Available online at www.sciencedirect.com
SCIENCE DIRECT®
LWT 38 (2005) 651–655
LWT
www.elsevier.com/locate/lwt

Effects of rosemary extract (*Rosmarinus officinalis*) on the stability of bread with an oil, garlic and parsley dressing

M.J. Frutos*, J.A. Hernández-Herrero

Universidad Miguel Hernández, E.P.S.O. Ctra. Beniel, km. 3.2, 03312 Orihuela, Alicante, Spain

Received 26 February 2004; received in revised form 23 July 2004; accepted 11 August 2004

Abstract

Rosemary extract (RE) at different concentrations (0, 2, 4 and 6 g/l) was added to a dressing consisting of sunflower oil, garlic and parsley. The dressing was then treated at 140 °C for 1 h to simulate the process of baking and was later stored in an oven for 10 days at 50 °C, to promote oxidation and to check the efficacy of the antioxidant in the RE. 2-Thiobarbituric acid (TBA) test and determination of peroxide value (PV) were performed every 2 days. The results obtained for PV revealed that from day 8 onwards the RE caused an antioxidant effect on the samples to which it had been added. The most efficient concentration was 0.4 g/l. Sensory tests performed on the bread with an oil and garlic/parsley dressing revealed no rancid taste during the initial 6 days of storage at 50 °C. No taste of RE was detected by a trained sensory panel at the two lowest concentrations added.

Keywords: Sensory analysis; Sunflower oil; Peroxide value; TBA; Rosemary extract

1. Introduction

The main problem which occurs with reactions of lipid oxidation is the development of unpleasant odours and flavours which reduce the consumers' acceptance and also the shelf life of many foodstuffs (Cheftel & Cheftel, 1992; Alfawaz, Smith, & Jeon, 1994). Thus, both natural and synthetic antioxidants are widely used (Gamel, & Kiritsakis, 1999). More recently though, there has been a general increase on the part of consumers to reject all synthetic additives in food, including antioxidants. Thus, over the last few years, this has led to an increase in the use of natural antioxidants, especially those of vegetable origin, and obtained in the form of extracts (Gür, & Gulden, 1997; Hall, Cuppett, & Dussault, 1998; Chen et al., 2003).

Rosemary extracts (REs) have been applied to different oils, retarding the oxidation more successfully than other natural and synthetic antioxidants such as butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) (Chipault, Mizuno, Hawkins, & Lundberg, 1952; Chipault, Mizuno, & Hawkins, 1956; Wu, Lee, Ho, & Chang, 1982; Houlihan, Ho, & Chang, 1985; Gamel & Kiritsakis, 1999; Özcan, 1999).

Bread with an oil, garlic and parsley dressing is a product, which is very susceptible to rancidity during storage and commercialization, due to the large amount of oil which it contains. The purpose of this study was to evaluate the efficacy of the addition of RE on the stability of this product, from both a chemical and an organoleptic viewpoint.

2. Material and methods

2.1. Rosemary extract

The RE was obtained from Furfural Español S.A., Murcia (Spain), the main components being the following diterpens: carnosic acid (20–30%), rosmarinic acid (0–1%) and rosmanol (0.5–1.5%); and flavones:

*Corresponding author. Tel.: +34 966749744; fax: +34 966749677.
E-mail address: mj.frutos@umh.es (M.J. Frutos).

0023-6438/$30.00
doi:10.1016/j.lwt.2004.08.013

apigenin-7-glucoside (0–1%) and apigenin (0–1%). All percentages refer to dry material. The RE, as a yellowish–green powder, presents a solubility of 2 g/l in water, 20 g/l in propylene glycol and 10 g/l in vegetable oils.

2.2. Elaboration of bread with an oil, garlic and parsley dressing

The bread was prepared using the following ingredients: 1 kg flour, 500 ml warm water, 40 g yeast and 20 g salt. The bread was baked in an oven at 200 °C for 28 min. Once the sunflower oil dressing (SD) was added to the slices of baked bread, they were toasted at 140 °C for 1 h. The SD contains 1 g of salt, 0.3 g of parsley and 10 g of finely chopped garlic for each 100 ml of oil. Three concentrations of RE, 2, 4 and 6 g/l were added to the SD to perform this test.

