RESEARCH PAPER | Dairy Technology | Volume : 6 | Issue : 1 | JANUARY 2016 | ISSN - 2249-555X

USE OF ESSENTIAL OILS IN DAIRY PRODUCTS. ESSENTIAL OIL OF BASIL (*Ocimum basilicum L.*)

KEYWORDS: dairy products, titratable acidity, syneresis, lactic acid bacteria

Iliana Kostova
Ruse University „A. Kanchev", Branch-Razgrad, 47 Aprilsko Vastanie Blvd., 7200 Razgrad,

Stanka Damyanova
Ruse University „A. Kanchev", Branch-Razgrad, 47 Aprilsko Vastanie Blvd., 7200 Razgrad,

Nastya Ivanova
Ruse University „A. Kanchev", Branch-Razgrad, 47 Aprilsko Vastanie Blvd., 7200 Razgrad,

Albena Stoyanova
University of food technologies – Plovdiv, 26 Maritsa Bvd., 4000 Plovdiv, Bulgaria,

Mihaela Ivanova
University of food technologies – Plovdiv, 26 Maritsa Bvd., 4000 Plovdiv, Bulgaria,

Radka Vlaseva
University of food technologies – Plovdiv, 26 Maritsa Bvd., 4000 Plovdiv, Bulgaria,

ABSTRACT *There are dairy products that were developed with an enriched composition through the addition of limseeds, sesameseeds, out flakes, honey, and essential oil of basil (Ocimum basilicum L.).*

The effect of the additives on the process of the acidifying, syneresis, and the development of lactic acid bacteria was researched. It was found that they are good for the lactic acid process. The prepared products have very good organoleptic properties and can be successfully used for the purposes of functional food.

Introduction

The use of essential oils in food products rouses growing interest given their antagonistic effect against pathogenic microorganisms and those causing food spoilage and their known therapeutic properties (for instance diuretics, anti-inflammatory, antiseptic, carminative, antispasmodic, and tonic). The application of essential oils in lactic acid products increases their nutritional value, organoleptic and health qualities (Admirdivani & Baba, 2011, Petrovski & Stoyanov, 2005, Rattanachaikunsopon & Phumkhachorn, 2010, Thabet et al., 2014, Unnithan et al.q 2013). These foods are considered to be functional because they improve the functions of important systems in the human body (digestive, cardiovascular, immune) improve health status and / or reduce the health risk of disease (Betored et al., 2011, Cardarelli et al., 2007, Kajiwara et al, 2002, Panesar et al., 2011, Roberfroid, 2002).

In our previous work (Damyanova et al., 2011) were prepared and examined dairy products containing linseed and sesame seeds, oat flakes and honey. It has been found that the products have the properties of functional food and the additives effect positively on the development of lactic acid bacteria and on the dynamics of acid formation in the milk, the coagulation and the synaeresis.

In our other studies (Kostova et al., 2014) we found that the essential oil of basil is characterized by high antimicrobial activity but does not inhibit the development of the lactic acid bacteria in dairy starter cultures.

The purpose of this work is to develop and examine a dairy product with an enriched composition by adding linseed, sesame seeds, oat flakes, honey and basil oil.

Material and methods

The studies were conducted in laboratory conditions with cow milk which is obtained from Razgrad region, northeastern Bulgaria.

The physicochemical parameters of raw milk (fat, solids-nonfat (SNF), density, added water, protein) were determined by the milkanalyzer EKOMILK Company BULTEH 2000.

The microbiological parameters of the raw and pasteurized milk were tested by conventional methods (Slavchev et al., 2003).

The fermented milk product with set coagulum (control) was prepared by a classical technology with the symbiotic starter culture of the strains *Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus thermophilus* purchased by the company Selur Pharma Ltd. (Dimitrov et al., 2008).

The studied samples (№ 1 to 3) were prepared by adding: oat flakes (6%), linseed (4%), sesame seed (2%) and honey (4%) (№ 1); basil oil (№ 2); the combination of the ingredients of the first and second examined samples (№ 3).

The used additives were purchased from the market, the essential oil of basil is provided by the company Vigalex LTD. The amount of the oil is 0,8 mg/kg of final product, which is consistent with the known literary data and our previous studies (Georgiev & Stoyanova, 2006, Kostova et al., 2014).

The prepared dairy products were analyzed on chemical, microbiological and organoleptic characteristics:

- The dynamics of the lactic acid process was monitored by the determination of the titratable acidity (°T) (Dim-

Volume : 6 | Issue : 1 | JANUARY 2016 | ISSN - 2249-555X

itrov et al., 2008, Slavchev et al., 2003).

