

Optimizing of Kefir Type Formulation and Evaluating its Quality during Shelf Life

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Abstract. Throughout the world there is a huge variety of fermented milks made by mesophilic fermentation. Kefir products are such type of fermented product. The typical flavor of kefir is developed by the yeast strains in particular. Brewer's yeast is a rich source of B-vitamins, minerals and amino acids and in this study we report that it can be used for milk's inoculation in co-cultivation with a mesophilic lactic culture. The quality of the kefir type product was evaluated by establishing the pH, acidity, syneresis and some of the sensory characteristics (taste, texture and mouth-feel) during the storage period in different time intervals, respectively after 24h, 7 days, 14 days and 21 days.

Keywords: kefir, brewer's yeast, quality parameters, shelf life.

INTRODUCTION

Kefir is typical fermented milk consumed all around the world. This "biotechnological" food is considered by nutritionists as having high nutritional value and positive bioactive effects due to some of its components like: organic acids, ethanol, acetaldehyde, carbon dioxide and probiotic bacteria (Farnworth, 2005). Kefir and products manufactured similar to kefir is an important part of the fermented milks market. Thousands of consumers eat and drink kefir and kefir type products every day. As regards the composition of kefir there may exist some legal, national or international, demands to kefir. It may be with regards to strain composition, strain origin, cfu/g. According to the literature and history, kefir has many health beneficial effects. It is said to have a positive effect on e.g. cataract, digestion, and lactose intolerance, to mention a few. Today's modern technologies have made it to produce DVS cultures consisting of the same strain families as the ones found in some kefir grains (Beshkova, 2002). Based on many years of experience it was developed a range of thermophilic and mesophilic lactic acid bacteria cultures in Direct Vat Set (DVS) form that can be combined and used for kefir products. Today's consumers demand a variety of dairy products with consistent flavor and mouthfeel and longer shelf life.

Yeast cells have long contributed to the nutritional value of fermented foods, like breads and beers. In some societies, "cloudy" beers make a major contribution to daily nutritional needs. The cloudy sediment of yeast cells provides essential B-vitamins, minerals and amino acids. And during the middle ages, infants were often fed the sediment from cloudy beer to keep them healthy and avoid nutritional deficiencies. Yeasts are a good source of protein or amino acids. Approximately 40% of the weight of dried yeast consists of protein. The quality of yeast protein is excellent for a vegetable protein and it is about equivalent in quality to soybean protein. Both are rich in lysine, and are excellent supplements to cereals, whose proteins are generally low in lysine. As with other plant proteins, yeast protein is low in the sulfur amino acids, but supplementing dried yeast with 0.5% methionine can raise its protein quality up to that of casein (Segal, 1989). However, there is a limit to how much yeast

can be fed, because about 20% of the crude protein nitrogen in yeast is in the form of nucleic acids. Nucleic acids can cause problems if over fed, because excessive nucleic acid intake results in elevated uric acid levels in the blood. High levels of uric acid tend to crystallize in the joints and this can cause gout and arthritis or even renal stones. While the nutritional value of yeast was recognized early, the identification of the nutritional factors which cured certain nutritional diseases did not take place until the early 20th century. That was when the B-vitamins were discovered. Several of these vitamins were first extracted and characterized from yeast, including biotin, niacin, pantothenic acid, and thiamin. Yeast has long been recognized as a rich source of natural B-vitamins. The gross composition of yeast biomass is: moisture 2-5%, crude protein 50-52%, true protein 42-46%, nucleic acids 6-8%, minerals 7-8%, lipids 4-7%, carbohydrates 30-37%. (Koroleva, 1992)

The objective of this study was to optimize the kefir type formulation- produced using starter cultures and brewer's yeast and evaluate its quality during shelf life.

