

The Impact of Encapsulated Raspberry Juice on the Surface Colour of Enriched White Chocolate

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Abstract : Chocolate is a complex rheological system usually defined as a suspension consisting of non-fat particles dispersed in cocoa butter as a continuous fat phase. Dark chocolate possesses polyphenols as major constituents whose dietary consumption has been associated with beneficial effects. Milk chocolate is formulated with a lower percentage of cocoa bean liquor than dark chocolate and it often contains lower amounts of polyphenols, while in white chocolate the fat-free cocoa solids are left out completely. Following the current trend of development of functional foods, there is an idea to create enriched white chocolate with the addition of encapsulated bioactive compounds from berry fruits. The aim of this study was to examine the surface colour of enriched white chocolate with the addition of 6, 8, and 10% of raspberry juice encapsulated in maltodextrins, in order to preserve the stability, bioactivity, and bioavailability of the active ingredients. The surface color of samples was measured by MINOLTA Chroma Meter CR-400 (Minolta Co., Ltd., Osaka, Japan) using D 65 lighting, a 2° standard observer angle and an 8-mm aperture in the measuring head. The following CIELab color coordinates were determined: L* - lightness, a* - redness to greenness and b* - yellowness to blueness. The addition of raspberry encapsulates led to the creation of new type of enriched chocolate. Raspberry encapsulate changed the values of the lightness (L*), a* (red tone) and b* (yellow tone) measured on the surface of enriched chocolate in accordance with applied concentrations. White chocolate has significantly ($p < 0.05$) highest L* (74.6) and b* (20.31) values of all samples indicating the bright surface of the white chocolate, as well as a high share of a yellow tone. At the same time, white chocolate has the negative a* value (-1.00) on its surface which includes green tones. Raspberry juice encapsulate has the darkest surface with significantly ($p < 0.05$) lowest value of L* (42.75), where increasing of its concentration in enriched chocolates decreases their L* values. Chocolate with 6% of encapsulate has significantly ($p < 0.05$) highest value of L* (60.56) in relation to enriched chocolate with 8% of encapsulate (53.57), and 10% of encapsulate (51.01). a* value measured on the surface of white chocolate is negative (-1.00) tending towards green tones. Raspberry juice encapsulates increases red tone in enriched chocolates in accordance with the added amounts (23.22, 30.85, and 33.32 in enriched chocolates with 6, 8, and 10% encapsulated raspberry juice, respectively). The presence of yellow tones in enriched chocolates significantly ($p < 0.05$) decreases with the addition of E (with b* value 5.21), from 10.01 in enriched chocolate with a minimal amount of raspberry juice encapsulates to 8.91 in chocolate with a maximum concentration of raspberry juice encapsulate. The addition of encapsulated raspberry juice to white chocolate led to the creation of new type of enriched chocolate with attractive color. The research in this paper was conducted within the project titled 'Development of innovative chocolate products fortified with bioactive compounds' (Innovation Fund Project ID 50051).

Keywords : color, encapsulated raspberry juice, polyphenols, white chocolate

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