Abstract

Flavonoids are biologically active polyphenolic compounds widely distributed in plants. Flavonoid intake may be associated with decreased risk of some chronic degenerative diseases in humans. Vegetables are one source for flavonoid compounds in the diet. USDA’s Nutrient Data Laboratory evaluated existing literature from sources around the world and compiled a database containing flavonoid values for 58 different vegetables, 28 herbs and edible leaves, and 4 vegetable recipes as part of the development of its Flavonoid Database for Foods (http://www.nal.usda.gov/fnic/foodcomp). Many vegetables, including onions, hot peppers, broccoli, snap beans, kale, and lettuce contain flavonoid compounds quercetin and kaempferol. Broadbeans and marmorfal peaks provide catechins, the flavonoids. Parsley, rhibashas and celery provide high levels of apigenin, a flavone. In compiling the database, analytically valid data were assigned a confidence code (most accurate, high confidence) based on the quality of the sampling procedures, analytical methods and quality control. While there were no A quality data for any flavonoid values for vegetables in the database, most vegetables had B or C quality data. This database is the first step in evaluating the need and directing research for obtaining new analytical data on the flavonoid content of vegetables.

Introduction

Food sources of flavonoids are vegetables, fruits, nuts, seeds, roots, and beverages like tea and wine. The USDA Database for the Flavonoid Content of Selected Foods, released in March 2003, contains information on the most prevalent dietary flavonoids. These are organized into five subclasses based on their chemical structure:

- **Flavonol compounds** quercetin, kaempferol, myricetin, isorhamnetin
- **Flavones** apigenin, luteolin
- **Flavan-3-ols** epicatechin, catechin, epigallocatechin, gallocatechin
- **Anthocyanins** cyanidin, pelargonidin, petunidin
- **Flavanones** hesperidin, naringenin, eriodictyol

Data on the flavonoid content of vegetables was compiled from the scientific literature and evaluated using the Nutrient Data Laboratory’s data quality evaluation system (Hollen et al., 2002). Ratings based on sampling plan, sample handling procedures, number of samples, analytical method and analytical quality control were combined to yield a Confidence Code for each flavonoid value. The database, available on the website, contains the Nutrient Databank Number for individual foods, mean value for each flavonoid measured (mg/100g), standard error, minimum and maximum values reported, the data quality rating and the Confidence Code. This presentation summarizes the flavonoid content of vegetables, herbs, and vegetable recipes contained in this new database.

Summary

- Flavonoid compounds quercetin, kaempferol and myricetin are widely prevalent in vegetables. Particularly good sources are onions, hot peppers, kale, broccoli, rutabagas and spinach.
- Legumes are the only vegetables which contain flavan-3-ol compounds catechins and epicatechins.
- Many herbs and edible leaves contain high levels of flavonols and flavones.
- Many of the flavonoid analyses available were performed using foods purchased outside of the U.S. and may not reflect values for foods available in this country.
- For many foods there are only single values.
- There are no analytical methods to separate and quantify all the major flavonoids from all the classes simultaneously. As a result, many researchers only analyze one class of flavonoids in a particular food.

Analysis of commonly consumed vegetables for flavonoid compounds is underway as part of the National Food and Nutrient Analysis Program. These data will be used to augment the values in the current database and address some of the gaps identified by this research.