International Food Research Journal 22(5): 2018-2024 (2015)
Journal homepage: *http://www.ifrj.upm.edu.my*

A study on quality criteria of commercial stuffed pasta (mantı), as traditional food

[1*]Gökmen, S., [2]Aydın, M.F., [3]Kocabaş, A., [4]Sayaslan, A., [5]Yetim, H. and [6]Çağlar, A.

[1]Technical Vocational School of Higher Education, Karamanoglu Mehmetbey University, 70100, Karaman, Turkey
[2]Higher Health School, Karamanoglu Mehmetbey University, 70100, Karaman, Turkey
[3]Department of Biology, Karamanoglu Mehmetbey University, 70100, Karaman, Turkey
[4]Department of Food Engineering, Karamanoglu Mehmetbey University, 70100, Karaman, Turkey
[5]Department of Food Engineering, Erciyes University, 38100, Kayseri, Turkey
[6]Department of Food Engineering, Afyon Kocatepe University, 03100, Afyon, Turkey

Article history

Received: 7 February 2015
Received in revised form: 10 April 2015
Accepted: 20 April 2015

Keywords

Mantı
Quality
Toxin
Food safety
Traditional food

Abstract

The stuffed pasta (mantı) is one of the famous traditional foods in Turkey. Because of the increasing demand for traditional foods in the world, it is important to standardize and commercialize the traditional foods. The objective of this study was therefore to determine physicochemical (moisture content, water activity, color, water binding capacity and cooking loss) and sensory properties and mycotoxin (aflatoxin B_1, aflatoxin-total and ochratoxin-A) contents of 15 different trademarks of mantı. Except for cooking loss, differences in moisture content, water activity, water binding capacity and color of the samples were found to be statistically ($p<0.001$) significant. Additionally, all quality criteria were determined to interact with each other. The results indicate that processing parameters and quality criteria of mantı should be standardized and strictly monitored to facilitate high-quality commercial production.

Introduction

The globalization of food trade and developments in food processing technologies have changed the practices of food transportation, handling, cooking and preparation (Gallegos-Infante *et al*., 2010). With current technology, foods can be produced and stocked in excess amounts in one place and then transported to all over the world. This marketing rule can also be applied to the traditional foods; i.e., any traditional food registered for a given region can be ordered and consumed easily by the people all around the world. This fact implies that key quality characteristics of traditional foods should be determined and standardized without losing their unique traits.

Although many definitions exist for the term "traditional food" (Jordana, 2000; Cayot, 2007; Pieniak *et al.*, 2009; Almlı *et al.*, 2011), the more inclusive and clear one was done by Guerrero *et al*. (2009, 2010) as ''a product frequently consumed or associated with specific celebrations and/or seasons, normally transmitted from one generation to another, made accurately in a specific way according to the gastronomic heritage, with little or no processing or manipulation, distinguished and known because of its sensory properties and associated with a certain local area, region or country". When it comes to the quality criteria of traditional foods, however, it is quite difficult to present a clear picture as they were often assessed by sensory approaches (Imm *et al*., 2011). Therefore, typical sensory and physicochemical characteristics of traditional foods should be determined to standardize and preserve their unique characteristics (Trichopoulou *et al*., 2007). For this purpose, Protected Geographical Indication (PGI) or Protected Designation of Origin (PDO) labels are used in the European Union. Moreover, the rate of registration for geographical indication has dramatically increased in the European Union, especially for traditional foods belonging to a specific region or a country. By this way, traditional foods are registered and protected by the law, and they provide socio-economic benefits for those regions.

One of the favored traditional foods in Turkish cuisine is a kind of stuffed pasta called "mantı", also known as "Kayseri Mantısı" that has been already registered for geographical indication by the

*Corresponding author.
Email: *sugokmen42@hotmail.com*
Tel: +90 338 226 2000; Fax: +90 338 226

Turkish Patent Institute. Mantı is a stuffed- product and composed mainly of two parts, the dough and the meat based filling. The dough is usually made of wheat flour, water, egg and salt, whereas the filling part is composed of ground meat, salt, onion and spices, especially basil and red and black pepper. It is particularly important for mantı to contain basil as a spice. When cooked in boiling water, mantı is expected to preserve its integrity and wholesomeness with a nonsticky surface and to provide somewhat an "al dente" chewing characteristic. Another important feature of mantı is its relatively small size (about 0.5 cm in diameter). Indeed, there is a dictum that "mantı pieces should be so small that 40 of them could be placed in a wooden spoon". Although Mantı is important in Turkey, limited research regarding its quality characteristics was conducted (Anonymous, 2008).

