Production And Some Properties Of Curd, A Yoghurt-Like Product, Manufactured By Potato Juice And Milk

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Abstract: In this study, a type of curd, a yoghurt-like product (YLP), was prepared by potato juice and milk and some of its physico-chemical, microbiological and sensory properties were examined. Analyses were applied to four yoghurt groups consisting of YLPs manufactured by using milk and potato juice at different ratios (0.5% for YLP1; 1% for YLP2 and 1.5% for YLP3) and yoghurt produced using starter culture (control group). Lactobacillus spp. and Lactococcus spp. numbers in all yoghurt samples manufactured by potato juice showed increase after the seventh day. The YLP manufactured by potato juice at a ratio of 0.5% was most preferred by panelists among the other YLP samples and most similar to yoghurt with starter culture.

Keywords: Curd, Microbiological analysis, Physico-chemical analysis, Potato juice, Sensory analysis, Yoghurt-like product.

1 INTRODUCTION

Yoghurt is an important fermented dairy product consumed worldwide mainly because of the beneficial impact on human health [1]. The production of well-known plain yoghurt is carried out by inoculation of milk with starter culture bacteria (Streptococcus salivarius subsp. thermophilus and Lactobacillus delbrueckii subsp. bulgaricus). It is reported that about 20 different types of yoghurt such as set or stirred, plain, fruit or flavored, concentrated yoghurt, frozen yoghurt, dried yoghurt, low-calorie yoghurt and low-lactose yoghurt are manufactured in the worldwide [2]. The properties of yoghurt, such as acidity, free fatty acid and aroma compounds contents as well as the sensory attributes and nutritional value are influenced by chemical composition of milk, processing conditions, ingredients added during manufacturing process and activity of starter culture during fermentation period [3], [4], [5]. In recent years, many studies have been carried out on the fortification of yoghurt [6], [7], [8]. The common objectives of these studies focused on improving of yoghurt quality in terms of nutritional composition, health promoting properties and consumers' preferences. The changes in physical, chemical and sensory attributes of yoghurt may cause deterioration of yoghurt, making it unacceptable for human consumption [1]. Because the changes in these properties of yoghurt can be also highly affected the consumers' preferences. Therefore, new approaches in terms of taste and aroma are necessary in yoghurt production. Many studies have been conducted on this subject so far [6], [7], [9], [10]. Potato (Solanum tuberosum L.) is the most important non grain food crop in the world.

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Potato and potato products are of great economic and nutritional significance. The estimated production of potato in the world is about 325 million metric tons in 2007 and the estimated consumption of potato was also about 32 kg/capita/year during 2005 [11]. The potato constituents such as "resistant potato starch", vitamin C, lutein and the content of chlorogenic acid, a phenolic compound, are important for human health due to their physiological beneficial effects. It is reported that the potatoes contain also free phenolic compounds, carbohydrate, protein and potassium [12]. Whereas phenolic compounds correlate with good antioxidant activity contributing to anticarcinogenic or cardio protective action [13], resistant potato starches have various beneficial physiological effects such as hypocholesterolemic effects, inhibition of fat accumulation and absorption of minerals and a potential to prevent a variety of human diseases such as diabetes, obesity, inflammatory bowel diseases, and cancer [14], [15]. Currently, no study has been conducted about preparation of curd, a yoghurt-like product (YLP), manufactured by using potato juice and milk. Objectives of this study are to develop a new type of curd by fermenting milk with potato juice and to investigate the some of its physico-chemical, microbiological and sensory attributes.

2 MATERIALS AND METHODS

2.1 Preparation of potato juice

Potatoes were washed thoroughly, peeled by knife and cut into pieces. The potato juice was obtained by a juice extractor.

2.2 Milk samples

All cow's milk samples were obtained at different times from a small dairy plant in Sanliurfa.

