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**EVALUATION AND COMPARISON THE PHYSICOCHEMICAL PROPERTIES  
PASTEURIZED KEFIR AND DOUGH**

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**ABSTRACT**

In this study, it was aimed to measure the physicochemical properties and acceptability of two fermented dairy product. The first is the traditional fermented Iranian dairy product that called Dough and the second is Kefir. 6 samples of industrial pasteurized Dough and kefir were taken from local store. The mean value for pH, acidity, protein, carbohydrate, calcium and phosphors content was 3.46 , 2.21 % ,2.60 % ,11.6 % , 1.04 and 0.71 % for Doogh samples, this mean value was 3.69 ,0.86 % ,3.92% , 0.10 and 0.08 % for kefir respectively.

**Key words: Fermented Iranian dairy products, Doogh, Kefir**

**INTRODUCTION**

One of the most important factor for people development is the ability to produce and preserve of and store large amount food stuff without spoilage .cultured dairy products are

the most important as foods, for peoples engaged in stock farming. In early times milk has been preserved by fermentation [16]. In all the word there are variable Kind of

traditional fermented dairy product with are prodded from cow, caprine, goat and sheep although bovine milk are widely used for the production of many different types of fermented products [3]. The most of the major fermented product are based on lactic acid bacteria, which produce organic acids especially lactic acid. The presence of these bacteria is crucial to the intrinsic properties of dairy fermented food stuff. The nature of traditional fermented dairy products is varied from one region to another. Its properties depend on type of milk, production process, local indigenous micro flora, the habits stock which in turn reflected the climatic of the region. For example traditional fermented milk in location with a low temperature climate contained mesophilic bacteria such as *Leuconostoc* and *Lactococcus spp.*, whilst thermophilic bacteria, which include mostly *Streptococcus* and *Lactobacillus*, prevailed in regions with a high temperature, Many traditional fermented dairy products were made in Middle East, Asia, Africa, and eastern and northern [16]. Iran has different Traditional dairy product such as Doogh, Kashk, Ghara-Ghooroot, Cheese and etc [1]. Doogh is fermented and traditional native beverage in Iran and has an import shear in food industry. Doogh is a beverage that produced from the dilution of yogurt after a

strong agitation step in special water proof sacs made from goat sheep skin or goatskin, called 'Mashk' Codex standard (2011). In 2009 The production of Doogh was 14,400,000 tons and about 1% of which has been the total export amount of the product and total export, total consumption and total annual production was 150000, 1250000 and 1400000 ton respectively [4]. Today's Doogh is produced all over the country in large industrial scale, but little study has been published about its properties. The origin of kefir grains is interested. While people originally attributed it to a direct Blessing from Allah .The word kefir is derived from "keif" that is the Turkish word, which means enjoyment or pleasure". This is maybe due to the overall sense of health and relaxation. Kefir history back to central Asia, shepherds peoples who live in the Caucasus Mountains discovered that raw milk carried in leather. Originally Kefir was unknown outside the Caucasus region, and Marco Polo did mention about it in his travels [15]. Kefir differs from other fermented milk in that it is not the result of the metabolic reaction of a single species of microorganism, but it is the prepped of fermentation with a mixture of microorganisms to a matrix of discrete "kefir grains [14]. Kefir grains contain lactic acid bacteria mainly *Lactobacilli*, *Lactococci*, and

*Leuconostocs* species, acetic bacteria and yeast mixture bound together with casein and complex sugars. After placing the grains in the fresh milk, the mixture is incubated for about one day at ambient temperature (68-77°F). After fermented process, the grains removed by straining the mixture through plastic strainer or stainless steel. The grains are recovered and placed into milk while the kefir may be consumed or stored [9]. The resulting product has a slightly acidic taste caused mostly by the presence of lactic acid, some effervescence due to CO<sub>2</sub> and a minute level (<2%) of alcohol resulting from the activity of the yeast cells [3]. Although in different countries usually it is produced from cow milk on an Industrial scale. Although kefir could be produced from sheep, goat, as well as buffalo milk with its own properties and the chemical properties of such product is also affected by the methods used for production. The quality of kefir was depended on the composition strain types of grains microorganisms, quality of raw milk as well as preconditions before inoculated [9]. This product defines as probiotic. It means food with different microorganisms that exhibit a beneficial effect on human health. Kefir has been credited with antifungal and antibacterial properties have demonstrated higher a

tioxidative and ant mutagenic activity than fresh milk. Also it has suggested that this product can suppress cells from UV damage [12, 5]. Today's both of pasteurized Doogh and kefir was produced in industrial scale. According to unique properties of fermented product study about its properties is interested. So the aim of this study was compare of the physicochemical characteristics properties of some pasteurized Iranian Doogh and Kefir.

