INFLUENCE OF TECHNOLOGICAL PROCESS CONTENT OF ASCORBIC ACID ON RED BEETROOT SALAD

INFLUENȚA PROCESULUI TEHNOLOGIC ASUPRA CONȚINUTULUI ÎN ACID ASCORBIC LA SALATA DE SFECLĂ ROŞIE

BARCAN (BĂETU) Alina[1], PATRAŞ Antoanela[1], ANGHEL Roxana[1], ANDREI Corina[1], BĂETU M.M.[1], FILIMON V.R.[1]
e-mail: alina_brcn@yahoo.fr

Abstract. *Vitamin C content of horticultural products may be influenced by various factors, such as genetic differences, climatic conditions and agricultural practices, processes of maturation and harvesting techniques, as well as the type of post-harvest handling. During processing, depending on the operations flow technology, the content of vitamin C decreases considerably, reaching sometimes insignificant quantities in the finished product. The purpose of this study is to monitor the dynamics of ascorbic acid during technological flow of red beetroot salad by acidification artificial. Analyses were performed in the following samples: beetroot-raw, beetroot taken on the technological and beetroot salad. There were determined simultaneously two other parameters that influence the content in ascorbic acid: the pH and ascorbate oxidase content.*
Key words: ascorbic acid, ascorbatoxidase, beetroot, technological process

Rezumat. *Conținutul de vitamina C al produselor horticole poate fi influențat de diverşi factori, precum: diferențele genotipice, condițiile climatice şi practicile agricole, procedeele de maturare şi tehnicile de recoltare, precum şi de tipul de manipulare după recoltare. In timpul prelucrării, în funcție de operațiunile fluxului tehnologic, conținutul de vitamina C scade considerabil, ajungând uneori în cantități infime în produsul finit. Scopul acestui studiu este de a monitoriza dinamica acidului ascorbic pe parcursul fluxului tehnologic de obținere a salatei de sfeclă roşie, prin acidifiere artificială. Analizele s-au efectuat la următoarele probe: sfeclă roşie – materie primă, sfeclă roşie prelevată de pe fluxul tehnologic cât şi salată de sfeclă roşie. Au fost determinați de asemenea şi alți doi parametri care influențează conținutul în acid ascorbic: pH-ul şi conținutul în ascorbat oxidază.*
Cuvinte cheie: acid ascorbic, ascorbatoxidază, sfeclă roşie, proces tehnologic

INTRODUCTION

Most products change their organoleptic properties and chemical composition, if they are not kept in optimal conditions after harvesting or are not properly preserved.

[1]University of Agricultural Sciences and Veterinary Medicine of Iasi, Romania

Various methods of preservation are ways to intervene in order to maintain unchanged the organoleptic properties and nutritional value of a product as long as possible. (Cuciureanu, 2002)

Knowledge of physical, chemical and biological properties occurring in a food product, since obtaining it, is necessary to apply the most appropriate methods of food storage and preservation. (Cuciureanu, 2010)

Conservation through artificial acidification is based on principle of acidoanabiosei and in practice, this type of storage is performed using vinegar.

The conservation agent action is dependent by:

- the liquid coating concentration in which are to be preserved the beetroots: acetic acid solution, whose concentration varies between 0,6 and 4% have a bacteriostatic action, and over 4% becomes bactericidal action; (Beceanu, 2009)

- species of microorganisms: bacteria are less resistant in acid medium. In concentrations of up to 4%, the acetic acid inhibits the growth of saprophytic bacteria; between 4 and 6% the spores forms are destroyed, and over 6% the spores are destroyed. Molds and yeasts have a greater resistance to acid;

- the pH of the food to which has been added the acetic acid. Acetic acid dissociation having a higher degree than lactic acid, it follows that the concentration of hydrogen will be higher and a lower pH.

- the concentration of NaCl and sugar – these two substances are raising the preservative effect of acetic acid. (Banu, 2008)

Industrial preparation of pasteurized or sterilized canning, carried out in the absence of air, it keeps a high content of ascorbic acid. Blanching vegetables in water decrease levels of vitamin C with 10÷50%, and blanching with water vapour, the losses are only 10 to 30%. These losses are due to vitamin C oxidation and dissolution in water. (Cuciureanu, 2010)

MATERIAL AND METHOD

The analyzed material was collected from the S.C. Contec Foods S.R.L. Tecuci. Samples were analyzed in the raw material (the first stage of technology-reception), a second set of samples has been collected by boiling the beetroots, third set of samples has been collected at the end of the technological process. Also it was examined and the beetroot salad after 3 months of storage at a temperature of 20° C and relative humidity of 75%. The samples have been shipped in vacuum polyethylene bags at low temperature, and then stored in a refrigerator at 2 to 4° C until analysis.

Technological process of obtaining beetroot salad includes the following phases: reception, cleaning, sorting, splitting, cleaning, cooking, preparation of the container (conservation vessels), preparation of vinegar solution, placing slices of beetroots in jars, adding vinegar solution, pasteurization, sealing, wrapping, storage and delivery of the finished product.

