Genetic Engineering For Agricultural Sustainability

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Introduction

Essential question:

How can biotechnology methods be used to improve agricultural sustainability?

PURPOSE STATEMENT

Purpose

Introducing GMO technology to strawberries by slowing the ripening process to reduce food waste.

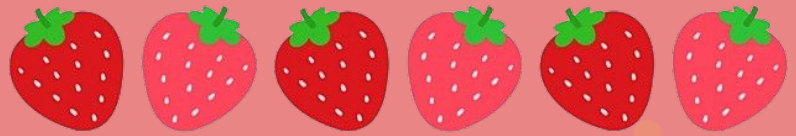
Potential

This technology has been used in tomatoes, increasing yield by up to 39% and shelf life by up to 2 weeks.

Novelty

There are currently NO GMO strawberries in the market.

What are GMOs?

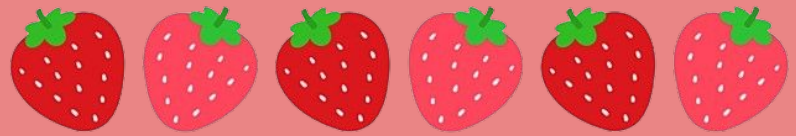


GMO's are known as: GENETICALLY MODIFIED ORGANISMS

- ★ GMOs are used by scientists to modify or alter the genes of organisms using genetic engineering techniques such as modifying the DNA sequence.
- ★ For example, one of the methods that people used for many years is breeding years, which genetically altered the species for many years until they achieved the desired result

How do GMOs help plants adapt to the harsh environmental conditions?

- ★ Protection against drought and disease
- ★ Protection against insects, modifications that produce bacteria which is fatal to insects



What are the pros of GMOS?

Pros

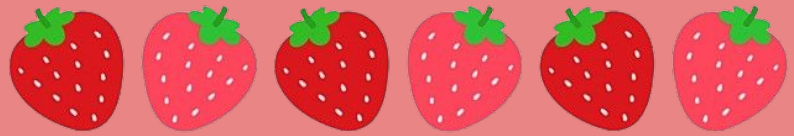
- ★ Increased amounts of crop yield
- ★ Require less resources for plant management
- ★ Use less pesticides for the crops
- ★ Reduced tillage ↠ reduced greenhouse gasses released into the atmosphere
- ★ Increased plant growth
- ★ Increased ranges of tolerances
- ★ Reduces risks of diseases
- ★ Increases supply of food while also conserving life

Cons

- ★ Possible long-term safety concerns
- ★ Lower biodiversity
- ★ Customer resistance
- ★ Cost

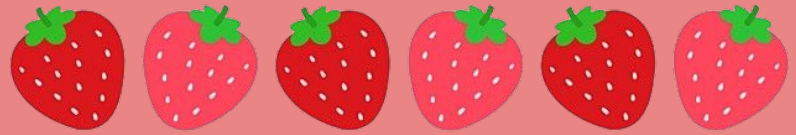
GMOs and Strawberries

56%



Of strawberries are wasted rather than eaten, according to York University.

35%



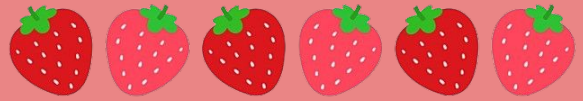
Are wasted by the consumer.

No GMO Strawberries

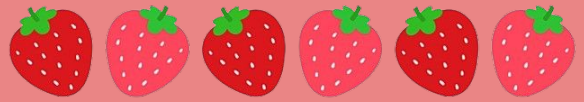
Currently there are no GMO strawberries being sold in the market.

Plant breeders use different techniques to create variety in strawberries with desired traits

- ★ The technique is known as hybridization
- ★ Hybridization is a method of manually cross breeding two organisms of the same species but different breeds.