2.3. Determination of level of lipid oxidation in SD

For the determination of the oxidative stability on the SD, 80 ml of the dressing was placed on 12 cm diameter glass petri dishes and was treated for 1 h at 140 °C, to simulate the baking process. A control sample, which was not subject to the heating process, was kept throughout the test. The SD was then stored in an oven at 50 °C to accelerate the oxidative process, and thus obtain results sooner. A 5 g sample was taken every 2 days to assess the level of oxidation or rancidity by means of the 2-thiobarbituric acid (TBA) test and the peroxide value (PV) measurement. The test was performed over a period of 10 days.

2.3.1. 2-Thiobarbituric acid test

A 0.5 g SD sample was homogenized in 2.5 ml of TBA solution and heated to 100 °C in a bath of water for 10 min (Taüfel & Zimmerman, 1960). It was then cooled immediately afterwards in an ice bath, centrifuged at 2840 g for 25 min and the supernatant analysed at 532 nm (Witas, 1972) in a Hewlett-Packard 8453 vis-UV spectrophotometer. A pattern curve was taken with 1,1,3,3-tetraetoxypropane to calculate the malondialdehyde (MDA) equivalent.

2.3.2. Peroxide value

The determination of the PV was performed according to the AOCS (1989) method. In an erlenmeyer 2 g of SD were mixed with 10 ml of chloroform. Glacial acetic acid (15 ml) and saturated aqueous solution of potassium iodine (1 ml) were added and then shaken and stored in the dark for 5 min. Distilled water (75 ml) were then added and mixed and the free iodine was measured with a 0.01 N solution of sodium thiosulphate, using a starch solution (10 g/l) as indicator.

2.4. Sensory analysis

Once the bread with the oil and garlic dressing had been baked, it was stored in an oven at 50 °C until it was required for the sensory tests. These were performed at 0, 6 and 12 days by a panel of trained judges whose ages ranged from 20 to 35 years. "A"–"not A" tests (ISO 8588-1987) and triangular tests were performed (ISO 4120-1983). The fresh samples were baked the same day and served at room temperature.

2.5. Statistical analysis

The chi-square test was used to analyse the results of the sensory analysis, while Scheffé's test was used with the SPSS v10.0 statistical programme (SPSS Inc., Chicago-Illinois-USA) for the other data.

3. Results and discussion

3.1. Determination of level of lipid oxidation

The results obtained on day 0 (1 h after the addition of RE) reveal that the MDA values in the SD without heat treatment increase with the extract concentration used (Fig. 1A). This effect is not so obvious in the SD with heat treatment (Fig. 2A). This significant increase ($\rho = 0.05$) of the values of MDA for the samples which

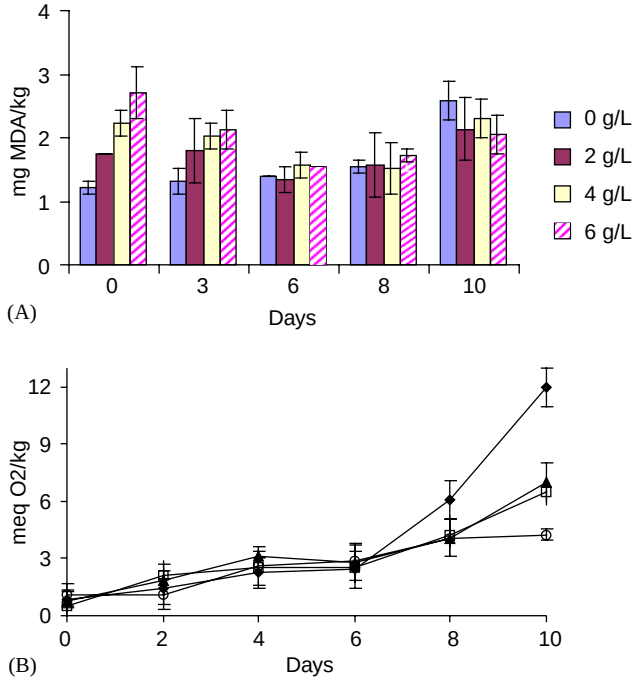

Fig. 1. Lipid oxidation of the samples stored at 50 °C, measured as A: mg MDA/kg and B: meq of oxygen (O_2)/kg of SD. The preparation contained 0 (♦), 2 (▲), 4 (○) and 6 g/l (□) of RE in SD. Data shown are mean of three ± standard deviation.