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REGULAR ARTICLE

MICROBIOLOGICAL QUALITY OF CONFECTIONARY PRODUCTS

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ABSTRACT

The aim of this work was to determine microbiological quality of confectionery products. In confectionery products microbiological parameters: total count of bacteria, coliforms bacteria, mesophilic aerobes bacteria and microscopic filamentous fungi were observed. The confectionery products were evaluated: Kremeš and Venček cake. For microbiological tests 20 samples of confectionery products were used. The numbers of total count of bacteria ranged from 3.29 log CFU.g^{-1}, the number of mesophilic aerobes bacteria ranged from 1.86 to 2.85 log CFU.g^{-1}, coliforms bacteria in confectionery products ranged from 0 to 2.06 CFU.g^{-1} and the number of microscopic fungi ranged from 1.13 to 1.96 CFU.g^{-1}. The samples of cake prom private production showed better microbiological quality as samples from market production. All investigated samples of confectionary products were in accordance with the Codex Alimentarius of the Slovak Republic.

Keywords: confectionary product, Kremeš, Venček, bacteria, microscopic fungi

INTRODUCTION

The issue of safety and wholesomeness (safety), food plays a special role in the prioritization of control during manufacture and handling of food. Along with developing the capabilities and accuracy of detection techniques used for increasing the importance of assessing the quality of food products and the quality of their individual components, from a microbiological point of view in all stages of production and processing. As a benchmark demonstrates its importance, together with technological, hygienic and nutritional parameters. Questions of quality and wholesomeness of food, together with regard to environmental protection are becoming increasingly of concern not only among experts from various professions and disciplines, but also the general public (**Kačániová and Juhaniaková, 2011**).

Association of Food and Drug Officials (**AFDO, 1990**), simple packaging or re-packaging operations can bring about an opportunity for the contamination or recontamination with pathogens if strict aseptic conditions are not adhered to. According to **Frazier and Westhoff (1978)**, sweets receive most of their contamination from their ingredients, although some contaminants may be added by unwrapped pieces by air, dust and handling. Additional contamination may come from equipment coming in contact with food from packaging materials and from personnel (**Abdullahi *et al.,* 2005; Aminu *et al.,* 2006; Kawo and Rogo, 2008; Shamsuddeen and Ameh, 2008; Shamsuddeen *et al.,* 2008**). Generally, poor sanitary conditions and the environment being highly charged with spoilage and pathogenic flora could be the source of contamination to food items exposed to it. Thus, retailers of food products, which include sweets, have been implicated in the spread of food-borne diseases (**Abdullahi *et al.,* 2005; Shamsuddeen and Ameh, 2008; Shamsuddeen *et al.,* 2008; Oyeyi and Lum-Nwi, 2008; Wada-Kura *et al.,* 2009**). Various products have been implicated in food poisoning due to their quality, composition and general handling (**Kawo and Abdulmunin, 2009**).

The present study aims at examining the microbiological quality of confectionary products sold at Slovakian market and made in private bakery a view to assessing their microbiological fitness for human consumption. In confectionery products microbiological parameters: total count of bacteria, coliforms bacteria, mesophilic aerobes bacteria and microscopic filamentous fungi were observed.

MATERIAL AND METHODS

Collection of confectionery samples

The samples of confectionery products selected types were added from Slovak market production and private production. For microbiological analyses Kremeš (5 samples from market), Kremeš (5 samples from private production), Venček (5 samples from market) and Venček (5 samples from private production) were used. For microbiological tests together 20 samples of confectionery products were used before expiration date.

Determination of CFU counts

For microbiological analysis the confectionary samples were processed immediately after collection. The total count of bacteria (TCB), mesophilic aerobes bacteria (MAB) coliforms bacteria (CB) and microscopic filamentous fungi (MF) were observed. Plate diluting method was applied for quantitative CFU (Colony Forming Units) counts determination of respective groups of microorganisms in 1 g of confectionery products. Petri dishes of gelatinous nutritive substrate were inoculated with 1 mL of confectionery samples (TCB, MAB, CB, MF) in three replications. Homogenized samples of confectionery were prepared in advance by sequential diluting based on decimal dilution system application. For microorganism cultivation three types of cultivating mediums were used, to segregate individual microorganism groups. Plate count agar was used for CFU segregation of TCB (incubation 48-72 h at 30 °C, aerobic cultivation method). Meat peptone agar was used for CFU segregation of MAB (incubation 48-72 h at 25 °C, aerobic cultivation method). Violet red bile agar was used for CFU segregation of CB (incubation 24 h at 37 °C, aerobic cultivation method). Malt agar was used for CFU segregation of MF (incubation 5-7 days at 25 °C, aerobic cultivation method). Cultivating medium composition corresponded to producer introductions (Biomark^{TM}, Pune, India). Basic dilution (10^{-1}) was prepared as follows: 5 g of confectionery was added to the bank containing 45 mL of distilled water. The cells were separated from substrate in shaking machine (30 minutes). Prepared basic substance was diluted to reduce the content of microorganisms below 300 CFU level.

RESULTS AND DISCUSSION

The control of raw materials, processing and environment are critical factors in the prevention of microbial contamination in confectionery. Salmonella has been found to be the major hazard in confectionery. Testing for this organism at specific control points provides the best means of quality control. Constant surveillance and good manufacturing practice are the best methods for prevention of contamination (**Kačániová and Juhaniaková, 2011**).

