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THE DYNAMIC OF THE NUMBER OF COLIFORM BACTERIA IN WHITE CHEESE

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Abstract: The aim of this research is that the presence of coliform bacteria in cheese is characterized undesirable, because it can cause a variety of defects on quality of cheese. For this reason, it is very important for this bacteria to be destroyed or to prevent their appearance in a number during processing and during the cheese ripening in the brine. During the cheese making, in the milk prepared for making cheese the number of coliform bacteria shows a small decrease comparing with their number in the raw milk, which proves that the number of microorganisms is less after pasteurization. During the cheese ripening in the pickle the number of coliform bacteria has kept at 3.0×10^3 /g of cheese for the second repetition, but for the first and the third repetition they disappeared which avoided the danger of early blowing or appearance of any other defect.

Key words: milk, coliform bacteria, soft white cheese.

Introduction

White cheese is the traditional product on the whole Balkan peninsula, and the Serbian Republic too. The specific geographic and the climate conditions of Pcinja region, the particularity of technological operations are all connected with the white soft cheese characteristics. Microflora which is present in milk in certain number is not static during the cheese production; it is changing constantly. The causes of these changes are: the change of temperature, pH, the presence of microb's products etc. Every aspect of microorganisms is in dynamic balance with the other aspects and with its influence it gives its contribution to the final look of the cheese. The microflora's research of any cheese is of specific importance for the standardization of the cheese type.

Materials and Methods

White pickled cheese is the product of "Dairy Han" from Vladicin Han. Cow milk from the whole Pcinja region in the Republic of Serbia is used as raw material for producing the white soft cheese.

Microbiological and physical-chemical researches in a dairy are done on three special production processes in the production of white soft cheese, and done in tri repetitions with the milk of summer lactation, in the microbiological and physical-chemical laboratory which are in the dairy itself.

Samples for the microbiological analysis are taken sterile and left in the sterile glass dishes. The number of the coliform bacteria is determined due to classic cultural method, based on the number of colonies grown on the hard stratum. The researches of the coliform bacteria are done on the standard Torlak's substratum, endo agar-selective substratum for detection, isolation and counting fecal E. coli and the coliform bacteria in different materials.

Measuring of pH has been done by the digital pH-meter HANNAHI99161 FOOD CARE. Titra acid of the samples is determined due to the method Soxhlet-Henkel.

Results and Discussion

The presence of the coliform bacteria in cheese can cause some defects in organoleptic characteristic of cheese. The number of coliform bacteria in white soft cheese (Table 1) are considering on the whole group of coliform bacteria.

Table 1. The number of coliform bacteria (CFU/mL or g test) in particular phases of cheese making

TEST	I	II	III
Raw milk	3.8×10^6	3.2×10^5	1.9×10^6
Milk before cheese making	2.8×10^6	3.0×10^5	1.7×10^6
Whey	2.4×10^6	1.2×10^5	1.0×10^5
Coagulate before manipulation	5.8×10^7	2.5×10^5	2.1×10^6
Coagulate after pressing	6.1×10^6	2.3×10^6	2.5×10^6
Cheese after forming and salting	8.7×10^5	6.8×10^5	3.4×10^5
The first day of salting	3.95×10^7	1.1×10^5	2.9×10^5
The 10 day of brining	1.6×10^6	8.0×10^5	7.1×10^4
The 20 day of brining	6.0×10^5	2.8×10^4	1.2×10^5
The 30 day of brining	3.0×10^4	2.1×10^4	2.5×10^4
The 45 day of brining	/	3.0×10^3	/

In the raw cow milk from which white soft cheese is made, the number of coliform bacteria was high I varied from 3.2 x 10^5 CFU/mL to 3.8 x 10^6 CFU/mL (Table 1), which shows on the low degree of hygiene during the production of milk. The highest value of number of coliform bacteria in milk for producing white soft cheese is marked on the first repetition, and the lowest value on the third repetition.

Table 2 shows the values of active and titra acids during all the production phases of white soft cheese in three repetitions (I, II, III).

Table 2. pH and acidity in °SH in milk, cheeses during cheese making

TEST	I		II		III	
	pH	°SH	pH	°SH	pH	°SH
Raw milk	6.60	6.20	6.70	6.50	6.50	6.40
Milk before cheese making	6.67	6.00	6.73	6.40	6.47	6.68
Whey	6.60	4.00	6.64	3.60	6.46	3.38
Coagulate before manipulation	6.67	12.80	6.53	13.90	6.31	14.60
Coagulate after pressing	6.56	31.10	6.29	29.80	6.11	28.60
Cheese after forming and salting	5.83	76.80	5.93	68.60	5.98	59.20
The first day of salting	6.03	75.60	5.22	76.70	5.21	72.20
The 10 day of brining	5.03	74.00	4.78	73.80	4.81	68.80
The 20 day of brining	4.43	62.00	4.05	74.00	4.28	66.00
The 30 day of brining	4.29	55.60	4.13	59.50	4.25	63.80
The 45 day of brining	4.27	72.40	3.90	56.00	4.11	62.00

After termic treatment on milk at the moment of making cheese, it has been noted the decreasing of number of coliform bacteria 1.36 times at first repetition, 1.07 at second repetition and 1.12 times at third repetition, which approximately is 1.18 times.

After forming chafer, coliform bacteria in higher percentage stay in it.

The comparative analysis of whey and chafer show that with the whey 3.97%, 32.43% and 4.55% of coliform bacteria have been destroyed, while in chafer they stay 96.03%, 67.57% and 95.45% at first, second and third repetition, which means in the limits from 67.57% to 96.03%.

