Optimization of direct production method of Concentrated Yoghurt

Elham Mahdian[a*], Mostafa Mazaheri Tehrani[b]

a. Department of Food Science, Islamic Azad University, Quchan branch, Quchan, Iran. E-mail: emahdian2000@yahoo.com
b. Food Science and Technology Department, Faculty of Agriculture, Ferdowsi University of Mashhad, Iran.
*Corresponding author

Abstract

Type and amount of starter cultures are tow important factors influence the quality of concentrated yoghurt. The effects of type (CH_1 and YC-380) and amount (2,4 and 6%) of starter cultures on the sensory properties of concentrated yoghurt that produced by concentration of milk using a vacuum evaporator to 2 levels of total solids were studied. Results showed that the flavour and texture scores of samples that were prepared with YC-380, were significantly higher than those were prepared with CH_1. Increasing the level of CH_1 to 4% improved the acceptability of all samples but had no significant effect in the samples with higher levels.

Key Words: Yoghurt؛ Concentrated Yoghurt؛ Starter Cultures؛ Sensory Properties

Introduction

Concentrated yoghurt is a fermented milk product made by concentration of yoghurt or milk to specific level of total solids. The traditional method of production consists of straining yoghurt using a cloth bag. Because of many disadvantages of traditional method such as long production time, contamination and reduction the nutritive value of product, many attempts have been done to replace the traditional method with new industrial methods. Some of these methods include using ultrafiltration and reverse osmosis membranes for concentration of yoghurt or milk or vacuum evaporation (7).

In general, the overall properties of yoghurt, such as acidity level, free fatty acid content, the production of aroma compounds (diacetyle, acetaldehyde, acetoin) as well as the sensory profile and nutritional value, are important traits of the product. these aspects are influenced by the chemical composition of the milk base, processing conditions, the activity of starter culture during the incubation period (1).

Concentrated yoghurt has properties superior to those of regular yoghurt, with higher protein (2.5x) and mineral (1.5x) contents, very low lactose content and fat content which can be varied according to consumer demand. Concentrated yoghurt should have considerable market potential (4).

Bouzar et al (1997) reported that type and specification of starter organism used in fermented milks production, are two important factors influence overall quality of product. Essential parameters that have to be considered for choosing starter organisms include: acidification, aroma, flavour, stability and texture (2).

Common starter culture used for production of yoghurt and concentrated yoghurt is a mixture of Stereptococcus salivarus ssp. thermophilus and Lactobacillus delbrukii ssp bulgaricus in equal proportion (1:1). They grow symbiotically and both of them contribute in acid and aroma production, proteolysis and growth (2).
Tamime and Robinson describe a certain type of yoghurt starter culture that reduce fermentation time to 4-6 hours. This culture also caused production of excessive amounts of diacetyl which improved flavour of the product (7).
Jumah et al (2001) investigated the effects of type and amount of starter culture on rheological properties of yoghurt during fermentation. They concluded that both factors influenced the rheological nature of yoghurt (3).
The objectives of this study were to maximize sensory acceptability of concentrated yoghurt produced directly from evaporated milk by testing different type and amount of starter culture.

Materials and Methods

Pasteurized standard milk (2.5% fat) was supplied from Toos plant. The starter culture (CH_1) was obtained from CHr. Hansen's laboratory, Denmark.
Preparation of the milk consists of three stages: Heat treatment (85°C for 5 minutes), separation of the fat (model D- 470, westfalia separator) and concentration. A batch type single effect evaporator (T = 55°C, P = -0/8 bar) was used for concentration of the milk to 2 levels (23, 27%). In order to controlling TS of the milk during concentration, model OK- GYEM refractometer was used.
Preparation of the yoghurt samples was done according to Tamim & Robinson advised method in 50gr containers. Inoculated milks was incubated at 45°C until PH of 1.6 – 1.7 was reached, then stored overnight at 4°C at which time the experiment was started (7).
total solids levels of the samples were determined according to the British standard Institution method.
the products were assessed by six judges using a sensory rating scale of 1- 5 (unacceptable/ excellent) (1).
Treatments include type and amount of starter culture in 3 levels {2% $CH_1(p_1)$, 4% $CH_1(p_2)$, 2% YC-380(y)} for samples with 23% total solids content and 4 levels {2% $CH_1(p_1)$, 4% $CH_1(p_2)$, 6% $CH_1(p_3)$, 2% YC-380(y)} for samples with 27% total solids content. As a control, we used traditional concentrated yoghurt (23% TS) that was available in markets.
statistical analysis of the result was completed using the Excel and MSTAT-C software programme and significantly different groups were detected by the Duncan test.

Results and discussion

Figure 1 shows the effect of starter culture (type and amount) on flavour and texture scores of samples with 23% total solids content. As it can be seen from figure 1, flavour score was not influenced by the amount of CH_1 starter culture (no significant difference observed between p_1 and p_2 at α =5%). Scores for samples inoculated with YC-380 starter culture(y) were significantly higher than CH_1 inoculated samples. This can be

due to the ability of YC-380 to produce higher aroma compounds during fermentation. However the flavour score of this sample is low when it is compared with control (α =5%).

