

# By-products from herbs essential oil production as ingredient in marinade for turkey thighs

Maria B. Mielnik<sup>a,\*</sup>, Signe Sem<sup>b</sup>, Bjørg Egelanddal<sup>b</sup>, Grete Skrede<sup>a</sup>

<sup>a</sup>Matforsk AS—Norwegian Food Research Institute, Osloveien 1, N-1430 Aas, Norway

<sup>b</sup>Institute of Chemistry, Biotechnology and Food Science, Norwegian University of Life Science, P.O. Box 5036, N-1432 Aas, Norway

Received 1 August 2006; received in revised form 12 January 2007; accepted 18 January 2007

## Abstract

Herb decoctions—the aqueous extract of rosemary, sage and thyme, left as by-product after steam distillation of essential oils, were investigated as a source of antioxidants in marinades for turkey thigh meat. Lipid oxidation after marinating, cooking and chill storage (warmed over flavour, WOF) was assessed by thiobarbituric acid-reactive substances (TBARS), GC-MS and sensory judgement on marinated and untreated meat. Results showed that marinating with herb decoctions, which exerted antioxidant activity (free radical scavenging), was an effective means of retarding lipid oxidation in raw and cooked meat. Meat from the rosemary marinade had the lowest TBARS values and volatile levels, while the control samples showed the highest values throughout the marinating, cooking and storage period. Oxidative changes in meat marinated with thyme and sage were significantly more advanced than in meat marinated with rosemary decoction. The partial least squares regression (PLS-R) showed that control samples were strongly related to the oxidation variables (volatiles, TBARS, rancidity) while the marinated meat had high scores for spicy and acidic odour and flavour. Results indicated that antioxidants contained in herb decoction, could be exploited in marinades to prevent rancidity in stored, heat-treated turkey meat products.

© 2007 Swiss Society of Food Science and Technology. Published by Elsevier Ltd. All rights reserved.

**Keywords:** Turkey meat; Antioxidants; Decoction; Marinating; Rancidity; Volatile compounds

## 1. Introduction

One of the major problems occurring during processing and storage of meat and meat products is lipid oxidation. This process initiates several changes, which adversely affects the products' colour, flavour, texture and nutritional value. Development of an undesirable rancid flavour in heat-treated meat, chill stored and subsequent reheated, is known as warmed over flavour (WOF; Timms & Watts, 1958). Oxidised flavour in refrigerated cooked meat can develop within 48 h at 4 °C in contrast to raw meat that can be frozen stored for several months without any development of rancidity (Pearson, Love, & Shorland, 1977). Pre-cooked products made from turkey meat are most susceptible to WOF, followed closely by chicken, pork,

beef and mutton (Wilson, Pearson, & Shorland, 1976). Low stability of turkey meat is due to the high amount of polyunsaturated fatty acids (Mercier, Gattellier, Viau, Remington, & Renner, 1998; Pearson et al., 1977), and relatively low levels of natural tocopherols (Sklan, Tenne, & Budowski, 1983). The oxidation of unsaturated fatty acids in turkey meat leads to the formation of many volatile compounds that could be associated with WOF (Ruenger, Reineccius, & Thompson, 1978).

WOF is the major cause limiting sensory quality in pre-cooked meat and is a great challenge to the catering industry. The control of WOF in meat is currently of great economic importance due to the increased demand for pre-cooked convenience food items for home and institutional use. WOF can be retarded through the use of any typical means of preventing lipid oxidation among which phenolic antioxidants appear as the most effective inhibitors (St. Angelo, Crippen, Dupuy, & James, 1990). In the past few

\*Corresponding author. Tel.: +47 6497 0160; fax: +47 6497 0333.

E-mail address: [maria.mielnik@matforsk.no](mailto:maria.mielnik@matforsk.no) (M.B. Mielnik).

years, a variety of plant materials containing phenolic compounds have been proven to be effective antioxidants in model systems. Since ancient times, herbs and spices have been added to food to improve sensory properties and prolong shelf life. Main objections against the use of spices as antioxidants are the characteristic flavour they give to the meat products. However, this could be turned towards a positive new exciting sensory sensation. Many herbs and spices rich in polyphenols exhibit antioxidative activities as they scavenge free radicals, similar to those of synthetic phenolic antioxidants (Cuvelier, Richard, & Berset, 1996). In various studies, herbs belonging to the mint family (*Labiatae*) have exhibited powerful antioxidant activity (Chipault, Mizuno, Hawkies, & Lundberg, 1952; Herrmann, 1981; Madsen & Bertelsen, 1995; Mielnik, Solgaard, Kjærnes, & Nilsson, 1996). The antioxidant activity of rosemary, sage and thyme has been thoroughly investigated (Aaby, Skryten, Skrede, & Mielnik, 2001; Bracco, Lölinger, & Viret, 1981; Cuvelier et al., 1996; Mielnik, Aaby, & Skrede, 2003; Miura, Inagaki, & Nakatani, 1989; Schwarz & Ternes, 1992).

