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Genetic Use Restriction Technology (GURTs)
A CSTA Position Paper
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Description:

GURTs (Genetic Use Restriction Technology) or gene switching technologies are a range of genetic techniques that manage the expression or dissemination of genes, up to the level of a whole genome of a plant or animal. Gene switches also occur naturally, and are involved in processes as diverse as plant development from seed to plant responses to environmental cues to plant senescence.

GURTs used or proposed for use in plant breeding have generally been classified by FAO as V-GURTs ("varietal") and T-GURTs ("trait"); V-GURTs results in the discontinuation of subsequent plant generations through non-viable seed, lack or loss of reproductive structure or premature senescence, while T-GURTs result in loss or gain or gain of specific traits or fail to breed true, but viable seed is produced.

T-GURT

T-GURT

In classical genetics, hybrid breeding is a widely adopted form of a GURT application (in use for over 70 years) that has resulted in substantial gains in yield in certain crops (e.g.: corn) due to a natural biological phenomenon termed 'hybrid vigor". As a result, growers typically do not replant the harvested seed, as it is inferior when compared to the yield and economic benefits of purchasing and planting new hybrid seed. This example is analogous to a T-GURT. Many techniques of modern biotechnology are available to achieve trait-specific genetic use restriction. A T-GURT may involve a specific trait regulated by an inducible promoter, often termed a "gene switch". T-GURT technology can also be used for removal of inserted genes not critical for expression of the desired trait, such as selectable marker genes.

V-GURT

V-GURT

Transgenic V-GURTs can be created by a number of techniques. Typically it involves chemical induction of a disruptor gene or chemical suppression of a constitutively active disrupter gene. In the first example, plants treated with a chemical inducer fail to produce viable seed, while in the latter case, the absence of the suppressor chemical would produce sterile seed. An example of a V-GURT from classical breeding is seedless watermelon or seedless grapes.

* The definition for Biotech/Genetic Engineering used here is the Codex interpretation and excludes the following techniques: 1) mutagenesis 2) cell fusion (including protoplast fusion) of plant cells where the resulting organism can also be produced by traditional breeding methods.

CSTA Position

In addressing the use of GURTs, the Canadian Seed Trade Association supports the following positions:

- GURTs encompass a number of different technologies, and should not be dismissed arbitrarily as a group.
- CSTA supports the Government of Canada view that GURTs could have potential benefits as a biosafety tool which could mitigate the dissemination of novel traits in the environment and should be reviewed by regulatory authorities on a case by case basis.
- CSTA understands that some individuals have concerns about some potential applications of GURTs; however, each technology should be assessed in its own unique context, and the risks and benefits it may provide for agricultural, pharmaceutical or industrial production.
- CSTA supports the need for farmers to have a choice among production systems and access to new technologies

Potential Benefits

- Openness to any emerging technology encourages private sector investment and innovation
- Gene switches switching on drought-resistance or nitrogen ulitlization genes, when and where they are required - leaving the plant with more energy to spend on growth and seed production or when pests are attacking a crop, only at the appropriate time.
- V-GURT technology could reduce volunteers in crop rotations.
- GURTs (both V and T) could offer another level of technical tools to manage Plant-Made Pharmaceuticals (PMPs) and Plant-Made Industrial Products (PMIPs).

Potential Concerns:

- Some groups are concerned about the potential loss of farmer's ability to save seed, or GURTs' potential to limit the availability of traits to the wider breeder community.
- Impact on public receptivity to agricultural biotechnology in general
- With respect to the environment, there is concern from some groups that GURTs could escape into wild populations, with negative environmental impacts.
- Some groups are concerned about the reliability of GURT technology for users, or over-reliance on technical solutions (like GURTs) for containment strategies.