STUDY OF FERMENTATIVE PROCESS OPTIMIZATION FOR OBTAINING FERMENTED CHEESE

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Abstract

Cheeses, as a result of applied biotechnology are some of the most complex and dynamic food, each piece can be considered a bioreactor in which occur numerous and complicated reactions, which have as final product with specific sensory characteristics. In this context, studies on optimization of fermentation fermented cheese

Keywords: enzymes, starter cultures, fermented cheese, fermentative process

INTRODUCTION

Cheeses plays an important role in human nutrition. They represent an important source of nutrients, with high biological value, concentrated in a small volume and high digestibility (Banu C., 2002).

Cheeses are some of the foods most complex and dynamic due to high nutritional value, a good digestibility and the pleasure which creates their consumption (Costin, 2003).

These are products obtained by coagulation of integral milk or cream, followed by processing curd as cheese and its maturation a fixed time (depending on the type of cheeses), under certain conditions of temperature and humidity (Chintescu G, 2001).

Cheese maturation is one of the most complex phenomena of biochemistry and biotechnology. During maturation, white coagulator, tasteless and hard to digest is turned into a product with a certain consistency, structure and characteristic properties of taste, smell and color, specific for each type of cheese. Changes that occur during maturation process are influenced by the main components of milk lactose, protein and fat (Lich. L.B., 2000).

MATERIALS AND METHOD

To achieve the proposed objectives were used selected cultures of lactic acid bacteria in which there have been several trials studying the influence on the type of crop maturation process of milk and coagulation of fermented cheese. Were used different types of cultures of microorganisms selected with different enzymatic compositions, sources of obtaining and commercial names (Table 1).

Table 1

Characterization of different types of microorganisms selected

Nr. crt	Name	Description
1.	*Lactobacillus delbrueckii spp bulgaticus* (Lb –12)	*Lactobacillus delbrueckii ssp bulgaricus* Culture can be used alone in Italian type cheese manufacture or in combination with other cultures: ex. *St. thermophilus*
2.	*Streptococcus Thermophilus* TH-4	*Streptococcus thermophilus* Culture can be used alone in Italian type cheese manufacture or in combination with other cultures: ex. *Lactobacillus delbrueckii ssp bulgaricus*
3.	Ezal TM 080	*Streptococcus thermophilus* *Lactobacillus delbrueckii ssp bulgaricus* Culture can be used alone in Italian type cheese manufacture
4.	Ezal TM 070	*Streptococcus thermophilus* Culture can be used alone in Italian type cheese manufacture or in combination with other cultures
5.	TTC-4	*Streptococcus thermophilus* *Lactobacillus delbrueckii ssp bulgaricus* Culture can be used alone in Italian type cheese manufacture or in combination with other cultures

To establish the coagulating enzyme used, with optimal effect on production of BF from milk cows have been made several tests with different types of coagulating enzymes, studying their influence on the coagulation process. For this purpose have been used different types of clot, with different characteristics and trade names (Table 2).

Table 2

Characteristics of different types of coagulating enzymes

Nr. crt.	Commercial name	Obtaining source
1.	Chymosin / (Stabo)	Calf stomach
2.	Maxiren (Protease from yeast)	*Kluyveromyces lactis*
3.	Chymogen (Chy-max) (Fungal Protease)	*Aspergillus niger* *var awamori*
4.	Fromase TL (Fungal Protease)	*Rhizomucor miehei*

Determinations concerning activity of different cultures of microorganisms on the process of coagulation was achieved by usual laboratory methods and techniques according to standards in current (Bals C., 2009).

RESULTS AND DISSCUTIONS

Regarding activity of starter cultures used, tests were performed to highlight their influence on coagulation time according to the temperature of the milk. These tests were performed comparative on the same type of milk to each variant.

The first indicator that can influence the activity of micro-organism cultures is the temperature (pH). Sensitivity to temperature being different, to ensure optimum activity have been used different temperatures, depending on the type of used culture. Was used buffalo milk with the following characteristics: non-fat dry matter = 9.5% total dry matter = 15%, fat = 5.5%. Milk pasteurization was made at 68˚C with retention of 30 minutes.

