THE INFLUENCE OF FOOD ADDITIVES (COLORANTS AND SWEETENERS) ON CONCENTRATIONS OF NICOTINAMIDE ADENINE DINUCLEOTIDES OF A NATURAL ORANGE JUICE

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ABSTRACT

Orange juice made from natural fruits, in a system certified by organic agriculture, shows a series of specific sensory characteristics to a raw juice, with a harsh taste and slightly bitter with a predominant variety.
Improving sensory characteristics of such juice-obtained in organic agriculture-addition task has been made of this raw juice with certain additives. In order to build a matrix that would provide the basis for carrying out a specific electrochemical biosensor and to determine possible falsification of this juice by adding additive synthesis have watched electrochemical signals emitted by the oxidized forms and reduced coenzymes NAD[2].
The work represents a synthesis of electrochemical studies that can be applied in processing systems in organic agriculture-which results in large differences in concentrations of oxidized and reduced forms NAD natural juice from oranges to add sometimes a range of natural and synthetic alimentary additives.

INTRODUCTION

In the last years, in Romania, organic farming has experienced a strong development; are becoming more and more in conversion organic operators or operators that are certificates- knew how to capitalize on the rich agricultural potential of Romania.
One of the greatest results produced by organic agriculture is the obtained quality for food as raw materials, raw materials that can develop the innocuous foods and functional foods.

To create added value in organic farming is necessary to ensure that the raw materials to be processed (respecting the working conditions of the system) [4, 5].
Because organic products creates some additional income for organic operators, appear a tendency as part of their produce to be forged and it is therefore very important that the study, on the added operation to allow and detect tampering. Therefore, scientific work has enabled the development of a method to allow then design an electrochemical analysis system-which can be used as an indicator of the extent of counterfeiting of organic products.

Specific objectives for this work paper consisted of:

-the operation of added of taste compounds under the same conditions of temperature, pressure for the assortment of organic Orange juice;

-checking the maximum absorbency zones and pick (where molecular absorption Spectra recorded a maximum) for NAD, and $NADH_2$ oxidized fatty acids and other compounds from added orange juice – conditions of the "based lines" of ecological juice unsweetened. It is used the method of addition of "Unique Add" using purified standards PA (pure analysis) for each of the compounds analyzed in the same conditions chemical "base lines";

-Elaboration of observations that results after the use of additives that are permitted by law -in areas which have maximum absorption Spectra;

Develop a study on the changes occurring in the organic orange juice while you use the addition operation with the help of permitted additives for Romania, in order to obtain refreshments juice with enhanced sensory features. We know the importance of these additives in their use in the construction of some organic food as well as the development of feed without nuisance [3].

MATERIALS AND METHODS

In order to develop the work paper (in the synthesis), have been studying National Legislation, European and International Regulations in this field and we analyzed the practical results achieved.

From the commercial network was bought a liter of organic orange juice (certified organic by one Spanish Certification Body) and from this juice was taken 10 mL and it has been filtered. This filtrate was diluted to 5%. After filtering the sample was transferred to a volumetric flask of 500 cm^3. This sample was witness version V0, unsweetened ecological juice Variant. For other experimental variants were made by about 50 mL of test sample unsweetened organic juice (for each variant) and were mixed in different glasses Berzelius with permitted food additives, under continuous agitation until complete dissolution.

To observe the changes that occur to the organic orange juice on addition task, have set up four experimental variants.

Experimental variants were thus formed:

V0 – variant of unsweetened witness (organic orange juice)

V1 - organic orange juice with yellow dye Tartrazine

V2 - organic oranges juice with Saccharin

V3 - organic orange juice with Diamond synthetic sweetener

V4 – organic orange juice with Sucrazit synthetic sweetener

The yellow food dye used in the recommended dose (1mL/1 kg produced), is the azoic product (TARTRAZINE) and was used in the V1.

Saccharin has been used at monosodium version for to construct the V2 in a concentration of 25 mg/50 mL unsweetened orange juice and presented the biggest time of solvation.

The Diamond sweetener was used in to V3 experimental variant and takes the form of a box with a manual dispenser containing 650 tablets (pills), in the equivalent of 2.8 kg of sugar.

Each tablet has the equivalent of a 4.4 g sugar. Each tablet contains 40 mg of sodium cyclamate and 4 mg monosodic saccharin (the ratio is 10/1 cyclamate/saccharin).

These sweeteners are treated with sodium carbonate and potassium citrate, citrate taking the role of regulator of acidity and carbonate the role of raising agent.

The Sucrazit sweetener are composed of synthetic sodium saccharin sweetener 19.52 mg treated with 48.81 mg sodium bicarbonate and 13.67 mg fumaric acid was used to construct the experimental version V4, in a concentration of 41 mg/50 mL water.

Samples were prepared for the conditions in which spectrophotometry were excluded intervention the interfering substances (to eliminate the errors of analysis) and under the same conditions of termostatare.

The spectroscopy of samples was done in the field of near UV (190-300nm), Visible domain (400-700nm) and near IR (700-1100nm), using a digital spectrophotometer, width of 1 cm and that change the Deuterium lamp with Tungsten lamp at 325nm.

As the main equipment was used a molecular spectrophotometer of UV-VIS absorption type PG 92+, produced by PG Instruments, United Kingdom.

With this equipment have been measured concentrations of NAD and $NADH_2$ in the UV spectral domain (between 190 and 400 nm).

