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Producing Yoghurt with the Rumex Acetocella (RA) Plant as the Starter and Comparing its Certain Characteristics with That Yoghurt Produced with the Yoghurt Starter

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Abstract: In this study, two separate portions of yoghurt was produced from the yoghurt starter (YC) and the Rumex acetocella extract (RE). Then they were stored at 4°C for 10 days. Some properties of both yoghurts were analysed on the 1st, 5th and 10th day of storage. According to the results, the effect of starter kinds a whey-off values and the number of *Streptococcus salivarius ssp. thermophilus* were not significant. So when studied with respect to its sensory properties, RE yoghurts were liked as much as YC samples at least.

Key words: Rumex acetocella extract, yoghurt

INTRODUCTION

The Rumex acetocella (RA), a kind of wild plant which grows in almost every part of Turkey is not only consumed both as a main course and as a salad ingredient but is also used for different purpose such as a kind of natural yoghurt starter in some regions in the Eastern part of Turkey, where there is a good deal of flocks of sheep breeding.

Due to the hard weather conditions in winter and the lack of required cooling facilities for keeping the yoghurt starters, breeders are unable to obtain available yoghurt starters when the sheep are milked for the first time. Therefore, they pick the RA in nature to use this plant as a yoghurt starter throughout the year (Anonymous, 2003).

By the light of this information, the target of this research is to succeed the production of yoghurt with the RE, a field in which no research has been done so far and to compare the characteristics of this yoghurt with the yoghurt made from that original yoghurt starter.

MATERIALS AND METHODS

Fresh cow milks were obtained from the herds of cattle on the Faculty farm. The RA plants were picked in nature. The stems, roots and leaves of these plants were washed thoroughly and cut in to pieces in a blender. After adding of 30 ml of water and keeping it at the room temperature for 30 min., the blend was filtered to get an ideal, clear and transparent extract. Whole milk was heated to 90°C for 15 min. and then cooled to 42°C. It was inoculated with 3% of this extract and incubated at 42°C for 18h. After pre-cooling to the room temperature for 30 min. the sample was stored at 4°C. This sample was used as the starter aim of yoghurt making. The skim milk powder used for concentration was provided from Pınar Süt Co. (Izmir, Turkey).

The production of yoghurt samples: Bulk samples of raw cow milks were standardized by adding skim milk powder and heated to 90°C for 15 min. and after cooling to 42°C, they were divided in to 2 separate portions. The first of portion was inoculated with 3% starter yoghurt culture (YC) and the latter with 10% of the extract (RE). All of the samples were incubated at 42°C for 3 h and after pre-cooling to the room temperature for 30 min. they were stored at 4°C for 10 days.

The yoghurt samples were analysed for pH (using a Hanna 210 pH-meter), titratable acidity (°SH), fat, total solids and total protein (Oysun, 1996), whey off value at the end of 60 min. (a modified method according to Harwalkar and Kalab, 1983) and penetration values by using a Gerber penetrometer (measured in mm. after 20 second of penetration). M17 agar (Oxoid Ltd., Basingstoke, Hampshire, England) for the enumeration of *Streptococcus salivarius ssp. thermophilus*, MRS agar for the enumeration of *Lactobacillus bulgaricus* (Shin *et al.*, 2000). For the identification of these bacteria in extract were used Buchanan and Gibbons (1974). Five panelists who were familiar with fermented dairy products judged sensory properties of the yoghurt samples by using a mixed-point system (Anonymous, 1989). Analysis of variance (ANOVA) was performed using the General Linear Model procedure of S.A.S. (Anonymous, 1987). In all cases 0.05 probability level considered.

