

New! Sign up for our free **email newsletter**.

Science News

from research organizations

Hotter, drier, CRISPR: editing for climate change

Date: March 1, 2021

Source: University of Queensland

Summary: Just 15 plant crops provide 90 per cent of the world's food calories. A review of genome editing technologies states gene editing technology could play a vital role to play in climate-proofing future crops to protect global food security. The review recommends integrating CRISPR-Cas9 genome editing into modern breeding programs for crop improvement in cereals.

Share: [!\[\]\(d3102649f02e825ddb76dc3de0190154_img.jpg\)](#) [!\[\]\(55ca3a38dbb940110628e54e3ea7505d_img.jpg\)](#) [!\[\]\(1ad7b9dfa1e10e48660df5dd18a1b20c_img.jpg\)](#) [!\[\]\(7b7f78f3b14c2b344e3d1b2a79a760c9_img.jpg\)](#) [!\[\]\(ea85bb5cc605bcd0e585ecc5f09976f5_img.jpg\)](#)

FULL STORY

Gene editing technology will play a vital role in climate-proofing future crops to protect global food supplies, according to scientists at The University of Queensland.

Biotechnologist Dr Karen Massel from UQ's Centre for Crop Science has published a review of gene editing technologies such as CRISPR-Cas9 to safeguard food security in farming systems under stress from extreme and variable climate conditions.

"Farmers have been manipulating the DNA of plants using conventional breeding technologies for millennia, and now with new gene-editing technologies, we can do this with unprecedented safety, precision and speed," Dr Massel said.

"This type of gene editing mimics the way cells repair in nature."

Her review recommended integrating CRISPR-Cas9 genome editing into modern breeding pro-

grams for crop improvement in cereals.

Energy-rich cereal crops such as wheat, rice, maize and sorghum provide two-thirds of the world's food energy intake.

"Just 15 plant crops provide 90 per cent of the world's food calories," Dr Massel said.

"It's a race between a changing climate and plant breeders' ability to produce crops with genetic resilience that grow well in adverse conditions and have enriched nutritional qualities.

"The problem is that it takes too long for breeders to detect and make that genetic diversity available to farmers, with a breeding cycle averaging about 15 years for cereal crops.

"Plus CRISPR allows us to do things we can't do through conventional breeding in terms of generating novel diversity and improving breeding for desirable traits."

In proof-of-concept studies, Dr Massel and colleagues at the Queensland Alliance for Agriculture and Food Innovation (QAAFI) applied gene editing technology to sorghum and barley pre-breeding programs.

"In sorghum, we edited the plant's genes to unlock the digestibility level of the available protein and to boost its nutritional value for humans and livestock," she said.

"We've also used gene-editing to modify the canopy architecture and root architecture of both sorghum and barley, to improve water use efficiency."

Dr Massel's research also compared the different genome sequences of cereals -- including wild variants and ancestors of modern cereals -- to differences in crop performance in different climates and under different kinds of stresses.

"Wild varieties of production crops serve as a reservoir of genetic diversity, which is especially valuable when it comes to climate resilience," she said.

"We are looking for genes or gene networks that will improve resilience in adverse growing climates.

"Once a viable gene variant is identified, the trick is to re-create it directly in high-performing cultivated crops without disrupting the delicate balance of genetics related to production traits.

"These kinds of changes can be so subtle that they are indistinguishable from the naturally occurring variants that inspired them."

In 2019, Australia's Office of the Gene Technology Regulator deregulated gene-editing, differentiating it from genetically modified organism (GMO) technology.

Gene edited crops are not yet grown in Australia, but biosecurity and safety risk assessments of the technology are currently being undertaken.

This research is funded by an Australian Research Council Discovery grant with support from the Queensland Department of Agriculture and Fisheries and The University of Queensland.

RELATED TOPICS

Plants & Animals

- > Agriculture and Food
- > CRISPR Gene Editing
- > Food and Agriculture
- > Biotechnology and Bioengineering

Earth & Climate

- > Global Warming
- > Climate
- > Environmental Awareness
- > Environmental Issues

RELATED TERMS

- > Agronomy
- > Plant breeding
- > Cereal
- > Heirloom plant
- > Seedbank
- > Gene
- > Climate change mitigation
- > Organic food

Story Source:

Materials provided by **University of Queensland**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Karen Massel, Yasmine Lam, Albert C. S. Wong, Lee T. Hickey, Andrew K. Borrell, Ian D. Godwin. **Hotter, drier, CRISPR: the latest edit on climate change**. *Theoretical and Applied Genetics*, 2021; DOI: [10.1007/s00122-020-03764-0](https://doi.org/10.1007/s00122-020-03764-0)

Cite This Page:

MLA

APA

Chicago

University of Queensland. "Hotter, drier, CRISPR: editing for climate change." ScienceDaily. ScienceDaily, 1 March 2021. <www.sciencedaily.com/releases/2021/03/210301112331.htm>.

Explore More*from ScienceDaily***RELATED STORIES****Genome Editing: Reducing Off-Target Mutations in DNA**

Sep. 15, 2023 — Researchers have developed a novel genome editing technique known as NICER, which results in significantly fewer off-target mutations than CRISPR/Cas9 editing. The technique uses a different type of ...

High-Precision Genome Sequencing of Buckwheat Breeds Hope for Future Harvests

Aug. 11, 2023 — Buckwheat's high-precision chromosomal-level genome sequence has been deciphered, a key step toward unraveling the evolution of the buckwheat genome and the origins of the cultivated crop. By ...

Six Novel Variants for CRISPR-Cas12a in Plants, Expanding Genome Engineering

Mar. 29, 2021 — Scientists innovate genome editing and engineering in plants, with the ultimate goal of improving the efficiency of food production. His new work contributes six novel variants of CRISPR-Cas12a in ...

New Plant Breeding Technologies for Food Security

Mar. 29, 2019 — Scientists argue that new plant breeding technologies can contribute significantly to food security and sustainable development. Genome editing techniques in particular, such as CRISPR/Cas, could ...

Breaking

this hour

-
- > Evaluating Truthfulness Ups Belief in Fake News
 - > Using AI, a New Class of Antibiotics
 - > How Jellyfish Regenerate Tentacles in Days
 - > How Did the Universe Begin?
 - > Reindeer Sleep While Chewing Their Cud
 - > Light Color and Internal Clock
 - > Insect Defense Strategies in the Cretaceous
 - > Neolithic Farmers
 - > Sounds of Sea Creatures
 - > Future of Endangered Species Act

Trending Topics

this week

PLANTS & ANIMALS

Dogs

Endangered Animals

Zoology

EARTH & CLIMATE

Environmental Policy

Sustainability

Exotic Species

FOSSILS & RUINS

Ancient DNA

Cultures

Origin of Life

Strange & Offbeat

PLANTS & ANIMALS

Reindeer Sleep While Chewing Their Cud

World's Smallest 'Fanged' Frogs Found in Indonesia

Coevolution Helps Santa's Reindeer Feast After Flight

EARTH & CLIMATE

Seals Stay Warm and Hydrated in the Arctic With Larger, More Convoluted Nasal Passages

How a Drought Led to the Rise of Skateboarding in 1970s California

Have Researchers Found the Missing Link That Explains the Mysterious Phenomenon Known as Fairy Circles?

FOSSILS & RUINS

Viking Dentistry Was Surprisingly Advanced

Earliest Evidence for Domestic Yak Found Using Both Archaeology, Ancient DNA

This Japanese 'Dragon' Terrorized Ancient Seas