Scientists at the University of Oxford's Department of Plant Sciences have discovered how the process of fruit ripening in tomato, including colour changes and softening can be speeded up or slowed down. It can be done by modifying the expression of a single protein located in subcellular organelles called the plastids. Scientists say that this offers a novel opportunity for crop improvement.

In tomato, the fruit ripening process involves changes in tiny "organelles" inside the fruit cells called plastids. It is these plastids that are responsible for giving colour to the fruit. In spite of their central importance in delivering fruit colour, little was known about how plastids participate in the ripening process.

The Oxford team has now discovered a function in fruit for a protein located in the plastids called SP1 (this SP1 protein controls a regulatory pathway called CHLORAD, which was discovered by the group in 2019). The new finding reveals an important regulatory or controlling role for plastids in the fruit ripening process in tomato and that it has real potential as a technology for crop improvement. Scientists say that for example it could be used to develop early or late fruiting varieties of fleshy fruits, or to improve the transportability or shelf-life of fruit by delaying ripening without compromising the quality of the ripe fruit.

The work was funded by the Biotechnology and Biological Sciences Research Council (BBSRC).

We have also covered news around several important developments on agriculture across India, globally and in the area of research. We hope you find the newsletter a good read!

Shivendra Bajaj
Executive Director
Federation of Seed Industry of India-Alliance for Agri Innovation

News from India and Around the World

Analysis of Potential Impact of COVID-19 on GMO Crops and Seeds Market

(Open PR)

As per expert analysts, the global GMO crops and seeds market is prophesized to grow moderately from 2017 to 2022. The market is expected to value at US$36,653.2 by the end of the forecast period growing at a CAGR of 8.3%. The global GMO crops and seeds market is segmented based on crop type, trait, sales channel, and region. In terms of crop type, the segment of corn is expected to lead the market during the forecast period which is 2017 to 2022. This segment accounted for 37.8 % of the market's share in 2017 owing to its use as an insecticide. On the basis of geography, North America is expected to dominate the global GMO crops and seeds market and is perceived to retain its position throughout the forecast period. This region is expected to burgeon at an excellent CAGR of 7.6% during the forecast period.

Feedback delay for gene-editing tech

(Farm Weekly)

WHILE the Federal government deregulated one type of gene-edited crops two years ago, the practical application of the gene technology by plant breeders in Australia has been hampered by a lag in a review to the Food Standards Code. In April 2019, the government, through the Office of the Gene Technology Regulator (OGTR), announced it would not regulate a form of gene editing known as SDN-1 (or site-directed nuclease-1). SDN-1, the most common version of a process which is generally known as CRISPR, and is a new breeding technique (NBT) that is different from traditional GM as it targets, cuts, and deletes DNA in a specific place, after which the cell's natural DNA repair process is allowed to operate, without further intervention.

Banned in Uganda: While the Irish potato faces disease and climate change, politics stymie farmers eager to adopt still unapproved GM seeds

(GLP)

It's a five–hour drive into the western part of Uganda to Kachwekano Zonal Agricultural Research and Development Institute (KaZARDI), where GM Irish potatoes are being bred. Visitors are welcomed by healthy looking plants, the centerpiece of the country's ongoing potato field trial. The group of farmers engaged in potato farming and seed production came for a tour at the institute. KaZARDI director Alex Barekye explained to the farmers that the plants are still being researched and are likely to be released next year, but only if the government gives it a green light.

Govt urged to focus on agri-sector

(The Tribune)

Adoption of biotechnology can be bridged such as the staggering yield gap in the crop of maize - national average 46 maunds per acre versus 120 maunds per acre for progressive farmers. Over 50% of global maize grain output comes from 14 countries that have embraced this technology. With China

primed to commercialise GM maize for cultivation in 2023, over 70% of global output will be benefiting from this technology.

A new chance for genetically engineered crops
(The Kathmandu Post)
Moreover, advocates argue, gene editing may be the key to developing more resilient, sustainable crops. These claims are backed by significant evidence: countries that have embraced GE crops report lower insecticide use, more environmentally friendly tillage practices, and improved crop yields. South Africa is a case in point. We began planting GE maize seeds widely in the 2001-02 season. Prior to that, average maize yields were around 2.4 tons per hectare; last season, that figure was 5.9 tons per hectare. As a result, South Africa managed to produce nearly 20 percent of Sub-Saharan Africa's maize on only about 2.5 million hectares of land. By contrast, Nigeria typically plants about 6.5 million hectares of maize, but accounts for only 15 percent of Sub-Saharan Africa's output, according to data from the International Grains Council. Across the region, maize yields average less than two tons per hectare. And irrigation does not explain the discrepancy: only 10 percent of South Africa's maize is irrigated; the rest of the crop is rainfed, like in the rest of Sub-Saharan Africa.