2.3 Yoghurt manufacture

In this study, a total of 12 yoghurt and YLP samples were divided into 4 groups: 3 samples for control yoghurt produced by starter culture, 3 samples for curd with 0.5% potato juice (YLP1), 3 samples for curd with 1% potato juice (YLP2) and 3 samples for curd with 1.5% potato juice (YLP3). Each experiment was carried out in three batches and duplicate samples were taken from each batch. The

first group yoghurt (control yoghurt) was made by starter culture according to the traditional method in the laboratory. The second, third and fourth group yoghurts were manufactured by potato juice additions at different ratios into milk without starter culture. For manufacture of control yoghurt, the milk was filtered by using a cloth filter. Heat treatment applied at 90 °C for 10 min. The milk was cooled to approximately 45 °C and inoculated with commercial starter culture (L. delbrueckii subsp. bulgaricus and S. thermophilus) at a rate of 1% (v/v). The inoculated milk was distributed into 100 mL sterile containers and incubated at 42 °C until a firm coagulum was formed (~ 5 h). The resulting yoghurt was cooled to room temperature and stored in a refrigerator at 5±2 °C overnight to stop fermentation and to obtain the desired consistency until analyses. The potato juice at a rate of 0.5% was added to milk instead of starter culture used in control yoghurt manufacture, to production of curd (second group, YLP1). The potato juice at rate of 1% was used to production of curd (third group, YLP2) and at rate of 1.5% to production of curd (fourth group, YLP3).

2.4 Analytical methods

The samples were analyzed at 7 day intervals (1st, 7th and 15th days). All analytical analyses were carried out in duplicate. pH values of the samples were measured at 17-20 °C by using a digital pH-meter (Microcomputer, 6307) after calibrating with fresh pH 4.0 and 7.0 standard buffer solutions**.** The samples were stirred with distilled water (1:1) before pH measurement. The titratable acidity of samples was determined after titrating with 0.1 N NaOH using 0.5% phenolphthalein indicator. About 10 g curd was diluted with approximately the same volume of hot distilled water before titration. The value of syneresis is expressed as the weight percentage of separated whey released by centrifugation per 100 mL of sample. About 15 g of sample was centrifuged (Termo) at 222 g for 10 min at 4 °C [16]. The viscosity of the samples was determined by using a viscometer (Soif, Snb-1) and measured at 30 rpm with spindle no. 64. Measurements were taken at room temperature using curd samples at 10 °C. Samples were manually stirred for 60 s before measurements. The viscosity values were expressed as centipoise (cP).

2.5 Microbiological analyses

In order to determine the microbiological changes of the YLP samples during storage stages, 10 g of sample was diluted in 90 mL of a sterile 0.1% (w/v) peptone water solution (Merck) and homogenized in a Colworth Stomacher Lab-Blender 400 (London, UK) for at least one min. The homogenate was decimally diluted in the same solution and each dilution was plated in duplicate on the media required for the different microbial groups to be examined [17]. The spread plate technique (0.1 mL) was used to determine for total aerobic mesophilic bacteria (TAMB) and moulds and yeastts, whereas the pour plate technique (1 mL) with overlay was utilized for lactic acid bacteria (LAB) [18]. TAMB were enumerated on standart plate count agar (PCA, Oxoid) after incubation at 30 °C for 72 h. Moulds and yeasts were determined on potato dextrose agar (PDA, Oxoid) acidified with 10% tartaric acid incubated 25 °C for 5 days [19]. Lactobacillus spp. were isolated in MRS agar (Oxoid) plates acidified with acetic acid to pH 5.4. Lactococcus spp. were isolated in M17 agar plates (Oxoid). MRS and M17 agar plates were incubated anaerobically (Merck Anaerocult A sachets) at 30 °C for 48 h [20]. After incubation, plates containing 30-300 colonies were counted and the results expressed as $\log_{10}$ cfu/g of samples.

2.6 Sensory analyses

The sensory analysis were performed by a trained panel of five members by using a sensory rating scale of 1–10 (unacceptable / excellent) for each attribute such as color / appearance, texture / consistency in mouth and with spoon, flavor / aroma and overall acceptability as described by Larmond [21]. The sensory scores were conducted on coded samples at 1st, 7th, and 15th days of storage at <10 °C. They were scored on a scale of 1–10 (1-2 = poor, 3-4 = fair, 5-6 = good, 7-8 = very good and 9-10 = excellent).

2.7 Statistical analyses

All statistical calculations were performed by using statistical software package [22]**.** The obtained values are presented as mean ± standard deviation (SD). Evaluation of significance was performed by analysis of variance, followed by Duncan's multiple range tests. The significance levels of $p < 0.05$ were used for statistical differences.

3 RESULTS AND DISCUSSION

The results of physico-chemical, microbiological and sensory analyses of YLP samples are presented in Tables 1, 2 and 3.

