CONTRIBUTIONS TO THE KNOWLEDGE OF THE QUALITY OF SOME SYRUP VARIETIES OBTAINED INDUSTRIALLY AND TRADITIONALLY

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Abstract

Fruit syrups are classified as non-alcoholic beverages obtained from the fruit juices of various species through mechanical processes (pressing) or diffusion, with the addition of sugar and acids, intended for the preparation of soft drinks and confectionery products and preserved with sugar. Processing into syrup is a method that can be applied to a wide range of fruits, such as: strawberries, raspberries, cherries, sour cherries, apricots, berries, blueberries, or citrus fruits. The research conducted aimed to highlight the differences between the two technologies for obtaining this product, as well as to analyse the main sensory and physicochemical indicators. By conducting a sensory analysis of the 9 syrup varieties, it was found that for each parameter evaluated, the maximum score was awarded to one of the syrup varieties prepared using the traditional method. Regarding the results of the physicochemical analyses, variations were observed between the two technological variants. Regarding the total sugar percentage, the difference was 16-18% higher for varieties prepared using the traditional method, while for acidity, the values obtained for industrially prepared syrup varieties were 1.04-1.30, and for traditional varieties, they were 3.42-3.80 (g malic acid/100 g product).

Key words: *syrup, fruits, sensory analysis, sugar*

INTRODUCTION

Syrup, a viscous solution containing high concentrations of sugar [1, 2, 5], frequently, with added flavouring or medicinal compounds, has been a staple of human diets and pharmacopoeias for ages, progressing from simple indigenous formulations to sophisticated industrial goods. Moreover, due to its palatable flavour and ease of administration, syrup is extensively utilised in the pharmaceutical sector [1, 3, 6, 7].

Fruit syrups are alternatively referred to as fruit molasses. The juice is clarified, and a substantial quantity of sugar is thereafter blended uniformly. Consequently, these are concentrated fruit liquids employed as sweeteners. They are utilised in minimal quantities for diluting purposes [1, 4].

Syrup is produced either from fresh fruit or by combining sugar, flavourings, essences, and water.

Syrup can be preserved for an extended duration in a sealed condition without refrigeration due to its elevated sugar content. Syrup can be utilised to create beverages or to produce confections such as bread and cookies.

The origins of soft drinks trace back to the mediaeval Middle East, where fruit-flavoured beverages had considerable popularity. They were frequently sweetened with substances such as sugar, syrup, and honey. An early record of soft drink production in France dates to approximately 1630, where individuals sold lemonade composed of water and lemon juice flavoured with honey.

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There has consistently been interest in non-alcoholic beverages, resulting in the development of a diverse array of tastes, ingredients, and technological breakthroughs. The quality of the syrup is essential, as it can influence the appearance, taste, and flavour of the finished soft drink products. A primary difficulty for soft drink manufacturers is the elimination of bulk visible impurities, such fruit fibres, sugar crystals, silt, and gels [2, 8]. These troublesome pollutants are generally eliminated by trap filtering techniques to safeguard downstream filtration from early clogging and to provide tank protection [8, 12]. This evolution includes various production methods, ranging from traditional artisanal techniques characterised by open-pan evaporation and minimal processing to highly mechanised industrial processes that emphasise consistency, shelf stability, and large-scale output [10, 11]. Traditional fruit syrup production generally entails concentrating fruit juices to elevated Brix levels (65–80°) with the addition of sugars, frequently depending on small-scale family enterprises and artisanal methods for fruit crushing and juice boiling [10] This conventional method frequently yields a product with significant variability in its physicochemical and microbiological characteristics, influenced by factors such as grape variety, maturity, geographical variations, and the particular processing parameters utilised [10].

The quality of syrup types is significantly affected by their production methods, with traditional approaches typically resulting in greater variability than industrial operations, which strive for homogeneity through controlled settings [10].

So, the conducted research aimed to highlight the differences between the two technologies for obtaining this product, as well as to analyse the main sensory and physicochemical indicators of the products.

