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## Production of traditional Turkish mesir paste

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### Abstract

Known today for its healing and nutritive characteristics, mesir paste was produced for the first time in Manisa in the 16<sup>th</sup> century during the Ottoman era. Water, sugar, citric acid and a variety of spices are used for the production of mesir paste. It is also determined that mesir paste has an effective role in prevention or retardation of some diseases. In this review, traditional production of mesir paste, its chemical properties and effects on health were explained.

**Key words:** Spice, acid, sugar, mesir paste, Turkish food, Manisa.

### Introduction

In recent years, there has been an increasing interest in herbal medicines and complementary medicine. This interest results from the fact that herbs and spices have no serious side effects and most of them can be used in various combinations by anybody. Furthermore, these mixtures contribute to the health of the human body as a whole <sup>1</sup>. Spices and herbs have been added to foods since ancient times, not only as flavoring agents, but also as folk medicine and food preservatives <sup>2</sup>. Mesir paste, on the other hand, thanks to the spices it contains, is extremely nutritious and protective against disease. Mesir paste is not only a significant and desirable food, but also a medicine that relieves stress and the accompanying aches and pains <sup>3</sup>. Especially in recent years, the revival of natural products and treatments has led to an increased interest in plants and spices to treat illness. Discovered during the Ottoman period, mesir paste is one of the best examples of this <sup>4</sup> (Fig. 1).

### Raw Materials Used in Mesir Production

Raw materials used in mesir production consist of sugar, organic acid, spices and water. The quality of these ingredients has a direct relation to the quality of the mesir paste produced. The first raw material used in mesir production is sugar.

**Sugar:** Sugar is an important raw material for paste production. The role of sugar is to provide flavor for the product as well as a jelly structure. Invert sugar is obtained through a mixture of glucose and fructose formed through hydrolyzations of sucrose <sup>5</sup>. Invert sugar is a very important food component <sup>6</sup> and it has important applications in beverage and food industries for making jams, noncrystallizable cream, artificial honey, liquid sugar, etc. <sup>7</sup>. Inverted sugar syrup is a sucrose-based syrup, produced by splitting each sucrose disaccharide molecule into its component monomers, glucose and fructose. The splitting is achieved through the action of invertase (a glycoside hydrolase enzyme), or an acid <sup>8</sup>. The specialty of invert sugar is that it is hygroscopic. Thanks to this, invert sugar plays a crucial role in preventing sweets from drying up and becoming crackly <sup>9</sup>. Invert sugar can be directly used in mesir paste. Moreover, invert sugar can be obtained by adding organic acid to sugar or water mixture.

It is important to note that sugar has an effect on both the quality and flavor of mesir paste. Because sugar is produced at a number of factories across Turkey and since there are chemical differences between the sugars produced by them <sup>10</sup>, it is advisable for mesir producers not to purchase sugar from different factories when possible.

**Organic acids:** As a result of hydrolyzation of sugar with organic acid, invert sugar syrups are used in mesir production. The most significant additive for preparation of invert sugar syrup is organic acid. Citric and tartaric acid are among the most commonly used organic acids for that purpose. Tartaric acid is imported from abroad, but citric acid is produced in Turkey. Therefore, as a cost consideration, manufacturers should use citric acid. The amount of citric acid used is determined by producers depending on the amount and consistency of mesir paste.



Figure 1. Several pictures of mesir paste.

**Spices:** Spices and herbs are valued for their distinctive flavors, colors and aromas and are among the most versatile and widely used ingredients in food preparation and processing throughout the world <sup>11</sup>. In the middle ages, herbs and spices were used for flavoring, food preservation and medical purposes <sup>12, 13</sup>. As for mesir paste, spices are an important ingredient.

Spices are herbal materials which essentially add flavor, smell and color to food, enrich their emotional characteristics and increase the consumption of food by whetting one's appetite. Several organs of plants (root, rhizome, bulb, bark, leaf, stem, flower, fruit and seed) are used as spices. Spices, which consist of varied compounds from different chemical categories, are not included among staple foods themselves. While the caustic, bitter and harsh flavors of spices are provided mainly by nonvolatile materials, smell and aroma are generated through volatile oils. What adds flavor, smell, aroma and taste to mesir paste and makes it health-giving is volatile oil obtained from spices <sup>4</sup>. Although the number of spices used in mesir paste production used to be 41 during the years when they were first formulized, health-giving Turkish paste is now produced out of 31 different spices since certain spices are not obtainable and some have been discovered to have adverse effects on human body by Turkish Ministry of Agriculture and Rural Affairs. Table 1 presents common and botanical names of spices used in mesir paste and for which disorders they are good <sup>1, 4, 14-18</sup>. As can be concluded from Table 1, spices are the basis for the health-giving properties of mesir paste and are as such essential ingredients.

