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Influence of Supplementation with Green and Black Tea on Viscosity and Sensory Characteristics of Drinking Yoghurt

Yeşil ve Siyah Çay İlavesinin İçilebilir Yoğurdun Viskozitesi ve Duyusal Özellikleri Üzerine Etkisi

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Key Words:

Tea, drinking yoghurt, viscosity, sensory characteristics

ABSTRACT

The effect of black and green tea on viscosity and sensory characteristics of drinking yoghurt was investigated. Two tea infusion concentrations (2% and 4%) were used in the study whereas drinking yoghurt without any additive was the control sample. The highest viscosity values were determined in control sample while there were no significant differences among the drinking yoghurts supplemented with tea extracts except 14th day. Addition of tea at a ratio of 4% adversely affected the taste scores when compared to the ratio of 2%. Drinking yoghurt infused by 2% green tea had similar colour and texture values to that of control sample. There were no statistically differences between samples supplemented with 2% either black or green tea in terms of overall acceptability.

Anahtar Sözcükler:

Çay, içilebilir yoğurt, viskozite, duyusal özellikler

ÖZET

Siyah ve yeşil çayın içilebilir yoğurdun viskozitesi ve duyusal özellikleri üzerine etkisi araştırılmıştır. Çalışmada iki çay infüzyon konsantrasyonu (%2 ve %4) kullanılırken herhangi bir ilave yapılmayan içilebilir yoğurt kontrol örneği olarak yer almıştır. En yüksek viskozite değerleri kontrol örneğinde tespit edilirken çay ekstraktı ilave edilen içilebilir yoğurtlar arasında 14.gün dışında önemli bir fark bulunamamıştır. %4 oranında çay ilave edilmesi %2 oranı ile kıyaslandığında tat puanlarını olumsuz yönde etkilemiştir. %2 yeşil çay ile muamele edilen içilebilir yoğurt kontrol örneğine benzer renk ve tekstür değerleri göstermiştir. %2 siyah veya yaşil çay ilave edilen örneklerde toplam kabul edilebilirlik açısından istatistiksel olarak herhangi bir fark belirlenememiştir.

INTRODUCTION

Yoghurt is one of the most popular dairy products worldwide, which is produced from milk by the lactic acid fermentation using *Lactobacillus delbrueckii* ssp. *bulgaricus* and *Streptococcus thermophilus* bacteria. Drinking yoghurt is a kind of liquid drinkable fermented dairy products which is consumed throughout all year and has same nutritional value and health effects with yoghurt. It provides an array of nutrients in significant amounts in relation to its energy and fat content, making it a nutrient-dense food. Furthermore, it has many health benefits, such as improved lactose tolerance, immune system, antitumor action and antioxidant activity, and a variety of health attributes associated with beneficial starter bacteria (Pohjanheimo and Sandell, 2009).

One of the most important properties of a fermented dairy product which determines its popularity is its rheological and sensory characteristics. Mixtures of biopolymers (proteins, polysaccharides, lipids) and interactions between these molecules identify the rheology of yoghurt (Ciron et al., 2012).

Viscosity is an effective parameter in order to evaluate rheological properties of a drinkable food, which had also a significant impact on the quality of the product. Sensory properties, such as taste, aroma and texture are also efficacious factors for consumers' preference (Köksoy and Kılıç, 2003).

Tea is a popular beverage worldwide which is produced from young leaves of *Camellia sinensis* L. Tea has well-established beneficial effects on human health such as mainly antibacterial and antioxidant activities because of its polyphenol content (Chan et al., 2011). Catechins have been said to be responsible for the antioxidant activity of tea and although different types of tea have been known to have good antioxidant activity green tea has been reported to be the tea most abundant in catechins (Najgebauer-Lejko et al., 2011). Black tea (fully fermented) and green tea (non-fermented) are the best known tea varieties with different chemical components. Polyphenolic compounds have a strong affinity to bind, and in some cases even precipitate proteins, particularly proline-rich, such as salivary proteins and caseins. Such interactions could cause modification of food microstructure as well as functional properties of both polyphenols and proteins. It has been reported that addition of tea extracts rich in polyphenolic compound to the milk system may increase the thermal stability of milk and contributes to the perception of astringency and bitterness as well as colour modification (Vega and Grover, 2011).

