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Physicochemical and microbiological quality ofsome commercialfruitdrinks and juices in Algeria

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Abstract - The objective of this study is to determine the compliance of fruit drinks and light juices. The physicochemical and microbiological analyses were carried out on thirty samples marketed in the city of Bechar in the southwest of Algeria. The physicochemical quality concerns the measurement of pH, acidity, density, Brix degree and refractive index. As well as microbiological quality control concerns the enumeration of total aerobic mesophilic bacteria, coliforms, fecal streptococci, sulfur-reducing anaerobes , yeasts and molds. Physicochemical results show means of pH3.27±0.32 with mean titratable acidity of 0.43±0.27g/100mL.The brix rate is showed an average value of11.27±2.64%.The refractive index and density show means of 1.35±0.004 and 1.03±0.02respectively. Microbiological examination of the samples revealed the total absence of the above-mentioned germs in most of the samples with the exception of six of them that showed the presence of molds (0.23±0.57 ufc/mL).All results of chemical quality present a highly significant difference between mean (p-value <0.001).

Keywords: Fruit juices, microbiological, physicochemical, quality, Bechar

1. Introduction

Fruit drinks are nonalcoholic beverages that are obtained by subjecting different types of fruit to certain processes according to a series of rigid standards to avoid food frauds or the marketing of ungenuine foods (Gallo et *al.*, 2019).

Fruit juice is a popular soft drink made of the pulp of different types of fresh fruits. Fruit imparts natural flavour to fruit. Fruit juices contain many components which are

beneficial for our health. Though the actual components varies from fruits to fruits, in general they contain flavonoid glycosides, dietary fiber, calcium, vitamin C, carotenoids, lutein, lycopene, carotene, phenolic acids, stilbenes, ellagic acid, amino acids, aroma compounds, anthocyanin, flavonols, polyphenols, potassium, vitamin D, low amount of sodium, cholesterol, fat etc (Ahmed *et al.*, 2018).

The physicochemical, microbiological and organoleptic controls in food industries correspond to the nutritional, hygienic and organoleptic qualities of the product. A global approach must be applied for the rigorous control of the microbiological quality and chemical stability of industrially produced juices. It involves the development of the production process, the design of equipment, hygiene and staff training and also the organization and management of production (Vierling, 2008).

This study aims at determining the physicochemical and microbiological qualities of fruit drinks and light juices marketed in Algeria.

2. Materials and methods

2.1. Sampling

Thirty samples analyzed divided into three groups: 27 fruit drinks and02 light juices. These samples included national and international brands with different tastes. Samples collected for analysis were randomly purchased at the local market in Bechar city. The samples chosen represent the types of fruit drinks that are often consumed by Algerian people.

2.2.Physicochemical analysis

The pH of the sample was measured using a pH meter, the total titratable acidity was measured by titration with 0.1N sodium hydroxide solution (results expressed in grams citric acid per 100ml of sample)while the quantity of total soluble solids (°Brix)and refractive index were measured by anAbbe refractometer. All assays were performedin triplicate.

2.3. Microbiological analysis

For microbial analysis, 1.0mL of fresh juice was diluted with 10 ml of Tryptone Salt Water solution and filtered through a sterile filter paper to remove solid particles. 1 mL filtrate was used for inoculation. The inoculum was deposited on Plat Count Agar, Violet Red Bile Glucose Neutral Crystal Agar. Baird Parker, Meat Liver Agar, Potato Dextrose Agar to isolate and count the total aerobic mesophilic bacterial, coliforms,

staphylococci, sulfite-reducing bacteria, yeasts and molds, respectively. Agar plates were incubated at 37°C and 44°C for 24 hours for bacteria and at 27°C for 72 hours for fungi. For the calculation, the average number per plate was divided by the volume of the sample and is expressed as CFU/mL.

2.4. Statistical analysis

The mean values and standard deviation were analyzed statistically using Microsoft Excel 2016.One-way ANOVA was carried out to test for any significant difference. Difference between means at *P-value*<0.0001 level were considered highly significant.

3. Results and discussion

The pH across the samples ranged from 3.26±0.33 and 3.36±0.1.Fruit juices have a low pH between 2 and 5 and this is due to their richness in organic acids (Nonga et *al.,* 2014). The low pH may have inhibited the growth and proliferation of the contaminants (Oranusi et *al.,* 2012). Means of titrable acidity are 0.43 ±0.3, 0.39± 0.01 and 0.45±0.3 for fruit drinks, juices light, nectar and juices respectively. These values reported in this work are close to that reported by Malainine et *al.*(2020).

Table 01: Physicochemical quality of juicedrinks

	pH	**Acidity (g/100mL)**	**Brix (g/100mL)**	**refractive index**	**Density**
Juices drinks	3.26±0.33	0.43±0.28	11.92±1.14	1.3509±0.002	1.0312±0.2
Light juices	3.36±0.1	0.39±0.09	2.5±0.55	1.3353±0.001	1.0076±0.002

Values are mean ± SD (triplicate)

Citric acid occurs naturally in fruit and its level varies depending on the variety; for orange juice it is between 0.68% and 1.20%, for lemon 4.2 and 8.33% (Sadler and Murphy, 2010). In industrial juice, organic acids such as citric acid are added as acidifiers to inhibit the growth of undesirable bacteria (Danyluk *et al.,* 2012), they play an important role in flavour(acidity) and color (react with the pigments in the juice), (Sadler and Murphy, 2010).

The brix value is showed a mean of 11.92±1.14 and 2.5±0.55 for juices drinks and light juices respectively. Then, index refraction the refractive index and density show average values of1.35±0.004 and 1.03±0.02 respectively.

Hygiene quality of fruits can be fairly judged by the abundance of

microorganisms associated with them. The degree of contamination of fruit products largely depends on the initial load, source and kinds of microorganisms related to the fruits and care taken during collection, processing and product handling (Jay, 1991).

Table 02 shows mean results of the microbiological quality of fruit drinks.

Table 02: Microbial quality of fruit drinks and light juices

MicroorganismUFC/mL	Maximum limit	Fruit drinks	Light juices
Total bacteria	10^2	0.03±0.2	Absent
Coliforms	Absent	Absent	Absent
Staphylococci	Absent	Absent	Absent
Sulfite-reducing	Absent in 20 mL	Absent	Absent
Yeast	10^2	Absent	Absent
Mold		0.23±0.57	Absent

Values are mean ± SD (triplicate)

There is a complete absence of bacteria and yeast in all samples with the presence of some molds in six fruit drinks (0.23±0.57ufc/mL). The absence of bacteria and yeasts means that the fruit juices tested meet the Algerian standard. In addition, all fruit juices tested are compliant and do not have a microbial load above the permitted standard.

The absence of bacteria and yeasts explains the effectiveness of the heat treatment, which has a role to play in avoiding the fermentation phenomenon that can lead to the crushing of carbohydrates, especially starches and sugars. Nevertheless, the thermal process can also reduce the content of vitamins and other thermolabile components, and the nutritional value of these products is therefore much lower than that of fresh fruit. In addition, the presence of preservatives and acidifiers such as citric acid can prevent the attack of microorganisms.

4. Conclusion

The results obtained during the physicochemical analyses carried out on our samples show that the fruit juices are acidic. The addition of citric acid and sugar is intended to inhibit bacterial growth.

The microbial load of fruit drinks below the accepted limit is a reflection of good manufacturing practices. But, presence of mold in some samples is currently

considered a risk due to the mycotoxins synthesized by these microorganisms.

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