Taking into consideration that Mantı has started to become widely industrialized and that its quality has almost importance for consumers, this research was conducted to assess the unique quality futures of Mantı as a traditional food. For this purpose, the physicochemical and sensory properties, as well as mycotoxin contents, of different trademarks of mantı samples were performed. Furthermore, it was the aim of this study to determine the relationships among the quality parameters of mantı samples investigated.

Material and Methods

Materials

Dried samples, belonging to 15 different producers, were purchased from local markets through September to November 2013. The samples were placed in sterile disposable bags (Interscience, Baglight) and maintained at room temperature until analysis.

Sample preparation (cooking)

Mantı samples (500 g) with about %12 moisture contents were cooked in 2 L of tap water. The tap water was confirmed to comply with the guidelines of MEGEP (2007), where water with medium hardness and free of ammonia and chlorine at pH 6.61 at 24°C. The water placed in a cooking utensil (buchner funnel) was heated up to boiling point and then 500 g of the sample and 1% (w/v) of salt were added. The sample was boiled for 12-15 minutes, depending on the cooking time. After that, the sample was filtered to remove water and then rinsed with 250 mL of cold water (Sitti, 2011; Aslan, 2012).

Physicochemical analysis

Cooked, rinsed and filtered Mantı samples were analyzed for moisture content, water activity, color, water binding capacity and cooking loss. All measurements were conducted in triplicates.

Moisture content and water activity

Moisture contents of the samples (1g) were measured with a halogen moisture analyser using Ohous MB45 Moisture Analyzer (Germany), while water activity of the samples (1 g) were determined using NovasinaLabmaster Water Activity (aw) Analyzer (Germany).

Color

Hunter Lab Colorflex (Japan) Colormeter was used for color-related (L^*, a^*, b^*) measurements (Kaya and Sözer, 2008).

Water binding capacity (wbc)

Twenty five g of sample was accurately weighted (W1) and cooked using 250 mL of tap water. After filtration, it was reweighted (W2). The WBC of the sample was calculated by the below equation.

$$WBC\ (\%) = (W2 - W1) / W1 * 100$$

Cooking loss

For the determination of cooking loss in Mantı, 25 g of sample was cooked and filtered. The cooking water was dried in oven at 135°C until it reached a constant weight. The measured weight at the end of the drying process was used to calculate the cooking loss (Sitti, 2011).

Sensory analysis

Sensory analysis of the cooked mantı samples was performed by 10 expert panelists in laboratory conditions. They were provided an assessment form to evaluate each sample for appearance, smell, texture, taste, and overall sensory characteristics. A 5-point hedonic scale was used, where 5 indicates excellent and 1 extremely unsatisfactory for sensory properties.

Aflatoxin analysis

The samples were firstly grinded using a mixer-type homogenizer (IKA, Germany). For the aflatoxin-B_1 and total aflatoxin (B_1+B_2+G_1+G_2) from mycotoxin analyzes, 5 g of sample was mixed with 25 mL of 80% (v/v) methanol in a sterile disposable bag, stirred for 2 minutes by bag mixer and then filtered through filter paper (Whatman, England). For the ochratoxin-A analysis from mycotoxin analyzes,

