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Investigation of physicochemical and sensorial quality of a type of traditional meat product: Bez sucuk

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ABSTRACT

In this research, the effects of different meat:fat ratios and storage periods on physicochemical and sensorial properties of a type of traditional meat product named as bez sucuks were investigated. For this purpose, three groups of bez sucuk were produced and named as BS10, BS20 and BS30 with the meat:fat ratios of 90:10, 80:20 and 70:30, respectively. Physicochemical and sensorial properties of samples were analyzed during processing and storage periods. Significant decreases in pH and water activity values, and increases in titratable acidity, free fatty acidity, thiobarbituric acid and peroxide values were observed at the end of the ripening stage. The results showed that proximate composition (except hydroxyproline content of BS10 and BS20) and pH values of all sucuk groups were in accordance with the food legislation and the sucuk standard. The results of sensory evaluation showed that BS10 and BS20 had the highest overall acceptance scores in comparison with BS30. According to the data, it is possible to produce bez sucuks named as BS10 and BS20 with a shelf life of approximately six months.

1. Introduction

In recent years, consumers have been preferring traditional meat products, thus, this increasing demand resulted in increases in the production ratios. Bez sucuk, a typical Turkish dry fermented beef sausage, is abundantly produced both by butchers and a few small scaled facilities (Ensoy, Polat, Yıldırım, Erdoğan, & Erinç, 2010). The specific property of bez sucuk is using cloth casings instead of natural and/or collagen casings. The diameter and the length of cloth casings which sewed from noncolored cloth having 42 threads per cm^2 are approximately 5 cm and 25 cm, respectively. The basic ingredients of bez sucuk are beef meat; sheep tail fat and/or beef carcass fat, salt, garlic, black pepper, red pepper, cumin and allspice. Its formulation is characterized by the absence of sodium nitrite as a curing agent; furthermore, this product is manufactured by traditional methodologies without starter culture utilization. The manufacturing process of bez sucuk is mainly consist of three stages; mixing the sucuk batter, filling into cloth casings, and ripening for 10–14 days. Bez sucuks are pressed with a cylindrical roller for two or three times during ripening period to give its characteristics ellipse slice shape having the diameters of 2 × 5 cm. The formulation (meat:fat ratio, sheep tail fat/carcass fat, seasonings) and the processing conditions such as relative humidity, temperature, ripening period show differences due to producers (Ensoy, Polat, et al., 2010; Köse, 2010). It was stated by many researchers that the quality of the fermented sausages depend on the type of meat source, the amount of ingredients, use of starter culture, casing diameter and ripening conditions (Talon, Walter, & Montel, 2000; Visessanguan, Benjakul, Riebroy, Yarchai, & Tapingkae, 2006).

In the ripening period of fermented meat products, various chemical, microbiological and sensorial changes occur; thus, these changes are responsible for the final characteristics of fermented sausages (Ensoy, Kolsarıcı, Candoğan, & Karslıoğlu, 2010; Fernandez, Ordonez, Bruna, Herranz, & Hoz, 2000). The lipid content of fermented sausages generally ranges between 25% and 55%, and the changes in lipid fraction have an important effect on the quality of final product (Çiçek, Kolsarıcı, & Candoğan, 2014; Ordonez, Hierro, Bruna, & Hoz, 1999; Talon et al., 2000; Visessanguan et al., 2006). Although a few studies were conducted on the properties of bez sucuks (Ensoy, Polat, et al., 2010; Kaval, Öncül, Yıldırım, & Ensoy, 2010; Köse, 2010; Turhan, Temiz, & Üstün, 2010), formulation and processing conditions were not investigated before the current study. The researchers noted that chemical and microbiological properties of bez sucuks produced especially by the butchers were not in accordance with TS 1070 Turkish Sucuk Standard (Anonymous, 2002) and Turkish Food Codex-Meat

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Products Communique (Anonymous, 2012).

The aim of this study is to manufacture bez sucuk in accordance both with the Turkish food legislation and Turkish sucuk standard, and to investigate the effects of different meat:fat ratio on the physicochemical and sensorial properties during both the ripening and the storage periods.

2. Materials and methods

2.1. Materials

2.1.1. Bez sucuk production

Three experiments were carried out involving three groups of bez sucuk named as BS10, BS20 and BS30, due to different meat:fat ratios which were 90:10, 80:20 and 70:30, respectively. The cubed beef meat was subdivided into three groups, then, other ingredients were added as follows; salt (1.6%), garlic (2%), cumin (0.8%), hot red pepper (0.8%), red pepper (0.6%), black pepper (0.4%), sucrose (0.5%) and allspice (0.2%), and combined (Mainca 400 mixer, Germany). Sucuk mixtures were stored at +4 °C over night, then, the mixtures and the sheep tail fat were ground twice using a grinding machine (Arı Makina, Turkey) having a plate with 3 mm orifaces. Following the grinding stage, the sucuk batters were mixed using a mixer, and were filled into cloth casings (Mainca EM–20, Germany). Sucuk batones were hung on stainless steel hangers. The ripening conditions are given in Table 1. Sucuks were pressed three times during the ripening period for fourteen days. After the ripening stage, sucuks were vacuum packed (La Minerva Pack 10 B, Italy) and stored at +4 °C for six months.

