



## MODfinder

Genetically Modified Organisms

Real-Time PCR detection and quantification



Commercially available genetically modified organisms (GMO) are plants whose genome was artificially inserted with DNA fragments from foreign species. Europe developed a strict regulation to give maximum protection of public health and of environment, while at the same time providing a science based regulatory structure where biotechnology can flourish.

European public opinion has expressed the desire of having an informed choice in what they are eating. Consequently, the European Union has introduced legislation on the traceability and detection of GMOs, including labelling of food and feed containing GMOs, or derived products thereof, above a defined threshold of fortuitous presence.

The development and application of reliable detection and quantitative analytical methods was essential for the implementation of the labelling rules. Real-time PCR is the gold standard in GMO analysis according to ISO norms. The molecular analysis required to comply with the current European Union GMO legislation consist of three distinct steps:

#### **Detection**

#### **Identification**

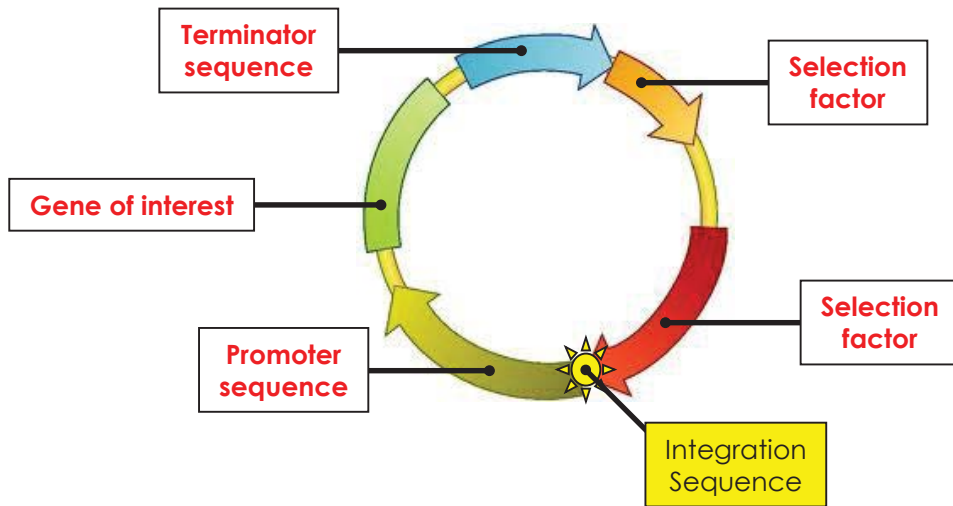
#### **Quantification**

**MODfinder** is the product line developed by **Generon** with premium quality molecular biology reagents to provide the customer a "turn-key" solution for the detection and quantification of a wide selection of specific and generic GMO events according to EU norms.

Using MODfinder products along with an appropriate DNA extraction method enables to test the presence of GMOs in the most diverse matrices: Bulk/Raw Ingredients, Semifinished products, Finished products.

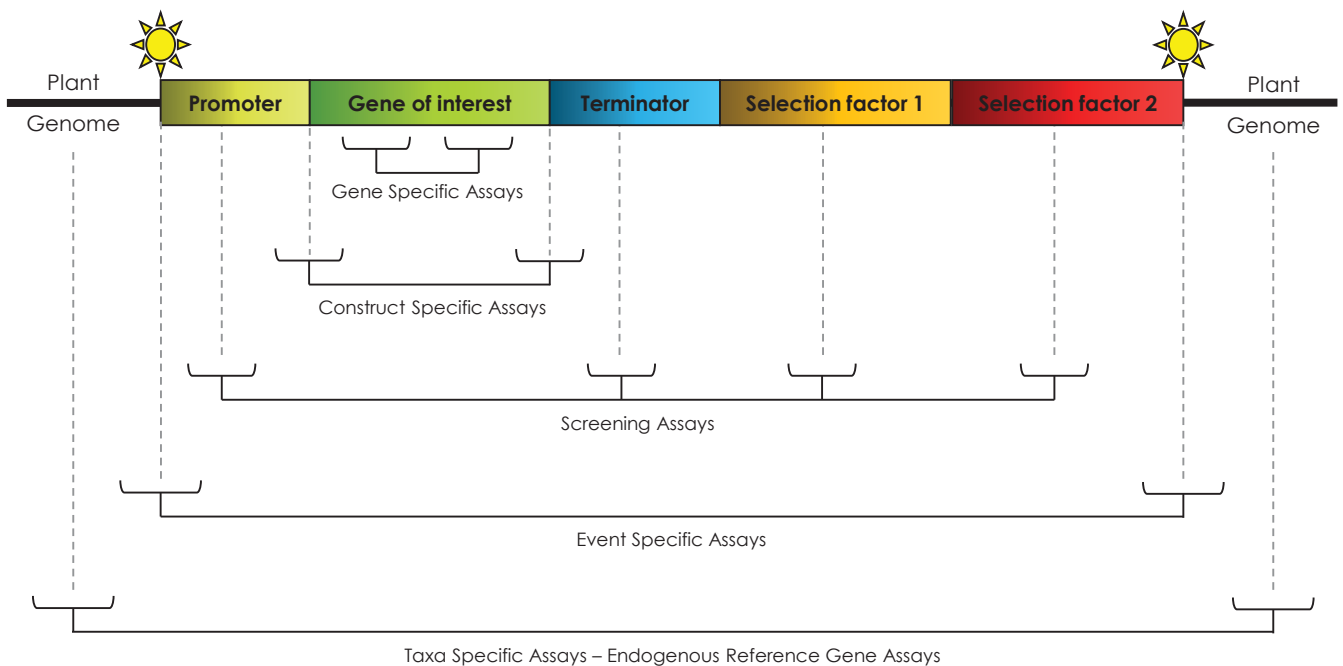
The gene construct is inserted in the recipient plant using a circular cloning vector composed of several elements, usually at least: the gene of interest, a promoter functioning as a start signal, a terminator functioning as a stop signal for regulation of gene expression and selection factors necessary for the segregation of the plasmid and of the transgenic cells (Figure 1).

