

THE STUDY OF FAT CONTENT OF TURKISH YOĞURT (*)

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HISTORY OF YOĞURT

Down through the centuries the Asiatic Turks have fermented milk so that it would keep longer in a hot climate than would the fresh product. This procedure has been and is now, very important in areas of the world where rapid transportation and refrigeration are not generally available.

Yoğurt is but one of the fermented milk products. Others include Kefir, Kimız, Araka, Tarho, Katih, Punch of cheese, Punch of milk, Dehri, Huslanka, Saur milk, Skyr, Wein of Galacton, Yazma, Urgutnik, Zioddu, Lebeniraib, Mazun, Kellermilch, Tatmjolk and Sostej.

The word «Yoğurt» is of Turkish origin. It was in use nearly one thousand years ago (11), (29)

According to AYGÜN (1) yoğut is a Turkish discovery. It is a national food that has been used for centuries in all Turkish countries. It was introduced into the Balkan countries by the Anadolu (Asia Minor) Turks. It was introduced into other European countries from the Balkan countries about the beginning of the twentieth century. YÖNEY (28) states yoğurt has been produced in the United States of America for about twenty-five years. But ROGERS (21) shows it has been produced in the United States since 1916.

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Types of Yoğurt and Methods of Production

There are three kinds of yoğurt: namely,

- 1 — Yoğurt or silivri yoğurt.
- 2 — Süzme Yoğurt or Torba Yoğurt (yoğurt of the cloth bag).
- 3 — Kurut (dried yoğurt) (1), (9).

1. Silivri Yoğurt

This is one of the well-known yoğurts which is widely used in the big cities. Its production is a big industry. Milk from sheep, cattle, goats, and water buffaloes can be used for its production.

The best yoğurt is made from sheep's milk. The first step in yoğurt production is boiling the milk with frequent stirring. This stimulates evaporation. Special types of clean plates or bowls are filled with known amounts of the boiled milk. This is then allowed to cool to about 43-44° C. At this temperature the fat rises to the top and covers the milk. Each plate or bowl is then inoculated with two per cent of its volume of one-day-old yoğurt. This is diluted with equal parts of water that has been boiled and allowed to cool to about 42-43° C. If nonhomogenized milk is used, inoculations are made with a syringe so as not to disturb the fat layer. The inoculated milk is incubated at 37-40° C. until it has almost solidified.

RUDANOVSKAYA (23) recommends the use of starter cultures in tablet form for the home preparation of yoğurt.

SOULID (25) found yoğurt cultures remain viable for five to eight months in milk.

REICHEL (20) suggested that a pH meter fitted outside the incubator be used to determine when yoğurt has reached the proper acidity.

PETTE and LOLKEMA (15) stated the true yoğurt aroma is linked with the production of acetaldehyde.

2. Süzme (drained) Yoğurt

Süzme yoğurt may be made from either **Silivri yoğurt** or from the by-product obtained when butter is made from yoğurt. In either case, the curd is hung in a cloth bag until all the liquid that will drain out has escaped. If made from silivri yoğurt, it contains all the fat in the original milk when it is made from milk with a high fat content. the fat of the finished silivri yoğurt may be removed and then added

on top of the yogurt after it has been drained in a cloth bag. If made from the by-product obtained after making butter, it is very low in fat content but contains the other constituents of milk. It is a palatable and nutritious food which is called Ayran.

Süzme yogurt will keep about a week without refrigeration if it is properly salted. If it is to be kept longer it is usually pressed, rolled into egg shaped masses, put in a jar or other container, and covered with olive oil.

3. Kurut (Dried Yoğurt)

This type of yogurt is made from Süzme or Torba yogurt by adding salt, shaping it properly, and drying it in the sun. Kurut has been made and eaten in Turkey for many years. It is mentioned in some of the old Turkish testaments.

İZMEN (9) found the content of Silivri yogurt to be as follows :

Moisture	83.630 %
Dry solids	16.370 %
Fat	4.930 %
Non-fat dry solids	11.437 %
Total Nitrogen	6.451 %
Lactose	4.103 %
Ash	0.976 %

According to GÜLMEZOĞLU and FİŞEK (5) riboflavin, nicotinic acid and biotin contents of 100 grams of yogurt are 177, 1.2, and 186 gammas, respectively.

