CONTENTS OF SOME MINOR COMPONENTS IN RAW DOUBLE-LOW RAPESEED OIL AND THEIR TRANSFORMATIONS DURING REFINING.

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Changes in contents of chlorophyll and carotenoid pigments as well as phosphorus and sulphur compounds during industrial production and refining of double-low "Jantar" variety rapeseed oil were evaluated.
Pressed and extracted oils contained 150-220 ppm /as P/ of phosphorus compounds /they were preliminary degummed before rafination/. Pressed oil contained ca 50% of phospholipids, while extracted oil - only ca 10%, majority of which being nonhydratable phospholipids. Both kinds of oils contained large amounts of inorganic phosphates.
Pressed oils contained ca 3 ppm of sulphur compounds /as S/, while extracted oils-ca 8 ppm. Volatile sulphur compounds constituted 15-40% of total sulphur.
The level of pheopthityns content was rather high, viz. ca 60 ppm /as pheophityne A/. Unsaponifiable matter contained ca 130 ppm of carotenoids /as lutein/.

Oil refining by means of H_3PO_4 resulted in the removal of more than 90% of phosphorus compounds, ca 50% of sulphur compounds and 80% of pheophityns on an average. Due to high content of these compounds in raw oils, however, there

still remains large amount of these substances in bleached oils.

INTRODUCTION

Low erucic acid type rapeseed oil is mainly produced in majority of European countries. Double improved varietes are not as widely grown as in Canada /Thomas, 1982/. The registered Polish variety of double improved rapeseed is called Jantar. Due to the new features of double improved varieties, both laboratory and industrial scale investigations on optimization of recovery and rafination of oils are carried out /Ragan et al., 1985, Diosady et al., 1984, Mag, 1983/. The presented paper aimed at evaluation of the content of chlorophyll and carotenoid pigments, sulphur and phosphorus compounds, as well as of the changes during industrial rafination.

MATERIALS AND METHODS

Pressed and extracted oils, as well as raw oils from 1985 crops were obtained from Oil Industry Plant in Szamotuły. Raw oils were a mixture of partially degummed expelled and solvent extracted oils. Rafination has been carried out in Oil Irdustry Plant in Gdańsk. Degumming and neutralization were carried out by Alfa-Laval continuous method. Oils were mixed with 0.2% of H_3PO_4 /conc.75%/ and neutralized with NaOH /20°Be/. Bleaching was carried out by a continuous method using ca 1.2% of Miltar Standard Polish bleaching earth. Time of contact of oil with bleaching earth was ca 30 min. Separation of bleaching earth was carried out by plate-and-frame filters.

The total phosphorus content was determined by a mo-

dified AOCS method. Phospholipids were extracted from oils with acidified methanol /95:5 v/v/ /Goh, 1984/. Chlorophylls content was determined spectrophotometrically by measuring the absorption of solutions of oil in CCl_4 at λ = 673 nm /paper in print/. Carotenoids were determined in unsaponifiable matter by measurement of absorption of hexane solutions at λ = 444 nm.

The content of total sulphur was determined by a modified Granatelli method. The quantitative composition of volatile sulphur compounds was analyzed by GLC using a flame-photometric detector and applying a technique of a direct injection of oil onto a precolumn. Sulphur compounds, vapourized from oil under conditions of the performed chromatographic analysis, were determined as volatile /paper in print/.

RESULTS AND DISCUSSION

The content of phosphorus and sulphur compounds, as well as chlorophyll and carotenoid pigments in raw, neutralized and bleached oils is listed in Table 1.
Our preliminary investigations on raw oils indicated that the level of content of phosphorus compounds in pressed and extracted oils was high, and that is why they were subjected to preliminary degumming prior to rafination process. It has been established that both kinds of oils contained similar classes of phosphorus compounds; however, in different amounts. Pressed oil contained ca 50% of phospholipids, while extracted oil - only ca 10%, 70% of which being nonhydratable phospholipids. It should be pointed out that both kinds of oils contained large amounts of in-

organic phosphates /research under way/, however extracted oil contained more of them.

Table 1. The content of phosphorus and sulphur compounds, as well as pigments in raw and refined oils.

Oils		Content [ppm]					
		total phosphorus	phospholipids as P	total sulphur	volatile sulphur compounds as S	pheophityns x/	carotenoids xx/
Sample 1	Pressed	221.0	104.3	3.0	0.9	68.6	166.8
	Extracted	173.0	19.7	8.3	1.3	50.3	125.8
	Raw	108.0	15.4	7.1	1.1	70.9	129.7
	Neutralized	27.0	7.0	4.1	0.8	50.3	108.6
	Bleached	8.0	2.9	3.9	0.5	22.9	35.1
Sample 2	Pressed	201.0	96.8	2.8	0.7	64.1	121.8
	Extracted	145.0	14.5	7.9	3.0	54.9	129.7
	Raw	144.0	22.5	6.6	2.0	59.5	71.5
	Neutralized	31.3	7.9	5.8	1.4	44.6	45.0
	Bleached	12.5	4.2	4.2	1.2	6.4	9.2

x/ - as pheophityne A

xx/ - as lutein

Rafination of oil proved that despite the use of H_3PO_4 there was still some phosphorus left in bleached oils. These oils have been found to contain only nonhydratable phospholipids, being among others the products of phosphatidylcholine and phosphatidylethanoloamine degradation, as well as inorganic phosphates /research under way/.

The content of total sulphur in oils, in spite of low level of glucosinolates content in rapeseed, was relatively high. The content of total sulphur in extracted oils was

almost 3 times higher than in pressed oils. Volatile sulphur compounds constituted 15-40% of total sulphur in these oils.

The chromatograms of volatile compounds contained in both kinds of oils were totally different. 1-cyano--3,4 epithiobutane was the main component of pressed oils while in extracted oils - 1-isothiocyanate-3-butene, and an unidentified compound. Volatile sulphur compounds constituted 15 - 30% of the total sulphur contained in raw oils /Abraham, 1985/. Ca 50% of the total and volatile sulphur were left in bleached oils compared to raw oil.

Jantar variety rapeseed oils were characterized by a high content of chlorophyll pigments; the possible reason being a substantial non-uniformity of seed with respect to maturity. The analysis of spectra indicated that pheophityne A constituted the main component of raw, neutralized and bleached oils, as opposed to laboratory extracted oils, in which chlorophyll A prevailed. A slightly higher content of pheophityne A has been found in pressed oils. The chlorophyll pigments were removed to a small extent during degumming and neutralization, despite the use of H_3PO_4. Bleached oils still contained rather large amounts of pheophityns, being responsible for formation of green colour of hydrogenated oils.

Previous investigations proved that lutein constites the major component of carotenoids contained in oils /ca 90%/, the rest being β-carotene. More

polar xanthophylls are mainly removed during refining. It has been established on the basis of spectrogram analysis that carotenoids contained in bleached oils are a complex mixture of their isomers and degradation products.

The results of investigations on industrial refining of Jantar variety rapeseed oil demonstrated that large amounts of phosphorus compounds and pheophityns remained in bleached oils despite the use of H_3PO_4. The phenomenon proves the necessity of application of more severe refining conditions or modification of the process, special attention paid to preconditioning of the oil before refining. Of special significance is the quality of the processed rapeseed, determined among others by a degree of seed maturity, and hence the level of content of chlorophyll pigments.

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