# INCREASING THE NUTRITIONAL VALUE OF SAHLEP

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**Abstract.** Innovations on technology and changing consumer expectations forced the development of dairy industry for producing novel products possessing different properties. In recent years, nutritionally enriched functional products have been prepared by the addition of highly valued nutritional compounds to milk. Sahlep, is a milk beverage, not only used as a drinking purpose to keep body the warm but also used for having the benefits of nutritional constituents and alleviating various diseases in Turkey for a long time. Whey proteins, contain, amino acids and various nutritionally high components. In addition, antioxidant, anticarcinogenic and hypocholesterotemic effects are the known some bioactivities. In this study, sahlep milk beverage was supplemented with whey protein concentrate (WPC 35) (1%, 2% and 3%). The pH, viscosity and sensory characteristics were analyzed. When sahlep milk beverage was supplemented with WPC 35 showed no effect on the pH value; however, viscosity was increased. According to sensory evaluations, supplemented with WPC 35 affected on colour, structure, taste and smell properties of sahlep milk beverage. The panelists gave the highest score to sahlep milk beverage supplemented with WPC 35 (3%), which is close to the control. It could be concluded that sahlep supplemented with WPC 35 (3%) could be prepared and suggested as a novel and nutritionally high product.

**Keywords:**

Sahlep,
milk beverage,
whey protein concentrate,
nutrition,
sensory,
viscosity

## INTRODUCTION

To prepare the sahlep beverage, firstly, milk is mixed with sugar and sahlep powder, then it is boiled, and finally some cinnamon powder is strewed on top of it and it is drunk as hot; it is a traditional, thickened milk drink (Tamer et al., 2006).

Sahlep is the name given to the tubers of the genera of *Orchis, Ophyris, Serapias, Platanthera,* and *Dactylorhiza*. The plant has Western Asia origins, a tuberous and herbaceous structure, flat and long leaves, and white, pink, red, lilac or purple flowers. It has been found that *Orchidacea* family, which includes the sahlep plants, has approximately 24 genera and 90 types (Tamer et al., 2012).

The word sahlep has been taken from the Arabic language which means fox. Sahlep is a drug that has been recorded in the medical books since the time of Dioscorides. Dioscorides, in his work "Materia Medica", gave information on the colours, leaves and flowers of orchids.

Avicenna, in his work "Kanun", provided vast information on sahlep (Öğretmen et al. 2012).

Sahlep plant grows in the geographical mid-zone of the world, and it provides healing effects for the people. Sahlep grows in almost every place in our country and its tubers are gathered and sold in some regions. When the climate conditions are available in Turkey, 8-10 tons of sahlep is produced per year. In addition, 10 tons of sahlep comes to Turkey through border trade from Iran, Iraq, Azerbaijan, Georgia, Syria and Macedonia (Güzel, 2012).

When the tubers are unearthed, they are washed by rinsing with plenty of water. The cleaned tubers are boiled in water, ayran (drink made of yoghurt and water) and seldom in milk for 15-30 minutes. The reason for boiling is to stop the development of the tubers. Moreover, the process of boiling helps create the unique taste and scent of sahlep. The boiled tubers are dried directly under the sun. The dried tubers are hardened and grinded in mills to obtain the fine powder. The powdered sahlep is generally used in making the sahlep beverage and Kahramanmaraş ice-cream (Sezik, 2012).

The functional properties of sahlep depend on its type and chemical composition, particularly its glucomannan content (Yaşar, 2010). Glucomannan, which is found in sahlep, has very good stabilizer characteristics, and it gives the proper, hard, flexible homogenous structure and stability to ice-cream (Tekinşen, 2010). As the glucomannan amount in the sahlep powder increases, the stability and aroma of the prepared sahlep beverage increases as well.

Tekinşen and Güler (2010), stated that the composition of the sahlep powder, which is produced from ten *Orchidaceae* species growing in Turkey, varied between 9.35-12.40% for moisture, 3.11-4.95% for protein, 0.95-2.83% for ash, 17.7-54.6% for glucomannan, and 5.44-38.7 for starch. Farhoosh and Riazi (2007) informed that the composition of two Iran sahlep powders varied between 12.85-13.56% for moisture, 3.09-7.35% for protein, 2.10-3.84% for ash, 22.13-58.22% for glucomannan and 1.67-6.15 for starch.

