ISSN 2692-5877
DOI: 10.46998/IJCMCR.2023.32.000797

International Journal of
Clinical Studies & Medical Case Reports

Research Article

Antioxidant Activity of Apple and Pear Fruits Grown in Nakhchivan AR of Azerbaijan

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Received: August 08, 2023 **Published:** December 26, 2023

Abstract

In the article, the antioxidant activity of apples and pears grown in Nakhchivan AR was studied. A number of important properties of apples and pears, which are very useful fruits for humans, were investigated and the results were reflected in the article. Apple varieties and forms distributed in the territory of Nakhchivan AR are mainly divided into 3 groups. The red muski apple and abbasbeyi pear varieties selected as the object of research are widespread in the territory of the autonomous republic and is a summer variety. Apple and pear fruits were conducted based on the DPPH method. The SC50 value was calculated for the samples taken. SC50 value for pear fruit was 6.73 ± 0.065, for apple 0.86 ± 0.032. It is clear from the obtained results that the antioxidant activity of pear fruits is higher than apple fruit.

Keywords: Antioxidant; Apple; Pear; DPPH; Radical; Fruit

Introduction

Studies in many countries prove that a diet rich in fruits and vegetables reduces the risk of the aging process and lifestyle diseases, especially cardiovascular, various diseases and other diseases such as cancer, rheumatoid arthritis, lung diseases, cataracts, Parkinson's or Alzheimer's. The compounds that provide this protective effect are said to be derived from phytochemicals and vitamins (C and E) with antioxidant properties. Their activity is explained by their ability to scavenge reactive oxygen species such as hydroxyl, peroxide radicals, and other reactive oxygen radicals such as hydrogen peroxide and singlet oxygen. The discussed compounds inhibit the activity of enzymes and form complexes with metals that catalyze oxidation reactions. The mentioned properties of fruit and vegetable combinations determine their beneficial properties for health. In recent years, environmental pollution, stress and the widespread use of ready-made foods have increased the formation of oxidizing substances in the human body. Increased oxidizing substances are harmful to all cells and organs of the body. It is known to have many effects on cardiovascular diseases, degenerative diseases of the nervous system, diseases of the immune system, gene damage, cancer and premature aging [6].

Recently, attention has been increasingly focused on antioxidants, which prevent the possible harmful effects of free radicals in the human body, prevent the deterioration of fats and other lipid-containing food products, and increase the stability of many pharmaceuticals and biochemical products. The antioxidant balance in the human body increases with age, environmental pollution, fatigue, excessive calorie intake, fatty foods and other factors. The body needs antioxidants such as phenolic compounds, carotenoids, vitamins C and E to either prevent or delay these factors that develop in favor of oxidants. These substances neutralize free radicals in living beings and prevent their negative effects on cells. Antioxidants are substances that delay or prevent the oxidation of lipids. Ascorbic Acid (AA) and α-tocopherol (α-TocH) are antioxidants that can also act as prooxidants. The value of fruits in human nutrition could be better explained by the development of culture and the clarification of the physiological and biological basis of human nutrition.

The reasons why fruits are necessary for nutrition and health can be listed as follows:
1. They provide the body with vitamins necessary for health.
2. Meets the body's needs in terms of some substances. For example, they provide minerals necessary for the formation of bones and teeth in children.
3. They are low in calories. Since they are weak in terms of protein and fat content, they do not cause obesity.
4. Fruits, with their different colors and smells, affect the sense organs, open and increase appetite.
5. They facilitate digestion, thus ensuring better utilization of nutrients by the body.
6. With the cellulose content, they facilitate digestion in the intestines and ensure the regular functioning of the intestines.
7. It also has therapeutic functions.

Fresh fruits and vegetables are an important part of human nutrition due to their bioactive components and health effects. In recent years, due to the development of awareness of healthy eating, consumers' expectations from food are changing, interest in bioactive components is increasing due to their positive effects in terms of full and adequate satisfaction of their needs

and health. Bioactive compounds are natural chemical components that provide the desired health and well-being to humans [1].

