

NATURAL ANTIOXIDANTS FROM THE RAPESEEDS

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logy, Plac Cieszyński 1, 10-957 Olsztyn, POLANDINTRODUCTION

Among numerous chemical changes undergoing in food products much attention is paid to oxidation-reduction processes of fats and the methods of their preventing. Commonly applied synthetic antioxidants inhibit changes of lipids, yet they are not neutral to human organism. Recently a growing interest has been observed in antioxidative properties of biologically active substances occurring in the world of plants.

MATERIAL AND METHODS

Defatted rapeseeds of the double-improved Jantar variety were extracted 6 times with 80% alcohol. After its chemical composition was determined with available methods, phenolic compounds were isolated from the condensed extract in the way shown in Fig. 1.

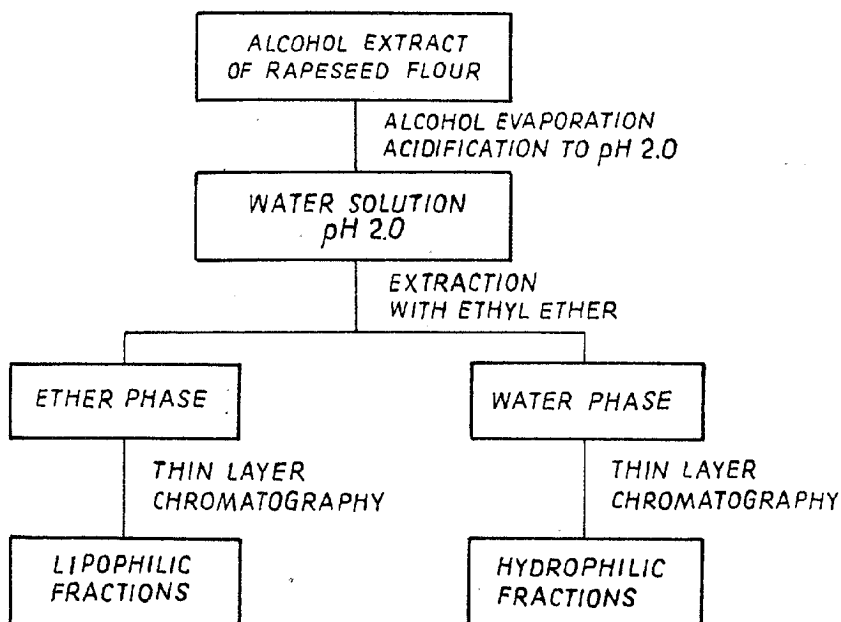


Fig.1. Scheme of phenolic compounds isolation

Phenolic acids of lipophilic compounds were determined with HPLC method as described by Zaderowski et al. 1985. Next both fractions were placed on 10 chromatographic plates covered with silica gel 60 F 254 Merck. Lipophilic compounds were developed in the mixture of ethyl ether:petroleum ether:acetic acid (100:20:1 v/v/v) while hydrophilic fraction was developed in 1% acetic acid.

Antioxidative properties were determined in all fractions using the method of Taga et al. 1984 with 0.1% addition of antioxidant to each sample. The inhibition effect of oxidation process was compared each time with effects caused by such commonly applied antioxidants as Tenox 2 (1) or vitamin E.

RESULTS

Condensed alcohol extract, a by-product at obtaining rape-seed protein concentrate, contained ab.30% carbohydrates, 21% phenolic compounds and other substances occurring in small amounts making up dry matter Fig.2.

