QUALITY SERVICES INTERNATIONAL GMBH | DR. CORD LÜLLMANN | BREMEN | GERMANY

Biofach Nürnberg 2012

Detection of pollen from GMO-plants in honey –

Point of view from laboratory

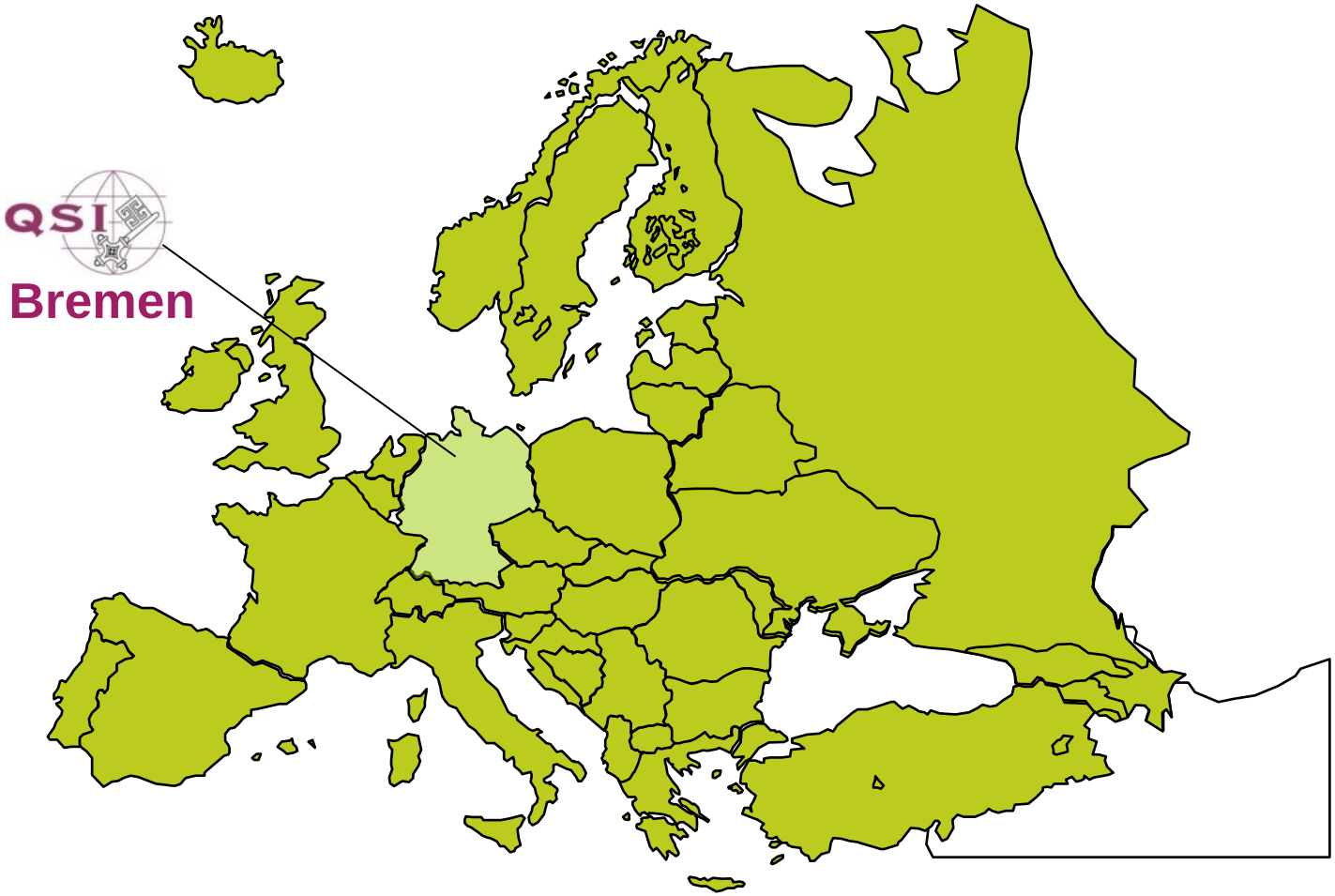
Gudrun Beckh

Quality Services International

Founded: 1954 in Bremen

Place: Bremen

Additional offices: Shanghai, PR China


Bremen

Quality Services International

Institute for

- Quality Control of food, cosmetics, pharmaceutics and commodities
- Product Development
- Quality Management
- Training and Support

The QSI Lab

- Accreditation: DIN 17025 by DAKKS
- Employees: > 50
- Qualifications: Chemists, Biologists,
  Food chemists, Pharmacists,
  Biological/Chemical Technicians,
  Personal for sampling,
  Marketing & sales group