Table 1: *The results of physico-chemical analyses of YLP samples**

Days	Attributes	Control Yoghurt	YLP1	YLP2	YLP3
1	pH	4.15±0.03 ^{Aa}	3.98±0.01 ^{Cc}	4.02±0.02 ^{Ba}	4.03±0.02 ^{Ba}
	Acidity (LA %)	0.83±0.03 ^{Aa}	0.75±0.02 ^{Bc}	0.79±0.04 ^{ABb}	0.81±0.01 ^{Ab}
	Syneresis (%)	2.67±0.22 ^{Ab}	2.70±0.26 ^{Ab}	3.26±0.76 ^{Aa}	3.52±0.39 ^{Aa}
	Viscosity (cP)	15343.33 ±368.56 ^{Ba}	17790.00 ±75.50 ^{Ab}	13486.67 ±612.32 ^{Cb}	9983.33 ±193.99 ^{Db}
7	pH	4.09±0.02 ^{Ab}	3.93±0.02 ^{Bb}	3.91±0.04 ^{Bb}	3.91±0.04 ^{Bb}
	Acidity (LA %)	0.87±0.01 ^{Aa}	0.80±0.02 ^{Cb}	0.87±0.01 ^{Aa}	0.84±0.01 ^{Ba}
	Syneresis (%)	2.76±0.19 ^{Bb}	2.82±0.20 ^{ABb}	2.99±0.03 ^{ABa}	3.06±0.05 ^{Aa}
	Viscosity (cP)	17893.33 ±1785.90 ^{Aa}	19416.67 ±619.78 ^{Aa}	18303.33 ±1276.30 ^{Aa}	11456.67 ±559.85 ^{Ba}
15	pH	4.02±0.03 ^{Ac}	3.89±0.01 ^{Ba}	3.90±0.08 ^{Bb}	3.92±0.06 ^{Bb}
	Acidity (LA %)	0.89±0.08 ^{A}	0.86±0.02 ^{Aa}	0.84±0.03 ^{Aab}	0.83±0.01 ^{Aa}
	Syneresis (%)	3.41±0.23 ^{Aa}	3.23±0.08 ^{ABa}	3.10±0.08 ^{Ba}	3.05±0.08 ^{Ba}
	Viscosity (cP)	16083.33 ±1331.78 ^{Aa}	14520.00 ±359.30 ^{Bc}	10293.33 ±284.49 ^{Cc}	11253.33 ±474.27 ^{Ca}

A, B, C, D shows the differences in properties between yoghurt groups in the same row; a, b, c shows the differences of properties of yoghurt groups between analysis days.

Table 2: *The results of the microbiological analyses with standard deviation (SD) (log_{10} cfu/g)**

Days	Microorganisms	Control Yoghurt	YLP1	YLP2	YLP3
1	Total viable counts	7.56±0.03 ^{Ab}	6.45±0.08 ^{Bc}	5.30±0.11 ^{Cb}	5.07±0.14 ^{Db}
	Lactobacillus spp.	6.70±0.03 ^{Ac}	4.86±0.08 ^{Bc}	3.77±0.05 ^{Cc}	3.31±0.16 ^{Dc}
	Lactococcus spp.	6.09±0.14 ^{Ac}	5.61±0.05 ^{Bc}	4.11±0.07 ^{Dc}	4.92±0.04 ^{Cc}
	Yeast / Mould	1.92±0.03 ^{Ab}	1.88±0.03 ^{Ab}	2.04±0.04 ^{Ab}	1.20±0.17 ^{Bb}
7	Total viable counts	7.33±0.06 ^{Bc}	7.97±0.04 ^{Ab}	5.39±0.18 ^{Cb}	4.01±0.17 ^{Dc}
	Lactobacillus spp.	6.91±0.07 ^{Bb}	7.56±0.03 ^{Ab}	7.51±0.06 ^{Ab}	7.39±0.22 ^{Ab}
	Lactococcus spp.	7.62±0.08 ^{Bb}	7.73±0.01 ^{Bb}	7.89±0.04 ^{Aa}	7.19±0.14 ^{Cb}
	Yeast / Mould	1.69±0.09 ^{Ac}	1.60±0.00 ^{Bc}	1.00±0.00 ^{Cc}	1.00±0.00 ^{Cb}
15	Total viable counts	9.87±0.05 ^{Ca}	9.19±0.14 ^{Dc}	10.47±0.17 ^{Aa}	10.21±0.07 ^{Ba}
	Lactobacillus spp.	8.05±0.09 ^{Ba}	7.84±0.04 ^{Ba}	8.38±0.14 ^{Aa}	8.01±0.17 ^{Ba}
	Lactococcus spp.	8.06±0.12 ^{Ba}	7.95±0.02 ^{Ba}	7.31±0.03 ^{Cb}	9.17±0.12 ^{Aa}
	Yeast / Mould	2.54±0.13 ^{Ca}	2.38±0.06 ^{Da}	3.90±0.05 ^{Ba}	4.31±0.05 ^{Aa}