**Figure 1** – Circular structure of a plasmid to transfer genes into a plant genome



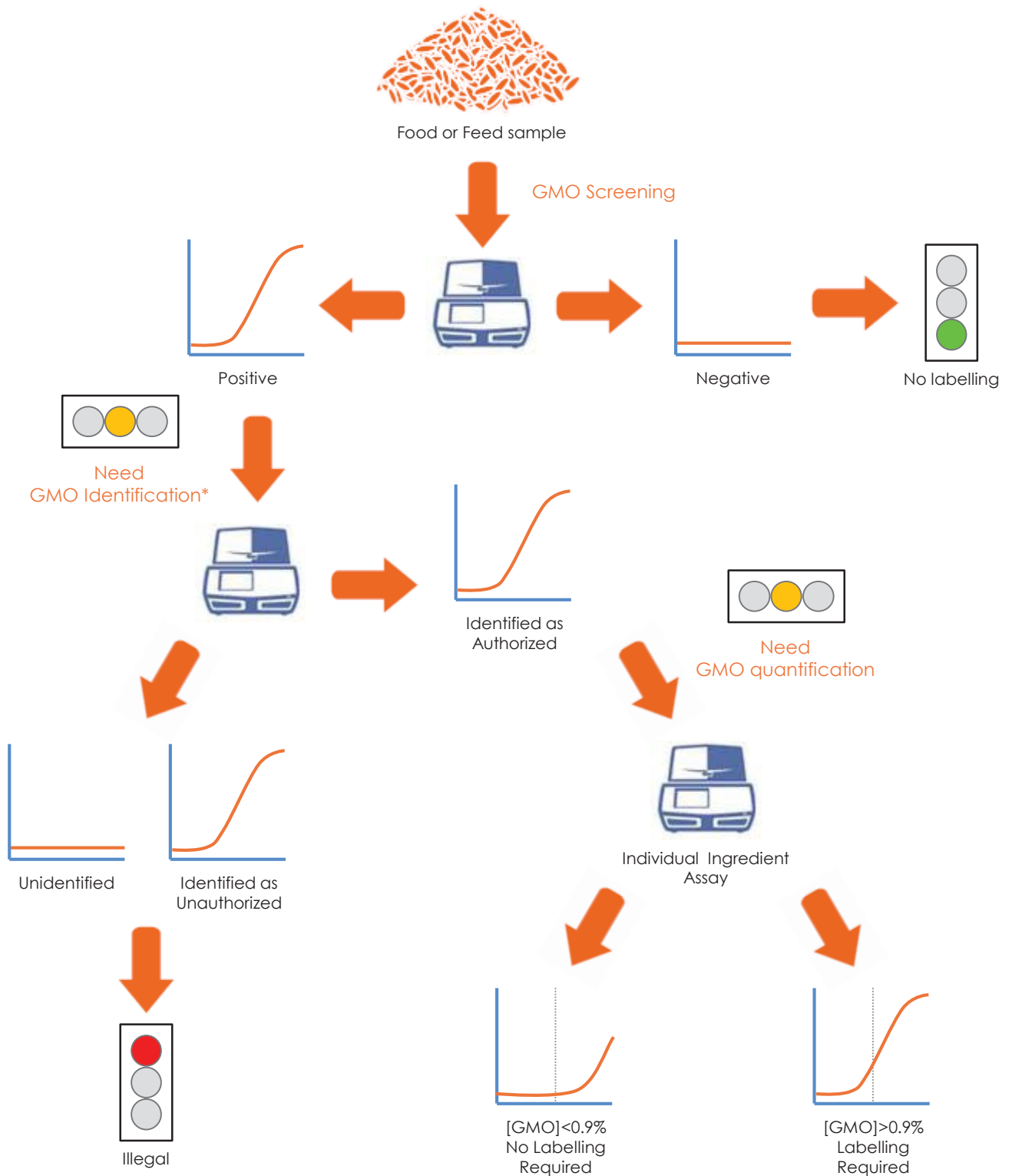
When the plasmid integrates into the plant genome it takes a linear structure that accounts for the different PCR-based GMO tests to detect it. These can be grouped into at least four categories corresponding to their level of specificity (Figure 2).

**Figure 2** – Structure of a «transgene cassette» transferred into a plant genome and PCR tests



The current EU legislation covers all GMOs that have received Community authorization for the placing on the market, including food and feed, containing or consisting of GMOs. Examples are GM seeds, and bulk quantities or shipments of whole GM grain e.g. soybean and maize. The regulations also cover food and feed products which are derived from GMOs. This includes starch, highly refined oil or flour produced from a GM maize or lecithin from soybean or rapeseed. Regulation (EC) 1829/2003 calls for the labelling of food and feed products that intentionally contain authorized GMO, or have an adventitious (accidental and technically unavoidable) presence of authorized GMOs, above a threshold of 0.9% in otherwise non-GMO food and feed. Every time that a non-labelled product contains authorized GMOs, but at a level below 0.9%, evidence must be provided that such adventitious presence could not have been avoided by routine food and feed chain procedures. Above the 0.9% threshold the product must be labelled. Noteworthy when the sample contains a mixture of GMOs, each ingredient (analytically translated as content per taxon) may not exceed 0.9%, irrespective of its proportion in the final product. In contrast, **unapproved GMOs are not permitted at any level.**

**Figure 3** – A decision tree for labelling GMO food and feed according to EU legislation



(\*) When testing complex matrices composed by more than one ingredient it is fundamental to have knowledge of the different plant varieties (taxa) present in the sample in order to restrict the number of GM specific tests to be performed.

As the number of genetically modified plants is increasing, it is necessary to use appropriate qualitative methods for GMO screening in food products. The basis for a qualitative GMO screening procedure is the use of control elements such as promoters, transcription terminators, and markers, such as resistance genes.

Negative responses from such a panel of screening methods eliminate the possibility of GMO presence in a test sample, but only if the selected screening methods cover all the GMOs to be detected.