Equipment and Methods

Gas chromatographic systems (GC), GC-MS

HPLC systems, LC-MS/MS

Isotope mass spectrometry

Equipment for: conventional chemical analysis

Organoleptic testing

Realtime-PCR for GMO-testing

Microbiological analysis

Our Management Team

Gudrun Beckh

- Managing Director
- Graduate Biologist
- Head of Honey Department
- Intern. Project-management Honey
- Experience in Honey Quality control since 1989

Actual Judgement of EU Court of Justice

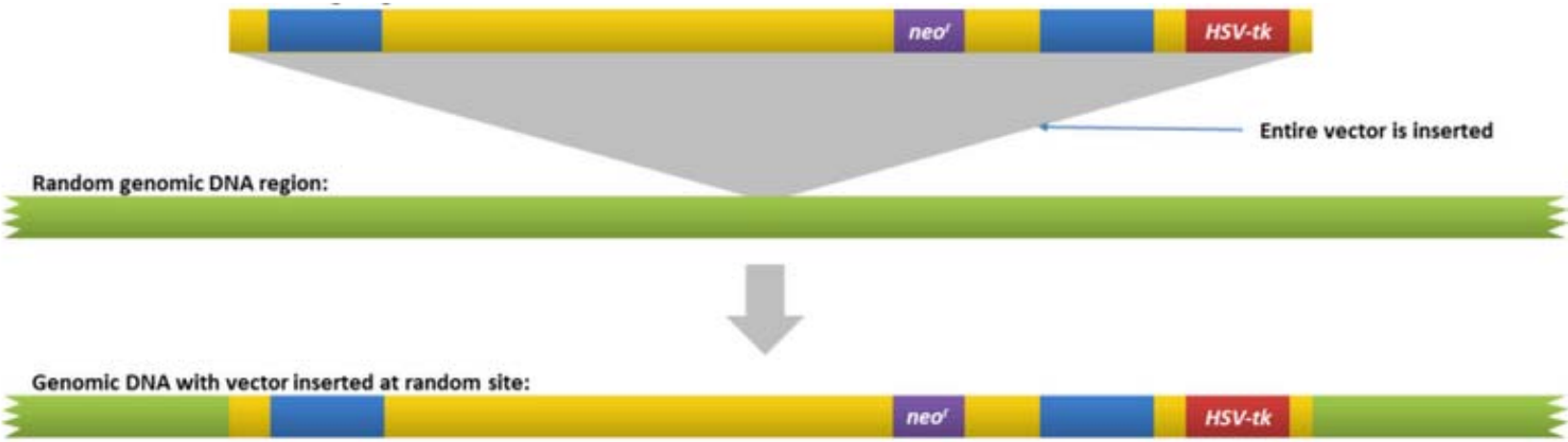
Main points

- **honey is not a product out of/with genetically modified plants <u>but</u> pollen is**
- **pollen in honey = ingredient (added by beekeeper during centrifugation)**
- **honey with gm pollen falls under EC regulation 1829/2003**

Historic facts

- natural gene transfer → EVOLUTION
- first “human” trials in 1986 with tobacco plants
- China allowed transgenic plants in 1992 (tobacco)
- EU and USA allowed cultivation in 1994
- no cultivation in Germany in 2012

