

SureFood® 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.

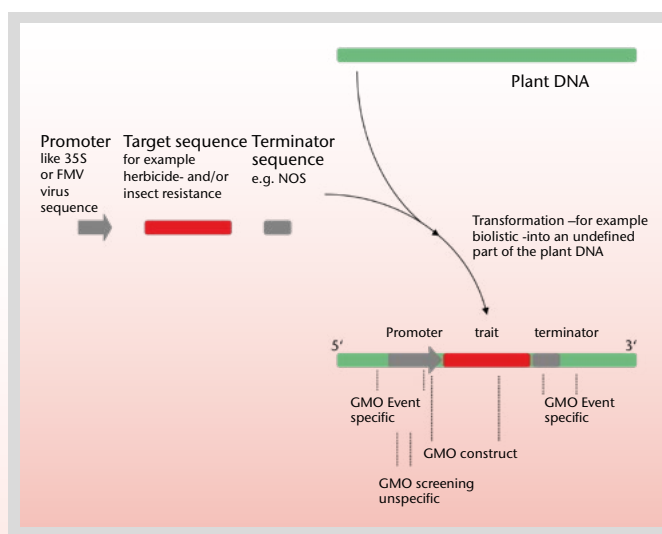


Fig.: Simplified presentation of the production and analytical sequences for plants containing GMO's

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.

GMO-event	OECD	Trait	EU regulated	Screening elements			
				35S	NOS	FMV	BAR
Soya							
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 ACS-GMO002-9	HR	-	+	+	-	+
Corn							
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	+	-	-	-
Canola							
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 ACS-BN003-6	HR, MS	F&F, imp	-	+	-	+
T45 (HCN28)	ACS-BN008-	HR	F&F, imp	+	-	-	-
Cotton							
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	+	+	-	-
Rice							
LLRice62 LibertyLink	ACS-OS002-	HR	In process	+	-	-	+
LLRice601 LibertyLink	BCS-S003-7	HR	-	+	-	-	-
Bt63	-	IR	-	-	+	-	-
Potato							
EH92-527-1 Amflora	BPS-25271-9	PQ	F&F, cult	-	+	-	-
Sugar beet							
A5-A15	DLF-0A515-7	HR	-	+	+	+	-
H7-1 Roundup Ready	KM-00071-4	HR	F&F	-	-	+	-
Linseed							
FP967 CDC Triffid	CDC-FL001-	HR	-	-	+	-	-
Papaya							
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

SureFood®	No. of tests/amount	Art. No.
SureFood® PREP – DNA-preparation		
Basic	100 preparations	S1052
Advanced	100 preparations	S1053
Add-On (For 2 g samples; in combination with SureFood® PREP Basic)	15 preparations	S1055
Extraction control		
Animal + Plant Control 3plex	100 reactions	F4053
SureFood® GMO		
Plant PLUS	100 reactions	S2049
Plant 4plex Corn/Soya/Canola/Cotton	100 reactions	S2156
Plant 4plex Corn/Soya/Canola+IAC	100 reactions	S2158
SureFood® GMO SCREEN – qualitative real-time PCR		
4plex 35S/NOS/FMV+IAC	100 reactions	S2126
4plex BAR/PAT/NPTII/CTP2:CP4 EPSPS	100 reactions	S2127
CaMV	100 reactions	S2027
4plex BAR/PAT/CryIAb/CTP2:CP4 EPSPS	100 reactions	S2128
P35S:BAR Rice	100 reactions	S2022



SureFood® PREP Basic



SureFood® GMO SCREEN 4plex Soya I

SureFood®	No. of tests/amount	Art. No.
SureFood® GMO ID – qualitative real-time PCR		
Canola		
4plex Canola I	100 reactions	S2166
4plex Canola II	100 reactions	S2167
Corn		
DAS-40278-9 Corn	100 reactions	S2140
4plex Corn I	100 reactions	S2170
Rice		
Bt63 Rice	2 x 50 reactions	S2024
Soya		
4plex Soya I	100 reactions	S2161
4plex Soya II	100 reactions	S2162
SureFood® GMO QUANT – quantitative real-time PCR		
Canola		
GT73 Quant	2 x 50 reactions*	S2061
Corn		
35S Corn	2 x 50 reactions*	S2020
Bt176 Corn	2 x 50 reactions*	S2015
Bt11 Corn	2 x 50 reactions*	S2016
GA21 Corn	2 x 50 reactions*	S2054
MIR162 Corn	2 x 50 reactions*	S2135
MON810 Cornx	2 x 50 reactions*	S2019
MON863 Corn	2 x 50 reactions*	S2051
MON89034 Corn	2 x 50 reactions*	S2071
NK603 Corn	2 x 50 reactions*	S2050
T25 Corn	2 x 50 reactions*	S2017
TC1507 Corn	2 x 50 reactions*	S2081
Soya		
Roundup Ready Soya	2 x 50 reactions*	S2014
35S Soya	2 x 50 reactions*	S2028
RR2Y Soya	2 x 50 reactions*	S2029
Reference material		
SureFood® GMO Plant Reference Sample	2 gram	S2150

MS8/6GT73/T45 Canola

MON88302/DPO734906/RF3 Canola

MON810/TC1507/NK603/MON89034

MON87708+CV127/DP305423/MON87701/MON87769

RR-Soya/RR-2Yield Soya/A2704-12/A5547-127

(0.1 % soya, maize, canola, rice)

* 1 x 50 reactions to quantify the reference gene

** Including 100 reactions inhibition Control MIX (ICM)