



Toolbox for the Mitigation of 3-MCPD Esters and Glycidyl Esters in Food

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German Federation for Food Law and Food Science

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Who is the BLL and who are its members?

The BLL

- is the umbrella association of the German food sector
- its membership consists of about 80 associations, 250 food companies and 150 individual members from:
 - Agriculture
 - Food manufacturers
 - Food industry
 - Retailers
 - Restaurants and Catering sector
 - Suppliers, Packaging industry
 - Commercial laboratories, Lawyers, Consultants



The BLL represents the food sector throughout the entire food chain “from farm to fork“

Toolbox zur Minimierung von 3-MCPD-Fettsäureestern und Glycidyl- Fettsäureestern in Lebensmitteln



April 2016



Toolbox for the Mitigation of 3-MCPD Esters and Glycidyl Esters in Food



December 2016



➤ **FEI-research projects on 3-MCPDE and GE in vegetable oils**

- 2009 – 2011: Investigations into the formation of 3-MCPD fatty acid esters (3-MCPDE) in vegetable oils and development of strategies for their mitigation
- 2012 – 2014: Basics for a large scale application of processes for the production of edible oils and fats with reduced levels of 3-MCPDE and related compounds
- 4 research bodies: Max-Rubner-Institut Detmold; PPM – Pilot Pflanzenöl-technologie Magdeburg; Deutsches Institut für Lebensmitteltechnik (DIL); Deutsche Forschungsanstalt für Lebensmittelchemie (DFA)
- monitoring of the research activities by a group of industry partners
coordination of the industry partners: BLL

 **Toolbox working group set up under coordination of the BLL
(January 2013)**

Members of Toolbox working group

- 4 German food sector associations (OVID, Margarine, BDSI, Kulinaria) and BLL
- 12 food companies (oil producers and processing industry, e.g. margarine, fine bakery products, hazelnut spreads, potato crisps, salad dressings, deep-fried fish products)
- 1 technical supplier for the oil producing industry
- 3 research bodies from the FEI-projects (MRI, PPM, DIL)
- 2 commercial laboratories (SGS Germany, CLF Eurofins),
1 food sector laboratory (LCI, Cologne)

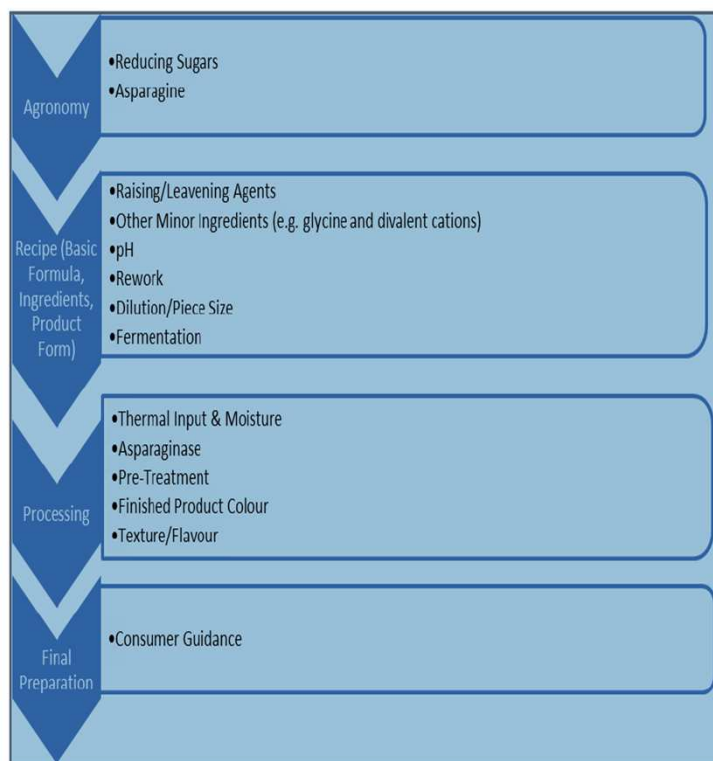
Aims of the Toolbox

- **promote and support measures to reduce levels of 3-MCPDE and GE in food**
- making results of the two FEI projects visible to food producers
- review the results considering practical knowledge and experiences from oil producers and provide „tested tools“
- add tools suitable for the food processing industry
- give access to information of scientific research and practical knowledge especially for SMEs
- **model: „Acrylamide Toolbox“ by FoodDrinkEurope**