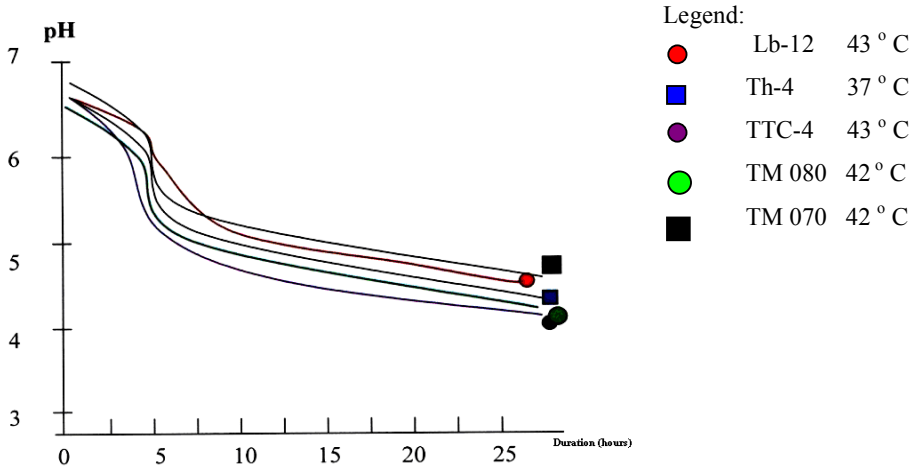

Fig. 1. Evolution of milk pH from selected cultural activities

From the data obtained is established that microorganisms operating at temperatures of 42-43˚C have a pH curve more abrupt compared to those operating temperatures of 37˚C. From study conducted it was concluded that the best results were obtained with selected culture that includes in its composition Streptococcus thermophilus and Lactobacillus delbrueckii spp bulgaricus.

The second parameter analyzes the influence of coagulant enzymes on milk clotting time. For this were used the following concentrations of enzyme expressed as (1 / E), as shown in Figure 2.

From the data presented can be seen that all four types of clot have coagulation speeds comparable in both unpasteurized milk and pasteurized milk. Differences in their behavior are minor for the concentration of identical enzyme.

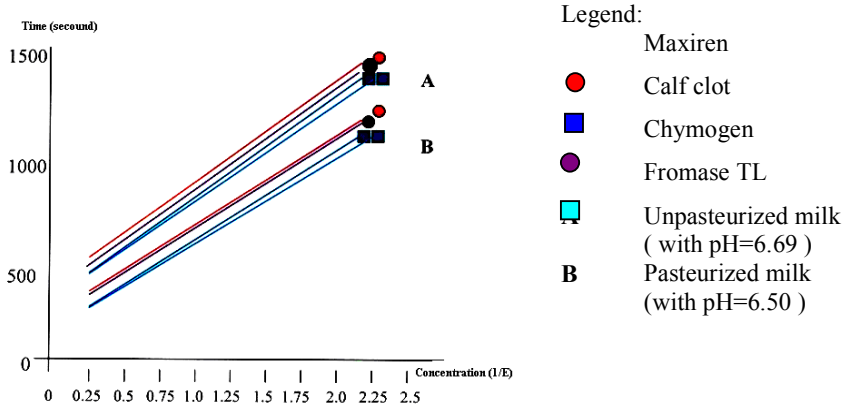

Fig. 2. Effect of coagulant enzymes of the clotting time

As regards the influence of milk temperature on clotting activity for all types of coagulating enzyme used is the same temperature sensitivity. Optimum activity is reached at 42.5^{0}C when using unpasteurized milk pH = 6.6 and 45^{0}C when using pasteurized milk with pH = 6.50. The enzymes are inactivated over temperature 55^{0}C and fewer than 15^{0}C the activity is very slow or absent. Curves show relative activity of clot at different temperatures, the value of 100% being attributed to a temperature of 35°C.

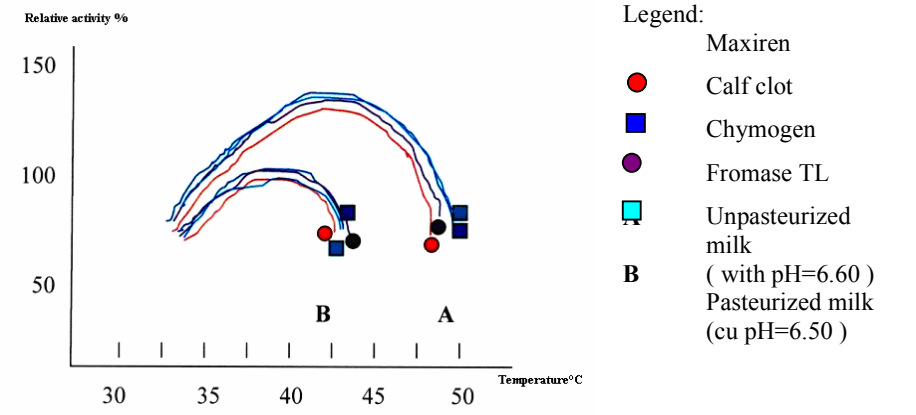

Fig. 3. The effect of milk temperature on the activity of clot

From the data presented is observed that all four types of clot have the same relative activity for both unpasteurized milk and pasteurized milk. Differences in regard to their behavior are minor when working under the same conditions of temperature and pH.