The rich chemical composition, the ability to store fruits for a long time, high productivity, and the possibility of cultivation in different soil and climate conditions have led to the cultivation of apples in large areas. In terms of acreage and total production, apples are in first place. Apples contain up to 13-15% sugar, vitamin C (its amount is higher in wild Oriental apples), vitamin B1, carotene, various acids, organic compounds of iron, potassium, sodium, phosphorus, magnesium, calcium, etc. is available. Apple fruits contain 4.92-14.61% sugars, 0.20-0.86% acids, 0.07-0.26% tannins, 0.28-0.50% ash elements and various vitamins (A1, B1, B2, C, P and PP) [3]. The red muski variety selected as the object of research is widespread in the territory of the autonomous republic and is a summer variety. The tree is of medium height, and its canopy is round. 4th year yields. The fruits are small, the size of the longitudinal section is 40-45 mm, and the width is 50-55 mm. Its mass is 65-75 g. The fruits are spherical oval in shape, the peel is thin and easy to peel. The taste is sweet and juicy. It is a very productive variety. The ripening period of its fruits lasts until June-July, depending on the location [4].

Dietary fiber is a carbohydrate compound that cannot be broken down or absorbed by digestive enzymes and is particularly important in preventing constipation. Fiber foods are recommended for the treatment of diabetes, heart and colon diseases, and high blood pressure [2].

The apple plant belongs to the Rosaceae family, the subfamily Maloideae, the genus Malus Mill, and the species M. domestica Borhk. There are 50 types of apples in the world. 3 types (Cultural apple, Siberian apple and Plum shaped apple) are cultivated under cultivation. In our republic, 2 types are spread - Oriental apple (M.orientalis Uglitiz), forest apple (M.silvestris Mill). Benefits of apple: This precious plant is very good for the human body and has many medical benefits. These are briefly mentioned below [5].

Apple improves the functioning of the cardiovascular system, helps fat people lose weight, softens the face, increases appetite, and relieves constipation. It is recommended to be eaten with the shell. Its water prevents vomiting, regulates blood pressure, salivary glands, and prevents dry mouth. Pregnant women are recommended to eat apples. Different varieties of orchard apples are grown in Azerbaijan. It is the main garden fruit in the Guba-Khachmaz zone in the Nakhchivan Autonomous Republic and other regions of the country. One of the famous local varieties is Kizil Ahmadi. Palmet, Simirenko, Dust apple, Tabak apple, Khumar apple, Logazbey, Daragi, White apple, Rosemary, Belflor and other varieties are also cultivated on a large scale [7].

Muhammad Husayn Khan wrote about apples in the 18th century: "ripe, fragrant and delicious apples" (sour and sweet) are more useful than tasteless ones. If eaten regularly, it is very beneficial for the heart. This fruit is especially useful in tachycardia (rapid heartbeat) and difficult breathing. Apple increases appetite, cleanses the intestines, and is good for the liver. In addition, it raises the vital tone of the body, cheers up, and has a positive effect on the mood. Eating an apple and smelling its aroma is good for chronic nervous diseases. Apple is useful for the brain, it increases working capacity. Baked apple is useful in dry cough, etc. Muhammad Momin writes that jam made from apple tree flowers is good for the heart and brain [4].

For this, apple blossoms and rose petals are taken in equal proportions and powdered sugar is poured over them, kept in a closed container for 10 days, then mixed well, 1 tablespoon is eaten daily in the morning on an empty stomach. Sour apple lowers blood pressure and has a more choleretic effect. Sour apple juice is boiled without sugar and thickened. The juice obtained is used as a choleretic agent and against stones in the gall bladder. Ibn Sina notes that a compress with apple leaves and juice heals newly formed purulent tumors and acne. In Azerbaijani folk medicine, dried apple peel is used as a diuretic when there are kidney stones, and its decoction is dripped into the ear for earaches. Apple juice called "cider" is made from its fruits. This wine should be taken little by little during constipation [8].

Being a good source of antioxidants, fiber and vitamins, pear also protects heart health. Thanks to the pectin in the pear, it benefits digestive health. It is a natural diuretic. Eating a whole pear or drinking pear juice helps regulate bowel movements and reduce bloating. It also protects the digestive organs from oxidative stress from the phytonutrients found in pears and other fruits. They also help balance the pH level and alkalize the body [5,10].

The Abbasbeyi variety selected as the research object is a summer variety. It is one of the most widespread ancient local varieties in the territory of Nakhchivan AR. It blooms in April. The fruit is large, the weight is 180-220 g, the height of the fruit is 80-85 mm. The skin is thin, the color is dark yellow, slightly red [4,7].

Material and Methods

The antioxidant activity of apple and pear fruits grown in the territory of Nakhchivan Autonomous Republic was studied. Apple and pear fruits were selected as the research object, and the research work was conducted based on the DPPH method. Dried fruit samples were ground into powder in a blender, and then 5 g were placed in a 50 ml vial flask, 25 ml of 50% ethanol was added to it, first totalized in an ultrasonic bath for 2 hours, and then extracted in a shaker for 24 hours. After filtration through filter paper, all volumes were brought up to 30 ml with 50% ethanol [9].

