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COMPARATIVE STUDY OF ACIDIFYING ACTIVITY OF SOME STARTER CULTURES USED IN DAIRY INDUSTRY

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Abstract

Four starter cultures used in dairy industry were investigated in this study for their acidifying activity. Two of them are mesophilic cultures R-703 and R-708 and the other two are thermophilic cultures FRC-60 and FRC-75. These cultures were inoculated in sterile cow milk and incubated at 32°C (mesophilic cultures) and at 45°C (thermophilic cultures). The pH value was determined every 2 hours. The acidification profile of all cultures was similar, but the termophilic cultures produced a faster acidification (after 4 hours), than the mesophilic cultures (after 6 to 8 hours). After 10 hours of incubation the pH value of the medium for all studied cultures was stabilized around 4.5.

Key words*: starter cultures, thermophilic, mezophilic.*

INTRODUCTION

Starter culture used in dairy industry is defined as an active microbial preparation deliberately added to initiate desirable changes during preparation of fermented products (Hati S. 2016). A starter culture can provide particular characteristics in a more controlled and predicttable fermentation (Huttkins R. 2006). The primary function of lactic starters is the conversion of lactose to lactic acid, but other functions of starter cultures may include the following: flavour, and alcohol production, proteolytic and lipolytic activities and inhibition of undesirable organisms (Dobrea M. 2008, Hati S. 2016). The lactic acid is responsible for the texture development of fermented milk products and contributes to the overall flavour, enhancing preservation boundaries (Bhattacharay S. 2010, Dobrea M. 2008).

MATERIALS AND METHODS

Two kinds of lyophilised, multiple starter cultures, were used: mesophilic cultures R-703, R-708 and thermophilic cultures FRC-60 and FRC-75. The starter cultures were inoculated in cow's milk with 3.5% fat content (autoclaved at 120°C for 15 minutes). The inoculation rate was 0.1 UI/l milk. The incubation temperature was 32°C for mesophilic cultures and 42°C for thermophilic cultures, for 14 hours. The cultures were examined for purity, and every 2 hours samples for pH determination were taken.

RESULTS AND DISCUSSIONS

The examination for purity of starter cultures showed that all cultures were pure.

The bacterial composition of mesophilic cultures was as follows: *Lactococcus lactis subsp. lactis, Lactococcus lactis subsp. cremoris* and flavoring bacteria *Lactococcus lactis subspecia lactis biovar. diacetilactis* and *Leuconostoc mesenteroides subsp. cremoris.* The thermophilic cultures included streptococci (*Streptococcus thermophilus)* and lactobacilli *(Lactobacillus acidophilus, Lactobacillus helveticus and Lactobacillus delbrueckii subsp. bulgaricus).*

The results regarding pH values of mesophilic cultures were noted in table 1 and fig. 1.

After analyzing the acidification curve of R-703 starter culture results that in the first 4 hours of incubation at 32°C, pH decreased by 0.22 units. An intense decrease of this value was recorded after 6 hours (1.15), and 8 hours of incubation (1.95). After 10 hours of

incubation the pH value was stabilized at 4.5. The acidification curve of culture R-708 shows that in the first 4 hours of incubation at 32°C, pH decreased by 0.27 units. As in the case of culture R-703, a significant decrease of this value is recorded after 6 hours (1.45) and 8 hours of incubation (2.05). After 10 h of incubation the pH value was stabilized at 4.5. The pH values of thermophilic cultures are included in table 2 and fig.2.