Nowadays, different ingredients have been used in the enrichment of fermented dairy products in order to improve their rheological and sensory characteristics and also nutritional and health effects. Addition of tea extract to dairy products is becoming popular due to the functional properties of tea. The impact of tea supplementation on antioxidant and antibacterial activities and microbiological characteristics of fermented dairy products has been well investigated by many researchers (Jaziri et al., 2009; Najgebauer-Lejko et al., 2011; Allah et al., 2012; Marhamatizadeh et al., 2013; Najgebauer-Lejko, 2014). However, there are limited reports devoted to the effect of tea addition on the viscosity and sensory characteristics of fermented dairy products.

The objective of the present study was to investigate the influence of supplementation with black and green tea on acidity, viscosity and sensory characteristics of drinking yoghurt. The effect of addition ratio of tea extracts on reported properties of drinking yoghurt samples was also be evaluated during refrigerated storage period.

MATERIAL and METHOD

Material

UHT milk which was used in the manufacture of drinking yoghurt was obtained from Pınar Dairy Products, Izmir, Turkey. Green and black tea leaves were obtained from a national commercial brand (Caykur, Rize, Turkey). Yoghurt starter culture, a combination of *S. thermophilus* and *L. delbrueckii* subsp. *bulgaricus* obtained in freeze-dried form (Jointec 12) from CSL (Centro Sperimentale del Latte, Italy) company.

All reagents and solvents commercially obtained were of analytical grade.

Yoghurt starter preparation

The freeze dried culture was propagated by inoculating in skim milk which was heated at 90°C for 30 min before the inoculation. The inoculated milk was incubated at 45°C until pH 4.6 was reached, then stored overnight at 4°C in refrigerator.

Manufacture of drinking yoghurts

Drinking yoghurt was prepared using whole milk containing 3.3% milk fat (Pinar Dairy Products, Izmir, Turkey). The milk was heated to 85°C and waited for 10 min, then divided into five equal portions and fortified with black (2BDY, 4BDY) or green (2GDY, 4GDY) tea at levels of 2% and 4%. The fifth portion was considered as the blank control (CDY). The teas were infused for 10 min then different batches were filtered through sterile cotton to remove the particles. The milk samples were ten cooled to 45°C and inoculated 3% yoghurt culture and divided into 200 mL plastic containers and incubated at 42°C until a pH 4.6 was reached. After fermentation, the samples were cooled and stored at 4°C for 21 days for the analyses.

Compositional analyses

The total solids were determined by drying samples at 105°C for 2h. Protein content was analyzed by the Kjeldahl method using the Kjeltec system distillation unit. A multiplication factor of 6.37 was used to convert percentage nitrogen to percentage protein (AOAC, 1995). The fat content was analyzed by the Gerber method (Renner, 1993). The titratable acidity was determined after mixing 10g of drinking yoghurt sample with 10 mL of distilled water and titrating with 0.1N NaOH using 0.5% phenolphthalein indicator. Analyses were performed in triplicate after 24 h of product storage at 4°C.

Viscosity

The viscosity of the samples was measured using a Brookfield Viscometer Model DV-II+Pro (Brookfield

Engineering Laboratories, Middleboro, MA, USA) at 4°C. Samples were tested using a no 2 spindle, and data were taken at 12 rpm for control sample and 180 rpm for samples supplemented with tea extracts.

Sensory characteristics

Drinking yoghurt samples prepared were analyzed for taste, colour, texture and overall acceptability during 21 days of storage. Sensory analysis was performed by using a panel group consisted of experienced academicians from the Department of Dairy Technology (Ege University, Izmir, Turkey) who were familiar with the attributes and scaling procedures of such samples under study (Bodyfelt et al., 1988). A 10-point hedonic scale was provided to the panelists.

Statistical analysis

The experiments were performed in twice with three parallel. Six values for each sample were averaged (n=6). The data obtained was processed by one-way ANOVA using the general linear model procedure of the SPSS version 11.05 (SPSS Inc., Chicago, IL, USA). The means were compared with the Duncan test at $p<0.05$ level.