Ethiopia - One of World's Genetic Diversity Centers
(All Africa)
'Biodiversity Status in Ethiopia and Challenges' expounded by Azamal Hussen and Vinod Kumar Mishra, among others, indicates that there is an urgent need of mapping biodiversity in various environments, doing inventory, monitoring biodiversity and sharing global data. Conservation of genetic resources will assist genetic improvement of crop plants and livestock. Bio-prospecting-value addition on biodiversity will provide economic gain for the country. However, necessary measures need to be initiated to safeguard the germplasms against potential threat of bio-piracy. National legislations-for access and benefit sharing, and trans-boundary movement of germplasms need to be ensured to safeguard the interest of the country too, according to the paper.

USGC helps connect dots on corn and ethanol in India
(Ethanol Producer Magazine)
"India wants to double its supply of corn, and this was a first opportunity to demonstrate U.S. corn industry best practices that India could model to fit its own need," said Alejandra Danielson Castillo, USGC director for South Asia. Having a broader conversation during this event about the types of technology that boosted U.S. corn yield and production allowed the Council to illustrate how the U.S. ethanol industry grew and how practices like precision agriculture, crop protection and soil management could help India meet its dual goals of feeding its population and addressing its environmental concerns. "We were able to connect the use of technology in our farming practices as the source of the increase in U.S. production and how this increase translated to a robust domestic market that gave birth to the ethanol industry, which is now helping to supply the world," Danielson Castillo said.

Embracing Safe Science for the Health of People and the Environment
(AgWeb)
Today, farming is a solutions and evidence-based career, requiring a level of understanding from agronomics to economics, science to sustainability. We rely on advanced technology, for example GPS systems, that allow precision measurements and then applications of the crop-protection and plant nutrition products. Improving crop productivity by improving the plants genetics to withstand bad weather and increase resistance to disease and pests has been farming's goal for hundreds of years. With Gene Editing [GE], crop researchers work with genes already in a plant to make them more resilient. It is the conventional breeding that farmers and nature have done for generations but done faster and more accurately using scientific precision rather than randomness of nature. As a farmer, I've grown up accepting the weather risk that many other industries do not have - my factory does not have a roof!

Thaw coming for U.K. gene-editing regulations
(Science Mag)

The United Kingdom is expected to make it easier to test and commercialize some genetically engineered crops and livestock. The decision, which will be announced by 17 June, applies to plants and animals whose genes have been edited with new precision techniques like CRISPR. That would put the United Kingdom in line with several countries including the United States, and U.K. biotechnologists say it will speed up research and stimulate investment. The decision will only apply to England. The European Union is also rethinking its restrictions on gene editing. An April report by the European Commission concludes it could make agriculture more sustainable and found "strong indications" that EU law isn't suitable for regulating gene-edited organisms. But any regulatory reforms would run into problems with the European Parliament, where anti–genetically modified organism sentiment is still strong.

Gene Editing Seeds With CRISPR Is Transforming Agricultural Biotechnology
(Forbes)
One of the main focuses of agricultural biotechnology is to feed a hungry world in a more sustainable way. Many current farming methods are inefficient because they require large amounts of water, fertilizer and pesticides. Agricultural biotech is trying to solve these problems by starting at the seed level. A company that specializes in seed technology, is using gene editing to change food production by making it more sustainable. It has raised $208 million in a Series D fundraiser and has reached a valuation of $1.2 billion.

Anti-GMO groups rush to block EU farmer access to gene-edited crops in the name of sustainable farming
(GLP)
Anti-GMO advocacy groups are public relations experts. Their objective — denying farmers access to sustainable technologies as part of a broader, radical environmental agenda — would win little public support if accurately presented, but they've learned to couch their ideology in terms that resonate. When they take donations from organic lobbying groups to promote GMO labels, they say they're only "exposing what the food industry doesn't want you to know." When they agitate to ban glyphosate, a weedkiller nearly every expert says is safe, they claim they're protecting the public from a dangerous chemical the EPA refuses to take off the market. These groups are now running the very same play again in Europe, in a bid to halt loosening restrictions on gene-edited crops, developed with new breeding techniques (NBTs) like CRISPR-Cas9.

