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How would you like it if your tomatoes were spicy? Well, for one it will help you liven up your bland dish without actually adding chilli to it. Scientists say that tomatoes are closely related to peppers and the two plants diverged 19 million years ago, however, tomatoes still have all the genes necessary to produce capsaicinoids (capsaicin is the chemical compound that gives hot chilli peppers the heat one experience when eating them). Researchers from the Federal University of Viçosa in Brazil writes in the journal *Trends in Plant Science* that gene-editing tools like CRISPR could turn it back on.

Researchers say that adding capsaicinoids to tomatoes will in fact turn out to be economical. Since they grow bountifully and easily, and there's a commercial and technical infrastructure surrounding them which makes tomatoes a safe option for agriculture. Peppers, on the other hand, do not grow as readily, are more easily affected by pests and diseases and their capsaicin yields are highly dependent on the environment (they lack the reliability that large-scale agriculture requires). When compared, pepper yields average about three tons per hectare; while tomatoes can yield around 100 tons per hectare.

Capsaicin on the other hand is in demand for more than just dishes. It is used in pepper spray, as an anaesthetic, it is anti-inflammatory, antioxidant and has weight-loss properties. Studies say that capsaicin may even be helpful in fighting cancer. Because of its varied commercial uses, a more dependable means of acquiring capsaicin would be advantageous. Currently, there is no efficient way of mass-producing capsaicin in a chemical plant, so it has to be grown naturally through peppers, and tomatoes could be an alternative option.

Now, how can they be grown? The researchers outline two methods by which this genetic manipulation could take place. Genes from a kind of bacteria that infects plants and has the ability to regulate their gene expression, could be tweaked and inserted into a viral vector to reactivate the capsaicin pathway in tomatoes. A more conventional genetic engineering like the gene-editing tool CRISPR could also be used to accomplish the same thing. There are still questions to be explored as to the efficacy of both techniques, but the researchers say they are fairly confident that any technical challenges could be tackled with further testing.

In this newsletter, we have captured the news on the above research and more interesting developments from around the world on the latest advancements in the agri industry. We hope you find it a good read.

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AgBiotech News

Europe must embrace GMOs to address the UN SDGs

(The Parliament Magazine)

If the world were to switch to organic agriculture, we would need even more land to produce the same amount of food. The most devastating ecological impact of agriculture is the replacement of forests with land brought under human control to produce food for ourselves or our domestic animals. Pests, diseases and weeds can reduce yields by 50 percent or more. Agrichemicals are widely used to manage these challenges. Plants have extremely powerful defence mechanisms against disease, but they only work if switched on early enough and this depends on them being able to detect the invading microorganism via dedicated receptors.

Organic, ZBNF, Biodynamic or GM – Way for future farming in India

(AgroSpectrum)

The challenges of meeting the food security and nutritional security of the country in a profitable way for the farmer and in an environmentally sustainable way are enormous. We have to get ready to feed 150 crore population in the next ten years, with the bottom of the pyramid requiring food at affordable prices.

Kenya demonstration plots show GMO maize resists insects, increases yields

(Cornell's Alliance for Science)

Demonstration plots in Kenya show that genetically modified (GM) maize varieties are more effective in controlling insect attacks than their conventional counterparts — without the use of pesticides. As a result of the pest protection provided by the Bt gene, the GM maize outperformed conventional varieties three-fold per hectare, according to the post-harvest evaluation of TELA project demonstration plots in east Kenya and the Rift valley. TELA maize also provides drought tolerance. However, these demonstrations showcased the effects of the Bt trait.

Scots scientists develop antibiotics-producing crops

(The National)

Scottish scientists have tested a new way to protect crops from disease by making the plants manufacture antibiotics. They hope it can replace conventional antibiotics, removing a driver of antibiotic resistance that could spread to human diseases. The team at Glasgow University genetically engineered plants to fight off bacterial infection on their own by producing a targeted protein antibiotic, or bacteriocin.

Recycling nutrient-rich industrial waste products

(The Times of India)

A new study suggests that recycling biotechnology byproducts can enhance soil health while reducing carbon emissions and maintaining crop yields. In a recent paper in Agrosystems, Geosciences and Environment, researchers examine the possible benefits of a new kind of crop fertiliser. They studied two fields of maize -- one plot treated with heat-inactivated spent microbial mass (SMB), and one plot treated with a typical farmer fertiliser practice.

Climate change: as crops are affected, debate heats up overuse of plant gene data

(Sight Magazine)

Rich and poor countries are at loggerheads over how to share benefits from genetic plant data that could help breed crops better able to withstand climate change. The little-known agreement is seen as crucial for agricultural research and development on a planet suffering rising hunger, malnutrition and the impacts of climate change. The debate over "digital sequence information" has erupted as the cost of sequencing genomes falls, boosting the availability of genetic plant data. A lot of modern crop breeding relies on these data today.