Regarding the effect of pH milk on the duration of clotting was examined the clot activity measuring the duration of coagulation at different pH values for the same type of milk. Different value of pH was made with starter cultures that were allowed to act more or less time, until the desired value.

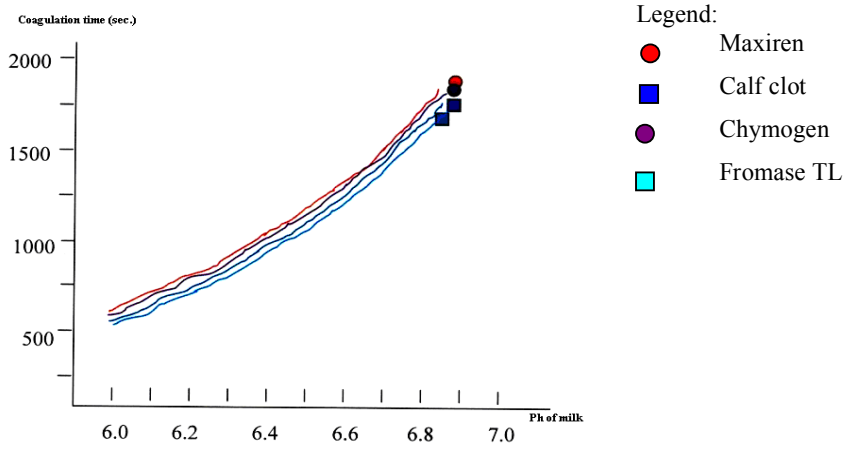

Fig. 4. Effect of pH on coagulation duration

From the data presented can be seen that all four types of clot have the same behavior depending on the pH of milk. Differences in regard to their behavior are minor.

CONCLUSIONS

From the data presented it was found that the evolution of the two types of microorganisms during the technological process is different, Streptococcus termophilus having more intensive development compared to Lactobacillus delbrueckii spp bulgaricus. However, each type of microorganism from selected pure culture contributes to the quality of final product. By using these pure cultures, with physiological and biochemical properties well-defined, it ensures the elicitation of a product with controlled flora and reproducible microbiological stability.

From the analysis of physico-chemical parameters evolution during maturation was noticed a normal evolution of fermented cheese during maturation respectively the acidity has at the beginning of the technological process upward trend, until after scalding when the acidity start to fall in the first weeks, so that at the end of maturation to increase slightly, the pH has an appropriate development, following the pattern of acidity, water content

has a decreasing trend, throughout maturation until the product is introduced in foil, moment in which loss of moisture disappears, the fat content has a jump after scalding and then remains constant.

Through the study conducted it was found that in the technological process for the manufacture of fermented cheese can be conducted the activity of microorganisms and the activity of coagulant enzymes in order to obtain maximum efficiency from both qualitatively and quantitatively.

REFERENCES

1. Balș Cristina (2009) - Ghid practic în tehnologia procesării și aprecierii producțiilor zootehnice, Ed. Universității din Oradea;
2. Banu C. (2002) – Manualul inginerului de industrie alimentară, vol II Ed Tehnică, Bucureşti;
3. Chintescu G, Toma A (2001) - Fabricarea brânzeturilor, Editura Negru Vodă, Făgăraş-Brasov,;
4. Costin, G. M. (2003) – Știința și ingineria fabricării brânzeturilor, Editura ACADEMICA, Galați;
5. Florea T, Leonte M (1998) - Chimia alimentelor, vol 1, Ed Pax Aura Mundi, Galați;
6. Lich. L.B. (2000) - Animal production in Vietnam in the past and development direction forward year 2000, National seminar on animal science and development to year 2000
7. Popovici I (1999) - Buffalo population and production in Romania, MAA;
8. Stănciuc N., G. Rotaru, 2008, Managementul siguranței alimentului. *Editura ACADEMICA, Galați*;