

Replacing of Water by Buffalo Milk or Buffalo Whey in Production of Traditional Afyonkarahisar Velense Noodle

* Seda YALÇIN^a , Erdal ÖZER^b , Tansu ÇELİK^b 

^a Afyon Kocatepe University, Afyon Vocational School, Department of Food Processing, Afyon/Türkiye

^b Afyon Kocatepe University, Afyon Vocational School, Department of Hotel, Restaurant and Catering, Afyon/Türkiye

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Abstract

The aim of this study is to produce velense noodle including buffalo milk, buffalo whey or water, evaluate their cooking and sensory properties and comparison of them. Velense noodle is a traditional product of Afyonkarahisar which is third gastronomy city of Turkey. Velense noodle is made from wheat flour, egg, salt and water. Water was replaced by buffalo milk and buffalo whey in the production of velense noodle. Because buffalo milk and buffalo whey have important components which give health benefits. So these new products will be more nutritional compared to traditional velense noodle. Cooking time, swelling volume, weight increase and cooking loss values of velense noodles were determined. The hedonic score of surface properties, chewiness properties, post chewing mouth feel properties, taste and overall acceptability were tested. The cooking time of all samples was 12 min. Velense noodle including buffalo milk or buffalo whey had better cooking properties means lower cooking loss and higher sensory scores than those of velense noodle including water. Velense noodle including buffalo milk had the best cooking and sensory properties. Swelling volume, weight increase and cooking loss of this velense noodle were 240%, 190% and 5.90%, while overall acceptability was 4.5 scores.

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* Corresponding Author

E-mail: syalcin@aku.edu.tr (S. Yalçın)

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INTRODUCTION

Noodle is a food originating in China and has spread to many parts of the world from here via silk (Kalkan et al., 2020). It is believed that noodles first appeared in China around 5000 BC and later spread to other Asian countries (Guoquan & Kruk, 1998). Noodles make up a significant part of people's diet in Asia, where approximately 40% of wheat is used in noodle production (Koca et al., 2018). Noodles are produced in many varieties around the world. Flour color, protein amount and quality, damaged starch amount, ash, yellow pigment content and polyphenol oxidase activity are the factors responsible for noodle color and affecting noodle quality. As a result, differences arise in terms of sensory, nutritional and quality characteristics of the product obtained (Park & Baik, 2004) The amount of protein, which is an important component of flour, affects the noodle texture. As the amount of protein increases, the hardness of the noodle also increases. Noodles of flours with low protein content are lighter in color, less strong and more easily breakable. Color, cooking properties, texture and taste are the main quality parameters that affect consumer acceptance (Levent, 2019). Traditional Turkish noodles are mainly produced from wheat flour, eggs and salt. The egg, which increases the nutritional value significantly, improves both the physical and sensory properties of these products. Milk, whey powder and other additives can be added to the noodle formulation in some regions of Turkey (Özkaya et al., 2001). Raw materials used in noodle production, especially flour, have a great impact on the quality of the final product (Park & Baik, 2004).

Noodle quality is based on protein, vitamin and mineral contents, cooking properties and texture features (Lu et al., 2016). Noodle is made from bread wheat (*T. aestivum*) flour, egg, salt and water (Hou & Kruk 1998). The primary processes of production are sheeting and cutting of dough (Miskelly, 1993; Cecillia, 2010; Corke & Bhattacharya, 1999). Animal based and plant based ingredients are incorporated into noodles to enhance quality and functionality (Chillo et al., 2009). Noodles are known with having low fat and sodium and high complex carbohydrates. For this purpose, development of new noodle with good acceptability, functional and nutritional is inevitable work (Li et al., 2012). Velense noodle is a type of noodle including wheat flour, egg, salt and water. Velense noodle is a local product of Afyonkarahisar. Velense noodle has triangle shape (Atik et al., 2022).

Buffalo milk has higher proteins, vitamins and minerals than other animal milks (Garau et al., 2021). Khan et al. (2019) showed that DPPH free radical scavenging activity of buffalo milk was 25.7%. Claeys et al. (2014) reported that protein content (32-40g/L) of buffalo milk was higher than that (25-28g/L) of cow milk. Rafiq et al. (2016) demonstrated that true protein, casein and whey protein of buffalo milk were 3.87%, 3.20% and 0.68%, while those of cow milk were 3.25%, 2.79% and 0.47%, respectively. Fuquay et al. (2011) reported that tocopherol content (324µg/g) of buffalo milk was higher compared to that (312µg/g) of cow milk. Buffalo milk contains more minerals than cow milk: Calcium content (184mg/100g) of buffalo milk was higher than that (123mg/100g) of cow milk (Garau et al., 2021). Calcium can facilitate the loss of body fat, because of binding fatty acids in intestine and reduces fat absorption (Denke et al., 1993; Jacobsen et al., 2005). Whey protein has a role as antioxidant, prevents lipid oxidation (Tong et al., 2000) and eliminates free radicals by the sulphur containing amino aside (McChartey et al., 2001). Glutathione peroxidase level, having antioxidant system, is increased. Whey protein addition to soy oil emulsion enhanced oxidative stability (Erel, 2004). Products containing whey protein have better antioxidant property (Khan, 2019). Lactoferrin and casein prevent lipid peroxidation, the formation of peroxide radical and oxygen uptake (Chen et al., 2000).

