DETERMINATION OF BENZOIC ACID AND SORBIC ACID IN FOODSTUFFS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY WITH UV DETECTION

XIV ENCONTRO DE QUÍMICA DOS ALIMENTOS
6-9 NOVEMBRO, 2018 VIANA DO CASTELO

João Costa[1], Celeste Serra[1], Elsa Vasco[2]

[1]Chemical Engineering Department, High Institute of Engineering of Lisbon, LISBOA, Portugal
[2]Food and Nutrition Department, National Health Institute Doutor Ricardo Jorge, IP, LISBOA, Portugal
(e-mail: elsa.vasco@insa.min-saude.pt)

INTRODUCTION In recent decades, there has been a change in the dietary pattern of the population towards an increase in consumption of more industrialized foods. With this, food industry has faced many challenges on maintaining the quality and nutritional value of the products and at the same time increasing the shelf life. Benzoic Acid (BA) and Sorbic Acid (SA), and its salts, are food preservatives responsible for inhibiting microorganism growth and thus, protecting food products from spoilage. Although these preseratives are recognized by the EFSA and FDA as being safe, there are concerns arising from their wide occurrence in food, cosmetics and pharmaceutical products, that can lead to an increase of the daily intake and possible risks of exceeding the acceptable daily intake (ADI)[1]. Therefore, occurrence data are essential to ensure consumer safety through exposure assessment studies.

AIM This study aimed to evaluate the presence of benzoic and sorbic acids in 23 samples of food products commercially available in the market, using a validated HPLC method with UV detection based on European Standard 12856, and compare their levels with the respective allowable limits.

MATERIALS AND METHODS

SAMPLE PREPARATION

- 23 Samples comprising (soft drinks, dairy products, quince jams, sauces, bakery and pastry products)
- Sample homogenization
- Sample weight
- Sample dissolution and protein and fat extraction with *Carrez* Solutions
- Sample filtration

CHROMATOGRAPHIC CONDITIONS

The analytical method was based on EN 12856.[2]
HPLC system: Waters 2695 Separations Module equipped with a sample cooler, a column heater/cooler and a 2996 photodiode array detector.
Column: Prevail™ C18 (250 x 4.6mm, 5 µm).
Mobile phase: Phosphate buffer (0.0125M, pH 3.5):ACN (95:5 V/V) gradient mode.
Flow Rate: 1 mL/min.
Injection Volume: 20 µL for standards and 10 or 20 µL for samples.
Detection: λ = 220 nm.
Identification: Based on standard retention time.

RESULTS AND DISCUSSION

- The HPLC method was previously validated and allowed a good resolution for the studied preservatives. Furthermore, this method can also be used for the determination of sweeteners and alkaloids (Figure 1).
- Both analytes were quantified using external standard method (Figure 2).

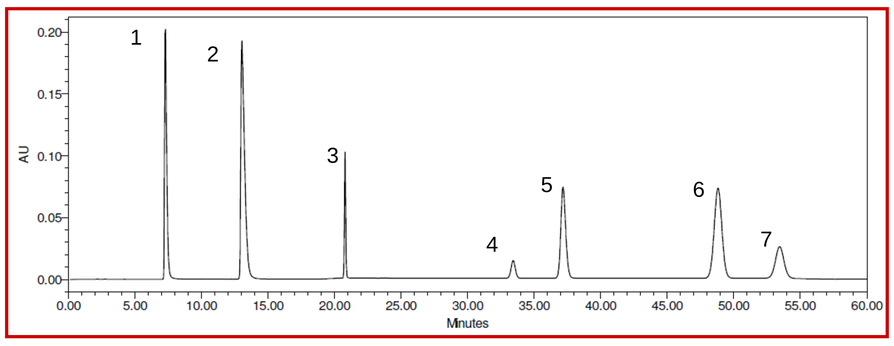

Figure 1. Chromatogram of acesulfame K (1), saccharin (2), theobromine (3), aspartame (4), caffeine (5), benzoic acid (6) and sorbic acid (7).