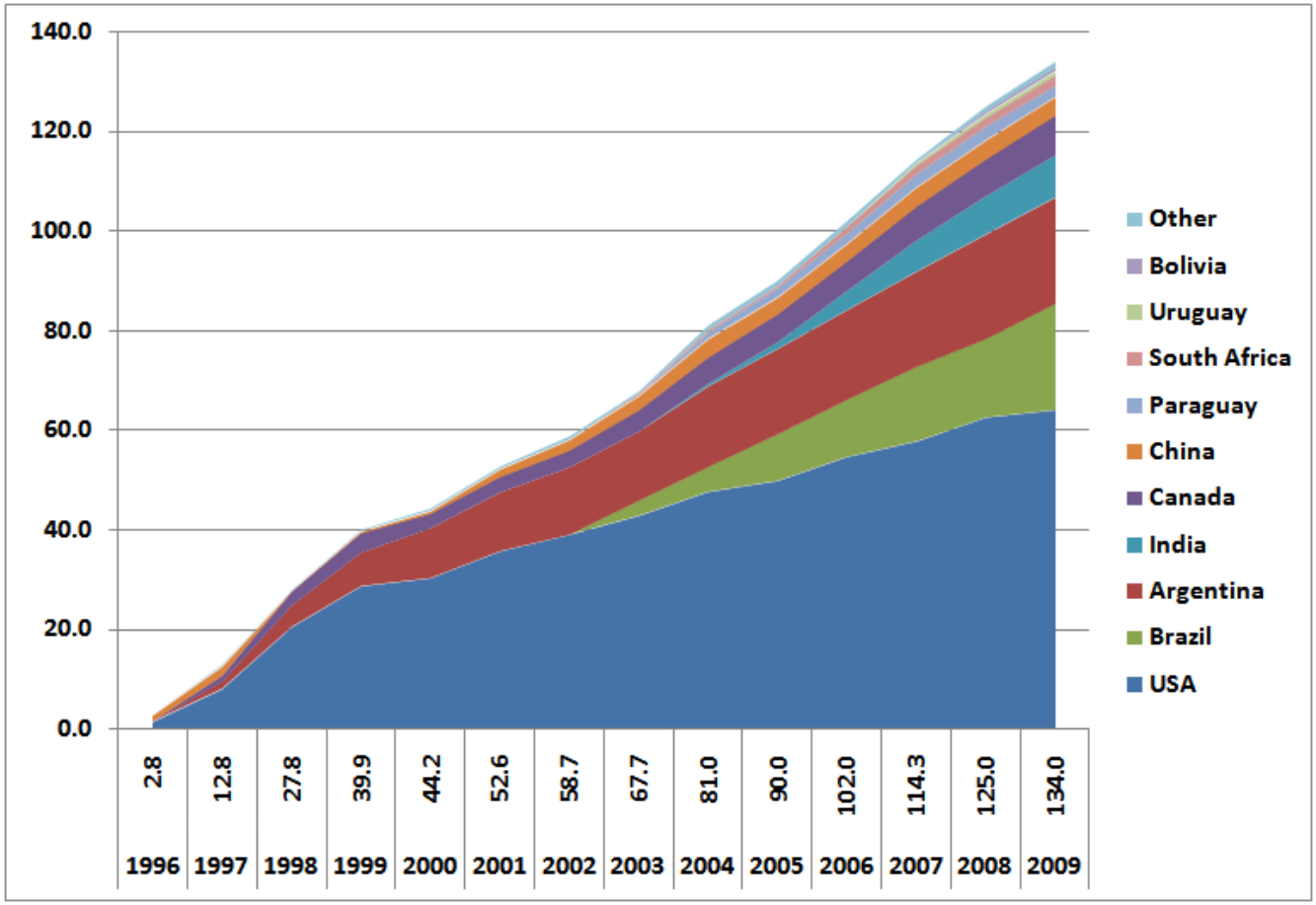
Science facts



Aim

- tolerance of plants against pests (insects, viruses…)
- immunity against the usage of total herbicides (RoundUp Ready)
- tailor made products (flavr savr tomato)

GMO cultivation (hectares)



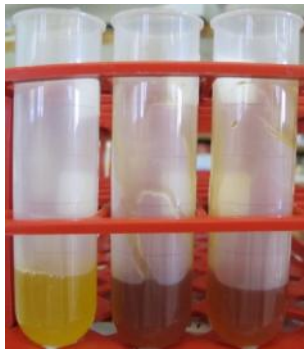
James, Clive (2010) Global Status of Commercialized Biotech/GM Crops: 2010 ISAAA Brief No. 42. ISAAA: Ithaca, NY.

GMO cultivation (hectares, 2010)

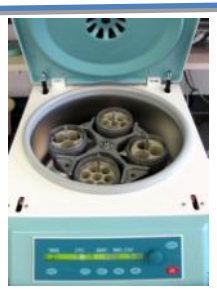
	cultivated area	cultivated GMO area	quota
soybean	103	73,3	71%
cotton	33	21	64%
corn	160	46,8	29%
rape	32	7	22%

http://www.transgen.de

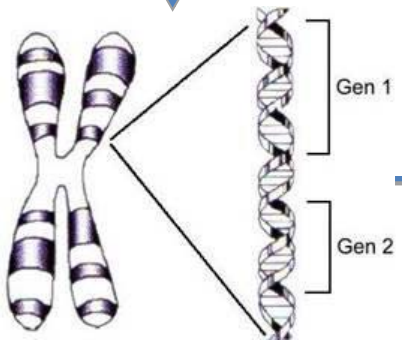
Analytical Methods



Sedimentation



DNA-Extraction



Determination
Real Time PCR

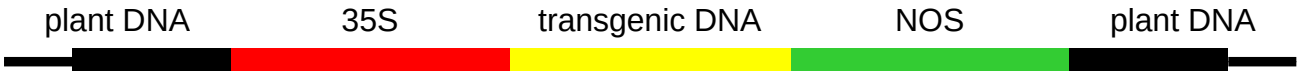
Detection of GMO in Honey

With Real Time PCR, DNA sequences of GMOs can be amplificated, resulting in several billion copies

→ Even detection of very small amounts of GMO sequences initially being present in honeys is possible