The Properties of Yoğurt

This is a relatively stable milk product. Its acidity inhibits the activity of lipase (28) and of many bacteria. Rancidity develops only slowly or not at all. Its stability makes it especially valuable in hot countries with inadequate cooling equipment.

The digestibility of yogurt is very high partly because micro-organisms have broken some of the complex components into simpler substances (3).

HONDA (9) studied the microflora of yogurt. He inoculated the sour milk with some of the common pathogenic bacteria to observe its bacteriostatic and bactericidal properties.

AYGÜN (1) mentioned that yogurt is a safety food when milk or

milk products containing viable *M. tuberculosis*, *Brucella* species, foot and mouth disease virus, or *S. typhi*.

GOLEM (4) in 1944 studied the survival time of *S. typhi* in Ayran, which is diluted yoğurt. He found its bactericidal action was correlated with its pH.

The antibiotic, bactericidal, and protozoacidal properties and lactic acid content of both cow's and human milk were studied by SENECA, HENDERSON, and COLLINS in 1950 (24). They found yoğurt possesses both bacteriostatic and bactericidal properties against a wide range of pathogenic and non-pathogenic bacteria and protozoa. They state these properties are directly related to the lactic acid content of the yoğurt. They also found the antibiotic factor in yoğurt is diffusible and filtrable and relatively heat-stable. It lost its activity when neutralized with Na OH.

KARASOY (10) found salmonella cannot survive more than 44 hours in yoğurt, but *E. coli* can survive 60 hours.

According to GÜRSEL and FİŞEK (7) yoğurt has a bactericidal action against *E. coli*, *S. typhi*, *Shig. paradysenteriae* (Flexner), *Br. melitensis*, *C. diphtheriae*, *K. pneumoniae* (Friedlander), and Pr. 19, × but not for *St. hemolyticus*, Type A.

GÜRSEL and FİŞEK (7) found, in 1953, that the bactericidal action of the micro-organisms of yoğurt depends on the amount of lactic acid produced by *Lact. Bulgaricus*.

POLYMENAKOS (19) states that patients who are treated with aureomycin or teramycin will not develop gastro-intestinal disturbances if they are given yoğurt.

According to GÜRSEL (6) yoğurt has a bactericidal action against *Mycobacterium tuberculosis typus humanus and bovinus* but not against the gallinaceous type.

METCNIKOFF mentioned the bactericidal properties of yoğurt.

For centuries yoğurt has been used in Turkey as a treatment for disturbances of the digestive tract.

The albumin and casein are in part transformed into digestible peptones and albuminoses in yoğurt by bacterial action (22).

The Micro-organisms of Yoğurt

REFİK and ŞADİ (19) mention three kinds of micro-organisms in yoğurt as follows :

I. Bacilli :

1 — Bacillus of Turk

2 — Homogen bacillus

3 — Delicate bacillus

II. Diplococci :

III. Yeasts :

1 — Oval yeasts

2 — Oblong yeasts

According to IZMEN (9) the best yoğurt culture will have two kinds of organisms :

«1 — *Thermobacterium* (yoğurt, bulgaricum) .

2 — *Streptococcus thermophilus*»

and will not contain other bacteria, yeasts, or molds.

GÜRSEL and FİŞEK (7) state yoğurt has three kinds of micro-organisms :

1 — *Streptococcus thermophilus*

2 — *Lactobacillus bulgaricus*

3 — *Saccaromyces*

According to AYGÜN (1) the microflora of yoğurt include seven different organisms.

ROSSEL (22) and BROCHU (2) say *S. thermophilus*, *L. bulgaricus*, and *Plocamobacterium yoghurtii* are the essential of yoğurt.

PENKO (14) isolated *S. thermophilus* and *L. bulgaricus* from yoğurt. He described their cultural and physiological characteristics.

PETTE and LOLKEMA (16), (17) stated the correct balance between *Lactobacillus sp. S. thermophilus* should be 1/1 in the test cultures. They regarded these organisms as the essential ones.

According to VLEESCHAUWER, OKERMAN, and NAUDTS (27) the yoğurt microflora are a mixture of *L. bulgaricus* and *S. thermophilus*. In some instances they found rods which closely resembled *L. casei* or cocci which differed from *S. thermophilus* by failing to ferment glucose, galactose, and saccharose.

OMURTAG, OMURTAG, and ORDAL (12) isolated *S. thermophilus*, a lactobacillus, and two kinds of yeast from Turkish Yoğurt.