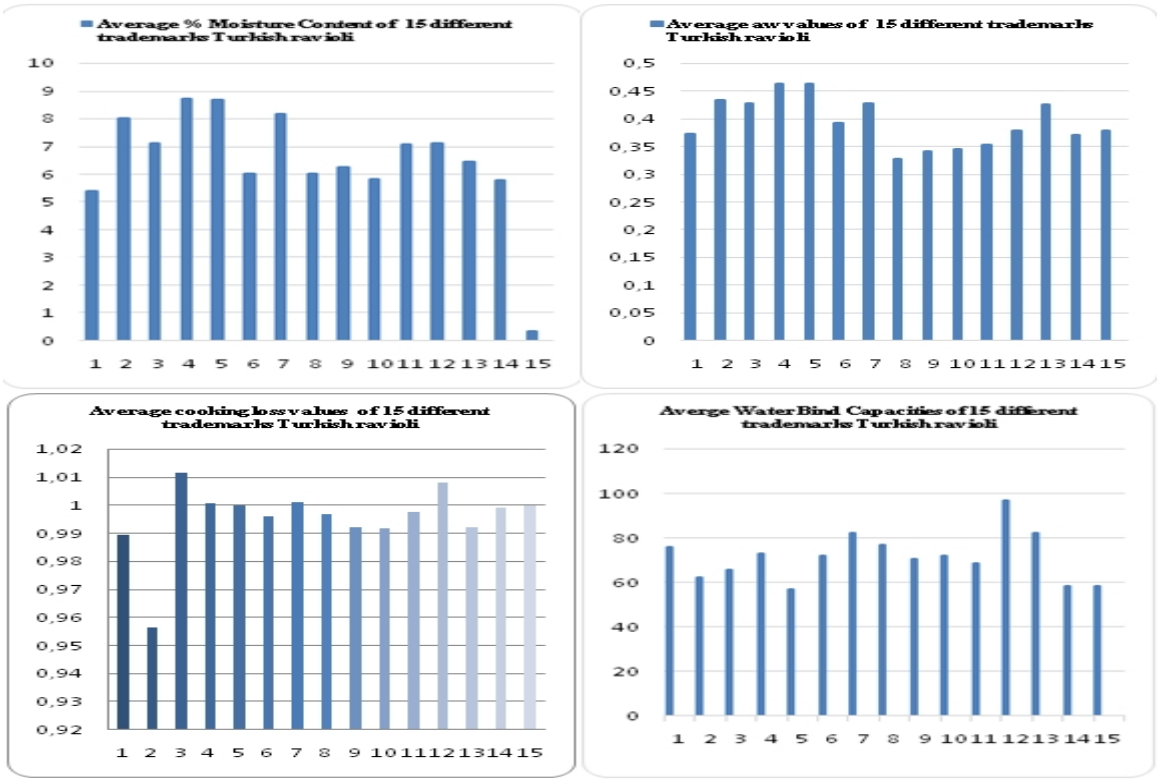

Figure 1. Physicochemical properties of 15 different Mantı samples

10 g of grinded sample was mixed with 50 mL of 70% (v/v) methanol, homogenized for 5 minutes and filtered (Leszczyńska *et al*., 2001). All filtrates were diluted with Tween 20 in a proportion of 1:10. The prepared samples were analyzed using commercial ELISA kits (Aflatoxin B_1 low matrix ELISA kit, Total aflatoxin low matrix ELISA kit and Ochratoxin-A ELISA kit) obtained from Helica Biosystems, USA.

Statistical analysis

Jump statistical software was used for all statistical analyses. Data were subjected to multiple one-way analysis of variance (MANOVA) and compared using Student's t-test.

Results

Mantı samples used in this study consisted of 15 different trademarks collected from local markets. Except for cooking loss, differences in moisture content, water activity, water binding capacity and color were found to be statistically significant ($p<0.001$) (Figure 1 and 2). Sensory properties of the samples were also statistically ($p<0.001$) significant (Figure 3). Mycotoxin contents of mantı samples used in this study were found be different, as well. Additionally, the results showed that all quality criteria have interactions with each other.

Discussion

Giannuzzi (1998) and Sitti (2011) reported some basic quality criteria of Mantı. First of all, yellowish color should be maintained during cooking and the cooking process should be longer than 7 minutes. Secondly, cooking loss should be less than 1% and increase in weight during cooking should be about 60%. For this purpose, the flour used for Mantı processing should have about 13% protein and at least 32% wet gluten (Anonymous, 2008). In our study, cooking losses were found to be about 1% for the Mantı samples. However, increase in weight during cooking was determined to be approximately 60%. This result indicates that Mantı samples differ greatly in quality. One of the reasons could be usage of different types of flour. Since quality of pasta and Mantı is mainly dependent on flour quality (Gallegos-Infante *et al.*, 2010; Fuad and Probhasankar, 2010). It was showed that microbiological quality of home-made Manti was quite low (Öztürk, 2009). The microbiological quality of manti samples covered in this study differed noticeably.