MATERIAL AND METHOD

In order to achieve the objectives of this research, were taken in study nine syrup assortments (four obtained in industrial system and five obtain in traditional system).

The sensory analysis was performed using the product quality assessment scale by scoring [1].

The soluble solid content was determined by means of the refractive index, expressed in Brix° [9].

The acidity of the syrups was determined by titration with sodium hydroxide in the presence of phenolphthalein as an indicator, and calculated using the following formula:

Total acidity $= \frac{0,0067 \cdot V}{m} \cdot 100$ g/100 g, where: 0.0067= the amount of malic acid, in grams, corresponding to one cm^3 of 0.1 N sodium hydroxide; V= the volume of 0.1 N sodium hydroxide used in the titration, in cm^3; m= the mass of the sample taken for analysis, in grams [9].

Determination of invert sugar content is based on the hot reduction of an alkaline solution of cupric salt with the help of sugars, by indirect titration of the cuprous oxide resulting from the reaction with a sodium thiosulfate solution, calculated using the following formula:

% Inverted sugar $= \frac{c \cdot V \cdot 100}{V_i \cdot 1000 \cdot m}$, where:

c = the amount of invert sugar, in mg, found in the table, corresponding to the volume of sodium thiosulfate used in the titration and multiplied by the correction factor; V = the volume of the graduated flask, in cm^3; Vi = the volume of the flask in which the inversion was made, in cm^3; m = the mass of the sample taken for analysis, in g [9].

The total sugar content was determined in accordance with standard STAS/12-70, and calculated using the following formula:

% Total sugar $= \frac{c \cdot V \cdot V_i \cdot 100}{V_1 \cdot 100 \cdot 1000 \cdot m}$, where:

c - sugar content (mg) corresponding to sodium thiosulphate volume used for titration; V - volume of the homogenized sample (ml); Vi- volume of the inverted sample (ml); V1- sample volume used for titration (ml); m - sample weight (g) [9].

Ash was determined by calcination at 550±20ºC in a oven, in accordance with standard STAS 2257-67.

The program employed for statistical analysis was SPSS. We computed the mean, standard deviation, and coefficient of variation.

RESULTS

The sensory analysis of the nine syrup varieties involved their evaluation by scoring the main parameters on the evaluation sheets: colour, appearance, odour, viscosity and taste, as well as totaling the ratings given by the evaluators.

The results obtained from the sensory evaluation are presented in the table 1.

Regarding the results of the sensory analyses, there were variations between the two ways of obtaining the syrups.

The investigated physicochemical analyses involved performing the following determinations: total sugar and invert sugar content, the content of soluble substances, the acidity of the ash insoluble in HCl and the total ash which are depicted in table 2.

Table 1 Sensory analysis of syrup samples

Trait	Industrial strawberry syrup	Industrial raspberry syrup	Industrial apricot syrup	Industrial sour cherry syrup	Traditionally strawberry syrup	Traditional y raspberry syrup	Traditionally apricot syrup	Traditionally sour cherry syrup	Traditionally fir syrup
Colour	3.66 ±0.49	3.80 ±0.41	3.60 ±0.51	3.80 ±0.41	3.86 ±0.35	3.86 ±0.35	3.81 ±0.35	3.80 ±0.35	3.46 ±0.52
General appeareance	3.46 ±0.74	3.33 ±0.72	3.60 ±0.51	3.40 ±0.74	3.82 ±0.41	3.80 ±0.41	3.75 ±0.41	3.75 ±0.41	3.73 ±0.46
Smell	3.60 ±0.51	3.73 ±0.59	3.80 ±0.41	3.86 ±0.35	3.93 ±0.26	3.93 ±0.26	3.88 ±0.26	3.88 ±0.26	3.86 ±0.35
Viscosity	3.33 ±0.82	3.53 ±0.74	3.53 ±0.74	3.80 ±0.41	3.86 ±0.35	3.86 ±0.35	3.81 ±0.35	3.80 ±0.35	3.80 ±0.41
Taste	3.33 ±0.82	3.73 ±0.46	3.53 ±0.52	3.46 ±0.64	3.86 ±0.35	3.86 ±0.35	3.81 ±0.35	3.80 ±0.35	3.93 ±0.26
Mean	17.40 ±1.24	18.13 ± 1.06	18.06 ±0.80	18.33 ± 1.23	19.33 ± 0.82	19.31 ± 1.60	19.06 ± 1.80	19.03 ± 1.32	19.26 ± 0.70
V%	7.14	5.85	4.42	6.73	4.22	4.54	3.87	5.37	3.65
Minimum	15	17	17	16	18	18	18	18	18
Maximum	20	20	19	20	20	20	20	20	20