CRISPR, disease-sensing technologies could yield a 'cornucopia' of healthier, tastier foods
(Genetic Engineering & Biotechnology News)
Consumers may soon begin purchasing fun-sized fruits and vegetables, as well as processed foods that incorporate healthier ingredients and producers may be able to grow crops that are drought- and flood-tolerant, yield more per acre, and are easier to harvest and transport—and are tastier, more nutritious, and less allergenic, too. These are just a few of the possibilities that are being realized thanks to recent applications of gene editing technology in crop science.

Gene editing startup hits milestones for new crops in $100M deal with Bayer
(WRAL Techwire)
Pairwise disclosed early completion of its development milestones in its collaboration with Bayer. Using gene editing technology known as CRISPR, Pairwise is seeking to develop new products aimed at improving corn, soybeans, wheat, canola and cotton.

GMOs are 'substantially equivalent' to conventional foods. Should they face reduced regulations?
(Genetic Literacy Project)
If there is a single concept that drives much of the divide in the GMO debate, it's substantial equivalence. Having different understandings or misunderstandings of the concept leads to rancor, distrust and talking past each other. Proponents see it as a commonsense way of determining if heightened regulatory scrutiny for a new product is warranted or unnecessary. Critics of genetic engineering often see it as some sort of trick — a sleight of hand or legalistic loophole. They ask how something can be so novel that on one hand, it merits the legal protection of a patent monopoly, and then on the other hand, the FDA can declare it to be substantially equivalent to its parent variety or breed. That suspicious and often paranoid take is nearly always based on misunderstandings of the concept of substantial equivalence and how patents work.

Research and innovation set to get boost in Punjab
(The Tribune)
Punjab witnessed a boost in technology as The Progressive Punjab Investors Summit 2019 saw research institutions, corporates, e-tailers and the Punjab government exchanging MoUs to promote research and development, innovation and facilitating MSMEs. Punjab Agricultural University (PAU) signed an MoU with California State University, Hero Group with Birmingham University and the state government with Amazon and Flipkart to facilitate the MSMEs. The PAU also inked agreement to promote cooperation in crop improvement, biotechnology, natural resources, production and cultural practices, water and irrigation technology, and agricultural business.

How international anti-biotech activists manipulate year-old Mexican government to block crop GMO innovations
(Genetic Literacy Project)
On December 1, 2018, Andrés Manuel Lopez Obrador (AMLO) became the 58th President of Mexico, taking 53 percent of the vote. During his campaign, he advanced important policy proposals to increase funding for scientific research and ensure the country's food self-sufficiency. So far, though, those campaign promises have not materialized. The new administration has been used by local affiliates of international environmental activist groups that have been working to make Mexico a GMO-free country. They focus their efforts mostly on corn because the plant originated in Mexico, which is still home to 64 different maize varieties. The AMLO administration opened the door to these activists by giving their leadership important government positions, where they can lobby to maintain bans on GM corn and soybean cultivation. Now, they are trying to reform Mexico's biosafety Law in order to outright ban genetically modified crops at the national level.

Gene Bill survives ambush

(The West Australian)

A last-ditch attempt to derail legislation allowing new gene editing technology — hoped to lead to better crop varieties — has been foiled in the Senate. Debate over gene editing legislation hit Parliament last month after amendments to the Gene Technology Act were signed off earlier this year. The Federal Government amendments marked the first changes to Australia's Gene Technology Regulations in nearly 20 years. Importantly, the amendments mean the SDN1 gene-editing technique falls outside the definition of a genetically modified organism. This means scientists, including plant breeders, can use the technique to remove unwanted genes from DNA without the practice being regulated as a GMO.

As natural cultivation of corn less profitable, GM now relevant: Report

(FNB News)

Using genetic modification techniques and bioengineering procedures to cultivate crops is being commonly exercised across the global food and beverage industry, according to a forecast on Global GMO Corn Market for 2017-26 period. With global farming conditions getting worse, cultivation of crops such as maize (corn) is being heavily marred by irregular presence of key micronutrients such as dietary fibres. Natural cultivation of corn, which is one of the richest source of energy (carbs) and has high presence of dietary fibres, is becoming less profitable as majority of farm produce remains under the low quality margin. This has instrumented the cultivation of corn crop as a genetically modified organism (GMO). The report on GMO Corn Market has been released by Fact.MR.

GM crops ban to stay in force in SA

(9News)

A second attempt by South Australia's Liberal government to lift a longstanding ban on genetically modified crops has failed. After disallowing the government's regulations in a vote late last month, parliament's upper house this week also rejected a bid to pass legislation to end the moratorium. The ban has been in place since 2003 and is legislated to continue until 2025.

