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Japan is all set to welcome a new gene-edited tomato which is a healthier version from the traditional ones. The Ministry of of Health, Labor and Welfare of Japan approved the production and sale of a tomato developed by the University of Tsukuba and startup Sanatech Seed. The variety features five times the normal amount of GABA (Gamma-AminoButyric Acid).

γ-Aminobutyric acid (GABA) is an amino acid that is found in animals, plants, and bacteria. In humans, GABA plays a major role in neurotransmission. In addition, when taken orally, it is effective in reducing elevated blood pressure and relieving stress. The researchers informed that the tomato does not contain any genes that differ from those of natural varieties. They also said that genome-editing has not increased the volume of allergens or toxic substances.

Hiroshi Ezura, a professor at the university and chief technology officer of Sanatech said that it took 15 years to develop this variety and using advanced technology it helped them to achieve the accuracy. The start-up plans to start offering seedlings for home gardens this spring via online orders, then fully launch seed sales to large-scale producers, with an eye toward widespread consumer access to the tomatoes in 2022. The seedlings and fruit will be clearly labelled as being produced with gene editing technology.

Other genome editing projects in Japan that is mostly handled by universities or public research institutions aims to produce higher-yield rice plants, meatier sea bream and hypoallergenic eggs.

Gene editing has many advantages and is one of the proven methods to grow food with enhanced benefits. It allows breeders to make small, specific and precise genetic changes in genome of the crop as per prior knowledge, without introducing any foreign DNA. The ease and precision of the methodology is solely based on genetic information and detailed know-how regarding the associated impact of the change. Since the final variety obtained has no foreign DNA and is similar to a conventionally bred variety, most nations do not regulate it or have softer regulations. The genetic change is made in the elite variety and with low regulatory costs, the overall cost of development and commercialization can be afforded by small and medium businesses. We hope countries realise it sooner than later the real potential that this technology holds and use it to drive growth in the agriculture sector and financial benefits for the farmer.

In this newsletter, we have captured interesting developments and research work from around the world in the agri industry. Hope you find it a good read.

Shivendra Bajaj
Executive Director
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AgBiotech News

Crop variety development process called balancing act

(The Western Producer)

A steady stream of better crop varieties designed for Canadian farmers is essential for success in world markets, requiring a careful balancing act as the country updates its seed regulations. “One of the things that many people are stressing is that any decisions need to be science based and not politically or socially driven,” Erin Armstrong says about the international discussions around new breeding technologies such as CRISPR gene editing. Canada is in the midst of a seed modernization initiative led by the Canadian Food Inspection Agency. Aimed at updating the Seeds Act and accompanying regulations as well as Plant Breeders Rights, it is set for completion in 2022. “This will be the first comprehensive review of the seed regs since the 1980s,” said Armstrong, executive director of the Barley Council of Canada. “It’s been quite a while since this has been undertaken.”

Cotton at risk due to lack of transgenic seed in Mexico

(La Prensa)

Cotton cultivation in Mexico could disappear next year, given the prohibition of SEMARNAT to use transgenic seed, warned the National Committee on Cotton Product System. The urgency for new genetically modified (GM) seeds of better quality for the next planting cycle led the organization to request a hearing from the Presidency to expose the problem. “To go back to planting conventional cotton, to begin with, there are no seeds, and it is not economically profitable, we are talking then that we are in danger that our crop will disappear by not having the seeds (GM) in the short term, starting in 2021” said Raúl Treviño, president of the Committee. The transgenic seeds improve characteristics of the fiber such as length and resistance, he explained. The vast majority of the more than 7,000 cotton producers, located mainly to the north, will have to migrate to other crops such as sorghum or corn.

Reaping the promise of biotechnology

(Business Mirror)

It has been nearly two decades since the Philippine government approved the sale and cultivation of genetically modified (GM) corn seeds in local farms. The government issued a permit to commercialize Monsanto Philippines’s bacillus thuringiensis (Bt) corn variety dubbed YieldGard on December 5, 2002. With this, the Philippines earned the distinction of being the first in Asia to commercialize Bt corn, a variety that enables corn farmers to save on production cost because they will no longer have to extensively use pesticides to kill the corn borer—a grain pest, particularly of corn.

Japan panel approves first genome-edited food

(NHK World Japan)

An expert panel at Japan's health ministry has given a go-ahead to sales of the country's first genome-edited food. The panel on Friday approved an application for the sale of a tomato whose genome has been edited to make it produce more of an amino acid called GABA. The substance is said to help

lower blood pressure. The tomato was jointly developed by the University of Tsukuba and a biotech firm.