**MODIfinder™ Screening Assays** collection includes:

- Real-Time assays for all the relevant screening target (including gene and construct specific assays) and allows their detection in single-plex or multiplex. Assays were developed following indications published in the JRC "*Compendium of reference methods for GMO analysis*" or in other peer reviewed scientific literature.
- Plant/Eukaryotic generic marker to determine the overall amplificability of the extracted DNA when ingredient are not known.

## MODfinder™ Screening Assays

### A. Singleplex Real-Time PCR kits for GM markers detection

Description (target acronym)	50 Reactions kit
MODfinder 35S Promoter Assay (p35S)	PGE01A-50
MODfinder 35S Terminator Assay (t35S)	PGE03A-50
MODfinder NOS Terminator Assay (tNOS)	PGE04A-50
MODfinder 28S Assay	PGE06A-50
MODfinder NptII Assay	PGE07A-50
MODfinder PAT Assay	PGE14A-50
MODfinder BAR Assay	PGE15A-50
MODfinder EPSPS Assay	PGE16A-50
MODfinder FMV Promoter Assay (pFMV)	PGE17A-50
MODfinder Cry1Ab/Ac Assay	PGE25A-50
MODfinder NOS Promoter Assay (pNOS)	PGE27A-50

### B. Multiplex Real-Time PCR kits for GM markers detection

Description	50 Reactions kit
MODfinder Assay 2-plex p35S(FAM) + tNOS(HEX)	PGE05A-50
MODfinder Assay 2-plex [NptII(FAM) + pNOS(Texas Red)]	PGE37A -50
MODfinder Assay 2-plex [NptII(FAM) + Pfmv(HEX)]	PGE40A -50
MODfinder MultiSCREEN Assay 3-plex [p35S(FAM)/tNOS (HEX)/pFMV(Cy5)]	PGE26A-50
MODfinder MultiSCREEN Assay 3-plex [p35S(FAM)/tNOS (HEX)/pFMV(Cy5) + IAC(Texas Red)]	PGE26A-C-50
MODfinder MultiSCREEN Assay 3-plex NPTII(FAM)/PAT (HEX)/EPSPS Cy5	PGE32A-50
MODfinder MultiSCREEN Assay 3-plex [ctp2cp4EPSPS(FAM)/PAT(HEX)/BAR(Texas Red)]	PGE38A-50
MODfinder MultiSCREEN Assay 4-plex p35S (FAM)/tNOS (HEX)/pFMV(Cy5)/BAR(Texas Red)	PGE34A-50
MODfinder MultiSCREEN Assay 4-plex NPTII (FAM)/PAT(HEX)/EPSPS (Cy5)/pNOS(Texas Red)	PGE35A-50
MODfinder MultiSCREEN Assay 4-plex [ctp2cp4EPSPS(FAM)/PAT(HEX)/BAR(Texas Red)/NPTII(cy5)]	PGE42A-50
MODfinder CP4EPSPS/BAR Duplex Assay [ctp2cp4EPSPS(FAM)+ BAR(HEX)]	PGE44A-50
MODfinder 35S Terminator/PAT Duplex Assay [35S terminator (FAM)+ PAT (HEX)]	PGE45A-50
MODfinder MultiSCREEN Assay 4-plex p35S(FAM)/tNOS(HEX)/pFMV(Cy5)/t35S(Texas Red)	PGE47A-50

### C. Special Screening kits

Description	50 Reactions kit
MODfinder CaMV Assay	PGE02A-50
MODfinder CaMV (FAM)/FMV (HEX) Duplex Assay	PGE39A-50
A positive screening for P35s or pFMV does not necessarily imply the presence of GMO-derived DNA. The detected genetic elements might as well naturally occur due to the presence of the host organisms namely the cauliflower mosaic virus (CaMV) or the figwort mosaic virus (FMV). These kits allow for the detection of the DNA of environmental Mosaic Virus causing "false GM positivity" when present in infected cells (e.g. rapeseed) contaminating the sample under investigation.	
MODfinder MultiSCREEN <b>Soy</b> 2-plex CV127/DP305423+DP356043(HEX)/MON87708+MON87769(FAM)	PGE41A-50
MODfinder MultiSCREEN <b>Soy</b> 3-plex CV127/DP305423/MON87701	PGS16A-50
This kit allows for the detection of these GM events all together in a single reaction: CV127 (FAM); DP305423 (HEX); MON87701 (Cy5).	
MODfinder MultiSCREEN <b>Soy</b> 3-plex A2704/DP356043/A5547	PGS18A-50
This kit allows for the detection of these GM events all together in a single reaction: A2704 (FAM); DP356043 (HEX); A5547 (Cy5).	
MODfinder MultiSCREEN <b>Soy</b> 3-plex CV127+MON87701/DP305423+DP356043/MON87708+MON87769	PGS21A-50
This kit allows for the detection of these GM events all together in a single reaction: CV127+MON87701 (FAM); DP305423+DP356043(HEX); MON87708+MON87769(Cy5).	
MODfinder MultiSCREEN <b>Canola</b> 3-plex Ms8/T45/Rf3	PGZ31A-50
This kit allows for the detection of these GM events all together in a single reaction: Ms8 (FAM); T45 (HEX); Rf3 (Cy5).	
MODfinder MultiSCREEN <b>Corn</b> LY038/DAS40278-9 Assay 2-PLEX	PGC28A-50
This kit allows for the detection of these GM events all together in a single reaction: LY038 (FAM); 98140(HEX); DAS40278-9 (Cy5).	

#### D. Kits for DNA Amplifiability verification

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Description	50 Reactions kit
MODfinder 28S (eukaryotic DNA) Assay	PGE06A-50
MODfinder Chloroplast ENDO Assay	PGE08A-50

For quantitation, the copy number of the GM PCR target relative to genome copies of the corresponding species is important because the principle of quantitation of GM content is to compare the relative ratio of these two. Usually, a PCR targeting a species-specific single copy gene is used to determine the amount of the species derived DNA, for example the soybean lectin gene for soya-derived DNA. Thus, we also need PCR methods for the reference targets (taxon specific endogenous reference gene).

These methods also help in the upstream identification of the ingredients present in an unknown and complex matrix, thus facilitating the identification of the contaminating, when the sample is found positive at a first screening.

