



Joint Research Centre

the European Commission's in-house science service



European Coexistence Bureau Technical Working Group for Soybean

Best Practice Document "Coexistence of genetically modified soybean crops with conventional and organic farming"

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Why do analyse the possibility for coexistence in soybean production?

~80% of the soybean area, nowadays, worldwide - GM varieties

the trend is still increasing 

Soybean production in European Union (EU) is quite limited

~98% of the EU consumption of soybean products – imports

only 10% (*estimated as soybean meal equivalent*) – IP, non-GM

market situation in EU without authorization of GM soybean cultivation yet

Why do analyse the possibility for coexistence in soybean production?

Technical working group (TWG) for soybean of the European coexistence bureau (ECoB) analyzed the possibility for coexistence between GM soybean cultivation and non-GM soybean, and honey production by addressing the:

- The potential sources of **GM cross-pollination**; and
- **The admixture which can occur** during the farm scale activities,

in the context of European agro-climatic and landscape conditions.

Coexistence concepts

EU Coexistence strategies are developed at national level

following general guidelines from the EC.

EC  **development of technical advice** through the ECoB

The mission of the ECoB (2008) is:

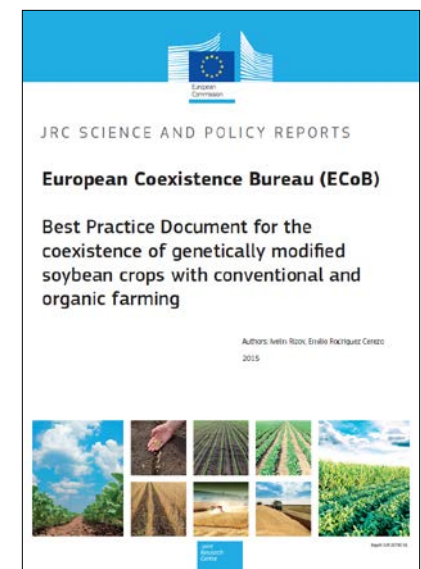
- to organise the **exchange of technical and scientific information** on the best agricultural management practices for coexistence; and
- to develop consensually agreed **crop-specific guidelines for technical coexistence measures.**

European Coexistence Bureau

TWG Maize, TWG Soybean , TWG Cotton and TWG Potato.

The TWG Maize:

TWG Soybean:



European Coexistence Bureau

Technical Working Group on Soybean : 14 Member States
began work on May 2013



Scope of the work TWG Soybean

- **Coexistence of cultivation of GM soybeans in the EU with non-GM soybeans and honey production**
- Crop production **up to the first point of sale**, including on farm storage
- Thresholds for coexistence to be analysed: **legal labelling threshold** and **private market thresholds**
- Review the **methods for quantification of GM soybean presence** in other crops and honey
- GM soybeans that contain a **single transformation event**.

Work of the ECoB TWG soybean

Two meetings : May 2013 and February 2014 in JRC premises

Review of literature (in total **123 references**) for:

- **adventitious GM presence in soybean crop production**
- **existing segregation systems** in soybean production
- management **farm practices**
- the presence of **soybean pollen in honey**;
- **detection and identification of GM soybean material** in non-GM soybean harvests and honey


Structure of the report

1. Introduction
2. Soybean biology
3. Soybean Cultivation in the EU: demand and crop production
4. Existing segregation systems in soybean production
5. Review of the available information on adventitious GM presence in soybean crop production
6. Occurrence of soybean material in honey
7. Detection of GM events in soybean crops and honey
8. Best practices for coexistence of GM maize and honey production
9. Economic analyses of best practice
10. References

2. Soybean biology

- Self-pollinating plant with **autogamy higher than 99%**
- **Cross-pollination rates** decrease to **less than 1.5% beyond one meter** from the pollen source and rapidly decrease with greater distances from the source
- **Wind-mediated pollination appears to be negligible**
- **Insect pollination occurs**, observed increases in yield for honey-bee-pollinated in comparison to self-pollinated soybean

3. Soybean Cultivation in the EU

- **Only 2% of the EU consumption** of soybean meal (about 31 million tonnes per year) **is produced domestically**
- The largest soybean producers in the EU are **Italy, Romania, Croatia, France, Austria and Hungary** accounting for more than **80% of the EU soybean cultivation area**
- **367 soybean varieties** in the **EU Common Catalogue**
- **Danube Soya Declaration**  cultivation of GM-free soybean in Danube region as a protein supply core of Europe.

