



Synthetic dye's substitution with chokeberry extract in jelly candies

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Abstract Matching the general trend of replacing synthetic additives with healthier natural products, the present research studies the effects of different concentrations of chokeberry extract which substitute carmoisine dye in jelly candies. Also, the colour and antioxidant properties of the aforementioned extract and their changes at various pH and in presence of different mineral salts from foods are analysed. The phenolic content of the extract was determined using HPLC and spectrophotometric methods. A high concentration of polyphenols was found in the chokeberry extract, of which around 97% were flavonoids. Catechin, epicatechin, ferulic acid and its methyl ester, protocatechuic, gallic and *para*-hydroxybenzoic acids were the major phenolics identified in the extract. The total antioxidant activity decreased in acidic media, while close-to-neutral and alkaline pH values did not exhibit any effect on this parameter. Furthermore, the green/red colour parameter, the chroma and the hue angle were enhanced in the most acidic media (pH 2.3 and 3.5). From the studied salts, CaCl₂ and KNO₃ had the most significant effects on colour. The chokeberry extract proved to be suitable as replacement of carmoisine dye in jelly candies, as the physico-chemical and microbiological properties comply with the regulated requirements. More than that, the extract

improved the antioxidant and sensory properties of jellies in all studied concentrations and the best total sensory score was obtained for 1.5% extract. After 5 and 50 days of storage, the microbiological properties were improved in candies prepared with aronia extracts compared to carmoisine, as the total viable count registered important diminutions.

Keywords Aronia · Carmoisine · Antioxidant · CIELab colour parameters · Total viable count · Storage

Introduction

Many studies proved that certain synthetic food additives may cause immediate or long-term health problems, when consumed for long periods of time (Borzelleca and Hallagan 1988). The ingestion of artificial dyes such as tartrazine and erythrosine combined with a diet rich in trans-fats, nitrites, nitrates and reduced intake of fibres is related to malignancies, specifically in the oesophagus, breast, rectum, stomach, and ovaries (Polonio and Peres 2009). Carmoisine (also named azorubine, or E 122) may induce allergic reactions, intensifying of asthma symptoms, intolerance in people sensitive to salicylates, children hyperactivity and is suspected for carcinogenic properties connected to urinary bladder cancer (Ghendov-Mosanu et al. 2016). On the other hand, jelly candies are multi-coloured sweets with gelatinous structure, especially popular among children, the production of which involves the use of various colouring additives to obtain an attractive appearance (Tamer et al. 2013). The replacement of the synthetic food dyes with colourings of natural origin is therefore a current concern.

The use of natural ingredients as food additives is becoming more and more popular across the food industry

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