Taxon specific assays can also be used to determine the overall amplifiability of the extracted DNA when the ingredient is known.



## MODfinder™ Taxon Specific Assays

### A. Singleplex Real-Time PCR kits for corn

Description	50 Reactions kit
MODfinder Zeine Assay	PGE10A-50
MODfinder Invertase Assay	PGE11A-50
MODfinder ADH1 Assay	PGE23A-50
MODfinder HMG Assay	PGE24A-50

### B. Singleplex Real-Time PCR kits for other taxon

Description	50 Reactions kit
MODfinder Soy (Lectin) Assay	PGE09A-50
MODfinder Flax Assay	PGE12A-50
MODfinder Rice Assay	PGE13A-50
MODfinder Canola (Rapeseed) Assay	PGE19A-50
MODfinder Potato Assay	PGE20A-50
MODfinder Cotton Assay	PGE21A-50
MODfinder Sugar Beet Assay	PGE22A-50
MODfinder Tomato Assay	PGE28A-50
MODfinder Wheat Assay	PGE29A-50

### C. Multiplex Real-Time PCR kits for taxa screening

Description	50 Reactions kit
MODfinder MultiENDO Corn/Soy Assay 2-PLEX This kit allows for a convenient detection of these taxa all together in a single reaction: Corn (FAM); Soy (HEX).	PGE43A-50
MODfinder MultiENDO Corn/Soy/Rapeseed/Cotton Assay 4-PLEX This kit allows for a convenient detection of these taxa all together in a single reaction: Corn (FAM); Soy (HEX); Rapeseed (Texas Red); Cotton (Cy5).	PGE33A-50

**MODfinder™ Identification Assays** were developed to detect the only unique signature of a transformation event that is the junction at the integration locus between the recipient genome and the inserted DNA. The identification of the GMO contaminating the matrix under investigation is a fundamental step when considering the labelling rules enforced in Europe.

Quantitation of GMO contamination must be in fact relative to something. In European legislation it refers to the presence w/w relative to the ingredient and not to the whole product. Therefore knowing exactly which is the event to quantify is crucial.

Noteworthy, even the event-specific methods have their limitations. When two GMOs are crossed (e.g. two different GM maize such as T25 and Mon810), the resulting hybrid offspring may contain the genetic modifications including the signatures of both events and will be indistinguishable from its two parents in a PCR test (unless the test is performed on DNA from a single plant, tissue or kernel/seed/grain). This phenomenon is referred to as **gene stacking**.

All the assays allows for qualitative DNA detection with a detection limit of 0.01% w/w depending on matrix and DNA preparation. Reaction volume 30 µl (sample 12 µl). Each assay box contains a positive and negative control.

Next tables list all the events (excluding the stacked events for clarity) registered in the Euginius project database, one of the most complete public database of GM available, their approval status [ ■ Approved ■ Not Approved ■ Approved with restrictions ] and the screening markers associated [ ■ Reported and detected by MODfinder screening assays ■ Reported as a modified variant and not detected by MODfinder screening assays] modified. Available MODfinder event specific kits part number are reported on the right.



# MODfinder™ GM Corn Identification Assays

Event	EU Approval	P-35S	T-35S	p-NOS	t-NOS	FMV	NPT II	EPSPS	PAT	BAR	Cry1Ab/AC	MODfinder Assay
32138	Red	Blue										
4114	Red	Blue	Blue						Blue			
5307	Red				Blue							PGC24A
676	Red	Blue	Blue						Blue			
678	Red	Blue	Blue						Blue			
680	Red	Blue	Blue						Blue			
B16 (DLL25)	Red	Blue								Blue		PGC06A
Bt10 maize	Red	Blue			Blue				Blue		Blue	
Bt11	Green	Blue			Blue				Blue		Blue	PGC04A
Bt176	Red	Blue	Blue							Blue	Blue	PGC01A
BVLA430101	Red											
CBH351	Red		Blue		Blue					Blue		
TC1507	Green	Blue	Blue						Blue			PGC08A
DAS40278	Red											PGC22A
DAS59122	Green	Blue	Blue						Blue			PGC11A
DAS59132	Red	Blue	Blue						Blue			
DBT418	Red	Blue								Blue	Blue	PGC12A
Event 3272	Red		Blue		Blue							PGC17A
Event 98140	Red	Blue										PGC13A
GA21	Green				Blue			Orange				PGC07A
LY038	Red											PGC16A
MIR162	Green		Blue		Blue							PGC14A
MIR604	Green				Blue							PGC10A
MON80100	Red	Blue			Blue		Blue	Blue			Blue	
MON802	Red	Blue			Blue		Blue	Blue			Blue	
MON809	Red	Blue			Blue		Blue	Blue			Blue	
MON810	Green	Blue			Blue		Blue	Blue			Blue	PGC02A
MON832	Red	Blue			Blue		Blue	Blue				
MON863	Red	Blue			Blue		Blue					PGC09A
MON87403	Red	Blue										
MON87411	Red	Blue						Blue				PGC27A
MON87419	Red								Blue			
MON87427	Green	Blue			Blue			Blue				PGC25A
MON87460	Green	Blue					Blue					PGC23A
MON88017	Green	Blue			Blue			Blue				PGC19A
MON89034	Green	Blue			Blue	Blue					Orange	PGC20A
Ms3	Red	Blue			Blue					Blue		
Ms6	Red	Blue			Blue					Blue		
MZHG0JG	Red	Blue			Blue	Blue		Blue	Blue			
MZIR098	Red	Blue			Blue			Blue	Blue			
NK603	Green	Blue			Blue			Blue				PGC05A
T14	Red	Blue	Blue						Blue			
T25	Green	Blue	Blue						Blue			PGC03A
TC6275	Red	Blue								Blue		
VCO-01981-5	Red		Blue					Blue				PGC26A