RESULTS and DISCUSSION

Composition

The mean values for total solids, protein and fat contents of drinking yoghurts after 1 day of storage are given in Table 1. As it can be seen from the table, highest total solid values were found in drinking yoghurts infused by 4% tea whereas samples added 2% tea had the lowest values. On the other hand, there were no significant differences ($p>0.05$) between the protein content of the drinking yoghurt samples.

A lower fat content ($p<0.05$) was found in samples supplemented with tea extracts than that of control sample. This reduction in the fat value during the manufacture can be explained by the incorporation of tea catechins with milk phospholipids and so indicating membrane forming characteristics (Gulseren and Corredig, 2013).

Table 1. Composition of drinking yoghurt samples

Product Type	Total Solids (%)	Fat (%)	Protein (%)
CDY	11.74±0.06^{b}	2.85±0.01^{a}	3.59±0.04^{a}
2BDY	11.49±0.03^{c}	2.81±0.03^{b}	3.57±0.05^{a}
4BDY	11.86±0.04^{a}	2.81±0.02^{b}	3.62±0.06^{a}
2GDY	11.47±0.05^{c}	2.81±0.02^{b}	3.60±0.06^{a}
4GDY	11.82±0.05^{a}	2.80±0.02^{b}	3.56±0.07^{a}

$^{a-c}$Means ± standard deviations in the same column with different superscript lowercase letters are significantly different ($p<0.05$).
CDY: control drinking yoghurt, 2BDY: drinking yoghurt supplemented with 2% black tea, 4BDY: drinking yoghurt supplemented with 4% black tea, 2GDY: drinking yoghurt supplemented with 2% green tea, 4GDY: drinking yoghurt supplemented with 4% green tea.

Titratable acidity

The titratable acidity values of drinking yoghurt samples during storage are shown in Figure 1. There were no significant differences between initial and final pH values in samples supplemented with either green or black tea ($p>0.05$). The control sample (CDY) had the highest titratable acidity during 14 days of storage, which might have resulted from its high microbial counts (data not shown). Najgebauer-Lejko (2014) also determined higher titratable acidity in control acidophilus milk than those of supplemented with different ratios of green tea during 21 days of storage.

It can be seen from Figure 1 that no significant differences ($p>0.05$) in acidity were observed among samples infused by either 2% black tea (2BDY) or 2% green tea (2GDY). Jaziri et al. (2009) also did not find any significant differences between acidity values of yoghurt samples with 2% black or 2% green tea. In our study, sample supplemented with 4% black tea (4BDY) had higher acidity than that of with 4% green tea (4GDY) ($p<0.05$). This can be attributed to higher viability of bacteria present in 4BDY when compared to 4GDY (data not shown). Marhamatizadeh et al. (2013) also observed an increase in acidity values of probiotic fermented milk supplemented with tea by the increase in the growth of starter bacteria.

Viscosity

The viscosity in acidified milk drinks such as drinking yoghurt or ayran (Turkish drinking yoghurt) is an important quality criterion, and the stability of these products is evaluated based on the viscosity and the amount of sediment.

Figure 2 shows the viscosity values of drinking yoghurt samples during 21 days of storage. Control sample was the most viscous one during the storage

so that it can be concluded that supplementation with tea extract decreased the viscosity values of drinking yoghurts. Sample supplemented with 2% green tea extract was more viscous than that of supplemented with 2% black tea extract throughout the storage. This shows that green tea strengthens the incorporation between milk proteins and polyphenols more than black tea. Moreover, it has been shown that the structures of catechins affect the affinities of tea catechins for casein micelles in the green tea polyphenol added milk system but no obvious impact for the black tea polyphenol added milk system (Ye et al., 2013). Avci et al. (2010) also reported that green tea increased gel hardness and improved water holding capacity in yoghurt formulation. On the other hand, increase in the addition ratio of green tea adversely affected the viscosity of the samples in our study.

