Banat's University of Agricultural Sciences and Veterinary Medicine from Timisoara,
Department of Exact Sciences,
Contact: web: http://dse.usab-tm.ro, e-mail: secretariat_dse@usab-tm.ro

QUALITY CONTROL OF USED WATERS IN TECHNOLOGICAL PROCESSES OF OBTAINING ICE–CREAM PRODUCTS

Monica Firczak[1], Delia Maria Perju[2], Mirabela Panfiloiu[3], Sorina Stanca[3], Persida Olar[1]

[1]*Sanitary–Veterinary and Food Safety Directorate of Timis,*
[2]*POLITEHNICA University of Timisoara, Industrial Chemistry and Environmental Engineering Faculty, Timisoara,*
[3]*S.C. Antarctica S.R.L. Timisoara, Sanmihaiul Roman, Romania*

Abstract. Drinking water is an essential element in the assurance of public health and the quality of life. Today the sources of drinking water as rivers, lakes and underground waters are in danger of being polluted by different contaminants. Water's quality can be defined as a conventional assemble of physical, chemical, biological and bacteriological characteristics, expressed as a value which allows the evaluation of the sample and the appreciation of its category. In the European legislation, as well as in our national legislation permitted levels for contaminants in drinking water Maximum are described. The concentration level domain varies from a zero in case of microorganisms such as *Coloformii faecali* to very small values–like ng/L for other contaminants–all these limits are established concerning the potential danger for human health or the modification of the quality organoleptic characteristics of the water.

Keywords**:** water, quality, control, ice–cream

Introduction

In all developed countries to control the water pollution is a permanent preoccupation, due to the contribution water has on the health of the nations.

Today, there is a continuous preoccupation regarding the quality of drinking water. The water we drink should not have a characteristic smell and it should taste well, in a contrary case, water may have substances, polluting substances that endanger our health.

In the EU member states the quality of drinking water for people is subject to norms. By means of the Order of the European Commission, standards have been set which are mandatory for the quality of drinking water in all member states [BUCUR, 1999; TEUŞDEA, 1998, Directive 98/83/CE].

This order includes 64 parameters, out of which 44 are a must and need regular monitoring for compliance with the rules [Directive 98/83/CE].

The order sets quality conditions for drinking water, for water we use to cook, for home utilities water, regardless of its origins or distribution channel: public network, can, bottles or other containers. The same rules are applied for water used in the food industry, provided that this does not affect the quality of the finite alimentary product. The quality of natural waters is determined, generally, by the total of mineral or organic substances, gases in it, particles in suspension and living organisms present [BUCUR, 1999; TEUŞDEA, 1998].

In terms of their condition, impurities can be solid, liquid, or gas. These can be dispersed in water, and can be categorized according to the dimensions of the particles dispersed in suspensions, colloids and solutions. Most substances are found in natural waters, and in enogh a quantity to influence their quality.

Undoubtedly certain water cannot contain all these impurities at once, the more the existence of some of them being inconsistent with the chemical balance from the water. Apart from these substances, in natural waters other type of impurities can be found. Thus, lead, copper can easily be met following water treatment processes or because of the transport system, as well as a result of meteoric waters [BUCUR, 1999; TEUŞDEA, 1998].

Some natural waters contain Selenium or Arsenic in enough a quantity to modify their quality. Likewise, it can be stated that all natural waters contain radioactive substances, Radium mainly, but only in some cases of subterranean waters the concentration of these substances is dangerously high.

Other natural sources contain chrome, cyanides, chlorine substances, acids, alkali, various metals or organic pollution sources, all carried by receptors, by waters used in industry or in urban media [BUCUR, 1999; TEUŞDEA, 1998].

The quality of water can be defined as

a conventional party of physical, chemical, biological and bacteriological characteristics, expressed in values (numbers), which allow to frame the sample in a certain category, being thus given a certain purpose [BUCUR, 1999].

