



## Trabajo Original

### Nutrient retention in popular dishes based on Google Trends data in Hatay cuisine *Retención de nutrientes en platos populares según datos de Google Trends en cocina Hatay*

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#### Abstract

**Introduction:** Hatay cuisine has an important place in Turkey and world cuisine. It consists of meat dishes, stuffed vegetables, vegetable dishes, jams, pickles, pilafs, soups, appetizers and salads, herbs collected from nature, desserts, pastries, dairy products and dry foods. The culinary processes differing in cultures alter nutrient value of foods. Food preparation and processing operations affect contents and bioavailability of micronutrients in traditional dishes. Several studies have been carried out to investigate the influence of traditional food preparation and processing methods in vitamins and minerals. In this study, nutrient retention in popular dishes of Hatay cuisine was analyzed.

**Material and methods:** Google Trends is an open access tool that allows to determine the popularity of search terms. In the current study, the most common dishes searched in the last 12 months by individuals living in Hatay province were selected. Şihilmehşi, tepsi kebabi, tuzlu yoğurt çorbasi, humus and künefe were the most searched on the web. We used the Nutrient Retention Factor Table of the United States Department of Agriculture (USDA), and the nutrient content of the Turkish traditional dishes described above was calculated after cooking of Hatay cuisine.

**Results:** the highest loss of micronutrients has been found in vitamin B<sub>6</sub>, folate, vitamin B<sub>12</sub> and thiamine. In şihilmehşi, the highest loss was in folate, with 40%. In tepsi kebabi, the highest loss appeared in vitamin B<sub>6</sub>, with 50%. In tuzlu yoğurt soup, 70% loss of B<sub>12</sub> was reported. In humus, the highest loss was in folate at the level of 40%. In künefe, the most loss occurred in folate with 30%.

**Conclusion:** specific cooking, preparation and preservation practices of traditional dishes that are compatible with local experience can be encouraged as an alternative or adjunct to other methods of increasing the availability of micronutrients in foods.

#### Keywords:

Hatay cuisine. Cooking methods. Nutrient retention. Micronutrients. Traditional dishes.

#### Resumen

**Introducción:** la cocina Hatay tiene un lugar importante en Turquía y en la cocina mundial. Se compone de platos de carne, verduras rellenas, platos de verduras, mermeladas, encurtidos, pilafs, sopas, aperitivos y ensaladas, hierbas recolectadas de la naturaleza, postres, repostería, productos lácteos y alimentos secos. Los procesos culinarios que difieren en las culturas alteran el valor nutritivo de los alimentos. Las operaciones de preparación y procesamiento de los alimentos afectan el contenido y la biodisponibilidad de los micronutrientes en los platos tradicionales. Se han llevado a cabo varios estudios para investigar la influencia de los métodos tradicionales de preparación y procesamiento de alimentos en las vitaminas y los minerales. En este estudio se analizó la retención de nutrientes en platos populares de la cocina Hatay.

**Material y métodos:** Google Trends es una herramienta de libre acceso que permite determinar la popularidad de los términos de búsqueda. En el estudio actual, se seleccionaron los platos más comunes buscados en los últimos 12 meses por personas que viven en la provincia de Hatay. Şihilmehşi, kebab en bandeja, sopa de yogur salada, hummus y künefe fueron los más buscados en la web. Usamos la tabla de factores de retención de nutrientes del Departamento de Agricultura de Estados Unidos (USDA, por sus siglas en inglés) y el contenido de nutrientes de los platos tradicionales turcos descritos anteriormente se calculó después de cocinar la cocina Hatay.

**Resultados:** las mayores pérdidas de micronutrientes se han encontrado en vitamina B<sub>6</sub>, folato, vitamina B<sub>12</sub> y tiamina. En Şihilmehşi, la pérdida más alta fue de folato, con un 40%. En el kebab en bandeja la mayor pérdida se presentó en vitamina B<sub>6</sub>, con un 50%. En la sopa de yogur salada, se informó una pérdida del 70% de B<sub>12</sub>. En hummus, la mayor pérdida fue en folato, a un nivel del 40%. En künefe, la mayor pérdida se presentó en folato, con un 30%.

**Conclusión:** se pueden fomentar prácticas específicas de cocción, preparación y conservación de platos tradicionales que sean compatibles con la experiencia local como alternativa o complemento de otros métodos para aumentar la disponibilidad de micronutrientes en los alimentos.