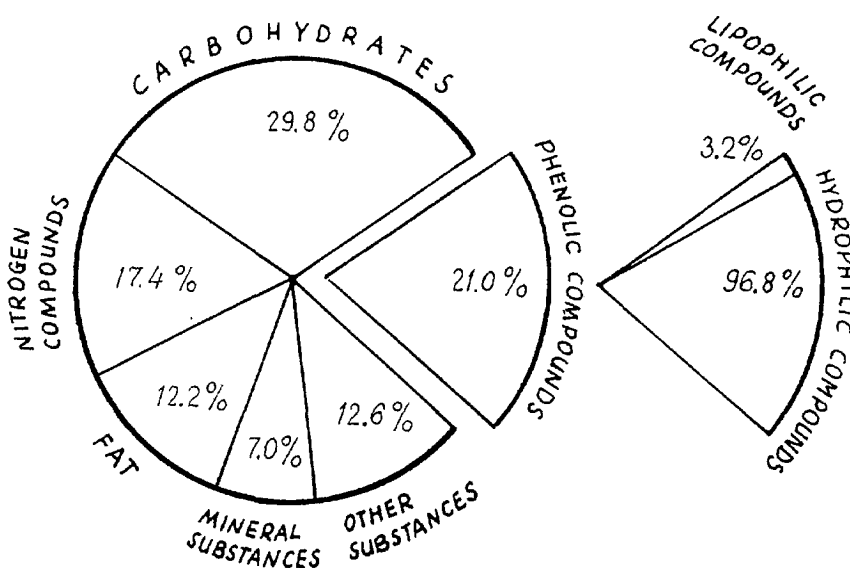


Fig.2. Chemical composition of alcohol extract in %

Alcohol-soluble compounds were separated with extraction method (liquid/liquid) into lipophilic fraction remaining in ethyl ether and containing 3% of total phenolic compounds, and hydrophilic fraction containing up to 97% of these compounds. HPLC revealed that lipophilic fraction was a mixture

- (1) composition: Butylated Hydroxyanisole 20%, Propyl Gallate 6%, Citric Acid 4%, Propylene Glycol 70%.

of phenolic compounds dominated by sinapic acid and its derivative (Fig.3.) while hydrophilic fraction was dominated by sinapin.

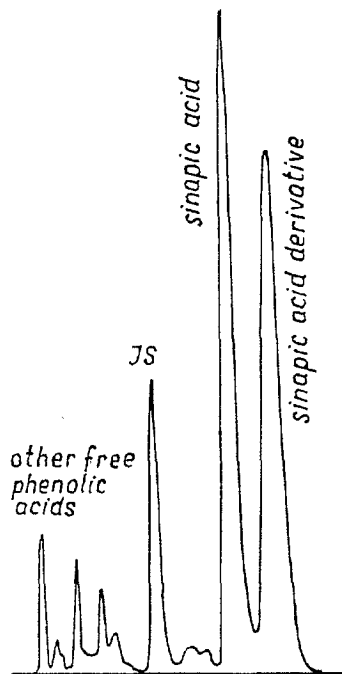


Fig.3. Basic free phenolic acids in lipophilic compounds

The compounds present in both fractions were separated with TLC method which produced 9 fractions in the group of lipophilic compounds and 3 in the group of hydrophilic ones (Figs 4 and 5). Evaluation of inhibition degree of oxidation processes conducted with the use of extract of each spot revealed the best properties in the case of fractions I, IV, V and IX. After 3 hours of experiment as little as 25% of linoleic acid was decomposed when fractions I and V were applied, 28% when fraction IV was used as an oxidant, whereas antioxidative properties of fraction IX were similar to those of Tenox 2 (36% of linoleic acid was decomposed - Fig.4). The remaining fractions showed ab.30% lower activity compared with trade antioxidants, and fraction VIII did not have even such properties. All 3 fractions of hydrophilic compounds (Fig.5) were characterized by high antioxidative activity. During 3 hours of experiment only 15% of linoleic acid decomposed when there was applied 0.1% addition of fraction 3 and 25-28% when fractions 1 and 2 were used.