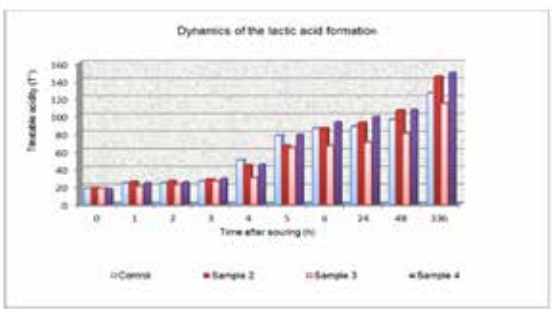
- Microbiological Research - total number of viable lactic acid bacteria - *Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus thermophilus* were carried out by growing of the synthetic medium M17 and MRS (Merck) methodology of IDF (IDF-Standard 122C: 1996, IDF-Standard 149A: 1997).
- The organoleptic assessment of the lactic acid products is carried out according to BNS 15612-83.

Results and discussion

The used milk for the experimental work meets the requirements of raw cow milk (Commission Regulation (EC) No853/2004, Regulation № 4 the Ministry of Agriculture and Food, 2008).

The dynamics of the lactic acid process and the acid formation of the tested samples are traced.

Figure 1. Dynamics of the lactic acid formation



The data in Fig. 1 shows that in all four samples the titratable acidity is increased as a result of the metabolism of lactic acid bacteria. More active lactic acid process was found in the samples with additives and when they are combined with basil oil. In these samples the tendency to increase the acidity was maintained until the end of the study period, as the 336th hour (14 days of the storage) the titratable acidity was higher than the control. The acid formation was slowed in the samples with the added essential oil but the accounted values of the titratable acidity were within acceptable values.

Figure 2. Syneresis of the fermented milk products

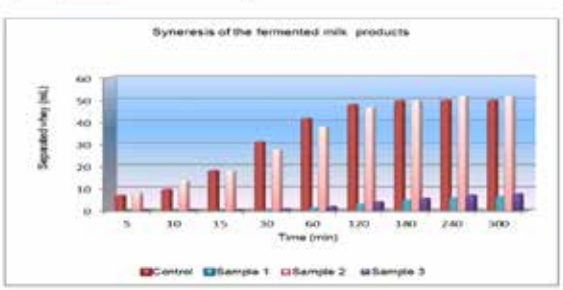
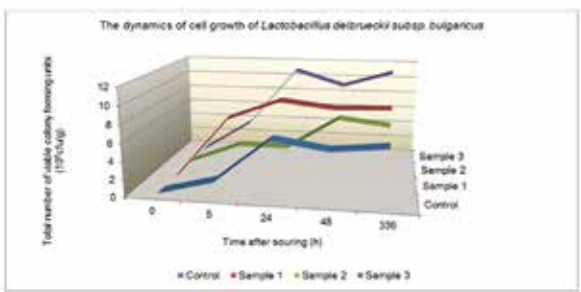


Figure 2 presents the results for the values of the syneresis of the prepared dairy products. This rheological parameter was one of the criteria for the quality of the lactic acid products. Lower values of the syneresis were associated with more stable and set coagulum. It can be seen that the amount of the separated whey is greatest at the control (50 mL for 5 hours) and the samples with the essential oil of basil (51,6 mL for 5 hours). The least amount of whey was divided at the lactic acid products (№1) with added oat flakes, linseed, sesame seed, honey (6,5 mL to 5 hours) and when they were combined with the essential oil (sample №3) (7.8 mL for 5 hours). Obviously, the oat flakes and seeds reduce the aqueous phase of the milk, which was confirmed by other studies (Damyanova et al., 2011). Probably this is due to the natural soluble fibers contained in these components and have the ability to absorb the water, as typical hydrocolloids.

The effect of the additives on the development of the lactic acid bacteria *Lactobacillus delbrueckii* subsp. *bulgaricus* and *Streptococcus thermophilus* in the tested products are shown in figures 3 and 4.

Figure 3. The dynamics of cell growth of *Lactobacillus delbrueckii subsp. bulgaricus*

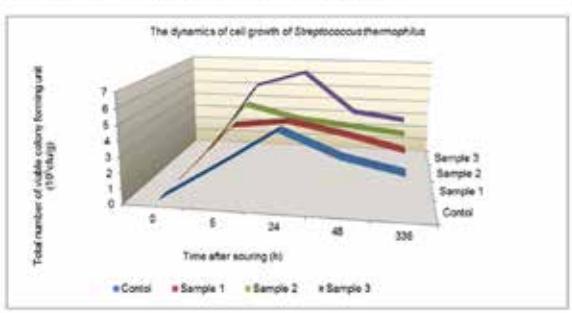


From the obtained data it is obvious that with the exception of the dairy product with basil oil, all the rest samples during the first 24 hours cells of *Lactobacillus delbrueckii* subsp. *bulgaricus* growth actively. After 1st day and to 14th day, the number of the viable cells was kept relatively the same as in the dairy products with additives, in combination with the basil oil (No 1 and 3) it was higher in comparison with the control. This is probably confirmed with the higher content of the nutrients needed for the development of the lactic acid bacteria. The obtained results correspond to the prescribed values for the titratable acidity, presented in Figure 1.

With the dairy product with basil oil (No 2) it was found slighter increase in the number of viable cells of *Lactobacillus delbrueckii* subsp. *bulgaricus* in comparison with the control and samples № 1 and 3. Probably the essential oil having antimicrobial activity slows down the growth of these bacteria.