#### Palabras clave:

Cocina Hatay. Métodos de cocina. Retención de nutrientes. Micronutrientes. Platos tradicionales.

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## INTRODUCTION

Food is a main necessity for all living beings and eating habits differ between cultures throughout history of humankind. Gastronomy investigates the relationship between culture and food and it is known as both science and art related to eating and drinking. Gastronomic values, food and nutrition culture of nations are closely connected to each other (1). Cuisine is a way of meeting the nutritional needs that are essential for human life. Turkish cuisine has an important place among world cuisines with its diversity and richness, because of both different geographical and climatic characteristics and its hosting different ethnic groups. Turkish cuisine has witnessed a process which has been shaped by the history, starting from the nomadic life in the Central Asian Period extending to the Seljuks, the Ottoman Empire and the Republic period (2). The variety of products in Central Asia and Anatolia, cultural interactions in the historical process, and the Seljuk and Ottoman palace cuisines have created the Turkish culinary culture. In general, it consists of juicy dishes prepared with cereals, vegetables and meat, soups, olive oil dishes, pastries and herbs and unique healthy products such as yogurt, bulgur and molasses. Blanching, boiling, simmering, shallow frying, deep frying, grilling and baking are common cooking techniques in Turkish cuisine (3).

Hatay cuisine has an important place in both Turkish cuisine and world cuisine in terms of its multicultural and gastronomic identity shaped by 13 world civilizations (4). The different religions, ethnicities and beliefs of the people diversified the dishes of the region. That is why Hatay cuisine reflects the combination of different civilizations which have lived together for centuries (5). The fact that the region was on main trade roads such as the Silk Road and the Spice Road, connecting Mesopotamia and Central Asia, and the coexistence of different ethnic groups and religions for centuries has created a rich culinary culture. Hatay and its cuisine obtained the title of gastronomy city as part of UNESCO Creative Cities Network (UCCN) in 2017 (6).

Due to the geographic position of the city, Hatay cuisine has some similarities with the Middle Eastern and Anatolian cuisine while maintaining its unique characteristics. Hatay cuisine consists of meat dishes, stuffed vegetables, vegetable dishes, jams, pickles, pilafs, soups, appetizers and salads, herbs collected from nature, desserts, pastries, dairy products and dry foods. In the meantime, spices are one of the most important distinguishing features of Hatay cuisine (7).

The culinary processes differing in cultures alter nutrient value of foods. According to the cooking method and type of food, loss of nutritional components occurs in different levels. The processes such as boiling, cooking, frying, microwaving and leaching into water can be the reason of nutrient losses (8). In order to perform a correct estimation of nutrient intake, it is important to calculate nutritional retention determining true nutritional information of foods (9). The aim of this study is analyzing the retention in some traditional dishes in Hatay cuisine: tepsi kebabı, şıhılmaşşi, tuzlu yoğurt çorba, humus and künefe.

## MATERIALS AND METHODS

Google Trends is an open access tool that allows to determine the popularity of search terms or topics searched by Google users in a specific area and time period. The tool provides an index of relative search volume ranged between 0 and 100. If the relative search volume for a term is 100, that means it is the most searched term in a particular period and area; 0 represents no or insufficient search for a term. The keywords can be analyzed in different languages and a maximum of five keywords can be compared at the same time through Google Trends (10).

In the current study, the most common dishes searched in the last 12 months by individuals living in Hatay province were selected. In this context, five main titles were chosen based on the *Hatay Culinary Culture and Food* book published by the Hatay governorship and all dish names in each title were searched. We have analyzed one of the meat dishes, vegetable dishes, soups, appetizers and desserts from traditional dishes of Hatay cuisine. The search was performed in Turkish language, Hatay was selected as the search region and we used the Google Trends data from May 2021 to April 2022. According to our analysis, it was found that tuzlu yoğurt çorbası, tepsi kebabı, şıhılmaşşi, humus and künefe had the highest search volume among the dish types.

The selected dishes contain meat, vegetables, grains, lentils and dairy products in different levels. The nutrients of the dishes are mentioned in table I, calculated according to the cooking methods according to the United States Department of Agriculture (USDA) Nutrient Retention Factor Table. Two hundred and ninety nutrients were evaluated in the table. This evaluation was based on different cooking methods such as boiling, frying, baking, reheating, etc. Initially, uncooked food contents were obtained using the Turkish National Food Composition Database (TürKomp) according to the recipes in table I. Nutrient losses were evaluated via USDA retention factor table. Uncooked nutrient values obtained from TürKomp and retention factor of the food with the highest loss were multiplied with each other. For instance, when the loss of vitamin C in a meal needs to be calculated, firstly it is necessary to calculate which food in the recipe has the lowest retention factor. Then, the level of vitamin C in the food is multiplied according to the retention factors of that food, and the level of vitamin C remaining after cooking is determined (11,12).