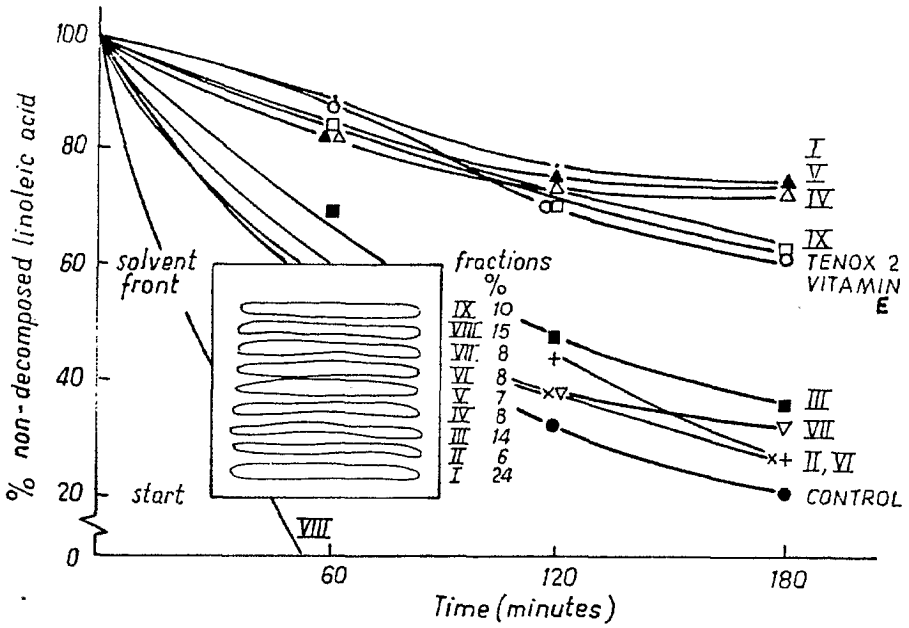


Fig.4. Antioxidant activity of lipophilic fractions

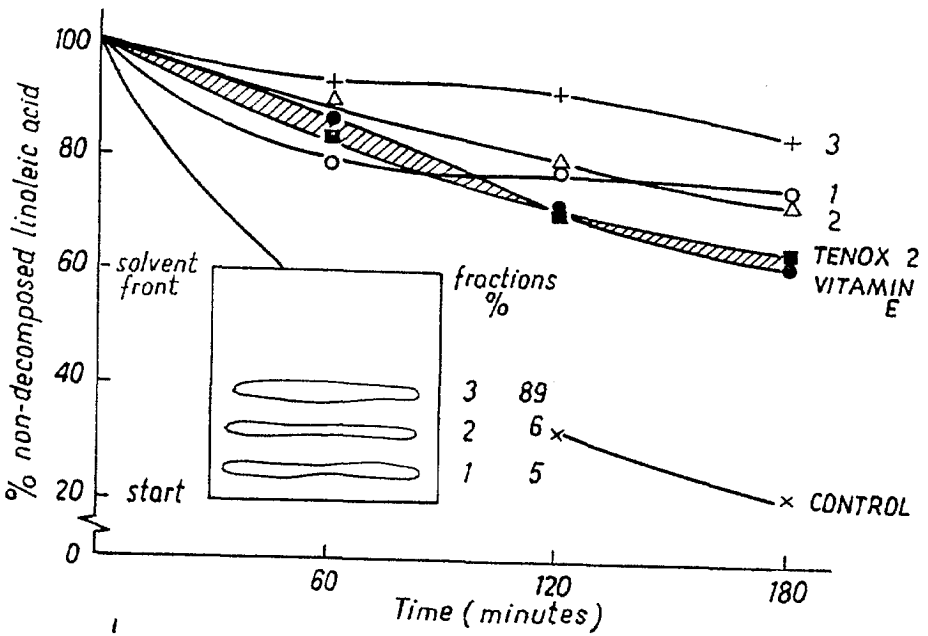


Fig.5. Antioxidant activity of hydrophilic fractions

DISCUSSION

From the earlier studies (Nowak et al.1989, Nowak et.al.1990) it follows that alcohol extract of rapeseed flour inhibits both oxidation process in fat and development of some bacteria strains.

The aim of this work was to find an answer to the question whether all the isolated compounds in alcohol extract act with the same strenght. Presented results permit to state definitely that not all of them have such properties. A criterion for evaluation was such level of oxidation inhibition of linoleic acid which exceeded the action of commonly applied antioxidants. Those conditions were fulfilled by all the hydrophilic and 4 out of 9 lipophilic fractions.

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