

COMPARING SOME CHARACTERISTICS OF FRESH, FROZEN AND CANNED STRAWBERRIES

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Abstract

We evaluated sensorial, physic-chemical and microbiological characteristics of fresh, frozen and canned strawberries. The sensorial analysis consisted in aspect, aroma and texture evaluation; the physic-chemical parameters analysed were: pH and water activity and the microbiological parameters were yeasts and moulds. All samples were purchased from the market, frozen strawberries packed in plastic bags, in air atmosphere and canned strawberries packed in metal recipients, in sugar syrup. Sensorial analysis was made by untrained panellists. All samples were smashed into a Stomacher before analysing from the physic-chemical and microbiological point of view. pH was determined using a INOLAB 720 WTW series pH-meter equipped with a Sen Tix Sp Spear immersion electrode and water activity was analysed using a Novasina LabMaster AW device. Yeasts and moulds number was evaluated using SR ISO 7954. From the sensorial point of view, fresh strawberries had the highest scores for aspect and texture and the most tasteful sample was canned strawberries due to sugar syrup. Most acid samples were those of frozen strawberries and most basic ones were those of canned strawberries. Water activity registered the highest value for fresh strawberries and for canned and frozen samples values were very similar. Yeasts and moulds had the lowest values for canned strawberries, followed by frozen and fresh strawberries.

Keywords: canning, freezing, strawberries, yeasts and moulds, water activity

INTRODUCTION

Fruits are an important source of vitamins, minerals, fibres, enzymes, aromatic volatile substances, and, beside vegetables, they have an essential role in human metabolism. Therefore, fruits and vegetables represent 20 – 25% of food intake and they are one of the standard of living indicators [1].

Berries are wide appreciated due to their taste, specific aroma and particular nutritive qualities. The issue of berries conservation is often approached worldwide from the preserving organoleptic properties and chemical composition of fresh fruit point of view.

Strawberries have many health benefits. Historically strawberries have been believed to have medicinal benefits in easing diarrhea, digestive upsets and gout. Furthermore, the fruit juice has been used externally to counteract sunburn, skin blemishes, and discolored teeth [3].

Strawberries are most known for being eaten raw due to the fact that they are highly perishable. In general, strawberries have a

maximum storage life of between 5 to 7 days at a temperature of 0°C and 95% relative humidity [3]. Processing of strawberries occurs due to the fact that strawberries are highly perishable. Products such as juice, jam, syrup and wine are all made from strawberries. The leaves of the strawberry plant have also been used in blended herbal teas. The most common forms of processed strawberries are frozen [2].

MATERIAL AND METHOD

In order to evaluate sensorial, physic-chemical and microbiological characteristics of fresh, frozen and canned strawberries, the following indicators were used: aspect, aroma, texture, pH, water activity, yeasts and moulds.

All samples were purchased from the market, frozen strawberries packed in plastic bags, in air atmosphere and canned strawberries packed in metal recipients, in sugar syrup.

Sensorial analysis was made by untrained panellists.

All samples were smashed into a Stomacher before analysing from the physico-chemical and microbiological point of view.

pH was determined using a INOLAB 720 WTW series pH-meter equipped with a Sen Tix Sp Spear immersion electrode and water activity was analysed using a Novasina LabMaster AW device.

Yeasts and moulds number was evaluated using SR ISO 7954.

RESULTS AND DISCUSSIONS

Sensorial characteristics

Regarding the evolution of organoleptic characteristics, in the wake of analyses performed by the ten panellists, after calculating arithmetic average of the results, we observed the following:

- The most appreciated aspect, with an average of 3.7, was registered by the fresh strawberries, followed by the canned strawberries, with an average of 3.1; frozen strawberries had the lowest average – 2.5 (Table 1);

Table 1. Appreciating aspect for analysed samples

Sample	Aspect										Average
Fresh strawberries	3	5	4	4	3	4	3	4	4	3	3.7
Frozen strawberries	2	2	4	3	2	2	2	3	3	2	2.5
Canned strawberries	2	3	2	4	4	3	3	4	4	2	3.1

- The most intense aroma was registered by the canned strawberries, followed by the fresh and the frozen ones. This can be explained by the fact that canned strawberries were preserved in light sugar syrup (Table 2);

- The higher average for texture was registered by the fresh strawberries (3.2) and the lowest value by the frozen ones (1.6) (Table 3).

Table 2. Appreciating aroma for analysed samples

Sample	Aroma										Average
Fresh strawberries	4	5	2	3	3	4	2	3	3	4	3.3
Frozen strawberries	2	2	4	1	2	2	1	2	2	2	2.0
Canned strawberries	4	4	5	4	4	5	3	4	4	5	4.2

The strawberries form and size, as well as possible imperfections and colour are factors related to strawberries aspect and have a relatively great influence on consumer's first impression.

Table 3. Appreciating texture for analysed samples

Sample	Aroma										Average
Fresh strawberries	4	4	3	2	4	2	4	2	4	3	3.2
Frozen strawberries	1	1	1	2	2	1	1	4	1	2	1.6
Canned strawberries	1	2	2	2	3	2	2	3	2	2	2.1

Considerations regarding aspect are also useful in products calibration and rating, concurring to evenness assurance and facilitating buy and sale operations.

Strawberries aesthetic properties are referring especially to their aspect as an important factor for consumer's first impression. Aesthetic message can be sent to the consumer directly by the product or indirectly by the package. Particular contributions to an appealing aspect have strawberries colour, form and symmetry and also package characteristics.

Gustatory properties are induced by the chemical characteristics of foods, respectively foods volatile components. Taste is an expression of chemical sensitivity and is decisive for assessing and selecting foods and also for creating psycho-physiological conditions favourable for ingestion.