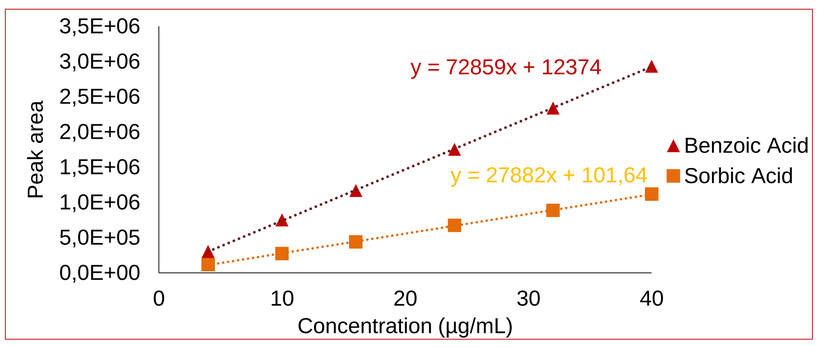

Figure 2. Calibration curves for benzoic acid (y=72859x + 12374, r=0.9999) and sorbic acid (y=27882x + 101.64, r=0.9998).

- Figures 3, 4 and 5, shows the levels of the food preservatives found in all samples and their comparison with the maximum permited levels (MPL) according to the present legislation.

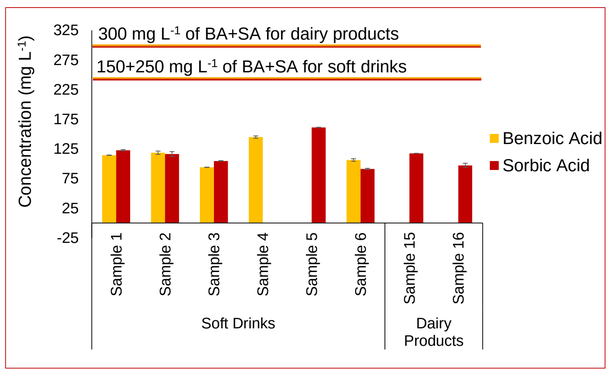

Figure 3. Levels of benzoic and sorbic acids (in mg L^{-1}) in soft drinks and dairy products samples and respective MPLs.

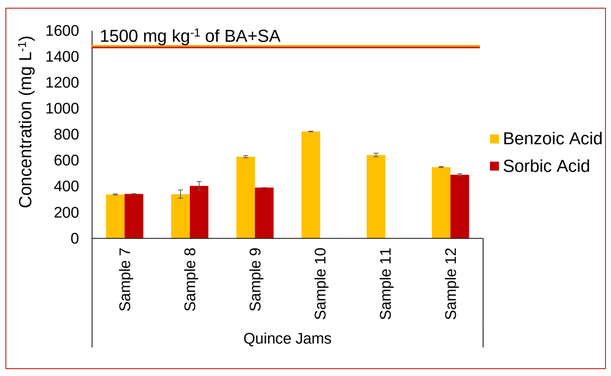

Figure 4. Levels of benzoic and sorbic acids (in mg kg^{-1}) in quince jam samples and respective MPLs.

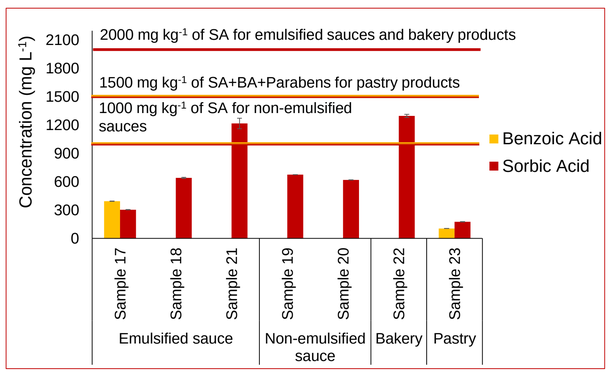

Figure 5. Levels of benzoic and sorbic acids (in mg kg^{-1}) in sauces, bakery and pastry samples and respective MPLs.

- All samples were within the limits imposed by Portuguese legislation.
- Samples 13 and 14, two quince jam, did not report both preservatives on the label, and their absence was confirmed.
- Recovery rates were between 93% and 105% for BA and 93% and 116% for SA at spiked levels of 50% of the MPL.

CONCLUSIONS The method used in the present work has proved to be suitable for a wide variety of food matrices.

Acknowledgement Study supported by Project MONITADITIVOS (INSA), Portugal.

References

[1] C. Lino, A. Pena, Food Chemistry, 2010, 121, 503-508..
[2] EN 12856:1999 - Foodstuffs Determination of acesulfame-k, aspartame and saccharin - High Performance Liquid Chromatographic method