

INFORMATION ABOUT PESTICIDES – ANALYSIS AND APPLICATION

MULTI-METHODS

- Multi-method DIN EN 15662 (ASU L00.00-115)
 - Applications: fruit, vegetables, tea (*Camellia sinensis*), fruit tea, cereals, legumes, high-fat products, animal products
 - In this determination, we prepare the samples according to the QuEChERS method, which has been firmly established and officially recognized for several years. QuEChERS stands for "Quick Easy Cheap Effective Rugged Safe" and describes a multi-method that can detect many substances simultaneously. We prepare the sample by extracting the analyte with acetonitrile and then measuring and quantifying by GC-MS, GC-FPD, GC-MS/MS, and LC-MS/MS. These multi-methods are applied via LC-MS/MS for all mentioned matrices as well as for high-fat matrices and samples of animal origin.
- Multi-method advanced DFG S19/ASU L00.00-34
 - Applications: herbs, spices, complex fruit teas, edible oils, fats, high-fat products, animal products
 - The modular multi-method ASU L00.00-34 (extended revision of the DFG method S19) is a proven method for the detection of pesticide residues with a wide range of applications. The method makes it possible to adapt extraction and determination methods by selecting individual building blocks (modules) for a wide variety of examination materials and analysis spectra. GC-MS, GC-FPD, GC-MS/MS and LC-MS/MS detect pesticide residues.

INDIVIDUAL AND GROUP METHODS

- Inorganic total bromide (DIN EN 13191-2)
 - Method: DIN EN 13191-2; GC-ECD
 - Applications: cereals, vegetables, dried fruits, nuts
 - This official method describes routine procedures for the preparation and quantification of bromide residues. In plant foods, it extracts and derivates inorganic bromide and detects it by GC-ECD. Please note: In the case of bromide detection, it cannot be distinguished whether it is a residue from gassing with methyl bromide (bromomethane) or is derived from geogenic origin (e.g. on cultivated land near the sea).
- Anthraquinone
 - Method: ASU L00.00-34; GC/DIN EN 15662; GC-MS/MS
 - Anthraquinone was used until 2013 as a raw material additive in the production of paper and cardboard. In the case of food packaging materials, anthraquinone could not be excluded from the food (migration). Anthraquinone is also formed when organic material incompletely burns or is transferred to the food during drying or smoking.
- Chlormequat/Mepiquat
 - Method: DIN EN 15055, LC-MS/MS (QuPPE method)
 - Applications: cereals (wheat, oats), fruits (pears), mushrooms
 - Chlormequat/Mepiquat is one of the growth regulators (stem shortening), which are often used in cereal crops to prevent cereal damage. In some cases, the active ingredient is also used in fruit growing to increase the yield (increased fruit number or decreased fruit fall).
- Diquat
 - Method: SOP M 3054, LC-MS/MS
 - Applications: fruit, vegetables (especially carrots, leeks, onions)
 - Diquat is one of the contact herbicides used worldwide in fruit and viticulture, as well as in different vegetable crops such as carrots, leeks and onions. The agent is also used as an herbicide in the harvesting of potatoes and for desiccating/drying (burning) in oilseeds (oilseed rape, linseed, soybean, sunflower) and cereals (oat).

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■ Dithiocarbamates/Thiuram

- Method: DIN EN 12396-2; HS-GC-MS
- Applications: fruit, vegetables, tea, herbs
- Dithiocarbamates and thiuram disulfides are used in a variety of fruits and vegetables as foliar fungicides in agriculture. These include, among others: Maneb, Thiram, Metiram, Propineb and Ziram. These active agents do not track routine analytics individually, but quantify them via the release of carbon disulfide as CS₂.

■ Dodin

- Method: DIN EN 15662; LC-MS/MS
- Applications: apricots, pomes, peaches
- Dodin is used as a fungicide in the cultivation of pome fruit and stone fruit, especially in apricots. It also has a low curative effect against apple scab. Dodin can be detected qualitatively with the multi-method, but a quantitative analysis is only possible by individual determination.

■ Ethephon

- Method: SOP M 2887; LC-MS/MS (QuPPe method)
- Applications: fruit (especially pineapple), cereals
- Ethephon is used as a growth regulator for maturing (e.g. for apples, peppers, tomatoes and bananas), flower indexing (e.g. for pineapple) or for dissolving fruits (e.g. for cherries and gooseberries). The effect is based on the release of ethene (ethylene) which is absorbed by the plants, and acts as a hormone in growth processes.

■ Fosetyl and phosphonic acid

- Method: SOP M2887, LC-MS/MS (QuPPe method)
- Applications: fruits, vegetables, herbs
- Fosetyl as well as phosphonic acid are authorized in the EU. The salts of phosphonic acid have also been used in the past as fertilizers. There are indications that plants store phosphonic acid and excrete it, especially in permanent crops over a longer period of time. Fosetyl finds use, inter alia, with strawberries, tomatoes, peppers, grapes and citrus fruits. It is used as a systemic fungicide and can be detected together with phosphonic acid.

■ Glyphosate/Glufosinate/AMPA

- Method: SOP M 3144, GC-MS/MS
- Applications: cereals, legumes, tea
- Glyphosate is used as a preemergence nonselective herbicide and can also be used in viticulture and fruit growing if the leaf area is not near the ground. The active ingredient has gained particular importance in the cultivation of genetically modified plants such as soybeans, oilseed rape, and maize, which have a resistance to glyphosate. Glyphosate and its main degradation product AMPA (aminomethylphosphonic acid) has been increasingly detected in cereals and oilseeds in addition to cereals in recent years. Glufosinate is used as a broad-spectrum herbicide against a wide range of weeds.