In the elaboration of this study the following methods were used:

- to calculate the content of ascorbic acid has been used the titrimetric method in accordance with STAS 5950;
- the pH has been set using the pH meter according to SR EN 1132;
- for the determination of ascorbatoxidase has been used titrimetric method with potassium iodate;
- the salt content has been determined using Mohr's method.

RESULTS AND DISCUSSIONS

The results of the tests, carried out on the product under study, are shown in the following figures.

Ascorbatoxidase is an important enzyme in the class of oxidoreductase whith copper-protein structure, is also called L-ascorbate oxygen oxidoreductase (EC. 1.10.3.3).

Ascorbatoxidaza catalyzes the oxidation reaction of L-ascorbic acid into dehydroascorbic acid, which (under the action of a reductaze whose specific coin is glutationul) may be reversible reduced to ascorbic acid (figure 1).

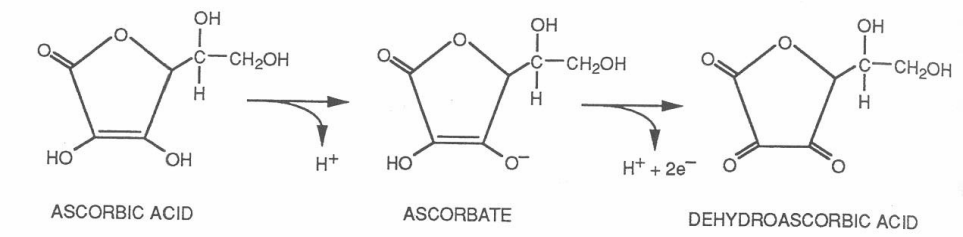

Fig.1 - Ascorbic acid and its oxidation in ascorbate and dehydroascorbic acid

In animal organisms, in which the enzyme is missing, the oxidation of L-ascorbic acid is made to the system citocromic.

The ascorbic acid act as biological transporter of hydrogen through redox processes.

The ascorbic acid oxidises especially to alkaline pH, and the neutral should be the ascorbatoxidase intervention.

In figure 2 is the variation in vitamin C content during processing of beetroots.

In within the method was determined the content of interfering substances, so the values obtained refer only to the total ascorbic acid content. The raw material from the technological flow has a ascorbic acid content of 9,52 mg/100g product. Ascorbic acid content, during processing, is influenced by technological stages, the processing method, preserving temperature and storage conditions before dispatch.

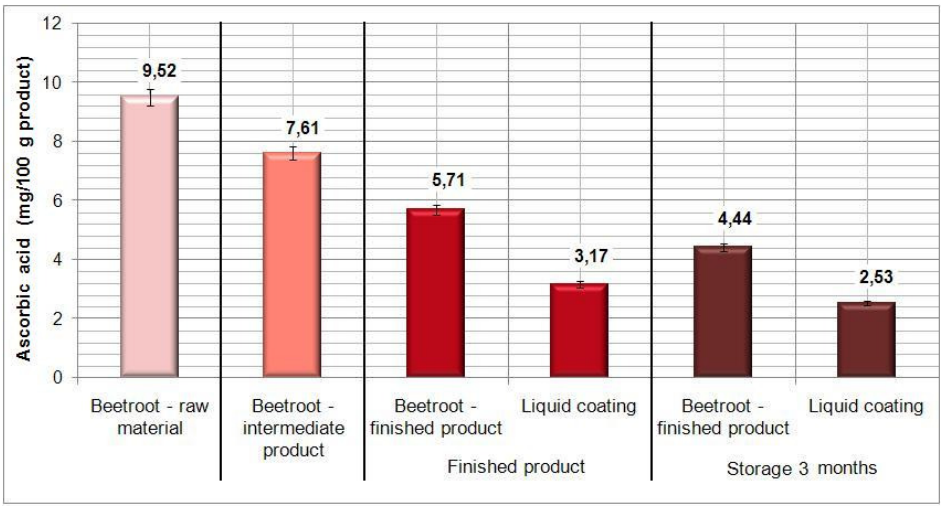

Fig. 2 - Ascorbic acid content during the technological flow

In within the method was determined the content of interfering substances, so the values obtained refer only to the total ascorbic acid content. The raw material from the technological flow has a ascorbic acid content of 9,52 mg/100g product. Ascorbic acid content, during processing, is influenced by technological stages, the processing method, preserving temperature and storage conditions before dispatch.

As a result of the determinations carried out it was concluded that until boiling technological stage end, there have been losses in ascorbic acid of 1,91mg/100 g product, and at the end of the technological process the content of ascorbic acid were 5,71mg/100 g product. After a storage period of 3 months at 20° C and 75% humidity, ascorbic acid content decreased to 4,44 mg/100 g product in the solid part and 2,53 mg/100 ml in the coverage liquid. Water that has been boiled the beetroot, is reused as liquid coatings. By adding salt and vinegar, its reduce the losses of ascorbic acid.

