Studies Concerning the Stability if Antioxidant Compounds in Aronia Melanocarpa Fruits

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Abstract

Aronia Melanocarpa fruits are high in vitamin C. Vitamin C is an antioxidant necessary for the human body to prevent scurvy, gum disease, bone and blood vessels and boost immunity. The paper also highlighted the determination of vitamin C in the Aronia Melanocarpa fruits, and studies on the stability of vitamin C in different pH environments in the process of oxidation in atmospheric oxygen. Ascorbics acid oxidation reaction proceeds through a chained mechanism. In 1936 Barron et all. [1], conducted the first study of auto-oxidation of ascorbic acid to dehydroascorbic acid. Through this research, we highlight areas where vitamin C pH will be stable.

Keywords: Aronia Melanocarpa, pH, Vitamin C, antioxidants

1. Introduction

Aronia melanocarpa belongs to the *Rosaceae* family and originated from the eastern parts of North America and East Canada. Its fruits are harvested between August and September [2].

A common name for *Aronia melanocarpa* is chokeberry. It is often confused with chokecherry, which is the common name for *Prunus virginiana*.

Vitamin C is a common natural substance, especially in plants. The content of vitamin C is an important parameter for assessing the nutritional value of the food as it degrades during storage [3], [4].

Vitamin C is a highly water-soluble compound that has both acidic and strong reducing properties. It naturally occurs in many plants and animals except in humans. The natural vitamin exists in L-ascorbic acid form. The D-isomer (i.e., D-ascorbic acid), which is the mirror image of the same molecular structure, has only about 10% of the activity of the L-isomer. L-ascorbic acid is a weak sugar acid which is structurally related to glucose attached to a hydrogen ion.

It is a strong reducing agent, which carries out its reducing function and easily converts to its oxidized form, the L-dehydroascorbic acid, when oxidative stress is present. Due to this characteristic, L-ascorbic acid is commonly applied in food industry as a food additive functioning as a versatile antioxidant to protect foods from deterioration by oxidation.

The richest natural sources of Vitamin C are fruits and vegetables, for example, blackcurrant, blueberry, orange, lime, lemon, strawberry, cabbage and malt. It is noted that Vitamin C can be chemically decomposed under certain conditions, such as heating and oxidation, many of which may occur during the cooking of food. [5]

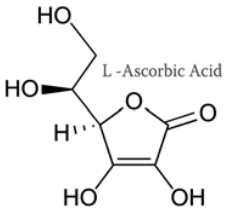

Fig. 1 Ascorbic acid structure

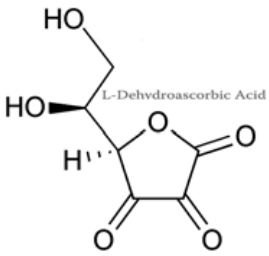

Fig. 2 Dehydroascorbic acid structure

The retention of vitamin C is often used as an estimate for the overall nutrient retention of food products because it is highly sensitive to oxidation and leaching into water-soluble media during storage, it begins to degrade immediately after harvest and degrades steadily during prolonged storage [6]

Vitamin C is an important anti-oxidant, helps protect against cancers, heart disease, stress, it is part of the cellular chemistry that provides energy, it is essential for sperm production, and for making the collagen protein involved in the building and health of cartilage, joints, skin, and blood vessels [3].

Aronia berries are high in vitamins, minerals, and folic acids.

Aronia fruit derived products have been widely studied and have gained popularity as a healthy food source, as well as for medicinal purposes [7], while the high content in phenolics, especially anthocyanins derivates, is at the basis of most medicinal benefits. [8]. The juice from *A. melanocarpa* berries is an important source of phenolic compounds with antioxidant properties: procyanidins, anthocyanins, (–)-epicatechin, chlorogenic acid, neochlorogenic acid [1], [9].

Medical research has documented many health benefits of aronia berries.[10]. Pîrvu L et. all [8] demonstrated anti-inflammatory power effect of the fruit of Aronia Melanocarpa and dermal tolerance testing in rabbits (see Fig.3).The skin was examined 24 hours later, to evaluate the degree of erythema, oedema, desquamation, scab formation and any other lesions. Examination was repeated after 48, 72 hours and 7 days. Anti-inflammatory power is similar to that of indomethacin.