■ Maleic hydrazide

- Method: SOP M 2887; LC-MS/MS (QuPPe method)
- Applications: potatoes, onions
- Maleic hydrazide is, among other things, a growth regulator used in the EU which is approved for use with potatoes and onions. Maleic hydrazide is also used as a herbicide in combination with other pesticides. The effect is based on the fact that the active ingredient inhibits cell division (mitosis) in root vegetation points and thus prevents sprouting and root growth.

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■ Ndl-PCB (non-dioxin-like polychlorinated biphenyls)

- Method: ASU L00 00-34; GC/DIN EN 15662; GC
- Application: animal products, vegetable oils, fats
- Ndl-PCBs (non-dioxin-like polychlorinated biphenyls) have been used in the past as hydraulic oils in transformers or in coatings. However, the manufacture and use of PCB has not been permitted for decades. PCBs belonging to the environmental contaminants are ubiquitous due to the persistence of the substances and improper disposal. According to research, the Ndl-PCBs (PCB 28, PCB 52, PCB 101, PCB 138, PCB 153, PCB 180) account for approximately 90% of total PCBs.

■ Nicotine

- Method: SOP M 2890, GC-MS/MS
- Applications: vegetables, herbal tea, spices
- Nicotine is a strong neurotoxin found predominantly in the tobacco plant. Other nightshade plants such as potatoes, tomatoes and eggplants also produce low levels of nicotine to repel predators. Previously, nicotine was also found in dried mushrooms and other dried products, which resulted in temporary maximum residue limits being determined for herbal tea, spices, mushrooms and others. The cause of the contamination of these foods with nicotine is still unclear because the substance has not been used as an insecticide in the EU since the 1980s.

■ Paraquat

- Method: SOP M 3056, GC-MS after isotope dilution analysis
- Application: herbal and fruit tea
- Pentachlorophenol (PCP) has fungicidal properties and acts as a wood preservative. PCP has been banned in Germany since 1989, but in some countries the substance is still used in the leather and textile industries. Therefore, in theory, food may also be contaminated via contact with wood, leather and textiles.

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■ Phosphine/Phosphane

- Method: SOP M 2330, HS-GC-FPDC
- Applications: cereals, animal feed, dried fruit, nuts
- Phosphine is also known as phosphorus hydrogen, aluminum phosphides or the molecular formula PH_3 . This fumigant is used in the storage protection (container gassing). For testing in foods, the substances should be sent to the laboratory as gas-tight as possible.

■ Acidic herbicides/free acids

- Method: SOP M 2889, LC-MS/MS/DIN EN 15662, LC-MS/MS
- Applications: cereals, legumes, herbs, fruits
- Acidic herbicides are carboxylic acids that act as herbicides. They are used as salt or ester in cereal cultivation against dicotyledonous plants such as thistle and chamomile. They work in the cultivation of cotton, soy, stone fruit, asparagus and coffee, but also generally in all crops, against annual and perennial weeds. We determine the acidic herbicides after hydrolysis of all salts and esters to their corresponding carboxylic acids. With the method DIN EN 15662, we determine the free acids and salts of the herbicides.

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■ Toxaphene/Camphechlor (Parlar 26, 50, 62)

- Method: ASU L00.00-34, GC-MS
- Applications: animal fats, fish, cotton
- Toxaphene/Camphechlor are chlorinated substances that have been used as insecticides in livestock or in cotton farming. According to the Stockholm Convention, toxaphene has been banned for decades because the substance belongs to the so-called "Dirty Dozen." The compounds accumulate in the fatty tissue of animals, especially fish, and thus enter the human organism.

OTHER METHODS FOR UNWANTED SUBSTANCES

■ Chlorate/Perchlorate

- Method: SOP M 2887, LC-MS/MS (QuPP method)
- Chlorate: Chloric acid salts have been used in the past for disinfection (biocide) or as an herbicide. Today, we return chlorate residues in food to chlorinated water during food processing or disinfection of food processing plants. Chlorate is formed during the chlorination of water with sodium hypochlorite or chlorine dioxide. Specific maximum residue limits have not yet been established.
- Perchlorate: Perchlorate naturally occurs in deposits of nitrate or potash. It forms in the atmosphere and precipitates into soil and groundwater. Perchlorate is an environmental contaminant that results from nitrate fertilizers as well as the use of rocket fuels, explosives, fireworks and other industrial processes. Perchlorate can also be formed in water disinfection with sodium hypochlorite. Water, soil and fertilizers are considered potential sources of food pollution.

■ QAC (quaternary ammonium compounds)

- Method: SOP M 2958, LC MS/MS
- Application: fruit, vegetables, animal foods
- QACs such as DDAC and BAC are used as cleaners and disinfectants, but also as plant tonics. Levels above the limit of quantification can be detected in fruits, vegetables and animal foods.

We are happy to adjust our analyses to your individual requirements.

**SGS INSTITUT FRESENIUS GMBH, BUILDING B5.2 (SAMPLE ENTRY), BUILDING B5.1 (CUSTOMER SERVICE)
TEGELER WEG 33, 10589 BERLIN, GERMANY, T +49 30 34607 - 700, F +49 30 34607 - 710, DE.FOOD.BERLIN@SGS.COM**

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