

Simultaneous Monitoring of 2-MCPD, 3-MCPD and Glycidyl esters in Oils and Fats

BMF 74 - Simultaneous Monitoring of 2-MCPD, 3-MCPD and Glycidyl esters in Oils and Fats

Monochloropropane-1,2-diol (MCPD) and its ester are food borne contaminants, mainly formed during high temperature processing of fat-containing matrices. Maximum levels of less than 2 µg MCPD per kilogram body weight per day have been established by Commission Regulation (EC) 1881/2006. The European Food Safety Authority (EFSA) Panel on Contaminants in the Food Chain (CONTAM) agreed with the estimate of 100 % release of 3-MCPD from its esters in humans.

Fatty acid esters of glycidol ("bound glycidol") are generated during the deodorization step of edible oil refining. Although the toxicological relevance of glycidyl fatty acid ester has not yet been fully elucidated, the glycidyl itself is categorized as a probable carcinogen in humans. Scientific studies indicate an almost entire release of glycidol from fatty acid esters within the digestive tract.

In 2013 EFSA published a scientific report on the analysis of occurrence of 3-MCPD in food in Europe and a preliminary expose assessment.

The European Commission therefore recommends the monitoring of the presence of MCPD, MCPD-esters and glycidyl esters in vegetable oils and fats. The preferred method for the determination of ester bound MCPD and glycidol is published by The American Oil Chemists' Society (AOAC).

AOAC official Method Cd 29a-13 is based on the method developed by Ermacora and Hrnčirik and describes the simultaneous analysis of 2- and 3-MCPD fatty esters and glycidyl fatty esters in edible oils and fats by acid transesterification:

The glycidyl esters are converted to 3-monobromopropandiol (3-MBPD) monoesters in an acid solution containing bromide salt. The 3-MBPD esters and the 2- and 3-MCPD esters, are then converted into free (non-esterified) form in acidic methanol solution. The fatty acid methyl esters generated during this reaction are extracted from the sample and 3-MBPD and 2- and 3-MCPD are then derivatised with phenylboronic acid prior to GC-MS analysis. Deuterated derivatives of glycidyl and 3-MCPD are used as internal standards.