Analytical Methods

Roundup Ready Soy GTS 40-3-2



LibertyLink Soy A2704-12

LibertyLink Soy A5547-127

Roundup Ready2Yield MON 89788

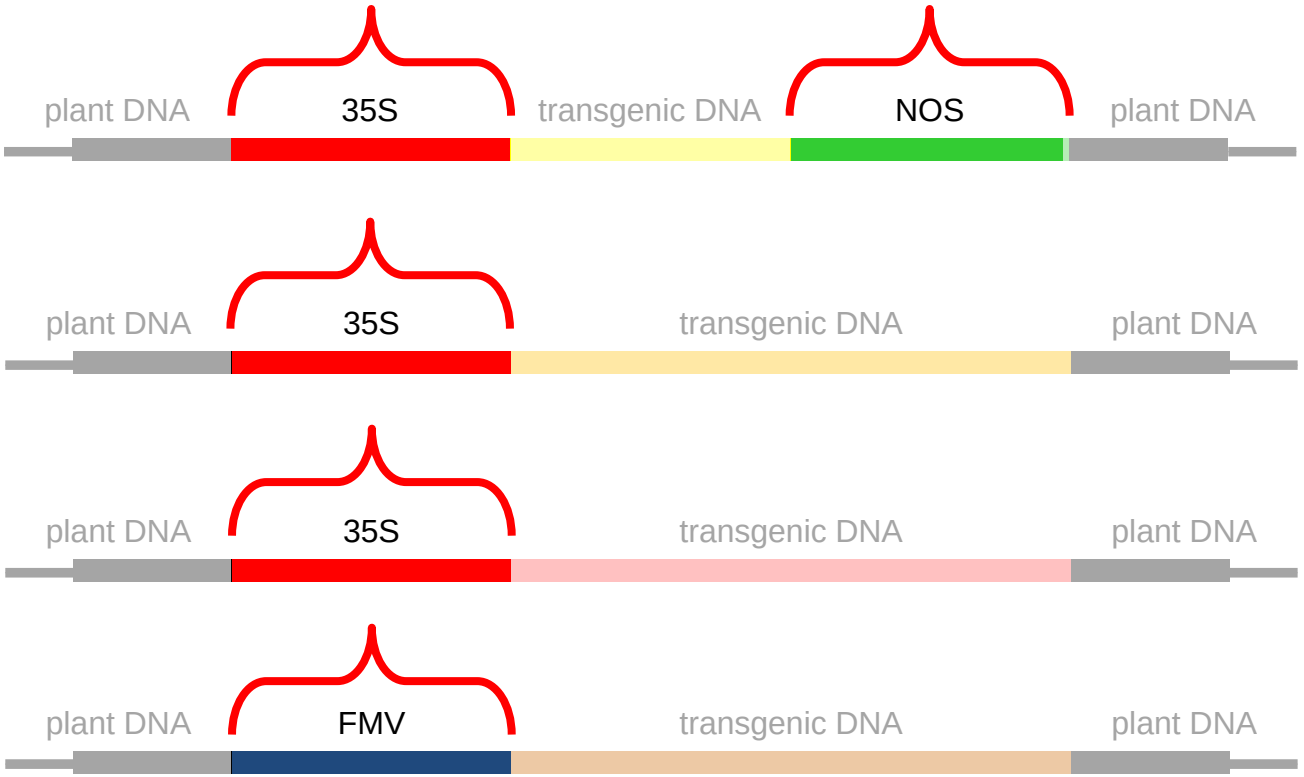
Strategy for Determination/Identification

