Effects of Chestnut (Castanea sativa Mill.) Peel Powder on Quality Characteristics of Chicken Emulsion Sausages

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Abstract

Sausages were prepared with fresh chicken breast meat and pork back fat, and formulated with different amounts of added chestnut (Castanea sativa Mill.) peel and ice water to study the effect on the products. The chicken emulsion sausages formulated with 1%, 2%, and 3% added chestnut peel powder were higher in moisture and ash content, and lower in energy values. The cooking loss, emulsion stability, and viscosity of the sausages were improved by the addition of chestnut peel. The fat content, pH, lightness, hardness, and springiness of the chicken emulsion sausage decreased as the amount of chestnut peel levels increased. The chicken emulsion sausages containing 1% and 3% chestnut peel had a higher overall acceptability than the control.

Key words: chicken sausage, emulsion sausage, chestnut peel, dietary fiber, sensory evaluation

Introduction

Chicken meat and products are very popular among consumers, while also providing an excellent source of animal protein for consumers in developing countries (Choi et al., 2010). The production and consumption of chicken meat has increased significantly throughout the world. Many chicken delicatessen meats are currently on the market, chiefly cooked products such as cured thigh meat and fillet, jerky, patties, sausages, and nuggets. These products are becoming more popular due to their sensory characteristics and ease of preparation. Sausage is one of the oldest known forms of processed meat products, and is very popular all over the world. Processed sausage such as emulsion sausage, however, may be high in fat. High fat levels in daily diets are associated with high blood cholesterol levels and undesired weight gain due to excess calories and other serious diet related diseases (Choi et al., 2010; Jiménez-Colmenero et al., 2003). Dietary fat content has been significantly correlated with coronary heart disease, obesity, and cancer (Choi et al., 2009; Nuria et al., 1999).

Among functional foods, dietary fiber plays an important role in the human diet. Dietary fiber in food has been added to various meat products to counteract problems caused by fat reduction, so dietary fiber has been ascribed a steadily increasing role in health and well-being (Choi et al., 2008, 2009; Kim et al., 2010; Lee et al., 2009). Furthermore, dietary fiber incorporated in meat products improves cooking yield, water holding capacity, and textural properties (Choi et al., 2007a; Joo and Chung, 2007). Many researchers have also carried out studies on the addition of dietary fiber to reduced-fat meat products, which helps improve rheological properties and stability (Aleson-Carbonell et al., 2003; Choi et al., 2009, 2010; Fernandez-Gins et al., 2003).

Chestnuts (Castanea sativa Mill.) have become increasingly important in human nutrition because of their nutrient composition and potential beneficial health effects, such as containing considerable amounts of dietary fiber, vitamins, essential fatty acids, and minerals (K, Mg, Fe, Mn, and Cu) (Inkaya et al., 2009; Yang et al., 2010). It is also a good source of bioactive substances, including lectin, cysteine, proteinase inhibitor, and quercetin (Wang and Ng, 2003). It has a long history of use of over 2000 years. Therefore, it has the potential to be used as a functional food ingredient.

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years in Asian countries such as Korea, China, and Japan, with important and growing economic roles. For many centuries, the chestnut has represented one of the most important food resources of Korean rural areas, but the depopulation of mountain areas has led to a decline in their consumption (Kim et al., 2008). About 60% of chestnuts grown in Korea are consumed domestically, and the rest are exported to Japan as peeled chestnuts, except for some chestnuts that are processed. Chestnut peels are produced as a by-product of peeled chestnuts and during chestnut processing. It is rich in carbohydrates and is also a good source of tannin compounds, minerals, and dietary fiber. In recent years, chestnut peel has been studied for its potential use in developing functional foods (Jeon and Park, 2000, Jeong et al., 2006; Oh et al., 2004, 2005). However, food with added chestnut peel has a bitter taste and off-flavor due to its containing tannin compounds. The use of chestnut peel in commercial products has so far been limited to the production of animal feed. Also, for meat products, not enough chestnut peel can be applied to it to make it a significant source of dietary fiber. The use of chestnut peel as source of dietary fiber for chicken emulsion sausages was investigated.

The objectives of this study were to evaluate the effects of various chestnut peel levels on the proximate composition, energy value, pH, color, cooking yield, emulsion stability, texture profile analysis, viscosity, and sensory evaluation of chicken meat emulsion type sausages.

Materials and Methods

**Chestnut peel powder preparation and processing**

Commercial samples of dried chestnut (*Castanea sativa* Mill.) peel were purchased from the local market, ground using a blender (KA-2610, Jworld Tech, Ansan, Korea) for a minute, and passed through a 20-mesh sieve. The chestnut peel powders (moisture content: 6.54%, protein content: 8.11%, fat content: 2.41%, ash content: 0.98%, digestible carbohydrates: 42.21%, and dietary fiber: 33.86%) were vacuum-packed and stored at -20°C before they were added into the treatments. The lightness, redness, and yellowness values of chestnut peel powder were 68.09, 5.47, and 11.31, respectively.

**Chicken meat emulsion sausages preparation and processing**

Fresh chicken breast meat (*M. pectoralis major*) and pork back fat (moisture 12.61%, fat 85.64%) were purchased from a local processor at 48 h postmortem. The chicken materials were initially ground through an 8 mm plate. The pork back fat was also ground through an 8-mm plate. The ground tissue was then placed in polyethylene bags, vacuum packaged using a vacuum packaging system (FJ-500XL, Fujee Tech, Seoul, Korea), and stored at 0°C until required for product manufacture. Suitable amounts of the muscle and fat were tempered at 4°C for 24 h prior to emulsion sausage preparation.

Meat packages were thawed (approx. 24 h at 5±2°C, up to between -1 and -2°C). Each batch of samples consisted of five meat batters which differed in composition with respect to the addition of chestnut peel powder levels (0, 1, 2, 3, and 4%). The five different emulsion sausages were formulated (Table 1) as follows: raw meat was homogenized and ground for 1 min in a silent cutter (Cutter Nr-963009, Scharfen, Germany). 1.6% NaCl, 0.2% sodium tripolyphosphate, 1.0% isolated soy protein, 0.45% sorbitol, 0.08% monosodium L-glutamate, 0.07% onion powder, and 0.07% ginger powder were added to the meat that had been previously dissolved in water and chilled (2°C), and then mixed for 1 min. The chestnut peel powder was added to meat batters, which were then homogenized for 6 min. A temperature probe (Kane-May, KM330, Germany) was used to monitor the temperature of the emulsion, which was maintained below 10°C during batter preparation. After emulsification, chicken meat batter was stuffed into collagen casings (#240, NIPPI Inc., Tokyo, Japan; approximate diameter of 25 mm) using a stuffer (Stuffer IS-8, Sirman, Italy). The meat batters were...