In the tested samples the cells of *Streptococcus thermophilus* growth actively up to 24 h. After that the growth rate decreases and at the end of the study period the number of the viable cells reduces (Fig. 4). The lactic acid bacteria *S. thermophilus* develop more accelerate in the samples with additives as the largest number reaches in combination in the samples with all additives (sample № 3).

Figure 4. The dynamics of cell growth of *Streptococcus thermophilus*



Volume : 6 | Issue : 1 | JANUARY 2016 | ISSN - 2249-555X

The data from the qualification of the obtained dairy products according to the organoleptic parameters are presented in Table 1. The obtained products were characterized with very good and balanced lactic acid taste, thick and smooth coagulum, homogeneous consistence and structure.

"Table 1 about here"

The organoleptic assessment of the dairy products shows that the characteristics of the variants 1-3 are not significantly different from those of the control sample. Considering that the proposed additives could be used successfully in the development of a variety of lactic acid products with an increased health effect.

Conclusion

Dairy products with added oat flakes, sesame seeds, linseeds, honey and essential oil of basil (*Ocimum basilicum* L.) were prepared. The combination of these additives do not affect adversely on the speed of the lactic acid process, it reduces the amount of the separated whey and the obtained product has got very good organoleptic properties. Considering the developed variants of fermented milk products can be successfully used for the needs of healthy diet.

(Table 1. Organoleptic indicators

Parameters	**Control**	**Sample № 1**	**Sample № 2**	Sample № 3
surface	smooth	smooth	smooth	smooth
Colour	White with cream-coloured shade	White with cream-coloured shade	White with cream-coloured shade	White with cream-coloured shade
Type of coagulum	thick, smooth	thick, smooth	thick, smooth	thick, smooth
Structure after cutting	smooth surface with slight serum separation	smooth surface without serum separation	smooth surface with slight serum separation	smooth surface without serum separation
Consistency after whipping the coagulum	homogeneous, like cream	homogeneous, like cream	homogeneous, like cream	homogeneous, like cream
Taste and flavor	tasty specific lactic acid	tasty specific lactic acid with a hint of the used nuts and honey	tasty specific lactic acid with a hint of basil	tasty specific lactic acid with a hint of the used nuts and honey, and basil

REFERENCE (1) Amirdivani S., Baba A. S. (2011) LWT – Food Science and Technology, 44, 1458 – 1464. (2) Betored E., Betored N., Vidal D., Fito P. (2011) Trends in Food Science & Technology, 22, 498 – 508. (3) BNS (Bulgarian National Standard) 15612-83 Dairy products. Organoleptic assessment. (4) Cardarelli H. R., Saad S. M. I., Gibson G. R., Vulevich J. (2007) Anaerobe, 13, 200 – 207. (5) Commission Regulation (EC) No853/2004 (29.04.2004). Off. Journal of European Union, L139 (6) Damyanova St., S. Todorova, Ivanova N., Ganeva E., Stefanova R. (2011) Scientific Works NUHT, Kiev, 37,(38), 47-51 (7) Dimitrov T., Mikhailova G., Iliev T., Naydenova N. (2008) Milk and milk products with research methods, Stara Zagora, Bulgaria (8) Georgiev E., Stoyanova A. (2006) Guide of the specialist of the balmy industry, Plovdiv, BNAEOPC, Bulgaria (9) IDF-Standard 122C: 1996 Milk and milk products - Preparation of samples and dilutions for microbiological examination (10) IDF-Standard 149A: 1997 Dairy starter cultures of lactic acid bacteria -Standard of identity. (11) Kajiwara S, Gandhi H, Ustunol Z. (2002) J. Food Protect, 65, 214–218 (12) Kostova I., Dimitrov D., Ivanova M., Vlaseva R., Damyanova S., Ivanova N., Stoyanova A. (2014) Food and Packaging, Science, Technique and Technologies, 5, 17-21. (13) Panesar P. S. (2011) Food and Nutrition Sciences, 2, 47 – 51. (14) Petrovski S., Stoyanov S. (2005) Essential oils and their applications in medicine and industry, „Publish Sai Set – №o", Sofia, Bulgaria (15) Rattanachaikunsopon P., Phumkhachorn P. (2010) Biosci. Biotechnol. Biochem., 74 (6), 1200-1204. (16) Regulation №4/2008 the Ministry of Agriculture and Food (Prom. SG. Br.23 of 29 February 2008). (17) Roberfroid M. B. (2002) British Journal of Nutrition, 88, Suppl. 2, S133 – S138 (18) Slavchev D., Enikova R., Makaveeva M. (2003) Guide for physical, chemical and microbiological control of dairy products, Association of Dairy Processors in Bulgaria, Sofia, Bulgaria (19) Thabet H. M., Nogaim Q. A., Qasha A. S., Abdoalaziz O., Ansheme N. (2014) Merit Research Journal of Food Science and Technology, 21 (1), 008 – 014 (20) Unnithan C., Dagnaw W., Undrala S., Subban R. (2013) International Research Journal of Biological Sciences, 2 (9), 1- 4.