

Original Paper

Production and Characteristics of a Traditional Food: Molasses (Pekmez)

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Abstract

Pekmez, which has been produced for a long time in Turkey, is one of the popular and traditional Turkish foods (Tosun & Üstün, 2003; Celik & Surucuoglu, 2005; Türkben, 2016). Pekmez is produced primarily from grapes (Arici et al., 2004; Alpaslan & Hayta, 2002; Sürücüoğlu & Celik, 2005; Batu et al., 2007; Dag, 2016; Demir, 2014). Molasses are usually preferred for breakfast in winter (Kuşçu & Bulantekin, 2016). Suitable for juice production, sugar content, acid value and ripening time are suitable for grape molasses production. Turkey, approximately 4185.126 tons of grapes are produced per year (TUIK, 2012), and approximately 30% of the grapes produced in Turkey are used for pekmez, wort and sausage with pekmez production in a year. In this study, some information is given on the history of Molasses, production stages, its types, effects on health and the relevant regulations and in terms of product chemical and microbiological characteristics.

Keywords

molasses, pekmez, traditional food

1. Introduction

Our country has suitable climatic and soil conditions due to its viniculture in terms of its geographical position on the world. Almost all regions have Anatolian lacquerware, and the date of the lacquering of this region extends to 3000 BC (Şimşek 2000; Didin et al., 2000; Çelik & Sürücüoğlu, 2005). Anatolia, which is the motherland of grape, has been famous for its rich grape varieties since ancient times and almost everywhere in the country is suitable for viniculture (Çelik & Sürücüoğlu, 2005). In the past years molasses, which is one of the basic nutrients of human beings, has become less productive in the changing world conditions. In our country molasses is made between at the end of September and the

beginning of October when the grapes are mature and this time is called molasses time. Pekmez is a concentrated and extended shelf-life form of several fruit juices, and it is formed by boiling without the addition of sugar or other food additives (Yoğurtçu & Kandaş, 2006; Celik & Surucuoğlu, 2005; Ekin & Celikezen, 2015). Pekmez is a good energy and carbohydrate source due to its high sugar content (up to 50%-80%) in the form of glucose and fructose; therefore, it easily passes into the blood without digestion (Karababa & Isikli, 2005; Akbulut et al., 2008; Karaca, 2009; Ekin & Celikezen, 2015). According to the Turkish Standards Institute (TS 3792), grape molasses are defined as a product that is produced by the addition of dark-matter substances obtained by vacuum or lightening according to the method of the present invention, without reducing the acidity of fresh or raisin syrup, or by reducing the acidity with calcium carbonate (Tetik et al., 2010; Türkben et al., 2010). Table 1 shows the chemical and microbiological properties of grape molasses according to TS3792 (TSE, 1989).

Table 1. Chemical and Microbiological Properties of Grape Molasses

Chemical properties	Limits
1. Water soluble solids minimum %	65
2. Sucrose	0
3. Total ash max %	2.0
4. The max % of ash that is not soluble in % 10 HCl solution	0.3
5. Artificial colours	0
6. Preservative	0
7. Max Arsenic (mg/kg)	0.2
8. Max Copper (mg/kg)	5.0
9. Max Zinc (mg/kg)	5.0
10. Max Iron (mg/kg)	15.0
11. Max Tin (mg/kg)	150.0
12. Max Lead (mg/kg)	0.3
13. Max sum of Copper, Iron and Zinc (mg/kg)	20.0
Microbiological properties	
1. Max number of mesophilic aerobic bacteria (Ad / g)	10 ⁴
2. The number of yeast and mold (Ad / g)	10 ³
3. The number of osmophilic yeast (Ad / g)	10 ²

2. Production of Molasses, Regulations and Analysis Methods

In the production of traditional molasses, the grapes are filled with nuts and the slaves are removed by chewing with the feet in boats made of wood or concrete. For deacidification, excess lime, white or neaby white molasses soil are used (Guldaz et al., 2004; Toker & Hayoğlu, 2004; Tetik et al., 2010;

Koca, 2014; Ekin & Çelikezen, 2015). The grape syrup is boiled on a strongly burning stove to provide easy and quick effect of the soil to the syrup, to prevent the action of the yeasts and to speed up the clarification; this is called the curdling of a grape syrup. After the curdling, the syrup is left to rest, after resting the clear part is separated from the sediment and clear syrup is obtained. The syrup is darkened on the open flame in boilers. In the case of increased acidity in the open boiler method, it is stated that the reducing sugars in the medium during the concentration process are decomposed by HMF to formic acid and levulinic acid when the pH level is lowered (İzgi, 2011).

