

## Production and Quality Characteristics of “Doogh”

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### ABSTRACT

Doogh, an Iranian drinking yoghurt type, is a fermented dairy beverage and constitutes an important part of daily beverage consumption in Iran. Doogh is commonly produced from mixing of yoghurt, drinking water, salt and essence of aromatic vegetables such as thyme, mint and oregano. Although some undesired properties such phase separation due to the low pH and aggregation of casein may be seen frequently in doogh, the high tendency for its consumption has increased the scientific and industrial efforts in order to improve the quality of the product. The specific standards are determined for doogh by the Institute of Standard and Industrial Researches of Iran (ISIRI). The aim of this paper is to give an overview on the production and quality properties of doogh.

**Key Words:** Doogh, Fermented dairy beverage, Quality properties, Iran

### “Doogh” Üretimi ve Kalite Özellikleri

#### ÖZET

Doogh, İran'da üretilen fermente bir yoğurt içeceği ve günlük içecek tüketiminin önemli bir kısmını oluşturmaktadır. Doogh, yaygın olarak yoğurt, içme suyu, tuzun yanısıra kekik, nane ve keklükotu gibi aromatik bitki özüt karışımından üretilmektedir. Düşük pH ve kazein kümeleşmesi nedeniyle faz ayırımı gibi istenmeyen özelliklerin sıkça görülmesine rağmen ürünün tüketimine yönelik yüksek eğilim, kalitesinin yükseltmesi doğrultusunda bilimsel ve endüstriyel girişimlerin artmasına neden olmuştur. İran Standart ve Endüstriyel Araştırmalar Kurumu (ISIRI) tarafından doogh için özel standartlar belirlenmiştir. Bu makalede, Doogh üretimi ve kalite özellikleri ile ilgili genel bilgilerin verilmesi amaçlanmıştır.

**Anahtar Kelimeler:** Doogh, Fermente süt içeceği, Kalite özellikleri, İran

#### INTRODUCTION

A large amount of yoghurt is used as a base to manufacture drinking or beverage products that are consumed either from a glass or direct from the retail container in many countries [1]. Drinking yoghurt is categorised as stirred yoghurt of low viscosity and this product is consumed as a refreshing drink [2]. “Doogh”, an Iranian fermented dairy beverage is one of the drinking yoghurt types and constituted an important part of daily beverage consumption in Iran [3]. Doogh is a

Persian word and derived from “milking”. It is usually produced by mixing set or stirred yoghurt and water at the same rate and addition some aqueous extracts of local herbs, some spices such as thyme, cucumber and garlic essence or mixture of them [4,5]. Similar products exist in “Ayran” in Turkey, “Than” in Armenia and “Lassi” in Southern Asia [6] and may differ from doogh in dilution ratio, rheological characteristics, fat content and sensory properties [7]. Nowadays, doogh is produced in large scales by small and large dairy units [3] that is indicated the common consumption of it in Iran. In

addition to more digestibility and having more vitamins and nutritional metabolites compared with the milk, doogh consumption increases the absorption of calcium [8]. Also the use of doogh in each meal caused a significant decrease in the number of pathogenic bacteria and could be prevented the microbial contamination [9].

The Institute of Standard and Industrial Researches of Iran (ISIRI) has set a standard for the different properties of doogh that produced by industrial dairy units. The chemical and microbiological properties of industrial doogh have been presented in Tables 1 and 2, respectively.

Table 1. The chemical properties of industrial doogh [4]

Chemical Properties	Quantity
pH	≤4.5
Fat (%)	≤50 of MSNF*
MSNF (%)	≥3.2(w/w)
NaCl (%)	≥0.2; ≤ 1.0(w/w)
Stabilizer (%)	≤10 of MSNF*

\*MSNF: Milk Solid Non Fat

Table 2. The microbiological properties of industrial doogh [4]

Microbiological Properties	Quantity (cfu/g)
Coliform	≤10
<i>Escherichia coli</i>	Negative
Mold and Yeast	≤100
<i>Staphylococcus aureus</i>	Negative

## PRODUCTION METHODS of DOOGH

Doogh is produced by two traditional and industrial methods in Iran. In traditional method, first yoghurt is produced from cow, sheep or goat's milk or mixture of them. The yoghurt produced is placed in a cloth bag and churning is continued with adding water partially. Then the fat layer in the top of diluted yoghurt is removed and fermentation is continued to achieve satisfactory taste and acidity. After adding salt and spices, the final product is stirred and kept in cool place [7].