Latin American researchers use gene editing to develop new crops that benefit farmers and consumers

(Alliance for Science)

Latin American farmers are partnering with scientists to create new crop varieties using gene-editing techniques such as CRISPR-CAS 9 in a move to help the region realize its potential as a world power in food production. The partnerships are an extension of the work that Latin American farmers have pursued for centuries as they dedicated their lives to safeguarding the region's tremendous biodiversity while developing a wonderful variety of crops, such as potato, corn, beans, tomato, chili, cocoa and cotton, among others.

The History of Plant Breeding--Improving on Nature?

(AgWeb)

The existence of human life on this planet relies entirely on a biochemical process called photosynthesis, which enables green plants to convert sunlight, water, and carbon dioxide into chemical energy in the form of carbohydrates and plant proteins, which humans and and other animals consume in order to sustain their lives. Even among peoples who rely almost entirely on animal foods in their diets due to the extreme climates they live in, such as the Inuit (Eskimo) tribes in Alaska, who live on seal, walrus, and whale meat, survive because those mammals consume small fish, which in turn feed on plankton, algae, and other fish and their eggs. Without plants, there would be no life on this planet.

Nobel Prize for CRISPR refutes anti-GMO activist rhetoric about crop gene editing

(GLP)

The year is coming to an end, and 2020 has popped a balloon filled with myths, untruths and lies deliberately spread by environmental groups (eNGOs) on gene editing. This fall the 2020 Nobel Prize in Chemistry was awarded for the discovery of the gene editing technology CRISPR/Cas9. This gene editing advancement, co-discovered by Emmanuelle Charpentier and Jennifer Doudna, is a transformative innovation that is demonstrating the staggering potential for improving global food security and human health. Early field trials of crop varieties developed by gene editing are reporting significant yield increases (such as 20% in rice), and we expect CRISPR/Cas9 to continue these advancements. In terms of improving human health, virtually all of the coronavirus (COVID-19) vaccines in development are utilizing gene editing technology.

Nigeria among six African countries leading in GM crop adoption

(Premium Times)

Nigeria, Ethiopia, and Malawi are now part of the African countries planting Genetically Modified (GM) crops, alongside South Africa, Sudan and Swaziland, according to a report by the International Service for the Acquisition of Agri-biotech Applications (ISAAA). The ISAAA's Global Status of Commercialised Biotech crops report, launched via a webinar broadcast on Monday, said Africa doubled the number of countries planting biotech crops from three in 2018 to six in 2019, leading the progress among the regions of the world in GM crop adoption. According to the report, the aforementioned six countries grew three major biotech crops (maize, soybean and cotton) on approximately three million hectares by the end of 2019. It says the seventh country, Kenya, granted approval for cultivation of Bt cotton and may soon join the league of adopter nations on the continent.

Molecular breeding speeds development of better seeds

(CIMMYT)

To adequately confront rapidly changing plant pests and diseases and safeguard food security for a growing population, breeders — in collaboration with their partners — have to keep testing and applying new breeding methods to deliver resilient seed varieties at a much faster rate using minimal resources. Molecular markers are essential in this regard and are helping to accelerate genetic gains and deliver better seed to smallholders across sub-Saharan Africa in a much shorter timeframe. Progress made so far in molecular plant breeding, genetics, genomic selection and genome editing has contributed to a deeper understanding on the role of molecular markers and greatly complemented

breeding strategies. However, phenotyping remains the single most costly process in plant breeding, thus limiting options to increase the size of breeding programs.

Experts discuss biotech crops as a greener solution

(Big News Network)

A UK-based agricultural economist and scientists from the University of the Philippines Los Banos (UPLB) reported that using crop biotechnology has reduced pesticide use associated with environmental impact and has been found to be beneficial for agricultural biodiversity. Dr. Graham Brookes, an agricultural economist at the UK-based PG Economics Ltd, presented the cumulative impact of using genetically modified (GM) crop technology in agriculture from 1996 to 2018. Aside from significant net economic benefits at the farm level amounting to more than USD 200 billion over a period of 22 years, he also presented key environmental impacts associated with using crop biotechnology such as reduced pesticide application by 775.4 million kg (8.3%). He said this resulted in the decreased environmental impact associated with herbicide and insecticide use on crops.

Smart and sustainable food systems

(Politico)

Plant breeding innovation blends traditional methods with the latest science and technology to develop new seeds that are better suited to evolving pests and a changing climate. Gene-editing tools like CRISPR, use a plant's natural genetic variability to develop crops that are more drought-tolerant, more nutritious, and more pest- or disease-resistant in a fraction of the time compared to older methods. This innovation can only flourish with the right policies and regulations. We believe gene editing is not only safe, but fundamental in achieving the goals of the EU Green Deal. The EU needs to find a balanced policy and reverse legislation that blocks new plant breeding tools. Otherwise, Europe could miss out on one of the most promising innovations of our lifetime to enable more sustainable resilient food systems.