A, B, C, D shows the differences in properties between yoghurt groups in the same row; a, b, c shows the differences of properties of yoghurt groups between analysis days.

In general, yoghurt production is usually carried out by inoculation of milk by using yoghurt or starter culture bacteria (Streptococcus salivarius subsp. thermophilus and Lactobacillus delbrueckii subsp. bulgaricus) [2]. However, a type of curd, a yoghurt-like product, was prepared by potato juice and milk in this study, and some of its physico-chemical, microbiological and sensory properties were examined. It is reported that the potatoes contain also “resistant potato starch” and free phenolic compounds [12]. While resistant potato starch have beneficial physiological effects and health-promoting properties [14], [15], free phenolic compounds also shows antioxidant activity contributing to anticarcinogenic or cardioprotective action [13]. Currently, no study has been conducted on curd manufactured by potato juice and milk. In this study, it was aimed to obtain a new type of curd and investigate some physico-chemical, microbiological and sensory attributes of this product, hereby, to incorporate resistant starch into human diets.

Table 3: *The results of sensory analyses of YLP samples**

Days	Sensory Attributes	Control Yoghurt	YLP1	YLP2	YLP3
1	Colour / Appearance	10.00±0.00^{Aa}	8.67±0.58^{Ba}	8.33±1.15^{Ba}	7.67±0.58^{Ba}
	Texture / Consistency with spoon	10.00±0.00^{Aa}	8.00±0.00^{Ba}	7.33±0.58^{Ba}	7.33±0.58^{Ba}
	Texture / Consistency in mouth	10.00±0.00^{Aa}	7.67±0.58^{B}	7.00±0.00^{Ba}	7.33±1.15^{Ba}
	Flavour / Aroma	10.00±0.00^{Aa}	8.00±0.00^{B}	7.67±0.58^{Ba}	7.00±0.00^{Ca}
	Acceptability	10.00±0.00^{Aa}	8.00±0.00^{B}	7.67±0.58^{Ba}	7.67±0.58^{Ba}
7	Colour / Appearance	10.00±0.00^{Aa}	8.00±0.00^{Ba}	7.67±0.58^{Ba}	7.67±0.58^{Ba}
	Texture / Consistency with spoon	10.00±0.00^{Aa}	8.00±0.00^{Ba}	7.67±0.58^{Ba}	7.67±0.58^{Ba}
	Texture / Consistency in mouth	10.00±0.00^{Aa}	7.33±0.58^{B}	7.00±0.00^{Ba}	6.67±0.58^{Ba}
	Flavour / Aroma	10.00±0.00^{Aa}	7.67±0.58^{B}	7.67±0.58^{Ba}	6.00±0.00^{Ca}
	Acceptability	10.00±0.00^{Aa}	7.33±0.58^{B}	7.67±0.58^{Ba}	6.00±0.00^{Cb}
15	Colour / Appearance	10.00±0.00^{Aa}	8.00±0.00^{Ba}	7.67±0.58^{Ba}	6.33±0.58^{Cb}
	Texture / Consistency with spoon	10.00±0.00^{Aa}	8.00±0.00^{Ba}	7.67±0.58^{Ba}	7.00±0.00^{Ca}
	Texture / Consistency in mouth	10.00±0.00^{Aa}	7.33±0.58^{B}	7.00±0.00^{Ba}	6.67±0.58^{Ba}
	Flavour / Aroma	10.00±0.00^{Aa}	7.00±0.00^{C}	7.67±0.58^{Ba}	4.00±0.00^{Da}
	Acceptability	10.00±0.00^{Aa}	6.33±0.58^{C}	7.67±0.58^{Ba}	3.00±0.00^{Dc}

A, B, C, D shows the differences in properties between yoghurt groups in the same row; a, b, c shows the differences of properties of yoghurt groups between analysis days.