MATERIALS AND METHODS

Kefir preparation: Pasteurized skimmed cow milk (milk fat 1,8%, protein 3,5% and pH=6,6-6,7) was used for kefir preparation. Milk was heated to 90-95°C for 5 min and then rapidly cooled to 30 °C. Starter culture containing *Lactococcus lactis* subsp. *lactis*, *Lactococcus lactis* subsp. *cremoris*, *Lactococcus lactis* subsp. *lactis*, biovar *diacetylactis*, *Leuconostoc mesenteroides* subsp. *cremoris* was added. Also it was added a yeast's suspension, drawn from beer's second fermentation. Brewer's yeast *Saccharomyces cerevisiae*, was prepared for inoculation in milk, by centrifugation. 1 litre of milk was inoculated with 1 ml starter culture (10^9 cfu/ ml) and 0.5 ml brewer's yeast (10^6 cfu/ ml). Cooling of the kefir commences directly after the desired acidity is reached at pH= 4.6-4.5. The kefir product was stored in a refrigerator at 4 °C (Kwak, 1996, Fontan, 2006).

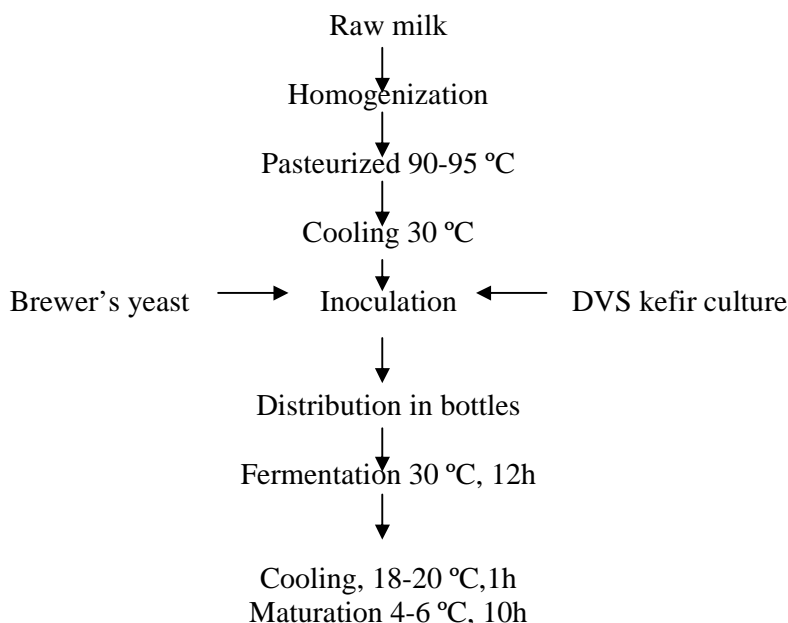


Fig. 1 Flow chart for kefir type production

Analysis: The samples were analyzed in duplicate for pH, acidity, syneresis during the storage period in different time intervals, respectively after 24h, 7 days, 14 days and 21 days(Irigoyen,2005)

The pH was measured with a pH-meter from Hanna-Instruments. Acidity was titrated by M/10 NaOH solution and expressed in terms of g/l lactic acid.

Degree of syneresis, expressed as a proportion of free whey, was measured by following method: 10 gram of sample was placed on a filter paper resting on the top of a funnel; after 10 min of drainage in vacuum condition, the quantity of remained kefir was weighted and syneresis was calculated as follow:

$$\text{Free whey (g/100g)} = [M_1 - M_2 / M_1] * 100$$

Where: M_1 - weigh of initial sample,g

M_2 - weigh of sample after filtration,g

Also a sensory evaluation was done (Drake, 2007); the taste, mouth-feel and texture were evaluated by a untrained panel of 5 members using a five-point score system (5 excellent, 1 unacceptable).

RESULTS AND DISCUSSION

During storage time from first day to 21th, some of quality parameters were changed as follow:

- ◆ pH: as shown in Fig.2, pH values increased in the first period of shelf life and reached the maximum in the 7th day; from this stage, the pH values decreased by passing time during storage. Microorganism's activity caused pH decrease, yeasts probably used sugar and organic acids and so pH value decreased.