CAMPRO
SCIENTIFIC

Germany

Tel. +49.(0)30.629.01.89.0
Fax +49.(0)30.629.01.89.89
info@campro.eu

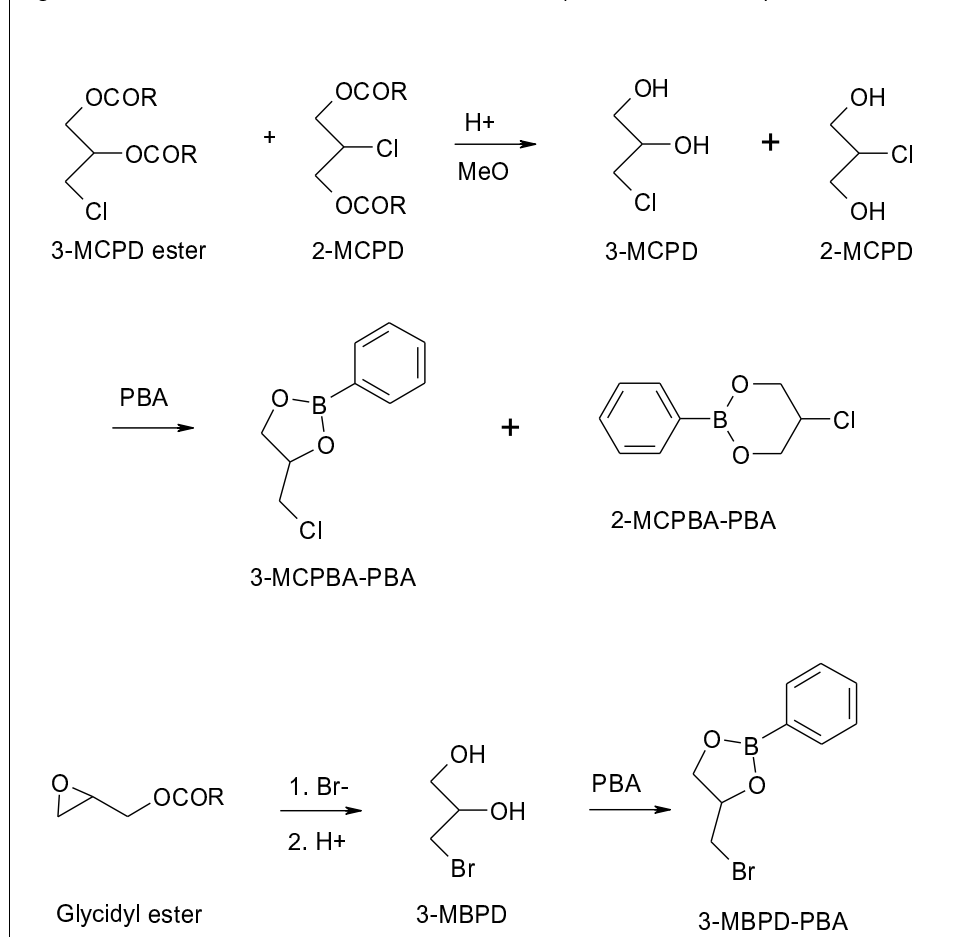
www.campro.eu

The Netherlands

Tel. +31.(0)318.529.437
Fax +31.(0)318.542.181
info.nl@campro.eu



Figure 1. Derivatization of 2-MCPD, 3-MCPD, 3-MBPD prior to GC-MS analysis



Required Standards:

High purity standards required for this method are offered by Chiron AS:

Chiron Cat. No.	Name	Abbreviation	Concentration	Purity
8967.35-K-T	1,2-Dipalmitoyl-3-chloropropanediol	PP-3-MCPD	1000µg/mL in toluene	99+ %
10523.35-K-T	1,3-Dipalmitoyl-2-chloropropanediol	PP-2-MCPD	1000µg/mL in toluene	98 %
8982.35-K-T	1,2-Dipalmitoyl-3-chloropropanediol-d5	PP-3-MCPD-d5	1000µg/mL in toluene	99+ %
9674.19-K-T	Glycidyl palmitate	Gly-P	1000µg/mL in toluene	99+ %
10524.19-K-T	Glycidyl palmitate-d5	Gly-P-d5	1000µg/mL in toluene	98 %
9924.19-K-T	Glycidyl palmitate-d31	Gly-P-d31	1000µg/mL in toluene	97+ %

Boronic acid derivative:

8618.9-K-ME	4-Chloromethyl-2-phenyl-1,3-dioxo-2-borolane 1000µg/mL in methanol, 98%
-------------	--

Available standards for MCPD and glycidyl ester analysis:

The following standards are available as either 10mg neat material, or in 1mL (minimum) of Toluene(T) at concentrations of 100µg/mL (100) or 1000µg/mL (K) as designated by the Chiron catalogue number.

	3-MCPD-1-monoesters	
8949.19-100-T	3-Chloro-1,2-propandiol-1-monopalmitate	3-MCPD-1-16:0
8950.19-100-T	3-Chloro-1,2-propandiol-1-monopalmitoleate	3-MCPD-1-16:1 (9-cis)
8951.21-100-T	3-Chloro-1,2-propandiol-1-monostearate	3-MCPD-1-18:0
8952.21-100-T	3-Chloro-1,2-propandiol-1-monooleate	3-MCPD-1-18:1 (9-cis)
8953.21-100-T	3-Chloro-1,2-propandiol-1-monolinoleate	3-MCPD-1-18:2 (9,12-dicis)

	2-MCPD-diesters	
10523.35-K-T	2-Chloro-1,3-propanediol-dipalmitate, PP-2-MCPD	2-MCPD-di16:0
10559.39-K-T	2-Chloro-1,3-propanediol-distearate	2-MCPD-di16:0

	3-MCPD-diesters	
8967.35-100-T	3-Chloro-1,2-propandiol-dipalmitate, PP-3-MCPD	3-MCPD-di16:0
8967.35-K-T	3-Chloro-1,2-propandiol-dipalmitate, PP-3-MCPD	3-MCPD-di16:0
8968.35-100-T	3-Chloro-1,2-propandiol-dipalmitoleate	3-MCPD-di16:1
8969.39-100-T	3-Chloro-1,2-propandiol-distearate	3-MCPD-di18:0
8969.39-K-IO	3-Chloro-1,2-propandiol-distearate	3-MCPD-di18:0
8970.39-100-T	3-Chloro-1,2-propandiol-dioleate	3-MCPD-di18:1
8971.39-100-T	3-Chloro-1,2-propandiol-dilinoleate	3-MCPD-di18:2

