**Production techniques being utilized to ensure purity of transgenic characteristics.**

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ABSTRACT

In order to maintain the purity characteristics of transgenic sugarbeet seed, a detailed, operational-procedure program was required to be written and followed. This paper's intent is to summarize these procedures so there is a general understanding of the procedures used for present and future production and the results that were obtained from using these procedures.

1. ***Field Selection:*** Careful field and grower selection was used to find fields that were void of potential problems.

   Potential problems that were avoided included:

   A. Viable sugarbeet seed from past productions.

   B. Carryover herbicides used on past crops.

2. ***Nursery Selection:*** For the growing of stecklings for transplanting, the site was selected on the same principals that were used for field selection.

3. ***Isolation Requirements:*** The isolation requirements were extended from 2 to 9 times the normal distance. Prevailing winds and natural barriers to pollen movement were also considered.

4. ***Labeling and Movement of Transgenic Material:*** All seed and plant material was labeled with orange tags labeled "*Transgenic Material*". These tags were used anytime the material was transported. This includes stock seed, stecklings, grower-combined seed, finished seed, and screenings. These tags also carry the Notification Number that may be required by the USDA for movement of GMO plant material.

5. ***Equipment Inspection and Cleaning:***

   A. *Seed Treaters* - Were inspected before their use on each individual seed lot and cleaned thoroughly after use on each seed lot.

   B. *Planters* – Only the best planters were allowed to be used and they were physically inspected for cleanliness by the company agriculturists before entering the field and upon completion of planting. Transplanters underwent a similar inspection and cleaning.

C. *Separators* – (used to divide male and female plants) were washed with a portable, high-pressure water system and treated with chemical solutions to remove and kill the pollen. This procedure was used before entering the field and before leaving the field.

D. *Swathers* – A complete inspection by both seed company and breeding company personnel was conducted. This inspection included areas that normally would not be suspected of hiding seed.

E. *Combines* – Underwent extensive inspection by seed company and breeding company personnel before entering the field.

1. Hege combines were used wherever possible. These combines are designed to have 100% accessibility for both inspection and seed removal.

2. Grower combines could only be used if they had not combined any sugarbeet seed in the growing year and had combined at least 200 acres of another crop or crops before combining the transgenic crop. The average combined used had combined 400-500 acres before use. Due to the large and diverse number of crops, growers are skilled in combining cleaning.

F. *Field Tote Boxes* – These were modified to allow a new plastic bag to be inserted, preventing any contamination of the seed from outside sources.

G. *Cleaning Equipment* – A 26-point inspection was performed on the cleaning equipment before seed was introduced. All transgenic seed was cleaned in sequential order to avoid the possibility of non-transgenic seed contamination.

H. The cleaned seed was then placed in clean containers for transport.

6. ***Sampling and Testing for Purity:***

To insure the purity of the transgenic character, samples were taken of all grower lots at all of the following stages: Field-run seed, clean seed prior to final processing, processed seed by size, and treated seed ready for sale.

A representative portion of each of these samples were planted and then sprayed with the recommended rate of herbicide to test for the transgenic character. Checks were also planted to verify results.

7. ***Field Monitoring and Growing:***

Transgenic seed fields were grown with the normal agronomic procedures but with additional monitoring for USDA requirements. These requirements include inspection of fields and nurseries to remove any potential plant escapes either from roots or seed.

8. ***Post-Harvest Procedures:***

Transgenic seed fields were shallow tilled to form a seedbed and then irrigated to sprout any shattered seed.

9. ***Screenings:***

Screenings were disposed of in a licensed landfill to prevent introduction into animal feed pellets.

10. ***Future Monitoring Procedures:***

A. Field inspections of production fields and nurseries were, and will be, made in the future to check for any escaped plants.

B. G.P.S. coordinates of the production fields and nurseries are overlaid on county road maps and integrated with data related to the production. This information will be used to monitor future field locations, rotation, and type of transgenic characteristics grown.

**RESULTS:**

This system was successful for the production of quality seed that retained the desired level of the transgenic character.

**CONCLUSION:**

A detailed integrated system to produce commercial seed with a transgenic trait is possible. For the future, it will require additional monitoring techniques beyond what has normally been necessary. The system will also require continued evaluation and monitoring to ensure that the transgenic traits are not inadvertently crossed with similar or different traits. This can be accomplished by a complete understanding of both the transgenic trait involved and the growing area where this seed will be produced.