During the phase of self-pressing and pressing, the number of coliform bacteria is decreasing for the first repetition 9.5 times, and increasing 9.2 times and 1.19 times at second and third repetition. At the first repetition in this phase of cheese making, pH is decreasing for 0.11 units (Table 2), and at second and third repetition for 0.24 and 0.20 units (Table 2). For increasing the number of coliform bacteria at the second and third repetition, no matter on pH values, is responsible added pollution the pressed mass during the handle manipulation of employees.

In the phase of moulding and dry salting comparing with the phase of self-pressing and pressing, the number of coliform bacteria is decreasing at all the three repetitions in the limits from 3.38 to 7.35 times, and 6.99 times, 3.38 times and

7.35 times for all the three repetitions. So as reducing fact when the number of coliform bacteria is in question also mention *Zarate et al.(1997*). In this phase of production, pH se moving in the limits from 5.83 to 5.98, and titra acid is increasing for 38.36 ^{0}SH (Table 2), which also increases the quantity of milk acid.

After the phase of standing white soft cheese in pickle, the number of coliform bacteria at the first repetition has increased comparing with the start number 10.4 times. The increase of the number of coliform bacteria at the first repetition is probably the result of some added pollution of pickle which contains coliform bacteria, similar as the cheese. The number of coliform bacteria in cheese was 3.95 x 10^7 CFU/g, and in pickle 3.90 x 10^7 CFU/mL (Table 1).

Maximum increase of the number of coliform bacteria is marked at the second repetition on the tenth day of pickling. The increase of number of coliform bacteria at the second repetition on the tenth day of pickling is the result of additional pollution of cheese by handle manipulation of staff.

On the twentieth day of pickling the number of coliform bacteria is also representing the tendency of decreasing for the first and second repetition.

On the thirtieth day of pickling, the number of coliform bacteria is decreasing too. This statement is due to the researches of *Núñez et al. (1985*), that states that the pH values are lower than 5.0 to 5.2 necessary for the inhibition of this bacteria.

On the forty-fifth day of pickling at the first and third repetition, coliform bacteria completely die from cheese (Table 1), and at the second repetition, the number of coliform bacteria is decreasing, but the bacteria is still present in cheese with the number of 3.0 x 10^3 CFU/g (Table 1).

The disappearance of coliform bacteria from cheeses before the end of their ripening have also marked *Tornadijo et al. (1993*) in cheese Armada made of goat's milk and *Rodrígez et al. (1995*) in cheese Leon made of cow milk. In pickle, on the forty-fifth day of pickling, coliform bacteria disappear at the first repetition, they are present at the second repetition 1.2 x 10^6CFU/mL, and in the third repetition is counted 3.8 x 10^4 CFU/mL (Table 1).

This results are equal with the *Kakurinov (1997*). The author has stated the decrease of number of coliform bacteria during the ripening of kumanovo's bitten cheese in pickle and their disappearance from the cheese mass after thirty days of ripening.

Rašić (1961) has shown the fact that pH, as an inhibitive factor for the development of coliform bacteria in some cases didn't influence, which has caused the early puffing of cheese. To the same statement have come *Tornadijo et al. (2001*), styding the cheese San Simon. They have shown the weak influence of pH on the number of Enterobacteriaceae. This results are not matching with the results got in the "Han dairy".

The presence of enterococa, according to *Giraffa (2003)* during the ripening of cheese is thanks to their tolerance to the temperature from 10 to 45

degrees celzius, pH value from 4.0 to 9.0, and the tolerance to the specific concentration of salt 6.5%, too.

Conclusion

Due to all of the facts that are already stated, we can give the following conclusions:

The high number of coliform bacteria is marked in raw milk, which indicates the bad hygiene during the cheese production.

Salting the cheese is limitated fact for the development of the microorganisms.

During the cheese ripening in pickle, the number of coliform bacteria is rapidly decreasing. The biggest decrease of the number of microorganisms is matching with the biggest decrease of pH.

Until the forty-fifth day of ripening, the coliform bacteria disappear or rapidly decrease in cheese. On the decrease of number of coliform bacteria and their disappearance from cheese influence: the decrease of pH, the increase of the concentration of milk acid, the concentration of pickle and the ripening in pickle.

Dinamika broja koliformnih bakterija u belom siru

J. Stojiljković, V. Kakurinov

Rezime

Cilj rada je da prisustvo koliformnih bakterija u belom siru okarakteriše nepoželjnim s obzirom na to da mogu izazvati razne defekte i nedostatke kvaliteta sira. Iz tih razloga, veoma je važno da ove bakterije odumru ili da se spreči njihova pojava u većem broju pri izradi i zrenju sireva.

U toku proizvodnje belog mekog sira, u mleku pripremljenom za podsirivanje, broj koliformnih bakterija pokazuje izvesno smanjenje u odnosu na njihov broj u prijemnom mleku, što ukazuje da se pasterizacijom mleka smanjuje broj mikroorganizama. Tokom dalje proizvodnje, broj koliformnih bakterija svoj maksimum dostiže u fazi samopresovanja i presovanja, kalupljenja i soljenja. Tokom zrenja sira u salamuri, broj koliformnih bakterija počinje da se smanjuje, da bi se na kraju salamurenja zadržao na 3,0 x 10^3/g kod drugog ponavljanja, a kod prvog i trećeg one su odumrle, čime je izbegnuta opasnost od ranog naduvavanja sira i pojave raznih drugih defekata.

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