THE REDUCING OF THE MICROBIOLOGICAL CONTAMINATION RISKS AT BAKERY PRODUCTS' PACKAGING THROUGH SANITATION PROCESS

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Abstract

The purpose of this paper is to present the way in which it is reduce the risk of microbiological contamination at the bakery products through sanitation process. The sanitation tests were made in order to verify the sanitation process efficiency. Through these sanitation tests, it is following-up if the microorganisms that affect negatively the food safety are developing. It is verifying if the obtained values are in the limits according to the Health Ministry Directive 975 / 1998. Because the packaging is the final operation in the making of the bakery product process, the sanitation tests were made on the working surfaces (packaging tables noted M). Three sanitation versions were tested: with chemical solutions, with UV radiations and combination. Two chemical solutions for cleaning in two concentrations were tested. On the base of the obtained results, the authors are recommending for sanitation the chemical solutions in concentrations that can ensure the efficacy of the operation (the commercial name of the solution is NEOSEPTAL FU on the base on anionic and cationic surfactants, concentration c_1= 0,2 %). The recommended solution with maximum efficacy was used in the sanitation version combined with UV radiation.

Key words: *risk, identification, monitoring, contamination, microbiologic, sanitation, UV radiation, solutions*

Introduction

In the context in which on the European and World level is putting a big accent on food safety, Lujerul Company considered the opportunity for developing a food safety system through its proceedings to monitoring the way in which it is keeping and making the hygiene of the used equipments

and of the production areas. The sanitation process is a key one for the production activity that is why the identification of the microbiological contamination risks and its monitoring are very important.

Because the packaging is the final operation in the making of the bakery product process, the sanitation tests were made on the working surfaces (packaging tables noted M). Three sanitation versions were tested: with two chemical solutions for cleaning in two concentrations, with UV radiation and maximum efficacy solution with UV radiation.

The cleaning solutions were chosen so that to correspond from economical and efficiency point of view without negative affecting the food safety. Maximum efficacy was obtained at the combined treatment chemical solution with UV radiation.

Experimental

2.1. Legal base

The sanitation tests were realized to identify the number of coliphorm bacteria, total viable counts, yeasts and moulds, which must not be higher than maximum acceptable level, according to Health Ministry Directive 975 / 1998. The maximum acceptable level is presented in table 1. The obtained values represent the proof of the sanitation process and of the tested solutions efficacy.

Table 1: Maximum microorganisms' acceptable level for working surfaces according to Health Ministry Directive 975/1998

Micro organism	**Maximum acceptable level**
Coliphorm bacteria	Absent (A)
Total viable counts	2 / cm^2
Yeast and moulds	20 / cm^2

2.2. Working procedure

In the laboratory, analysing methods according to the current official standards were used.

To perform the analysis the analytical sampling method was used with a wet hydrophobic swab, peptone water, in a 10-cm2 surface, limited by a sterilized template.

The inoculation was made through the incorporation technique on the following medium:

VRBL (violet red bile lactose agar)

PCA (plate count agar)

SDA (sabouraud dextrose agar)

After incubation period - about 24 hours for coli forms bacteria, 72 hours for the total number of counts and 120 hours for yeasts and moulds – the colonies number has been counted with the Colony Counter. After that, the number of the microorganisms has been calculated with the next formula:

$$N = \frac{\sum C}{(S)} d$$

In which:

N = number of the micro organisms / cm^2

d = dilution, 10^{-1}

C = number of the colonies

S = the surface of the template, 10 cm^2

NTG = total viable counts

2.3. Sample preparation

To reduce the microbiological contamination risks, it was tested three sanitation versions:

1. The treatment with cleaning solutions and the selection of those with maximum efficacy;
2. The surfaces treatment only with UV radiation without initial cleaning;
3. The surfaces treatment with UV radiation after cleaning with the tested solution at version one.

In version one were taken in study two solutions in order to demonstrate their efficiency:

S_1 on the base on anionic surfactants and phosphates (Caraform)

S_2 on the base on anionic and cationic surfactants (Neoseptal FU)

The solutions were used at concentrations:

c_1=0, 2% and c_2=0, 1%

The solutions were tested on five contaminated working surfaces (tables for packaging) noted: $M_{1, 2,3,4,5}$ before (control sample) and after cleaning.

The solutions $S_{1,}$ and S_2 have been tested in order to verify if they are not contaminated and they are not influence upon the results.

After the solution with maximum efficacy was chosen the experiment was repeated and the sanitation surfaces were expose at UV radiation before sanitation (version 2) and after sanitation (version 3).

