EUROPEAN MARGARINE ASSOCIATION

IMACE POSITION

Setting maximum levels for 3-MCPD esters and glycidyl esters in final products

Brussels, 3 January 2024

Maximum levels for 3-MCPD esters (3-MCPDE) and glycidyl esters (GE) have already been established for oils and fats. Margarine producers already work with compliant oils.

Margarine and related products contain a fat phase and a water phase and can be characterized as water-in-oil (W/O) emulsions in which the water phase is finely dispersed as droplets in the continuous fat phase. The exact composition of the fat and water phase is depending on the properties of the end-product (application, taste, texture, nutritional properties, etc.).

Depending on the nature of the product the recipe will typically consist of a fat phase, emulsifier(s), flavour(s), colour(s), water, salt, vitamins and preservatives. Stabilizers are often added to low-fat spreads.

According to current knowledge 3-MCPD esters and glycidyl esters can be present in the oils and fats. The margarine producers work with oils compliant with the Regulation (EU) 2023/915 as regards maximum levels of 3-monochloropropanediol (3-MCPD), 3-MCPD fatty acid esters and glycidyl fatty acid esters in certain foods[1].

Emulsifiers are present in margarines and fat spreads in much lower amounts than oils and fats. The most common used emulsifiers in margarine and fat spreads are lecithin, E322 and mono- and diglycerides of fatty acids, E471. Other emulsifiers can also be used, depending on the application. Similarly, margarine producers work with emulsifiers E 471 compliant with the Regulation (EU) 2023/1428[2] as regards mono- and diglycerides of fatty acids (E 471).

[1] Commission Regulation (EU) 2023/915 of 25 April 2023 on maximum levels for certain contaminants in food and repealing Regulation (EC) No 1881/2006

[2] Commission Regulation (EU) 2023/1428 of 7 July 2023 amending the Annex to Regulation (EU) No 231/2012 as regards mono- and diglycerides of fatty acids (E 471)

Information on the possible degradation or formation of glycidyl esters and 3-MCPD esters during processing of the food

It is well established that 3-MCPDE and glycidyl esters can be potentially generated at high temperatures. It has been shown that 3-MCPDE are formed at temperatures above 180 °C[3] and GE are formed at temperatures above 200 °C[4].

Margarine and fat spreads are produced at much lower temperatures. Margarine and fat spreads are produced starting from a fat and a water phase. The fat phase is hold at a temperature above the melting point of the fat, typically at a temperature below 65°C. The highest temperature applied during the whole process is the temperature during pasteurization, which is at typically 75-85°C for a very short time (several seconds). After mixing the fat and the water phase, the emulsion is pumped to the crystallization line, where the emulsion is chilled in order to start the crystallization process.

It has been clearly demonstrated that during margarine processing there is no additional formation of 3-MCPDE and GE, besides what is already present in the raw materials (Ermacora and Hrncirik, 2014)[5].

Should the EC requests further data to validate the above, IMACE members are willing to submit data on ingredients and end-products to demonstrate this.

IMACE's view regarding the setting of maximum levels for 3-MCPD esters and glycidyl esters in margarines and fat spreads

IMACE members believe that levels on these contaminants should be regulated at the stage where formation and mitigation can occur.

As 3-MCPDE and GE are process contaminants and there is no formation of those during the production process of margarines and fat spreads, is therefore of IMACE opinion that if further maximum levels are to be established at EU level those should be set at raw material level, if needed.

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[3] F. Destaillats, B. D. Craft, L. Sandoz and Kornél Nagy. 2012. Formation mechanisms of Monochloropropanediol (MCPD) fatty acid diesters in refined palm (Elaeis guineensis) oil and related fractions. *Food Additives & Contaminants.* Part A, 29:1, 29-37

[4] F. Destaillats, B. D. Craft, M. Dubois and K. Nagy. 2012. Glycidyl esters in refined palm (Elaeis guineensis) oil and related fractions. Part I: Formation mechanism. Food Chemistry. V 131, Issue 4, 15 April 2012, Pages 1391-1398

[5] Ermacora and Hrnčiřík, 2014. Development of an analytical method for the simultaneous analysis of MCPD esters and glycidyl esters in oil-based foodstuffs. *Food Additives & Contaminants*.Vol. 31- Issue 6

For oils and fats, the max levels are already defined and applied. If maximum levels will be established for other ingredients, the margarine producers will work with compliant ingredients. In this case, it is of critical importance to have validated analytical methods for the determination of 3-MCPD esters and glycidyl esters in these ingredients.

Practical Examples

Case 1: Use of compliant oils and compliant E 471

Margarine 80% fat, of which 100% palm oil, including 0.3% E 471

	Glycidyl esters	3-MCPDE	
Contaminants in final product (80%) from oils	800 µg/kg	2000 µg/kg	
Contaminants in final product (0.3%) from E471	15 µg/kg	7.5 µg/kg	
Maximum permitted level, sum of individual oils + E471:	815 µg/kg	2007.5 µg/kg	Above the proposed limits by using compliant oils
Maximum permitted level, EC proposed product limit	750 µg/kg	1250 µg/kg	

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Case 2: Use of non-compliant oils in formulations and compliant E 471

Three-quarter fat margarine 60% fat, of which 40% palm oil and 60% liquid oils, including 0.3% E 471.

3-MCPD in oil mixture: (40% * 2750 µg/kg) + (60% x 1375 µg/kg) = 1925 µg/kg

	Glycidyl esters	3-MCPDE	
Contaminants in final product (60%) from oils	660 µg/kg	1155 µg/kg	
Contaminants in final product (0.3%) from E471	15 µg/kg	7.5 µg/kg	
Maximum permitted level, sum of individual oils + E471:	**675 µg/kg**	**1162.5 µg/kg**	**! Within the proposed limits with non-compliant oils !**
Maximum permitted level, EC proposed product limit	750 µg/kg	1250 µg/kg	

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