When tepsi kebabı was considered to calculate retention factors, firstly, uncooked nutritional contents of the dish was obtained using the Turkish National Food Composition Database, and divided to the number of portion get one serving size of the dish (Table II). After that, ingredients and cooking methods of tepsi kebabı were mentioned and loss of nutrients was evaluated according to the retention factors in the USDA retention factor table (Table III). Meat had the highest nutritional loss, which means its retention factors multiplied with nutritional values of tepsi kebabı. Lastly, the nutritional values of tepsi kebabı obtained from TürKomp and the retention factors of the food ingredient that has the highest loss were multiplied with each other (Table IV).

**Table I. Recipes**

Dish	Ingredients	Procedures
Tepsi kebabı	1 kg of low-fat ground beef 2 onions 2 tomatoes 1 bunch of parsley 1 potato 2-3 green peppers 1 tablespoon tomato paste 5-6 cloves of garlic Black pepper	The parsley is very finely chopped. Salt, pepper and parsley are added to the minced meat and mixed well. The mixed mortar is spread on the tray with 1 cm thickness. Potato skins are peeled. The ground beef is garnished with sliced potatoes, tomatoes, onions and green peppers. The tomato paste is dissolved in enough water and poured on the tray. It is cooked in the oven at high temperature until the water is absorbed and served hot
Şıhılmaşı	18 very small zucchini 200 g minced meat 1 glass of skinless chickpeas 1 large onion Oil Salt Black pepper Garlic	The top and bottom parts of the zucchinis are cut, peeled lightly with a serrated knife and hollowed out. Hollowed-out zucchinis are lightly fried in hot oil. Finely chopped onion and minced meat are fried in oil. Chickpeas are boiled and their shells are removed. Boiled chickpeas, salt and pepper are added into mortar. The prepared mortar is filled into the hollowed-out zucchinis. The zucchinis are arranged on a tray and the tomato paste dissolved in water is poured on it. After it stays in the oven for the cooking time, it is served by pouring garlic yoghurt on it
Tuzlu yoğurt çorba	1/2 glass of rice 200 grams of salted yoghurt 2 liters of water 1 tablespoon butter mint Red pepper flakes	Rice is boiled in water until they open like flowers. If desired, a clove of chopped garlic can be added. If the water is missing, water is added again. Salted yogurt is added to water. It is boiled until it melts. A tablespoon of butter is added when it thickens. It is sprinkled with red pepper flakes, with a little more mint when it is close to turn off the stove. It is served hot
Humus	250 g chickpeas 1 glass of tahini 2 juiced lemons 3 cloves of garlic Cumin Paprika Olive oil Salt	Chickpeas are soaked overnight. They are boiled in a saucepan until well cooked and strained. They are passed through a fine-mesh strainer twice. Lemons are squeezed, the garlic is pounded, the tahini is crushed and mixed with the mashed chickpeas and salt is added into it. This mixture is spread on a serving plate. Cumin and ground pepper are sprinkled and olive oil is drizzled. It is garnished with tomatoes, pickles and parsley
Künefe	1 kg künefe 600 g unsalted künefe cheese 250 g butter Pistachio	Raw künefe is placed in a rimmed tray (künefe tray). Middle part of künefe tray is opened and butter is put in it. It is cooked lightly over low heat and the oil is thoroughly fed into the künefe. This process is done by hand or with the help of a wooden spoon. Lightly cooked and oiled künefe is divided into two. The tray is well greased with butter. Half of the künefe is spread well on the tray and pressed with 0,5-1 cm thickness. Unsalted künefe cheese is sprinkled on it nicely. Cheese is covered with the other half of the separated künefe. It is turned over the fire until both sides are thoroughly browned. It is served after cooking

