

Chapter 4

The History of Soap Production in Turkey and around the World, and the Development Processes of Production Methods

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Soap is a cleaning product widely used as a skin cleanser, with a chemical composition that is an alkaline salt of fatty acids. Many substances with washing and cleaning properties are used as hygiene materials that affect people's daily lives. Soap is one of these substances used for cleaning living things and objects. The history of soap dates back thousands of years, to the ancient Babylonians. Until approximately the 12th century, Turks used natural soda, soapwort, parsley, soapwort, spoonwort, milk root, bitter tree, hawthorn, rabbit's ear, Indian chestnut, and other saponin-containing substances and ash instead of soap. Records of soapmaking can be found in the Waqf document of the Kurşunlu Mosque in Edremit, built around 1300, and in the registers dating from 1530-1664. Since the 1980s, Turkey's soap industry has seen the rise of both large, modern enterprises and small, traditionally produced soaps. While modern production methods now constitute the majority, handmade soaps produced using traditional methods continue to thrive. This study examines the soap-making process and methodological developments from ancient records to the present day.

1. Introduction

The earliest records of soap making are found on Sumerian clay tablets from around 2000 BC. Soap was made by boiling a mixture of oil and wood ash and was used to extract oil from wool before dyeing. An Ebers Papyrus from Egypt mentions that ancient Egyptians regularly bathed and used a combination of animal fat and ash around 1550 BC.

By 600 BC, the Phoenicians were making soap using wood ash and animal fat. Soap made from elderberry, goat tallow, and tree root was used as a medium of exchange between the Phoenicians and Gauls. During the Roman Empire, it is unclear whether the Romans learned about soap from Mediterranean peoples or from the Celts in Britain; the Celts initially called soap 'Saipo,' which later changed to 'Soap.' The first soap made was a sticky substance obtained by cooking animal fat with an alkali called "caustic," derived from wood ashes. This was used to extract oil from wool before dyeing. Roman women also discovered that when raindrops mixed with soap on a mountainside, the soap could aid in washing clothes.

The Greek physicist Galen (130-200 AD) was the first to write about the use of soap in personal hygiene. According to the physicist Theodorus in 385 AD, soap later began to be used as shampoo. (Mukhopadhyay, 2011; Ertel, 2000; Hunt, n.d.). In the 7th century, soapmaking became an art in the Mediterranean countries of Italy, France, and Spain with the introduction of olive oil into soapmaking. During the Middle Ages, soap produced in Marseille was introduced to Marseille by the Phoenicians of Verchelin, and later, large-scale soap production spread to Genoa and Venice, as well as the Spanish province of Castile, taking its name from the Castilian crown (Figure 1). Fragrances were added to soap, and special soaps were made for personal hygiene and clothing cleaning. During this period, soap production flourished most in Germany. By the end of the 12th century, the first English soap production began in Bristol. This production led to the destruction of large areas of British forests. As a result, soap was heavily taxed, becoming a luxury item only the royal family could afford for daily bathing.

In the Middle Ages, the weight of soap bars was usually determined by decrees, and each bar of soap had to have a seal imprint. A soap called “Dudu-Osun”, which gave it its black color, was made from the ashes of locally harvested plants and barks in West Africa (Figure 2) (Koru, 1991; Öztürk & Sarıyıldız, 1997; Öztürk, 2002).



Figure 1. Castilian Soap



Figure 2. Africa black Soap

In 1791, the French chemist Nicolas Leblanc discovered alkali soda ash by chemically transforming sodium chloride. Because alkali is a fundamental component of soap, this discovery marked a turning point for commercial soap. When Louis Pasteur declared that soap reduced the spread of infections through personal hygiene, demand for soap increased dramatically. W. H. Lever began operating palm farms in the Belgian Congo and copra farms in the Solomon Islands. The discovery of hydrogenation, using vegetable oils instead of tougher animal fats, was a major step forward. During World War II (1948), there was a shortage of raw materials for soap production. This shortage led German scientists to discover synthetic detergent. As a result, detergents began to be used in homes, hotels, restaurants, and public spaces after 1950, and played a significant role in shaping today's skin cleansing industry. From that time until today, soap has undergone a major transformation with the addition of many different components to make it cosmetically acceptable (Ertel, 2000; Gibbs, 1939; Abbas et al., 2004).

