



## Residue Analysis: Ethylene Oxide

Ethylene oxide is a highly toxic and reactive gas used to kill animal pests in warehouses and overseas containers. Due to its bactericidal and fungicidal effect, it is also still used to sterilise seeds, spices and other heat-sensitive food raw materials in large parts of the world - especially in Asia, but also in the USA.

### RESIDUES OF ETHYLENE OXIDE DETECTED IN VARIOUS PRODUCTS

In the EU the use of the fumigant, which is classified as a pesticide and biocide, has been banned for food applications since 1981. It may still be used for disinfection if contact with food is safely excluded.

In August 2020, the first reports of illegal use of ethylene oxide in sesame seeds became known.



A warning via the European **Rapid Alert System (RASFF)** from Belgium in September 2020 then triggered a wave of investigations into residues of the active substance and its degradation product (2-chloroethanol).

The true extent of the contamination originating in India was revealed. The EU Commission then tightened the import conditions for sesame seeds from India and increased the control frequency for imports.



The highly contaminated sesame seeds from India were presumably intended to be particularly effectively protected against salmonella infestation.

After numerous complaints regarding the microbiological condition the EU had already tightened the import conditions beforehand. The goods were quickly distributed via branched trade routes and subsequently already processed in many products before the contamination was detected. Numerous product recalls and costly destruction of goods were and still are the result.

In the meantime, residues of ethylene oxide/2-chloroethanol have also been discovered in spices (e.g. pepper, turmeric, ginger powder).

While ethylene oxide itself decomposes quickly as a reactive gas, its main degradation product is chemically stable and no less toxic, albeit in a different way.

Link to RASFF - Illegal use of ethylene oxide: [https://ec.europa.eu/food/safety/rasff/ethylene-oxide-incident\\_en](https://ec.europa.eu/food/safety/rasff/ethylene-oxide-incident_en)

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## THE EU MAXIMUM RESIDUE REGULATION

The **EU Maximum Residue Regulation (EC) No. 396/2005** defines the maximum residue level in relation to the sum parameter of the active substance ethylene oxide itself and its metabolite 2-chloroethanol, which is formed upon reaction with chlorides and chlorine-containing compounds.

The result is expressed in the analysis report as „ethylene oxide“.

Code number	Groups and examples of individual products to which the MRLs apply	Current MRL [mg/kg]
0100000	FRUITS, FRESH or FROZEN; TREE NUTS	0.02
0120000	except : Tree nuts	0.05
0200000	VEGETABLES, FRESH or FROZEN	0.02
0300000	PULSES	0.02
0400000	OILSEEDS AND OIL FRUITS *	0.05
0500000	CEREALS	0.02
0600000	TEAS, COFFEE, HERBAL INFUSIONS, COCOA AND CAROBS	0.10
0800000	SPICES	0.10

For detailed data please refer to: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015R0868>

**\*Note:** Sesame belongs to OILSEEDS AND OIL FRUITS

## OUR LABORATORY IN ROTTERDAM IS YOUR SPECIALIST FOR FOOD ANALYSIS

Our **AGROLAB laboratory Dr. Verwey** was confronted with a sharp increase in demand for analytical residue testing for ethylene oxide last autumn and was able to ramp up its measurement capacity for this test in record time.



Our in-house method is based on the German method according to §64 LFGB ASU 53.00-1. It involves the conversion of 2-Chlorethanol to ethylene oxide under alkaline conditions. The produced ethylene oxide (consisting of any ethylene oxide originally present in the sample and the ethylene oxide formed from ethylene chlorohydrin) is purged via a nitrogen flow into an aqueous reservoir containing sodium iodide and sulfuric acid.

The ethylene oxide is converted to iodohydrin, which is subsequently partitioned into ethyl acetate. The iodohydrin content is determined by gas chromatography using tandem mass spectrometric (GC-MS/MS) detection. The limit of quantification is 0.01 mg/kg.

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