## MODfinder™ GM Soy Identification Assays

Event	EU Approval	P-35S	T-35S	p-NOS	t-NOS	FMV	NPT II	EPSPS	PAT	BAR	CryIAb/Ac	MODfinder Assay
260-05	Red	Blue			Blue							
A2704-12	Green	Blue							Blue			PGS01A
A2704-21	Red	Blue							Blue			
A5547-127	Green	Blue							Blue			PGS03A
A5547-35	Red	Blue	Blue						Blue			
CV127	Yellow											PGS08A
DAS44406	Green							Orange	Blue			PGS12A
DAS68416	Green								Blue			PGS13A
DAS81419	Red								Blue		Blue	PGS14A
DP305423	Green											PGS05A
DP356043	Green											PGS06A
FG72	Green				Blue			Blue				PGS11A
GTS 40-3-2	Green	Blue			Blue			Blue				PGS02A
GU262	Red	Blue	Blue						Blue			
MON87701	Green										Blue	PGS07A
MON87705	Green					Blue		Blue				PGS09A
MON87708	Green											PGS15A
MON87712	Red	Blue										
MON87751	Red										Blue	PGS19A
MON87754	Red											
MON87769	Green											PGS10A
MON89788	Green					Blue		Blue				PGS04A
SYHT0H2	Red	Blue			Blue				Blue			PGS20A
W62	Red	Blue			Blue					Blue		
W98	Red	Blue			Blue					Blue		

## MODfinder™ GM Rice Identification Assays

Event	EU Approval	P-35S	T-35S	p-NOS	t-NOS	FMV	NPT II	EPSPS	PAT	BAR	CryIAb/Ac	MODfinder Assay
Bt63	Red				Blue						Blue	PGR03A
Bt-ZJ22	Red				Blue							
Golden Rice 2	Red				Blue							
Kefeng6	Red	Blue	Blue								Blue	
KMD1	Red	Blue		Blue			Blue				Blue	
LLRICE06	Red	Blue	Blue							Blue		
LLRICE601	Red	Blue			Blue							PGR01A
LLRICE604	Red	Blue								Blue		
LLRICE62	Red	Blue	Blue									PGR02A
T1c-19	Red	Blue			Blue					Blue		

## MODfinder™ GM Cotton Identification Assays

Event	EU Approval	P-35S	T-35S	p-NOS	t-NOS	FMV	NPT II	EPSPS	PAT	BAR	Cry1Ab/Ac	MODfinder Assay
10215	Red	Blue										
10222	Red	Blue										
10224	Red	Blue										
19-51A	Red											
281-24-236	Red								Blue			PGT03A
3006-210-23	Red								Blue		Orange	PGT04A
31807	Red	Blue					Blue				Blue	
31808	Red	Blue					Blue				Blue	
BXN10211	Red	Blue										
COT102	Red				Blue						Blue	
COT67B	Red				Blue						Blue	
DAS81910	Red								Blue			
Event 1	Red	Blue			Blue		Blue				Blue	
GHB119	Red	Blue	Blue		Blue					Blue		PGT09A
GHB614	Green							Blue				PGT07A
LLCotton25	Green	Blue			Blue					Blue		PGT05A
MON1076	Red	Blue			Blue	Blue	Blue				Blue	
MON1445	Yellow	Blue			Blue	Blue	Blue					PGT02A
MON15985	Green	Blue			Blue		Blue				Blue	PGT06A
MON1698	Red	Blue			Blue	Blue	Blue					
MON531	Yellow	Blue			Blue		Blue				Blue	PGT01A
MON757	Red	Blue			Blue		Blue				Blue	
MON88701	Red	Blue			Blue			Blue		Blue		
MON88913	Green	Blue				Blue		Blue				PGT08A
T303-3	Red	Blue			Blue					Blue	Blue	
T304-40	Green	Blue			Blue					Blue	Orange	PGT10A

## MODfinder™ GM Sugarbeet Identification Assays

Event	EU Approval	P-35S	T-35S	p-NOS	t-NOS	FMV	NPT II	EPSPS	PAT	BAR	Cry1Ab/Ac	MODfinder Assay
GTSB77	Red	Blue				Blue		Blue				
H7-1	Yellow					Blue		Blue				PGB01A
SBVR111	Red		Blue		Blue							
T120-7	Red	Blue		Blue			Blue		Blue			

## MODfinder™ GM Rapeseed (Canola) Identification Assays

Event	EU Approval	P-35S	T-35S	p-NOS	t-NOS	FMV	NPT II	EPSPS	PAT	BAR	CryIAb/Ac	MODfinder Assay
23-18-17	Red	Blue					Blue					PGZ10A
23-198	Red	Blue					Blue					
73496	Red											
Falcon GS 40/90	Red	Blue	Blue						Blue			PGZ03A
GT200	Red					Blue		Blue				
GT73	Green					Blue		Blue				
HCN10	Red	Blue	Blue	Blue			Blue		Blue			PGZ11A
HCR1	Red	Blue	Blue						Blue			
Liberator	Red	Blue	Blue						Blue			
MON88302	Green					Blue		Blue				PGZ09A
MPS961	Red											
MPS962	Red											
MPS963	Red											PGZ01A
MPS964	Red											
MPS965	Red			Blue	Blue		Blue					
Ms1	Yellow			Blue	Blue		Blue			Blue		PGZ08A
Ms8	Green				Blue					Blue		
OXY-235	Red	Blue			Blue							
Rf1	Yellow			Blue	Blue		Blue			Blue		PGZ07A
Rf2	Yellow			Blue	Blue		Blue			Blue		
Rf3	Green				Blue					Blue		
T45	Green	Blue	Blue						Blue			PGZ04A
Topas 19/2	Yellow	Blue	Blue	Blue			Blue		Blue			

## MODfinder™ GM Flax Identification Assays

Event	EU Approval	P-35S	T-35S	p-NOS	t-NOS	FMV	NPT II	EPSPS	PAT	BAR	CryIAb/Ac	MODfinder Assay
FP967	Red			Blue	Blue		Blue					PGF01A