**Table II. Nutritional contents of tepsi kebabı**

Nutrients	Amounts for 6 serving size	Unit	Amounts for one serving
Protein	223.45	g	37.24
Iron, Fe	27.33	mg	4.56
Phosphorus, P	1,897	mg	316.17
Calcium, Ca	386	mg	64.33
Magnesium, Mg	396	mg	66.00
Potassium, K	6,279	mg	1,046.50
Sodium, Na	777	mg	129.50
Zinc, Zn	49.4	mg	8.23

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**Table II (Cont).** Nutritional contents of tepsi kebabı

Nutrients	Amounts for 6 serving size	Unit	Amounts for one serving
Thiamine	1.858	mg	0.31
Riboflavin	2.286	mg	0.38
Niacin	65.263	mg	10.88
Vitamin B6	4.499	mg	0.75
Vitamin B12	17.42	µg	2.90
Vitamin A	1,389	RE	231.50
Retinol	66	µg	11.00
Vitamin C	451.5	mg	75.25
Beta-carotene	15,868	µg	2,644.67
Lycopene	22,186	µg	3,697.67
Folate	332	µg	55.33

**Table III.** USDA retention factor table for tepsi kebabı

	Beef ground baked with drippings	Boiled/baked tomatoes	Baked veg., roots, etc.	Baked veg., greens	Potatoes baked in casserol	Boiled/baked tomatoes
Ca	100	100	100	100	100	100
Fe	100	100	100	100	100	100
Mg	100	100	100	100	100	100
P	100	100	100	100	100	100
K	100	100	100	100	100	100
Na	100	100	100	100	100	100
Zn	100	100	100	100	100	100
Cu	100	100	100	100	100	100
Vit C	85	95	75	70	80	95
Thiamine	60	95	90	90	80	95
Riboflavin	100	95	95	95	95	95
Niacin	90	95	95	95	95	95
B6	50	95	95	95	95	95
Folate	70	70	80	75	75	70
Folic acid	70	70	80	75	75	70
Total folate	70	70	80	75	75	70
Choline	90	90	100	100	100	90
B12	75	100	100	100	100	100
Vit A	80	95	95	95	100	95
Vit. A RE	80	95	95	95	100	95
Alkol	100	100	100	100	100	100
Carotene B	80	95	95	95	100	95
A carotene	80	95	95	95	100	95
Cryptoxanthin B	80	95	95	95	100	95
Lycopene	80	95	95	95	100	95
Lutein + Zeaxanthin	80	95	95	95	100	95

**Table IV.** Retention of nutrients in tepsi kebabı

Nutrients	Unit	Amounts for one serving	Retention
Protein	g	37.24	595.87
Iron, Fe	mg	4.56	4.56
Phosphorus, P	mg	316.17	316.17
Calcium, Ca	mg	64.33	64.33
Magnesium, Mg	mg	66.00	66.00
Potassium, K	mg	1,046.50	1,046.50
Sodium, Na	mg	129.50	129.50
Zinc, Zn	mg	8.23	8.23
Thiamine	mg	0.31	0.19
Riboflavin	mg	0.38	0.38
Niacin	mg	10.88	9.79
Vitamin B6	mg	0.75	0.37
Vitamin B12	µg	2.90	2.18
Vitamin A	RE	231.50	185.2
Retinol	µg	11.00	8.8
Vitamin C	mg	75.25	63.96
Beta-carotene	µg	2,644.67	2,115.73
Lycopene	µg	3,697.67	2,958.13
Folate	µg	55.33	38.73

**Table V.** Retention of nutrients in dishes

	Folate retention	Thiamine retention	Vitamin C retention	Vitamin B6 retention	B12	Riboflavin
Tepsi kebabı	70 %	60 %	85 %	50 %	75 %	60 %
Şıhılmaşı	60 %	65 %	65 %	70 %	75 %	
Tuzlu yoğurt çorba		60 %		55 %	30 %	
Humus	60 %	65 %	65 %			
Künefe	70 %	80 %				