Dough preparation of mantı is quite similar to pasta dough preparation. Gallegos-Infante (2010) reported that protein content, amylose/amylopectin ratio and the chain length distribution of amylopectin are the key parameters affecting water binding capacity and moisture content. It was also indicated that protein

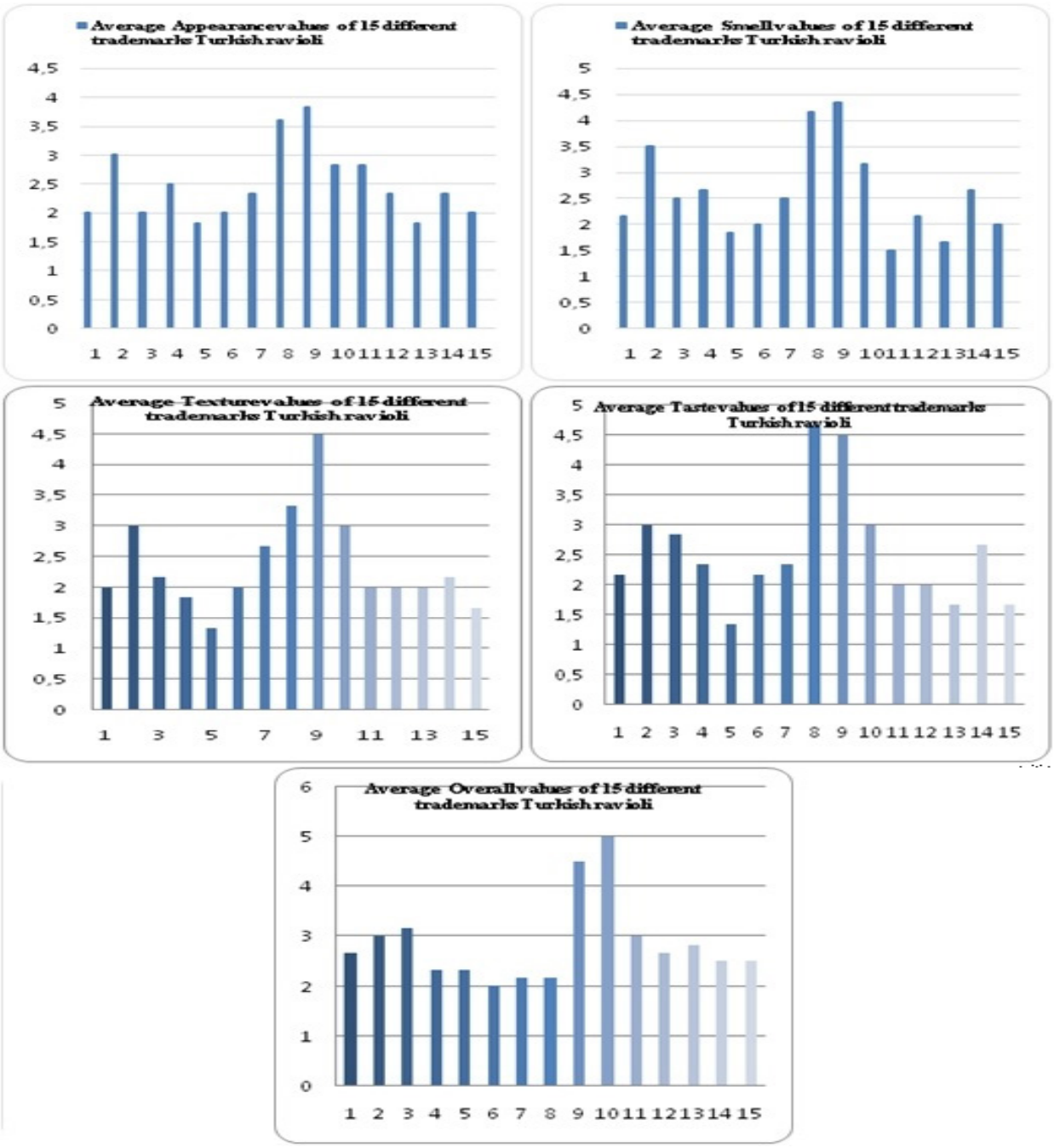

Figure 2. Sensory properties of 15 different Mantı samples

denaturation resulted in protein-carbohydrate-lipid matrix formation, which in turn decreased the moisture content. Furthermore, the matrix prevented the solubilization of starch, hence, increased the water binding capacity. Prabhasankar *et al.* (2007) also provided similar results. They found that addition of whey protein concentrate affected the physical, cooking, sensory and micro-structural characteristics of pasta. Another study showed that out addition of soluble fiber into pasta dough in a decrease in the protein content and broken down the protein matrix (Chillo *et al.*, 2011). Fuad and Probhasankar (2010) also mentioned that flour properties change the physicochemical and sensory quality of the pasta. In this study, the physicochemical and sensory features of Mantı samples were significantly differ from each other possibly due to the usage of flour having different quality.