To establish the quality of water ,out of its many features–chemical, physical, biological that can be measured by laboratory analyses, a limited number is in fact use, but considered significant [BUCUR, 1999].

The world system of supervision of the environment sets the tracing the quality of water by means of 3 parameter groups: organoleptic indicators (taste and smell), physical indicators (pH, electric conductivity, colour, turbidity) and chemical indicators [BUCUR, 1999; TEUŞDEA, 1998, Directive 98/83/CE]. The water control indicators are presented in *Table 1–3* [STAS SR EN ISO 6222/2004; STAS SR EN ISO 7899/2/2002; STAS SR EN ISO 9308/1/2004; Legea nr. 458 2002; Legea nr. 311, 2004].

Table 1

Organoleptic indicators of water

Organoleptic indicators (degrees)	Admitted values
Smell	2
Taste	2

Table 2

Water's bacteriological indicators of

Bacteriological indicators		Limits
NTG, UFC=units that can form colonies	Network water	max 20UFC/ml
	Local surce	100 UFC/ml
Nr. of coli forms bacteria/100ml)	*Colform bact.*	0
	E. coli	0
	Enterococcus	0

Table 3

Physical and chemical indicators of water

Physical–chemical indicator	Limits
pH	6.5–9.5
Nitrates (mg/l)	0.5
Nitrites (mg/l)	50
Ammonium (mg/l)	0.5
Chlorines (mg/l)	250

Purpose of the Research. The present paper has monitored water quality control by analyzing a group of physical, chemical and bacteriological parameters, to determine the quality of water used in making ice cream, during a year.

Material and methods

Samples of water have been analyzed, once a month, for a year, identifying the values of the following parameters:

- NTG;
- colli–form bacteria;
- *E. Coli*;
- *Enterococci;*
- pH;
- as well as the presence of:
  - nitrates;
  - nitrites;
  - ammonium and chlorine components.

The results were expressed as number of units able to form colonies/ml of sample. If there is no colony on the blade, the result is expressed in absences/ml sample (UFC/ml).

The way to determine the number of UFC/ml was the classic procedure known in literature:

- inoculation of a measurable volume or dilution of the sample;
- cultivation in a specific grown medium (environment);
- incubation of the blade at 36+/-2°C,for 44 hours, when we aim to determine the total number of germs at 37°C, or: 22+/–2°C, for 68 hours, when we aim to determine the total number of germs at 22°C.
- Detection and count of *Escherichia Coli* and coli form bacteria in water:
  - is based on filtering water sample through filtering membrane;
  - incubating the membrane on a selective medium (environment);
  - biochemical characterization of lacto–positive, typical colonies, which leads to detecting and counting the coli–form bacteria(8).

The membrane is examined and all the characteristic colonies that have yellow color in the under–membrane medium are considered bacteria lacto–positive bacteria.

For the oxydase test and the iodine one, the following is done:

- passages of several characteristic colonies on negative non–selective agar and tryptophan bouillon.
- the non–selective agar is incubated at 37ºC for 24 hours, for the oxydase test The reaction between the oxidant re–agent and the colony is a positive one if

a bluish-red colour appears within 30 seconds.

All the colonies that give negative reaction with the oxidizes are counted as coli–form bacteria and all the colonies that give negative reaction response with oxidaze, and positive with indole, as *Escherichia Coli*.

On ready–made culture medium (growth environments) *E. Coli* shall form blue colonies, and the sum of red and blue colonies is the number of coli form bacteria.

Detection and counting of intestinal (gut) enterococci in water is done by filtering membrane, and is based on: filtering the water sample through the filter membrane, followed by incubation of the membrane on a medium that contains Natrium azide (to inhibit the growth of negative-gram bacteria) and 2,3,5–trifenil–tetrazolium chlorine substance, colorless substance, which would be reduced to red–colored formosan by the intestinal enterococci. Typical colonies, obvious, are colored pink ore brown, in the centre alone, or entirely. On the growth plates with ready-made growth medium, the enterococci form blue or bluish-greenish colonies.

