Antioxidant Activities of Allspice Extracts in Rapeseed Oil

NGUYEN DAC VINH, MÁRIA TAKÁCSOVÁ, DANG MINH NHAT and KITTI KRISTIÁNOVÁ

Slovak Technical University – Faculty of Chemical Technology, Department of Saccharides and Food Preservation, Bratislava, Slovak Republic

Abstract

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Spices are an important component of both commercial and homemade foods. Many spices have been shown to possess an antioxidant effect. In our study, we tested the activity of different allspice extracts (ethanol, chloroform, diethylether, benzene and hexane) on the stability of rapeseed oil. The order of antioxidant effectiveness was as follows: ethanol extract > chloroform extract> diethylether extract > benzene extract > hexane extract. The ethanol extract exhibited a remarkable antioxidant effect.

Key words: rapeseed oil; antioxidants; allspice; allspece extracts

Oxidation of lipids has a detrimental effect on the colour, flavour, texture and nutritional value of food (HETTIARACHCHY *et al.* 1996). Synthetic antioxidant compounds can prevent lipid from oxidation, but the use of such compounds has been related to health risks resulting in strict regulations over their use in food products. Increasing consumer concern over such risks has stimulated research for alternative antioxidant sources, which has led to the use of natural antioxidants instead of BHA, BHT and TBHQ (ANON 1991). Several spices have been tested in foods: rosemary, sage and marjoram in meat (KORCZAK *et al.* 1988); clove, thyme, rosemary, cumin, sage caraway in linoleic acid emulsion (FARAG *et al.* 1989), oregano in cottonseed oil (LAGOURI & BOSKOU 1996). However, the solvents used for extraction may have a different influence on the antioxidant effect of spices (CHANG *et al.* 1977; POKORNÝ *et al.* 1997). In our work we used hexane, benzene, diethylether, chloroform and ethanol to extract allspice. The extracts were tested in rapeseed oil for their antioxidant activity.

MATERIAL AND METHODS

The refined rapeseed oil was purchased from Palma-Tumys, a. s. Bratislava (acid value: 0.097 mg KOH/g; fatty acid composition [in %]: $C_{16:0}$:5.83, $C_{16:1}$:0.55, $C_{18:0}$:1.85, $C_{18:1}$:56.03, $C_{18:2}$:23.31, $C_{18:3}$:10.42, $C_{20:1}$:1.34, $C_{22:1}$:0.67). Allspice was purchased from Kotanyi Gmbh, Wolkersdorf, Austria.

The 10% allspice extracts were prepared with 5 solvents (hexane, benzene, diethylether, chloroform and 96% ethanol) during 48 hours at room temperature. The obtained extracts were added after sedimentation at the 0.5% concentration into oil samples. The samples were stored in wide-mouth bottles in the thermostat at 60°C in the dark and under free access of air oxygen, and analysed over a period of 21 days.

The peroxide value (PV) was determined iodometrically, the thiobarbituric acid (TBA) value was determined by spectrophotometry (DAVÍDEK *et al.* 1974). The content of conjugated dienes and trienes was also measured (DAVÍDEK *et al.* 1974). The content of oxidized fatty acids was determined by reversed phase HPLC (VALENTOVÁ *et al.* 1986).

RESULTS AND DISCUSSION

The peroxide value increased during the storage period (Fig. 1a). All the extracts tested showed an antioxidant effect except the hexane extract. The peroxide value of the control sample (oil without extract) and hexane extract-treated sample achieved 20 mval/kg between 3rd and 7th day of storage. The peroxide value of other samples exceeded 20 mval /kg between 7th and 10th day of storage. The peroxide value of 20 mval/kg is conventionally accepted as the end of the induction period (POKORNÝ *et al.* 1997). Ethanol was clearly the best solvent. The medium polar diethylether was slightly more effective than the polar chloroform, but less effective than the polar ethanol. The benzene extract had a weaker antioxidant effect than diethylether and chloroform extracts.