Another factor affecting the properties of dough is drying temperature. It should be high enough to denature the proteins and forming a protein matrix (Gallegos-Infante *et al.*, 2010; Gimenez *et al*., 2013). The samples used in this study belong to different trademark, thus, applied drying temperature through production could vary. In other words, different sensory quality of the samples may be caused by the differences in their drying process.

Above mentioned criteria are intrinsic ones.

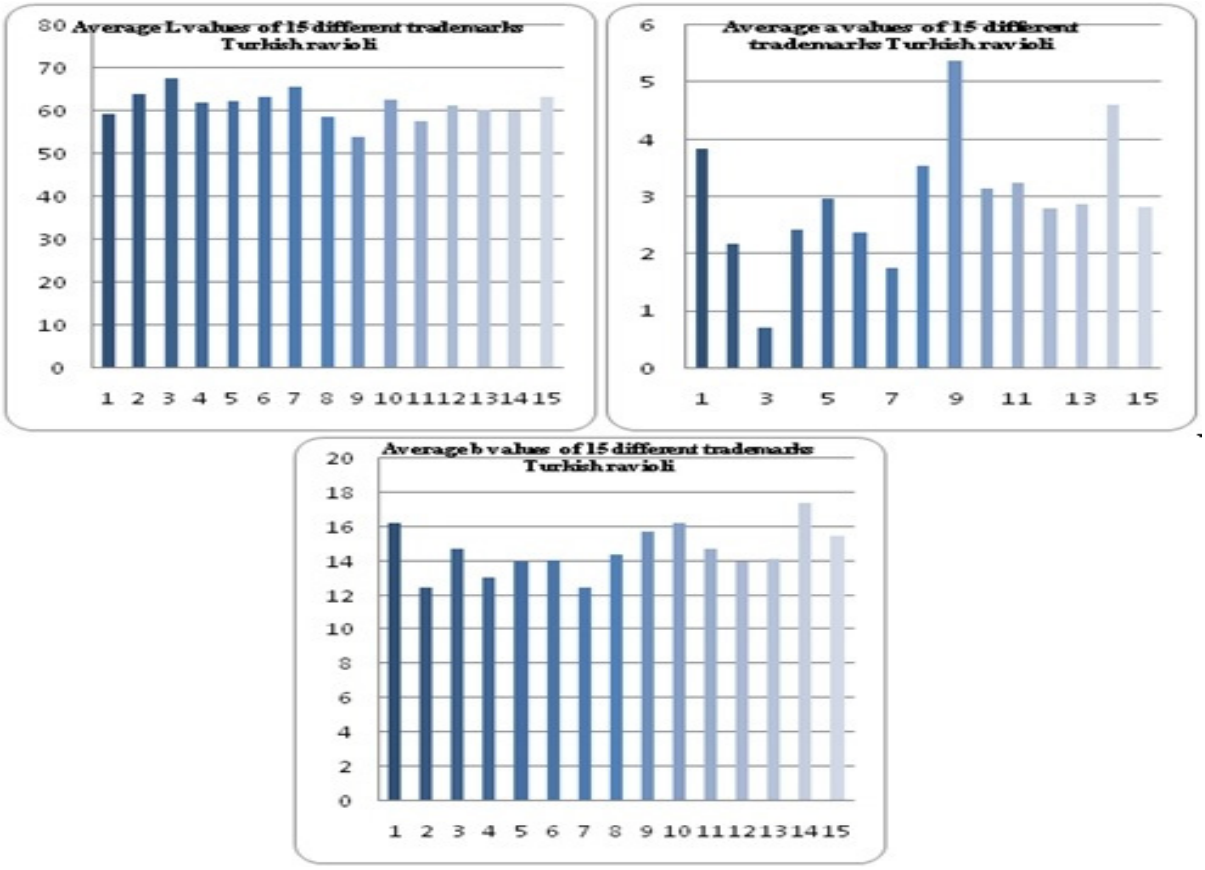

Figure 3. Color properties of 15 different Mantı samples

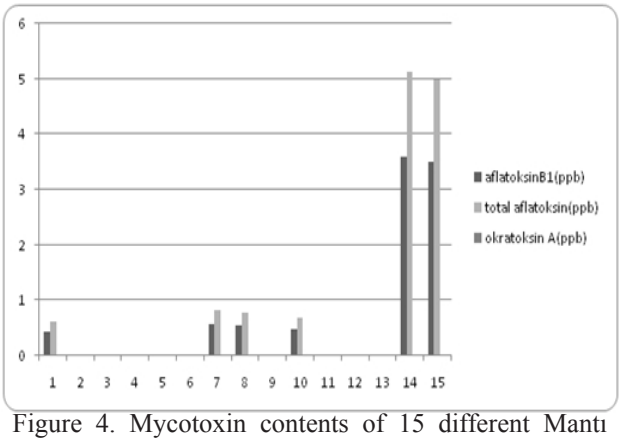

Figure 4. Mycotoxin contents of 15 different Mantı samples

Besides them, the parameters related to storage conditions (such as temperature), packaging and transportation are also the factors that should be kept stable to preserve the quality of mantı. Otherwise, changes in these parameters can easily alter the physicochemical (moisture content, water activity, water binding capacity and color) and sensory quality of mantı samples. It is likely that storage temperature and time for the mantı samples may vary due to differences in their sources.

In this study, 15 different mantı samples were evaluated and significant differences were determined in their physicochemical and sensory properties (Figures 1-3). Although there is geographic registration and specific criteria for mantı, it appears that Turkish mantı producers use different flours and ingredients, leading to distinguished variances in physicochemical and sensory properties of commercial ravioli products.