## **MATERIAL AND METHODS**

### **Material**

Randomly selected different stores located in Tehran and 3 samples of pasteurized Doogh and Kefir were obtained from local store in Iran and Named A, B and C. Sampling of each product was done according to International standard number 326[7].

### **Methods**

The pH value of samples was measured using pH meter. PH and titratable acidity was measured according to the method of international standard number 2852[6]. Moisture, salt, protein and ash were measured according to the method of international standard number 637, 639 and 1755 respectively [9, 10 11]. Calcium and phosphors was measured according to Otles and Cagindi, (2003).

### **Data Analysis**

Data collected from the aforementioned study samples were analyzed based on 0.05% coefficient of error by a software program. The data analysis was performed using MINITAB statistical software, release 14.2 (MINITAB Inc., state college, PA and USA). At first such software program proved samples normal conditions and then the significant difference among data was precisely studied via Anova –one – way test and *p*-value was determined.

### Sensory Analysis

A 5 point hedonic scale (1= lowest desirability, 5= highest desirability) was designed to evaluate the sensory characteristics by using 30 trained panelists about overall acceptability. Water was provided to wash the mouth between two oral tests.

## RESULTS AND DISCUSSION

Table 1 and 2 shows the content of the main physicochemical properties in Doogh and kefir samples respectively. The pH value of Doogh samples had a between 3.25 and 3.90, with a mean 3.64. According to the statistical analysis this entire sample was similar ( $p \leq 0.05$ ). Maximum level of pH in International standard was 4.5 and so all of samples were accepted (ISIRI, 1998). The highest pH value of kefir was 3.81 and the lowest was 3.59, there wasn't any statistical

difference between the kefir samples. This result was similar to pH values approved in kefir by other workers. However, a little higher values( about 4.30) than ours were shown by Otles and Cagindi, (2003), Cetinkaya *et al.*, (2012), Kesenikas *et al.*, (2011), Purnomo *et al.*, (2012) and Oner *et al.*, (2010 ). The highest acidity in the Doogh samples was 0.91 % and the lowest was 0.54 % and this difference was statistically significant ( $p \leq 0.05$ ). About the kefir samples, acidity of all samples statistically was similar and the min value was 0.86%. These content were consistent with the limit (min. 0.6 %) laid down in Codex standard. According to codex standard the lowest acceptable limit of acidity in kefir is 0.6%, therefore all of samples was acceptable. Also similar result noted by Cetinkaya *et al.*, (2012) who found an average of 0.8% acidity, in kefir in Bursa. The highest and lowest moisture content of Doogh and kefir sample was 89.71%, 73.78% and 94.835%, 87.04% respectively and in both then this difference was significant ( $p \leq 0.05$ ). The density values of Doogh and kefir samples analyzed in this work ranged from 1026.11 to 1053.41 and 1017.94 to 1034.93 respectively. In both of them significant difference was observed ( $p \leq 0.05$ ). Higher value of density refers to higher weight of samples, it means lower

level of water and higher percent of solid not fat. In any food sample, if the amount of water should be close to 100 %, its density should be close to 1000 Kg/m<sup>3</sup> (density of water) as shown in Table 1 and 2, in any sample where more water is less density and closer to density of water. One of the most important of food component is fat that directly affected on taste and calorie of food stuff. The highest level of fat in Doogh and kefir samples was 3.61 % and 3.53%, in both of them it was shown significant difference with another samples. ( $p \leq 0.05$ ). According to codex standard fat content of kefir should be lower than 10% .Therefore all of kefir samples were In accordance with this standard. Also, other published article reported similar results. Cetinkaya *et al.*, (2012) and Otles and Cagindi, (2003) indicated the fat contents of kefir was 2.3% and 3.5%, respectively. Another important and valuable component in diet of people is protean that supply essential amino acid for body and directly affected on formation of enzyme and in directly grow and human health. The average content of protein in Doogh sampled was 2.60% and there wasn't significant difference between 3 different commercial samples, but in kefir samples the content of protein has shown statistically significant difference ( $p \leq 0.05$ ). The min

