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Analysis and study on the antioxidant of citrus fruits

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Abstract

The term "antioxidant" is mainly used for two different groups of substances: industrial chemicals which are added to products to prevent oxidation, and natural chemicals found in foods and body tissue which are said to have beneficial health effects. Citrus fruits are the source of the second category. They are fruits of the genus *Citrus* having thick rind and juicy pulp. *Citrus Fruits* are well-known for its nutrition and health-promotion values. In recent years, the antioxidant activity of *Citrus* fruits and their roles in the prevention and treatment of various human chronic and degenerative diseases have attracted more and more attention. *Citrus* fruits are suggested to be a good source of dietary antioxidants. To have a better understanding of the mechanism underlying the antioxidant activity of *Citrus* fruits, we have done these experiments of analysing acidity, moisture content & antioxidant content of 3 citrus fruits (will be discussed below).

Keywords: Citrus fruits, antioxidants, acidity of fruits, health benefits of fruits

Introduction

Citrus is a genus of trees with fleshy, juicy fruits, widely used edible plants belonging to *Citrus* and related genera of the family *Rutaceae* (orange family). Included are the tangerine, citrange, tangelo, orange, pomelo, grape fruit, lemon, lime, citron, and kumquat. Introduced throughout Europe during the Crusades, they were brought by Portuguese and Spanish explorers to the West Indies, hence they were introduced into North and South America. Commercially they are now the most important group of tropical and subtropical fruits in the world. The fruits are rich in vitamin C (ascorbic acid), various fruit acids (especially citric acid), and fruit sugar. The rind, which contains numerous oil glands, and the fragrant blossoms of some species are also a source of essential oils used for perfumes and similar products. Citrus fruits can be damaged by freezing temperatures, pests (scale insects, rust mites), and various bacterial, viral, and fungal diseases (e.g., citrus canker, greening, tristeza, and melanose).

How can antioxidants benefit our health?

Antioxidants are substances that can prevent or slow damage to cells caused by free radicals, unstable molecules that the body produces as a reaction to environmental and other pressures.

They are sometimes called "free-radical scavengers."

Free radicals are waste substances produced by cells as the body processes food and reacts to the environment. If the body cannot process and remove free radicals efficiently, oxidative stress can result. This can harm cells and body function. Free radicals are also known as reactive oxygen species (ROS).

Antioxidants act as radical scavenger, hydrogen donor, electron donor, peroxide decomposer, singlet oxygen quencher, enzyme inhibitor, synergist, and metal-chelating agents. Antioxidant supplements may help reduce vision loss due to age-related macular degeneration in older people.

Foods that are particularly high in antioxidants are often referred to as a "superfood" or "functional food."

Health benefits of Citrus fruits are associated with its high amounts of photochemical and bioactive compounds such as flavonoids, limonoids, phenols, carotenoids, minerals and vitamins. The plant is used in traditional medicine as an antiseptic, antiviral, antifungal, astringent, diuretic, mosquito bite repellent, for the treatment of stomach ailments.

Materials & methods

Three types of Citrus fruits, Lemon (*Citrus lemon*), Sweet lime or Mosambi (*Citrus limetta*) Orange (*Citrus sinensis*) were taken.

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Measurement of moisture content

Food moisture analysis involves the whole coverage of the food items in the world because foods are comprising a considerable amount of water rather than other ingredients. Moisture content of the food material is important to consider the food is suitable before the consumption, because moisture content affects the physical, chemical aspects of food which relates with the freshness and stability for the storage of the food for a long period of time and the moisture content determine the actual quality of the food before consumption and to the subsequent processing in the food sector by the food producers.

The moisture content was measured by using standard AOAC method. 5g sample was placed in hot air oven at 105°C for 4 hr. and then tested and dried until constant weight.

Measurement of Acidity

The acidity of three types of juices was estimated against 0.1 (N) NaOH using Phenolphthalein as indicator.

Measurement of phenolic content (expressed in mg/gm.)

The amount of total phenol was determined with the Folin-Ciocalteu reagent. Gallic acid was used as a standard compound and the total phenols were expressed as mg/g Gallic acid equivalent using the standard curve equation. Where y is absorbance at 765 nm and x is total phenolic content in the extracts of Lemon.

Results

Table 1: Determination of Moisture

Sample Name	% moisture content
Orange	90.8
Mosambi	91.2
Lemon	93.2

Table 2: Determination of Acidity

Name of fruit juice	Acidity (expressed in terms of citric acid).
Lemon	7.28%
Mosambi (sweet lime)	0.296%
Orange	0.74 %

By using the same method, acidity of Mosambi and lemon was found to be 0.296% and 7.28% (in terms of citric acid). So according to the result, Lemon has got the percentage of acidity, higher than the other two fruits.

Table 3: Determination of Polyphenol

Name of fruit juice	Polyphenol content(mg/l)
Lemon	160.57
Mosambi (sweet lime)	232
Orange	193.78

Now antioxidants of polyphenols were calculated in terms of concentration of Gallic acid by using the equation, $y = 0.0028x - 0.2026$ where y = absorbance at 765 nm and x = concentration of Gallic acid in ppm.

Putting the values of y in the above equation, we got the antioxidant content in terms of concentration of Gallic acid. We saw Mosambi sample has the highest amount of antioxidant present in it i.e. 232 mg/l whereas orange and lemon sample has got 193.78 mg/l & 160.57 mg/l respectively.

Discussion

On completion of the experiment of analyzing the antioxidant content in various citrus fruit we noticed that Mosambi sample has the highest amount of antioxidant present in it i.e. 232 mg/l whereas orange and lemon sample has 193.78 mg/l & 160.57 mg/l respectively, although the acidity of Mosambi is the lowest among them.

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