



Review

Potential applications of plant based derivatives as fat replacers, antioxidants and antimicrobials in fresh and processed meat products



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ABSTRACT

Growing concern about diet and health has led to development of healthier food products. In general consumer perception towards the intake of meat and meat products is unhealthy because it may increase the risk of diseases like cardiovascular diseases, obesity and cancer, because of its high fat content (especially saturated fat) and added synthetic antioxidants and antimicrobials. Addition of plant derivatives having antioxidant components including vitamins A, C and E, minerals, polyphenols, flavanoids and terpenoids in meat products may decrease the risk of several degenerative diseases. To change consumer attitudes towards meat consumption, the meat industry is undergoing major transformations by addition of nonmeat ingredients as animal fat replacers, natural antioxidants and antimicrobials, preferably derived from plant sources.

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Contents

1. Introduction	47
2. Effects of plant based derivatives on lipid oxidation and shelf life extension of meat products	48
2.1. Fruit and vegetable extracts as natural antioxidants	48
2.2. Herbs and spice extracts as natural antioxidants	51
3. Role of plant derivatives in the development of low fat healthier meat products	52
3.1. Vegetable oils and low fat meat products	52
3.2. Plant fibers and low fat meat products	53
4. Role of plant extracts as natural antimicrobials in meat products	53
5. Conclusion	54
References	54

1. Introduction

Changes in lifestyle and eating habits of human beings, has been shown by researchers and health organizations (World Health Organization (WHO), Food And Agriculture Organization (FAO)) to be the major cause of increases of diseases like, obesity, cancer, cardio vascular failures, (Jimenez-Colmenero, Muniz, Alonso, & Collaborators, 2010;

WHO, 2003). Nowadays people are showing greater interest in foods that contain bioactive or functional components which will give additional benefits to their health status (Cofrades, Serrano, Ayo, Carballo, & Jimenez-Colmenero, 2008). As Hippocrates said 'let food be thy medicine and medicine be thy food' is now seen in the development of healthier, functional food products. Food products are important and suitable vehicles for the human beings to carry and deliver the essential nutrients that may improve their wellbeing. Among foods, meat and meat products occupy a prominent position in the human diet because of their high quality protein content, essential amino acids and excellent source of B-group vitamins, minerals and other nutrients, (Zhang, Xiao, Samaraweera, Lee, & Ahn, 2010). Many consumers believe meat and

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meat product consumption is unhealthy, because of their high animal fat, cholesterol, synthetic antioxidants and antimicrobials contents which may be associated with the several degenerative diseases (Serrano, Librelotto, Cofrades, Sánchez-Muniz, & Jiménez-Colmenero, 2007). Food technologists and nutritionists have been making great efforts to develop novel meat products with low fat and low sodium contents containing natural antioxidants and antimicrobials and enriched with dietary fibre and ω -3 and ω -6 fatty acids (Fig. 1).

Development of healthy food products is possible in two ways – one is decreasing the undesired substances and other is by increasing the levels of desired healthier components (Decker & Park, 2010). This strategy could be employed for the development of healthier meat products.

Presently researchers are showing great interest in the utilization of plant based derivatives derived from nuts, fruits, vegetables, herbs and spices for the development of modified and healthier meat products with improved shelf life (Fig. 2). The present review aims to evaluate the present scenario in meat research for the development of healthier and shelf stable meat products by the successful utilization of plant based materials/derivatives.

2. Effects of plant based derivatives on lipid oxidation and shelf life extension of meat products

Among foods, meat is one of the most prone to bacterial spoilage and oxidative deterioration under normal storage conditions (Fung, 2010). Lipid oxidation is a chemical process that involves the development of off odors and decreases the acceptability of meat and meat products by deterioration of their color, texture and nutritive value (Kanner, 1994). Meat and meat products when subjected to processing (heat) and storage undergo changes in their physical and chemical characteristics that leads to development of oxygenated free radicals which initiate the oxidation of polyunsaturated fatty acids while destruction of the

