









Agriculture Division of DowDuPont™

CRISPR Impact on Plant Breeding

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Plant Breeding Develops Product Diversity

Six Vegetables That Are the Same Biological Species						
Wild Mustard Plant	Kohlrabi	Kale	Broccoli	Brussels Sprouts	Cabbage	Cauliflower
						
	Stem	Leaf	Flower bud and stem	Lateral leaf bud	Terminal leaf bud	Flower bud
Selected Characteristic						

Examples of Traits Developed by CRISPR-Cas Gene Editing



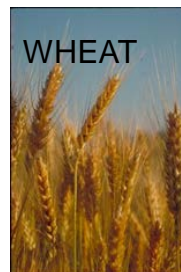
Corn:

- Reduced phytate
- Waxy starch
- Disease resistance



RICE

- Yield components improvement
- Fragrant
- High amylose

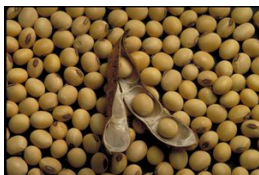


WHEAT

- Powdery mildew resistance
- Low gluten



Virus resistance



Soybean:

- Improved oil quality
- Delayed flowering



CAMELINA

- Improved oil quality



- Powdery mildew resistant
- Parthenocarpic (seedless)
- High GABA
- Longer shelf life



Canker resistance

Solutions Around the Corner

Could gene-editing save chocolate from extinction? Mars reveals its plan

<http://www.dailymail.co.uk/sciencetech/article-5228113/Could-gene-editing-save-chocolate-extinction.html>

These scientists are on a mission to save chocolate

Cacao isn't on the brink of extinction, but it is under threat.

<https://www.nbcnews.com/mach/science/these-scientists-are-mission-save-chocolate-ncna842641>



Cacao Innovative Genomics Institute

To protect vineyards from pests and reduce pesticide use, CRISPR could be the answer

Andrew Porterfield | Genetic Literacy Project | December 15, 2017



<https://geneticliteracyproject.org/2017/12/15/search-protect-vineyards-pests-reduce-pesticide-use-crispr-answer/>



Leaves afflicted with powdery mildew

"The fungus will always be there. But if the plants can [become] resistant, we don't have to spray so much".

Rong Di, a plant pathologist and molecular biologist, Rutgers University, USA

<https://www.winemag.com/2017/01/01/can-science-save-our-favorite-wines/>

Solutions Around the Corner?

GOING BANANAS OVER CRISPR

March 9, 2017 · by athenssciencecafe · in Agriculture, Blog, Conservation, Genetics, Plants, Technology. ·

<https://athensscienceobserver.com/2017/03/09/going-bananas-over-crispr/>



Most bananas grown today are of the Cavendish variety, which are being wiped out by Panama disease. **Image Credit:** Flickr via Hanoi Mark.

nature International

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NATURE | NEWS

Geneticists enlist engineered virus and CRISPR to battle citrus disease

Desperate farmers hope scientists can beat pathogen that is wrecking the US orange harvest.

Heidi Ledford

16 May 2017

Are gene-edited oranges, grapefruits the answer to devastating disease?

Researchers using CRISPR gene-editing technology, nanotechnology to fight citrus greening

by Sustainable Food News
January 20, 2017



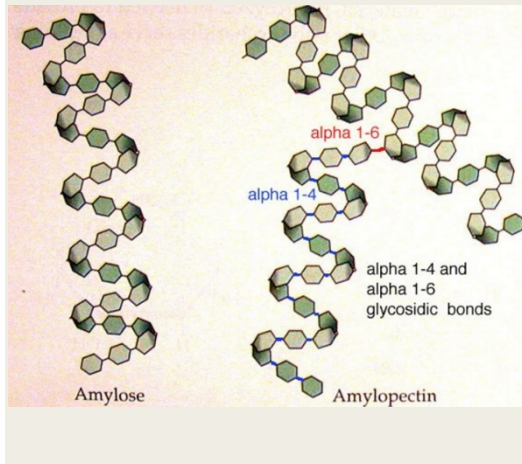
geneticliteracyproject.org

Citrus greening has slashed US orange production in half over the past decade, and threatens to destroy the US\$3.3-billion industry entirely.