Structure of the Toolbox: Main Groups



Acrylamide



3-MCPDE & GE

- Agriculture
- Oil Mill / Refinery (Vegetable oil Production)
- Industrial Use of Vegetable oils / Food Processing
- Food Preparation

Toolbox: Information provided for each tool

- short description of the tool (tool name)
- mode of action / mitigation effect of the tool
- oils for which the tool is most probably suitable (categories: all oils, fruit pulp oils, palm oil)
- substance classes which are reduced by the tool (categories: 3-MCPDE or GE or both or „unspecified“)
- conditions / limitations of use of the tool
- consequences of the use of the tool
- to what extent has the tool already been tested:

1. industrial scale	2. pilot scale	3. laboratory scale	4. model experiment	5. single result	6. theoretical consideration
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- reference (e.g. article, patent, presentation)

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Toolbox Main Group
Agriculture

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- **4 subgroups**

- Breeding
- Cultivation
- Harvest
- Storage and Transport (up to the oil mill)

- **4 tools in total**

- 1 tool for each subgroup
- combined tools to initiate effective mitigation (consisting of up to 7 single identified tools)



Examples:

- **Minimization of the entry of chlorine-containing substances during cultivation** *[theoretical consideration]*
 - e.g. check the use of chlorine-containing fertilizers and pesticides; avoid the use of chlorinated water or iron chloride when irrigating the plantations; avoid the cultivation on saline soils
 - suitable for all oils
 - reduces the levels of 3-MCPDE

- **Quick harvest at the optimal time; careful harvest, separation of loose/damaged fruits** *[single result]*
 - minimizes the enzymatic cleavage of triglycerides
 - suitable for fruit pulp oils
 - reduces the levels of 3-MCPDE and GE
 - not always possible in case of remote/hard to reach plantations

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Toolbox Main Group
Oil Mill/Refinery

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- **5 subgroups – 21 tools in total**
 - Production of crude oils – 2 tools
 - Refining of vegetable oils – 13 tools
 - Post-treatment of refined vegetable oils – 4 tools
 - Modification of vegetable oils – 2 tools
 - Storage and Transport (up to the customer) (no tools)
 - **Main Group with by far the highest number of tools**
 - **6 tools already tested on industrial scale**



Examples:

- **Replace physical refining by chemical refining** [*industrial scale*]
 - lower temperatures during the deodorization step possible; removes possible precursors by washing them out
 - suitable for all oils
 - reduces the levels of 3-MCPDE and GE
 - but: chemical refining has a higher environmental impact and results in higher oil losses

- **Deodorization using a two-step temperature profile (2-step-deodorization)** [*laboratory scale*]
 - reduces the temperature stress on the oil
 - suitable for all oils
 - reduces the levels of 3-MCPDE and GE
 - needs extra efforts

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Toolbox Main Group Industrial Use/Processing

BIOL



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Toolbox Main Group Preparation





Toolbox Main Groups Industrial Use / Processing and Preparation



■ **2 subgroups**

- Recipe = „exogenous source“
entry by the use of refined vegetable oils containing 3-MCPDE and/or GE
- Production process = „endogenous formation“
new formation of 3-MCPDE and/or GE during processing or preparation



Toolbox Main Groups Industrial Use / Processing and Preparation

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Subgroup Recipe - „exogenous source“

- Main Group Industrial Use / Processing
 - only 2 tools identified
 - selection of a suitable vegetable oil with lower levels of 3-MCPDE and GE
 - reduction of the amount of fat/oil in the final product
 - **both tools are used in practice by the food industry**
- Main Group Preparation
 - no tools identified
 - consumers cannot recognize whether it is a suitable vegetable oil with lower levels of 3-MCPDE and GE



Subgroup Production process - „endogenous formation“

- new formation possible during roasting, grilling or frying of food
- new formation obviously only affects MCPDE
- new formation seems only to affect certain foods of animal origin (fish, meat....)

The following tools have been tested for plausibility and are based on single results:

- add only low amounts of salt, use ingredients that are low in salt
- reduce temperatures during processing or preparation
- keep the usage time of a frying fat as short as possible

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Download:

<https://www.bll.de/de/lebensmittel/sicherheit/unerwuenschte-stoffe-kontaminanten/3-mcpd-und-glycidyl-fettsaeureester/toolbox-minimierung-3-mcpd-glycidyl>