The antioxidant effectiveness can be evaluated at different stages of oxidation by measuring hydroperoxide formation on the basis of conjugated dienes (FRANKEL *et*

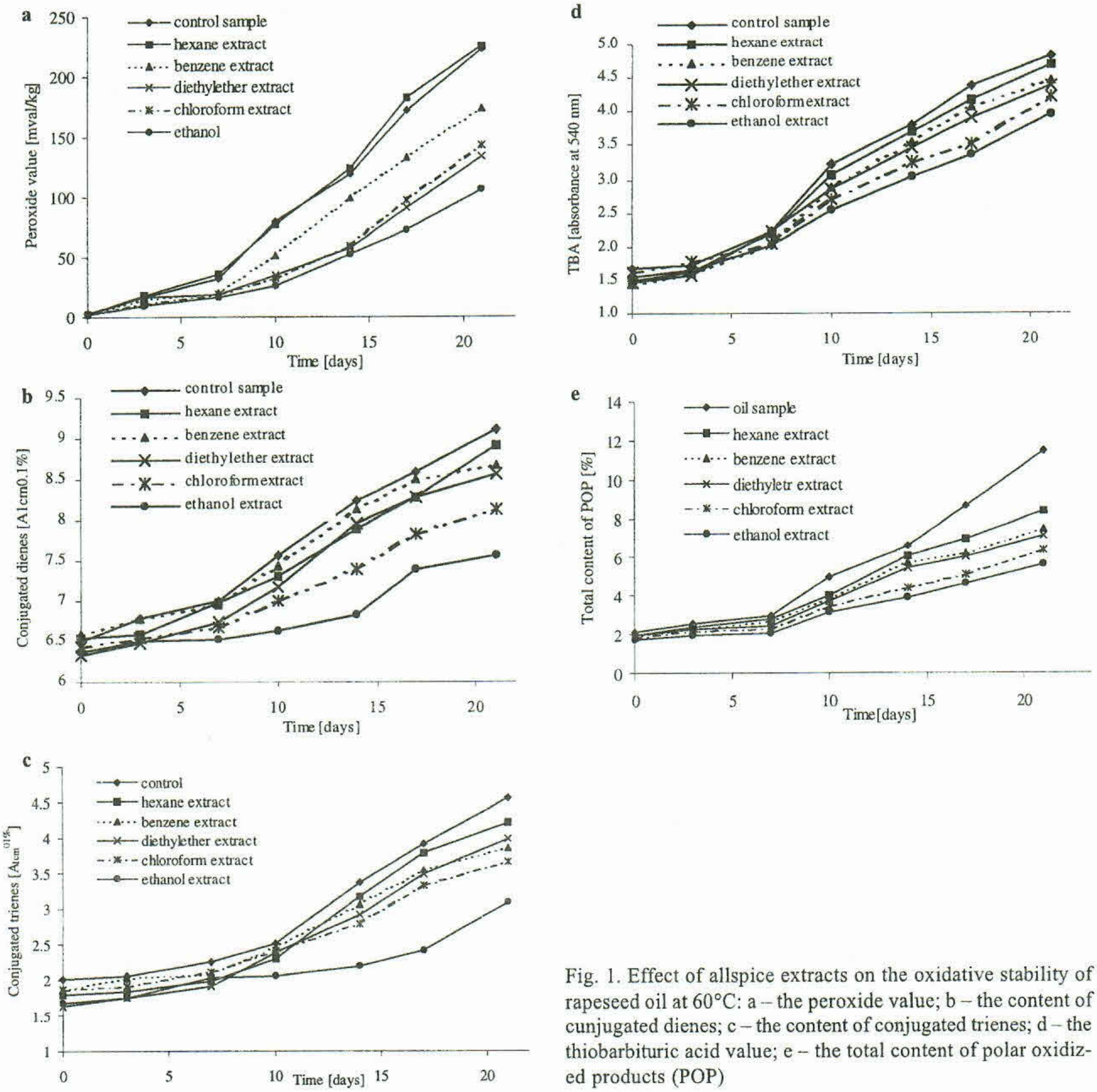

Fig. 1. Effect of allspice extracts on the oxidative stability of rapeseed oil at 60°C: a – the peroxide value; b – the content of cunjugated dienes; c – the content of conjugated trienes; d – the thiobarbituric acid value; e – the total content of polar oxidized products (POP)