4. Existing segregation systems in soybean production

1. Soybean seed production.
2. Case study of Coexistence of GMO and non-GMO soybean in France.
3. Canadian Identity Preserved Recognition System.

4.1. Soybean seed production

The isolation distances to meet the standards for varietal purity (Council Directive 2002/57/EC) reported by Le Ny et al. (2011) for soybean cultivation are as follows:

- **1 m** to the same variety and **5 m** to a different variety, for **certified seeds** (varietal impurities is 1%);
- **5 m** to the same variety and **10 m** to a different variety, for **pre-basic and basic seeds** (varietal impurities is 0.5%).

4.2. Case study of Coexistence of GMO and non-GMO soybean in France

- The present practices of soybean seed and crop production maintain the GMO adventitious admixture below **0.9%**; but
- The **0.1% threshold** requires implementation of a **set of coexistence measures**:
 - **10 m** from any GM field for seed productions;
 - thorough **cleaning of all on-farm machinery and installations**;
 - proper processing and **verifications of seed use**;
 - molecular **analyses (PCR) throughout the whole production chain**.

4.3. Canadian Identity Preserved Recognition System (CIPRS)

In CIPRS the maintaining of IP requirements established by soybean industry on farm level is achieved by utilization of:

- **Certified Seed;**
- Approved isolation distances (**3m, enough for market requirements of 0.5 - 1.0%**);
- **Field history;**
- **Cleaned** planting & harvesting equipment;
- Cleaned & labelled storage bins;
- Cleaned trucks/trailers.

5. Review of the available information on adventitious GM presence in soybean crop production.

- Outcrossing to wild relatives: **wild soybean species do not exist in Europe**
- Outcrossing between GM and non-GM soybeans
Studies in cultivated soybean from **USA, Japan, and Brazil** agree on **the absence of any detectable outcrossing at a distance of 10 meters.**
- Volunteers: **survival almost impossible**
- Leftover grain appears in the on-farm machinery
- **Seed dispersal may also occur during: seeding, harvesting, handling, storage and transport.**

6. Occurrence of soybean material in honey

- Presence of soybean pollen in Soybean **unifloral** honey (studies from **USA, Argentina, and Mexico**)
! beehives are located in the vicinity of soybean fields; and honey is seasonally harvested!
- **Polyfloral** honey can have **soybean pollen but as minor one**.
- **No quantitative data about the presence of soybean pollen in EU produced honey.**
- Presence of soybean material other than honey (from the use of **soybean-containing substitutes in commercial bee feeding**)

7. Detection of GM events in soybean crops and honey

- **PCR-based methods**, both qualitative and quantitative
- **Protein-based methods**

The **EU-RL GMFF** has **validated** quantitative **PCR methods** for identification and quantification of **several GM soybean events**.

A practical and robust **PCR protocol** able to quantify **GM pollen** relative to total pollen in honey or honey as whole is not available.

8. Best practice for coexistence in soybean crop production

Best practices for ensuring seed purity

The use of certified soybean seeds (EU legislation)

Best practice for reducing pollen-mediated gene flow

Isolation distances:

- ***5 m between the fields to limit cross-pollination to 0.9%***
- ***10 m isolation if 0.1%***

Temporal isolation an alternative to spatial isolation is difficult to achieve under European conditions

Best practices during sowing, harvesting, drying and storage in farm

Harvesting is the most critical step in soybean cultivation.

The equipment used for processing of GM crops should be cleaned thoroughly before it can be used for processing of non-GM crops.

Best practice for coexistence with honey production

The current practices in honey production and marketing in Europe are sufficient to ensure that adventitious presence of GM soybean pollen in honey is far below the legal labelling thresholds and even below 0.1%.

9. Economic analyses of proposed best practices

- No empirical data are available
- Economic data from soybean segregation systems operating in elsewhere can be relevant (e.g. CIPRS provides C\$ 0.60 - 0.40 to compensate cost of IP programs)
- Farmers will consider both monetary and non-monetary benefits of GM adoption versus coexistence costs in their decision making process to select what kind of variety to adopt.

10. References



Thank you for your attention

ECoB web site: <http://ecob.jrc.ec.europa.eu>

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