At the beginning of the molasses cooking process, foams are formed on the surface of the must, called skimmed fat, and they must be taken from the medium with the flat cheeks in order to provide a clear molasses appearance. The syrup which have been cleaned from their skimmed fat are left to boil in their own form for a while to darken. Even if there is a sudden foaming on the syrup surface during this time, it is only a temporary foaming which does not boil and is not in the form of skimmed fat. However, in order to avoid caramelization in this excess molasses, it is necessary to constantly mix it (Vardin, H. & Vardin, B. C., 2004; Batu, 2005; Koca, 2014).

In the modern method, the raisins are first moistened and passed through the mincing machine. The minced raisins are extracted according to the principle of reverse flow. In grapes obtained from fresh grapes, the grapes that have been cleaned are separated from their stems by being passed through the stalk separating machine, pounded, and crushed by passing through the grape crushing mill. In order to obtain syrup, the grapes are passed through a separator to separate pristine and coarse materials. After the separation process, molasses soil or calcium carbonate (CaCO_3) is added for acidity. The grape syrup is heated to 70°C to provide easy and quick effect of the soil to the syrup, to prevent the activity of the yeast and to speed up the clarification. Clarification is carried out so that the grape syrup can be clarified and the bitter flavors can be removed. The sieving process can be carried out by applying heat, by tannin-gelatin application or enzymatically. After clarification, the syrup is concentrated by vacuum and the desired dry matter value is reached (Aydınlık, 2012; Koca, 2014).

Acid removal and clarification of fresh grapes after pressed and raisins after extraction become cloudy. Grape juice blurring is caused by organic molecules that give rise to a viscous structure in the product with the crust particles, the fiber, the cell and the cell fragments in various dimensions of the fruit juice, and these suspension particles give stability to the particles (Şengül et al., 2007; Koca, 2014). The organic molecules in the colloidal dimensions that are responsible for the formation of a stable suspension of turbidimetric particles are: pectic substances, polyphenols, proteins, starch and arabindIn these, the pectic substances have a separate prescription due to their protective colloid properties. For this reason, for a successful cleaning process, it is first necessary to break down the pectic substances to galacturonic acids, which are building blocks with pectolytic enzymes (Kayışhoğlu, 2001; Batu, 2005; Karaca, 2009; Aydınlık, 2012; Koca, 2014).

The obtained juice contains various turbidity materials which cause a large majority to form tartaric acid and cause the syrup to have a blurred appearance as well as the free acidity which leads to the pH being

between 3-4. For this reason, the free acidity of the syrup should be neutralized to the 6-6.5 pH level, so that the syrup can be produced at the desired sweetness level. In the meantime, it is still possible to obtain a clear view of the molasses by removing the various turbidity materials contained in the syrup. In order to accomplish this, a suitable practice is to use a high (over 80%) soil of calcium carbonate content called molasses soil (Batu & Aktan, 1993; Batu et al., 2007; Tetik et al., 2010; Ekin & Çelikezen, 2015). This process takes place by adding the soil to the syrup and heating it for 5-10 minutes to neutralize the free acidity in the environment with CaCO_3 contained in the soil. Thus, the precipitate can be easily separated as a result of the reduction of the colloid substances causing the turbidity in the medium, the loss of the isoelectric point due to the change of the pH level of the medium and the calcination of Ca ions in the medium as calcium tartrate (Zengin, 2006; Turhan et al., 2007; Akaydin, 2009; Koca, 2014; Ekin & Çelikezen, 2015).