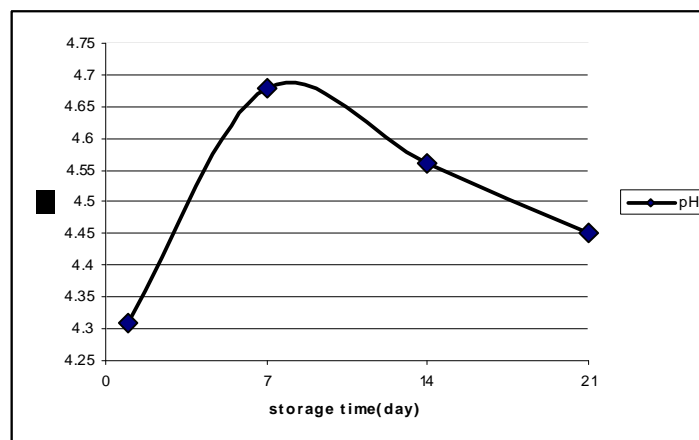


Fig. 2. pH value during storage time

- ◆ Acidity, expressed in g/l lactic acid, increased until 7th day of shelf life but decreased in remained period (Fig. 3)

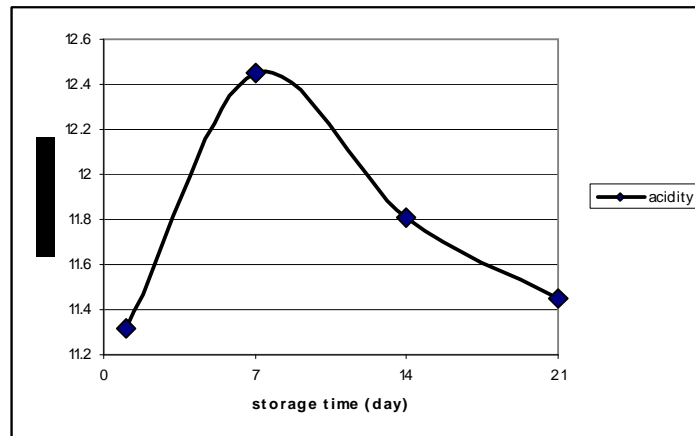


Fig. 3. Acidity value during storage time

- ◆ Syneresis' values in the whole period of the shelf life was constant and it was not observed any strong liquid elimination (Fig.4)

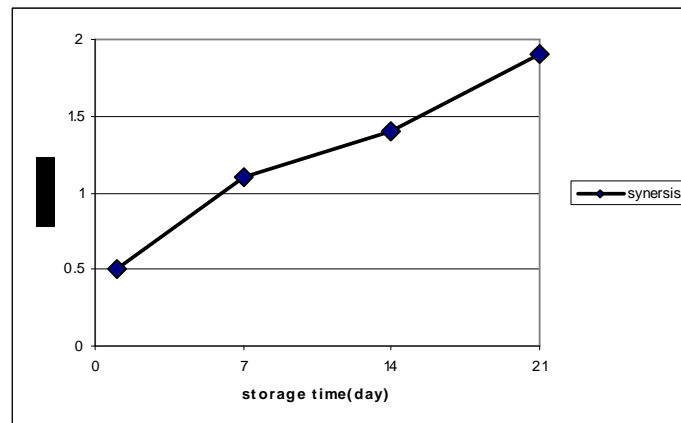


Fig. 4. Syneresis value during storage

- ◆ Taste's score didn't have special trend ; the highest scores was obtained for the 7th and the 14th days.Pannelists didn't reported that the yeasty taste was unpleasent (Fig.5)
- ◆ Texture's score increased by the 7th day of storage and reached a value in the vicinity of maximum (excellent) but from this stage texture's score decreased to 4 point (good).(Fig. 6)
- ◆ Mouth-feel's score was the highest at first day of storage; for this stage the score decreased, probably due to the brewer's yeast presence.(Fig. 7)

