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Development of the First Component for The New "Yogric" Product

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ABSTRACT

Parallel to the increase of dairy products consumption, the demand for lactose-free product ranges also grows up. The latter possess all the health benefits peculiar to milk and prevent digestive problems. Our research aims to obtain the first component of lactose-free bicomponent product Yogric, which is the mixture of yogurt and ricotta. For this purpose, we have identified the necessary starter culture, which should be used to get yogurt with the necessary properties. The dose of Ha-Lactase 5200 has been determined, which would reduce the lactose content in yogurt to less than 0.1 %, so that to consider it as a lactose-free product.

Introduction

The number of lactose-free products is growing rapidly. This is not surprising, because according to experts, 65 % of the world's population suffer from lactose intolerance. Numerous innovations are manufactured worldwide per all ranges of dairy products. The main focus is on dairy yogurt, but it is rapidly transpassing to other dairy products such as cream cheese and mozzarella. Analysts of the branch industry predict about 10 % annual growth of lactose-free cheese in the global market by 2023. Loyal consumers of lactose-free products are ready to buy them at a premium price, and in some cases pay twice as much as regular products. Thus, the development and production of lactose-free products is well justified (www.chr-hansen.com).

All over the world, a group of consumers with similar needs stands out – "Generation Millennials" or "Generation Y" – people born between 1980 and 2000. They consider yogurt to be a natural, tasty and healthy product that serves as an excellent fast food. These are representatives of different cultures who are actively looking for new experiences. They are happy to try new dishes and foods with unfamiliar tastes, as they do not mind eating several times a day, preferring natural and healthy alternatives to sweets. Health benefits and ease of use are the prerequisites on which the consumer relies when choosing a product (www.chr-hansen.com).

Materials and methods

These research activities were carried out with the support of Innovative Agriculture Training and Learning Camp (AGRI CAMP) Program which is financed by The United States Agency for International Development (USAID) and implemented by International Center for Agribusiness Research and Education (ICARE). The contents are the responsibility of author/s and do not necessarily reflect

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Experimental yogurts were prepared from reconstituted milk with 3.2 % fat content, fat-free dry matters – 8.2 %, density – 1027 kg/m^3, titratable acidity – not higher than 21^{0}T. Reconstituted milk is stored for 9...12 hours at 6...8 ^{0}C for hydration, pasteurized for 3...5 minutes at 90...95 ^{0}C and cooled to a coagulation temperature of 44 ^{0}C. A freeze-dried, frozen culture and lactase enzyme was added at coagulation temperature, then mixed for 10 minutes to distribute culture and enzyme evenly. The dose of culture is 100 units per 250 liters of milk. Coagulation was carried out by the thermostatic method to obtain dense coagulation without the presence of syneresis at *pH = 4.5...4.6*. Ready yogurt was transferred to the refrigerator at a temperature of 4...5 ^{0}C. The studies were carried out 12 hours after placing the yogurt in the refrigerator (Tamime and Robinson, 2003).

Pre-selected yogurts with five bacterial cultures were produced from the Danish organization Christian Hansen. The organoleptic and physicochemical parameters of the latter were studied. Yogurt cultures consist of symbiotic combinations of strains of Lactobacillus delbrueckii subsp, Bulgaricus and Streptococcus thermophilus. Among these yoghurts the one, which complied with the requirements of the processed product has been singled out (Tetra Pak Processing Systems AB, 2003). Based on the latter, the technology of lactose-free products using the lactase enzyme was developed. For the preparation of lactose-free yogurt, heat-resistant lactase Ha-Lactase 5200 NLU was used as the main ingredient in the processed product. Ha-Lactase 5200 is an ultrapure standardized liquid β-galactosidase (lactase). The enzyme lactase was introduced into the experimental yogurt with the doses of 0.16; 0.32; 0.48; 0.64 and 0.80 ml/l. The lactose balance in yogurt was determined using the LACTOSENS R test (www.chr-hansen.com).