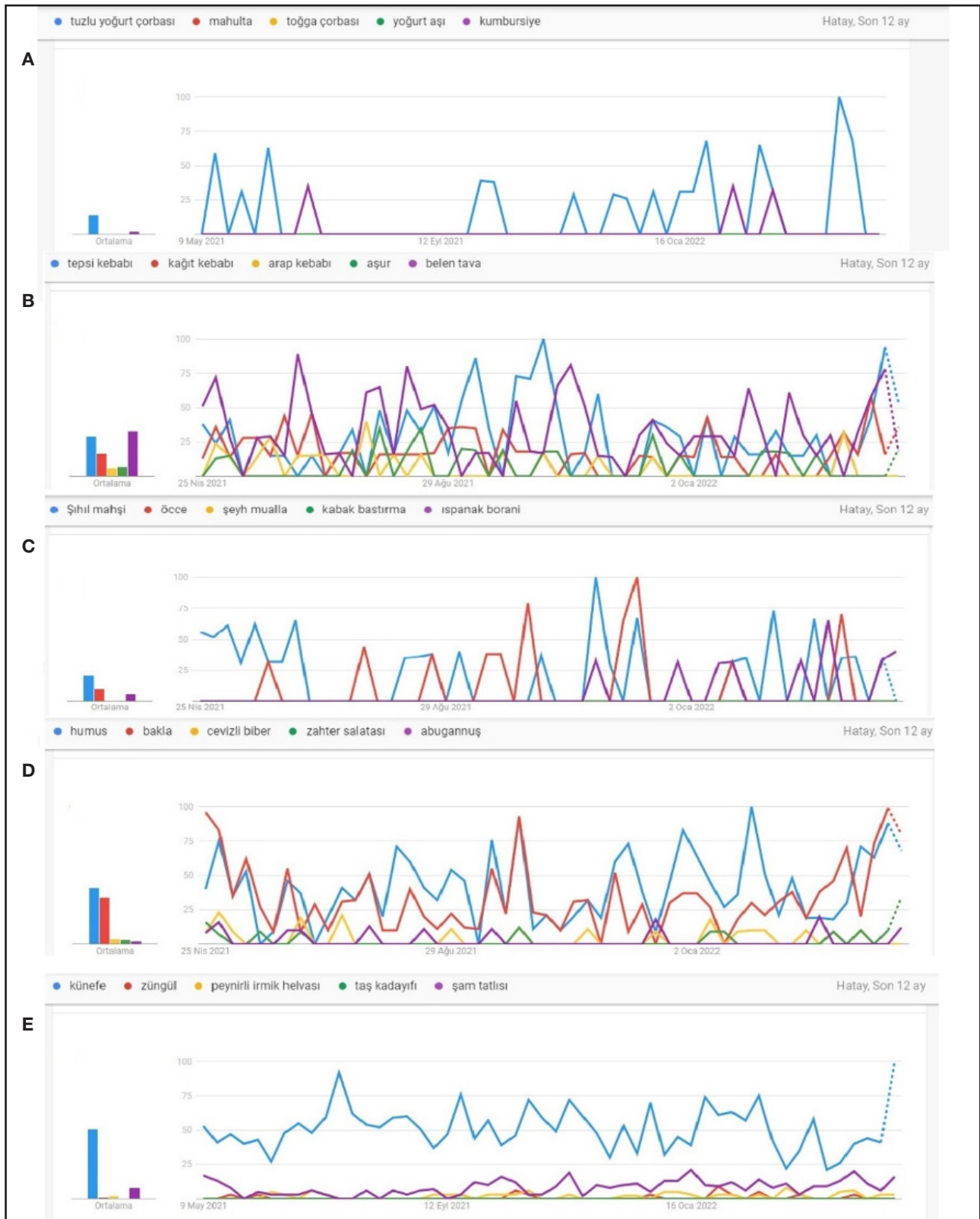
## RESULTS

According to our analysis, it was found that tuzlu yoğurt çorbası had the highest search volume among the soup types served in Hatay cuisine (Fig. 1A), tepsi kebabı had the highest search volume among meat dishes (Fig. 1B), şıhılmaşı among vegetable dishes (Fig. 1C) and hummus among appetizers (Fig. 1D). Lastly, künefe had the highest search volume among the desserts in Hatay cuisine (Fig. 1E).

As shown in table V, retention of nutrients in şıhılmaşı, tepsi kebabı, tuzlu yoğurt çorbası, humus and künefe were listed.