value of protein was 3.08%. According to codex standard acceptable limit was min. 2.7% and therefore all of this kefir samples was suitable. Otles and Cagindi, (2003) demonstrated the mean values of 3.3% for protein contents, but, Kesenikas *et al.*, (2011) showed a little higher protein content ( about 4% ). In kefir and Doogh production process salt should be added to product due to reached suitable and salty flavor. The salt content in human diet is very important because it is necessary for life but high content of this ingredient has adverse effect on human health such as high pressure of blood. Salt content of 3 commercial Doogh was 1.01%, 0.86% and 1.05%. According to international standard of Iran maximum percent of salt for Doogh is 1% and so just one of samples (B) was acceptable and 2 another samples was a little higher salt content. In kefir samples salt content was in range 0.69% and 1.11% and between these samples significant difference was observed ( $p \leq 0.05$ ). Mean carbohydrate content of Doogh and Kefir was 11.6 % and 3.92 % respectively. Between the each grope of Doogh and kefir samples significant difference was observed ( $p \leq 0.05$ ). But there was high difference between the carbohydrate content of kefir and Doogh samples. These phenomena was shown in the

work of Purnomo *et al.*,(2012) and Kesenikas *et al.*, (2011), and explain as below: Lactose has an important and essential role as one of nutrient for grow of lactose fermenting microorganisms .Lactose has the most effective nutrient for growth of kefir grains compared to other polysaccharides. It means increasing of lactose content will also increase the level of kefir biomass. Kefir is a suitable diet for people who safer lactose intolerant that have the inability to digest high content of lactose that is the predominant carbohydrate of milk. As a result of fermentation the lactose percent is decreased in kefir and the galactosidase level was increased [13]. The obtained result was similar to those recorded for kefir by Otles, and Cagindi, 2003, who note that the lactose content was 4%. Ash content refers to total mineral in food stuff. Ash content of Doogh and kefir sample has shown significant difference. The range of this parameter for Doogh and kefir was 0.66 % to 1.34 % and 0.41% to 0.91 % respectively. Calcium and phosphorus is valuable nutrients in the human body. Most of the phosphorus in the body is found in association with calcium like as teeth and bones where it is essential to structure. Mean calcium content for Doogh samples were 1.04% and between this samples there wasn't any significant

difference but phosphorus content has shown statistical significant difference ( $p \leq 0.05$ ) and its mean value was 0.71%. Calcium and phosphorus content in kefir samples didn't show any significant difference, and its limit was 0.08% to 0.12% for calcium and between 0.07 % to 0.10% for phosphorus, which is similar to the data reported by Otles and Cagindi, (2003), who observed calcium and phosphorous content in kefir was 0.12% and 0.10% respectively. Total acceptability in Doogh and kefir samples showed significant differences ( $p \leq 0.05$ ). between Doogh, C sample has lowest consumer acceptability may be due to low dry mater ( high moisture ) that affect mouse fell or due to the lowest acidity that affected on taste it means this sample has lower soured taste than other samples. Probably consume prefer and choice concentrated and soured taste for Doogh. In compare to Doogh Kefir samples have lower acceptability. It should be noted that kefir recently produced in Iran and in compare to Doogh is a new product. Kefir has prickly, acid, and slightly yeasty flavor. Also acid and yeasty taste together with prickly sensation was due to carbon dioxide as typical kefir organoleptic characterization [12], maybe this flavor not very popular for Iranian peoples.