Until approximately the 12th century, Turks used natural soda, soapwort, parsley, soapwort, spoonwort, milk root, bitter tree, hawthorn, rabbit's ear, Indian chestnut, servant's dust, etc., and other saponin-containing substances and ash instead of soap. Records of soapmaking can be found in the Waqf document of the Kurşunlu Mosque in Edremit, built around 1300, and in the register books from 1530-1664. In the Republican era, soapmaking was developed in Ayvalık, an olive oil producing town. The Greeks living there produced soap to meet their household needs. However, after the population exchange, the Cretans who settled in the region further developed soapmaking. Due to industrialization and branding, factories began to close, but the local people continued to produce their own soap at home (Koru, 1991; Öztürk & Sarıyıldız, 1997; Öztürk, 2002). Since the 1980s, Turkey has established itself in the soap industry with both large, modern enterprises and small, traditionally produced soaps. While modern production methods constitute the majority of total production, handmade soaps produced using traditional methods continue to hold their place. In Turkey, the raw

materials used in soap making include tallow, olive oil, sunflower oil, olive oil refining residues, palm oils, and mixtures thereof. Soap factories have been built in certain regions and centers where olive trees grow in Turkey. Primarily in Antakya, but also around Gaziantep, Kilis, and Kahramanmaraş, these soap factories are called “masmana” or “masbana.” This local name is understood to have originated from the Syrian region, as a document dated 1183 AH/1770 AD indicates that a soap factory in the Idlib district was referred to as a “masbana.”

2. Classification of Soaps

2.1. Classification and General Characteristics of Soaps

Turkish Standards Institute has divided soaps into four classes according to the number of fatty acids they contain (Devlet Planlama Teşkilatı, 2008).

1. Extra soaps
2. First class soaps
3. Second class soaps
4. Third class soaps

Extra soaps contain 75% or more fatty acids. Toilet soaps, shaving soaps, pure soaps in powder, granule, stick, and sheet form are types of extra soaps.

- **Toilet soaps:** These soaps are obtained from extra soaps by adding suitable substances and through physical processes such as cooling, crushing, drying, mixing, and molding.
- **Shaving soaps:** These are soaps used by lathering them with a shaving brush.
- **Pure soaps:** These are soaps that have been transformed into different forms such as powder, stick, sheet, and granule by various methods from extra soaps (Keskin, 1983).

2.2. First Class Soap

They contain at least 0.2% fatty acids. The main types of first-class soaps are bath soaps and resin soaps.

- **Bath soap:** These are soaps obtained by adding substances suitable for first-class soaps and then applying physical processes such as crushing, cooling, drying, mixing, and molding.
- **Resin soaps:** In resin soaps, the total resin acids are at least 10%.

2.3. Second Class Soap

They contain at least 40% fatty acids. Examples of second-class soaps include bitter water soap, glycerin-based clear soaps, textile soaps, pomace soaps, textile milling soaps, shaving soap powders, and powdered soaps.

- **Bitter water soap:** These soaps do not contain sugar.
- **Glycerin-based clear soaps:** The amount of glycerin in these soaps is at least 5%.
- **Textile soaps:** They are made only from olive oil and olive oil acids.
- **Pomace soaps:** These are soaps made only from pomace oil.
- **Textile milling soaps:** In these soaps used in the textile industry, the amount of free alkali is at most 0.1% when calculated in terms of NaOH. - Shaving soap powders: This is soap powder used for shaving.
- **Powdered soaps:** These are soaps that have been powdered to which various substances have been added to improve their washing properties (Keskin, 1983).

2.4. Third Class Soap

These are soaps with less than 40% fatty acid content. Unsaponified oils are at most 1%. Liquid toilet soaps, sandy soaps and Aleppo soaps are third-class soaps.

- **Liquid toilet soap:** The amount of free alkali is at most 0.05% when calculated in terms of KOH. - Sandy soaps: These are soaps produced to increase the cleaning properties of soap by adding mechanical effects.
- **Aleppo soaps:** These are soft soaps produced using potassium compounds partially or completely as saponifying agents. The amount of free alkali is at most 0.5% when calculated in terms of KOH (Keskin, 1983).

2.5. Classification of Soaps According to Their Intended Use

Soaps according to their intended use:

1. Soaps used as bath soap
2. Soaps used for cleaning

3. Soaps used in medicine
4. Soaps used for special purposes

2.6. Soaps Used as Bath

- **Toilet soap:** It is obtained from a paste with a free alkali content of less than 0.05% and a sodium chloride content of around 0.5%. The raw material is then dried to lose 20% of its water content, thus increasing the fatty acid content to 78%. Coloring agents are added. Mixing and kneading are performed to give the soap a suitable form and to ensure that these additives are well distributed, after which the soap is cut into the desired pieces.
- **Scented soap:** The increasing interest in scented soap as a hobby, due to the care taken in its production and the fact that it can be produced in different ways, has led to the widespread use of scented soap. When soaps are scented, the essential oils added to the fragrance do not withstand alkaline environments well, so there is a risk of the fragrance deteriorating. To ensure the durability of the fragrance, it may be necessary to add some substances.
- **Transparent or clear soap:** These are soaps to which sugar, glycerin, or alcohol are added to maintain their homogeneity during the cooling process.
- **Floating soap:** This is toilet soap to which air is mixed to reduce its density, making it less dense than water (Devlet Planlama Teşkilatı, 1987).