Table 1. The pH values of mesophilic cultures (incubated at 32°C)

Determining number	Time (hours)	pH values R-703	pH values R-708
1	0	6.65	6.65
2	2	6.5	6.48
3	4	6.43	6.38
4	6	5.5	5.2
5	8	4.7	4.6
6	10	4.5	4.5
7	12	4.5	4.5
8	14	4.5	4.5

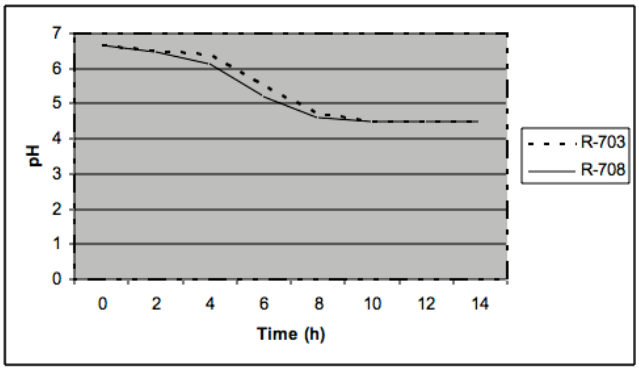

Fig.1. The dynamic of pH of mesophilic cultures

Table 2. The pH values of thermophilic cultures (incubated at 42°C)

Determining number	Timp (hours)	pH values FRC-60	pH values FRC-75
1	0	6.65	6.65
2	2	6.55	6.55
3	4	6.28	6.1
4	6	5.74	5.32
5	8	4.85	4.75
6	10	4.55	4.52
7	12	4.5	4.5
8	14	4.5	4.49

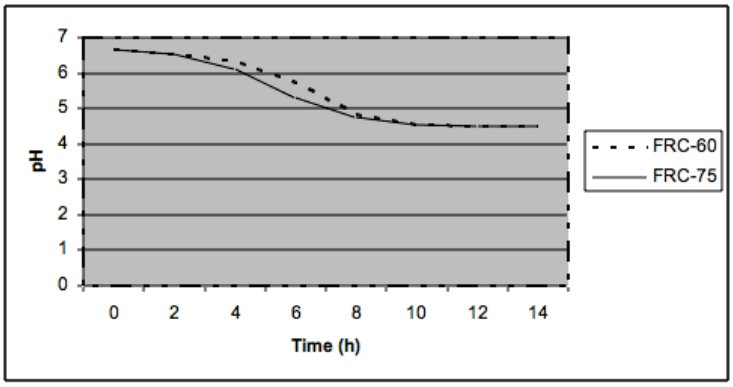

Fig. 2. The dynamic of pH of thermophilic cultures

Examining the acidification curve of culture FRC-60 it seemed that in the first 2 hours of incubation at 42°C, pH value decreased by 0.1 units. A stronger decline of this value is recorded after 4 hours (0.37), 6 hours (0.91) and 8 hours of incubation (1.80).

The acidification curve of culture FRC-75 showed that in the first 2 hours of incubation at 42°C, pH value decreased by 0.1 units. An intense decrease of this value was recorded after 4h (0.55), 6h (1.33) and 8 hours of incubation (1.9). After 12 hours pH value was stabilized to 4.5 for both thermophilic cultures.

Examination of acidification curves of starter cultures R 703, R-708, FRC-60 and FRC-75 showed that the fermentative profile of those four cultures is similar. However, if for the mesophilic starter cultures R 703 and R-708 the most significant changes in pH values were recorded after 6 and 8 hours of incubation at 32ºC, in the case of thermophilic starter cultures, after 4 hours of incubation at 42ºC, we found significant pH decreases, which continued up to 10 hours of incubation.

pH values remained constant to 4.5 after 10h of incubation of mesophilic cultures and 12 hours in case of thermophilic cultures.

CONCLUSIONS

All starter cultures showed a lower acidify-cation during the first 2 hours of incubation.

The most important decreasing of pH values were recorded after 6 and 8 hours of incubation for mesophilic starter cultures R-703 and R-708, whereas thermophilic cultures have induced significant acidification after 4 hours and continued to decline the pH up to 8 hours of incubation.

3. The constant pH value of 4.5 was reached after 10 hours of incubation for the mesophilic cultures and after 12 hours of incubation for the thermophilic cultures.

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