Table 1: physicochemical properties of pasteurized Doogh

Properties	A	B	C	Acceptable limit *
pH	3.25±0.01 <sup>a</sup>	3.78±0.00 <sup>a</sup>	3.90±0.00 <sup>a</sup>	4.5 max
Density	1026.11±1.51 <sup>a</sup>	1042.63±2.05 <sup>b</sup>	1053.41±1.72 <sup>b</sup>	-
acidity	0.91±0.03 <sup>a</sup>	0.76±0.13 <sup>a</sup>	0.54±0.02 <sup>b</sup>	-
Fat	3.61±0.21 <sup>a</sup>	2.31±0.07 <sup>b</sup>	2.52±0.16 <sup>b</sup>	-
Moisture	89.71±1.43 <sup>a</sup>	78.66±0.76 <sup>b</sup>	73.78±0.93 <sup>b</sup>	-
Protein	2.33±0.08 <sup>a</sup>	2.71±0.05 <sup>a</sup>	2.80±0.11 <sup>a</sup>	-
Salt	1.01±0.06 <sup>a</sup>	0.86±0.10 <sup>b</sup>	1.05±0.04 <sup>a</sup>	1 (%) max
Carbohydrate	8.03±0.78 <sup>b</sup>	12.76±1.05 <sup>a</sup>	13.97±1.21 <sup>a</sup>	-
ash	0.66±0.02 <sup>b</sup>	1.02±0.01 <sup>a</sup>	1.34±0.04 <sup>a</sup>	-
phosphorus	0.07±0.03 <sup>b</sup>	1.02±0.06 <sup>a</sup>	1.06±0.03 <sup>a</sup>	-
Calcium	0.91±0.07 <sup>a</sup>	1.13±0.09 <sup>a</sup>	1.09±0.05 <sup>a</sup>	-
Total acceptability	4.74±1.03 <sup>a</sup>	3.97±0.81 <sup>b</sup>	4.82±0.96 <sup>a</sup>	-

\*: International standard; <sup>a-b</sup>: Values in same row with same superscript are not significantly (P<0.05) different.

Table 2: physicochemical properties of pasteurized kefir

Properties	A	B	C	Acceptable limit *
pH	3.59±0.03 <sup>a</sup>	3.69±0.00 <sup>a</sup>	3.81±0.05 <sup>a</sup>	-
Density	1017.94±1.13 <sup>b</sup>	1034.93±2.54 <sup>a</sup>	1020.43±6.02 <sup>a</sup>	-
Acidity	0.82±0.05 <sup>a</sup>	0.87±0.01 <sup>a</sup>	0.90±0.06 <sup>a</sup>	min. 0.6%
Fat	2.32±0.18 <sup>b</sup>	3.53±0.05 <sup>a</sup>	2.21±0.11 <sup>b</sup>	less than 10%
Moisture	94.83±1.14 <sup>a</sup>	87.04±1.62 <sup>b</sup>	93.33±1.50 <sup>a</sup>	-
Protein	3.03±0.22 <sup>ab</sup>	3.41±0.27 <sup>a</sup>	2.81±0.70 <sup>b</sup>	min. 2.7%
Salt	1.11±0.02 <sup>a</sup>	1.09±0.08 <sup>a</sup>	0.69±0.04 <sup>b</sup>	-
Carbohydrate	2.41±0.31 <sup>b</sup>	4.98±0.08 <sup>a</sup>	4.38±0.77 <sup>a</sup>	-
ash	0.41±0.03 <sup>b</sup>	0.91±0.05 <sup>a</sup>	0.53±0.02 <sup>b</sup>	-
phosphorus	0.07±0.01 <sup>a</sup>	0.10±0.03 <sup>a</sup>	0.08±0.02 <sup>a</sup>	-
Calcium	0.08±0.01 <sup>a</sup>	0.12±0.04 <sup>a</sup>	0.11±0.02 <sup>a</sup>	-
Total acceptability	4.24±1.14 <sup>a</sup>	4.26±0.71 <sup>a</sup>	3.68±0.45 <sup>b</sup>	-

\*: codex standard; <sup>a-b</sup>: Values in same row with same superscript are not significantly (P<0.05) different.

## CONCLUSION

Health benefits and high nutritional values fermented dairy product like Doogh and kefir are numerous; therefore it is suggested to people for premature infants, nursing women, young children pregnant, patient and old people. Many researchers investigated many characterization of fermented dairy product but mostly not well defined. Future study will appear more clarification about this product and its therapeutic and nutritional benefits.

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