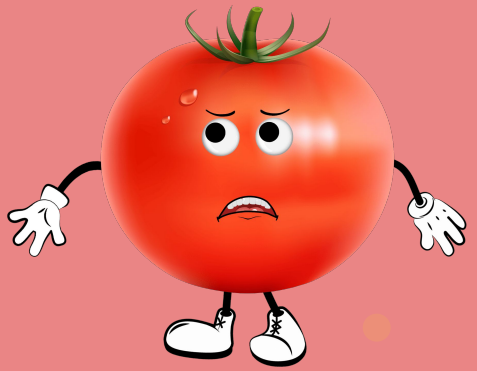
Flaws of Hybridization



- Hybridization is when two genetically individuals are combined to produce a third individual with a preferred set of traits.
- Hybridization processes are time consuming.
- Hybridization reduces the life span of different fruits, causing it to rot quickly.
- We can reduce price by producing higher yields through genetic modifications

Case Study

- ★ Upto 50% of crop yields are wasted. One of the first crops modified to slow down rot were tomatoes.
- ★ Ethylene, a hormone found in plants, is what controls the ripening process.
- ★ By controlling the production of ethylene by inserting antisense genes, crops can have an extended lifetime.
- ★ Research shows that an enzyme called polygalacturonase- which causes tomatoes to soften- can be turned off (Flavr Savr tomato).



Case Study

(purdue study)

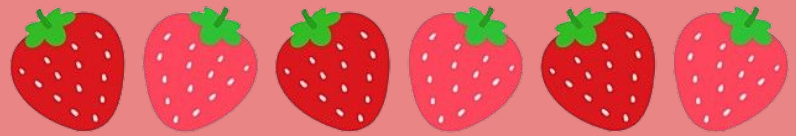
- ★ Students at a lab added in a yeast gene which increases production of spermidine in tomatoes
- ★ Spermidine is a compound that slows aging
- ★ Tomatoes lasted 8 days longer before shrivelling

Connection to Strawberries

- ★ Study shows that these findings could be replicated in other fruits due to the universal nature of DNA code.
- ★ Greatly increase shelf life and therefore reduce waste
- ★ Reduce price, increase quality

Education on GMOs to consumers

- ★ Many consumers are concerned with any fruits and vegetables being modified by GMOS
- ★ Some individuals don't buy due to them being "inorganic"
- ★ However, with proper education, we can reduce the stigmas against GMOs and show the public their benefits.




thank you

Works Cited

Strawberries and Hybridization Are Strawberries GMOs? It is important to note there are currently no genetically modified strawb, https://www.ncfb.org/wp-content/uploads/2021/03/Strawberries-and-Hybridization.pdf. Accessed 20 April 2024.

“An Analysis of Food Waste in Ontario's Domestic Fresh Strawberry Supply Chain.” *YorkSpace*, https://yorkspace.library.yorku.ca/items/89e5b90e-d086-4766-be97-c76d812912f9. Accessed 20 April 2024.

Collins, James. “How antibiotics kill bacteria: from targets to networks.” *NCBI*, 4 May 2010, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2896384/. Accessed 20 April 2024.

Fabio, Michelle. What Ever Happened to the Flavr Savr Genetically-Engineered Tomato? Tags: Flavr-Savr, General-Electric, Genetically-Engineered-Tomato. 16 Feb. 2015.

“Gene leads to longer shelf life for tomatoes, possibly other fruits.” *Purdue University*, 28 June 2010, https://www.purdue.edu/newsroom/research/2010/100628HandaTomato.html. Accessed 20 April 2024.

“Innovation: Genetic alteration of plants aims to stop the rot: A.” *The Independent*, 24 September 1994, https://www.independent.co.uk/news/business/innovation-genetic-alteration-of-plants-aims-to-stop-the-rot-a-sloweddown-tomato-is-the-first-fruit-of-a-process-to-make-food-crops-last-longer-and-cut-waste-1451036.html. Accessed 20 April 2024.

“Prevent bacteria from feasting on your fresh produce, causing spoilage.” *MSU College of Agriculture and Natural Resources*, 30 January 2013,