1. Step Triple Screening

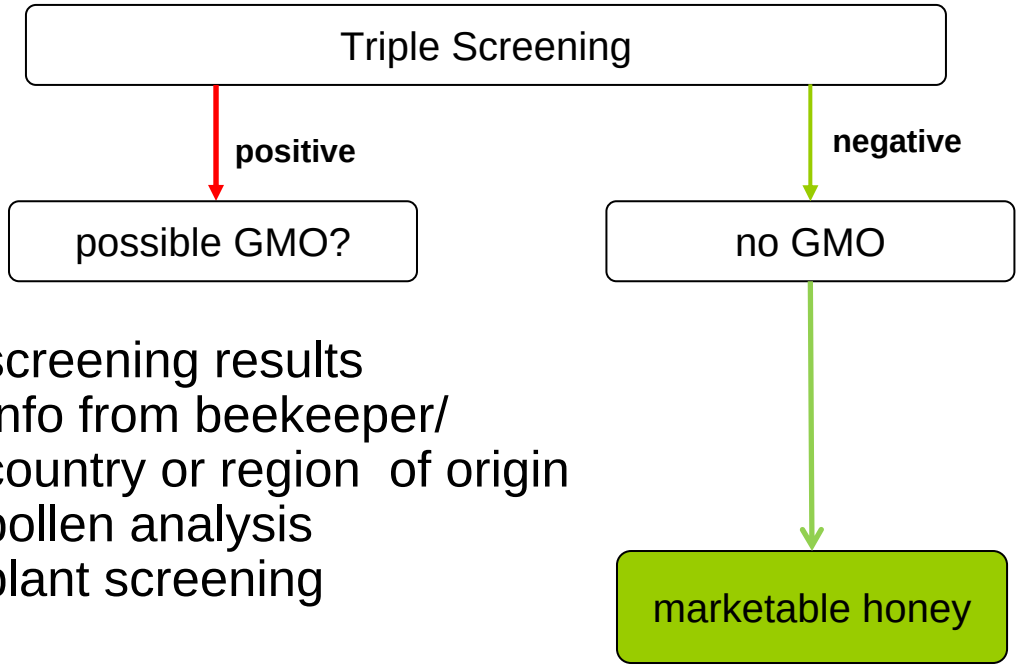
Identifying „Marker“ Sequences

35S, NOS, FMV

Triple Screening



Strategy for Determination/Identification

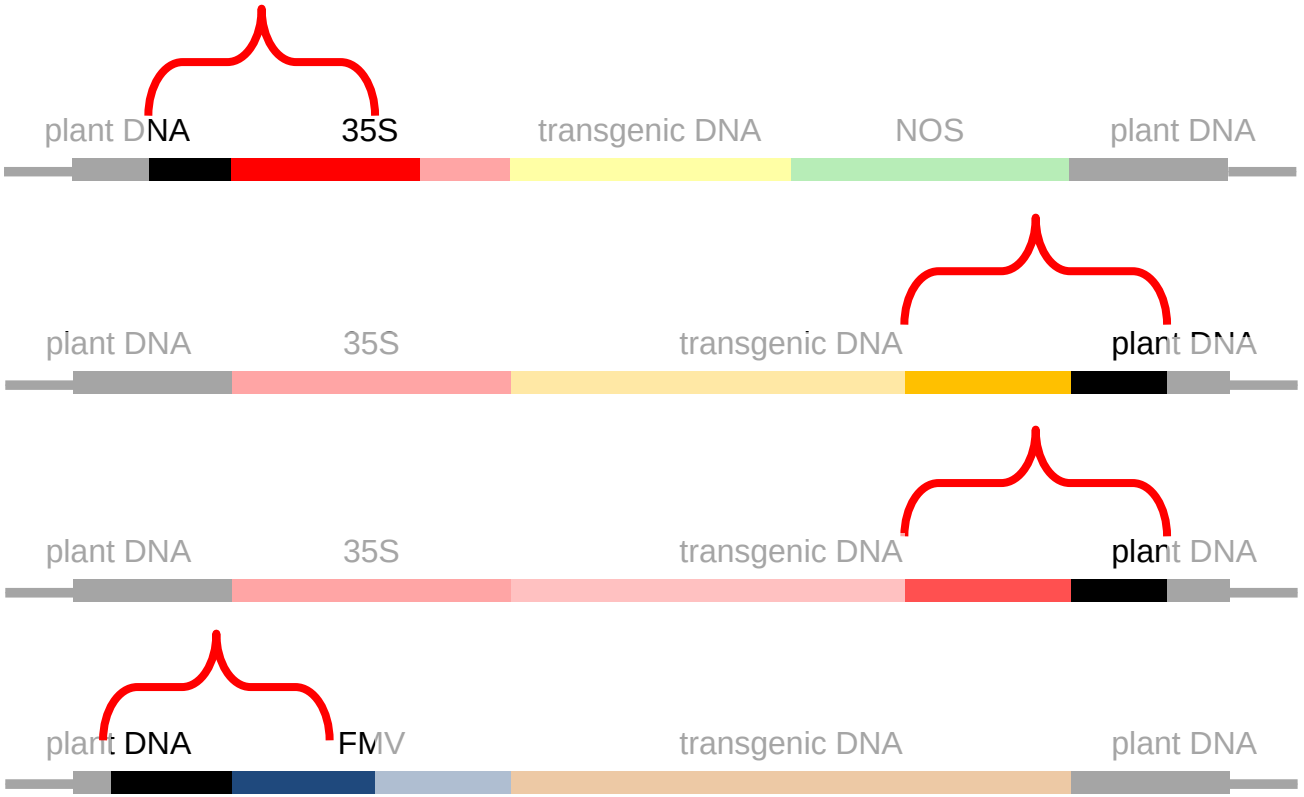


- screening results
- Info from beekeeper/ country or region of origin
- pollen analysis
- plant screening