Presumably KERN's *Dispora caucasicum*, BEYERINCK's *Bact. caucasicum*, PREUDENREICH's *Bact. caucasicum* (21), IZMEN's *Thermobacterium yoğurt* (9), and ROSELI's (22) and BROCHU's (2) *plocamobacterium yoghurtii* are identical with REFİK and ŞADİ's *Bacil. of Turk*.

It is suggested to consider the taxonomy of *Lact. bulgaricus* as *Bacterium of Turk* for its Nomenclator.

Turkish yoğurt

Turkish Regulations Concerning Yoğurt

Turkish regulations concerning yoğurt are as follows (26) :

CHAPTER. 2.

Section V

Yoğurt

Paragraph 50 : Yoğurt is a lactic fermentation product available for human consumption which is produced by adding yoğurt culture to boiled milk.

Yoğurt can be made from either whole milk or 50 % whole and 50 % skim milk of cows, sheep, water buffalo, or goats. According to Paragraph 23: Torba yoğurt made from skim milk may be sold. But it is unlawful to sell any other type of yoğurt made from skim milk.

Paragraph 51 : Constituents of Yoğurt

	% Fat	% Non-fat dry solids
Whole milk of cows	3	8
Whole milk of sheep	6	10
Whole milk of water buffalo	7	9
Whole milk of goats	4	8.5
50 % skim milk of cows	2	8
50 % skim milk of sheep	4	10
50 % skim milk of water buffalo	4.6	8
50 % skim milk of goats	3	8.5

The consistency, appearance, odor, and tests must be natural.

Yoğurt may be made by mixing not more than two kinds of milk in equal parts. The fat content of such yoğurt must at least equal half the sum of the fat content of each of the two milks used in the mixture. The required non-fat dry solids content is at least half the sum of the non-fat dry solids of each of the two types of milk combined to produce the mixture.

Paragraph 52 : The container must be covered with a waterproof paper. The container must carry a label which identifies the type of yoğurt (made from whole milk, made from 50 % whole and 50 % skim milk, or torba yoğurt), gives the type of milk used (cows', sheep, 2tc,) lists the net weight, gives the date of production, and names the firm which produced it.

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Paragraph 53: The addition of starch, any kind of animal fat; etc. is prohibited. Yoğurt containing dirt or any foreign material must not be sold. Torba yoğurt may contain 2 % of salt.

Paragraph 54: Dirty, spoiled, rancid, moldy or improperly fermented yoğurt or yoğurt made from unhealthy milk can not be sold.

Paragraph 55: Containers which affect the yoğurt or permit its contamination by unsanitary material must not be used.

EXPERIMENTS

MATERIAL: Twenty samples of yoğurt made from 50 % whole and 50 % skim milk of cows were bought in Ankara in July 1958.

METHOD: The method which was used in this study was the modification of BABCOCK method for the determination of fat content of yoğurt by OMURTAG and TUCKEY (13).

RESULTS

Number of samples	% of fat content	Number of samples	% of fat content
1	2.8	11	2.2
2	2.8	12	2.0
3	2.8	13	2.4
4	2.6	14	2.2
5	1.9	15	2.4
6	2.2	16	2.2
7	2.5	17	2.2
8	2.5	18	2.4
9	2.2	19	2.5
10	2.2	20	2.2

Table (1): % of fat content of the samples.

DISCUSSION

According to the Turkish Regulations, Paragraph 51, the fat content of 50 % whole and 50 % skim milk of cows yoğurt should be 2 % . In this study the fat content of the only 5 % of the samples were below the legal limit.

SUMMARY.

In this study the fat content of 20 samples of 50 % whole and 50 % skim milk of cows yoğurt were determined by the modification of BABCOCK method by OMURTAG and TUCKEY.

Accortong to this study the content of 5 % of the samples were lower than the legal limit, 5 % were at the legal level and 90 % were higher than the minimum legal limit.

ÖZET

Denemeye alınan 20 adet yarım yağlı inek yoğurdunun yağ muhtevisi OMURTAG ve TUCKEY tarafından modifiye edilmiş olan BABCOCK metodu ile tayin edilmiştir.

Bu çalışmaya göre, numunelerden 1/20 sinin yağ muhtevisi, yarım yağlı inek yoğurduna ait kanuni haddeden aşağı, 1/20 si tam kanuni limit üzerinde ve 18/20 sinin de kanuni haddeden yüksek olduğu bulunmuştur.

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