natural antioxidant systems. In general, development of shelf stable meat products involves the use of synthetic polyphenolic antioxidants such as butylated hydroxy anisole (BHA), butylated hydroxyl toluene (BHT) and tertiary butyl hydroxy quinone (TBHQ) to delay lipid oxidation, by reacting with the free radicals and chelating metal ions such as, copper and iron which act as catalysts of the oxidation process. However consumer concerns about the safety of synthetic antioxidants in foods, led to the utilization of natural antioxidants in meat and meat products as alternative antioxidants to preserve the food, with additional health benefits. For instance consumption of plant extracts that are rich in natural phenolic compounds (eg, grape seed extract, green tea extract, black currant extract) are reported to decrease the risk of several degenerative diseases such as obesity, atherosclerosis and cancers and extend the shelf life of meat and meat products by delaying oxidation and microbial spoilage (Bagchi et al., 2000; Jia, Kong, Liu, Diao, & Xia, 2012).

Addition of natural antioxidants to meat and meat products is one of the important strategies in development of healthier and novel meat products. In this regard several studies utilizing herbs, spices, fruits and vegetable extracts, and have shown that addition of these extracts to raw and cooked meat products decreased lipid oxidation, improved color stability and total antioxidant capacities which are important characteristics for shelf stable meat products (Table 1). The major active components/phytochemicals responsible for the antioxidant activity of plant derivatives are polyphenols, flavonoids, phenolic diterpenes and tannins (Zhang et al., 2010). Table 1 summarises studies reporting antioxidant and lipid oxidation inhibition activities of plant derivatives in meat products.

2.1. Fruit and vegetable extracts as natural antioxidants

Fruits and vegetables are one of the richest sources of natural polyphenols. Plant polyphenols have strong antioxidant activity against

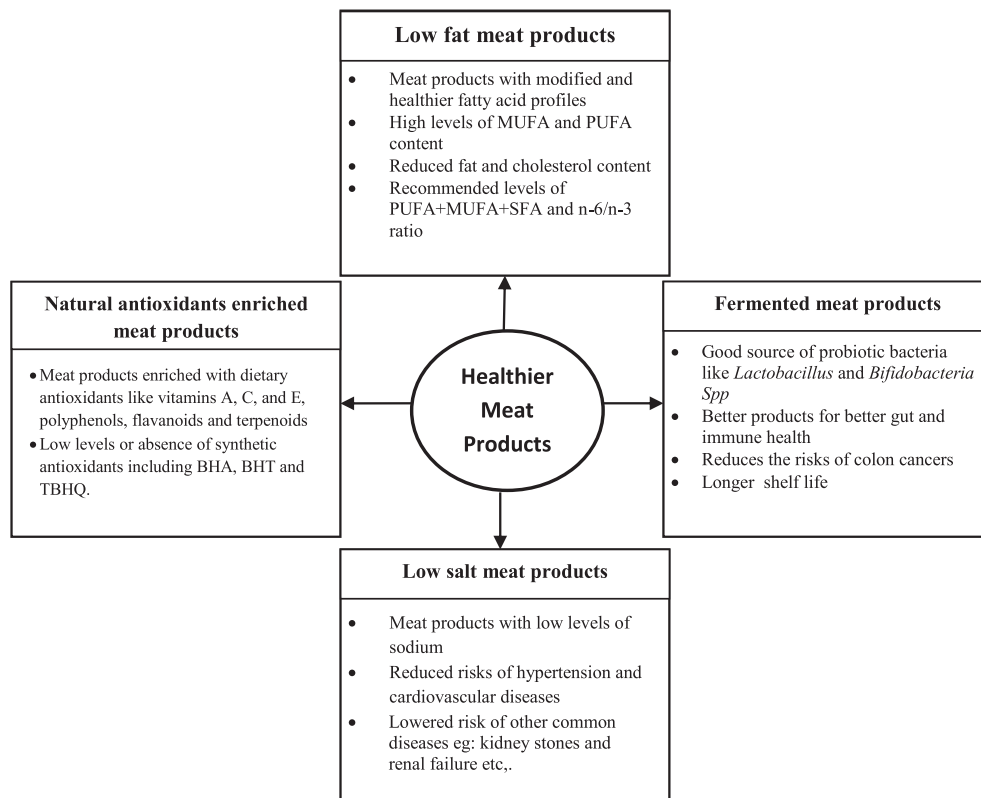


Fig. 1. Healthier meat products and their characteristics.

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