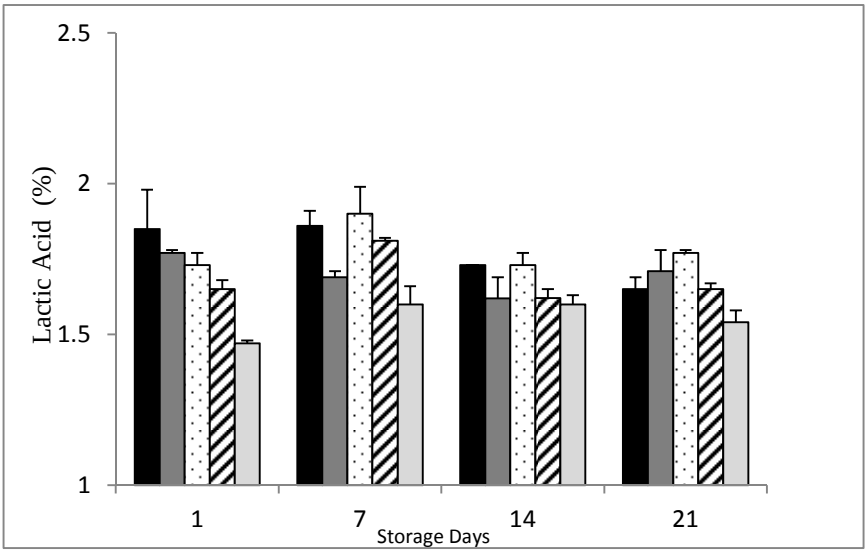

Figure 1. Titratable acidity (% lactic acid) in drinking yoghurt samples during 21 day of storage. CDY: control drinking yoghurt (black bar), 2BDY: drinking yoghurt supplemented with 2% black tea (dark gray bar), 4BDY: drinking yoghurt supplemented with 4% black tea (dotted bar), 2GDY: drinking yoghurt supplemented with 2% green tea (hashed bar), 4GDY: drinking yoghurt supplemented with 4% green tea (light gray bar).

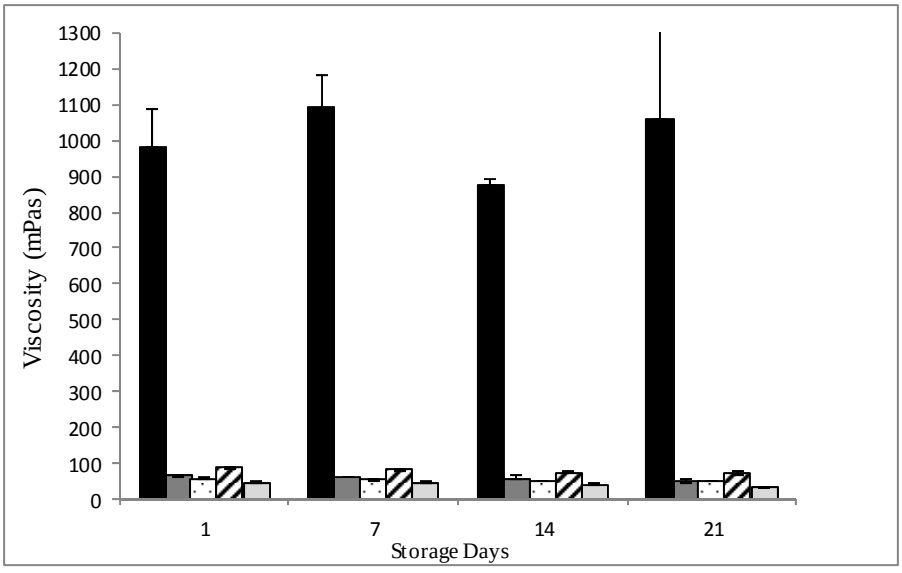

Figure 2. Viscosity (mPas) in drinking yoghurt samples during 21 day of storage at 4°C. CDY: control drinking yoghurt (black bar), 2BDY: drinking yoghurt supplemented with 2% black tea (dark gray bar), 4BDY: drinking yoghurt supplemented with 4% black tea (dotted bar), 2GDY: drinking yoghurt supplemented with 2% green tea (hashed bar), 4GDY: drinking yoghurt supplemented with 4% green tea (light gray bar).

Amirdivani and Baba (2013) investigated some properties of green tea infused yoghurt during storage and found also that apparent viscosity of plain yoghurt (291.3 Pas) was higher than those of green tea supplemented yoghurt samples (76.98-86.41 Pas) on the 1st day of storage. The authors reported that the plain yoghurt exhibited a more compacted casein micelle aggregates network than that of green tea infused yoghurts so that samples added with green tea were more runny and showed low viscosity.