# MODfinder™ GM Potato Identification Assays

Event	EU Approval	P-35S	T-35S	P-NOS	1-NOS	FMV	NPT II	EPSPS	PAT	BAR	Cry1Ab/Ac
AM04-1020											
ATBT04-06											
ATBT04-27											
ATBT04-30											
ATBT04-31											
ATBT04-36											
AV43-6-G7											
Bt10 potato											
BT12 potato											
BT16 potato											
BT17 potato											
BT18 potato											
BT23 potato											
BT6 potato											
E12											
E24											
EH92-527-1											
F10											
F37											
G11											
H37											
H50											
HLMT15-15											
HLMT15-3											
HLMT15-46											
J3											
J55											
J78											
PH05-026-0048											
RBMT15-101											
RBMT21-129											
RBMT21-152											
RBMT21-350											
RBMT22-082											
RBMT22-186											
RBMT22-238											
RBMT22-262											
SEMT15-02											
SEMT15-15											
SPBT02-5											
SPBT02-7											
V11											
W8											
X17											
Y9											

MODfinder  
Assay

PGP01A

**MODfinder™ Quantitative kits** were developed to quantify the presence of a GMO in a sample according to EU indications.

For quantitation, the copy number of the GM PCR target relative to genome copies of the corresponding species is important because the principle of quantitation of GM content is to compare the relative ratio of these two. Usually, a PCR targeting a species-specific single copy gene is used to determine the amount of the species derived DNA, for example the soybean lectin gene for soya-derived DNA.

Using Real-Time PCR Quantitation can be done by comparison with a standard curve obtained by using DNA extracts from reference materials. In standard curve quantitation, the final quantitative estimate is based on comparing estimated quantity of GM to estimated quantity of reference TAXA.

All **MODfinder™ Quantitative kits** allows for qualitative DNA detection with a detection limit down to 0.01% w/w depending on matrix and DNA preparation. Reaction volume 30 µl (sample 12 µl). Each kit contains: event specific primers and probe mix (50 test, 30 µl reaction end volume); taxon specific primers and probe mix (50 test, 30 µl reaction end volume); standard solutions at scalar target GM concentration; taxon DNA standard solutions at scalar concentration; negative control. Standard solutions are obtained extracting lot traceable reference materials using lon-Force DNA Extraction kit.



## MODfinder™ Quantitative Assays

### A. Quantitative kits for CORN GM events

Description	50 Reactions kit
MODfinder Corn Bt176 Quantitative	PGC01Q-50
MODfinder Corn MON810 Quantitative	PGC02Q-50
MODfinder Corn T25 Quantitative	PGC03Q-50
MODfinder Corn BT11 Quantitative	PGC04Q-50
MODfinder Corn NK603 Quantitative	PGC05Q-50
MODfinder Corn GA21 Quantitative	PGC07Q-50
MODfinder Corn TC1507 Quantitative	PGC08Q-50
MODfinder Corn MON863 Quantitative	PGC09Q-50
MODfinder Corn MIR604 Quantitative	PGC10Q-50
MODfinder Corn DAS59122 Quantitative	PGC11Q-50
MODfinder Corn 98140 Quantitative	PGC13Q-50
MODfinder Corn MIR162 Quantitative	PGC14Q-50
MODfinder Corn Event 3272 Quantitative	PGC17Q-50
MODfinder Corn MON88017 Quantitative	PGC19Q-50
MODfinder Corn MON89034 Quantitative	PGC20Q-50
MODfinder Corn DAS40278 Quantitative	PGC22Q-50
MODfinder Corn MON87460 Quantitative	PGC23Q-50
MODfinder Corn Event 5307 Quantitative	PGC24Q-50
MODfinder Corn MON87427 Quantitative	PGC25Q-50
MODfinder Corn VCO-01981-5 Quantitative	PGC26Q-50
MODfinder Corn MON87411 Quantitative	PGC27Q-50

### B. Quantitative kits for SOY GM events

Description	50 Reactions kit
MODfinder Soybean A2704-12 Quantitative	PGS01Q-50
MODfinder Soybean GTS 40-3-2 (RoundUp Ready) Quantitative	PGS02Q-50
MODfinder Soybean A5547-127 Quantitative	PGS03Q-50
MODfinder Soybean MON89788 Quantitative	PGS04Q-50
MODfinder Soybean DP305423 Quantitative	PGS05Q-50
MODfinder Soybean DP356043 Quantitative	PGS06Q-50
MODfinder Soybean MON87701 Quantitative	PGS07Q-50
MODfinder Soybean CV127 Quantitative	PGS08Q-50
MODfinder Soybean MON87705 Quantitative	PGS09Q-50
MODfinder Soybean MON87769 Quantitative	PGS10Q-50
MODfinder Soybean FG72 Quantitative	PGS11Q-50
MODfinder Soybean DAS44406 Quantitative	PGS12Q-50
MODfinder Soybean DAS68416 Quantitative	PGS13Q-50
MODfinder Soybean DAS81419 Quantitative	PGS14Q-50
MODfinder Soybean MON87708 Quantitative	PGS15Q-50
MODfinder Soybean MON87751 Quantitative	PGS19Q-50
MODfinder Soybean SYHT0H2 Quantitative	PGS20Q-50

## MODfinder™ Quantitative Assays

### C. Quantitative kits for COTTON GM events

Description	50 Reactions kit
MODfinder Cotton MON531 Quantitative	PGT01Q-50
MODfinder Cotton MON1445 Quantitative	PGT02Q-50
MODfinder Cotton 281-24-236 Quantitative	PGT03Q-50
MODfinder Cotton 3006-210-23 Quantitative	PGT04Q-50
MODfinder Cotton LL 25 Quantitative	PGT05Q-50
MODfinder Cotton MON15985 Quantitative	PGT06Q-50
MODfinder Cotton GHB 614 Quantitative	PGT07Q-50
MODfinder Cotton MON88913 Quantitative	PGT08Q-50
MODfinder Cotton GHB119 Quantitative	PGT09Q-50
MODfinder Cotton T304-40 Quantitative	PGT10Q-50