	Labelled MCPD-esters	
8981.19-100-T	3-Chloro-1,2-propandiol-1-monopalmitate-d5	3-MCPD-1-16:0-d5
8976.21-100-T	3-Chloro-1,2-propandiol-1-monostearate-d5	3-MCPD-1-18:0-d5
8977.25-100-T	3-Chloro-1,2-propandiol-1-monobehenate-d5	3-MCPD-1-22:0-d5
8982.35-100-T	3-Chloro-1,2-propandiol-dipalmitate-d5, PP-3-MCPD-d5	3-MCPD-di16:0-d5
8982.35-K-T	3-Chloro-1,2-propandiol-dipalmitate-d5, PP-3-MCPD-d5	3-MCPD-di16:0-d5
8978.39-100-T	3-Chloro-1,2-propandiol-distearate-d5	3-MCPD-di18:0-d5
8978.39-K-T	3-Chloro-1,2-propandiol-distearate-d5	3-MCPD-di18:0-d5
8979.47-100-T	3-Chloro-1,2-propandiol-dibehenate-d5	3-MCPD-di22:0-d5
8979.47-100-T	3-Chloro-1,2-propandiol-dibehenate-d5	3-MCPD-di22:0-d5

BMF 74 - Simultaneous Monitoring of 2-MCPD, 3-MCPD
and Glycidyl esters in Oils and Fats

	Glycidyl fatty acid esters	
9674.19-100-T	Glycidyl palmitate, Gly-P	glycidyl C16:0
9896.19-100-T	Glycidyl palmitoleate	glycidyl C16:1 (9-cis)
9899.21-100-T	Glycidyl stearate	glycidyl C18:0
9671.21-100-T	Glycidyl oleate	glycidyl C18:1 (9-cis)
9673.21-100-T	Glycidyl linoleate	glycidyl C18:2 (9-cis, 12-cis)
9672.21-100-T	Glycidyl linolenate	glycidyl C18:3 (9-cis, 12-cis, 15-cis)
9897.23-100-T	Glycidyl arachidate	glycidyl C20:0
9900.23-100-T	Glycidyl gondolenate	glycidyl C20:1 (11-cis)
9898.25-100-T	Glycidyl behenate	glycidyl C22:0
9714.3-10MG	(+/-)-Glycidol	
10551.3-10MG	(+/-)-Glycidol-1,1,2,3,3-d5	

	Labelled glycidyl esters	
10524.19-K-T	Glycidyl palmitate-d5, Gly-P-d5	glycidyl C16:0-d5
9924.19-K-T	Glycidyl palmitate-d31, Gly-P-d31	glycidyl C16:0-d31
9924.19-10MG	Glycidyl palmitate-d31, Gly-P-d31	glycidyl C16:0-d31

Please note: All details are without guarantee.

Literature:

AOCS Official Method Cd 29a-13:

2- and 3-MCPD Fatty Acid Esters and Glycidol Fatty Acid Esters in Edible Oils and Fats by Transesterification.

AOCS Official Method Cd 29b-13:

Determination of Bound Monochloropropanediol- (MCPD-) and Bound 2,3-epoxy-1-propanol (glycidol) by Gas Chromatography/ Mass Spectrometry (GC/MS).

AOCS Official Method Cd 29c-13:

Fatty-acid-bound 3-chloropropane-1,2-diol (3-MCPD) and 2,3-epoxy-propane-1-ol (glycidol), Determination in Oil and Fats by GC/ MS (Differential Measurement).

European Commission, SANCO G (2014) 46514

A.Ermacora and K.Hrncirik (2012), J. Am. Chem. Soc. 89, 211-217

A.Ermacora and K.Hrncirik (2013), J. Am. Chem. Soc. 90, 1-8

A Novel Method for Simultaneous Monitoring of 2-MCPD, 3-MCPD and Glycidyl Esters in Oils and Fats.

For ordering and information about prices and delivery, please contact:

CAMPRO

SCIENTIFIC

Germany

Tel. +49.(0)30.629.01.89.0
Fax +49.(0)30.629.01.89.89
info@campro.eu

www.campro.eu

The Netherlands

Tel. +31.(0)318.529.437
Fax +31.(0)318.542.181
info.nl@campro.eu