The viscosity value of control drinking yoghurt in our study did not significantly ($p>0.05$) vary during the storage period but a significant reduction ($p<0.05$) was detected in the values of the other samples on 14th day. In another study, viscosity values did not also significantly change at the end of 20 day of storage in control Turkish drinking yoghurt, ayran (Sanli et al., 2013). On the other hand, Irigoyen et al. (2005) determined an appreciable decrease in viscosity values over the course of storage in kefir samples.

Erkaya et al. (2015) investigated the effect of thermosonication on some properties of ayran during storage. The authors detected an increase in the viscosity values during 30 day of storage. This contradiction with our results can be attributed to the difference in composition of the products. Ayran was manufactured by both dilution with water and addition salt at a ratio of 0.75% in the said study whereas such processes were not applied in our study.

Sensory characteristics

The results of the sensory evaluation of the drinking yoghurt samples are shown in Table 2. Sensory characteristics of the samples did not change statistically during 21 days of storage ($p>0.05$). Control sample had high scores in terms of all sensory properties during storage. Addition of tea at a ratio of 4% significantly decreased the taste scores of drinking yoghurt samples when compared to the ratio of 2% throughout the storage.

Table 2. Sensory characteristics of drinking yoghurts during storage

		Storage days			
	Type of drinking yoghurt[1]	1	7	14	21
Taste					
	CDY	8.11 ± 0.32^{Aa}	8.00 ± 0.00^{Aa}	8.00 ± 0.28^{Aa}	7.90 ± 0.14^{Aa}
	2BDY	5.77 ± 0.80^{Ba}	5.10 ± 0.14^{Ca}	6.00 ± 1.13^{BCa}	5.60 ± 0.00^{Ba}
	4BDY	4.46 ± 0.29^{Ba}	3.70 ± 0.14^{Db}	4.40 ± 0.28^{Da}	4.70 ± 0.14^{Ca}
	2GDY	5.77 ± 0.80^{Ba}	5.70 ± 0.42^{Ba}	6.40 ± 0.28^{Ba}	5.50 ± 0.14^{Ba}
	4GDY	4.08 ± 1.53^{Ba}	4.00 ± 0.00^{Da}	4.60 ± 0.28^{Ca}	4.30 ± 0.14^{Da}
Colour					
	CDY	8.45 ± 0.21^{Aa}	8.40 ± 0.28^{Aa}	8.10 ± 0.14^{Aa}	8.40 ± 0.28^{Aa}
	2BDY	6.70 ± 0.14^{BCa}	6.30 ± 0.42^{Ca}	7.20 ± 1.13^{ABa}	6.90 ± 0.14^{Ba}
	4BDY	6.23 ± 0.81^{Ca}	5.50 ± 0.14^{Da}	6.10 ± 0.71^{Ba}	6.50 ± 0.71^{Ba}
	2GDY	7.58 ± 0.59^{ABa}	7.20 ± 0.00^{Ba}	7.70 ± 0.14^{ABa}	7.00 ± 0.00^{Ba}
	4GDY	7.45 ± 0.71^{ABCa}	6.80 ± 0.00^{BCa}	7.30 ± 0.14^{ABa}	7.00 ± 0.00^{Bb}
Texture					
	CDY	8.37 ± 0.50^{Aa}	8.50 ± 0.42^{Aa}	8.20 ± 0.57^{Aa}	8.10 ± 0.14^{Aa}
	2BDY	7.20 ± 0.28^{ABa}	7.20 ± 0.28^{Ba}	7.10 ± 0.71^{ABa}	6.80 ± 0.57^{ABa}
	4BDY	6.70 ± 1.00^{Ba}	6.30 ± 0.71^{Ba}	6.50 ± 0.71^{Ba}	6.50 ± 0.71^{Ba}
	2GDY	7.15 ± 0.71^{ABa}	7.00 ± 0.00^{Ba}	7.40 ± 0.28^{ABa}	6.60 ± 0.57^{Ba}
	4GDY	6.75 ± 0.35^{Ba}	6.70 ± 0.14^{Ba}	7.00 ± 0.28^{ABa}	6.00 ± 0.57^{Ba}
Overall acceptability					
	CDY	8.15 ± 0.21^{Aa}	8.00 ± 0.00^{Aa}	7.90 ± 0.14^{Aa}	7.90 ± 0.42^{Aa}
	2BDY	6.23 ± 0.61^{ABa}	5.70 ± 0.14^{Ba}	5.70 ± 0.14^{Ca}	5.50 ± 0.14^{Ba}
	4BDY	5.80 ± 1.13^{ABa}	4.30 ± 0.14^{Ca}	4.80 ± 0.28^{Da}	5.20 ± 0.85^{Ba}
	2GDY	6.00 ± 0.85^{ABa}	5.70 ± 0.42^{Ba}	6.60 ± 0.28^{Ba}	5.70 ± 1.00^{Ba}
	4GDY	4.53 ± 1.60^{Ba}	4.00 ± 0.28^{Ca}	5.40 ± 0.28^{CDa}	4.60 ± 0.57^{Ba}