**Water:** Another raw material required for proper production of mesir paste is water. Water hardness and its level of chlorine have been shown to have a direct impact on the quality of food products <sup>19</sup>. They are no less important in helping to determine the quality of mesir paste and soft, potable water should be preferred as an ingredient. In addition, the proportion of water to sugar is vital for mesir paste production. The proportion of sugar to water is generally between 1/1 and 1/3. This depends on the concentration of mesir and spices in mesir paste.

### Stages of Mesir Production

Stages of mesir production are schematically presented in Fig. 2. The first stage of mesir production process is preparation of spices.

**Preparation of spices:** In the first stage of mesir paste production, 31 types of spices are collected, mixed and ground in special mills. After being ground, the spices are passed through a fine sieve <sup>16</sup>. The most important objective of sieving spices after they have been ground is to prevent those that have not been ground properly from being included in spice mixture. The properly sieved spices are added to the mixture at the third stage.

**Syrup preparation:** After the spices have been prepared, one can proceed to syrup composition (preparation). In order for syrup to be composed, the first step is to put water and sugar in a container. The mixture of water and sugar is stirred and brought to a boil. While boiling, the mixture effervesces and expands in volume. It is at this point that citric acid is added. The mixture is stirred for another 5 min, after which the color turns from cream to light brown. After this change in color, it is boiled for another min and allowed to turn even browner before being removed from the fire.

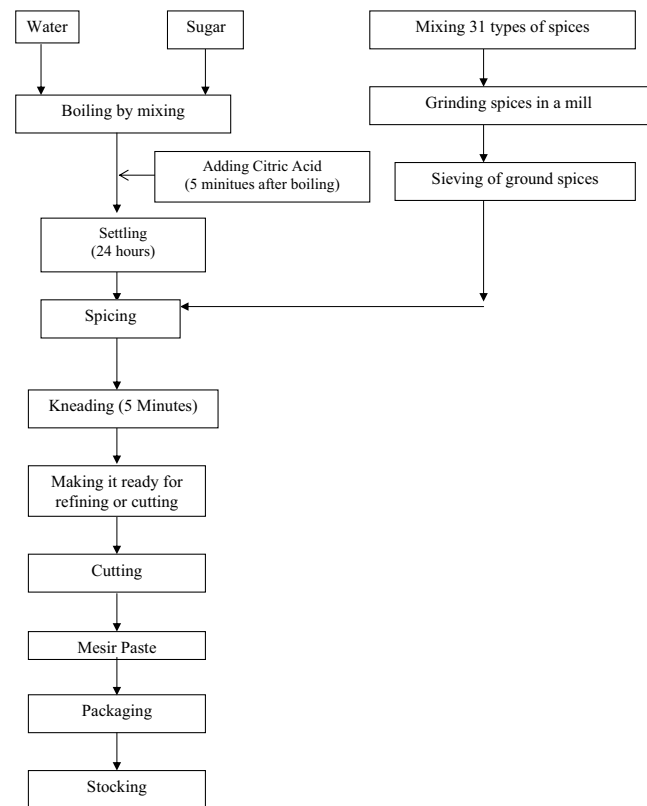


Figure 2. Stages of mesir paste production.

**Cooling of syrup and spicing:** After citric acid has been added to the boiled mixture and it has been boiled for another 5 min, the well browned mixture is put in a cold, copper container and kept at room temperature for 24 hours. It is extremely important that it should be let to sit for exactly 24 hours. At the end of 24 hours, not does only the syrup find its actual taste through cooling and solidifying, but the mixture also reaches optimum temperature for kneading. Even though cooling can be achieved by certain cooling devices and modern refrigerators in a very short time, keeping the mixture at room temperature is thought to be important by producers since it has an effect on the flavor of mesir paste. At the end of 24 hours, the mixture becomes even browner than when it was first put into the container. The cooled and condensed gel is poured over the spice, which have been previously laid onto the counter. The mixture is allowed to absorb the spices completely for a period of 15 min. At this stage, it is again important for the quality of mesir paste that the production environment should be at room temperature.

**Making it ready for kneading and cutting:** After the jelly has absorbed the spices, it is manually kneaded for 5 min and turned into paste. There are two reasons why the mixture is kneaded. The first is to enable the paste to absorb all the spices and the other is to make the paste consistent enough to be packaged. Having acquired the required consistency thanks to kneading, the paste is then converted into the form of a long rope and refined.