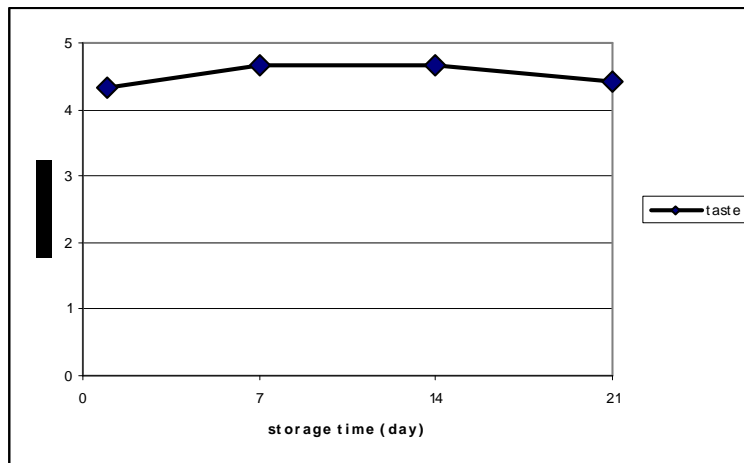


Fig. 5 Taste value during storage

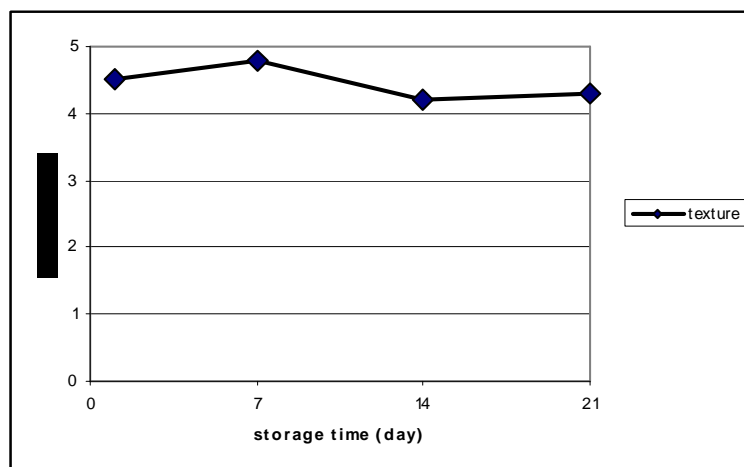


Fig. 6 Texture value during storage

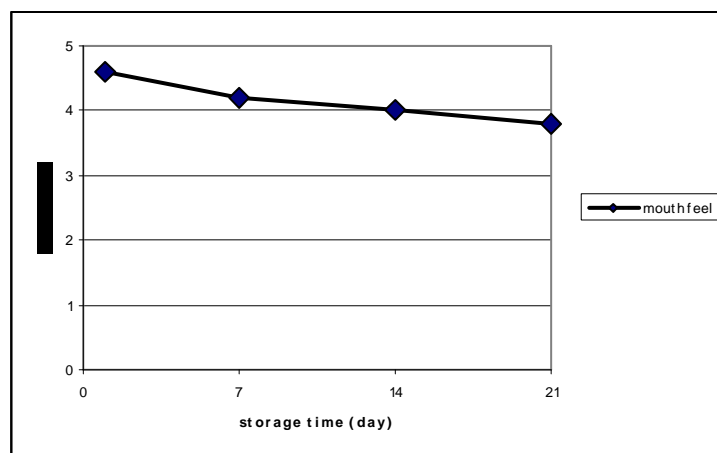


Fig. 7 Mouth-feel value during storage

CONCLUSIONS

It was obtained a kefir type product by co-cultivation of a lactic starter culture and brewer's yeast on milk base. By evaluating some of the quality parameters during the shelf life of the product, it was observed that pH and acidity increased in the first period but decreased in the remained period. Syneresis was constant in whole period. Sensory evaluation demonstrated a good acceptability of the kefir type product.

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