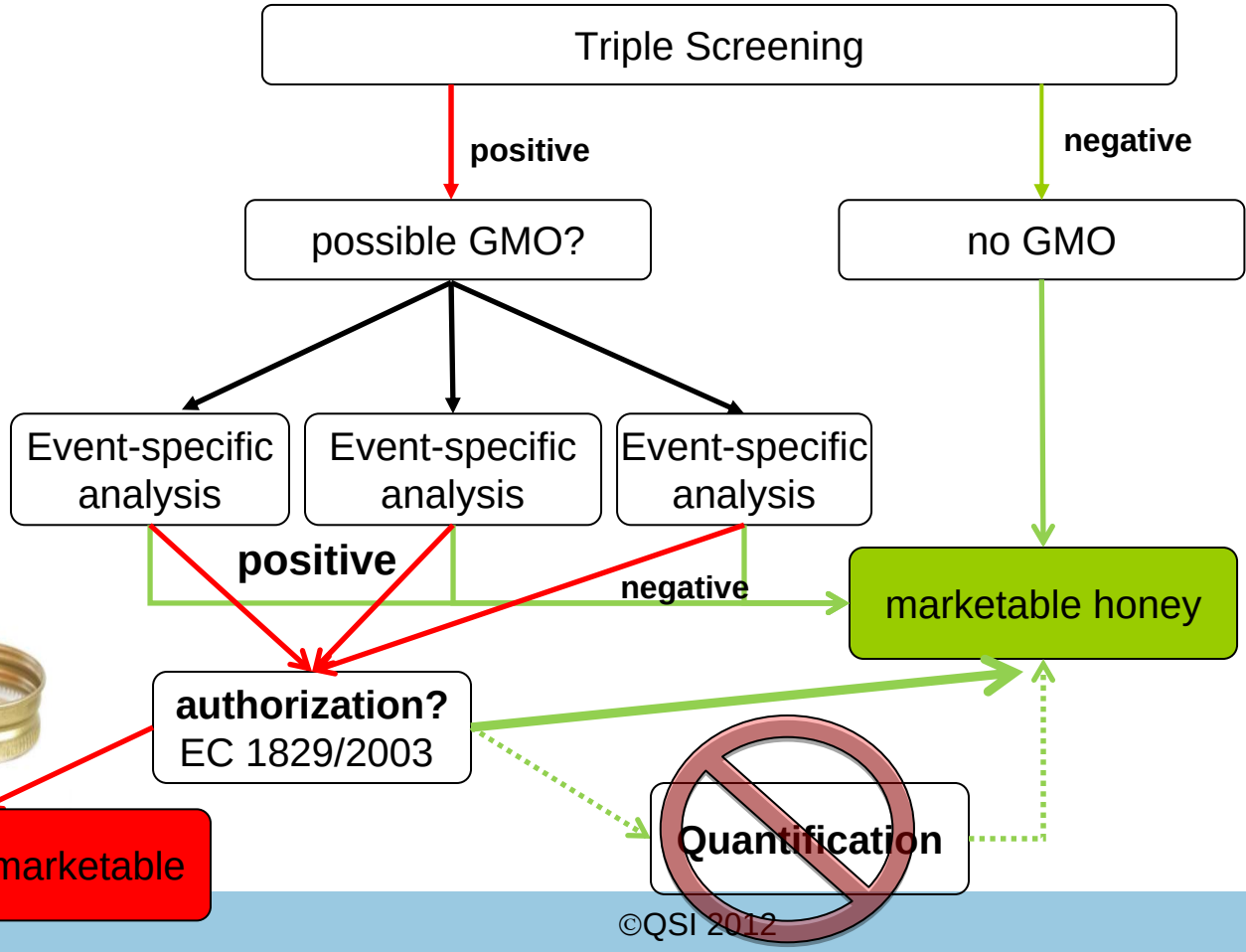
Event	Plant	35S	NOS	FMV
23-198, 23-18-17 (Laurical)	canola	+	-	-
Falcon GS40/90	canola	+	-	-
GT200	canola	-	-	+
GT73	canola	-	-	+
Topas19/2 (HCN 10, HCN 92 LibertyLink)	canola	+	-	-
Liberator L62 (pHoe6/AC)	canola	+	-	-
MS1, RF1, RF2; MS1xRF1 (PGS1) MS1xRF2 (PGS2) (SeedLink)	canola	-	+	-
MS1	canola	-	+	-
RF1	canola	-	+	-
RF2	canola	-	+	-
MS1xRF1 (PGS1)	canola	-	+	-
MS8	canola	-	+	-
RF3	canola	-	+	-
MS8 x RF3	canola	-	+	-
OXY 235	canola	+	+	-
PHY14, PHY23, PHY35, PHY36	canola	-	-	-
T45 (LibertyLink)	canola	+	-	-
GHB 119	cotton	+	+	-
LL25	cotton	+	+	-
MON 531	cotton	+	+	-
MON 1445	cotton	+	+	+
MON 15985	cotton	+	+	+
MON 88913	cotton	+	-	+
T304-40	cotton	+	+	-
FP967 (CDC-Triffid)	linseed	-	+	-
676, 678, 680	maize	+	-	-
3272	maize	-	+	-
59122	maize	+	-	-
98140	maize	+	-	-
Bt11	maize	+	+	-
B16 (DLL25)	maize	+	-	-
Bt176 (176; Maximizer)	maize	+	-	-
CBH-351 (StarLink)	maize	+	+	-
DBT418 (Bt-Xtra)	maize	+	-	-
GA 21 (Roundup Ready)	maize	-	+	-
MIR 162	maize	-	+	-
MIR 604	maize	-	+	-
MON 802	maize	+	+	+
MON 809	maize	+	+	+
MON 810	maize	+	-	-
MON 832	maize	+	+	+
MON 863 (YieldGard)	maize	+	+	-
MON 80100	maize	+	+	+
MON 87460	maize	+	+	-
MON 88017	maize	+	+	+
MON 89034	maize	+	+	-
MS3 (SeedLink)	maize	+	+	-
MS6 (SeedLink)	maize	+	+	-
NK 603 (Roundup Ready)	maize	+	+	+
T14	maize	+	-	-
T25	maize	+	-	-
TC1507 (DAS 1507)	maize	+	-	-
TC-6275 (DAS-06275-8)	maize	+	-	-