Mycotoxin contents of mantı samples were presented in Figure 4. Six out of fifteen samples had higher level of mycotoxin content than the limits set by the Turkish Food Codex (Code no. 26879). Moreover, the mycotoxin amount in two samples (sample numbers 14 and 15) were extremely high (limit 4 µg/kg). This suggests that quality control at critical points of mantı processing (Figure 5) be strictly enforced. The personnel training, hygiene and sanitation conditions should be improved and monitored throughout the production process and continued until consumption. In other words, precautions and the number of the quality control points should be increased in production, packaging, transportation and storage stages. Although Mantı is a widely consumed traditional food product in Turkey, only Kayseri mantı has a registration for geographical indication.

In conclusion, the results showed that although all mantı samples were called Mantı, they significantly differed from each other with respect

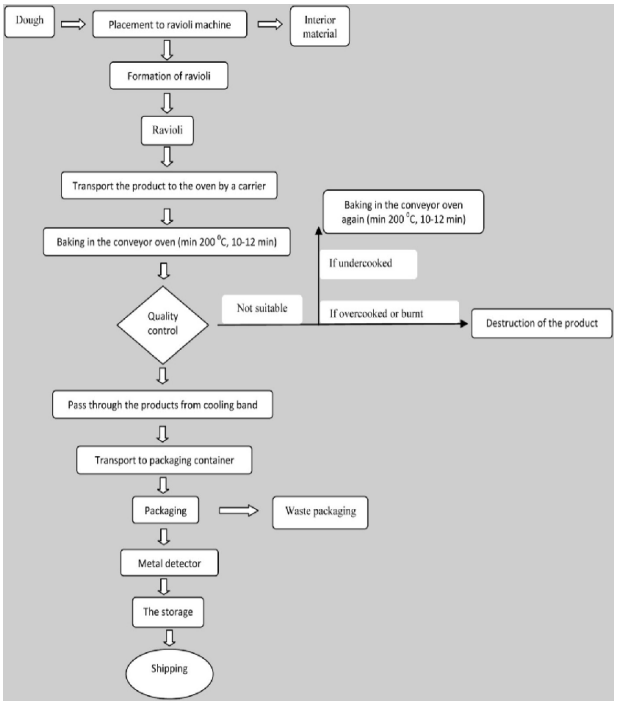

Figure 5. Industrial production flow chart for ravioli (Sitti *et al*., 2011)

to physicochemical and sensory qualities. Although Mantı is very important in Turkey, research regarding its quality and safety is very limited. Therefore this study is one of its kinds that yields some answers to the problems regarding the traditional foods in Turkey. The results indicate that industrial processing of mantı should be standardized and that critical control points monitored more effectively to successfully commercialize this traditional product.

References

Almli, V.L., Verbeke, W., Vanhonacker, F., Naes, T. and Hersleth, M. 2011. General image and attribute perceptions of traditional food in six european countries. Food Quality and Preference 22: 129-138.

Anonymous. 2008. Kayseri Chamber of Commerce, Kayseri Manti, T.C. Patent No: 113, T.C. Turkish Patent Institute.