Table 2 Chemical analysis of syrup samples

Specification	Industrial products				Traditionally made products				
	Industrial strawberry syrup	Industrial raspberry syrup	Industrial sour cherry syrup	Industrial sour cherry syrup	Traditionally strawberry syrup	Traditionally raspberry syrup	Traditionally apricot syrup	Traditionally sour cherry syrup	Traditionally fir syrup
Total sugar (%)	66.32 ±0.21	66.15 ±0.53	65.38 ±0.48	65.92 ±0.43	84.73 ±0.38	85.51 ±0.67	85.38 ±0.87	85.92 ±0.55	82.94 ±0.68
Inverted sugar (%)	60.02 ±0.42	59.95 ±0.24	59.12 ±0.45	59.73 ±0.54	79.12 ±0.37	79.54 ±0.68	79.44 ±0.54	79.73 ±0.75	79.48 ±0.64
Total soluble solids (Brix°)	61.24 ±0.77	61.04 ±0.13	60.73 ±0.39	61.90 ±0.64	70.50 ±0.35	71.04 ±0.34	70.73 ±0.05	71.90 ±0.68	68.02 ±0.56
Acidity (g) malic acid /100 g	1.04 ±0.78	1.10 ±0.02	1.17 ±0.87	1.30 ±0.49	3.42 ±0.89	3.56 ±0.07	3.75 ±0.45	3.32 ±0.49	3.88 ±0.48
Insoluble ash (%) in HCl 10%	0.02 ±0.53	0.02 ±0.18	0.02 ±0.65	0.03 ±0.46	0.07 ±0.70	0.09 ±0.18	0.06 ±0.46	0.04 ±0.98	0.12 ±0.04
Total ash (%)	0.11 ±0.28	0.11 ±0.61	0.12 ±0.65	0.14 ±0.48	0.24 ±0.38	0.23 ±0.43	0.22 ±0.34	0.24 ±0.48	0.22 ±0.44

Similar to sensory analysis, the obtained results reveal variations between the two ways of obtaining the syrups.

DISCUSSIONS

Regardless of advancements in technology and soft drink production techniques, fruit syrups and their quality have consistently remained crucial to the manufacturing of soft drinks.

For sensory analysis a number of 15 untrained panellists awarded scores ranging from 0 to 4 for each specified parameter. Thus, each evaluator could award a maximum of 20 points for each sample.

Following the sensory analysis, it is clearly noted that the assessors appreciated the syrup varieties obtained in the traditional system more.

Regarding the colour, it was observed that the maximum values were recorded for the syrups obtained in the traditional system, and in the case of the strawberry variety, it was appreciated that it has the closest colour to the fruit from which it comes, and therefore it obtained an average of 3.86 points. The evaluators considered that for the four syrup varieties obtained in the industrial system, the colour corresponds largely to that of the fruit of origin, which is why the average scores obtained vary between 3.60 and 3.80 points.

It is also noted that the five syrup varieties obtained in the traditional system obtained the highest scores for appearance, ranging between 3.73 and 3.80. The highest score goes to strawberry syrup, while industrial raspberry syrup obtained the lowest score of 3.33, and the others were assessed as having a similar appearance, a statement justified by the score between 3.40 and 3.60.