The pH and acidity values of all YLP samples are nearly similar during the analysis period, while are slightly higher in the control yoghurt samples (Table 1). However, the acidity values of all YLP samples were increased gradually in parallel with the control yoghurt samples, whereas pH values were decreased. These changes may be a result of the continuing chemical changes and the microbial activities during the storage time. This can be explained by the presence of lactic acid bacteria in YLP samples. As a matter of fact, lactic acid bacteria were isolated in curd samples (Table 2). Although no study has been carried out on curd manufactured by potato juice and milk, our results were discussed with the results obtained for the yoghurt, which is similar to our product examined in present study. Similar results were obtained in bio-yoghurts made from goats' milk using a starter culture and probiotic culture, with or without cysteine addition by Güler-Akın and Akın [23] and in probiotic yoghurt containing a exudative Zedo gum by Ghasempour et al. [16]. The starter cultures in yoghurt are also active at refrigerated temperature and can still produce a small amount of lactic acid that results in decreased pH [24]. However, Panda et al. [10] determined no variations in pH, titratable acidity and lactic acid values in a curd like product prepared by fermenting boiled sweet potato puree in different concentrations and cow milk with starter culture. Syneresis, an important defect, can be defined as whey separation in yoghurt [25] [26]. The syneresis value of YLP1 was increased gradually in parallel with the control yoghurt samples, however, slightly decreased in YLP2 and YLP3 during the storage period (Table 1). This result could be related to the acidity of all yoghurt samples. Similar finding was also reported by Güler-Akın and Akın [23]. Use of β-glucan hydrocolloidal composite as a fat replacer in manufacture of non-fat yoghurts was investigated in another study [26]. They determined that addition of β-glucan composite caused a decrease in whey separation values and whey separation was significantly decreased in all yoghurt samples during storage, in agreement with our results obtained for syneresis values of YLP2 and YLP3. Preheat treatment of milk, greater total solids content of milk by adding milk protein concentrates, polysaccharides or thickening agents such as carrageenan, gelatinized starch or gelatin and acidity resulting from growth of bacterial cultures have been mentioned as the most effective factors to control of syneresis in yoghurts [16], [25]. The decreasing syneresis of YLP2 and YLP3 may be related to the potato juice in samples due to the water-holding properties of starch. Increased viscosity during storage could be due to protein rearrangement and protein – protein contact [26]. It was determined variations in the viscosity values of all YLP samples in present study (Table 1). The viscosity values of all YLP samples reached the highest level in the 7th day. The viscosity values of YLP1 samples were higher than the values of other YLP samples including control samples in the 1st and 7th days. On the other hand, the viscosity values of YLP3 were lower than other YLP samples during the storage period in the 1st and 7th days, although starch is viscosity-increasing [14]. The lower viscosity value in the 15th day was determined in YLP2 samples. In general, the viscosity values of all YLP samples in our study were found decreased during the storage time similar to the results of Celik and Bakirci [6] obtained for their control yoghurt samples, but in contrary to the results of Sahan et al. [26] obtained for yoghurts with and without β-glucan composite. Similarly, addition of mulberry pekmez (highly concentrated juices produced from mulberry and grape fruits) into yoghurt resulted in lower viscosity in study of Celik and Bakirci [6]. In general, numbers of examined microorganisms showed a tendency to increase in the YLP samples during the storage