2.7. Soaps Used in Cleaning Work

- **Aleppo soap:** Also known as potash soap or soft soap, these are mostly translucent, oily paste-like soaps made from a combination of vegetable or animal oil and a KOH solution.
- **Powdered soap:** These are hard soaps that have been powdered (Ertel, 2000).

2.8. Soaps Used in Medicine:

- **Antiseptic soap:** Soap that acquires antiseptic and germicidal properties by adding bactericidal substances such as hexas, diphenylmethane, dichlorophenol, and dichlorophenol-derived synthetic compounds.
- **Pomace Soap:** Soap made from pomace oil, obtained from the residue remaining after olive oil production. Used in skin diseases and hair loss.

- **Cosmetic soap:** Soap that helps soften and nourish the skin. These soaps are divided into two categories: simple, very oily soaps and soaps with added cosmetics (lanolin, lecithin, ketyl alcohol).
- **Liquid soap:** An aqueous solution containing 36% potash soap made from coconut oil. For use in surgeries, liquid soap is diluted at a ratio of 1/5.
- **Antiparasitic, insecticidal anticyptogamic soap:** This soap contains parasitocidal substances, DDT, sulfur, and sodium polysulfide.
- **Almond oil soap:** Made from almond oil and sodium hydroxide, it is used as a liquid oil in various medicines such as pills and liminents.
- **Medical soap:** This soap is obtained by saponifying almond or kernel oil with a sodium hydroxide solution. - Potassium coconut oil soap: This is a surgical soap that is properly dissolved in water and sterilized, and used to wash hands and gloves before operations. Solid soaps containing substances such as sulfur, ichthyol, tar, and various antiseptics constitute medical soaps and are used in skin diseases (Ertel, 2000).

2.9. Soaps Used for Special Purposes

- **Tallow soap:** Soap obtained by saponification of tallow with a NaOH solution. Its alcoholic solution is a gel that forms the basic substance of apodeldac balsam.
- **Semi-cooked soap:** Soap obtained by making a paste at high temperatures, with or without partial salting.
- **Flake soap:** Soap in the form of fine and regular geometric flakes with a fatty and resin acid ratio of at least 78%.
- **Metallic soap:** Soap generally obtained from the double decomposition between the dissolved powder of any heavy metal and alkali soap. - Cold-made soap: Soap obtained by the exothermic reaction of liquid substances with a sodium or potassium hydroxide solution. - Sawdust soap: Soap in the form of sawdust with a fatty and resin acid ratio of 75%.

3. Soap Production Methods

3.1. Cold Method

This is a simple soap production method. It requires the preparation of an emulsion of the “oil in water” type, which requires at least 30% NaOH or KOH solutions. The reaction is exothermic, meaning it releases heat, but the temperature remains below 100°C. Because the method is

simple, it is applied in small-scale plants. With this method, on the one hand, glycerin remains in the soap and is not recovered, and on the other hand, saponification is rarely complete, and unsaponified parts remain in the soap, which prevents the products from being well preserved (Devlet Planlama Teşkilatı, 2008).

3.2. Semi-Cooking Method

In this method developed for making shaving soap, the emulsion must remain at 90°C for a certain period of time, and the absence of excess fat or alkali must be confirmed by analysis, and this excess alkali must be neutralized definitively (Devlet Planlama Teşkilatı, 2008).

3.3. Marseille Method

In this method, the processes of dough formation, salting, cooking, and achieving a smooth consistency are carried out. The soap dough, left to cool, is formed into parallel surfaces of specific scales, transferred onto models, and cut into molds of a specific weight. This process takes 24 to 60 hours. The soaps are kept in a heated double-walled feed chamber and fed into a cooling press similar to cellular press filters. More modern machines that operate continuously both cool the soap and remove excess water. Thus, powdered or flake soap is obtained (Osagie, 2015).

3.4. Clayton Method

It emerged around 1934. In this method, applied by Benjamin Clayton, a high temperature is applied and then an anhydrous soap is obtained which is rehydrated (Osagie, 2015).