A 100 µM DPPH methanol solution was used to determine the radical scavenging activity of the components in the samples. For this, 3.94 mg of DPPH is weighed, dissolved in some methanol, and the final volume is made up to 100 ml. During the determination of DPPH radical scavenging activity, the sample solutions obtained by serial dilution were added to the DPPH radical concentration kept constant in the medium. Absorbance values were measured spectrophotometrically at a wavelength of 517 nm by mixing the sample with the radical in a ratio of 1:1. The radical scavenging power of the antioxidant substance in the sample was calculated by drawing an exponential graph from the obtained values [8].

Result

It was determined that fruit extracts obtained in ethanol scavenge the DPPH radical, that is, they show antioxidant activity. The SC50 value was calculated for the samples taken.

Table 1: SC50 values of pear and apple varieties.

Example	Measured sample	DPPH SC_{50} (mg/mL)
Pear	8,98q/20 mL	6,73 ± 0,065
Apple	7,19q/20 mL	0,86 ± 0,032
Trolox	-	0,00±0,00

Table 2: Spectrum values of apple and pear fruits.

kons= 7,19g/20			
359,5			
3,595	0,034	0,038	0,032
1,7975	0,094	0,097	0,095
0,89875	0,292	0,288	0,284
0,449375	0,394	0,398	0,395
0,2246875	0,469	0,459	0,458
0,11234375	0,5	0,485	0,515
0,056171875	0,532	0,531	0,579

kons= 8,98g/20			
449			
8,98	0,214	0,211	0,211
4,49	0,361	0,361	0,372
2,245	0,435	0,433	0,452
1,1225	0,486	0,478	0,492
0,56125	0,518	0,518	0,518
0,280625	0,533	0,491	0,54
0,1403125	0,53	0,567	0,535

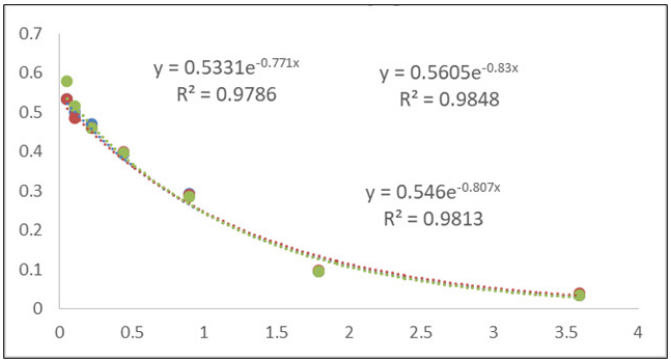

Figure 1: Dpph value of apple fruit.

The results are shown in table 1. SC50 value for pear fruit was 6.73 ± 0.065, for apple 0.86 ± 0.032. The obtained results show that the antioxidant activity of pear fruits are higher than apple fruit.

In addition to the antimutagenic and potent antioxidant effects of apple and its juice, important findings from in-vivo studies

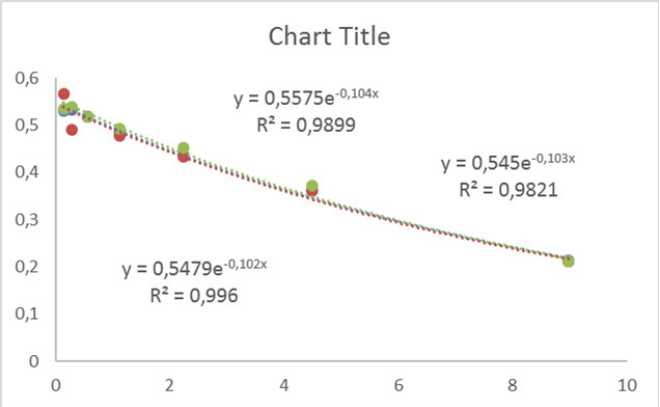

Figure 2: Dpph value of pear fruit.

show that it is protective against cancer, diabetes, obesity, cardiovascular disease, asthma, and other lung diseases. In addition, the advantage of apple fiber and its pectin in eliminating mutagens in the intestinal cavity and washing out mutagens with water retention properties and thereby reducing their effectiveness is an indication that they are an important protector of the intestines. Other studies on apples and apple juice have shown that this food can prevent the formation of colon and lung cancer in humans, as well as protect against liver and breast cancer, due to the antioxidants, pectin and vitamins in this food.

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