

# SureFood<sup>®</sup> GMO Kits

For qualitative and quantitative detection of genetically modified organisms (GMO) in food & feed

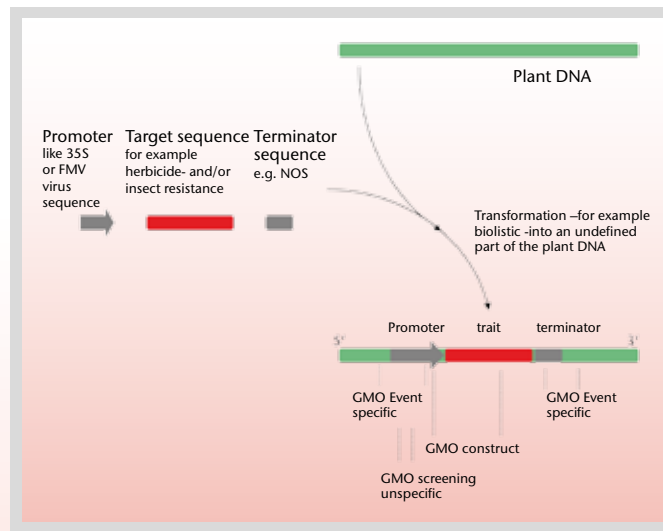
- Robust DNA preparation for complex samples
- Multiplex screening
- Qualitative detection
- Quantification



## GMO-analysis in food and feed

Currently, the routine analyses for the detection of genetically modified organisms (GMO) focus on genetically modified crops.

Most GMO events contain promoter/terminator sequences (35S, NOS, FMV and others) which are not natural in these plants. Identification of these sequences is used for absence/presence screening of GMO. Some new GMO soya events do not contain such sequences. Screening must be performed by direct identification.



**Fig.:** Simplified presentation of the production and analytical sequences for plants containing GMO's

## A multi-level analysis method of GMO products has proven its worth:

### 1. DNA preparation

According to the relevant ISO standards samples can be collected and the DNA can be prepared using SureFood® PREP Advanced. The efficiency of the extraction of difficult digested

plant tissue can be tested with GMO PLANT detection kits with or without internal amplification control or with the new SureFood® Animal + Plant Control.

### 2. Screening with SureFood® GMO SCREEN

The first screening step detects the presence of vectors as 35S, NOS or FMV (Figure Mosaic Virus). If the results are only 35S positive, checking with GMO SCREEN CaMV is recommended, to exclude a natural virus contamination. The differentiated detection of different vectors help to include/exclude potential

GMO events in particular plant matrices.

The GMO SCREEN 4plex 35S/NOS/FMV+IAC (S2126) in parallel or sequentially with BAR/NPTII/PAT/CTP2:CP4 EPSPS (S2127) offers a comprehensive analysis.

### 3. Qualitative identification with SureFood® GMO ID

For food, the zero tolerance thresholds are set for GMO's that are not approved in the EU. Thus, a qualitative identification

is sufficient. The detection limit of SureFood® GMO test kits is about 0.01 % depending on the matrix and level of processing.

### 4. Relative quantification with SureFood® GMO QUANT

According to the EU labeling concept-defined by EC 1829/2003 and EC 1830/2003 – food has to be labelled with an allowed GMO-proportion of about 0.9 % per matrix. The GMO event quantification is proportionally relative to the particular plant

matrix (e.g. MIR162 to corn in food). EC 619/2011 applies for animal feed. 35S Corn and 35S Soya kits can be used to quantify GMO corn and GMO Soya unspecificly.

### Stacked events

Stacked Events (combination of GMO events in one plant) are difficult to identify but the presence of GMO will be detected using the screening kits.

### Future GMO technology

The CRISPR technology will be used for genome editing (like a targeted natural mutation) in commercial available plants in the future; so far no regulation and no detection systems are available.

The modular SureFood® GMO kits can be used almost with any real-time thermocycler. The 4-plex kit needs a multiplex device for the detection of FAM-, VIC-, HEX-, Cy5-channel.

## Screening table of common crops containing GMO's

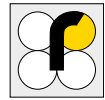
Due to the combination of different vectors, it is possible to include/exclude the presence of certain GMO events.