$^{a-b}$Means ± standard deviations in the same row with different superscript lowercase letters are significantly different ($p<0.05$).

$^{A-D}$Means ± standard deviations in the same column with different superscript uppercase letters are significantly different ($p<0.05$).

[1]CDY: control drinking yoghurt, 2BDY: drinking yoghurt supplemented with 2% black tea, 4BDY: drinking yoghurt supplemented with 4% black tea, 2GDY: drinking yoghurt supplemented with 2% green tea, 4GDY: drinking yoghurt supplemented with 4% green tea.

Control sample and samples supplemented with green tea had similar colour scores on the 1st and 14th days whereas control sample showed the highest colour values on the other days of storage. Infusion with black tea extract significantly decreased the colour values of drinking yoghurt samples when compared to that of control sample. In another study, green tea supplemented yoghurt samples had higher colour scores (8.0-8.48) than that of plain yoghurt (5.9) (Amirdivani and Baba, 2013).

The drinking yoghurt without any additive had the highest texture scores during storage which can be attributed to its higher viscosity values than those of other samples. On the other hand, there were no significant ($p>0.05$) differences in texture scores among drinking yoghurt samples infused by tea extracts during 21 days. This is also in parallel to their viscosity values obtained throughout the storage period. Amirdivani and Baba (2013) also determined lower texture scores for 2% green tea added yoghurt than that of plain yoghurt.

Highest scores ($p<0.05$) were given to the control drinking yoghurt sample by the panelists in terms of overall acceptability during 21 days of storage. In another study, acidophilus milks with tea were also less appreciated by the panelists when compared to plain acidophilus milk (Najgebauer-Lejko, 2014). Amirdivani and Baba (2013) determined that green tea (two different green tea types at a ratio of 2%) added yoghurt samples had significantly ($p<0.05$) higher scored aroma and overall acceptability but lower texture scores than plain yoghurt. The obtained results for aroma and overall acceptability scores are different from our findings probably due to the type of tea used.

There were no significant ($p>0.05$) differences in overall acceptability values between the samples supplemented with either black or green tea at the beginning and end of the storage. On the other hand, addition of 4% any tea extract significantly decreased the overall acceptability scores of the samples on 7th and 14th days.

CONCLUSIONS

Supplementation with black tea extract gave drinking yoghurt a less viscous structure and a worse overall acceptability when compared to supplementation with green tea extract. The colour and texture values of drinking yoghurt supplemented with 2% green tea were similar to that of control sample whereas taste was less preferred by the panelists. Although 2GDY had lower sensory and viscosity values than that of control drinking yoghurt it showed acceptable characteristics of a drinkable food. In conclusion, green tea at a ratio of 2% can be used as an alternative ingredient in the fortification of drinking yoghurt. Therefore, a functional dairy product will be obtained by delivering also health benefits to consumers as high antioxidant activity of green tea has been well known. Nevertheless, further investigation is needed in order to improve especially the sensorial characteristics of fermented dairy products containing tea extracts.

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REFERENCES

Allah, A.A.A., M.I. Ibrahim, S.M.A. Allah and M.A. Amin. 2012. Antimicrobial effect of tea and tea with milk beverages on oral *Streptococcus mutans* and *Lactobacilli*. World Applied Sciences Journal, 19(9):1327-1334.