Regarding the sensory attribute "smell", the analyzed products did not present a foreign smell, which was pleasant, characteristic of the fruit of origin. All nine varieties obtained high scores for this attribute, between 3.60 in the case of industrial strawberry syrup, and 3.93 for traditional strawberry syrup. This aspect highlights the fact that the evaluators preferred the syrup produced in the traditional system, to the detriment of the one produced industrially.

For the taste parameter, the evaluators appreciated the fact that fir syrup has the most pleasant taste, obtaining a high score of 3.93. This was followed closely by the strawberry syrup from the traditional system, with 3.86. The strawberry syrup from the industrial system obtained the lowest score, 3.33, while the apricot and sour cherry varieties obtained between 3.46 and 3.53 points, and the raspberry one 3.73.

For viscosity, both the minimum and maximum points were obtained by the strawberry syrup, varying between 3.33 for the variety obtained in the industrial system and 3.86 for the one from the traditional system.

Regarding chemical analyses, we observe differences between the two syrup production systems.

The legislation in force for these product categories is not clearly defined, the existing regulations sporadically mentioning certain minimums or maximum only for certain constituents. The minimum sugar quantity allowed for syrup produced in an industrial system is 40%, with no maximum specified. The results obtained for this parameter vary between 65.38-66.32% for syrup produced in an industrial system, and for the traditional one these were between 82.94-85.92%. As can be seen, the samples subjected to analyses exceed the minimum mentioned previously.

Regarding the quantity of invert sugar in syrup produced industrially, it is located in the range of 59.12-60.02%, and for syrup produced according to traditional recipes it is 80.48-82.54%.

The results of the analysis of soluble substances, expressed in Brix°, for the samples obtained in the industrial system, varied between 60.73 and 61.90, and for the samples from the traditional system, values of 69.50 were obtained for strawberry syrup and 68.02 for fir syrup. The regulations in force provide for a maximum allowed of 66 Brix° for samples coming from an industrial system, and the results obtained are within the standard.

Regarding acidity, a maximum percentage of 1.5 g malic acid/100 g of product is allowed for the syrup obtained in the industrial system. The results of the samples from the industrial system fall within the limits provided by law and vary between 1.04 g in the case of strawberry syrup and 1.30 g for cherry syrup. The values obtained for the syrup obtained in the traditional system are much higher with values that varied between 3.32 g for strawberry syrup and 3.88 g for fir syrup.

In the case of total ash content, the maximum allowed limit is 0.17% for industrial syrup, the results obtained by us varying between 0.11-0.14 %, values that fall within the standard. In the case of traditionally prepared syrup, the values varied between 0.22-0.24 %.

The admissibility conditions regarding the amount of ash insoluble in 10% HCl, for industrial syrup, assume compliance with the limits of 0.01-0.03%, the results obtained by us varying between 0.02-0.03%. In the case of traditionally prepared syrup, the values varied between 0.04-0.12%.

CONCLUSIONS

Following the analysis, both sensory and physicochemical, satisfactory results were obtained, the samples falling within the limits imposed by law.

By carrying out the sensory analysis of the 9 syrup varieties, it was found that when evaluating each parameter, the maximum value was given to the syrups obtained in the traditional system. This fact demonstrates the general preference of the evaluators for products obtained according to traditional recipes, which preserve as faithfully as possible the sensory characteristics of the fruits from which they come.

Regarding the results of chemical analyses, significant variations were observed between the two types of technologies.

In the case of the percentage of total sugar, the difference was 16-18 percent, higher in the case of the varieties prepared in the traditional system, this fact being explained by the different method of obtaining, as well as by the greater amount of sugar added.

Acidity is another parameter for which values with a large difference were obtained. If in the case of syrup varieties prepared in the industrial system an acidity of 1.04-1.30 was obtained, the one from the monastery recorded values of 3.42-3.80. The higher percentage identified in the samples from the syrup obtained in the traditional system appeared as a result of the addition of malic acid as a preservative, which has high acidity, as well as due to the use of fresh fruits.

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