



CODE OF CONDUCT
Principles of Quality Assurance in Beet Seed Production
(Version of 22 October 2007, amended in October 2014)

Summary

The principles of quality assurance and measures highlighted in this paper are aimed at managing adventitious presence of GM¹ beet seed in conventional sugar beet and fodder beet, as well as the adventitious presence of other GMOs² in GM sugar beet and fodder beet seed.

Adventitious presence of GMOs can only be minimized but not totally excluded because seed production occurs in open fields under natural conditions. There is a strong need for practicable rules and regulations governing a high level of purity for seed of conventional varieties in relation to adventitious presence of GMOs and for seed of GM varieties relating to adventitious presence of other GMOs.

1. Objective

The objective of this industry position paper on quality assurance of sugar beet and fodder beet (hereinafter referred to as “beet seed”) is to describe measures the seed industry has taken to minimize the likelihood of adventitious presence of GM beet seed in conventional seed or adventitious presence of different GMOs in GM beet seed. It has been agreed upon by SYNGENTA, SESVanderHave, STRUBE GmbH, KWS SAAT AG and their Affiliated Companies³.

This objective is accomplished by implementing guidelines and standard operating procedures (SOP) (preventive measures) covering every step from the stage of R&D⁴ activities up to delivery of commercial beet seed to the customer. In addition to these measures, actions are undertaken to control all different steps of this process.

2. Deregulation of GM beet events

The status of deregulation of GM sugar beet events varies according to territories. Similarly, requirements set up by regulators may vary by country. Therefore the principles adopted by the industry must reflect these regional differences.

2.1. North America (USA+Canada)

There are three GM sugar beet events which have been deregulated in North America: H7-1; GTSB77 and T120-7. The event H7-1 was first commercialized in 2007.

¹ GM: Genetically modified

² GMO: Genetically modified organism

³ For the purposes of this paper, the term “Affiliated Companies” shall mean in relation to SYNGENTA, SESVanderHave, STRUBE GmbH and KWS SAAT AG any entity which controls, is controlled by or is under common control with SYNGENTA, SESVanderHave, STRUBE GmbH or KWS SAAT AG. For the purposes of this definition, a business entity shall be deemed to “control” another business entity if it owns, directly or indirectly, 50% or more of the outstanding voting stock or capital stock of such a business entity. An entity is considered to be an Affiliated Company only so long as such control exists.

⁴ R&D: Research and development

2.2. Europe

No GM beet events are approved for cultivation at this moment in Europe. As of date no commercialization of GM beet seed can take place in Europe.

2.3. Other territories in the world

No GM beet events are currently commercialized in other countries.

3. Adventitious presence of GM beet seed

3.1. Adventitious presence in conventional seed

Adventitious presence (AP) of GM sugar beet seed in conventional beet seed cannot be totally excluded. As of date, there are no official thresholds governing AP of GM seed in conventional seed in Europe. There is an urgent need for such a threshold to be in place in Europe due to the commercialization of GM sugar beet hybrids in the US. Thresholds may vary and some territories or countries may not regulate adventitious presence.

Three possible main sources of AP of GM seed in conventional seed productions are identified:

- Spread of GM pollen to multiplications of conventional seed
- Unintentional mix of plants during transplanting
- Unintended commingling during harvest, transport, processing or storage

Quality assurance systems have been implemented to address the issues posed by AP. These consist of preventive measures and testing procedures. They are presented in section 5.

3.2. Adventitious presence in GM seed

This refers to adventitious presence of a GM event in the production of another event.

Similar preventive measures and testing procedures in point (3.1.) above also address this case.

4. Pre-commercial and commercial production of GM beet seed

4.1. Europe

There are currently no pre-commercial or commercial productions of GM beet seed in Europe. If in the future commercial or pre-commercial GM seed is produced in Europe quality assurance measures will focus on the separation of GM and conventional seed during the whole production procedure (i.e. multiplication and processing).

Production of GM beet seed in Europe is limited to R&D activities only. Tests for AP and traces of GM beet seed in commercial beet seed lots are already being performed.

4.2. North America

There are commercial productions of GM beet seed of a deregulated event in the USA and Canada.

Quality assurance systems to prevent adventitious presence and traces of GM seed as presented in the protocols of the Annexes have been implemented by the seed industry.

These measures are focused on separating GM seed and conventional seed during the whole production procedure, from multiplication to processing.

In addition GM commercial seed lots are tested for AP of other GM seed.

5. Principles of preventive measures and testing procedures for adventitious presence in R&D, conventional and GM beet seed production

The guidelines for preventive and control measures are in three parts:

1. R&D activities related to GM seed (from variety development to basic seed production) – Protocol in Annex 1
2. Production of conventional seed for commercialization – Protocol in Annex 2
3. Production of GM seed for commercialization – Protocol in Annex 3

Code of Conduct - Principles of quality assurance in beet seed production

The following sections outline general preventive and control measures to ensure a high level of purity of conventional and GM seed.