Event	Plant	35S	NOS	FMV
55-1, 63-1 (Sunup)	papaya	+	+	-
X17-2	papaya	+	+	-
AM 04-1020 (Amadea)	potato	-	+	-
ATBT04-X (New Leaf)	potato	+	+	-
AV43-6-G7	potato	-	+	-
BT6, BT10, Bt12, BT16, BT17, BT18, BT23 (New Leaf)	potato	+	+	-
EH92-527-1(Amflora)	potato	-	+	-
RBMT15-101, SEMT15-02, SEMT15-15, HLMT15-46 (New Leaf)	potato	-	+	-
RBMT21-129, RBMT21-152, RBMT21-350 (New Leaf)	potato	-	+	-
RBMT22-082, RBMT22-186, RBMT22-238, RBMT22-262(New Leaf)	potato	-	+	+
SPBT02-5	potato	+	-	-
SPBT02-7	potato	+	+	-
Bt63 (TT51-1)	rice	-	+	-
KeFeng6	rice	+	+	-
KMD1	rice	+	+	-
LL06	rice	+	-	-
LL62 (LibertyLink)	rice	+	-	-
LL601	rice	+	-	-
356043	soybean	+	-	-
A2704-12	soybean	+	-	-
A2704-21, A5547-35	soybean	+	-	-
A5547-127 (LibertyLink)	soybean	+	-	-
FG 72	soybean	-	+	-
G94-1, G94-19, G168	soybean	+	+	-
GTS 40-3-2 (Roundup Ready)	soybean	+	+	-
GU262 (LibertyLink)	soybean	+	-	-
MON88705	soybean	-	-	+
MON 89788	soybean	-	-	+
W62, W98 (Liberty Link)	soybean	+	+	-
GTSB77	sugar beet	+	-	+
H7-1 (Roundup Ready)	sugar beet	-	-	+
T120-7 (LibertyLink)	sugar beet	+	-	-
35 1 N	tomato	-	+	-
1345-4 (Endless summer)	tomato	+	+	-
5345	tomato	+	+	-
8338	tomato	+	+	-
B, Da. F (Vegadura)	tomato	+	+	-
CGN-89564-2 (FlavrSavr)	tomato	+	-	-
Huafan No 1	tomato	+	+	-

Event Specific Analysis



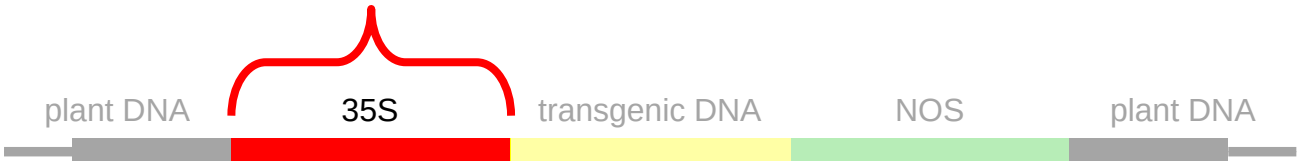
Strategy for Determination/Identification

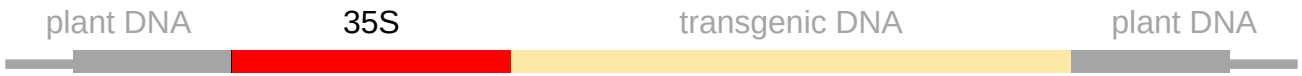


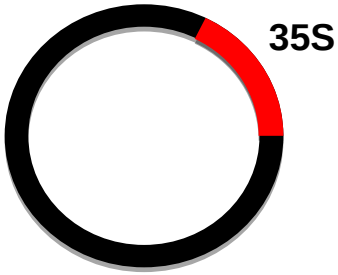
Difficulties with the Analytical Methods