Aroma is a complex gustatory-olfactory characteristic, particular for foods. It is a sensation generated by the properties of some substances that stimulates taste or/and flavour. Knowing aroma forming mechanisms is very important in catering for blending aroma components and also for creating the conditions that generate it during technological processes.

The importance of texture as a general factor of acceptability for a particular food group varies greatly from case to case and according to this criterion, strawberries are classified as products that texture is important.

Considering that aroma has the higher rate in strawberries choice (50%), and that appearance and texture matter in proportion of 35% and 15%, after calculating the weighted average of the three sensory parameters analysed for strawberry samples, we obtained the results presented in Table 4.

By analysing table 4 we can observe that the highest final sensory rating was registered by fresh strawberries (3.52) and the lowest by frozen strawberries (2.11). That can be explained by the fact that both freezing and canning (during thermal treatment) leads to

changes of aspect, aroma and texture of strawberries. Canned strawberries samples had a value of final sensory rating higher than those

of frozen strawberries (3.4 to 2.11) because were preserved in light sugar syrup.

Table 4. Weighted average of the three sensory parameters analysed for strawberry samples

Panellist number	Fresh strawberries				Frozen strawberries				Canned strawberries			
	A ¹	T-A ²	T ³	WA ⁴	A ¹	T-A ²	T ³	WA ⁴	A ¹	T-A ²	T ³	WA ⁴
1	5	5	4	4.85	2	2	1	1.85	3	4	2	3.35
2	4	4	2	3.70	4	4	4	4.00	2	5	3	3.65
3	3	3	2	2.85	2	2	1	1.85	4	4	2	3.70
4	4	4	4	4.00	2	2	2	2.00	3	5	3	4.00
5	3	2	2	2.35	2	1	2	1.50	3	3	2	2.85
6	4	3	3	3.35	3	2	1	2.20	4	4	2	3.70
7	4	3	4	3.50	3	2	1	2.20	4	4	2	3.70
8	3	4	4	3.65	2	2	1	1.85	2	5	1	3.35
9	4	3	4	3.50	3	1	1	1.70	4	4	2	3.70
10	3	4	3	3.50	2	2	2	2.00	2	4	2	2.00
Final sensory rating	3.52				2.11				3.4			

¹A = aspect;

²T - A = taste - aroma;

³T = texture;

⁴WA = weighted average.

Physic-chemical characteristics

pH values for strawberries samples varied within 3,65 and 3,81 (fig. 1).

Water activity in strawberry fruits is higher for canned strawberries compared with fresh and frozen ones due to the light sugar syrup in which they were preserved (fig. 2).

Microbiological characteristics

The highest number of yeasts and moulds was registered for fresh strawberries samples (fig. 3). Yeasts and moulds colonies developed on Petri plates inoculated with canned strawberries suspension were outnumbered by the colonies developed on plates inoculated with frozen strawberries suspension (for yeasts 3.5×10^2 compared with 1.3×10^3 and for moulds 1.1×10^2 compared with 2.7×10^3).

The fact that canned strawberries had the lowest microbial load give proof of the efficacy of thermal sterilisation on canning technological flow.

Also, the outnumbered colonies of yeasts and moulds for fresh strawberries samples when compared with frozen ones demonstrate the microbiostatic and sometimes even microbicide effect of preliminary treatments applied on frozen technological flow.

CONCLUSIONS

From the sensorial point of view, fresh strawberries had the highest scores for aspect and texture and the most tasteful sample was canned strawberries due to sugar syrup.

Most acid samples were those of frozen strawberries and most basic ones were those of canned strawberries. Water activity registered the highest value for fresh strawberries and for canned and frozen samples values were very similar.

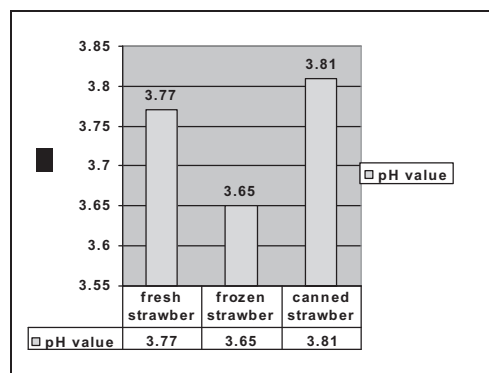


Fig.1. pH values for strawberry samples analysed

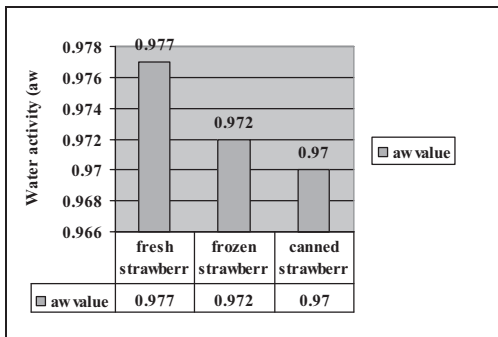


Fig.2. Water activity values for strawberry samples analysed

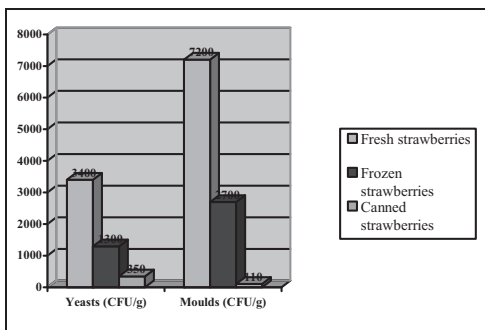


Fig. 3. Yeasts and moulds colony forming units for strawberry samples analysed

Yeasts and moulds had the lowest values for canned strawberries, followed by frozen and fresh strawberries.

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