### D. Quantitative kits for RAPESEED (Canola) GM events

Description	50 Reactions kit
MODfinder Canola MS8 Quantitative	PGZ01Q-50
MODfinder Canola RF3 Quantitative	PGZ02Q-50
MODfinder Canola RT73 Quantitative	PGZ03Q-50
MODfinder Canola T45 Quantitative	PGZ04Q-50
MODfinder Canola HCN92 Quantitative	PGZ05Q-50
MODfinder Canola RF1 Quantitative	PGZ06Q-50
MODfinder Canola RF2 Quantitative	PGZ07Q-50
MODfinder Canola OXY-235 Quantitative	PGZ08Q-50
MODfinder Canola MS1 Quantitative	PGZ09Q-50
MODfinder Canola DP073496 Quantitative	PGZ10Q-50
MODfinder Canola MON88302 Quantitative	PGZ11Q-50

### E. Quantitative kits for other taxa GM events

Description	50 Reactions kit
MODfinder Sugar beet RURH7-1 Quantitative	PGB01Q-50
MODfinder Potato AMFLORA Quantitative	PGP01Q-50
MODfinder Rice LL62 Quantitative	PGR02Q-50

### F. Quantitative kits for screening markers

Description	50 Reactions kit
MODfinder 35S Promoter Quantitative	PGE01Q-50
MODfinder tNOS Quantitative	PGE04Q-50

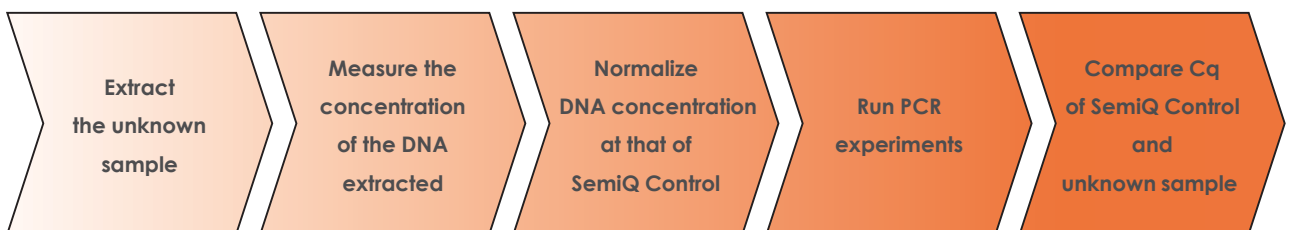
Gene stacking creates a problem not only with respect to identification, but it also creates a potential problem for quantitation. As an example, if a gene-stacked GM maize is authorized, then 0.6% gene-stacked hybrid shall be treated as a 0.6% GM maize according to EU legislation but PCR tests would report 0.6% GM maize A + 0.6% GM maize B, that is 1.2% GM maize altogether. Euginius Database lists: 39 Stacked GMO approved or approved with restrictions; 135 Stacked GMO not approved for any application.



**MODfinder™ SemiQ Controls** are purified DNA extracted from traceable reference materials at a defined concentration.

When used as cut-off positive controls in GM detection experiments performed on matrices derived from single ingredients (e.g. soy grains, lecithin, corn, corn starch...) when unknown samples are normalized at the same DNA concentration, they allow for a convenient estimation of contamination level without the need of more expensive classical quantification experiments.

MODfinder semiQ controls are available in 120 µl vials at a standard concentration of 3 ng DNA/µl and a 0.2% GM contamination, custom concentrations and cut-off are available on demand.



## MODfinder™ Semi-Q Controls

### A. Screening markers Semi-Q Controls

Cat.#	Marker	Cat.#	Marker	Cat.#	Marker
PGE01R	35S Promoter (p35S)	PGE07R	NptII	PGE17R	FMV promoter (pFMV)
PGE03R	35S Terminator (t35S)	PGE14R	PAT	PGE25R	Cry1Ab/Ac
PGE04R	NOS terminator (tNOS)	PGE15R	BAR	PGE27R	NOS promoter (pNOS)
PGE05R	p35S + tNOS Duplex	PGE16R	EPSPS	PGE36R	MultiSCREEN New Soy

### B. Events Specific Semi-Q Controls

Cat.#	Marker	Cat.#	Marker
PGC01R	MODfinder Corn Bt176 SemiQ Control	PGS11R	MODfinder Soybean FG72 SemiQ Control
PGC02R	MODfinder Corn MON 810 SemiQ Control	PGS12R	MODfinder Soybean DAS44406 SemiQ Control
PGC03R	MODfinder Corn T25 SemiQ Control	PGS13R	MODfinder Soybean DAS68416 SemiQ Control
PGC04R	MODfinder Corn BT11 SemiQ Control	PGS14R	MODfinder Soybean DAS81419 SemiQ Control
PGC05R	MODfinder Corn NK603 SemiQ Control	PGS15R	MODfinder Soybean DAS87708 SemiQ Control
PGC07R	MODfinder Corn GA21 SemiQ Control	PGS19R	MODfinder Soybean MON87751 SemiQ Control
PGC08R	MODfinder Corn TC1507 SemiQ Control	PGS20R	MODfinder Soybean SYHT0H2 SemiQ Control
PGC09R	MODfinder Corn MON 863 SemiQ Control	PGT01R	MODfinder Cotton MON 531 SemiQ Control
PGC10R	MODfinder Corn MIR 604 SemiQ Control	PGT02R	MODfinder Cotton MON 1445 SemiQ Control
PGC11R	MODfinder Corn DAS 59122 SemiQ Control	PGT03R	MODfinder Cotton 281-24-236 SemiQ Control
PGC13R	MODfinder Corn 98140 SemiQ Control	PGT04R	MODfinder Cotton 3006-210-23 SemiQ Control
PGC14R	MODfinder Corn MIR 162 SemiQ Control	PGT05R	MODfinder Cotton LL 25 SemiQ Control
PGC17R	MODfinder Corn Event 3272 SemiQ Control	PGT06R	MODfinder Cotton MON 15985 SemiQ Control
PGC19R	MODfinder Corn MON88017 SemiQ Control	PGT07R	MODfinder Cotton GHB 614 SemiQ Control
PGC20R	MODfinder Corn MON89034 SemiQ Control	PGT08R	MODfinder Cotton MON 88913 SemiQ Control
PGC22R	MODfinder Corn DAS 40278 SemiQ Control	PGT09R	MODfinder Cotton GHB119 SemiQ Control
PGC23R	MODfinder Corn MON87460 SemiQ Control	PGT10R	MODfinder Cotton T304-40 SemiQ Control
PGC24R	MODfinder Corn Event 5307 SemiQ Control	PGZ01R	MODfinder Canola MS8 SemiQ Control
PGC25R	MODfinder Corn MON87427 SemiQ Control	PGZ02R	MODfinder Canola RF3 SemiQ Control
PGC26R	MODfinder Corn VCO-01981-5 SemiQ Control	PGZ03R	MODfinder Canola RT73 SemiQ Control
PGC27R	MODfinder Corn MON87411 SemiQ Control	PGZ04R	MODfinder Canola T45 SemiQ Control
PGS01R	MODfinder Soybean A2704-12 SemiQ Control	PGZ06R	MODfinder Canola RF1 SemiQ Control
PGS02R	MODfinder Soybean GTS 40-3-2 SemiQ Control	PGZ07R	MODfinder Canola RF2 SemiQ Control
PGS03R	MODfinder Soybean A5547-127 SemiQ Control	PGZ08R	MODfinder Canola OXY-235 SemiQ Control
PGS04R	MODfinder Soybean MON89788 SemiQ Control	PGZ09R	MODfinder Canola MS1 SemiQ Control
PGS05R	MODfinder Soybean DP305423 SemiQ Control	PGZ10R	MODfinder Canola DP073496 SemiQ Control
PGS06R	MODfinder Soybean DP356043 SemiQ Control	PGZ11R	MODfinder Canola MON88302 SemiQ Control
PGS07R	MODfinder Soybean MON87701 SemiQ Control	PGP01R	MODfinder Potato AMFLORA SemiQ Control
PGS08R	MODfinder Soybean CV127 SemiQ Control	PGR02R	MODfinder Rice LL62 SemiQ Control
PGS09R	MODfinder Soybean MON87705 SemiQ Control	PGB01R	MODfinder Sugar beet RURH7-1 SemiQ Control
PGS10R	MODfinder Soybean MON87769 SemiQ Control		