- “false-positive” Screening results

Triple Screening







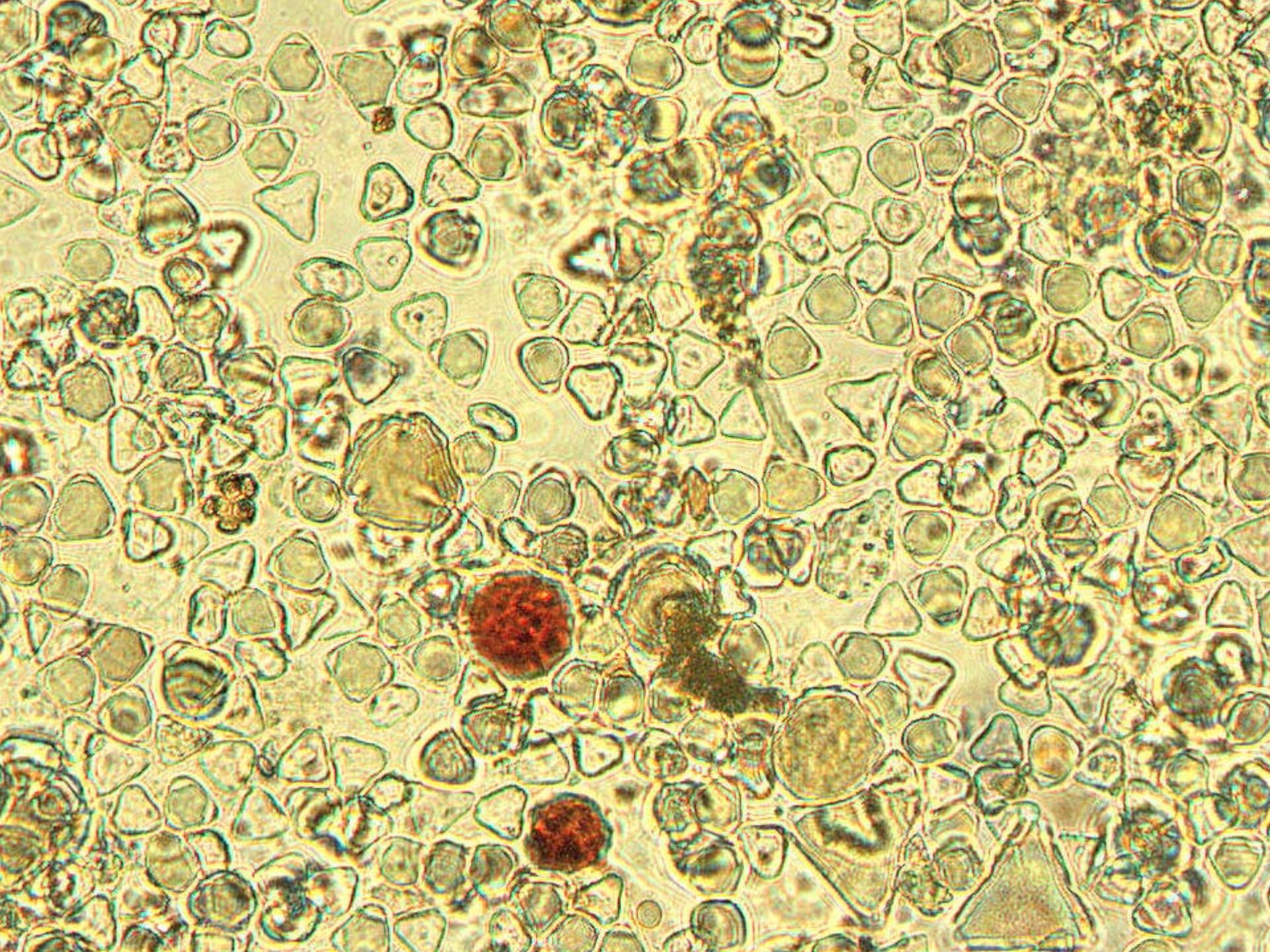
CAMV (cauliflower mosaic virus)

Difficulties with the Analytical Methods

- “false-positive” screening results
- pollen is a solid particle in liquids

Difficulties with the Analytical Methods

- "false-positive" screening results
- pollen is a solid particle in liquids
- no method for quantification available
  - correlation pollen ↔ DNA
  - extraction yield? (no reference material available)
  - 0,9% rule – of what? (species pollen, whole pollen content, honey)
- secondary contamination with non-nectar-plant pollen
  (corn pollen: less attractive for bees)



Organic Food

Generell:
organic food: **NO** production out or with GMO

Exception:
unavoidable contamination
→ beekeeper has to proof, that contamination is unavoidable (seperation of beehives to GMO plants)

Recommendations to beekeepers

- contact your government for a gm-crop site map
- avoid these crops (especially for export to EU/organic honey)
- test your honey before export
- keep being informed

Thank you for your Attention

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