period except for yeast / mould in the 7th day (Table 2). The microorganism numbers of YLP2 and YLP3 were relatively lower than those of YLP1and control yoghurt in the 1st day. TAMB counts of YLP1 were higher than those of YLP2 and YLP3 samples in the 1st and 7th days. The number of mould and yeast increased in the 15th day in all YLP samples (Table 2). Microorganisms isolated from YLP samples may have been contaminated through various sources such as by potato juice and tools/equipment used in this study. Also, low pH, moisture content, temperature and high salt level during ripening of cheese contribute to the growth of yeast according to Beresford et al. [27]. The low pH value and moisture content of the YLP samples may have promoted the increasing of yeast. Lactic acid bacteria are essential bacteria in yoghurt production. Since the investigated curd manufactured by potato juice and milk in present study is a yoghurt-like product, therefore, it is important the presence of lactic acid bacteria in this product. Lactic acid bacteria in YLP may be originated from the contamination by potato juice and/or equipment during the manufacture process. Since vegetables are harvested from or near the soil, their microflora on the surface of fresh produce are extremely variable and they can be exposed to contamination and spoilage with various species of microorganisms including lactic acid bacteria [28]. Lactobacillus spp. and Lactococcus spp. numbers increased in all YLP samples during storage time (Table 2). The Lactobacillus spp. and Lactococcus spp. numbers were determined higher in control yoghurt samples than in the YLP samples in the 1st day, while these microorganisms' numbers were similar in all yoghurt samples in the 7th and 15th days (Table 2). The cause of this may be due to the starter cultures used during the manufacture of control yoghurt. In a study, the counts of lactic acid bacteria in curd like product prepared by fermenting boiled sweet potato puree and cow milk with starter culture were determined $0.5x10^6$ after fermentation for 6 h and $7x10^7$ cfu/mL after fermentation for 18 h [10]. In another study, lactic acid bacteria were counted at the level of $1.58x10^6$ cfu/g in yoghurt prepared by fermenting milk, sweet potato, sucrose and gelatin mixtures with yoghurt bacteria [9]. The results of these both studies were similar to our findings. Also, pH values of samples and positive impact of starch on bacteria may have contributed to the increase of lactic acid bacteria in YLP samples. It is reported that Lactobacillus spp. in yoghurt shows growth continuously in a pH range of 4.0–4.4, so the acidity of yoghurt tends to increase because they are also capable of producing acid [29]. In our study the pH values of all YLP samples were also fairly suitable for the growth of these bacteria. The increase of lactic acid bacteria in YLP samples in the 7th day may be attributed to suitable pH values of the medium (Tables 1 and 2). Birt et al. [15] reported also a positive interaction between colonic microbiota and resistant starches. The mean sensory analysis scores for YLP samples are shown in Table 3. The control yoghurt samples manufactured by starter cultures were evaluated as 10 points for each sensory attribute. In general, total sensory scores of all YLP samples tend to decrease throughout storage. There were significant variations ($p < 0.05$) between control yoghurt and all yoghurt samples manufactured by potato juice at 1th, 7th and 15th days in terms of sensory analyses. In our study, the highest score was given to YLP1 samples by panelists after the control yoghurt, followed by YLP2 and YLP3 samples, respectively (Table 3). In other words, YLP3 samples have the lower score in the 7th day in terms of texture / consistency in mouth and flavor / aroma and in the 15th day in terms of all sensory attributes than YLP1 and YLP2 samples. It is reported that the sensory properties of yoghurt, especially sweetness, are important for consumers' acceptance [30]. Therefore, YLP3 were not considered as acceptable in the 15th day. The results of sensory analysis showed that the potato juice at a rate of 0.5% is an appropriate concentration to obtaining consumable curd during the storage period. Drake et al. [31] examined sensory properties of low fat yogurts fortified with 0%, 1%, 2.5%, or 5% soy protein concentrate for 1 mo. Soy flavor and aroma did not increase with storage time in their study. However, yoghurt with 5% soy protein was darker, chalkier and less sweet compared to control yoghurt; yoghurts with 1% or 2.5% soy protein were similar to control yogurt. In another study, curd with 8-12% sweet potato puree was the most preferred by consumer's panelists and addition of sweet potato puree (8-12%) made the curd quite firm and imparted flavor and body / texture [10]. In our study, potato juice raised the formation of a specific flavor that gives feeling flavor of potato in YLP samples; however, it did not cause obvious defects in consistency and color of products. A slightly increase of undesirable potato flavor and aroma was determined towards the end of storage period in YLP samples, especially in YLP3 samples, according to the results of sensory analyses (Table 3). The color / appearance and texture / consistency of YLP samples were similar to control yoghurt manufactured with starter culture, but were slightly sweetish compared to the control yoghurt.

4 CONCLUSION

In conclusion, it was determined that the YLP manufactured with potato juice at a rate of 0.5% was most preferred by panelists among the other YLP samples and most similar to yoghurt produced with starter culture. Further study is needed for the complete characterization of this type of curd and for the fortification with various flavors or nutritional additives.

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