In Kremeš (tab. 1) from market production the total number of bacteria ranged from 3.72 to 4.08 log CFU.g^{-1}. The number of mesophilic aerobes bacteria ranged from 2.53 to 2.85 log CFU.g^{-1}, number of coliforms bacteria ranged from 0 to 1.47 log CFU.g^{-1} and number of microscopic filamentous fungi ranged from 1.56 to 1.93 log CFU.g^{-1}. The Codex Alimentarius of Slovak republic just indicates number of coliforms bacteria (10^3) and microscopic fungi (10^2). All samples of Kremeš from market production were accordance with Codex Alimentarius of the Slovak Republic **(CA SR, 2009)**.

Table 1 Microbiological quality of Kremeš from market production

	The group of microorganisms in log CFU.g^{-1}			
Number of sample	**TCB**	**MAB**	**CB**	**MF**
1.	4.08	2.56	0	1.69
2.	3.84	2.85	1.47	1.59
3.	3.89	2.53	0	1.93
4.	3.72	2.42	0	1.56
5.	4.03	2.58	0	1.74

TCB-total count of bacteria; MAB-mesophilic aerobes bacteria;
CB-coliforms bacteria; MF-microscopic filamentous fungi

In Kremeš (tab. 2) from private production the total number of bacteria ranged from 2.95 to 3.25 log CFU.g^{-1}. The number of mesophilic aerobes bacteria ranged from 1.89 to 2.51 log CFU.g^{-1}, number of coliforms bacteria were not found and number of microscopic filamentous fungi ranged from 1.13 to 1.23 log CFU.g^{-1}. The Codex Alimentarius of Slovak republic just indicates number of coliforms bacteria (10^3) and microscopic fungi (10^2). All samples of Kremeš from private production were accordance with Codex Alimentarius of the Slovak Republic **(CA SR, 2009)**. The results of microbiological quality of Kremeš from private production showed better microbiological quality in all tested microorganisms.

In study of **Kačániová and Juhaniaková (2011)** were found in honey cube Kremeš number of coliforms bacteria $4x10^2$ CFU.g^{-1}. Number of yeast in this study was $1.2x10^2$

CFU.g^{-1}. Zero numbers of microscopic fungi and staphylococci and the absence of cells *Salmonella* sp. were found. Similar our study the Kremeš samples were accordance with Codex Alimentarius of the Slovak Republic.

Table 2 Microbiological quality of Kremeš from private production

	The group of microorganisms in log CFU.g^{-1}			
Number of sample	**TCB**	**MAB**	**CB**	**MF**
1.	3.25	2.15	0	1.23
2.	3.15	2.11	0	1.15
3.	3.30	2.51	0	1.21
4.	2.95	2.05	0	1.13
5.	3.10	1.89	0	1.23

TCB-total count of bacteria; MAB-mesophilic aerobes bacteria;
CB-coliforms bacteria; MF-microscopic filamentous fungi

In Venček (tab. 3) from market production the total number of bacteria ranged from 3.59 to 3.86 log CFU.g^{-1}. The number of mesophilic aerobes bacteria ranged from 2.18 to 2.41 log CFU.g^{-1}, number of coliforms bacteria ranged from 0 to 2.06 log CFU.g^{-1} and number of microscopic filamentous fungi ranged from 1.53 to 1.96 log CFU.g^{-1}. The Codex Alimentarius of Slovak republic just indicates number of coliforms bacteria (10^3) and microscopic fungi (10^2). All samples of Venček from market production were accordance with Codex Alimentarius of the Slovak Republic **(CA SR, 2009)**.

Table 3 Microbiological quality of Venček from market production

	The group of microorganisms in log CFU.g^{-1}			
Number of sample	**TCB**	**MAB**	**CB**	**MF**
1.	3.78	2.18	0	1.59
2.	3.59	2.31	0	1.63
3.	3.79	2.25	2.06	1.53
4.	3.59	2.41	0	1.96
5.	3.86	2.32	0	1.56

TCB-total count of bacteria; MAB-mesophilic aerobes bacteria;
CB-coliforms bacteria; MF-microscopic filamentous fungi

In Venček (tab. 4) from private production the total number of bacteria ranged from 3.29 to 3.71 log CFU.g^{-1}. The number of mesophilic aerobes bacteria ranged from 1.86 to 2.01 log CFU.g^{-1}, number of coliforms bacteria were not found in all tested samples and number of microscopic filamentous fungi ranged from 1.15 to 1.29 log CFU.g^{-1}. The Codex Alimentarius of Slovak republic just indicates number of coliforms bacteria (10^3) and

microscopic fungi (10^2). All samples of Venček from private production were accordance with Codex Alimentarius of the Slovak Republic **(CA SR, 2009)**. The results of microbiological quality of Venček from private production showed better microbiological quality in all tested microorganisms.

Table 4 Microbiological quality of Venček from private production

	The group of microorganisms in log CFU.g^{-1}			
Number of sample	**TCB**	**MAB**	**CB**	**MF**
1.	3.66	1.89	0	1.25
2.	3.55	1.95	0	1.29
3.	3.50	1.86	0	1.24
4.	3.29	2.01	0	1.15
5.	3.71	1.93	0	1.19

TCB-total count of bacteria; MAB-mesophilic aerobes bacteria;
CB-coliforms bacteria; MF-microscopic filamentous fungi

CONCLUSION

The aim of this study was obtained microbiological quality of confectionary products from two different productions as were manufacture and private. The better microbiological quality of confectionary products in all followed microbial parameters were in private production. Understanding the nature of microorganisms (including their sources and growth characteristics) is key to microbial control in confectionery products. Microorganisms gain access to food-processing areas through multiple routes (e.g., raw materials, personnel and equipment traffic, water leaks and pests). Failure to implement appropriate and effective process and sanitation controls could allow these microbes, including pathogens, to become established in the processing environment where they may be able to survive for extended periods of time and re-contaminate product.

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