Aslan, N. 2012. Effects on Quality of Dried Mantı of The İnfrared Drying Method, Canakkale: Canakkale Onsekiz Mart University, Master Thesis.

Cayot, N. 2007. Sensory quality of traditional foods. Food Chemistry 101: 154-162.

Chillo, S., Ranawana, D.V. and Henry, C.J.K. 2011. Effect of two barley β-glucan concentrates on *in vitro* glycaemic impact and cooking quality of spaghetti LWT. Food Science and Technology 44: 940-948.

Fuad, T. and Prabhasankar, P. 2010. Role of ingrediants in pasta product quality: A review on recent developments. Critical Reviews in Food Science and Nutrition 50: 787-798.

Gallegos-Infante,, J.A., Rocha-Guzman, N.E., Gonzalez-Laredo, R.F., Ochoa-Martinez, L.A., Corza, N., Bello-Perez, L.A., Medina-Torres, L. and Peralta-Alvarez, L.E. 2010. Quality of spaghetti pasta containing mexican common bean flour (*Phaseolus vulgaris* L.). Food Chemistry 119: 1544-1549.

Giannuzzi, L. 1998. Shelf-life of fresh filled pasta. Hazard analysis and critical control points of the manufacturing process and household practices. Journal of Food Processing Preservation 29: 449-446.

Giménez, M.A., González, R.J., Wagner, J., Torres, R., Lobo, M.O. and Samman, N.C. 2013. Effect of extrusion conditions on physicochemical and sensorial properties of corn-broad beans *(Vicia faba)* spaghetti type pasta. Food Chemistry 136: 538-545.

Guerrero, L., Claret, A., Verbeke, W., Enderli, G., Zakowska-Biemans, S., Vanhonacker, F., Issanchou, S., Sajdakowska, M., Granli, B.S., Scalvedi, L., Contel, M. and Hersleth, M. 2010. Perception of traditional food products in six European regions using free word association. Food Quality and Preference 21: 225-233.

Guerrero, L., Guaurdia M.D., Xicola, J., Verbeke, W., Vanhonacker, F., Zakowska-Biemans, S., Sajdakowska, M., Sulmont-Rosse, C., Issanchou, S., Contel, M., Scalvedi M.L., Granli, B.S. and Hersleth, M. 2009. Consumer-driven definition of traditional food products and innovation in traditional foods. A qualitative cross-cultural study. Appetite 52: 345-354.

Imm, B.Y., Lee, J.H. and Lee, S.H. 2011. Sensory quality index (SQI) for commercial food products. Food Quality and Preference 22: 748-752.

Jordana J. 2000. Traditional foods: challenges facing the european food industry. Food Research International 33: 147-152.

Kaya, A. and Sözer, N. 2005. Rheological behaviour of sour pomegranate juice concentrates (*Punicagranatum* L.). International Journal of Food Science and Technology 40(2) : 223-227.

Leszczyńska, J., Masłowska, J., Owczarek, A. and Kucharska, U. 2001. Determination of aflatoxins in food products by the ELISA Method. Czech Journal of Food Science 19: 8-12.

MEGEP, 2007. Analyses of drinking and using water. Module No: 541GI0091, Ankara, The Ministry of National Education.

Ozturk, İ., Karaman, S., Sagdic, O. and Kayacier, A. 2009. Kayseri Piyasasında Satılan 197 Mantıların Bazı Mikrobiyolojik Ozellikleri, Türkiye Ulusal Sempozyumu, s.198. Van: II. Geleneksel Gıdalar Sempozyumu.

Pieniak, Z., Verbeke, W., Vanhonacker, F., Guerrero, L. and Hersleth, M. 2009. Association between traditional food consumption and motives for food choice in six European countries. Appetite 53: 101-108.

Prabhasankar, P., Jyotsna, R., Indrani, D. and Rao, G.V. 2007. Influence of whey protein concentrate, additives, their combinations on the quality and microstructure of vermicelli made from Indian T. Durum wheat variety. Journal of Food Engineering 80: 1239-1245.

Sitti, S. 2011. Effect of Vacuum and Modified Atmosphere Packaging on Some of the Quality Characteristics of Kayseri Manti. Kayseri: Erciyes University, Master

Thesis.
Trichopoulou, A., Soukara, S. and Vasilopoulou, E. 2007. Traditional foods: a science and society perspective. Food Science and Technology 18: 420-427.