A factor, which affects to a large extent the content of ascorbic acid, is pH of the raw material and the environment in which it is preserved.

In figure 3 is the dynamics of pH depending on the stage of technological flow.

Red beetroot as raw material, has a pH value of 6,26. During processing the ph value declines, so after boiling the beetroot followed by cooling, vacuum packing and storage in the refrigerator until analysis, pH reaches 5,94. From samples taken at the end of the technological process has been obtained value is 4,02. This decrease is due to the vinegar added, thereby ensuring the conservation.

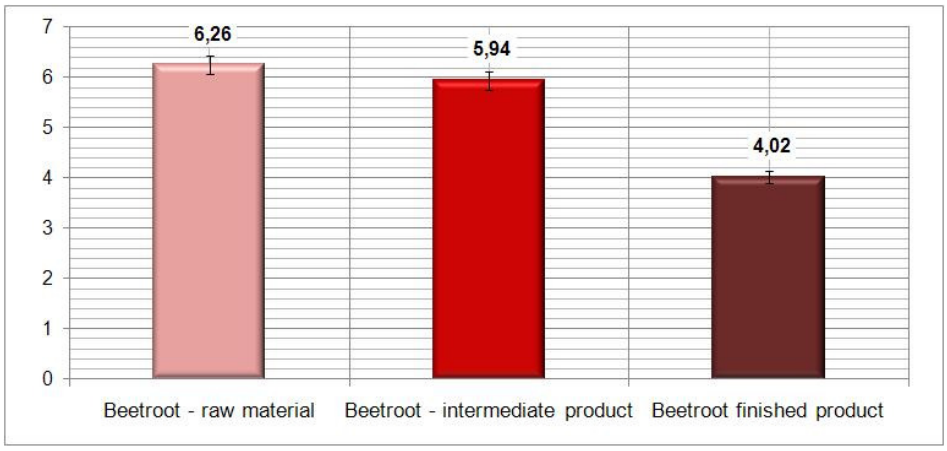

Fig. 3 – The variation of pH value

In figure 4 is another parameter that affects the content of ascorbic acid, which is ascorbatoxidase.

Fig. 4 - The graphic representation of ascorbatoxdases dynamics

During the process flow is highlighted the destruction of this enzyme due to heat treatment. So at the raw materials it was determined that the value of ascorbatoxidase is 40,63 µM/g/min, greatly decreases after blaching operation of beetroots and at the end of the technological process this is totally destroyed.

The amount of sodium chloride added to preserve the beetroot salad has a great influence on the content of ascorbic acid. The more sodium chloride is higher, the lower is ascorbic acid content. From the analyses carried out it was

revealed that beetroot salad has a content 0,8893% sodium chloride (figure 5). At this concentration, along with artificial acidification shall ensure the preservation of the finished product and gives pleasant taste.

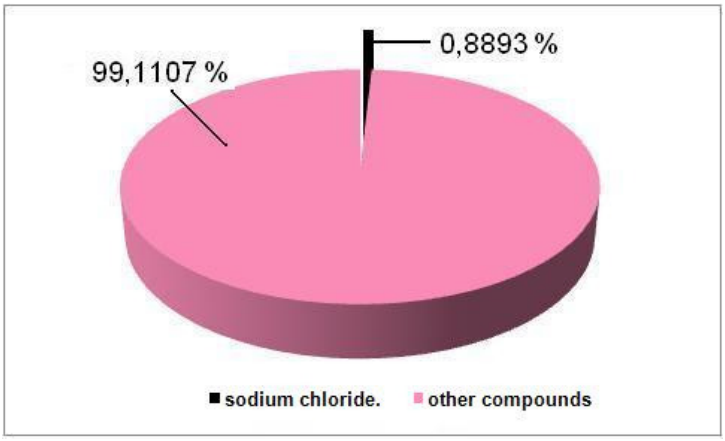

Fig. 5 - Sodium chloride content in red beetroot salad, (%)

CONCLUSIONS

1. In the food industry a decisive factor for the retention of nutrients is the nature of the technological process; as it requires high temperatures and long processing time, so more the content in nutrients is diminished.

2. Ascorbic acid content was reduced during processing at the rate of approximately 40%.

3. The ascorbatoxidase is totally destroyed by heat treatment.

4. The pH value of beetroots at the beginning of the technological flow is near that of neutral, but during the process its decreases due to the vinegar added, thus ensuring the preservation of the product.

REFERENCES

1. **Banu C., 2008** – *Tratat de industrie alimentară – probleme generale*, Editura ASAB, Bucureşti.
2. **Beceanu D., 2009** – *Tehnologia prelucrării legumelor şi fructelor*, Editura „Ion Ionescu de la Brad", Iaşi.
3. **Cuciureanu Rodica, 2010 –** *Igiena alimentului*, Editura Performantica, Iași
4. **Cuciureanu Rodica**, **2002** – *Elemente de igiena mediului și a alimentației,* Editura Junimea, Iași.