The physical and chemical parameters were monitored once a month, for 15 months: Determining azotes compounds (N): in sulfuric acid and phosphorus acid, the nitrite ions react with 2,6–dimetyl–fenol, and we have: 4 nytro–2,6–dimetyl–fenyl, an orange–colored complex whose intensity can be photometrical numbered (determined).

In a concentrated sulfuric acid solution, the nitrate ions react with the benzoic acid to form red–coloured nitro compounds with a photometrical–determined concentration. Determining the azotytes: in acid solution, the azotyte ions interact with sulfanilic acids to form di–azonium salt, which further interacts with dihydro–chlorure (chlorine) N–1–naftil–etilendiamine, to form a N red–violet colour, photometrical measured.

Determining Chlorine: chlorines ions interact with mercury tiocianate (II), to form mercury chlorine (II), which is easily dissociated, and the free tiocianate forms, in the presence of Iron ions (III), the red iron tiocianate which can be photometrical measured, at a wave length of 468nm.

Results

The bacteriological parameters studied for 15 months, once a month, have revealed the following: no coli form, *E. coli* or *Enterococcus* have been identified in any of the 15 months during which the monitoring took place.

Discussion

The results of the monitoring, for the bacteriological exam, are given in *Table 4*.

Table 4

Bacteriological test of water

Nr. Crt.	Monitoring date	Obtained dates/100ml			
		NTG/ml; 37ºC	Coliform bacteria	E. coli	Enterococcus
1	25.01.2008	2	0	0	0
2	21.02.2008	3	0	0	0
3	26.03.2008	2	0	0	0
4	23.04.2008	5	0	0	0
5	29.05.2008	2	0	0	0
6	27.06.2008	4	0	0	0
7	24.07.2008	2	0	0	0
8	27.08.2008	2	0	0	0
9	24.09.2008	3	0	0	0
10	22.10.2008	2	0	0	0
11	26.11.2008	2	0	0	0
12	22.12.2008	1	0	0	0
13	28.01.2009	3	0	0	0
14	25.02.2009	2	0	0	0
15	23.03.2009	2	0	0	0

Table 5

Physical–chemical test of water

Nr. crt.	Monitoring date	Obtained dates				
		pH	Azotytes (m/l)	Azotus (mg/l)	Ammonium (mg/l)	Chlorine (mg/l)
1	25.01.2008	7.2	0.005	0.2	0.15	4
2	21.02.2008	7.5	0.004	0.3	0.2	5
3	26.03.2008	7	0.006	0.2	0.2	3
4	23.04.2008	7.2	0.004	0.3	0.13	4
5	29.05.2008	7.3	0.007	0.3	0.24	4
6	27.06.2008	7.0	0.004	0.2	0.15	4
7	24.07.2008	6.3	0.004	0.2	0.15	2
8	27.08.2008	6.9	0.005	0.2	0.2	2
9	24.09.2008	7.8	0.003	0.2	0.15	4
10	22.10.2008	6.8	0.004	0.3	0.20	4
11	26.11.2008	7.2	0.003	0.2	0.15	4
12	22.12.2008	7.4	0.004	0.2	0.15	3
13	28.01.2009	6.7	0.007	0.3	0.21	4
14	25.02.2009	7.6	0.003	0.2	0.17	2
15	23.03.2009	7.3	0.004	0.2	0.15	4

The results of the physical and chemical exams on water, which set to trigger and determine the N–compounds, Cl–compounds and pH are given in *Table 5*.

Conclusions

1. Following counts it has been established that the water used to make ice cream

corresponds to and respects the quality norms, all physical, chemical and micro-biological parameters monitors coming within the allowed limits.

2. It is recommended that these parameters be verified once a month, to avoid contamination of drinking water.

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