'Natural health' and conspiracy sites exploit social media to fester opposition to GMO crops. Here's a study about what can be done to stop it

(Genetic Literacy Project)

The average American consumes about one ton of food each year. Livestock chomp on approximately 50 billion servings of grain and other foods annually. Together, these figures represent trillions of meals since 1996, when crops modified by biotechnology, mostly corn and soybeans, but also alfalfa, potatoes, squash and papaya, went on sale in the United States. How many deaths or illnesses have been linked to genetically modified crops? Not one. Not so much as a sniffle.

FSANZ Releases Final Report on Review of Foods Derived Using New Breeding Techniques

(FSANZ Report)

Food Standards Australia New Zealand (FSANZ) released the final review on foods developed using new breeding techniques (NBT) and found that while views in the community differed, many agreed that the current definitions lack clarity and are no longer fit for purpose when it comes to the safety and regulations of NBT-derived foods. FSANZ previously conducted consultations in 2018 with key stakeholders and the rest of the community regarding their view on NBT-derived foods. Specifically, these consultations aimed to describe the respondents' views on how NBT-derived foods should be captured for pre-market approval. More importantly, it also meant to determine if the definitions of the terms "food produced using gene technology" and "gene technology" needed to be improved and further clarified.

New Research

Scientists are creating super-healthy, gene-edited spicy tomatoes

(Quartz)

Somewhere in an alternate universe, humans are eating spicy tomatoes. We're not though, because 19 million years ago on Earth, the juicy fruit and its spicy cousin, the chili pepper, split from their

common ancestor, forever changing the trajectory of the two cultivated plants. While they still share much of the same DNA, they've taken on much different growing patterns, shapes, and taste profiles.

GM potato trials point to blight resistant crops of the future
(Farming UK)
A genetically modified potato with improved tuber quality and resistance to the devastating disease late blight has progressed successfully through trials. The field trials follow lab experiments to modify Maris Piper potatoes with late blight resistance genes from wild relatives of potato. To improve tuber quality, the modified Maris Piper lines also have genes switched off – or "silenced" – to reduce browning upon bruise damage. A gene was also switched off to avoid cold-induced sweetening, which is the accumulation of reducing sugars during cold storage that causes blackening when potatoes are cooked at high temperatures.

Tiny rare fruit that tastes like pineapple could hit stores thanks to gene editing
(Denton Daily)
A rare fruit could wind up in U.S. stores in the near future after scientists spliced its DNA to make it heartier and more efficient. It's called the groundcherry, and its success could lead to the modification of more rare fruits and vegetables. Found in Central and South America, the groundcherry grows in a husk like a tomatillo but tastes a bit like a pineapple. Occasionally found at farmers markets, it's known as an "orphan crop," a plant too finicky for mass production.

Could this high-iron GM wheat help prevent anaemia?
(Eastern Daily Press)
A genetically modified (GM) wheat plant whose grain makes flour with extra iron to help anaemia sufferers has shown promising results in its first season of field trials in Norwich. Crop scientists from the John Innes Centre, who have been testing the biofortified wheat at the Norwich Research Park, found double the amount of iron in white flour milled from the grain, compared to control wheat. The aim of the research is to produce an ingredient which could be used in white bread to reduce iron deficiency anaemia - a significant global health problem which particularly affects women and young girls.

Scientists Turn Crop Waste into Fragrances with Microbes
(Labiotech)
A team of researchers in Brazil and the UK has developed a fermentation technique to turn plant waste, such as wheat straw, into a valuable chemical used in the fragrance industry. In a study published in the journal Green Chemistry, the scientists used engineered Escherichia coli bacteria to break down sugar cane and wheat straw, waste products from the agricultural industry. The bacteria then fermented the waste materials into coniferol, a high-value chemical used in fragrances and washing powders. The research was carried out by scientists based at the Manchester Institute of Biotechnology, University of Manchester, UK, and two universities in Brazil.

Brazilian Scientists Publish Most Complete Genome Sequence of Commercial Sugarcane
(FAPESP)
An international group of researchers led by scientists from Brazil's Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) has assembled the most complete genome sequence of commercial sugarcane, mapping 373,869 genes, equivalent to 99.1% of the total genome. The group sequenced the variety SP80-3280, one of the top 20 sugarcane varieties grown in São Paulo. It was chosen for sequencing because more data are available about this variety in scientific literature than any other variety. The sequence published has made it possible for the first time to identify gene promoters, regions in DNA that control gene expression. Researchers from the University of São Paulo (USP) are now developing tools for the genetic improvement of sugarcane and testing several candidate genes in genetically modified (GM) plants

'Tuning' plant flowering signals with CRISPR could yield heartier crops suited to harsh environments
(Science)
Increasing human populations demand more productive agriculture, which in turn relies on crop plants adjusted for high-yield systems. Genetic tuning of the signaling systems that regulate flowering

and plant architecture can be applied to crops. Crops that flower sooner might be adaptable to regions with shorter growing seasons, and compact plant shapes might facilitate agricultural management. The universality of these plant hormone systems facilitates application to a range of crops, from the orphan crop teff to the well-known wheat.