Microorganisms have the greatest potential for deploying gene technology in farming
(Hortidaily)
Gene-editing techniques are booming. With continued improvements, higher editing success rates and cheaper methods are expected. The positive applications include higher productivity in crop and livestock production as a result of improved plant and animal genetics. Innovative new crop and livestock inputs, such as better probiotics to enhance animal gut health, and new biologicals for crop protection and nutrient uptake can also be expected. Gene-editing technology, already being applied in humans, plants, animals, and microorganisms, has a vast impact on several areas and industries. As genes are the code for physical traits – such as yield, disease resistance, and appearance – the power of gene editing unlocks possibilities for designing a biological system to suit one's needs. "Gene editing can greatly reduce the time and cost of plant and animal breeding, which is crucial for a resilient supply chain, especially in this era marked by climate change. Also, it offers added value through innovative products and longer shelf life," according to Chia-Kai Kang, Analyst – Farm Inputs for Rabobank.

Tunisia to develop sustainable methods to increase crop production
(Hortidaily)
The Center for Sustainable Development at Qatar University (QU) was recently awarded a project to produce biological fertilizers based on salt-tolerant microorganisms to promote organic crop production in Qatar. The project is in response the Food Security Call from the Qatar National Research Fund and Ministry of Municipality and Environment and aims to increase Qatar's food security in a sustainable manner. This bio-fertilizer will not only improve plant productivity and fruit quality but also enhance the soil quality and allow for the use of salt-water for sustainable production of conventional crops such as tomatoes.

Yuan Longping, Plant Scientist Who Helped Curb Famine, Dies at 90

(GM News Hub)

Yuan Longping, a Chinese plant scientist whose breakthroughs in developing high-yield hybrid strains of rice helped to alleviate famine and poverty across much of Asia and Africa, died on Saturday in Changsha, China. He was 90. The cause was multiple organ failure, China's main state-run newspaper, People's Daily, reported. An earlier report from an official news service in Hunan Province, of which Changsha is the capital, said Mr. Yuan had been increasingly unwell since a fall in March during a visit to a rice-breeding research site. Mr. Yuan's research made him a national hero and a symbol of dogged scientific pursuit in China. His death triggered messages of grief across the country, where Mr. Yuan — slight, elfin-featured and wizened in old age — was a celebrity. Hundreds left flowers at the funeral home where his body was being kept. Mr. Yuan made two major discoveries in hybrid rice cultivation, said Jauhar Ali, the senior scientist for hybrid rice breeding at the International Rice Research Institute in Los Baños, the Philippines. Those discoveries, in the early 1970s — together with breakthroughs in wheat cultivation in the '50s and '60s by Norman Borlaug, an American plant scientist — helped create the Green Revolution of steeply rising harvests and an end to famine in most of the world.

CropLife Asia Highlights How Plant Science Is 'Part Of The Solution' On Biodiversity Day

(Scoop World)

In concert with the theme for this year's International Day for Biological Development (or Biodiversity Day), We're part of the solution, CropLife Asia and its members are commemorating the day by raising the necessity of a biologically diverse planet in ensuring our sustainable future and highlighting that plant science industry is increasingly 'part of the solution' in supporting biodiversity. At present, climate change, deforestation and human activity pose the greatest threats to biodiversity. This is particularly concerning as richness in biodiversity is key in supporting agricultural systems and food production. Innovations in plant science offer solutions that can help mitigate a number of these threats to biodiversity.

Will genetically modified vaccines make Europe rethink "Frankenfood"?

(Marketplace)

For more than two decades, much of Europe has resisted the genetic modification of crops. This has had negative economic consequences for the United States, which has a global lead in this technology. Rejection of so-called Frankenfoods across the European Union has denied American agribusiness and biotechnology firms billions in potential export revenues and has strained trans-Atlantic trade relations. But that could be about to change, due to COVID-19. Millions of Europeans have been happy to receive a coronavirus vaccine, which relies on genetic engineering, prompting the question: What's the difference between a GM shot and a GM crop? Will COVID-19 finally clinch the case in Europe for the commercial development of a technology that promises higher agricultural productivity, lower food prices, a cleaner environment and bigger export revenues for the U.S.?