Results and Discussion

The obtained results for version one – cleaning only with chemical solutions in the order to chose those with most efficacy are presented in table 2:

Table 2: The evolution of the number of the microorganisms depending on the initial contamination degree and the used solution

Micro organisms	Coliphorm bacteria					Total viable counts [N/cm^2]					Yeasts and moulds [N/cm^2]				
Working surface	M1	M2	M3	M4	M5	M1	M2	M3	M4	M5	M1	M2	M3	M4	M5
Control sample	P	P	P	P	P	15	11,85	7,25	9,4	12,3	7	5,5	3,7	4,6	6,2
S1 c1	A	A	A	A	A	0	0	0	0	0	0	0	0	0	0
S1 c2	A	A	A	A	A	0,3	0,2	0,1	0	0,1	0	0	0	0	0
S2 c1	A	A	A	A	A	0,2	0,1	0	0,05	0	0	0	0	0	0
S2 c2	A	A	A	A	A	0,5	0,25	0,15	0,1	0,2	0	0	0	0	0
S1	A					0					0				
S2	A					0					0				

A = absent
P = present

From table 2 we can observe that the values for microorganisms are in the imposed limits presented in table 1.before and after cleaning.

The solutions S_1 and S_2 with c_1 concentration have better efficacy that those with c_2 concentration.

For the solutions with c_1 concentration, the efficacy is better in the case of the S_1 solution.

Independent of the initial microbial contamination, after sanitation process, the coliphorm bacteria is taking out and the number of microorganisms is decreasing. The yeasts and moulds are taking out.

The experiment was continued with the expose at UV radiation, and the obtained results are showing in table 3. The efficacy solution is S2 at c1 concentration for cleaning and UV treatment. Repeating the hole testing procedure it was obtained the results from table 3, which is joining the sanitation versions 2 and 3.

Table 3: The evolution of the number of the microorganisms depending on the initial contamination degree and the sanitation method

Micro organisms	Coliphorm bacteria					Total viable counts [N/cm^2]					Yeasts and moulds [N/cm^2]				
Working surface	M1	M2	M3	M4	M5	M1	M2	M3	M4	M5	M1	M2	M3	M4	M5
Control sample	P	P	P	P	P	19	16,8	9,4	13	14,2	9	6,5	4,7	8,6	7,2
Ss c1	A	A	A	A	A	2	1,8	1	1,2	1,6	0	0	0	0	0
UV	A	A	A	A	A	0,9	0,6	0,1	0,4	0,7	1,9	1,3	0	0	1,7
S2 c1 + UV	A	A	A	A	A	0	0	0	0	0	0	0	0	0	0

A = absent
P = present

It can be observed that in the case of the very contaminated surfaces, to eliminate the microorganisms, the maximum efficacy is obtained by using a combination between the sanitation with S_2 solution in c_1 concentration and the UV radiation treatment. To eliminate the yeasts and moulds all versions are efficacy.

Conclusions

The identification and the monitoring of the microbiological contamination risks are based on the sanitation tests and in accordance with sampling and sanitation programmes that are applied in production areas.

Testing more proposed chemical substances for sanitation, it was demonstrated on the base of analysis that their efficacy is depending on the initial microbiological contamination and on the nature and concentration of the used chemical solution.

However, were adopted middle way solutions in order to achieve an optimal ratio between price and quality so that the costs for keeping a good hygiene in production areas not increasing too much, but in the same time not to affect the food safety.

It is recommended the chemical substances based on anionic and cationic surfactants (NEOSEPTAL FU) in 0.2% concentrations witch can be spraying on stainless tables without retentively and with good efficacy.

Based on the obtained results at the sanitation tests, for maximum efficacy in the sanitation process we can recommend utilization of the UV radiation after sanitation with the chemical substances based on anionic and cationic surfactants at 0.2% concentration.

References

*** The Manual of Quality, Environment and Food Safety– SC Lujerul SA

*** Procedures and the registration regarding quality, Environment and food safety – SC Lujerul SA

*** Tasting procedures specific for microbiology– SC Lujerul SA

*** STAS ISO 4832:1992 Microbiology. General guidance for establishing of coli forms – Colony count technique

*** SR ISO 7954 Microbiology. General guidance for the counting of yeasts and moulds – Colony count technique at 25^0C

*** STAS ISO 4833:2003 Microbiology of food and animal feeding stuffs. Horizontal method for the counting of microorganisms. Colony count technique at 30^0C