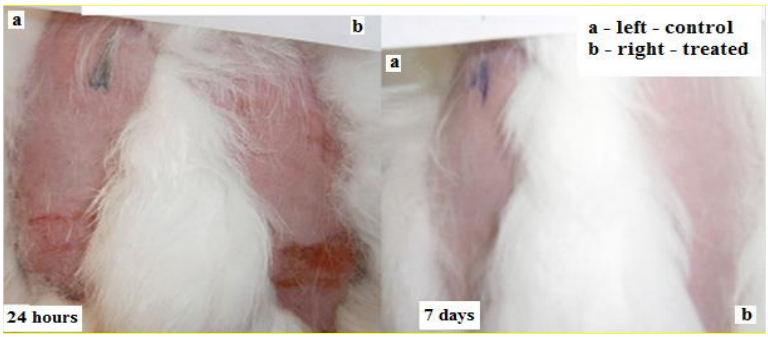

Fig. 3 Anti-inflammatory power effect of the fruit of Aronia Melanocarpa

and dermal tolerance in rabbits [8]

2. Materials and Methods

Plant material: Mature Aronia Melanocarpa fruit samples (see Fig.4), approximately 1 kg each was collected from Dragasani Vâlcea in September 2016. The marketing conditions of these products were reacreated in the laboratory by stocking them at 4^0C.

Fig.4. Aronia Melanocarpa Fruits from Dragasani - Vâlcea

A. Extraction of Ascorbic Acid from Samples

The extracts were obtained following the next protocol: 15 gram fresh fruits of Aronia melanocarpa fruits as extracted with 10 mL of acidified solutions methaphospohoric acid 5%. The residue was re-extracted until the extraction solvents remained colorless (the total solvent volume was 50 mL). The extract was filtered through a Whatman no. 5 filter paper. Fruit juices were prepared using a robot type fruit squeezer. Juice clear samples was filtered to remove pulp and seeds and stored in already labeled plastic containers were stored at refrigerated at 4°C for seven days after processing.

Acid ascorbic concentration was determinated by titrimetric method on Aronia juice pulp clear juice and fresh fruits.

B. Standardizing Solution and Titration of Juice Samples

Vitamin C standard solution: 1mg/mL

Vitamin C solution (10 mL) was titrated into 100 mL conical flask and 10 drops of starch solution was added. This will be until the first blue colour which persisted for about 20 sec was observed. Juice samples and fresh fruits extracts (10mL) were titrated. The initial and final volume of iodine solution required to produce the colour change at the end point was recorded triplicate in all cases.

C. Chemical Analyses

Vitamin C from fresh fruit and juice was determined using KIO_3 titration and pH of the juices was evaluated using a digital pH meter pH/mV Cond /TDS/Temp at 25ºC (see Fig. 5).

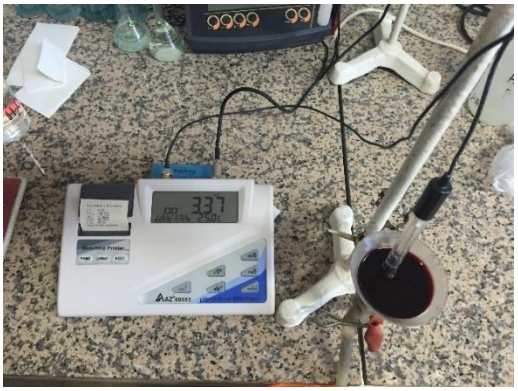

Fig. 5. pH - Aronia Melanocarpa juice (Day 3)

3. RESULTS AND DISCUTIONS

The level of ascorbic acid was found 127,85 - 120,08 in fresh fruits and 180,42 – 150,42 in fresh juice is in agreement with the other studies in literature. Our results illustrated that ascorbic acid should be responsible for the effective antioxidant properties of the Aronia Melanocarpa extract (see Table 1).

Tabel 1. Evolution of vitamin C and pH during storage

S/N 0		Sample		Ascorbic Acid mg/Kg and mg/L			pH			Diference	
		Common Name	Botanical Name	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Vit. C	pH
1	Fresh Fruits	Chokeberry	Aronia M.	127.85	122.36	120.08	3.58	3.50	3.45	7.77	13
2	Fresh juice	Chokeberry	Aronia M.	180.42	174.86	150.98	3.45	3.40	3.37	29.44	8

The pH fluctuations were measured between 3,58 - 3,45 from freh fruits and juice between 3,45 - 3,37. These results show differences depending on the fresh fruit and fresh juice and retention time (see Table 1).

pH is the main factor affecting the stability of vitamin C, thus high values of pH favoring the oxidation processes of vitamin C [3]

It is recomanded fresh juice, squeezed and consumed immediately.

4. Conclusions

- The relationship between food and health is becoming increasingly important, customers are now demanding healthy, tasty, natural and functional, which were grown in uncontaminated environments. [3]

- Aronia Melanocarpa are high in vitamin C but results presents in this study confirm the degradation of vitamin C in time that the Aronia Melanocarpa extracts.

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