Avocado, sunflower and olive oils as replacers of pork back-fat in burger patties: Effect on lipid composition, oxidative stability and quality traits

J.G. Rodríguez-Carpena a, D. Morcuende b, M. Estévez b,⁎

a Food Science, Faculty of Veterinary, Autonomous University of Nayarit, 63190, Tepic, Nayarit, Mexico
b Animal Production and Food Science, University of Extremadura, 10003, Cáceres, Spain

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The present study investigates the effects of avocado, sunflower and olive oils used as back-fat replacers, on the fatty acid composition, oxidative stability, volatiles profile and color and texture properties of cooked pork patties. The vegetable oils modified the fatty acid profiles of the patties by lowering the percentages of SFA (from 36.96% to ~25.30%) and reducing the atherogenic index (from 0.41 to ~0.24). Vegetable oils had higher amounts of antioxidant compounds such as tocopherols (10.8–53.9 mg/100 g) than back-fat (5.9 mg/100 g). Consistently, patties manufactured with the oils had significantly lower amounts of lipid and protein oxidation products than control patties. Avocado oil contributed with specific aroma-active terpenes to patties and had a significant impact on particular color and texture parameters. The results from this study highlight the technological applications of the vegetable oils as food ingredients in the design of healthier meat commodities.

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1. Introduction

Meat should be an essential component of a healthy and well-balanced diet owing to its properties as a source of high-quality protein, high-available iron, essential fatty acids and B-group vitamins (Biesalski, 2005). However, recent studies have established a likely relationship between meat consumption and an increased risk of suffering serious health disorders such as colorectal cancer and coronary-heart diseases (CHD) (Ferguson, 2010). As a result of the scientific evidence, health authorities insist on recommending a substantial reduction of cooked meat products consumption while certain processed meat should be directly avoided (World Cancer Research Fund/American Institute for Cancer Research, 2007, 2009). Amongst other factors, animal fat and particularly, saturated fatty acids (SFA), have been recognized as influential factors in the pathogenesis of heart failure and cancer associated to meat consumption (Kratz, 2005; Lin, Zhang, Cook, Lee, & Buring, 2004). Furthermore, the controversy about the possible link between meat consumption and the so-called “affluence” diseases has a great impact on consumers who perceive animal fat and meat as generally unhealthy (reviewed by Webb & O’Neill, 2008). Consumer’s increasing demand and concern towards food and nutrition gets into conflict with current trends towards processed and commodity meals (Grunert, 2006). Certain convenience meat products, such as burger patties, are still consumed world-wide despite of the bad image in relation to their impact on consumer’s health.

In recent years, great efforts have been exerted in order to improve the nutritional quality of processed meat products and regain consumer’s trust in meat. For instance, the replacement of animal fat with vegetable oils in meat products has been found to be an efficient and successful strategy to enhance the nutritional value of muscle foods by decreasing SFA levels and adding natural antioxidants as tocopherols. Olive oil, which has been demonstrated to display protective effects against several cancer types (Escrich, Moral, Grau, Costa, & Solanas, 2007), has been commonly used as animal fat replacer in meat products with positive effects in terms of nutritional value and oxidative stability. The beneficial effect of the partial replacement of animal fat with olive oil, has been investigated in numerous meat products such as frankfurters (Choi et al., 2010; López-López, Cofrades, & Jiménez-Colmenero, 2009), liver pâté (Martín, Ruiz, Kivikari, & Puolanne, 2008) and dry-cured sausages (Muguerza, Gimeno, Ansorena, Bloukas, & Astiasarán, 2001). Amongst other effects, olive oil provides meat products with high levels of oleic acid and monounsaturated fatty acids (MUFA), natural antioxidants such as tocopherols and reduces cholesterol levels without affecting considerably the sensory characteristics of the products (Kayaardi & Gök, 2003; Martín et al., 2008; Muguerza, Fista, Ansorena, Astiasarán, & Bloukas, 2002). The effect of some other vegetable oils such as the sunflower oil has been scarcely studied in meat products. The considerably high amount of polyunsaturated fatty acids (PUFA) in sunflower oil could increase the oxidative instability of the meat product and hence, seriously affect its sensory quality. Yilmaz, Simsek, and Isikli (2002) reported no adverse sensory effects on frankfurters formulated with 15% sunflower oil while Pennisi-Forell, Ranalli, Zaritzky, André, and Califano (2010) added natural antioxidants to

⁎ Corresponding author. Tel.: +34 927257122; fax: +34 927257110.
E-mail address: mariovet@unex.es (M. Estévez).