RESULTS AND DISCUSSIONS

The main results obtained in this study are shown in the graphs below.

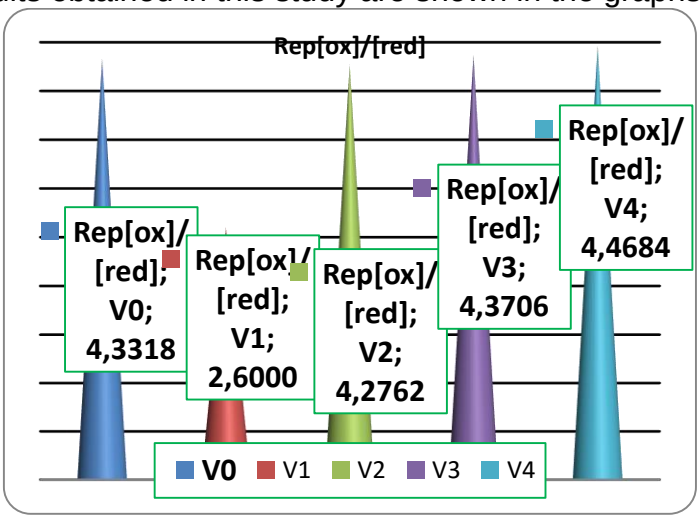

Figure 1-The registered report of oxidized form and reduced form of Nicotinamide Dinucleotide

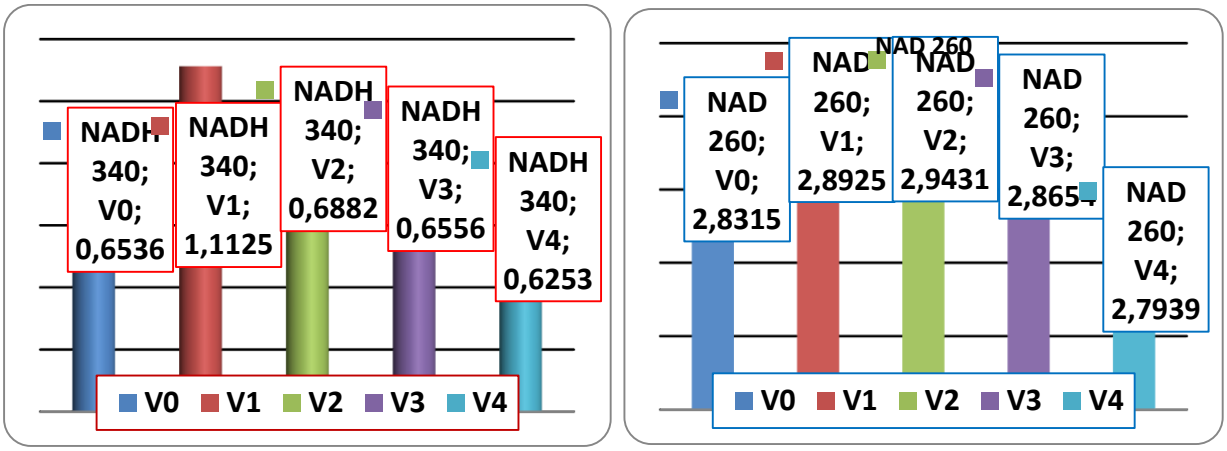

Figure 2-The concentration of reduced form of $NADH+H^+$ (a) the concentration of oxidized form of NAD (b)

Analyzing the graphs above, it can be seen directly as synthetic sweetener causes a strong reaction of the oxidation of organic Orange juice media. This reaction is even more powerful than the average reaction caused the dissolution of the azoic dye Tartrazine. Even if a dye Tartrazine is lower in calories, it is a powerful synthesis dye and works (as can be seen V1 from Figure 2a) on oxidoreductases who use reduced Coenzyme $NADH+H^+$.

Untreated Saccharine develop the greatest concentration of oxidized forms of NAD (as seen in Figure 2b), being forbidden to consumers who have digestive problems.

Tartrazine dye produces a very important decrease of measured redox potential redox and this is reflected by the lowest ratio of the concentration of oxidized and reduced forms of NAD inside media of orange juice (as can be seen V1 from the Figure 1).

The most important increase in the potential redox has been registered in the case of the Variant that uses Sucrazit (where saccharin is treated with bicarbonate and fumaric acid). In this case, it is registered one of the greatly reduced for concentrations of coenzymes NADH forms and redox potential and therefore register a major increase [1].

CONCLUSIONS

-The Organic Agriculture is very important for Romania; it is an economic segment which is in a lot of spelling development and produce added value;
- In the European Union is given a special importance of organic agriculture sector growth-through the develop of processing of organic raw agricultural products and this tendency are improve in the Horizon 2014-2020;
- The Food Processing Specialist has a very important role in public information, awareness raising, training and preparation of all stakeholders of organic agriculture;
- Using the electrochemical elements (redox potential, *p*H, rH) and the molecular spectral analysis for the coenzyme of oxidoreductases it can be a good matrix for electrochemical sensors;
- Using the electrochemical specific sensors it can be determined the originality of organic products and this aspect can contribute meaningful on health of consumers;
- For organic orange juice the used synthetic sweeteners can be more dangerous than the used azoic dye. In the case of used sweeteners it appears big change in the report of oxidized and reduced form of NAD coenzymes;

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