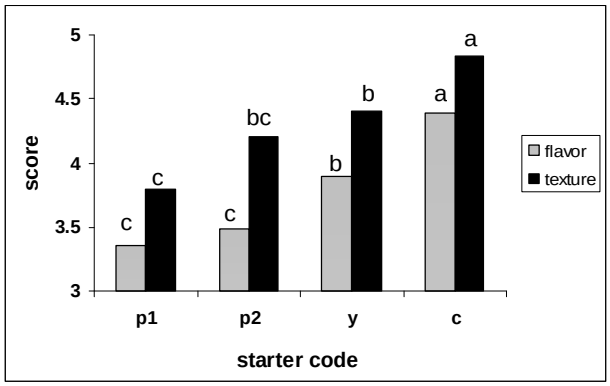

Figure1. flavour and texture scores of concentrated yoghurt with 23% total solids content 2% $CH_1(p_1)$, 4% $CH_1(p_2)$, 2% YC-380(y)

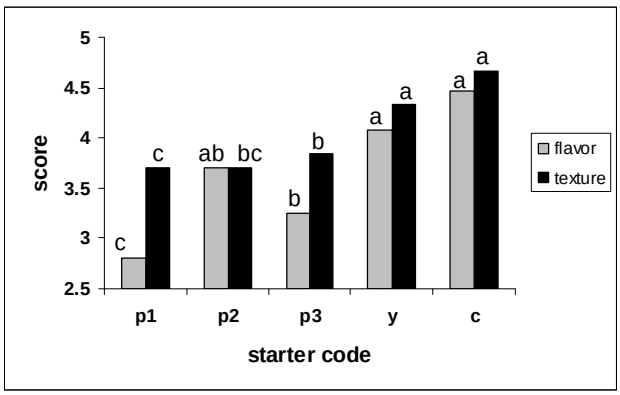

Figure2. flavour and texture scores of concentrated yoghurt with 23% total solids content 2% $CH_1(p_1)$, 4% $CH_1(p_2)$, 6% $CH_1(p_3)$, 2% YC-380(y)

The effects of type and amount of inoculum on texture profile of 23% TS samples are also shown in figure1. Increasing CH_1 amount from 2% to 4% improved the texture of samples but their difference is not significant (α =5%). Texture scores of YC-380 inoculated samples were higher than CH_1 inoculated samples but still lower than control. This can be explained by considering this fact: YC-380 culture has medium viscosity profile but CH_1 has low viscosity profile.

An important factor that has a great effect on texture properties of yoghurt, is exopolysacharides and other metabolites that are produced by starter bacteria. As a result type and amount of inoculum can influence this aspect very much.

Figure 2 shows flavour and texture scores of samples with 27% TS content as affected by starter cultures. Increasing the amount of CH_1 inoculum up to 4% and using YC-380 instead of CH_1 culture all improved the flavour profile of concentrated yoghurt with

27% TS. As it can be seen from figure 2 no significant difference observed between p_2, y and control. This means that using additional amount of inoculum and also stronger culture can promote the acceptability of concentrated yoghurt with elevated total solids content (27%).
The promoting effect of increasing inoculum amount of CH_1 (2% to 6%) and using YC-380 starter culture are also clear (figure 2). According to figure 2 sample "y" (YC-380 inoculated sample) would be in the same range of acceptability with control. As it was explained for 23%TS samples, this can be due to the high power of YC-380 culture in producing aroma compounds and medium viscosity profile.
Sharal et al (1996) showed that concentrated yoghurt produced using common starter cultures and Bifidobacterium bifidum or propionibacterium feroidenrichi ssp shermanii, had organoleptic properties better than usual concentrated yoghurt (5).
Tamime and Robinson (1978) examined three types of starter culture (CH_1, RR, Boll-3) on physiochemical and sensory properties of concentrated yoghurt. They concluded that CH_1 culture cause better sensory qualification than other cultures. Consistency data from penetrometer showed that samples prepared with RR culture had better texture and longer shelf-life (6).

Conclusion

1. using additional amount of CH_1 inoculum up to 4% improve the flavour and texture scores of concentrated yoghurt (23% and 27% total solid).
2. samples inoculated with YC-380 starter culture had higher flavour and texture scores in comparison with CH_1 starter culture.

References

1. Bonczar, G., M..Wszolek, and A.Siuta. 2002. The effects of certain factors on the properties of yoghurt made from ewe's milk. Food Chemistry 79:85-91
2. Bouzar, F. Cerning, J., and Desmazeaud, M. (1997). Exopolysaccharide production and texture promoting abilities of mixed- strain starter cultures in yoghurt production. *J. Dairy Sci.* **80:** 2310-2317
3. Jumah, R. Y., Abu-Jdayil, B., and skaker, R.R. (2001). Effect of type and level of starter culture on the rheological properties of set yoghurt during gelation process. *Int. J. of food properties.* **4(3):**531-544.
4. Salji, J. (1991). Concentrated yoghurt: a challenge to our food indstry. *Food Science and technology Today*. **5(1):** 18-19.
5. Sharal, O. M., Mehanna, N. S., El-shafei, K., and Metwally, A. E. (1996). Effect of using different starters on quality of labneh. *Annals-of-Agriculture- science-Ain-shams-university*. **41 (2) :** 901-912.
6. Tamim, A.Y., and Robinson, R. K. (1978). Some aspects of the production of a concentrated yoghurt (labneh) popular in the middle East. *Milchwissenchaft.* **33 (4):** 209-212.
7. Tamime, A.Y.,& Robinson, R.K. (1999). Yoghurt, Science and Technology. *Cambridge, uk:woodhead publishing Limited.*