## ŞIHILMAŞI

In şıhılmaşı the highest loss was in folate, with 40 %. Folate decreased from 15,33 mcg to 9,2 mcg. Loss of vitamin C and thiamine were 35 %, while loss of niacin and vitamin B6 were 30 %. Vitamin C decreased from 25.8 to 16.81 mg, thiamine from 0.32 to 0.205 mg, niacin from 3.85 to 2.693 mg, and B6 from 0.43 to 0.298 mg. There was a 25 % loss of vitamin B12, potassium and riboflavin, and 20 % loss of magnesium. Potassium decreased from 952 to 714 mg, magnesium from 88.5 to 70.8 mg, and vitamin B12



**Figure 1.**

The most common searches of Hatay local dishes on the web. A. tuzlu yoğurt çorbası had the highest search volume among the soup types served in Hatay cuisine. B. Tepsi kebabı had the highest search volume among meat dishes. C. Şihıl mahşi showed the highest search volume among vegetable dishes. D. Hummus had the highest search volume among appetizers. E. Lastly, künefe had the highest search volume among the desserts in Hatay cuisine. Hatay, Turkey. Data source: Google Trends.

from 3,48 mcg to 2,61 mcg. Loss of iron, phosphorus, calcium, sodium, zinc, vitamin A and beta carotene percentages ranged from 10 to 15 %.

### TEPSİ KEBABI

In tepsi kebabı, the highest loss appeared in vitamin B6, with 50 %. Vitamin B6 decreased from 0,75 mg to 0,37 mg. A 40 % loss occurred in both thiamine and riboflavin. Thiamine decreased from 0,31 mg to 0,19 mg, and riboflavin from 0,38 mg to 0,23 mg. Folate loss was 30 % while B12 loss was 25 %. Folate decreased from 55,33 mcg to 38,73 mcg, and B12 decreased from 2,90 mcg to 2,18 mcg. Vitamin A, retinol, lycopene and beta-carotene loss were 20 %. Vitamin A decreased from 231,5 RE to 185,2 RE. Vitamin C decreased from 75,25 mg to 63,96 mg with, a 15 % loss. Niacin decreased from 10,88 mg to 9,79 mg, with a 10 % loss.

### TUZLU YOĞURT ÇORBASI

In tuzlu yoğurt soup, a 70 % loss of B12, 45 % loss of B6 and 40 % loss of thiamine were reported. B12 decreased from 30 mcg to 0,089 mcg, B6 from 0,02 mg to 0,01 mg, and thiamine from 0,07 mg to 0,04 mg.

### HUMUS

Considering the nutrient losses of hummus, it was observed that the highest loss was in folate at the level of 40 %. While the amount of folate was 13.3 mcg before cooking, it decreased to 7.4 mcg after cooking. Following this, there was a 35 % loss in thiamine and vitamin C levels. The same degree of loss (15 %) was observed in minerals such as iron, phosphorus, calcium, magnesium, potassium, sodium and zinc.

### KÜNEFE

While no loss was observed in most of the minerals in künefe, most losses occurred in folate and thiamine, with 30 % and 20 %, respectively. After cooking, folate decreased from 45.3 mcg to 31.7 mcg. A 10 % loss was observed in riboflavin, niacin, vitamin B6 and vitamin A.

### DISCUSSION

In general, more than one cooking method is applied to local dishes. Overall differences in the retention of nutrients between cooking methods could be used to determine which method of

cooking favored best nutrient retention. Retention in meat, legumes, dairy, vegetable and cereals were compared as main food groups in famous Hatay dishes. The different cooking methods alter the biological value of dishes.

Red meat is a common ingredient in many dishes in Hatay cuisine such as tepsi kebabı and şihılmaşı. Lean red meat is an excellent source of protein, niacin, vitamin B6, vitamin B12, phosphorus, zinc and iron. Protein in red meat contains all essential aminoacids and has a high digestibility compared to beans and whole wheat. The amount of protein in cooked red meat is 28-36 g/100 g, which is a high biological value (13). All vitamins and minerals, including calcium, sodium, potassium, magnesium and phosphorus, decrease during the cooking of meat. Fat-soluble vitamins such as retinol and alpha-tocopherol are less sensitive to heat than water-soluble vitamins (14). While B vitamins in different meat cuts were found as the most affected nutrients by cooking (15), thiamine showed the highest (70-100 %) loss in a study which cooked meat cuts analyzed (14). In our study, nutrient loss of tepsi kebabı, which has red meat as the main ingredient, was the highest in vitamin B6 (50 %), followed by thiamin (40 %) and riboflavin (40 %).

In şihılmaşı, not only the meat but also the legume and vegetable content of the dish were related to a wide spectrum of nutrient loss. High loss was reported in folate, vitamin C, thiamine, niacin and vitamin B6 compared to other nutrients. Similarly, in hummus, these micronutrients constitute the highest proportion of losses.