The objective of this study is to investigate the effect of buffalo milk and buffalo whey on cooking and sensory properties of velense noodle. There is no study about using of buffalo milk or buffalo whey in the production of noodle.

Materials and Methods

Materials

Wheat flour (10% protein), egg and salt were purchased from a local market in Afyonkarahisar. Buffalo milk (4% protein) was obtained from Afyon Kocatepe University Buffalo Farm.

Buffalo Milk Production

Buffalo raw milk (1 kg) was boiled on the heater for 30 min. Then it was cooled.

Buffalo Whey Production

Lemon salt including citric acid (10 g) was added to buffalo milk (1000 g) and boiled for 15 min. After precipitation, cheese was obtained. Whey was separated.

Velense noodle production

Wheat flour (500 g), egg (120 g), salt (15 g) and water (150 g) were mixed for 9 min. Then dough was rested for 30 min. After that, dough was sheeted with rolling pin. Yufka has 60 cm of diameter and 1.5 mm of thick. Yufka was cut into triangles. Noodle was dried at room temperature for 60 min. Control was obtained. Other noodles were prepared with replacing of water by buffalo milk or buffalo whey (Figure 1.).

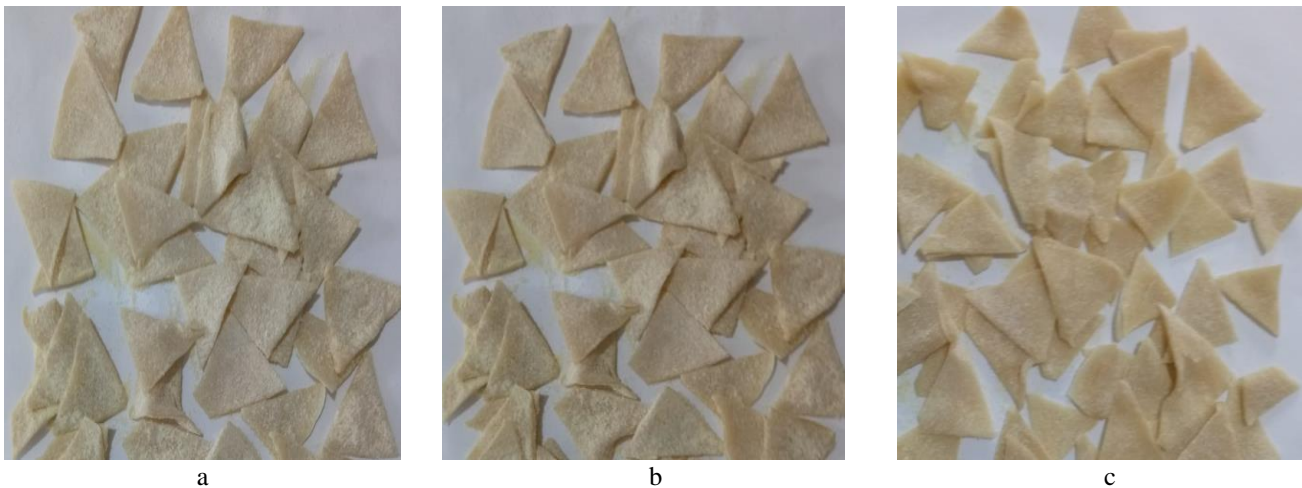


Figure 1. Photograph of velense noodles including milk (a), whey (b) and water (c)

Cooking Analysis

Cooking time was determined as the time required for disappearing of white core when noodle was pressed between glasses. Swelling volume, weight increase and cooking loss values were analyzed according to the method reported by Yalcin and Basman (2008a,b) and Yalcin (2021).

Sensory Evaluation

Sensory scores were conducted using five-point hedonic scale with 25 panelists according to Yalcin (2005) with some modification. According to the results of the sensory analysis, the surface properties, chewiness properties,

post-Chewing mouth feel properties and overall acceptability properties of velense noodles were investigated.

Statistical Analysis

Statistical differences between velense noodles were evaluated using one way analysis of variance (ANOVA) followed by Duncan test. Difference between groups was significant at $P < 0.05$. All data were analyzed using IBM Statistics SPSS 24

Results and Discussion

Cooking properties

There were significant differences between swelling volume, weight increase and cooking loss values of velense noodle samples, while there were no significant difference between their cooking times.

Cooking time of velense noodles including buffalo milk, buffalo whey or water was 12 min. This value is consistent with the result of Atik et al. (2022). It was found that the cooking time of velense noodle made from wheat flour was 12 min. It has been reported that the cooking time of noodle made from wheat flour of several varieties was in the range of 10-16 min (Bhattacharya et al., 1999).