In the most dairy units, doogh is produced by cow milk. Two methods are used in the industrial production of doogh (Figure 1). The common production method of doogh -that covers the largest volume of production- is constituted separation of cow milk fat, preparation of yoghurt from raw milk fat and adding water, salt and essential oils [10]. After preliminary chemical and microbiological analysis, the fat of raw milk is standardized to < 1%. Then homogenizing (55-60°C, 150 bar) and heat-treatment (90-95°C, 5-10 min) are applied to milk and after decrease the temperature of milk to 42-43°C, *Streptococcus thermophilus* and *Lactobacillus delbrueckii* spp. *bulgaricus* (1/1, 2%) are inoculated to milk as starter cultures. The mix is incubated at 37-38°C and fermentation is continued until the decreasing the pH of yoghurt to 4.6-4.7. Then yoghurt produced is cooled to 20-25°C and mixed with drinking water (50-60%), edible salt (≤1%) and essence

of aromatic vegetables such as thyme, mint and oregano (1-2%). The heat treatment (78°C, 10 min) and homogenizing are applied to final product and after cooling, doogh is stored at 7±1 °C [11].

In the other method, doogh is produced by the fermentation of milk diluted with water in some dairy units in Iran. In this method, after raw milk preliminary analysis and fat rate standardizing, drinking water is added to milk and the dry matter of milk is set at 8-8.5 %. Then homogenizing (50-55°C, 2 bar), heat-treatment (90-95°C, 5-10 min), cooling (42-43°C), inoculation of starter cultures (2%), incubation (37-38°C, until the decreasing the pH to 4.6-4.7), cooling (20-25°C), adding edible salt (1%) and essence of aromatic vegetables is applied respectively. The final product is stored at 7±1°C. Similar to the implementation of this method is widely used in the production of ayran in Turkey [12].

According to ISIRI, doogh produced in Iranian dairy units is divided into 4 groups; 1- non-carbonated and un-heat treated, 2- non-carbonated and heat treated, 3- carbonated and un-heat treated, 4- carbonated and heat treated. Heat treatment and carbonating are applied to product after fermentation. Heat treatment is used in order to stop the activity of starter microorganism, to prevent the possible cross contamination and to extend the shelf life of the final product [4].

## SOME PROPERTIES of DOOGH

Fermented dairy products can be classified into the viscous, diluted or beverages and carbonated product. According to this classification, doogh is located in diluted category although doogh has been carbonated to produce a fizzy variant of the traditional product in dairy factories recently [1].

Doogh has an acidic nature and similar to the other acidified milk drinks, because of the aggregation of casein due to the low pH of it, phase separation occurs frequently [13]. During the production of acidified beverages such as doogh by yoghurt dilution, the particles of fragmented acid-casein gel are separated. This condition makes severe loss of stability and increased tendency to sedimentation in particles mentioned [14]. On the other hand, the edible salt used in the manufacture of doogh can cause increasing the phase separation [15]. So the consumer shakes the product before consumption. In order to prevent this phenomenon, different researches have been done about the increasing of stabilization mechanism of doogh by using different gums as stabilizer such as orchid and guar [13,16], tragacanth [5,10,13], gellan and pectin [7,17,18]. It has been shown that using one gum in comparison with a combination of several gums has a better effect on the stability of doogh generally and gum added has caused some changes in the rheological properties of doogh. Also it has been determined that there is no correlation between the stabilization capability of gum used and the pH range of doogh produced [5,13].