The loss of nutrients is quite high during the frying process of zucchini, which is the pre-cooking method in şihılmaşı. It can be made healthier by using the boiling method or *sous vide* technique can be applied with the help of vacuum to prepare it in the oven without contacting with water. The positive results of the *sous vide* technique, which is a new cooking technique in the world of gastronomy, have been observed in the pre-cooking process of the karniyarik dish. It is predicted that molecular gastronomy will lead to an increase in the number of experimental studies on this technique, which has become widespread (16).

Soaking is an important process before cooking legumes which removes antinutritional factors such as  $\alpha$ -galactosides, phytates and lectins and reduces vitamins and minerals. Presoaking legumes in alkaline solutions such as water results in greater loss of vitamins. Thiamine, riboflavin and niacin content of legumes decreases after the soaking and cooking processes (17).

Legumes are also excellent sources of folate. Cooking and softening of legumes need long time, which lowers nutritional value of this group. Rather than boiling, pressure cooking after soaking is recommended for maximum retention in folate of cooked legumes (18). In our study, in hummus and şihılmaşı dishes, folate retention amounted to 60 %, supporting the high loss of folate in legumes during cooking processes. Soaking, boiling and baking processes caused nutritional losses depending on cooking time.

Salted yoghurt is a local dairy product made from yoghurt and strained yoghurt in the Hatay region. Yoghurt or strained yogurt is thickened by heat treatment and salted for storage up to one year.

Salted yoghurt is rich in calcium, phosphorus and potassium minerals but it has been determined that the filtration process causes losses in minerals, especially phosphorus and potassium (19). In our study, a high loss of vitamin B12 (70 %) was estimated in tuzlu yoğurt çorba, containing salted yoghurt. Loss of vitamin B12 mostly results from leaching into water during the cooking processes. Also, during sterilization, a 20 % loss of B12 in milk can occur (8). In a study, vitamin B12 retention of six different fermented products including yoghurt were analyzed. Levels of vitamin B12 decreased by 40-60 % during manufacture (20). On the other hand, vitamin B6 (45 %) and thiamine (40 %) losses are noteworthy. Since rice and yoghurt are cooked in water, high loss of the vitamin B group is expectable.

Künefe is a dessert special to Hatay province made from tel kadayıf and künefe cheese (a pastry similar to shredded wheat and unsalted dessert cheese) (21). Folate and thiamine losses were reported as the main nutrient losses of the dish. Since there is not a reported retention factor for tel kadayıf and künefe cheese, these ingredients' losses were estimated as a form of wheat product and cheese.

Micronutrient levels of dishes change as a result of different cooking methods and micronutrient content of foods. High losses of vitamin B12, B6, folic acid, thiamine and vitamin C were reported in famous Hatay dishes.

The main vitamin B12 sources are meat, milk, eggs, fish, and shellfish. Meat, especially sheep meat, has higher bioavailability of vitamin B12 (22). According to our study, B12 losses were reported in tepsi kebabı, tuzlu yoğurt çorba and şihılmaşı. The highest loss was in tuzlu yoğurt çorba. As mentioned above, a high loss of vitamin B12 is likely in fermented products. Milk and dairy products, especially yoghurt and yoghurt-based products such as salted yoghurt, have an important place in Hatay cuisine. Accordingly, retention in dairy products should be taken into account. Dairy products are added to soups, appetizers, salads and other meals. Additionally, dairy products such as salted yoghurt and sürk cheese are widely consumed in breakfast (19). Zahtar, which is an important spice consumed in many dishes in Hatay cuisine, is added to sürk cheese (23).

Grains, pulses, nuts, seeds, potatoes, herbs and spices, meat and meat products and fish are foods rich in vitamin B6 (24). An experimental examination on the retention of vitamin B6 in foods indicated that boiling caused higher loss than sauteing and deep frying. Wet heating was mainly responsible for vitamin B6 losses and retention in dry heating of animal foods was relatively low. Average B6 loss after cooking was calculated as 13 % in dairy meals, whereas it increased until 75 % in beef boiled in long time (25). Vitamin B6 loss of chicken meats mostly consumed in Turkey was investigated and ranged between 55 % and 89 % (26). In our study, vitamin B6 retention was 50 % in Tepsi kebabı, 55 % in tuzlu yoğurt çorba and 70 % in şihılmaşı. Long term cooking of these foods and using more than one cooking method are the main reasons causing vitamin B6 retention decrease.

