INFLUENCE OF TECHNOLOGICAL PROCESSES ON THE QUALITY OF RAPESEED LECITHIN

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Introduction

We have previously reported on the applicability of rapeseed and soybean lecithins in the food industry (NIEWIADOMSKI, 1970; NIEWIADOMSKI et al., 1972).

The phospholipids which are present in oil bearing seeds occur as phospholipid-protein complexes. The stability of these complexes is dependent upon the moisture content of the seeds and the temperature. Thus, the composition of phospholipids isolated under industrial conditions differs from that of the phospholipids present in the fresh seeds.

Methods

Effect of the rapeseed cooking process. Thermal treatmant takes place at the time of cooking the seed before the oil is extracted. The effects of heating during one hour were investigated (SAWICKI et al., 1974) in an oil mill. Subsequently the crushed seeds were extracted in a pilot plant apparatus and the oil obtained was dried.

Table 1: Influence of cooking of the rapeseed meal on the phospholipid content of rapeseed oil

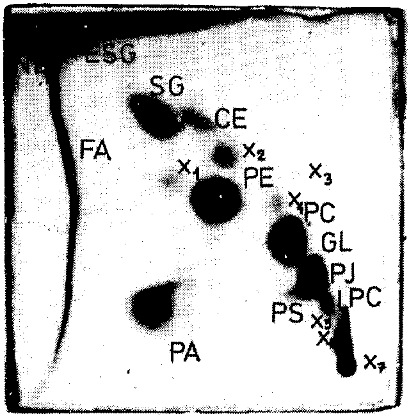
Temperature (° C)	Acid value of the oil	% P	Quantity of phospholipids (%)
20	2,3	0,015	0,01
60	3,0	0,024	0,10
90	3,2	0,043	0,60

It is obvious from table 1 that the higher the temperature the more phospholipids pass over to the oil during extraction.

The oil from seeds that had not been subjected to heating are least coloured. Lecithin from unheated meal has a characteristic smell with a delicate sour component, but seeds are heated to 90° C a strong smell of rapeseed lecithin appears.

A comparison of oil obtained by industrial distillation with that from the same source but freed of a solvent under laboratory conditions showed that distillation conditions have no considerable effect upon content of colouring substances. Remarkable differences, however, were observed in the odor. Lecithin obtained in the laboratory had a much more pleasant characteristic rapeseed smell than the industrial material which had a "sickly" and "soupy" odor.

Composition of the gums from hydration. The composition of the sludge obtained after hydration in industrial processing of rapeseed was also investigated (ZAJAC and NIEWIADOMSKI, 1974). Figure 1 shows a typical thin-layer chromatogram.



NL - neutral lipids; ESG - esterified steryl glucosides; SG - steryl glucosides; CE - cerebrosides; PE - phosphatidyl ethanolamines; PC - phosphatidyl cholines; GL - glycolipids; PI - phosphatidyl inositols; PS - phosphatidyl serines; LPC - lysophosphatidyl cholines; PA - phosphatidic acids; FA - fatty acids; x - unidentified

Figure 1: Two-dimensional thin-layer chromatography of the lipids in rapeseed gum

We have found a total of 29 classes of lipids, quantitative data which are based mainly on the results of column chromatographic analyses are given in table 2.

Table 2: Composition of "rapeseed lecithins" and "soybean lecithins"

Component	"Lecithins" from	
	Rapeseed	Soybean
Neutral lipids	29	35
Phosphatidyl ethanolamines	17	8
Phosphatidyl cholines	20	21
Phosphatidyl inositols	8	20
Lysophosphatidyl cholines	1	no data
Glycolipids	11	no data
Others	14	11

The quantitative differences in the composition of lipid classes in rapeseed and soybean certainly do not qualify "rapeseed lecithin" as less valuable.

Effect of Drying Gum from hydration. The effect of temperature is apparent also at drying the sludge obtained in the hydration process. It is necessary to take into account not only the chemical characteristics but also consistency, colour ams smell of the material.

We used a thin-layer evaporator installed in a big oil mill (BRATKOWSKA and NIEWIADOMSKI, 1974). The effects of the initial moisture content of the sludge, of the temperature and of the pressure was determined.

It was found that the bigger the moisture content of the sludge the less water was contained in the lecithin at similar temperature and absolute pressure values.

In order to investigate the effect of drying on the colour, spectrophotometric measurements were taken of lecithin in chloroform solutions, both in UV and visible ranges. Standard lecithins were compared with those obtained under laboratory conditions from industrial gums. Lecithin dried at 115 and 121^{o} C contained the most "melanophosphatides" and it was least coloured.

The smell of the products was determined by means of the ranking method.

It was found that drying under laboratory conditions gives lecithin with a typical rapeseed oil smell, free of any smell. The intensity of smell increases in a factory as the temperature during sludge drying rises.

If the pressure inside the dryer is too high, the lecithin smells like cabbage and the degree of drying is insufficient.

Discussion

The quality of rapeseed lecithin is a result of a series of conditions during industrial processing. Our results can be summarized as follows:

- Lecithin should be dried at a lower temperature than 110^{o} C. Otherwise a burning smell appears and the colour is darker.
- The absolute pressure should not be higher than 0,2 kg/cm^{2}.
- The sludge should not contain more water than 33 to 40 %.

If those conditions are maintained the rapeseed lecithin has a light colour, an appropriate consistency, a pleasant taste and smell characteristic for rapeseed oil.

A factor of considerable significance is the content of sulfur compounds, which are characteristic for rapeseeds. In order to decrease it, the application of higher temperatures is advisable although these have an adverse effect on the phospholipides. The best possible vaccum conditions should, therefore, be provided in order to make the distillation process easier.

Provided proper industrial equipment is used the quality of the commercial lecitihin derived from rapeseed oil is solely dependent upon the application of appropriate technology.

Thus, rapeseed lecithin may offer additional economic advantages.

References

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