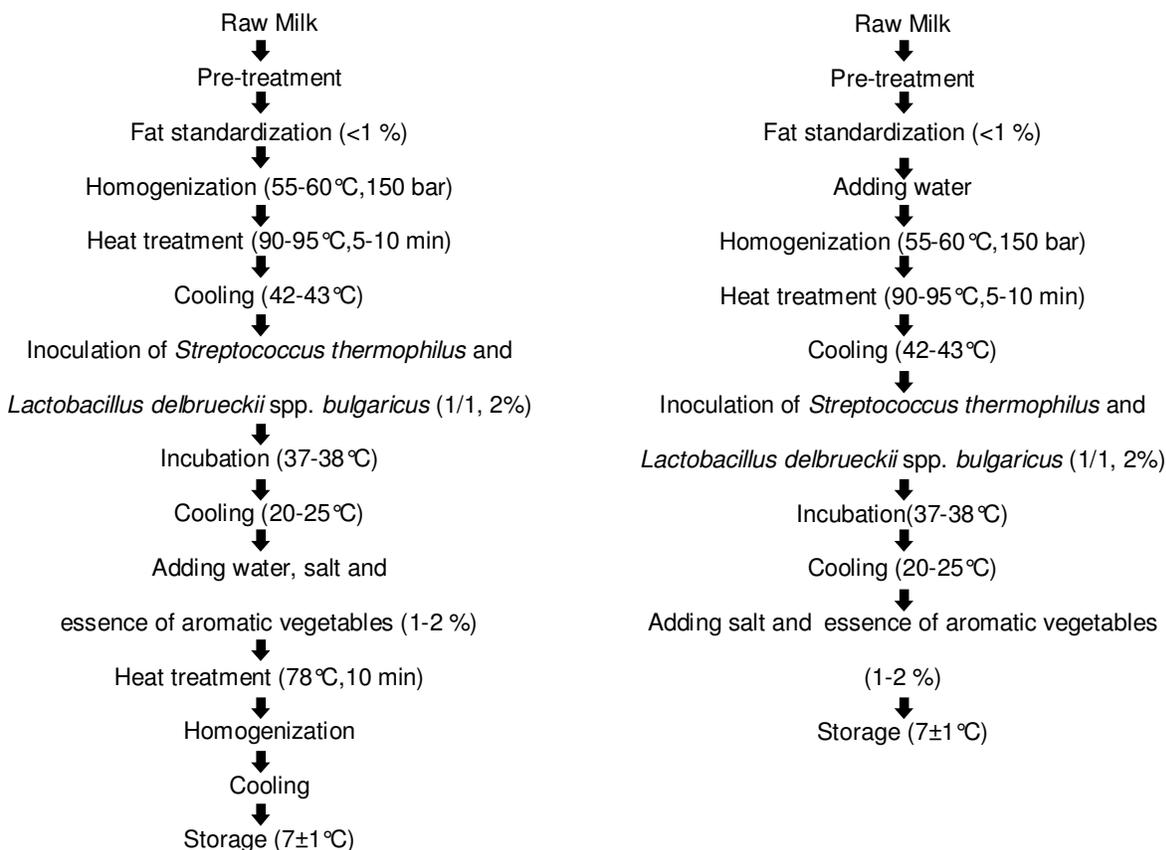


Figure 1. The industrial production of doogh by two methods [11,12]

Generally, the use of stabilizing agents and heat treatment are necessary in order to prevent the phase separation and increase the shelf life during the production of acidified products [19]. In this context, the use of high-ester pectin is recommended to stabilize acidified milk drinks such as doogh. Pectin as a stabilizer is protected the proteins during heat treatment and prevented the aggregation of them [2]. Furthermore, satisfactory results are obtained from the using probiotic bacteria for the microbiological, sensory and texture stability of doogh [20]. Furthermore the results of the research on the flow behavior of doogh are shown that because of the diluted state of doogh, the colloidal particles are apart from each other and doogh has a Newtonian flow behavior. Also the colloidal particles distributed in a large range and different shapes [3].

The hygiene status of materials and equipment used has an important role in the microbial quality of the product. So that the quality of raw milk, adequacy of heat treatment, microbiological quality of edible salt and aromatic vegetables used in production, hygiene level of filling equipment and packaging containers and the air condition of the production hall are the most effective factors on the microbial quality of the final product [11]. Furthermore, the storage temperature of doogh has a significant effect on the shelf life of the product. The results of a research have shown that the maximum

shelf life of doogh is in refrigerator temperature and shelf life decreases with increasing storage temperature [21].

## CONCLUSIONS

Doogh is a fermented dairy beverage produced and consumed in large scales in Iran. The mix of yoghurt, drinking water, edible salt and essence of aromatic vegetables are used in the production of doogh. Doogh is an acidic food, and aggregation and sedimentation of casein occur due to the acidic nature of it that causes to phase separation in the product. Different stabilizing agents are used to increasing the stability of product that results of using them are satisfactory. However, researches are continuing in this context and in order to reach desirable results, various stabilizing agents are used in single form or combination with other agents. The microbial quality of doogh is affected by microbial quality of raw milk and additives, hygienic conditions of production hall, equipments and materials and sufficiency of heat treatment applied to product. So in order to produce a high quality product, the use of suitable raw material and production under hygienic conditions is necessary.

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