**Cutting:** Turned into the form of rope, the paste is then cut into lengths weighing 8-10 g (21-23 g for the bigger size: “the long bar”) and delivered for packaging <sup>20</sup>. For cutting mesir paste, knives

**Table 1.** Spices included in mesir paste, botanical names and their beneficial characteristics to human disorders.

No.	Name of spice	Botanical name	For which disorders they are good
1	Aniseed	<i>Pimpinella anisum</i> L.	Strengthens the stomach, whets one's appetite and is digestive.
2	Mastic	<i>Pinus nigra</i> Arn.	Effective in disorders related to respiration and urinary tract
3	Black cumin	<i>Nigella sativa</i> L.	Helps diuretics, increases post-natal milk and is beneficial to asthma, bronchitis and coughing.
4	Darıil Fülful	<i>Piper longom</i> L.	Digestive and increases the number of sperm and sexual potency.
5	Galanga	<i>Alpinia galanga</i> (L.) Sw.	Strengthens stomach and intestines.
6	Mustard seed	<i>Brassica nigra</i> (L.) Koch.	Whets one's appetite, awakens digestion and has a positive effect on blood circulation.
7	Coconut	<i>Cocos nucifera</i> L.	Digestive, enables the intestines to work better, invigorates and strengthens the metabolism.
8	Lesser Galangal	<i>Alpina officinarum</i> Hance	Stops coughing, prevents halitosis, effective against headache and dizziness.
9	Cassia	<i>Cassia fistula</i> L.	Beneficial to common cold, relieves eye pain and can be used as cathartics.
10	Elixir	Eliksir	
11	Cardamom	<i>Elettaria cardamomum</i> Maton	Whets one's appetite, helps easy digestion, activates kidneys and greatly helps diuretics.
12	Black pepper	<i>Piper nigrum</i> L.	Activates the digestive system and whets one's appetite.
13	Cloves	<i>Eugenia caryophyllata</i> Thunb.	Prevents formation of microbes in stomach and intestines; stimulant, regulates the digestive system.
14	Cubeb	<i>Piper cubeba</i> L.	Regulates urinary and respiratory tracts.
15	Cumin	<i>Cuminum cyminum</i> L.	Can be used for regulating digestion and helps diuretics.
16	Coriander	<i>Coriandrum sativum</i> L.	Hypertensive, effective on nervous system and relieves headaches.
17	Lemon peel	<i>Citrus limon</i> (L.) Burm.	Eliminates stomach acids, dilutes the blood, enlivens red blood cells and is effective against intoxication.
18	Licorice extract	<i>Glycyrrhiza glabra</i> L.	Expectorant effect and beneficial to labored breathing, ulcer and gastritis.
19	Myrrh	<i>Commiphora myrrha</i> Engl.	
20	Saffron	<i>Crocus sativus</i> L.	Prevents throbs and gives relief.
21	Yellow myrobolani	<i>Terminalia citrina</i> Roxb.	This has a strengthening effect on heart, activates one's mind and can be used for healing wounds.
22	Senna	<i>Cassia acutifolia</i> Del.	
23	Samli Sasli	Dame D'onze Heures	
24	Fennel	<i>Foeniculum vulgare</i> Miller	Can relieve stomach and has the effect of easy digestion
25	Cinnamon	<i>Cinnamomum cassia</i> (Nees) Blume	Relieves constipation and stomachache, stimulating effect on muscles and digestive tract movements.
26	Theriac	Antidatodum midridaticum	
27	Vanilla	<i>Vanilla pnalifolia</i> Andr.	Strengthens the body, anti-febrile, increases sexual potency.
28	Allspice	<i>Pimenta officinalis</i> Lindl.	Prevents atherosclerosis, increases body resistance and is digestive. It whets one's appetite.
29	Ginger	<i>Zingiber officinale</i> Roscoe	Increases sexual potency and is beneficial to constipation, circulatory disorders and common cold.
30	Turmeric	<i>Curcuma longa</i> L.	Refreshes liver, removes lipoidosis and edemas formed in liver.
31	Zedoary	<i>Curcuma zedaariae</i> Roscoe	Strengthening, protective effect on stomach, whets one's appetite.

of different sizes and exclusively designed scissors can be used. The important element during cutting is that each piece should have the same length on average in order to ensure standardization in packaging.

**Packaging:** Having been cut into pieces weighing 8-10 and 21-23 g, the paste is strained through a fine sieve, thus causing any dry spices to fall away. Packaged in accordance with all sanitary standards, the mesir paste is distributed throughout Turkey and foreign markets in small and big packages, 195 and 350 g, respectively, and also in a 105 g long bar.

#### Factors in Quality of Mesir Paste and Suggestions

Although different opinions are maintained by producers about how to ensure the quality of mesir paste, the generally accepted quality criteria are its color and consistency. The paste is dark brown while its consistency should be neither too soft nor too

hard. Another factor in quality of mesir paste is elasticity. The paste should be neither too hard so as to pose a problem in chewing nor too soft so that it sticks to the consumer's teeth or tongue.