The organoleptic evaluation of the experimental yogurt was carried out according to the Chr. Hansen protocol (www.youtube.com). The rate of coagulation and post-acidification of yogurt was determined with standard methods (Aghababyan, et al., 1988).

Results and discussions

The aim of the current research is to study the technology of a new fermented milk product. Our goal is to get a superfood from yogurt and ricotta. Due to the special technology, the new product will not contain lactose and can be useful for lactose intolerant people, as well as children and athletes. Besides, compared to lactose, the sweet taste of galactose and glucose increases the sweetness to the product.

The first component of the new Yogrik product being developed is yogurt. For the production of yogurt, we have developed 5 samples using freeze-dried and frozen cultures: YF-L811, Express 1, Speed 1, Premium 6, YC-X16. The choice of culture affects the characteristics of the final product, such as flavor, acidity, texture and appearance. The results of organoleptic evaluation of experimental yogurts, as well as the determination of the dynamics of fermentation and post-acidification are shown in Figures 1, 2.

Figure 1. Sensory evaluation of the tested yogurt *(composed by the authors).*

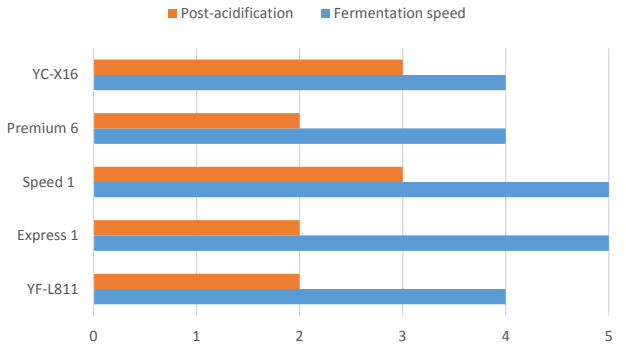

Figure 2. Technological evaluation of the tested yogurt *(composed by the authors).*

It is intended to get a low syneresis yogurt with a high gel firmness, low ropiness, pleasant but not sharp taste and aroma. It is very important that the experimental yogurt should have a low rate of post-acidification and a medium fermentation speed. As the results of figures 1 and 2 show, the most suitable product type under development is the yogurt, which is produced via Premium 6 culture.

For lactose-free products, the minimum residual lactose level is 0. 1%. Therefore, as a result of fermentation, we should get yogurt with the similar lactose level. To this end, different doses of the lactase enzyme were added to milk, and after 24 hours the residual lactose content was determined. The results of the study are shown in Figure 3.

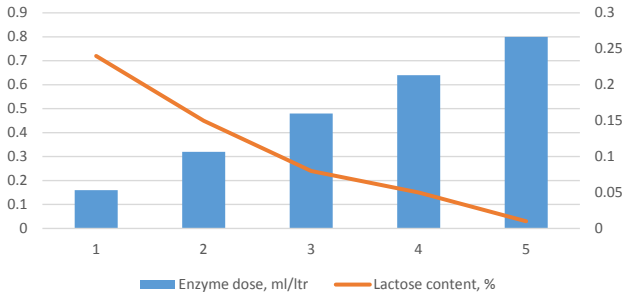

Figure 3. Lactose content in experimental yogurt in case of adding various doses of lactase enzyme to milk *(composed by the authors).*

According to the results of the conducted study on residual lactose content, it can be concluded that in order to reduce the lactose content in yogurt to less than 0.1 %, it is necessary to add enzyme Ha-Lactase 5200 at least 0.48 ml per liter of milk (for this composition).

Conclusion

The results of the research enabled to develop a technology for the preparation of lactose-free yogurt, which should be the first component of the new Yogric product. Studies have shown that Premium 6 yogurt culture suites best for the product under development. To reduce the lactose content of yogurt to less than 0.1 %, at least 0.48 ml of the lactase enzyme Ha-Lactase 5200 per liter of milk should be added.

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