The basis of digital PCR (dPCR) is to quantify the absolute number of targets present in a sample, using limiting dilutions, PCR and Poisson statistics.

At Generon we developed a **MODfinder Digit** a portfolio of kits based on Bio-Rad ddPCR systems for quantitative analysis of GMO in food and feed samples. Digital PCR is an alternative technique for quantifying gene copy number which may provide more accurate measurements than other approaches currently available as it is not dependent on amplification efficiency. Of particular importance, ddPCR measurements are made independent of any calibrator and, therefore, this technique has the potential to be considered as a primary method for use in certification of nucleic acid reference materials.

The measurement principle has a high metrological quality and can overcome several of Real-Time GMO analysis difficulties by transforming exponential data from conventional PCR to digital signals that simply indicate whether or not amplification has occurred after a defined number of cycles.

Thanks to the collaboration with major food testing entities and ddPCR technology implemented at the R&D department, Generon is able to provide **MODfinder ddPCR quantified controls** copy number counted positive controls for any target including some GMO that have no standard material available.

## MODfinder™ DigIT Kits

Cat.#	Description	Cat.#	Description
DGE01K	MODfinder DigIT 35S kit	DGE24K	MODfinder DigIT HMG kit
DGE04K	MODfinder DigIT †NOS kit	DGE34K	MODfinder DigIT pFMV/DP356043 + DP305423 kit
DGE05K	MODfinder DigIT p35S/†NOS duplex kit	DGC02K	MODfinder DigIT Corn MON 810 kit
DGE07K	MODfinder DigIT NPTII kit	DGC20K	MODfinder DigIT Corn MON89034 Assay
DGE09K	MODfinder DigIT Lectin kit	DGS01K	MODfinder DigIT Soybean A2704 kit
DGE14K	MODfinder DigIT PAT kit	DGS02K	MODfinder DigIT Soybean GTS 40-3-2 (RoundUp Ready) kit
DGE15K	MODfinder DigIT BAR kit	DGS03K	MODfinder DigIT Soybean A5547 kit
DGE17K	MODfinder DigIT pFMV kit	DGS06K	MODfinder DigIT Soybean DP356043 kit
DGE19K	MODfinder DigIT Canola ENDO kit		
DGE21K	MODfinder DigIT Cotton ENDO kit		

Each kit includes all the reagents necessary to perform 96 reactions buffer ddPCR, target specific oligos (primers and probe) at optimized concentration. Positive and negative controls. Droplet generator oil and disposable plastics are not included.

## MODfinder™ ddPCR Quantified Amplicons/Plasmids/RM DNA Extracts

Cat.#	Description
PGC02D	MODfinder Corn MON 810 ddPCR Quantified Reference Material
PGC05D	MODfinder Corn NK603 ddPCR Quantified Reference Material
PGC06D	MODfinder Corn CBH-351 ddPCR Quantified Amplicon
PGC12D	MODfinder Corn DBT 418 ddPCR Quantified Amplicon
PGC20D	MODfinder Corn MON89034 ddPCR Quantified Reference Material DNA extract
PGF01D	MODfinder Flax FP967 ddPCR Quantified Amplicon
PGR01D	MODfinder Rice LL601 ddPCR Quantified Amplicon
PGR03D	MODfinder Rice BT63 ddPCR Quantified Amplicon
PGS01D	MODfinder Soybean A2704-12 ddPCR Quantified Reference Material
PGS02D	MODfinder Soybean GTS 40-3-2 (RoundUp Ready) ddPCR Quantified Reference Material
PGS03D	MODfinder Soybean A5547-127 ddPCR Quantified Reference Material
PGS04D	MODfinder Soybean MON89788 ddPCR Quantified Reference Material
PGS06D	MODfinder Soybean DP356043 ddPCR Quantified Reference Material
PGS07D	MODfinder Soybean MON87701 ddPCR Quantified Reference Material
PGZ05D	MODfinder Canola HCN92 ddPCR Quantified Amplicon



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