New Research

Jose M. Barrero, Donald J. MacKenzie, Richard E. Goodman and T.J.V. Higgins provide an in-depth look at what we need to know about a biotech shield for cowpea against the major insect pests

(Open Access Government)

Cowpea (Vigna unguiculata) is a vital staple crop in West Africa consumed daily by more than 200 million people and provides an important source of income. Nigeria, the largest producer, still needs to import around 500,000 tonnes per year to meet domestic demand. This is because insects can reduce yields by 90%, both pre- and post-harvest (Singh, 1990). One of the major pre-harvest pests is the lepidopteran (moth), Maruca vitrata, known as the pod-borer. The major post-harvest or storage pest is the coleopteran (beetle), Callosobruchus maculatus, known as the cowpea weevil, which is a bruchid (Figure 1). Pre-harvest cowpea yield losses due to the pod-borer range from 20 to 80% (Ba et al., 2019) and it is conservatively estimated that over 30,000 tonnes are lost to bruchids annually during storage (Caswell, 1981). More recently, the post-harvest bruchid damage has been estimated at 25% (Baributsa et al., 2010). Genetic solutions for both problems are feasible using biotechnology,

and their deployment in the field to control these pests would allow Nigeria and neighbouring countries to become self-sufficient with less reliance on chemical pesticides.

Researchers Uncover the Watermelon's Origins

(Smithsonian Magazine)

Prior to these new findings, published last week in the journal Proceedings of the National Academy of Sciences, the predominant view was that the watermelon's evolutionary roots were in South Africa, reports Tara Yarlagadda for Inverse. But once lead study author Susanne S. Renner and her co-authors started sequencing the DNA of wild plants in the watermelon's genus—Citrullus—a different picture emerged. "It turned out there were more species than previously thought, and that plants from South Africa were not genetically close to today's domesticated watermelon," Renner, an evolutionary biologist at Washington University in St. Louis, tells Inverse. In 2015, one of Renner's graduate students, Guillaume Chomicki, took a closer look at the DNA of the supposed South African ancestor of the watermelon and found the two species were more distantly related than expected. "From there, one thing led to another," Renner tells Gizmodo.

Company lays groundwork for gene-edited hemp

(Capital Press)

A biotechnology company has taken a key step toward genetically editing hemp with an eye toward easing large-scale production of the crop. Calyxt, a Minnesota-based plant technology firm, has transformed the hemp genome to provide a "proof of concept" that the crop can be altered with its TALEN method of using "gene scissors," said Sarah Reiter, its chief business officer. "For us, it's sort of a dream crop. It also needs a ton of improvement to reach that potential," Reiter said. Achieving a more uniform plant height, reducing the amount of psychoactive THC compound and enhancing the size and consistency of seed are among the traits that Calyxt will now try to develop in hemp, she said. The company expects to concentrate more on fiber and grain production than the plant's CBD content, she said. Cannabidiol, or CBD, is an extract that's popularly used for its healthful properties.

Scientists discover how to alter colour and ripening rates of tomatoes

(Mirage News)

Scientists at the University of Oxford's Department of Plant Sciences have discovered how the overall process of fruit ripening in tomato (including colour changes and softening) can be changed -speeded up or slowed down – by modifying the expression of a single protein located in subcellular organelles called the plastids. This offers a novel opportunity for crop improvement. The production of fruit is a vital process for plants because it enables them to reproduce and thrive. One strategy that plants use to ensure that their fruit are successful is to give them a colourful appearance, so that they are attractive to animals for seed dispersal.

Argentina to develop herbicide resistant cotton

(Fibre2fashion)

Argentina's Bioheuris, and Gensus, a company that produces and markets certified cotton seeds, have announced a partnership to develop herbicide resistance in cotton crop using CRISPR gene editing. Bioheuris is a biotechnology company that develops sustainable post-GMO weed management systems in corn, soybeans, cotton, rice, sorghum, and alfalfa. Herbicide resistant GMO cotton expressing genes from other species are already available for farmers in several countries. The technology these companies are developing is different because it creates herbicide resistant traits by enhancing the performance of the crop's own genes. Four herbicide resistant GMO traits are commercially available in cotton globally, but only one, authorised more than 20 years ago, is on sale in Argentina.

Canada allowed commercial cultivation of drought-tolerant HB4 soybeans

(Pen Media)

Good progress of Argentine biotechnology. This Tuesday, Health Canada and the Canadian Food Inspection Agency reported that the regulation that has reviewed the approval process for this Soybean HB4 Drought and herbicide tolerant. According to the company's statement, in Canada

cultivates 2.5 million hectares each year A mule is less than three tons per hectare. Therefore, soybean production areas are suitable for HB4 value generation.

***