RESULTS AND DISCUSSION

The extract prepared with the RA included 6.4 pH, 50,000 cells g⁻¹ of *Streptococcus salivarius ssp. thermophilus* and 2500 cells g⁻¹ of *Lb. bulgaricus*. First

Table 1: Some properties of yoghurt (n=3)

Samples	Total solids %	Fat %	Protein %
RE	15.50	3.20	4.02
YC	15.70	3.20	4.13

Table 2: Some properties of yoghurts during storage for 10 d (n=3)

S	SD	Acidity (°SH)	pH	Whey off value (g)	Penetration value (mm)	<i>Str. salivarius ssp. thermophilus</i> (log CFU/g)	<i>Lb. bulgaricus</i> (log CFU/g)
RE	1	37.33	4.41	3.76	3.56	6.30	5.62
	5	40.33	4.33	3.56	2.50	6.04	6.14
	10	40.65	4.23	3.41	1.50	5.94	6.46
YC	1	39.83	4.21	3.87	4.36	6.34	6.18
	5	52.00	3.98	3.44	2.00	6.07	6.28
	10	52.45	3.95	3.36	1.00	5.80	6.52

Table 3: The sensory properties of yoghurts during storage for 10 d (n=3)

S	SD	Appearance max.5 p	Consistency in mouth max.5p	Consistency with spoon max.5 p	Odour max.5 p	Flavour max. 5p	Total max.25p
RE	1	4.8	4.7	4.7	4.7	4.7	23.2
	5	4.8	4.8	4.5	5.0	4.5	23.6
	10	4.8	4.8	4.8	3.9	3.9	22.6
YC	1	4.7	5.0	5.0	5.0	4.6	24.5
	5	4.7	4.8	4.6	4.7	3.9	20.7
	10	4.7	5.0	5.0	4.0	3.8	22.8

S: Samples SD: Storage Days RE: Yoghurt made from Rumex acetocella extract YC: Yoghurt made from yoghurt culture

yoghurt made of extract had weak consistency and sweetness taste because of the growth of *Streptococcus salivarius ssp. thermophilus* cells only in basic media (pH 6.4). This yoghurt was used as starter in the production of RE sample. However *Lactobacillus bulgaricus* cells grew at the second passage (RE). This shows us that RA is a natural yoghurt starter.

Table 1 shows the average total solids, fat and protein values of yoghurts. Total solid content of two samples were consistent with the values stated in the Turkish Food Codex Fermented Milk Bulletin (8) to: on the other hand, yoghurt samples were characterized as fatty (>3.0%) according to this Bulletin (Anonymous, 2001).

Table 2 shows some properties of two yoghurts during the storage period. The differences between the titratable acidity (°SH) of RE and YC samples were found to be significant (p<0.05). The acidity increase in all yoghurts during the storage period was found only to be significant between on the 1st and 5th days (p>0.05) and the acidity values were consistent with the values given by Turkish Food Codex Fermented Milk Bulletin (>26°SH). The effect of yoghurt kinds on pH value were significant (p<0.05). There was a decrease in pH values of all samples during the storage period and these differences were also found significant (p<0.05) except YC sample between on the 5th and 10th days.

Whey-off value in RE sample was determined lower than YC at first day of storage. However it was seen reverse situation at the end of storage While increasing the whey-off value of RE during the storage period the whey-off value of YC was decreased and this was found to be statistically no significant (p<0.05). The penetration values of the yoghurt were affected from starter types and storage period (p<0.05). Nevertheless, the penetration values of YC sample were determined to be lower at 5th and 10th days of storage. Both the whey-off values of samples and penetration values decreased at the storage time. This situation was caused by the coagulum of yoghurt be firmness during the storage time.

The storage days were affective on the number of *Streptococcus salivarius ssp. thermophilus*, but starter types used for coagulation were not (p<0.05). The number of *Streptococcus salivarius ssp. thermophilus* decreased during the storage time (Table 2). On the other hand, the number of *Lactobacillus bulgaricus* cells of RE yoghurt were determined less than YC sample's at the beginning of storage. This difference was also found significant (p<0.05). The storage days were effective on the number of both samples of *Lb. bulgaricus* cells (p<0.05).

As it is shown at the Table 3 sensory evaluation, the mean scores for flavour and appearance of RE yoghurts were higher than YC samples. However the panelists stated that the YC yoghurts had weak structure. As a result, the RE yoghurts were liked as much as YC samples at least.

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