The production of essential oils by steam distillation of herbs leaves two aqueous extracts as by-products, a water fraction of the distillate (hydrolate) and a decoction. The dark coloured decoction contains plant particles, various organic acids, proteins and flavonoids. The decoction of freshly harvested herbs leaves a lot of antioxidants since their relative vapour pressures are low at the conditions of steam distillation (Farrel, 1985). New sources of natural antioxidants suited for food is in the centre of technologist's interest all the time. Initial investigation of by-products from the essential oils production indicated that decoction was more powerful antioxidant resource than hydrolate, and thus deserves further investigation.

Marinating, originally used for preserving meat and making it tender, is now being adopted by industry and restaurants to give meats new and exciting flavours. Marketing of marinated poultry parts is one of the fastest growing segment of the food industry around the world. In view of the limited oxidative stability of turkey meat, the use of antioxidants in marinades seems to be required. A water extract from herbs (decoction) treated so far as by-products from distillation of essential oils can be considered as a new source for antioxidants in marinades and in the future as an extra income. The application of herb decoction as main ingredient in marinade for the purpose of restraining rancidity of poultry meat has not been yet described.

The presented study was designed to evaluate the effect of marinades based on decoction from rosemary, sage and thyme to retard lipid oxidation in pre-cooked turkey thighs, chill-stored for 1 week. The lipid oxidation process was followed by measuring volatile oxidation products, by sensory attributes, and by thiobarbituric acid-reactive substance (TBARS) values.

## 2. Materials and methods

### 2.1. Production of decoction

Water vapour distillation of herbs was carried out at Norwegian Essential Oil A/S, which mainly produces essential oils and where decoction is considered a by-product. The distillation processes included whole fresh plant from rosemary, sage and thyme. Each herb in amounts of 35 kg with 30 L water was used in the distillation process at atmospheric pressure and 100 °C. Decoction from rosemary, sage and thyme were poured into plastic containers and cooled in a cold storage room. Soon after, decoctions were sent to Matforsk AS where they were centrifuged (Beckman Model J2-2, USA) for 25 min at 9000g to remove the small particles from the liquids and poured into glass bottles to be stored at +4 °C until the marinades were prepared.

### 2.2. Marinating of turkey thighs

The turkey thighs were obtained from a local processing plant the day after slaughtering. Cuts of thigh meat without skin were soaked in one of four different marinades in proportion of 25 g marinade per 100 g meat. Decoctions of rosemary, sage and thyme described above, were used for three of the marinades. These marinades consisted of decoction with 120 g salt/l marinade. Water with salt (12%) and no antioxidant was used as a control. The turkey meat cuts were marinated overnight in plastic boxes. Next day, the excess of marinade was wiped with a paper towel and the samples were vacuum packed in plastic bags (ca 450 g). These samples were cooked in a water bath at 80 °C for 30 min and cooled for 45 min in running water to reach approximately 15 °C. Later on, the plastic bags were opened and the juices poured out. Excessive fluid was wiped off the meat with paper towels. The heated meat cuts were divided into smaller portions, transferred to plastic boxes covered with aluminium foil to get air-exposure, and stored for 7 days in a dark room at 4 °C.

### 2.3. Measurements

#### 2.3.1. Antiradical power (ARP)

The antioxidant activity of the different marinades was determined by using the 2,2-diphenyl-1-picrylhydrazyl, DPPH<sup>•</sup> (Sigma Aldrich Ltd., BH12 4QH, 0000 England) according to the procedure described by Brand-Williams, Cuvelier, and Berset (1995) with some modifications. DPPH<sup>•</sup> (25 mg/l) and samples were dissolved in ethanol instead of methanol. The sample solution (0.1 ml) was mixed with DPPH<sup>•</sup> solution (3.9 ml). Samples were prepared in duplicate for each of at least three concentrations used. Blank solution contained 0.1 ml ethanol and 3.9 ml DPPH<sup>•</sup>. The reaction mixtures were covered and left in the dark at room temperature. After 180 min of incubation, the reduction of the DPPH<sup>•</sup> free radical was

Download English Version:

<https://daneshyari.com/en/article/4565086>

Download Persian Version:

<https://daneshyari.com/article/4565086>

[Daneshyari.com](https://daneshyari.com)