### Overview 1: Screening table

| GMO-event                      | OECD                         | Trait  | EU regulated                                | Screening elements |     |     |     |
|--------------------------------|------------------------------|--------|---|--------------------|-----|-----|-----|
|                                |                              |        |   | 35S                | NOS | FMV | BAR |
| <b>Soya</b>                    |                              |        |   |                    |     |     |     |
| A2704-12 Liberty Link          | ACS-GM005-3                  | HR     | F&F, imp                                    | +                  | -   | -   | -   |
| G94-1, G94-19, G-168           | DD-026005-                   | PQ     | -   | +                  | +   | -   | -   |
| GTS 40-3-2 Roundup Ready       | MON-04032-6                  | HR     | F&F, imp. application for culture withdrawn | +                  | +   | -   | -   |
| MON89788 Roundup Ready 2 Yield | MON-89788-1                  | HR     | F&F, imp                                    | -                  | -   | +   | -   |
| W 62, W98 Liberty-Link         | ACS-GMO001-8<br>ACS-GMO002-9 | HR     | -   | +                  | +   | -   | +   |
| <b>Corn</b>                    |                              |        |   |                    |     |     |     |
| 3272                           | SYN-E3272                    | PQ     | In process                                  | -                  | +   | -   | -   |
| Bt11                           | SYN-BT 011-1                 | IR     | F&F with drawn                              | +                  | +   | -   | -   |
| BT176 NaturGard KnockOut       | SYN-EV176-9                  | IR     | Expired                                     | +                  | -   | -   | +   |
| CBH-351 StarLink               | ACS-ZM004-3                  | HR, IR | -   | +                  | +   | -   | +   |
| DAS59122 Herculex RW           | DAS-59122-7                  | HR, IR | F&F, imp                                    | +                  | -   | -   | -   |
| GA21 Roundup Ready             | MON-00021-9                  | HR,    | F&F, imp, cult in process                   | -                  | +   | -   | -   |
| MIR162                         | SYN-IR162-4                  | IR     | F&F, imp                                    | -                  | +   | -   | -   |
| MIR604                         | SYN-IR604-5                  | IR     | F&F, imp                                    | -                  | +   | -   | -   |
| MON810 Yieldgard               | MON-00810-6                  | IR     | F&F, imp, cult in process                   | +                  | -   | -   | -   |
| MON863                         | MON-00863-5                  | IR     | F&F, imp                                    | +                  | +   | -   | -   |
| MON88017                       | MON-88017-3                  | HR, IR | F&F, imp                                    | +                  | +   | -   | -   |
| MON89034                       | MON-89034-3                  | IR     | F&F   | +                  | +   | +   | -   |
| NK603 Roundup Ready            | MON-00603                    | HR     | F&F   | +                  | +   | -   | -   |
| T25 LibertyLink                | ACS-ZM003-2                  | IR     | F&F, imp, cult                              | +                  | -   | -   | -   |
| TC1507 Herculex I              | DAS-01507-1                  | HR, IR | F&F   | +                  | -   | -   | -   |
| <b>Canola</b>                  |                              |        |   |                    |     |     |     |
| Falcon GS40/90 LibertyLink     | ACS-BN010-4                  | HR     | In process                                  | +                  | -   | -   | -   |
| GT73 Westar Roundup Ready      | MON-00073-7                  | HR,    | F&F, imp                                    | -                  | -   | +   | -   |
| GT200 Roundup Ready            | MON-89249-2                  | HR     | -   | -                  | -   | +   | -   |
| MS8xRF3 SeedLink               | ACS-BN005-8x<br>ACS-BN003-6  | HR, MS | F&F, imp                                    | -                  | +   | -   | +   |
| T45 (HCN28)                    | ACS-BN008-                   | HR     | F&F, imp                                    | +                  | -   | -   | -   |
| <b>Cotton</b>                  |                              |        |   |                    |     |     |     |
| LLCotton25                     | ACS-GH001-                   | HR     | F&F, imp                                    | +                  | -   | -   | +   |
| MON531 Bollgard                | MON-00531-                   | IR     | Imp, cult in process                        | +                  | +   | -   | -   |
| MON1445 Roundup Ready          | MON-01445-2                  | HR     | F&F, imp, cult in process                   | +                  | +   | +   | -   |
| MON15985 Bollgard II           | MON-15985-7                  | IR     | F&F, imp, cult in process                   | +                  | +   | -   | -   |
| <b>Rice</b>                    |                              |        |   |                    |     |     |     |
| LLRice62 LibertyLink           | ACS-OS002-                   | HR     | In process                                  | +                  | -   | -   | +   |
| LLRice601 LibertyLink          | BCS-S003-7                   | HR     | -   | +                  | -   | -   | -   |
| Bt63                           | -                            | IR     | -   | -                  | +   | -   | -   |
| <b>Potato</b>                  |                              |        |   |                    |     |     |     |
| EH92-527-1 Amflora             | BPS-25271-9                  | PQ     | F&F, cult                                   | -                  | +   | -   | -   |
| <b>Sugar beet</b>              |                              |        |   |                    |     |     |     |
| A5-A15                         | DLF-0A515-7                  | HR     | -   | +                  | +   | +   | -   |
| H7-1 Roundup Ready             | KM-00071-4                   | HR     | F&F   | -                  | -   | +   | -   |
| <b>Linseed</b>                 |                              |        |   |                    |     |     |     |
| FP967 CDC Triffid              | CDC-FL001-                   | HR     | -   | -                  | +   | -   | -   |
| <b>Papaya</b>                  |                              |        |   |                    |     |     |     |
| 55-1/63-1 SunUp/Rainbow        | -                            | VR     | -   | +                  | +   | -   | -   |

#### Legend

HR = herbicide resistance, IR = insect resistance, VR = virus resistance, PQ = product quality, MS = male sterility, F&F = accredited for food and feed  
Imp = import and processing; Cult = sowing in EU



