DETERMINATION OF TRANS ISOMERS IN HARDENED RAPESEED OIL

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ABSTRACT

Content of *cis* and *trans* isomers was determined in selected samples of hydrogenated low erucic rapeseed oil with methods of gas chromatography and infrared spectrometry.

INTRODUCTION

Process of hydrogenation of plant oils is accompanied with side reactions including forming of *trans* isomers and displacement of unsaturated bonds in carbon chain.
Determination of the formed *trans* isomers is the important problem in the estimation of hydrogenated product.

EXPERIMENTAL

Analytical methods

The samples of low erucic rapeseed oil with the different grade of hydrogenation were analysed.
Content of *trans* isomers was determined by the gas chromatography method and by infrared spectrometry method.
The grade of hydrogenation was also estimated on base of determination of iodine number.

Conditions of GLC method.
Hewlett-Packard gas chromatograph with flame ionization detector.
Column: SP-2560 (Supelco), length 100 m, diameter 0,25 mm,

gas carrier - argon, column temperature 200°C
gas carrier - helium, column temperature 180°C
Column: SP-2380, length 30 m, diameter 0,25 mm,
gas carrier - argon, column temperature 185°C.
Temperature of injector and detector 220°C.
The standard mixture of *cis-trans* isomers Number 4-5170 (Supelco) was used for identyfication of isomers.

RESULTS

The results are shown in Table 1.

SUMMARY

Method of infrared spectrometry allows for the fast, accurate determination of the total content of *trans* isomers in the samples of hydrogenated oils.
Method of gas chromatography requires interesterification of triglycerides into fatty acid methyl esters and time of analysis with use of capillary column with length 100 m elongates to 75 minutes.

Gas chromatography method supplies however more informations about analysed sample than infrared spectrometry method.
In time of one analysis quantitative composition of fatty acid methyl esters and total content of trans isomers (consistent with infrared spectrometry results)are determined.
It allows also to state if polymerization takes place during hydrogenation reaction. These data give important informations for introducing the changes in a hydrogenation process.

In our works the best results in a separation of geometrical isomers *cis - trans* as well as positional ones were achieved for the following conditions:column SP-2560, length 100 m at temperature 180°C with helium as gas carrier.

TABLE 1. *Cis* and *trans* isomers in selected samples of low erucic rapeseed oil

FAME	*Cis* and *trans* isomers; GLC, % Rapeseed oil			Hydrogenated rapeseed oil					
	IV 113,7			IV 93,9			IV 83,0		
	1	2	3	1	2	3	1	2	3
C18:0	1,8	2,1	1,8	3,2	3,2	3,2	3,5	3,9	3,9
cis C18:1 positional isomer cis	57,5	54,3	54,0	69,1	50,9	50,0	33,2	42,9	41,7
C18:1 trans	-	3,2	3,6	-	4,0	4,7	-	1,5	2,0
C18:1 cis	0,3	0,4	0,4	-	13,6	13,9	48,2	33,4	35,1
C18:2 cis-trans	19,8	19,8	20,0	9,0	7,7	7,6	-	0,8	0,5
C18:2 trans-cis	-	-	-		1,9	1,6	-	1,2	0,7
C18:2 trans-trans	-	-	-	3,0	2,2	2,1	2,5	1,2	0,8
C18:2 cis	-	-	-	1,1	1,3	1,3	-	1,0	1,3
C18:3+C20:1 trans	11,2	9,3	9,9	2,9	0,9	0,9	1,6	-	-
C18:3+C20:1	-	2,0	1,0	3,2	3,2	3,2	0,7	2,2	1,6
C20:0	0,6	0,6	0,6	0,6	0,7	0,6	0,7	0,8	0,8
Trans isomers	0,3	2,4	1,4	-	22,2	22,1	-	39,0	39,5
Trans isomers IR method		1,8			20,4			40,1	

1. SP-2380.185°C.AR
2. SP-2560.200°C.AR
3. SP-2560.180°C.HE