# THE INFLUENCE OF REFRIGERATION TIME AND OF SUGAR ADDITION ON ASCORBIC ACID CONTENT IN SOME NATURAL JUICES

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**Abstract:** *Following some studies concerning the main factors influencing the concentration of vitamins within food raw materials, especially ascorbic acid, this work tries to make evident the influence of the refrigeration temperature and of the sucrose addition on content of this vitamin in three types of natural juice. The biological material was represented by black currant, raspberry and quince natural juices, obtained from these fruits by means of a crushing out process. For each type of juice, samples without addition and samples with 5% and 10% sucrose addition were made up. The ascorbic acid determination was carried out from fresh juice as well as from juice kept in refrigerator, at certain time intervals (24, 48, 96 and 168 hours). The storage of these juices under refrigeration conditions has determined percentage reductions of vitamin C content of these ones. Thus, after 168 hours of storage, in the three types of analyzed juices the highest loss of vitamin have been registered in samples without sucrose addition, and the least ones in samples with 10% addition. The comparison of vitamin C values in the three analyzed juices, subjected to 168 hour- refrigeration process, has emphasized that the highest loss of ascorbic acid have been in quince juice, and the least one in black currant juice.*

**Keywords:** *vitamin C, sucrose, black currant, raspberry, quince.*

## Introduction

There are some factors which influence negatively the vitamins concentration in food raw materials, such as: high temperatures over certain values, freezing, and presence of oxygen and of some chemical substances, certain pH values etc.

During food raw materials processing, the level of their vitamins can be negatively affected through some operations such as: handling-preservation after harvest of vegetable produce and of meat and aquatic produce, collecting-storage of milk, cutting-chopping end/or scalding, boiling of fruits and legumes, cereals grinding, the adding of chemical substances into legumes, fruits, meat (Adrian and Petit, 1970; Ferrando and Mainguy, 1970; Flanzy, 1970; Scriban, 1970; Ulrich and Delaporte, 1970; Banu et al., 2003).

As for vitamin C, its concentration can be reduced with various percentages, depending on the type of processing of raw material containing this vitamin. Thus, three months potatoes storage leads to loss of 50%, the sterilization, but especially vegetables boiling leads to vitamin loss between 47% and 82%. The addition of bicarbonate, used to soften some legumes, contributes to diminution of vitamin C concentration (Banu et al., 2003).

The storage of legumes for a year at temperatures around -10º can lead to vitamin C loss of 80–90% (Selman, 1994).

The addition of anthocyans, sugar and even starch seems to have a protecting action on vitamin C (Banu et al., 2003).

Retention of ascorbic acid is better in rapid drying at high temperatures than in slower drying at lower temperatures. Drying methods that expose the food to air result in losses of vitamin C due to oxidation. On the other hand,

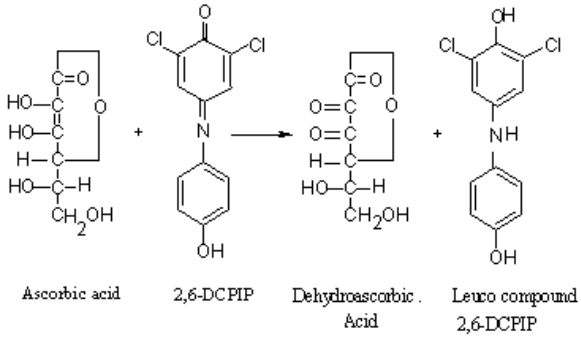
freeze drying, which is carried out in the absence of oxygen, does not cause loss of vitamin C (Ball, 2006).
According to Selman (1994), the inefficient blanching causes some loss of vitamin C by oxidation, as well as by leaching.
As to microwave heating, the ascorbic acid content is higher in vegetables cooked by microwave heating than by conventional methods (Hill, 1994).
In this work, the variation of vitamin C (ascorbic acid) concentration within three types of natural juices, without and with sucrose addition, stored at +2ºC, certain time periods, has been studied.

## Experimental

The biological material was represented by natural juices of black currant, raspberry and quince, obtained from these fruits by means of a crushing out process. In order to limit the contact with air and the possibility of vitamin C oxidation, once obtained the juices were rapidly poured into plastic bottles (300 ml capacity) tightly closed, and introduced into refrigerator at +2º C.
For each type of juice, samples without addition and samples with 5% and 10% sucrose were made up.

