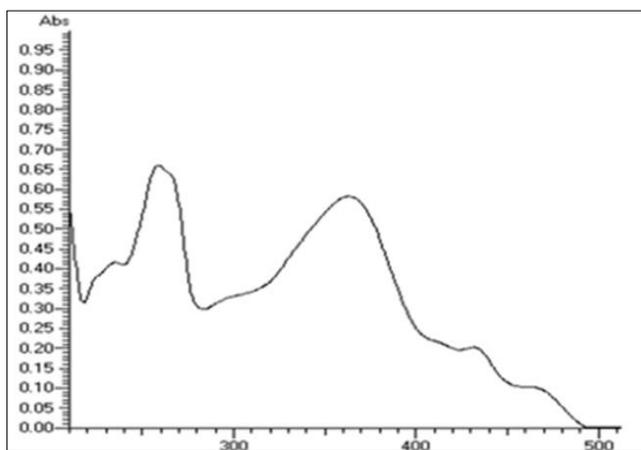


Fig 2: UV spectrum of quercetin

Quercetin and campherol of the flavonols, predominate in fruits and vegetables, and they are mainly found in the peel of fruits. Isoflavones are widespread in legumes, especially soybeans. Black clover, three-leaf clover and sunflower seeds also contain isoflavones. Of the flavan-3-oles (+) - catechin, (-) - epicatechin, (-) - epigallocatechin and their gallate esters are widespread in the plant kingdom. Tea leaves are also very rich in these substances. Flavan oligomers (proanthocyanins) are found in apples, grapes, some berries, dates, currants and barley grains. Anthocyanins and their glucosides are also found in various berries and red grapes. In addition to their physiological role in plants, flavonoids are one of the important components of human nutrition, despite their lack of nutritional value.

References

1. Guliyev VB, Mansur H. Flavonoids Istanbul: Çağaloğlu, 1999, 380.
2. Kuhnau J. The flavonoids: a class of semi-essential food components their role in human nutrition // World Rev Nutr Diet,1976,24,117-191.
3. Mabry T, Markham K, Thomson M. The systematic identification of flavonoids. Berlin- Heidelberg- New York: 1970, 176.
4. Mabry T, Markham K, Thomson M. The systematic identification of flavonoids. Berlin- Heidelberg- New York: 1970, 176.
5. Oktay Y. Capparis (Capparis spp.) Exchange of spicy compounds and flavonoids in the process. Thesis of the doctor. Ankara University, 2008, 101.
6. Rahimova SA. Flavonoids of *Capparis herbacea* L. species distributed in the flora of Nakhchivan Autonomous Republic // Scientific works of Azerbaijan State Agrarian University, 2017, 2.
7. Yuksel K. Biochemistry and Analysis of Anthocyanin Pigments / Journal of Turkish Scientific Compilations,2005:8(1):19-25.