5.1. Preventive measures

Several principles are implemented in all types of activities and operations by each company:

- A quality assurance system whereby every GM plant material can be traced
- Written SOPs for all aspects of handling GM beet plants and GM beet seed and staff trained on their use and application
- Conventional and GM seed handled separately, with specific labels or a unique identifier used for all GM material
- Sharing of information on the locations and traits of GM seed production worldwide.

5.2. Testing procedures

- Protocols to test for AP of GM seed in conventional seed lots and GM seed lots.
- Information exchange on detection methods of such traits which are shortly before production.

More detailed information can be found in the Annexes.

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Annex 1

Preventive measures for R&D activities for GM and Non-GM beet

All stages of seed development
up to and including the basic seed production of regulated and deregulated GM beet

All activities involving GM beet plants and GM beet seed are subject to local, national and international regulations; the signatory breeding companies commit to adhere to them.

- Breeding companies share information about the traits and locations of their respective GM seed production fields; by so doing they have the opportunity to redefine their site of seed production in case it is situated close to a conventional seed or another GM event production area
- A minimum four years rotation between GM beet seed-crop and conventional beet seed-crop is adopted
- When the GM event is in the pollinator (male parent) the isolation distance between GM and conventional or other GM event seed production is at least 3 kilometers; no specific isolation, other than a clear separation, is required if the GM event is in the female parent
- Bolting plants of *Beta* species are removed before flowering within a radius of at least 1000 m around GM multiplications
- Written standard operating procedures (SOPs) are prepared for all aspects of handling GM beet plants and GM beet seed; staff is routinely trained on their use and application
- Transport of regulated GM seed is done only in closed containers
- Storage of regulated GM seed occurs in dedicated areas separated from conventional or non-regulated seed
- Careful cleaning of all machinery is carried out before and after each step in the production process of a seed lot of different event or separate production lines (different GM, Non-GM) are used in the production process
- Monitoring for volunteer beets is done in fields used for GM seed production
- Shallow post-harvest tillage is recommended
- Preventive measures can be different for regulated and non-regulated seed productions
- Seed lots are tested for the adventitious presence of GMO before shipment to third parties, for example:
 - Testing of conventional seed lots used for variety trials
 - Testing of GM seed lots used for variety trials
 - Testing of conventional seed lots used in field trials by research institutes and/or industry
 - Testing of GM seed lots used in field trials by research institutes and/or industry
- Seed lots are sampled according to internationally accepted sampling techniques

Annex 2

**Preventive measures for
Production of conventional beet seed for commercialization**

- The signatory breeding companies have agreed to share information on the traits and locations of their respective GM beet seed multiplications worldwide
- In addition, as part of the information sharing, breeding companies will exchange information on detection methods of traits which are shortly before production
- Isolation distance of at least 3 kilometers between GM and conventional beet seed production is maintained
- Bolting plants of *Beta* species are removed before flowering within a radius of 1000 m around GM multiplications
- A minimum four years rotation is adopted by breeding companies when producing seed
- Separation of conventional and GM seed is maintained during processing
- The processing order of seed lots cleaned, graded and pelleted is thoroughly recorded
- Careful cleaning of all machinery is carried out before and after each step in the production process or separate production lines (GM, Non-GM) are used in the production process
- Basic seed lots used for commercial seed production are tested for GM traces
- Seeds are sampled after harvesting or before pelleting according to internationally accepted sampling techniques
- Conventional seed lots are tested for adventitious presence of GM seed by either PCR or immunological tests and/or herbicide application

Annex 3

**Preventive measures for
Production of GM beet seed for commercialization**

Signatory breeding companies will adhere to local, national and international regulations that rule all activities involving GM beet plants and GM beet seed.

- Appropriate standard operating procedures (SOPs) are written for all aspects of the handling of GM beet plants and GM beet seed and the staff is trained and briefed on their use and application
- The signatory breeding companies agree to share information on the traits and locations of their respective GM seed multiplications worldwide. In addition breeding companies will exchange information on the appropriate detection method for GM traits
- Quality assurance systems are in place whereby every GM plant material is recorded and can therefore be traced
- When the GM event is present in the pollinator (male parent) an isolation distance of at least 3 kilometers between GM and conventional or other GM event seed production is maintained; no specific isolation other than a clear separation is required if the GM event is present on the female parent
- Bolting plants of *Beta* species are removed before flowering within a radius of 1000 m around GM multiplications
- A minimum four years crop rotation is adopted by breeding companies when producing seed
- The processing order of seed lots cleaned, graded and pelleted is thoroughly recorded
- Careful cleaning of all machinery is carried out before and after each step in the production process or separate production lines (different GM events, Non-GM) are used in the production process
- Basic seed lots used for commercial seed production are tested for traces of other GM events before planting
- Seed lots are sampled after harvesting or before pelleting according to internationally accepted sampling procedures
- GM seed lots are tested by PCR or immunological tests and/or herbicide application in case of herbicide tolerance traits