Why CRISPR Looks Promising for Apple Breeding

(Growing Produce)

Apple production has been dominated by a handful of cultivars, such as 'Gala,' 'Red Delicious,' 'Fuji,' 'Golden Delicious,' 'Honeycrisp,' and others, although there are thousands of named apple cultivars. Given the market recognition of these widely grown cultivars, using the CRISPR/Cas9 system to enhance their fruit quality attributes and resistance to diseases and storage disorders are considered one of the most effective strategies in apple genetic improvement.

International Research Team Finds Genes Conferring Resistance to Multiple Leaf Rust in Barley

(KAUST Discovery)

An international team led by researchers at the King Abdullah University of Science and Technology (KAUST) has identified genes that confer resistance to multiple leaf rust species in barley. Simon Krattinger from KAUST's Center for Desert Agriculture refers to their findings as non-host resistance, the resistance of an entire species against all strains of a pathogen. All barley cultivars are resistant to leaf rusts of other cereals; therefore, there is no clear genetic variation within barley species that might indicate which genes are involved. KAUST's collaborators in the Netherlands infected 1,733 barley cultivars with wheat leaf rust. They found that most plants were resistant, but a few lines developed hints of leaf rust at the seedling stage. The team was able to crossbreed these lines to generate one line that was highly susceptible to wheat leaf rust which was then crossed with a normal barley cultivar and analyzed to pinpoint the genetic variations conferring nonhost resistance.

Upcoming Events

December 2019

International Conference on Food, Nutrition Security and Sustainable Agriculture
Date: December 01-03, 2019
Venue: Grand Nile Tower Hotel, Cairo, Egypt

African Farming Agro Investment Summit
Date: December 02-03, 2019
Venue: The Tower Hotel, London, UK

AgriBusiness Global Trade Summit Southeast Asia
Date: December 03-04, 2019
Venue: Jakarta, Indonesia

Women in Food & Agriculture summit
Date: December 03-04, 2019
Venue: NH Collection Grand Hotel Krasnapolsky, Amsterdam, Netherlands

ANZ Smart Farms and AgTech Forum
Date: December 03-05, 2019
Venue: The Langham Melbourne, Melbourne, Australia

KISAN 2019
Date: December 11, 2019
Venue: Pune, Maharashtra

ISCA International Science Congress

Date: December 08-09, 2019
Venue: Bhilai Institute of Technology Durg, Durg, India

International Conference on Plant & Soil Science
Date: December 09, 2019
Venue: Park Taipei Hotel, Taipei, Taiwan

International Conference on Agricultural, Biological and Environmental Sciences
Date: December 09-10, 2019
Venue: Mercure Pattaya Ocean Resort, Pattaya, Thailand

EU Agricultural Outlook Conference
Date: December 10-11, 2019
Venue: Brussels, Belgium

International Conference on Green Urbanism
Date: December 11-13, 2019
Venue: Università degli Studi Roma Tre - Architettura, Rome, Italy

International Conference on Agricultural and Biological science
Date: December 19-20, 2019
Venue: Palm Garden Hotel, Putrajaya, Malaysia

January 2020

Grain Tech fair
Date: January 10, 2020
Venue: Pune, Maharashtra

South West Agriculture Conference
Date: January 07-08, 2020
Venue: Canada, North America

Cropping Systems Conference
Date: January 07-08, 2020
Venue: Kennewick, USA

National Youth Summit on Agri Science
Date: January 09-12, 2020
Venue: Chevy Chase, USA

Hi-Tech Agri Fair (iKISAN)
Date: January 10-13, 2020
Venue: Bhuj, India

Annual Northeast Aquatic Plant Management Society Conference (Annual NEAPMS Conference)
Date: January 14-16, 2020
Venue: North Elba, USA

Wheat Industry Winter Conference (WIWC)
Date: January 13-18, 2020
Venue: Washington DC, USA

Global Forum for Food and Agriculture Berlin (GFFA)
Date: January 16-18, 2020
Venue: Berlin, Germany

9th Edition Krushi Mahotsav
Date: January 23-27, 2020
Venue: Nashik, Maharashtra

International Production & Processing Expo
Date: January 23-30, 2020
Venue: Atlanta, USA