Also, when mesir paste is too soft, this can cause the paste to stick to its packaging material and spoil the form of the package. Prior to packaging, therefore, producers should test the elasticity of the paste. Some known methods of evaluation involve "fingerprint feeling" and "mouth feeling"<sup>10</sup>.

Another factor determining the quality of mesir paste is the level of experience of the staff. Since the more experienced the staff is, the higher the quality of the paste, mesir producers need to hire experienced staff as much as possible.

In addition, the time period during which the jelly is settled and the temperature in which this occurs are important elements affecting the quality of mesir paste. In the event the jelly is preserved less than 24 hours or the room temperature is

unfavorable, it will be affected adversely. Another factor affecting quality is the fineness of the spices. If the spices are too coarse, it results in a paste that is too hard, causing the consumer to have difficulty in chewing.

### Some Chemical Properties of Mesir Paste

The chemical composition of mesir paste is mainly determined by spices, herbs and sugar content, but climate and the stage of maturity of the herbs and spices also influence the composition.

Table 2 presents the main compounds of the mesir paste <sup>16</sup>. Total dry matter content of the mesir paste change is 81.4-83.4%. The sucrose is the main sugar of the mesir paste. Glucose level is similar to fructose level.

Phenols in mesir paste are responsible for its peculiar pungent taste and for its high stability (Table 3) <sup>16</sup>. Citric acid is used in the mesir paste production (Table 4). Prepared with 31 different spices to the ground mixture of spices during the cooking quinic and malic acids extraction has been realized.

**Table 2.** Main components of the mesir paste.

Component	The codes of the mesir paste		
	M1	M2	M3
Total dry matter	81.4	83.4	83.3
Titrate acidity (%)	0.171	0.186	0.205
pH	3.66	3.58	3.54
Total sugar (%)	83.3	84.0	84.2
Reducing sugar (%)	29.60	30.14	30.25
D-glucose (%)	14.81	15.65	14.84
D-fructose (%)	10.72	12.60	11.35
Sucrose (%)	57.77	55.75	58.01
Formol number	29.0	31.0	31.0
Ash (%)	0.72	0.76	0.74

**Table 3.** The phenols of the mesir paste.

Phenolic compounds (mg/kg)	Sample code	Change limits			Standard deviation	Variation coefficient (%)
		Min	Max	Mean		
Catechin	M1	432.3	481.5	455.6	22.4	24.0
	M2	1175	1385	1253.8	100.5	4.0
	M3	1091	1099	1095	4.6	0.2
Catechol	M1	-	-	-	-	-
	M2	11.65	19.6	15.26	3.27	10.7
	M3	31.90	35.75	33.51	1.808	2.7
p-Cumaric acid	M1	22.85	27.88	24.98	2.1	4.2
	M2	-	-	-	-	-
	M3	30.0	30.97	30.47	0.54	0.9
Ferulic acid	M1	-	-	-	-	-
	M2	64.55	73.15	68.85	6.08	6.2
	M3	65.0	65.8	65.4	0.462	0.4
o-Cumaric acid	M1	-	-	-	-	-
	M2	7.0	7.1	7.05	0.007	0.7
	M3	7.1	7.2	7.15	0.009	0.8
Rutine	M1	-	-	-	-	-
	M2	40.0	50.55	46.24	5.04	5.4
	M3	-	-	-	-	-
Total	M1	670.0	760.4	705.4	4.05	3.8
	M2	1236.7	1511.5	1353.2	137.1	5.1
	M3	12.18	1229.9	1224.4	5.5	0.2

**Table 4.** Distribution of organic acids of the mesir paste.

Organic acid	Sample code	Change limits			Standard deviation	Variation coefficient (%)
		Min	Max	Mean		
Quinic acid	M1	0.13	0.16	0.15	0.014	5.3
	M2	0.43	0.50	0.47	0.028	2.9
	M3	0.45	0.49	0.47	0.013	1.3
Malic acid	M1	0.016	0.024	0.020	0.018	2.8
	M2	1.34	1.52	1.44	0.082	2.8
	M3	1.54	1.62	1.56	0.04	1.4
Citric acid	M1	0.024	0.074	0.046	0.021	2.3
	M2	0.085	0.10	0.09	0.07	3.3
	M3	0.055	0.063	0.058	0.0037	1.7
Total	M1	0.17	0.21	0.18	0.023	7.2
	M2	1.86	2.12	1.99	0.115	2.8
	M3	2.05	2.17	2.09	0.051	1.2

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