ASSESSMENT OF QUALITY PARAMETERS FOR MARKETED SOFT DRINKS

EVALUAREA UNOR PARAMETRI DE CALITATE LA BĂUTURI RĂCORITOARE COMERCIALIZATE

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Abstract. *Soft drinks (non-alcoholic) are liquids that are consumed to hydrate the body and especially to combat the sensation of heat. Through this study we tried to analyse a series of quality indices for marketed soft drinks, considering their widespread use and consumption by all population groups. Eight well-consumed brands of soft drinks, Cola type or based on orange juice, were selected, and the analyzed indicators focused on pH, titratable acidity and content in nitrite, phosphate, chlorine and sulphite ions. Among the analyzed products, the most acidic proved to be Coca Cola (0.353 g citric acid / 100 mL), Pepsi and Freeway Orange (0.340 g citric acid / 100 mL) and the one with the lowest content in free acids, Santal Orange (0.268 g citric acid / 100 mL). Regarding the content in the analyzed ions, the highest values for nitrites were recorded at Freeway Orange (7.33 mg / L), for phosphates, at Coca Cola (187.82 mg / L), for chlorides, also at Coca Cola (0.164 g / 100 mL), and for sulphites, at Giusto Natura Orange (12 mg / 100 mL).*
Key words: soft drinks, quality indices, soluble ions

Rezumat. *Băuturile răcoritoare (nealcoolice) sunt lichide care se consumă pentru hidratarea organismului şi în special pentru a combate senzaţia de căldură. Prin intermediul prezentului studiu am încercat să analizăm o serie de indici de calitate la băuturi răcoritoare comercializate, considerând desfacerea lor pe scară largă şi consumul de către toate grupele de populaţie. Au fost selectate opt mărci mult consumate de băuturi răcoritoare, de tip Cola sau pe bază de suc de portocale, iar indicatorii analizaţi au vizat pH-ul, aciditatea titrabilă şi conţinutul în ionii azotit, fosfat, clor şi sulfit. Dintre produsele analizate, cele mai acide s-au dovedit a fi Coca-Cola (0.353 g ac. citric/100 mL), Pepsi şi Freeway Orange (0.340 g ac. citric/100 mL) iar cel cu conţinutul cel mai mic în acizi liberi, Santal de portocale (0.268 g ac. citric/100 mL). Referitor la conţinutul în ionii analizaţi, cele mai mari valori pentru azotiţi s-au înregistrat la Freeway Orange (7,33 mg/L), pentru fosfaţi, la Coca Cola(187,82 mg/L), pentru cloruri, tot la Coca Cola (0,164 g/100 mL), iar pentru sulfiţi, la Giusto Natura de portocale (12 mg/100 mL).*
Cuvinte cheie: băuturi răcoritoare, indici de calitate, ioni solubili

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INTRODUCTION

Refreshing beverages or soft drinks are products made from aromatic concentrates, or concentrated fruit or vegetable juices, fruit or herbal syrups, flavoring substances (natural or synthetic), mixed with tap water or mineral water, sweeteners (sugar, glucose, saccharin etc.), food acids, vitamins, food coloring (natural or synthetic), with or without the addition of carbon dioxide.

Lately, some substances, namely: vitamins, iron, lecithin, honey, caffeine, phosphorus and sodium have been introduced into beverages. (Banu *et al.*, 2010)

Soft drinks are marketed under different types and brands by a lot of industries around the world (Asiegbu *et al*., 2011). These soft drinks are usually consumed on daily bases especially during activities like hard work and sport (European Food Safety Authority, 2006). Being relatively affordable, they are highly consumed at home, in restaurants on a daily basis or during social events (*Godwill et al., 2015*).

Fruit juices that are used only as ingredients for soft drinks are lemons, limes, currants, strawberries, raspberries and peaches. Some fruit juices such as orange, grapefruit, apple, pineapple, tomato, and some tropical fruits are marketed as natural juices, but are also used as ingredients in carbonated soft drinks. (Mantziki *et al*., 2017)

Carbonated beverages are cold packed to maintain carbonation and cannot be hot-processed to remove spoilage caused by yeast and mold spores. Carbonated drinks usually contain the equivalent of 8 g/L of dissolved CO_2. Preservatives are added to most carbonated beverages to prevent spoilage, protect flavor and extend shelf life. (Banu *et al.*, 2010)

Different studies proved that sweetened soft drinks consumption is directly associated with the risk of developing health problems (obesity, type 2 diabetes, tooth decay and cardiovascular disease. (Miller *et al.*, 2020) Many research and efforts have focused on consumption of sweetened soft drinks because they contribute to total added sugar intake. (Rosinger *et al*., 2017; Blecher *et al*., 2017) The 2020 strategic plan from the American Heart Association (AHA) recommends no more than 360 kcal per week from this type of drinks. (Lloyd-Jones *et al*., 2010)

This undertaken study has the role of determining some quality indicators such as pH and titratable acidity but also the content of soft drinks in nitrites (NO_2^-), phosphates (PO_4^{3-}), chlorine (Cl^-), sulphites (SO_3^{2-}), by specific dosing methods.

