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ANTIOXIDANT ACTIVITY OF WHEAT BRAN EXTRACT IN RAPESEED OIL

Summary

Lipids can undergo autooxidation leading to undesirable compounds formation. In an effort to retard the processes involved, various natural antioxidants are applied.

In our paper, the antioxidant activity of the ethanol extract from wheat bran on the oxidative stability of rapeseed oil was studied. The extract was added at the 0.1 and 0.3% vol. concentration.

The results of the peroxide and thiobarbituric acid values have shown that the wheat bran extract has an antioxidant effect. The inhibition effect in percentage was 34.4%, and 46%respectively for 0.1%, and 0.3% addition of wheat bran ethanol extract.

Total phenolics in wheat bran extract (0.08 mg TAE/g dry matter) were determined spectrometrically using Folin-Ciocalteu reagent and expressed as tannic acid equivalents (TAE).

Key words: lipid oxidation, antioxidant, wheat bran, rapeseed oil.

Introduction

Lipids are very important food components, however, they easily undergo autooxidation that leads to the formation of a number of undesirable compounds. Oxidation of lipids has a detrimental effect on sensorial, nutritional and hygienic value of food. In an effort to retard the processes involved, a wide range of antioxidants have been applied. An interest in using of antioxidants from natural sources to stabilise fat-containing foodstuffs has been increasing.

Many compounds of plant origin, such as from vegetables, fruits, spices, legumes, cereals, were tested for their antioxidant effects. Agricultural and industrial residues are also good sources of natural antioxidants. Grape and apple pomace, grape seeds,

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cereal bran, wheat germ, peanut hulls, citrus peels, hulls from legumes, corn steep liquor, malt rootlet, olive mill waste waters were studied as low-cost source of antioxidant [1, 2, 4-13, 15, 17, 18].

Polyphenols are the major plant compounds with antioxidant activity [14]. Furthermore, tocopherols, tocotrienols, ascorbic acid, carotenoids have been reported as compounds with antioxidant effect.

In wheat bran, protocatechuic, *p*-hydroxybenzoic, gentisic, caffeic, vanillic, chlorogenic, syringic, *p*-coumaric and ferulic acids were identified. α- and β-tocopherol and phytic acid are also present. Approximately 80% of the *trans*-ferulic acid of the entire wheat grain was found in the bran [16].

The aim of our work was to study the antioxidant activity of the wheat bran ethanol extract on the oxidative stability of rapeseed oil.

Materials and methods

Substrate: commercially available rapeseed oil Raciol (Palma – Tumys, a.s. Bratislava).

Plant material: wheat bran purchased from Marianna, Ivánka pri Dunaji, Slovakia.

Extraction: twice, with 96.6% ethanol (1:10) under reflux in a water bath at 80°C for 1 hour, filtration, concentration under reduced pressure at 40°C.

Addition: wheat bran extract was added to oil samples (20 ml) at concentration 0.1 and 0.3% (vol.).

Storage: Schaal oven test: at 60°C in the dark under free access of air oxygen for 21 days. Rapeseed oil without additives was used as control.

Analyses: peroxide value and thiobarbituric acid values [3] were determined in duplicate on days 0, 4, 7, 10, 14, 17 and 21. Total phenolics in the extract obtained were determined spectrophotometrically using Folin-Ciocalteu reagent [19] and given as tannic acid equivalent (TAE).

Results and discussion

In general, the peroxide value increased during storage. The greatest increase in amount of the hydroperoxides was found in control sample. The peroxide values in the antioxidant treated samples were lower than in the samples without extract (Fig. 1).

The production of the primary oxidative products was slower in samples with extracts from the 4th day of storage onwards. It is to note that, the most intensive inhibition of oxidation started from 14th. After 21 days of storage the peroxide values of samples with addition of 0.1% and 0.3% wheat bran extract were lower compared to the control sample by 34.4% and 46.0%, respectively. The application of extract retarded the production of secondary products of oxidation (Fig. 2). After 21 days of

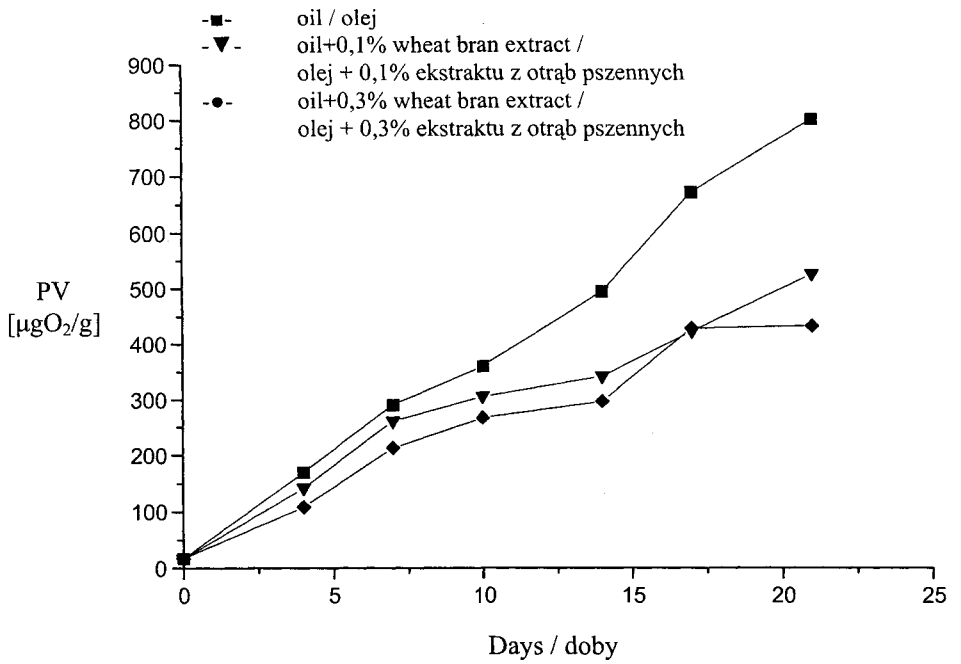

Fig. 1. Peroxide values (PV) [μg O_2/g oil] in rapeseed oil samples during storage.
Rys. 1. Wartości liczby nadtlenkowej w próbach oleju rzepakowego w trakcie przechowywania.