Amirdivani, S. and A.S.H. Baba. 2013. Rheological properties and sensory characteristics of green tea yoghurt during storage. Life Science Journal, 10(12): 378-390.

AOAC. 1995. Official Methods of Analysis. 16th edition. Gaithersburg MD, sec.33.2.11. Method 991.20.

Avci, E., Z. Yuksel and Y.K. Erdem. 2010. Green yoghurt revolution. Identification of interactions between green tea polyhenols and milk proteins and resultant functional modifications in yoghurt gel. 5th Central European Congress on Food, 19-22 May, Bratislava 01-2010.

Bodyfelt, F.W., J. Tobias and G.M. Trout. 1988. The sensory evaluation of dairy products. Van Nostrand Reinhold, New York, p.598.

Chan, E.W.C., E.Y. Soh, P.P. Tie and Y.P. Law. 2011. Antioxidant and antibacterial properties of green, black, and herbal teas of *Camellia sinensis*. Pharmacognosy Research, 3(4): 266-272.

Ciron, C.I.E., V.L. Gee, A.L. Kelly and M.A.E. Auty. 2012. Modifying the microstructure of low-fat yoghurt by microfluidisation of milk at different pressures to enhance rheological and sensory properties. Food Chemistry, 130(3):510-519.

Erkaya, T., M. Başlar, M. Şengül and M.F. Ertugay. 2015. Effect of thermosonication on physicochemical, microbiological and sensorial characteristics of ayran during storage. Ultrasonics Sonochemistry, 23: 406-412.

Gulseren, İ. and M. Corredig. 2013. Storage stability and physical characteristics of tea-polyphenol-bearing nanoliposomes prepared with milk fat globule membrane phospholipids. Journal of Agricultural and Food Chemistry, 61: 3242-3251.

Irigoyen, A., I. Arana, M. Castiella, P. Torre. and F.Z. Ibáñez. 2005. Microbiological, physicochemical, and sensory characteristics of kefir during storage. Food Chemistry, 90(4): 613-620.

Jaziri, I., M.B. Slama, H. Mhadhbi, M. Urdaci and M. Hamdi. 2009. Effect of green black teas (*Camellia sinens* L.) on the characteristic microflora of yogurt during fermentation and regriferated storage. Food Chemistry, 112(3): 614-620.

Köksoy, A. and M. Kılıç. 2003. Effects of water and salt level on rheological properties of ayran, a Turkish yoghurt drink. International Dairy Journal, 13(10):835-839.

Marhamatizadeh, M.H., E. Ehsandoost and P. Gholami. 2013. The influence of green tea (*Camellia sinensis* L.) extract on characteristic of probiotic bacteria in milk and yoghurt during fermentation and refrigerated storage. International Journal of Farming and Allied Sciences, 2(17): 599-606.

Najgebauer-Lejko, D. 2014. Effect of green tea supplementation on the microbiological, antioxidant, and sensory properties of probiotic milks. Dairy Science and Technology, 94: 327-339.

Najgebauer-Lejko, D., M. Sady, T. Grega and M. Walczycka. 2011. The impact of tea supplementation on microflora, pH and antioxidant capacity of yoghurt. International Dairy Journal, 21(8): 568-574.

Pohjanheimo, T and M. Sandell. 2009. Explaining the liking for drinking yoghurt: The role of sensory quality, food choice motives, health concern and product information. International Dairy Journal, 19(8):459-466.

Renner, E. 1993. Milchpractikum. Pp.9-10. Germany: Justus-Liebig-Universita

Sanli, T., E. Sezgin, E. Senel and M. Benli. 2013. The effect of transglutaminase on some physicochemical and sensory properties of the Turkish drinking yoghurt Ayran. International Journal of Dairy Technology, 66(3): 410-416.

Vega, C and M.K. Grover. 2011. Physicochemical properties of acidified skim milk gels containing cocoa flavanols. Journal of Agricultural and Food Chemistry, 59: 6740-6747.

Ye, J., F.X.X. Fan and Y. Liang. 2013. Interactions of black and green tea polyphenols with whole milk. Food Research International, 53(1): 449-455.