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Effect of partial replacement of fat with added water and tragacanth gum (*Astragalus gossypinus* and *Astragalus compactus*) on the physicochemical, texture, oxidative stability, and sensory property of reduced fat emulsion type sausage

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ABSTRACT

This study aimed to investigate the effect of partial fat replacement with two species of gum tragacanth (*Astragalus gossypinus and Astragalus compactus)* on physicochemical, textural, oxidative stability, and acceptability of reduced fat emulsion type sausages. Increasing the concentration of both gums to 1%, minimized extractable fat and cook loss. *A. gossypinus* at the concentration of 1% was the most effective in retardation of TBARS formation in sausages ($p < 0.05$). Reduced-fat sausages with 1% *A. gossypinus* showed the lowest carbonyls at the end of storage (28 days) ($p < 0.05$). Sausages with 1% *A. gossypinus* or *A. compactus* showed the lowest shear force (~6 and ~7 N respectively) and hardness (~21 N/cm^2) among all treatments ($p < 0.05$). The results suggested that *A. gossypinus* (1%) enhanced oxidative stability and textural properties. Addition of 0.5% *A. gossypinus* showed an acceptable sensory score of the sausage formulation and as a potential fat replacer in the reduced fat sausages.

1. Introduction

Due to the desire for healthy foods, many consumers in recent years have limited their consumption of high-fat convenience meat products due to high cholesterol and calorie contents that related to the development of cardiovascular disease and hypertension (Hygreeva, Pandey, & Radhakrishna 2014). Besides potential health risks associated with high-fat convenience meat products, the oxidation of lipid and proteins resulting from prooxidative heme proteins, metal ions, and other soluble compounds negatively affect texture, flavor, and color and, thus, can lead to organoleptic degradation of meat products and even the formation of toxic compounds (Estévez & Cava 2004). On the other hand, fats are an essential source of energy and carrier for fat soluble vitamins in these products (Vural, Javidipour, & Ozbas 2004) and contribute significantly to flavor, tenderness, appearance, texture, and shelf life of meat products. However, development of low-fat meat products without affecting sensory and textural properties is challenging (Mun et al. 2009; Zhang, Xiao, Samaraweera, Lee, & Ahn 2010). Several strategies have been used to overcome these problems including the use of water and lean meat, proteins (soy, whey proteins, egg white, oat bran, wheat, milk caseinates), carbohydrates (fibers, starches, maltodextrins, cellulose, dextrin, gums) and even synthetic ingredients (Polydextrose, Olestra or sucrose polyester) (Peng & Yao 2017). Among these compounds, hydrocolloids (such as xanthan, carrageenan, guar, and locust bean gum) have been demonstrated to enhance functionality and technological qualities of meat products presumably due to their water binding, viscosity, and gelation properties (Ramírez, Barrera, Morales, & Vázquez 2002). These functional properties lead to increasing water holding capacity, reducing cooking loss, modifying texture and stabilization and emulsification of sausage emulsion (Choi et al. 2014; Han & Bertram 2017; Henning, Tshalibe, & Hoffman 2016).

Gum tragacanth is an exudate from the stem of the bush like plant *Astragalus* species, and it is one of the few natural plant sources of L-fucose-substituted polysaccharides. Gum tragacanth has been reported to have both emulsifying and stabilizing properties in emulsions and considered to facilitate emulsification as well as providing stabilization of the emulsion (Gavlighi, Michalak, Meyer, & Mikkelsen 2013; Wang 2000). In low-fat mayonnaise, the highest values of rmness and

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