MATERIAL AND METHOD

The following soft drinks were analyzed, for the above specified indices and anions content:

P 1 – Coca Cola;
P 2 – Pop Cola;
P 3 – Sprite;
P 4 – Fanta;
P 5 – Pepsi;
P 6 – Santal Orange;
P 7 – Giusto Natura;
P 8 – Freeway Orange.

All beverages were purchased a day before the analyses and kept in proper conditions. pH was tested by potentiometric method, titratable acidity by volumetric

method and expression in mg citric acid/100 mL. The nitrites content was determined using the Griess colorimetric method, the phosphates using the phosphomolybdenic solution method and a Spekol 1100 spectrophotometer and the chlorides using the titrimetric method with silver nitrate standard solution. The sulphite contents was determined using the volumetric method involving standard iodine and sodium thiosulphate solutions.

RESULTS AND DISCUSSIONS

The moisture and dry matter of the analyzed samples were determined using a Biobase hot air oven at 105^0C in order to properly express the specific ions content in samples. Their values are presented in table 1.

Table 1

Humidity and dry matter values for the analyzed samples

Sample	Humidity (%)	Dry matter (%)
P 1	97.4986	2.5014
P 2	98.1438	1.8562
P 3	97.9235	2.0765
P 4	97.2741	2.7259
P 5	97.5690	2.4310
P 6	89.9811	10.0189
P 7	90.8021	9.1979
P 8	95.0998	4.9002

The pH values were determined by potentiometric method in the undiluted beverages, at room temperature. Recorded data are shown in figure 1, observing that the biggest drop in pH value was registered for P 1 followed by P 2 and P 8.

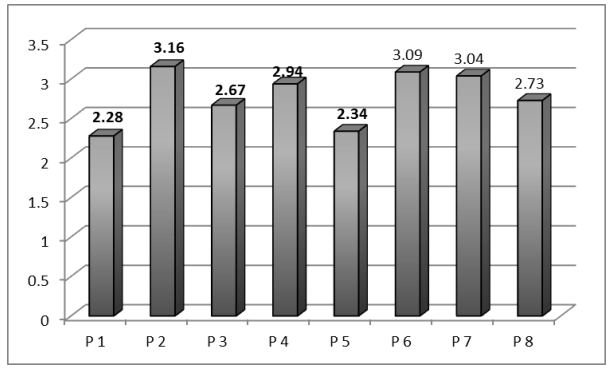

Fig. 1 pH values at room temperature

Acidity was expressed in g citric acid/100 mL and the obtained values are presented in figure 2.

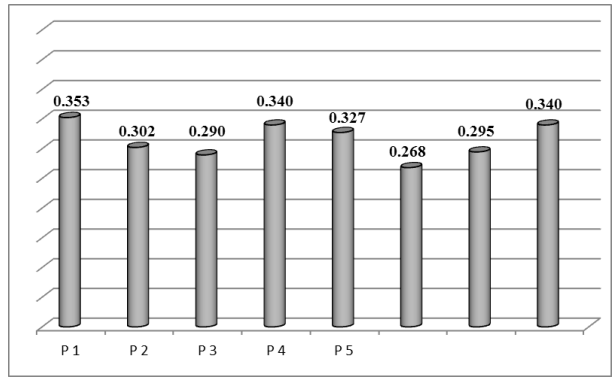

Fig. 2 Titratable acidity values, in g citric acid/100 mL

From all analyzed products, the most acidic proved to be Coca Cola (0.353 g citric acid / 100 mL), followed by Pepsi and Freeway Orange (0.340 g citric acid / 100 mL); the lowest content in free acids was registered for Santal Orange (0.268 g citric acid / 100 mL). Although high acid concentration could be of importance in killing gastrointestinal bacteria, low pH could cause teeth erosion. The effect of low pH has been shown in so many studies to be responsible for tooth decay especially when the acidity of the soft drink is high. (Bamise C. T. et al., 2009; Panich M. et al., 2009)

According to Griess method, we prepared a series of standard solutions and drew a calibration curve, based on which we determined the nitrite content of the samples, as presented in figure 3:

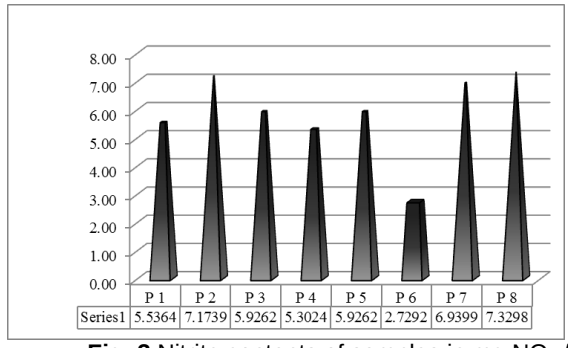

Fig. 3 Nitrite contents of samples in mg NO_2^-/ L

As shown in figure 3, in what regards the soft drinks samples, the highest value for nitrite content was registered for Freeway Orange (P_8) and the lowest for Santal Orange (P_6).

For the phosphate content (figure 4), we determined that Coca Cola (P_1) had the highest value – 187.82 mg/L, due to the fact that phosphoric acid is the acidifying compound in this beverage brand. Again, Santal Orange had the lowest value, of 62.61 mg/L.

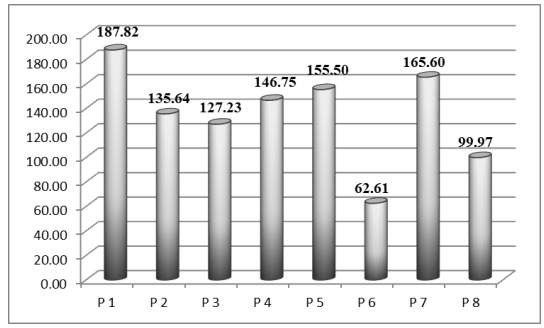

Fig. 4 Phosphate contents for the analyzed soft drinks

The highest level of chlorides was registered also for Coca Cola (P_1) – 0.164 g Cl^-/100 mL and the lowest for Pepsi (P_5) – 0.075 g Cl^-/100 mL, as shown in figure 5.

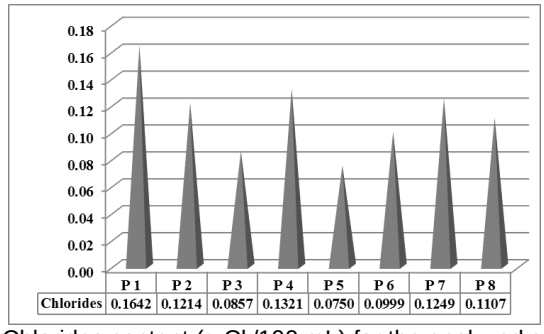

Fig. 5 Chlorides content (g Cl^-/100 mL) for the analyzed samples

Sulphites are usually added to food products, including beverages, as preservatives. Their quantity varies with the type of product and brand.

The soft drinks presented different amounts of sulphites, the highest value being registered in P_7 (Giusto Natura Orange) – 12 mg/100 mL, and the lowest in P_6 (Santal Orange) – 2.4 mg/100 mL, data being presented in figure 6.

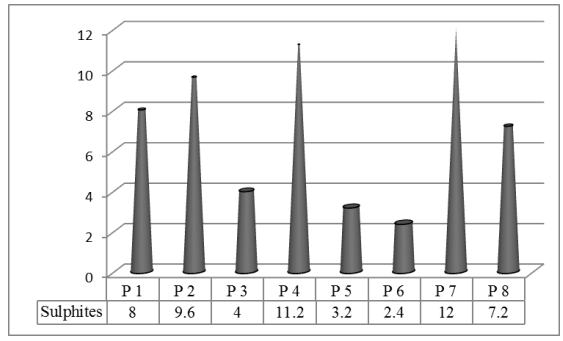

Fig. 6 Sulphites content for the analyzed samples (mg/100 mL)

CONCLUSIONS

1. For the analyzed beverages, the highest content in nitrites was registered for Freeway Orange (P_8) – 7.33 mg/L and the lowest for Santal Orange (P_6) – 2.73 mg/L, which also registered the lowest value for sulphite ions – 2.4 mg/100 mL;

2. The highest level of chlorides was registered for Coca Cola (P_1) – 0.164 g Cl^-/100 mL and the lowest for Pepsi (P_5) – 0.075 g Cl^-/100 mL;

3. Coca Cola (P_1) had the highest value for phosphates – 187.82 mg/L and Santal Orange had the lowest value, of 62.61 mg/L;

4. The highest content in free acids was registered for Coca Cola (0.353 g citric acid / 100 mL), followed by Pepsi and Freeway Orange (0.340 g citric acid / 100 mL), the lowest content being registered for Santal Orange (0.268 g citric acid / 100 mL).

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