

11th International Congress on Engineering and Food (ICEF11)

Development of active packaging containing natural antioxidants

Claudia Contini^a, Maria G. Katsikogianni^b, Feidhlim T. O'Neill^b, Michael O'Sullivan^a, Denis.P. Dowling^b, Frank.J. Monahan^{a*}

^a UCD School of Agriculture, Food Science and Veterinary Medicine, University College Dublin, Belfield, Dublin 4, Ireland
(frank.monahan@ucd.ie)

^b UCD School of Electrical, Electronic and Mechanical Engineering, University College Dublin, Belfield, Dublin 4, Ireland.
(denis.dowling@ucd.ie)

Abstract

Two active packagings, consisting of PET trays sprayed with citrus fruit extract and α -tocopherol, were developed and tested. A comparison of the antioxidant activity of the two packagings was carried out on cooked meat stored at 4°C. Lipid oxidation in citrus fruit extract-coated trays, measured with TBARS analysis, was significantly lower ($p < 0.01$) than in uncoated (control) trays. Trays coated with α -tocopherol did not show any antioxidant activity. Morphology examination showed a more irregular coating for citrus fruit extract. Different orientations of the active phenolic groups on the PET surface could explain the differences in antioxidant efficacy of the two packagings.

© 2011 Published by Elsevier B.V. Open access under [CC BY-NC-ND license](#).

Selection and/or peer-review under responsibility of 11th International Congress on Engineering and Food (ICEF 11) Executive Committee.

Keywords: active packaging; citrus extract; α -tocopherol; coatings; lipid oxidation

1. Introduction

The new concepts of active and intelligent packaging are influencing the marketing of food. An active package may be defined as a system that modifies the condition of the food to extend its shelf-life or improve food safety or sensory properties [1]. Physical polymer surface modification methods have been applied in food packaging to alter barrier properties, to improve the mechanical characteristics or to modify adhesion behaviour of food packaging polymers [2]. These technologies can be applied to the preparation of plastic surfaces coated with specific organic substances [3]. The use of natural compounds

*Corresponding author: Frank Monahan Tel.: +353-1-7167090; Fax: +353-1-7161147.
Email: frank.monahan@ucd.ie

in the preparation of an active packaging with antioxidant properties is a relatively new approach to the problem of the preservation of meat products. The antioxidant can be added for preservation of the polymer against oxidation or for preservation of the packaged food. Synthetic additives with antioxidant activity have been widely used in the food industry but recent trends, driven by consumer concerns about synthetic food additives, are towards the use of natural antioxidants. These natural substitutes include herbs and spices extracts, which have been shown to be very efficient in preventing lipid oxidation in food products [4]. Bioflavonoids are among the major constituents of these plant extracts and they are known to act as antioxidants by scavenging the free radicals that form during the oxidative processes [5]. In the present study, a citrus extract, containing a mixture of bioflavonoids, was examined as a potential antioxidant for the development of active antioxidant packaging. α -Tocopherol was chosen as a second natural antioxidant for the comparison with the citrus extract, because it is known to exhibit good antioxidant activity [6]. The objective of this study was to examine the efficiency of citrus fruit extract and α -tocopherol sprayed (nebulised) onto the surface of recycled PET food trays in preventing lipid oxidation in cooked meat. Slices of cooked turkey meat were stored on coated trays at 4°C for 4 days and the ability of the two coatings to reduce lipid oxidation compared. Turkey meat was chosen as reference food due to its relative abundance of poly-unsaturated fatty acids (PUFA), which make it suitable for the evaluation of oxidative processes [7].

2. Materials & Methods

The antioxidant packagings were prepared by spraying the antioxidant compounds onto the surface of recycled PET trays, using a nebuliser. Surface morphology, roughness and film thickness of the α -tocopherol and citrus coatings were evaluated using a Wyko NT1100 (Veeco, Tucson, USA) optical profilometer in vertical scanning interferometry (VSI) mode, which allowed a 3 dimensional image of the coating to be built over several hundred nanometers. Surface wettability was examined by measuring water contact angles (WCA) on the coatings using the sessile drop technique at room temperature with an optical contact angle measuring instrument OCA 20 (Dataphysics Instruments GmbH, Filderstadt, Germany). For the experiment with antioxidant coated trays, the meat was cut into square shaped pieces of approximately 3 g. Meat samples were randomly placed on the PET trays which were immediately overwrapped with a catering film. Samples were removed immediately (day 0) and after 1, 2 and 4 days of storage in a refrigerator at 4°C, for measurement of lipid oxidation with the TBARS assay [8].

3. Results & Discussion

In the experiment for the evaluation of the antioxidant efficiency of the coated PET trays, the preparation of the meat was optimized to maintain the initial oxidation of meat samples at a value of ~ 2 mg malonaldehyde (MDA)/kg meat (Figure 1). The TBARS values of samples on the control trays increased significantly ($p < 0.01$) at days 1 and 2, to reach a value of ~ 7 mg MDA/Kg meat, which remained unchanged thereafter. Meat on the α -tocopherol-coated trays did not show any reduction in TBARS values, compared to the control samples, over the 4 days of the experiment. TBARS values for turkey meat stored on the citrus-coated trays were significantly lower ($p < 0.01$) than those of samples on the control trays and α -tocopherol-coated trays after 1, 2 and 4 days of storage. Since α -tocopherol was chosen as a second natural antioxidant because of its well know antioxidant activity in meat samples [6], the different antioxidant activity may be related to the different characteristics of the two coatings, which affected the interactions between the antioxidant molecules and the meat.

Download English Version:

<https://daneshyari.com/en/article/1264943>

Download Persian Version:

<https://daneshyari.com/article/1264943>

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