3.5. i.p.c. Method (Fatty Acids, Potassium Hydroxide and Controlled Saponification Process)

This is a method developed by Gunther Jacobs. The oil method is used to produce high-quality soap bars, including hard soap varieties. I: Immersion (The stage of mixing the oils used in the process with potassium hydroxide or sodium hydroxide) P: Process (Management of the saponification process) and C: Cold Process or Controlled (The saponification reaction takes place under control, at the desired temperature and consistency) refers to the process of “incorporating fatty acids, potassium hydroxide and caustic soda”. Since this method focuses on incorporating these components in a controlled manner to obtain the desired chemical reaction (saponification), it includes specific steps to ensure the appropriate reaction and consistency. An inert solvent is used to melt the oils and create an emulsion with sodium hydroxide (Betsy et al., 2013).

3.6. Sharpless Method

The principles of the Marseille method are applied and centrifugal operation is performed at every stage of manufacturing (Koru, 1991).

3.7. Du Pont de Nemours Method

Glycerides are converted into methyl esters by the action of methanol and the esters purified by continuous distillation are treated with an alkali in anhydrous or concentrated solution (Betsy et al., 2013).

3.8. Monsavon Method

An emulsion of the “oil in water” type is used. Concentration is done with an alkaline solution at low temperature such that the pure soap has 61% fatty acid and 0.2% excess sodium hydroxide. Since the reaction, which starts by contact with a hot wall, is exothermic, it continues on its own. The soap is washed in a tower with a concentrated hydroxide solution whose concentration is equal to the limiting hydroxide solution, and the cleaning process is done by adding slightly alkaline water in which some plain soap is dissolved and dark-colored parts are obtained. The phases (75% soap, 25% brown phase) are separated by resting in double-envelope containers for 12 to 24 hours. The brown phase is thus separated from the pure soap and limiting hydroxide solution by adding a certain amount of sodium chloride (Betsy et al., 2013).

3.9. Continuous Cooking Method

Continuous saponification of oils is the process of washing and centrifuging the soap paste, separating it from the glycerin-containing soap waters continuously. The system is a modern technology developed by the Italian company Mazzoni. Its principle is based on the instantaneous saponification of oils together with alkali at 120-135°C under 2-3 atm pressure in a single-phase environment, separation of glycerin-containing waters, washing and centrifuging of the soap with washing waters according to the countercurrent principle (Ondokuz Mayıs Üniversitesi, n.d.).

3.10. Exhibition-Style Production Method

All and/or some of the stages after firing are done in simple methods. These processes are also produced in a semi-mechanical way by including cutting and stamping processes (Clint, 1992).

4. Soap Technology Used in Türkiye

Soap is produced in Turkey using two systems: exhibition and continuous. Although exhibition soapmaking is widespread, it is carried out with traditional methods and primitive technology. This production style, which has completely disappeared in Europe, has a large producer base because it does not require much financing. The continuous system requires advanced technology and toilet soap is generally produced in this system (Clint, 1992). Soap production in Turkey continued as simple, exhibition-style soap making until the 1980s, after which machine soap making began and has shown significant improvements in capacity and quality with each passing year, modernizing the industry. Higher quality soap is produced using continuous saponification technology. Modern-style machine soap making is produced in Turkey. These factories are mainly located near raw material sources and are widespread in the Mediterranean, Aegean, Marmara, and Southeastern Anatolia regions.

5. Conclusions

When consumer habits are evaluated in Turkey's 9th development plan, it is seen that soap is a consumer product used for personal hygiene, with an average of three times a day for washing hands and face, and once a week for bathing, as well as for cleaning items with various soaps and spaces with traditional soap (Aleppo soap). Various products in different designs, shapes, and packaging have been launched to popularize soap use, but a certain consumption potential has not been exceeded. It is seen that technological advancements, along with the culture and infrastructure of society, play a significant role in this situation. The annual consumption increase in the traditional soap market is seen as dependent on population growth and the economic status of individuals, and the expectation of increased sales is linked to growth in foreign markets.

From a foreign trade perspective, the domestic soap industry's competitiveness in packaged soap production makes it an important part of Turkey's export portfolio. It exports products that meet expectations, particularly to countries outside of developed nations. After the 1994 crisis, the soap sector grew rapidly, but slowed down in 2000. Subsequently, the sector experienced a significant contraction in the domestic market due to the impact of the 2001 crisis. The total soap market in Turkey contracted by approximately 20% between 2000 and 2002. This contraction was particularly noticeable in the traditional solid soap market, while the liquid soap market continued to grow despite the crisis. Production in the soap sector resumed after 2002, partly due to exports. Approximately 40% of soap production is consumed domestically, while 60% is exported.

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