2.1 Grape Molasses Production Flow Chart

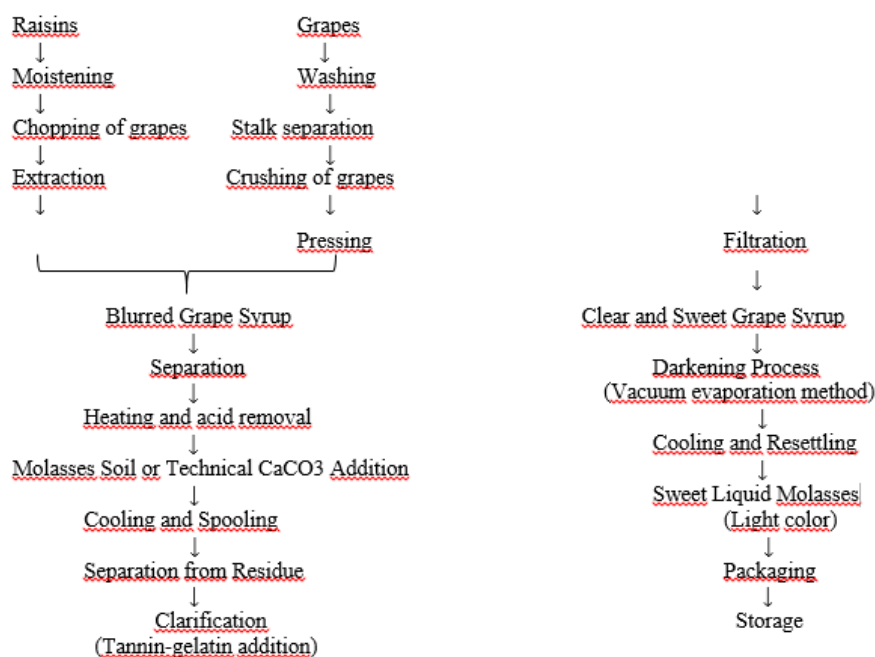


Figure 1. Stages of Molasses Production

As a physical analysis, homemade liquid-solid and fabricated liquid-solid molasses samples were examined for the presence of foreign substances in the molasses. Sensory analyzes of the molasses samples were evaluated for appearance, texture, taste and smell. For microbiological analysis, 10 grams of molasses samples were weighed, 90 ml of sterile physiological saline (0.85% NaCl solution) was added to them, and the mixture was homogenized for 1 minute and then a dilution series was prepared up to 10^{-5} .

As a microbiological analysis, the total number of mesophilic aerobic microorganisms of molasses

samples was measured at 35 °C for 48 hours in Plate Count Agar (PCA-Merck), mold-yeast number at 25°C in Potato Dextrose Agar (PDA-Merck) 5 days, Staphylococcus aureus in Baird Parker Agar (BPABiomerieux) at 37 °C for 24 hours and the number of Escherichia coli was determined by incubating for 48 hours at 44 °C in Coli ID (Biomerieux). Determination of microorganism numbers; the most probable number method was used for the coliform group and the bulk sowing method was used for the others.

3. Results

3.1 Product Features

The sensory analysis results of the product characteristics of the molasses samples studied are as follows: The samples are suitable for appearance and have no burning odor or foreign matter. Its appearance is unique and homogeneous, without sediment and sugar. Solid molasses is not fluid and looks bright. Microbiological analysis results of four molasses samples are given in Table 2.

Table 2. Microbiological Analysis Results of Molasses Samples (cfu/g)

Company		Total count of mesophilic aerobic bacteria	Yeast-mold	Coliform (MPN)	E.coli	S.aureus
A	Liquid-Homemade	5.7x10 ³	1.4x10 ⁵	4	Unidentified	<10
	Solid-Homemade	7.8x10 ²	1.0x10 ²	<3	Unidentified	2.0x10 ¹
B	Liquid-fabrication	6.5x10 ³	1.4x10 ⁴	9	Unidentified	3.1x10 ¹
	Solid-fabrication	1.2x10 ²	1.7x10 ⁴	9	Unidentified	5.0x10 ¹

The total number of mesophilic aerobic microorganisms generally provides information on food quality, not only the safety of food, but also the quality of food, shelf life and post-heat transmission (Colak et al., 2007). The total number of mesophilic aerobic microorganisms in molasses samples ranged from 8.0 x 10¹-6.9 x 10⁴ cfu / g and the number of yeast and mold was 1.0 x 10²-1.4 x 10⁵ cfu / g.

The presence of coliform group bacteria in foods is considered a sign of poor sanitation conditions, inadequate or incorrect pasteurization practices, re-infection after cooking and pasteurisation (Colak et al., 2007). Since all of the coliform group bacteria are not of fecal origin, E.coli has been sought as a marker of fecal contamination. E. coli can not be detected in this study.

The presence of Staphylococcus aureus in foods is considered a sign of personnel hygiene (Colak et al., 2007). The number of S. aureus in the molasses samples was <10-5.0 x 10¹ cfu / g.

4. Conclusion

As a result, the samples included in the study are scarce to give a general conclusion. However, it is a fact that the molasses has some disadvantages in terms of microbiological properties if it does not cause any problems in terms of sensory properties. Problems can be solved if hygiene and sanitation rules are obeyed in production and marketing and the regulations are taken into consideration. Adversities are not encountered in large businesses that fit into hygiene rules and are named for packaging. Grape production which occupies the most important place in every period of Turkish history, grape molasses which is made with grapes, and many other products are required to be made in conformity with the standards and quality. Many companies have been selling molasses through the internet, but there is not enough information about their content and product quality.

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