Effect of Storage Temperature on the Physicochemical Stability of a Sugar-Sweetened Carbonated Beverage (Pepsi Regular)

Lynda Makhloufi[1], Lydia Djellouli[2], Meriem Belaouni[3]

[1]*University of Akli Mohand Oulhadj, Bouira, Algeria*
[2]*University of Science and Technology Houari Boumediene, Algiers, Algeria*
[3]*University* of *Mustapha Stambouli, Mascara, Algeria*

Abstract

The physicochemical quality of sugar-sweetened carbonated beverages may deteriorate during storage, particularly when products are exposed to elevated temperatures throughout distribution and retailing. This study evaluated the effects of storage temperature and duration on the physicochemical stability of a commercial sugar-sweetened carbonated beverage, Pepsi Regular. Samples were stored at 4 °C, room temperature, and 45 °C for 35 days. Physicochemical analyses were performed periodically to determine pH, titratable acidity, dissolved carbon dioxide (CO_2), and total soluble solids expressed as °Brix. Data were evaluated using multifactor analysis of variance followed by Tukey's post-hoc test, with statistical significance established at $p < 0.05$. Storage temperature and duration significantly affected the investigated parameters. The pH remained within 2.50 –2.72, although significant variations were observed among storage conditions. Titratable acidity showed the greatest deterioration at 45 °C, decreasing from 11.50 to 10.10 g/L. At room temperature, it declined from 11.90 to 11.00 g/L, whereas refrigerated samples showed only a limited reduction from 11.90 to 11.73 g/L. Dissolved CO_2 progressively decreased under all conditions, with the greatest loss at 45 °C and the lowest loss at 4 °C. °Brix exhibited comparatively limited variations, indicating greater stability of soluble solids than carbonation and acidity. These findings demonstrate that elevated temperature accelerates physicochemical deterioration, while refrigeration better preserves acidity, carbonation, and overall beverage quality.

Keywords: Carbonation; Carbon dioxide loss; Quality assessment; Shelf life; Thermal degradation