storage the thiobarbituric acid value of samples with addition of 0.1% and 0.3% wheat bran extract was lower than that of the control sample by 6.6%, and 5.0% respectively. The antioxidant activity of 0.3% addition of wheat bran extract was stronger than that of 0.1% addition of wheat bran extract. This is in accordance with a general trend – increased antioxidant activity is found with increasing extract concentration until the maximal concentration. The results indicate that extract acted as antioxidant in rapeseed oil and the extract was more effective in retarding of production of hydroperoxides i.e. acted as primary antioxidant.

The content of total phenolics in wheat bran extract was determined spectrometrically using Folin-Ciocalteu reagent and calculated as tannic acid equivalent (TAE). The amount of total phenolics was 0.08 mg TAE/g dry matter.

Conclusions

According to our experimental data, based on primary and secondary lipid oxidation products analyses, wheat bran ethanol extracts showed the antioxidant activity in

rapeseed oil.

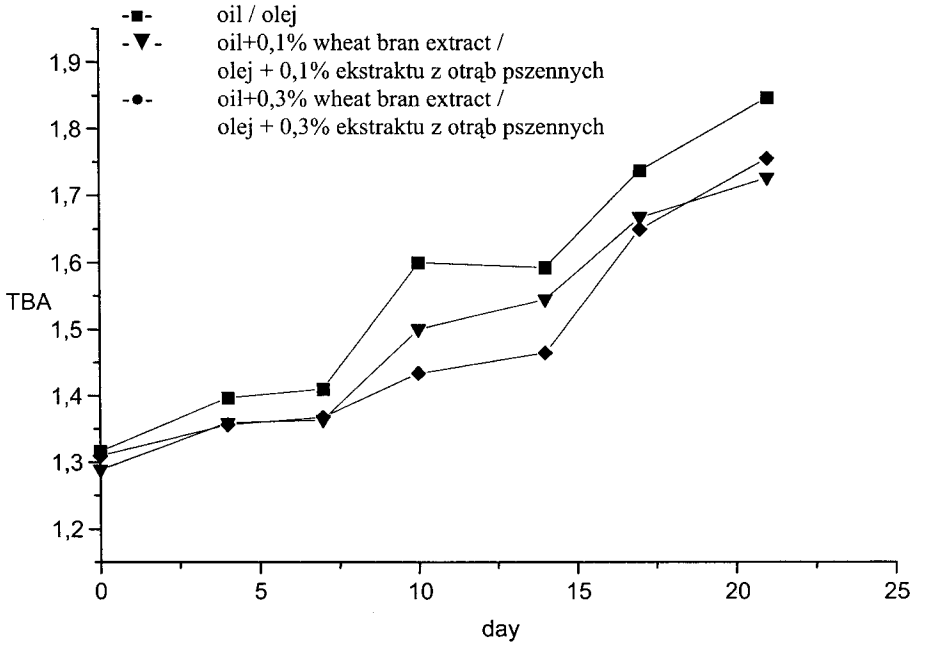

Fig. 2. Thiobarbituric acid values (TBA) ($A^{1\%}_{1cm}$) in rapeseed oil samples during storage.
Rys. 2. Wartości wskaźnika TBA ($A^{1\%}_{1cm}$) w próbach oleju rzepakowego, w trakcie przechowywania.

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WŁAŚCIWOŚCI PRZECIWUTLENIAJĄCE WYCIĄGU Z OTRĄB PSZENNYCH W STOSUNKU DO OLEJU RZEPAKOWEGO

Streszczenie

Tłuszcze ulegają autoutlenieniu prowadzącemu do tworzenia niepożądanych związków. W celu opóźnienia tych procesów stosuje się różne naturalne przeciwutleniacze.

Badano właściwości przeciwutleniające etanolowego ekstraktu z otrąb pszennych na stabilność oksydacyjną oleju rzepakowego. Ekstrakt dodawano w ilości 0,1 i 0,3% (v/v). Wyniki oznaczeń liczby nadtlenkowej i wskaźnika TBA wskazują, że ekstrakt z otrąb pszennych wywierał wpływ przeciwutleniający. Działanie hamujące wynosiło 34,4% przy 0,1% dodatku etanolowego ekstraktu otrąb pszennych, a 46% przy 0,3% dodatku tego ekstraku.

Ogólna zawartość fenoli w ekstrakcie z otrąb pszennych, oznaczona spektrofotometrycznie przy użyciu odczynnika Folina-Ciocalteu i podana jako równoważnik kwasu taninowego (TAE) wyniosła 0,08 mg TAE/g s.m.

Słowa kluczowe: utlenianie tłuszczów, przeciwutleniacz, otręby pszenne, olej rzepakowy.