It has been stated that sahlep keeps the body warm in cold days, increases resistance against common cold and prevents diarrhea. The most important component of sahlep is glucomannan (Tamer et al. 2012). Glucomannan is the name of the fibers that dissolve in neutral water and it is known to have many beneficial health effects (Yasar et al., 2009). Glucomannan has a polysaccharide structure, and it is a hemicellulose which consists of linear β-D-mannose and α-D-glucose monomers that are linked with β-1-4 links. Glucomannan is a stabilizer with a high water holding capacity. It can also be used for the treatment of chronic constipation (Tamer et al. 2012). Glucomannan contributes to the normalization of natural blood glucose, and lessening stress in pancreas, moreover, it has a preventive effect on blood sugar anomalies such as hypoglycemia. In addition, it plays a role in preventing the chronic diseases and controlling weight (Farhoosh and Riazi, 2007).

Whey is the name of the liquid remaining after milk has been curdled and casein is separated while producing cheese. Whey is an important by-product of the milk industry that makes cheese or casein. This by-product constitutes almost 85-90% of milk volume, and approximately 55% of milk nutrition remains in this by-product (Brandelli et al., 2015).

Whey can be turned into food additives through simple drying or by removing mineral elements, lipids and lactose. Whey products such as whey protein concentrates (WPC) and whey protein isolates (WPI) are developed by using different techniques such as ultrafiltration, microfiltration, reverse osmosis and ion exchange (Segat et al. 2014).

Whey protein products are considered as perfect food additives because of their unique functional properties. Whey proteins are added to foods not only because of their functional properties, but also because of their high nutritional value and GRAS status (El Salam et al., 2009).

Whey is a source of important proteins, and it is used as an agent increasing viscosity, forming gel, stabilizing emulsions or foams and hydrating in the production of many complex foods. In fact, since whey proteins include a high amount of β- Lactoglobulin and α-Lactalbumin and have other important minor compounds (protease peptone fraction), they are also responsible for hydration, gelation, emulsifying and foaming properties (Segat et al., 2014).

Whey contains only 5 basic proteins; β –Lactoglobulin, α-Lactalbumin, glycol-macropeptide, immunoglobulins and serum albumin (Krissansen, 2007).Whey includes many components that are beneficial for health, which are essential amino acids, bioactive peptides, antioxidants and immune-globulins. Among the important roles played by whey proteins are radical scavenging, anti-inflammatory, antitumor, immune-stimulatory, hypotensive, gut homeostasis, anti-obesity, anti-diabetic, muscle bio-synthesis, osteo-protective and radio-protective functions (Patel, 2015).

The purpose of this study is to study the impact of whey protein added to sahlep on the rheological and sensory properties of sahlep.

## MATERIALS AND METHODS

### Raw Material and Excipients

Milk: The milk obtained from morning milking in Osmaniye private milk enterprise was taken and then homogenized and used.
Whey protein concentrate (WPC 35): It was obtained from Enka Milk (Konya, Turkey) company.
Starch: Corn starch was used (Dr.Oetker, İzmir, Turkey).
Sahlep: Sahlep was supplied from a private company in Kahramanmaraş (Turkey).
Sugar: The sugar was supplied from Torku Company (Konya, Turkey).
Ginger: The ginger was bought from Bağdat Baharat (Kahramanmaraş, Turkey).
Cinnamon: The cinnamon was bought from Bağdat Baharat (Kahramanmaraş, Turkey).

### Method

### Sahlep Production

The controls of the raw milk were performed; its fat rate was adjusted to 3.5%, and it was homogenized. Whey protein concentrate (WPC 35)**,** sahlep, sugar, starch, cinnamon, and ginger were added in the amounts indicated in Table 1, and the mixture was mixed to become homogenous by using an homogenizer (Ultra Turrax, Janke & Kuntel KG, IKA, Werk, Germany). Double-walled steam boilers were used to heat the mixture at 85˚C for 10 minutes, and then it was cooled down to 25˚C. The manufactured

sahlep samples were stored at +5˚C during the analyses. Sahlep production is illustrated in Diagram 1.

**Sahlep Analyses**

pH Analysis: Orion Star™ A 211 pH Benchtop Meter digital pH meter (Thermo Scientific, Waltham, MA) was used for measuring this.

Viscosity Analysis: The viscosity of the samples was measured by using the Selecta STS-2011 Viscometer (Barcelona, Spain) device at 40ºC.

Sensory Analysis: In order to make a comparative assessment of the sahleps with the sensory method, a panelist group of 13 was formed with people from the Osmaniye Korkut Ata University,,Food Engineering Department, and the panelists were trained. Panelists gave Hedonic-type scores (1-9 points) independently from each other and in a comparative manner (Meilgaard et al., 1999).

Statistical Analysis: An analysis of variance was made by using the SPSS 18.0 package program for the physical, chemical and microbiologic data that were gathered. Duncan multiple comparison test was used to identify the differences. (Düzgüneş et al., 1987).