Source: <http://www.nytimes.com/2008/08/26/science/26citrus.html>

CRISPR-Cas Waxy Corn

Starch



No. 2 Yellow Dent Corn



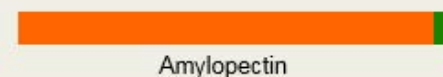
- Translucent appearance
- Feed / ethanol / food
- Starch:



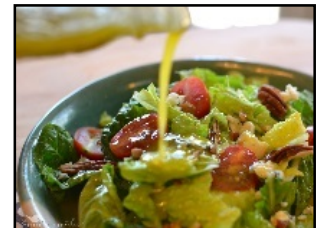
Waxy Corn



- Candlewax-like appearance
- Food / industrial
- Starch:



- High amylopectin starch corn
- Phenotype due to **mutation in *Wx1* gene**: starch synthase catalyzing amylose biosynthesis
- In commercial cultivation since mid-1940's
- Variety of uses in food and paper-making industries



Corteva™ Agriscience Collaborations through Open Innovation



CIMMYT

Targeting Maize Lethal Necrosis Disease



Danforth Center

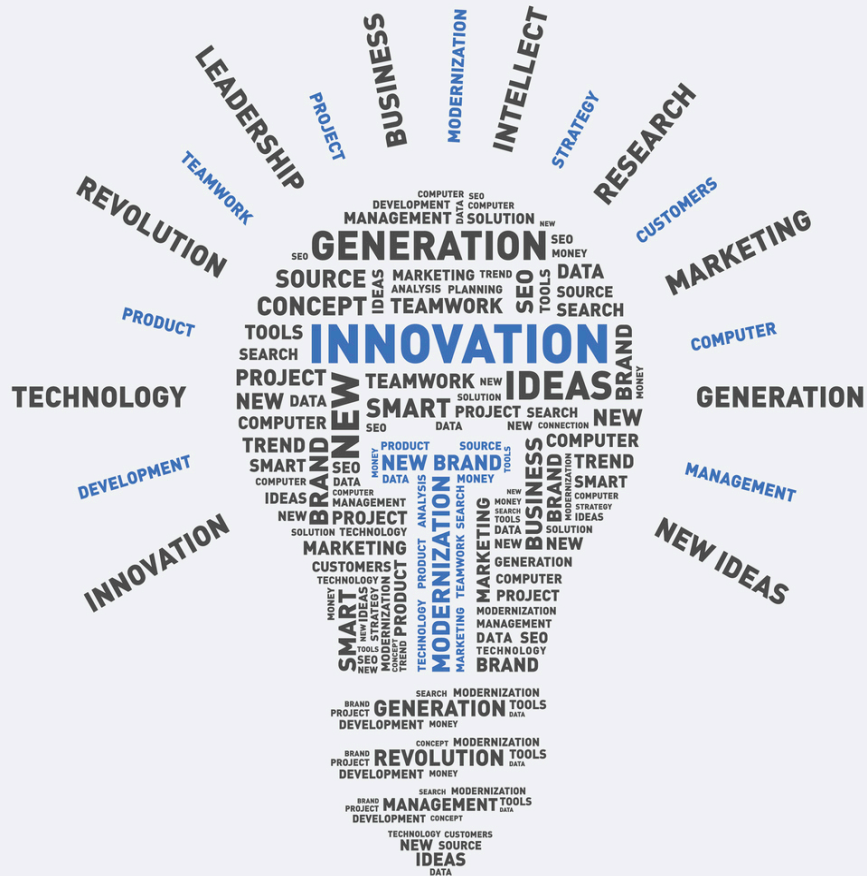
Targeting Cassava Improvement



ICRISAT

Targeting food security crops such as sorghum and millet

What Enables Innovation



Technology

- Science
- Technical capabilities
- Intellectual property
- Collaborations

Policy

- Regulatory frameworks

"Social
license"

- Societal value
- Trust
- Who benefits?
- Transparency