2.1.2. Sampling

Three randomly selected sucuk batones were removed at each stage of processing as follows; initial mixture, 2nd, 4th, 10th and 14th days. For storage periods, sucuk samples were taken on the first day (day 0) and days 30, 60, 90, 120, 150 and 180. Titratable acidity (TA), pH, water activity (a_w), color, free fatty acidity (FFA), thiobarbituric acid (TBA) value and peroxide value (PV) were evaluated at all steps mentioned above. On the first day of storage, moisture, fat, ash, salt and hydroxyproline contents were analyzed. The sensory scores of both raw and cooked sucuk samples were determined during storage periods.

2.2. Methods

2.2.1. Physicochemical analysis

After removing the cloth casings, samples were homogenized. Moisture, protein (NX6.25), fat, ash (AOAC, 2006), salt (Lees, 1975) and hyroxyproline contents (Yang & Froning, 1992) were measured.

The pH of the sample was determined using an Orion 420A pH-meter and sample slurries were then titrated with 0.1 N NaOH to an endpoint of pH 8.30. To measure the total TA, the meq of NaOH were converted to and expressed as percent lactic acid (Candoğan, 2000).

The a_w values of sucuk samples were measured by using a previously calibrated AquaLab Series 3 TE model (USA) at each sampling stages (Köse, 2010).

The measurements of Commission Internationale de l'Eclairage (CIE) L* (lightness), a* (redness) and b* (yellowness) values were carried out immediately after slicing and repeated five times in different three slices by using Minolta Chrometer CR300 (Japan) which was calibrated with white calibrating plate having the L*a*b* values of 96.18, 0.17, and 1.96, respectively (Dellaglio, Casiraghi, & Pompei, 1996).

The lipids were extracted from 100 g of samples (Bligh & Dyer, 1959), and FFA content was determined as oleic acid% (AOAC, 2006). PV of bez sucuks was measured according to AOCS (1994), and results were expressed as meq O_2/kg fat.

TBA value was determined as milligram of malondialdehyde (MA)/kg sample using the method of Tarladgis, Watts, Younathan, and Dugan (1960).

2.2.2. Sensory properties

Cooked and uncooked bez sucuk slices of each group with a 3 mm thickness were served to 10 trained assessors consisting of 5 male and 5 female whose ages were between 25 and 45, and trained about the manufacturing technology and the sensorial properties of the product at the beginning of each panel. The uncooked samples were evaluated for appearance, color, texture, taste, odor and overall acceptance parameters, while the cooked samples which were grilled, and evaluated for the taste, odor, texture and overall acceptance parameters. Sensory characteristics were scored on a continuous scale from 1 to 9 (1–3: bad, 4–5: not bad, 6–7: good, 8–9: excellent) for each of the characteristics (Çiçek et al., 2014).

2.2.3. Statistical analysis

The results of analyses, which depend on the processing steps/storage periods and the meat:fat ratios were analysed according to a completely randomized design with three replicates. All data were subjected to variance analyses (ANOVA) by using SPSS 20.0. Duncan multiple comparison test was performed to investigate the differences between mean values with a 5% level of significance.

3. Results and discussions

3.1. Physicochemical analysis

The moisture, protein, fat, ash, salt and hydroxyproline contents of bez sucuks are given in Table 2. Although utilizing different meat:fat ratios resulted in different moisture, protein, fat, ash and salt contents ($P < 0.05$), the difference between the hydroxyproline contents of sucuk groups were not significant ($P > 0.05$). According to both TS 1070 Turkish Sucuk Standard (Anonymous, 2002) and Turkish Food Codex-Meat Products Communique (Anonymous, 2012), the maximum moisture content of Turkish sucuks should be 40%, while the minimum protein content was stated as 20% in standard and as 16% in codex. The minimum and maximum fat contents of Turkish sucuks should be 35% and 40%, respectively (Anonymous, 2002). According to Turkish Sucuk Standard (Anonymous, 2002), the maximum salt and hydroxyproline contents were also limited as 5% and as 225 mg HP/100 g sample, respectively. It was seen that the moisture, protein, fat and salt contents of all groups were in accordance both with the standard and the codex, while the hydroxyproline contents of BS20 and BS10 were higher than the maximum limit stated in the standard. Köse (2010) reported that the moisture, protein, fat, ash, salt and hyroxyproline contents of bez sucuks were in the ranges of 35.20–49.96%, 15.64–27.83%, 27.05–33.72%, 3.28–6.81%, 1.71–4.88% and 130.9–373.6 mg HP/100 g, respectively. Similar results were also noted by Turhan et al. (2010).

Table 1
The ripening conditions of bez sucuks.

Step	Temperature (°C)	Time (day)	Relative humidity (%)
1	22	2	90
2	22	2	85
3	20	3	80
4	18	3	75
5	18	4	60