The ascorbic acid determination was carried out from fresh juice as well as from juice kept in refrigerator, at certain time intervals (24, 48, 96 and 168 hours).

The method was based on reduction of 2,6-Diclorphenolindophenol (2,6- DCPIP) to the leuco compound of 2,6- DCPIP, by ascorbic acid (Artenie and Tănase, 1981).




## Results and Discussion

Table 1 presents the values of ascorbic acid content in black currant juice.

**Table 1.**
The black currant juice ascorbic acid content, with and without sugar addition, stored at certain time periods in refrigerator (2º C)

| Ascorbic Acid (mg %) | | | |
|---|---|---|---|
| Juice type / Storage length | Sucrose free juice | Juice with 5 % sucrose | Juice with 10 % sucrose |
| *0 hours | 198,75 | 198,75 | 198,75 |
| 24 hours | 196,52 | 198,04 | 197,13 |
| 48 hours | 186,06 | 194,26 | 196,45 |
| 96 hours | 165,74 | 170,03 | 175,89 |
| 168 hours | 136,57 | 145,29 | 160,42 |

* Blank sample

As seen, both in the sucrose free black currant juice and in samples with sucrose addition, the vitamin C concentration has gradually decreased once with juice keeping in refrigerator. The highest differences between samples, which have begun to come into view after 96 hours, have appeared after 168 hours of storage.

The greatest value was registered by juice with 10% sucrose (19,29% vitamin loss beside blank), and the least was registered by sucrose free juice (31,29% vitamin loss beside blank).

The table 2 reproduces the values of ascorbic acid content in raspberry juice.

**Table 2.**

The raspberry juice ascorbic acid content, with and without sugar addition, stored at certain time periods in refrigerator (2º C)

| Ascorbic Acid (mg %) | | | |
|---|---|---|---|
| Juice type / Storage length | Sucrose free juice | Juice with 5 % sucrose | Juice with 10 % sucrose |
| *0 hours | 42,00 | 42,00 | 42,00 |
| 24 hours | 39,76 | 40,08 | 40,08 |
| 48 hours | 35,51 | 38,70 | 39,70 |
| 96 hours | 32,08 | 36,15 | 38,50 |
| 168 hours | 27,14 | 30,45 | 32,65 |

* Blank sample

Also in raspberry juice, reductions of vitamin C concentration can be seen, once with increase of the samples keeping length in refrigerator at +2º C. More marked then in the case of black currant juice, in raspberry juice, after 168 hours of storage, the vitamin C loss has been of 35,38%, in sucrose free juice sample, and 22,27% in juice sample with 10% sucrose.

In the table 3 the values of ascorbic acid content in quince juice are given.

As seen in the table, in quince juice, the vitamin C loss has been the highest as against black currant and raspberry juices. Thus, after 168 hours of storage at +2º C, in sucrose free juice sample the vitamin C concentration has diminished (as against blank) with 39,47%, and in juice sample with 10% sucrose has diminished with 29,33%.

**Table 3.**

The quince juice ascorbic acid content, with and without sugar addition, stored at certain time periods in refrigerator (2º C)

| Ascorbic Acid (mg %) | | | |
|---|---|---|---|
| Juice type / Storage length | Sucrose free juice | Juice with 5 % sucrose | Juice with 10 % sucrose |
| *0 hours | 70.840 | 70.840 | 70.840 |
| 24 hours | 68.992 | 68.998 | 69.166 |
| 48 hours | 67.760 | 68.005 | 68.537 |
| 96 hours | 65.296 | 66.108 | 67.214 |
| 168 hours | 56.672 | 58.851 | 59.332 |

* Blank sample

## Conclusions

The storage under refrigeration conditions (+2º C) of some natural black currant, raspberry and quince juices, with and without sucrose addition at certain time periods, has determined percentage reductions of vitamin C content in these juices.

After 168 hours of storage, in the three types of analyzed juices the highest vitamin loss have registered in sucrose free juice samples, and the least ones in juice samples with 10% sucrose.

The comparison of vitamin C values in the three analyzed juices, subjected 168 hours to refrigeration process, has emphasized that the highest loss of ascorbic acid have been in quince juice, and the least one in black currant juice.

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