During cooking, it is desired that the volume increase of noodle is higher. Because the less volume increase indicates that the noodle absorbs less water and this causes the noodle to be hard after cooking (Bhattacharya et al., 1999). Velense noodle including buffalo milk had significantly highest swelling volume and weight increase values, while the lowest swelling volume and weight increase were belong to velense noodle including water. Velense noodle including buffalo whey had lower swelling volume and weight increase values than those of velense noodle including buffalo milk, while higher swelling volume and weight increase values than velense noodle including water. It is desired that the water absorption of noodles is high during cooking. As a result of its low water holding capacity, noodle had a hard texture after cooking (Bhattacharya et al., 1999).

Velense noodle including buffalo milk had lower cooking loss value compared to that of velense noodles including buffalo whey or water. The amount of substances that passes into the water is an important contribution criteria in the evaluation of noodles. It is desired that a good quality noodle does not disintegrate and deform during the cooking period, keep its shape and the amount of substance passes into the water is low (Köksel, et al.,2000).

Table 1. Cooking values of velense noodles including buffalo milk, buffalo whey or water

Sample	Cooking time (min)	Swelling volume (%)	Weight increase (%)	Cooking loss (%)
Milk	10 a	240 a	190 a	5.90 c
Whey	10a	235 b	186 b	5.93 b
Water	10 a	230 c	179 c	5.98 a

Sensory properties

Sensory properties of velense noodle samples are shown in Figure 2. Velense noodle including buffalo milk had the highest sensory scores (higher than 4). Second sensory score was belonged to velense noodle including buffalo whey. Velense noodle including water had lower sensory scores compared to other noodle samples.

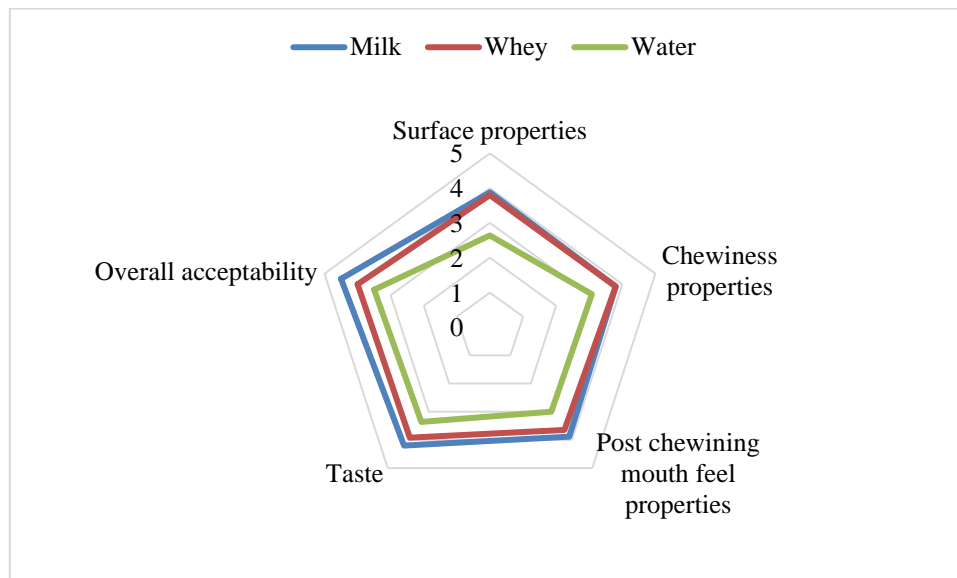


Figure 2. Sensory graphic of velense noodles including buffalo milk, buffalo whey or water

Conclusion

The traditional velense noodle produced in Afyonkarahisar has wheat flour, egg, salt and water. Water was replaced by buffalo milk or buffalo whey in this study. Buffalo dairy products are rich in important components capable of providing economic development and health benefits (Garau et al., 2021). The reason for using buffalo milk in velense noodle production was to increase protein, vitamin, mineral and antioxidant contents. Buffalo whey was used in velense noodle for evaluating of by product obtained from cheese production, increasing of protein, vitamin, mineral and antioxidant contents and also obtaining cheaper product compared to velense noodle including buffalo milk. Velense noodle samples, including buffalo milk or buffalo whey had better cooking properties and higher sensory scores than control velense noodle. Higher swelling volume and weight increase and lower cooking loss give good quality to noodles (Yalcin & Basman, 2008ab, Yalcin, 2021). It was concluded that buffalo milk and buffalo whey enhanced cooking and sensory quality. Velense noodles including buffalo milk or buffalo whey are novelty products. Because buffalo milk is used only for the production of cream, yoghurt, cheese and desserts, so far (Özer et al., 2022) and buffalo whey is by product of cheese. Afyon's geographical features, altitude, harsh climatic conditions, various herbs in natural pastures and plateaus affect milk quality. Buffaloes are mostly fed with poppy pulp which is unique to Afyon. It gives a distinct flavor to milk. Cream made from this milk has a different taste and durability (Sandıkçı & Özkan, 2017). The focus on buffalo milk and buffalo whey has highlighted the nutritional power of velense noodles and possibility for development in functional food production.

Author Contributions

Author 1: Production of whey from buffalo milk, analysis of noodles, writing of the article

Author 2: Collection of sensory data

Author 3: Production of velense noodles

Conflicts of Interest

All authors of the article contributed equally to the article process. The authors have no conflicts of interest to declare.

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