al. 1996). The content of conjugated dienes in ethanol extract-treated sample increased slowly in comparison to its content in the control sample. The chloroform extract was less effective than ethanol extract, but more effective than the diethylether, benzene and hexane extracts. Benzene, hexane and diethylether extracts slightly reduced the content of conjugated dienes in oil (Fig. 1b).

The content of conjugated trienes in the ethanol extract-treated sample was the lowest. The other extracts had only a weak effect. The polar solvents were more effective than the unpolar solvents (Fig. 1c).

The TBA values are shown in Fig. 1d. The examined extracts lowered the content of malondialdehyde in the samples. The extracts, obtained with polar solvents (ethanol and chloroform) had the strongest antioxidant effect. The unpolar solvents (hexane and benzene) were slightly effective. The diethylether extract was a little bit more effective than the benzene extract. After 21 days of storage the TBA value of the ethanol extract-treated sample was 18% lower than the TBA value of the control sample and the TBA value of the hexane extract-treated sample was only 3% lower.

The total content of polar oxidized products (POP) was measured by means of a reversed phase HPLC method (VALENTOVÁ *et al.* 1986). As the results showed, all the extracts examined had an antioxidant effect. The ethanol extract was the most effective. The antioxidant activity of the extracts increased with the polarity of solvents (Fig. 1e).

The main constituent of allspice is eugenol (54.26%), followed by β-caryophyllene (8.69%) (PINO & ROSADA 1996). Eugenol is known as an antioxidant compound (MADSEN & BERTELSEN 1995), but allspice has rarely been tested for an antioxidant effect. Allspice had an antioxidant effect on raw ripened sausages (PALIC *et al.*

1993). The results showed that the extracts tested had an antioxidant effect. The polar solvents were more effective than unpolar solvents. The antioxidant constituents are likely to have dissolved better in polar solvents. Ethanol was the most suitable solvent for extracting allspice. The rapeseed oil is easy to be oxidized because of a higher content of linolenic acid. The 0.5% ethanol extract of allspice exhibited a remarkable antioxidant effect on the oil. The order of effectiveness in inhibiting oil oxidation was as follows: ethanol extract > chloroform extract > diethyl-ether extract > benzene extract > hexane extract.

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Súhrn

NGUYEN D. V., TAKÁCSOVÁ M., DANG M. N., KRISTIÁNOVÁ K. (2000): **Antioxidačné pôsobenie extraktov nového korenia v repkovom oleji.**. Czech J. Food Sci., **18**: 49–51.

Koreniny sú dôležitou zložkou komerčných ako aj domácich potravinárskych produktov. Bolo dokázané, že mnohé koreniny majú antioxidačný účinok. Sledovali sme antioxidačné pôsobenie rôznych extraktov nového korenia (etanolového, chloroformového, dietyléterového, benzénového a hexánového) na stabilitu repkového oleja. Účinok extraktov klesal v poradí: etanolový > chloroformový > dietyléterový > benzénový > hexánový. Etanolový extrakt vykazoval silný antioxidačný účinok.

Kľúčové slová: repkový olej; antioxidanty; nové korenie; extrakty nového korenia

Corresponding author:

Doc. Ing. MÁRIA TAKÁCSOVÁ, CSc., Slovenská technická univerzita, Chemickotechnologická fakulta, Katedra sacharidov a konzervácie potravín, Radlinského 9, 812 37 Bratislava, Slovenská republika, tel: + 421 7 59 32 556 4, fax: + 421 7 39 31 98, e-mail: takacsova@chelin.chtf.stuba.sk