## SureFood® GMO products

### Overview 2: SureFood® GMO kits

| SureFood®   | No. of tests/amount | Art. No. |
|---|---------------------|----------|
| <b>SureFood® PREP – DNA-preparation</b>                         |                     |          |
| Basic   | 100 preparations    | S1052    |
| Advanced  | 100 preparations    | S1053    |
| <b>Extraction control</b>                                       |                     |          |
| Animal + Plant Control  | 100 reactions       | F4053    |
| Plant PLUS  | 100 reactions       | S2049    |
| Plant   | 100 reactions       | S2056    |
| <b>SureFood® GMO SCREEN – qualitative real-time PCR</b>         |                     |          |
| CaMV  | 100 reactions       | S2027    |
| P35S:BAR Rice Screening   | 100 reactions       | S2022    |
| 35S + NOS + FMV Screening                                       | 3 x 100 reactions** | S2026    |
| <b>SureFood® multiplex screening</b>                            |                     |          |
| 4plex 35S/NOS/FMV+IAC Screening                                 | 100 reactions       | S2126    |
| 4plex BAR/PAT/NPTII/CTP2:CP4 EPSPS                              | 100 reactions       | S2127    |
| Plant 4plex Corn/Soya/Canola/ Cotton                            | 100 reactions       | S2156    |
| Plant 4plex Corn/Soya/Canola+IAC                                | 100 reactions       | S2158    |
| 4plex Soya I<br>(MON87708+CV127/DP305423/<br>MON87701/MON87769) | 100 reactions       | S2161    |
| 4plex Canola I<br>(MS8/6T73/T45 Canola)                         | 100 reactions       | S2166    |
| 4plex Canola II<br>(MON88302/DPO734906/RF3 Canola)              | 100 reactions       | S2167    |



SureFood® PREP Plant



SureFood® GMO SCREEN

| SureFood®   | Resistance/effect          | GMO producer      | No. of tests/amount | Art. No. |
|---|----------------------------|-------------------|---------------------|----------|
| <b>SureFood® GMO ID – qualitative real-time PCR</b>     |                            |                   |                     |          |
| Canola  |                            |                   |                     |          |
| MS8 Canola  | Herbicide res. Glufosinate | Bayer CropScience | 100 reactions       | S2062    |
| Corn  |                            |                   |                     |          |
| MIR162 Corn   | Insect res. Vip3Aa20       | Syngenta          | 100 reactions       | S2035    |
| MON863 Corn   | Insect res. Cry3B          | Monsanto          | 100 reactions       | S2037    |
| Rice  |                            |                   |                     |          |
| Bt63 Rice   | Insect res. CryI A(b)      |                   | 2 x 50 reactions    | S2024    |
| Soya  |                            |                   |                     |          |
| Roundup Ready Soya                                      | Herbicide res. Glyphosate  | Monsanto          | 100 reactions       | S2030    |
| RR2Y Soya   | Herbicide res. Glyphosate  | Monsanto          | 100 reactions       | S2034    |
| A2704-12 Soya   | Herbicide res. Glufosinate | Bayer CropScience | 100 reactions       | S2057    |
| <b>SureFood® GMO QUANT – quantitative real-time PCR</b> |                            |                   |                     |          |
| Corn  |                            |                   |                     |          |
| Bt176 Corn  | Herbicide res. Glufosinate | Bayer CropScience | 2 x 50 reactions*   | S2015    |
| Bt11 Corn   | Insect res. CryI A(b)      | Monsanto          | 2 x 50 reactions*   | S2016    |
| T25 Corn  | Constructive promoter      | diverse           | 2 x 50 reactions*   | S2017    |
| MON810 Corn   | Constructive promoter      | diverse           | 2 x 50 reactions*   | S2019    |
| 35S Corn  | Herbicide res. Glyphosate  | Monsanto          | 2 x 50 reactions*   | S2020    |
| NK603   | Herbicide res. Glyphosate  | Monsanto          | 2 x 50 reactions*   | S2050    |
| MON863 Corn   | Herbicide res. Glyphosate  | Monsanto          | 2 x 50 reactions*   | S2051    |
| GA21 Corn   | Insect res. Cry3Bb1        | Monsanto          | 2 x 50 reactions*   | S2054    |
| MIR162 Corn   | Herbicide res. Glyphosate  | Syngenta          | 2 x 50 reactions*   | S2135    |
| Soya  |                            |                   |                     |          |
| Roundup Ready Soya                                      | Herbicide res. Glyphosate  | Monsanto          | 2 x 50 reactions*   | S2014    |
| 35S Soya  | Constructive promoter      | diverse           | 2 x 50 reactions*   | S2028    |
| RR2Y Soya   | Herbicide res. Glyphosate  | Monsanto          | 2 x 50 reactions*   | S2029    |

\* 1x50 reactions to quantify the reference gene

\*\* Including 100 reactions inhibition Control MIX (ICM)