*Table 1: The ratios of additives used in sahlep production*

| Samples | Milk (mL) | Whey protein concentrate (WPC 35) (g) | Sahlep (g) | Sugar (g) | Starch (g) | Ginger (g) | Cinnamon (g) |
|---|---|---|---|---|---|---|---|
| **Control** | 1000 | - | 8 | 80 | 2 | 1 | 1 |
| **%1** | 1000 | 10 | 8 | 80 | 2 | 1 | 1 |
| **%2** | 1000 | 20 | 8 | 80 | 2 | 1 | 1 |
| **%3** | 1000 | 30 | 8 | 80 | 2 | 1 | 1 |

*Table 2: pH and viscosity values of sahlep samples*

| | Control | Sample 1 (%1) | Sample 2 (%2) | Sample 3 (%3) |
|---|---|---|---|---|
| **pH** | $6.73^{a} \pm 1.01$ | $6.75^{a} \pm 0.05$ | $6.73^{a} \pm 0.17$ | $6.70^{a} \pm 0.14$ |
| **Viscosity** | $105.50^{c} \pm 9.19$ | $123.50^{b} \pm 2.12$ | $137.65^{b} \pm 3.53$ | $165.72^{a} \pm 7.07$ |

The difference between the values indicated in the same line with different letters is statistically significant ($p<0.05$).

Milk
↓
Control (degree of acidity, pH, fat, antibiotic)
↓
Milk fat adjustment and homogenization
↓
Adding the additives (whey protein concentrate (WPC 35)**,** sahlep, sugar, starch, cinnamon, ginger)
↓
Mixing (until the additives become homogenous)
↓
Heat Treatment (at 85˚C for 10 minutes)
↓
Cooling (25˚C)
↓
Storage (+5˚C)

**Diagram 1**
Flow Chart for Sahlep Production

*Table 3: Sensory analysis results of sahlep samples*

| Quality Attribute | Control | Sample 1 (1% ) | Sample 2 (2%) | Sample 3 (3% ) |
|---|---|---|---|---|
| **Color** | $8.38^{a} \pm 0.80$ | $6.92^{b} \pm 1.35$ | $7.35^{b} \pm 0.94$ | $8.04^{a} \pm 0.72$ |
| **Structure** | $7.88^{a} \pm 0.76$ | $6.19^{c} \pm 0.89$ | $6.73^{b} \pm 0.92$ | $7.77^{a} \pm 0.95$ |
| **Scent** | $7.92^{a} \pm 0.80$ | $6.27^{c} \pm 1.04$ | $6.85^{b} \pm 0.73$ | $7.73^{a} \pm 1.0$ |
| **Taste** | $8.15^{a} \pm 0.67$ | $6.19^{b} \pm 0.90$ | $6.65^{b} \pm 0.89$ | $7.73^{a} \pm 0.92$ |
| **Overall** | $8.19^{a} \pm 0.75$ | $6.15^{c} \pm 1.12$ | $6.85^{b} \pm 1.05$ | $8.15^{a} \pm 0.83$ |

The difference between the values indicated in the same line with different letters is statistically significant ($p<0.05$).

## RESULTS AND DISCUSSION

Table 2 presents the pH and viscosity results of sahlep samples. In terms of pH, there was no statistically significant difference among samples ($p>0.05$). However, as the whey amount increased, the viscosity values of samples increased as well, and this increase was found to be statistically significant ($p<0.05$).

Table 3 presents the sensory analysis results of sahlep samples. As the figure indicates, there was significant difference among samples in terms of colour ($p<0.05$). The control sample and the sample with 3% additive received the highest scores, and the difference between them was insignificant ($p>0.05$). The difference among samples in terms of structure was found to be significant ($p<0.05$). The control sample and the 3rd sample with 3% additive received the highest structure values, and the difference between them was statistically

insignificant ($p>0.05$). Likewise, the control sample and the 3rd sample with 3% additive received the highest score in terms of scent, and the difference between them was also insignificant ($p>0.05$). The lowest value belonged to the 1st sample with 1% additives. The difference among samples in terms of taste was found to be significant ($p<0.05$). The difference between the control sample and the 3rd sample with 3% additive was insignificant ($p>0.05$) and those samples received the highest scores in terms of taste. According to the overall evaluation criteria, the highest scores were received by the control sample and the 3rd sample with 3% additive, and the difference between these samples was insignificant ($p>0.05$). The lowest value belonged to the sample with 1% additive.

## CONCLUSION

According to the result of the analysis, the viscosity level increased as the amount of whey proteins increased. According to the evaluation criteria of colour, scent, structure, taste and general acceptability, the control sample and the 3rd sample with 3% additives received the highest scores. The difference between the scores of the control sample and the 3rd sample was statistically insignificant ($p>0.05$), and the sample that was the closest to control sample was the 3rd sample. Adding 3% whey protein concentrate (WPC 35) can be recommended to increase the nutritional value of the sahlep drink and improve its biological property.

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