Consuming the water used for boiling in foods, eating raw foods, using dry heating in a short time and short-term heating, especially for animal foods, are recommended to avoid vitamin B6 loss (25). Vitamin B fortification of meat products can also compensate the

loss during cooking. Fortification is achieved by vitamin B1, B6 and B12 since they are vital for the human body (27).

Liver, fortified cereal and other grains, legumes and vegetables, especially leafy greens, are excellent sources of folate. Folate retention depends on the type of food and processing methods (28). Folic acid is highly susceptible to light, air, heat and some pH conditions. Cooking time, temperature, pH and leaching into cooking water causes folate loss (18). Some foods that contain folate were examined and folate retention was reported ranging between 14 % and 99 %. Folate retention of boiled lentil was 43 %. In roasted beef liver, folate retention was 14 %, which is the lowest level in the study (28). Duration and type of cooking of green vegetables decreases folate retention in important levels. While retention in boiled broccoli and spinach was about 50 %, steamed broccoli and spinach and grilled beef did not significantly decrease folate content (29). In tepsi kebabı and künefe, folate retention was 70 %, while it was 60 % in hummus and şihılmaşı. Retention in hummus and şihılmaşı was lower because of the legume content of the foods.

Cereals and legumes meet a significant part of the thiamine requirements in diet. Inappropriate preparation and cooking techniques cause loss of thiamine in foods. Adding excess water to foods, draining of cooking water, high temperature, high pH and long cooking time increase the loss of thiamine (30). When thiamine retention is considered, it was assessed that thiamine loss was common in most of the traditional foods. In a study conducted in Japan, the average retention of thiamine in meals was found to be 50-60 %. There was a great loss of thiamine in green vegetables and rice, and it was pointed that boiling results in large losses (31). Consistent with this finding, thiamin retention was around 60-65 % when calculated using USDA. Another study conducted with more than 200 food samples stated that the cooking losses of ascorbic acid, thiamine, riboflavin, beta-carotene and folic acid were 34.6, 30, 52.2, 45.9 and 32.2 %, respectively (32).

Vegetables are rich sources of vitamin C and cooked vegetables have higher vitamin C content than raw ones. Steaming has been stated as the best cooking method to maintain vitamin C content of foods (33). Vitamin C content comes from zucchini in şihılmaşı, tomatoes in tepsi kebabı and lemon in hummus. Although losses ranged between 15 and 35 were reported, these losses are neglectable because of low amounts of vitamin C.

The calculations related to nutritional loss may overestimate the retention of nutrients. Results of a Korean study indicated that folate intake from cooked dishes could be overestimated in comparison to a microbiological assay after trienzyme extraction. In this study, the calculated values were found higher than the analyzed values (34). It should be noted that data measured by laboratory methods could be more reliable than the calculation. Furthermore, our approach overestimates the losses study because we chose the retention factor of the ingredient with the highest loss. This results in overestimating the losses of some nutrients which take part in the foods with higher retention factors. Therefore, using only the USDA Nutrient Retention Factor Table for retention of nutrients seems like a limitation of the study.



The second limitation of the study is that we used the dishes of only Hatay cuisine and only the specific dishes selected according to their popularity through Google Trends. It could be better if dishes of other regions were analyzed and compared with each other. Thirdly, although we got reliable results by Google Trends, selected dishes might not reflect the nutritional culture of the Hatay cuisine. In a study conducted in South America (35), a questionnaire was used in order to collect recipes of region and a dietary recall for nutritional intake. This might be useful to reflect nutritional intake, but there might be subject bias.

## CONCLUSION

In conclusion, cooking methods can cause significant loss of vitamins and minerals in internationally famous Hatay cuisine dishes. Common techniques such as prolonged cooking in water and baking caused mainly vitamin B6, folate, vitamin B12 and thiamine losses. Making local foods in Turkey is quite difficult. Generally, various cooking methods are applied to dishes. Local foods can be made healthier by choosing special cooking, preparation and preservation practices which decrease micronutrient loss. Steaming rather than boiling can be applied when cooking vegetables in order to minimize the water-soluble vitamins. Likewise, rather than boiling, pressure cooking can be applied when cooking legumes. It is predicted that issues that adversely affect human health such as excessive use of oils would be solved by using different cooking techniques such as *sous vide*. Cooking methods that adversely affect human health predispose towards diseases such as obesity and cancer. Different cooking techniques should be investigated within the scope of researches that help foods become healthier and increase the rate of individuals benefiting from nutrients.

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