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Aronia Extracts in the Production of Confectionery Masses

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Abstract: The article examines the opportunity to use extracts and Aronia melanocarpa (Michx.) Elliot fruit powders in the production of sugar confectionery for the substitution of synthetic dyes. In the technology of manufacturing confectionery masses, synthetic dyes are used that can cause various allergic reactions, as well as hyperactivity syndrome and lack of concentration in children. The composition of hydroalcoholic extracts was analyzed, and the metabolites of polyphenols, individual anthocyanins and organic acids were quantified. Antioxidant capacity and CIELab chromatic parameters were tested. The technology for manufacturing confectionary masses with extract and powder of aronia was developed. The sensory profile, physicochemical and microbiological quality parameters, antioxidant activity and color characteristics of the confectionary masses with the extract and powder of aronia addition were determined on the 1st and 50th day from the production date. The evolution of DPPH antioxidant activity of confectionery masses during storage was measured in vitro, in the conditions of gastric digestion. The results showed that Aronia melanocarpa (Michx.) Elliot extract is rich in polyphenols, flavonoids and tannins, the main organic acids being represented by malic, citric, acetic and ascorbic acid. During the 50th storage day, the antioxidant activity was higher in confectionery masses containing aronia compared to the control. The sensory and microbiological testing of confectionary masses demonstrated that the combination of extract and aronia powder ensures the optimal shelf life and organoleptic scores. It was demonstrated that during the storage of confectionery masses with aronia, the physicochemical indicators of quality were in accordance with the regulated admissible values. Positive effects of aronia were observed on confectionery masses' color saturation. These results underline the opportunity to use aronia extract and/or powder in confectionery industry to replace synthetic dyes and obtain products with enhanced functionality.

Keywords: Aronia melanocarpa (Michx.) Elliot; biologically active compounds; antioxidant activity; color parameters; sugar products; quality characteristics

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1. Introduction

Aronia (Aronia melanocarpa (Michx.) Elliot) is widely distributed in eastern, southern, and central parts of Europe, being grown on an industrial scale [1]. Aronia fruits are used in the manufacture of juices, purees, jams, jellies and wine [2]. This is due to the high content of polyphenols, with considerable antioxidant activity and a remarkable coloring potential [3,4].

Among the polyphenols present in aronia, quercetin is the strongest antioxidant among the monomer phenolic compounds, followed by cyanidol-glucoside and chlorogenic acid [5]. Anthocyanins, flavonols and hydroxycinnamic acids contribute about 59.4% of the total antioxidant activity of aronia without assuming the possible synergism/antagonism between individual antioxidants [6]. About 40% of antioxidant activity can be attributed to proanthocyanidins, the main antioxidants of aronia fruit [7]. Bushmeleva et al., showed that anthocyanins in aronia fruit show a pronounced reduction and antiradical activity, which exceeds the corresponding indices of other polyphenols and vitamin C [8]. The aronia fruits, due to their high biologically active compounds (BAC) content, have a wide range of pharmacological effects, such as pronounced antioxidant activity and medicinal and therapeutic benefits: gastroprotective, hepatoprotective, antiproliferative and anti-inflammatory [9]. Aronia can help prevent chronic diseases, metabolic disorders, diabetes and cardiovascular disease [10]. The health benefit of aronia fruits against inflammation in RAW 264.7 cells has been shown [11]. These fruits show antimicrobial activity against the pathogenic bacteria *Bacillus cereus*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* [12].

Confectionery masses are used as a filling for candies, biscuits and other pastries. To assign the color red, synthetic dyes such as azorubine (E122), amaranth (E123), ponceau 4R (E124), erythrosine (E127) and allura red AC (E129) are used [13], which can affect the health of consumers often causing allergic reactions and aggravating asthma [14]. Foods containing azorubine (E122) are not recommended for children because this substance causes the syndrome of hyperactivity and lack of concentration [15]. In this context, in order to replace synthetic dyes, there is an opportunity to use extracts and aronia fruit powder in the production of sugar confectionery. In addition, there is a need in the development of technology for the manufacture of sugar products with natural dyes, beneficial to the health of the human body. The application of BAC from powders and extracts of aronia fruit in the creation of sugar products for the replacement of synthetic dyes is particularly current [16,17].

Thus, the aim of this paper was to underline the possibility to use aronia extract and powder for the enrichment of confectionery masses. For this purpose, the aronia extract was characterized regarding the content of bioactive compounds, organic acids and color parameters. Then, the effects of aronia extract and powder on confectionery masses' properties on the 1st day and after 50 days of storage were evaluated by investigating the sensory profile and physicochemical and microbiological characteristics, including antioxidant activity.

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