Safer use of biotech emphasised to double crop production by 2030

(The Financial Express)

USAID and International Food Policy Research Institute (IFPRI) hosted the event to learn from stakeholders about challenges, prospects, and recommendations for agricultural research and biotechnology. The experts also suggested making the private sector skilled enough for rapid commercialisation of biotech products in agriculture. Bangladesh Agricultural Research Council member director (crops) Dr Md Aziz Zilani Chowdhury said the country's food production should be increased by 100 per cent within 2030 to achieve an SDG.

Researchers Recommend More Transparency for Gene-Edited Crops

(Phys.org)

Researchers at North Carolina State University call for a coalition of biotech industry, government and non-government organizations, trade organizations, and academic experts to work together to provide basic information about gene-edited crops to lift the veil on how plants or plant products are modified and provide greater transparency on the presence and use of gene editing in food supplies. At issue is a May 2020 U.S. Dept. of Agriculture rule called SECURE (sustainable, ecological, consistent, uniform, responsible, efficient) that governs genetically engineered organisms. The rule is expected to exempt most genetically modified plants to pre-market field testing and data-based risk assessment. In fact, the USDA estimates that 99% of biotech crops would receive this exemption.

Chinese scientists use gene-editing technology to promote agriculture

(Xinhua)

China has released the country's 10 most significant advances in agricultural science and technology. Notably, five of them are associated with gene-editing technology. The 10 advances by Chinese agricultural scientists last year were announced at the Forum 2020 on Science and Technology for Agricultural and Rural Development in China, which opened in Nanjing, capital of east China's Jiangsu Province. Chinese researchers identified a gene in teosinte, the wild ancestor of maize, and used it to alter maize, giving it a narrower form and enhanced high-density maize yields. In another study, scientists edited four genes in hybrid rice and obtained plants that could propagate clonally through seeds. This could help increase the yield of hybrid rice and change the pattern of crop breeding and

the seed industry in the future, according to a researcher from the Agricultural Information Institute of the Chinese Academy of Agricultural Sciences.

No Commercial Clearance For GM Crops In India Since 2006; Union Government's Policy Lacks Clarity, Say Experts

(Swarajya)

The Union government's policies on transgenic crops provides no incentive for seed companies to scale up their size and is creating a negative environment for the seed industry, according to experts in the sector. "Nothing has happened with regard to GM crops in the last 15 years. Two new applications, Bt (Bacillus thuringiensis) brinjal and GM mustard, got technical clearance but not political. Similarly, herbicide tolerant Bt (HTBT) cotton has been put on the backburner," said Ram Kaundinya, Director-General, Federation of Seed Industry of India (FSII). The last time a GM crop got approval for commercial launch in India was Bollgard II, an advanced version of Bollgard I Bt cotton, in 2006. Since then, no GM crop has been approved for commercial launch.

Meat from plants: Could animal proteins grown in GM crops be used to make burgers?

(GLP)

Using a genetic engineering technique known as molecular farming, Moolec Science believes it can leverage the scale of production of crop farming to create animal proteins more cost effectively than other forms of cellular agriculture – like cultured meat – can do today. The technique, which uses genetically-modified crops like tobacco or safflower to produce proteins, has been used since the 90s in the pharmaceutical industry. However, using molecular farming for production of animal cell protein through crops for use in food is relatively new and something Moolec's predecessor company has spent years working on.

Research

Novel Approach to Increase the Precision of Wheat Breeding

(Lab Manager)

Wheat researchers at the John Innes Centre are pioneering a new technique that promises to improve gene discovery for the globally important crop. Crop breeding involves assembling desired combinations of traits that are defined by underlying genetic variation. Part of this genetic variation often stays the same between generations, with certain genes being inherited together. These blocks of genes—very rarely broken up in genetic recombination—are called haplotype blocks. These haplotypes are the units that breeders switch and select between plants to create new crop lines. In the new study which appears in Communications Biology John Innes Centre researchers led by the group of professor Cristobal Uauy show that current platforms used by breeders do not provide the resolution needed to distinguish between haplotypes, potentially leading to inaccurate breeding decisions.

Molecular breeding speeds development of better seeds

(CIMMYT)

To adequately confront rapidly changing plant pests and diseases and safeguard food security for a growing population, breeders — in collaboration with their partners — have to keep testing and applying new breeding methods to deliver resilient seed varieties at a much faster rate using minimal resources. Molecular markers are essential in this regard and are helping to accelerate genetic gains and deliver better seed to smallholders across sub-Saharan Africa in a much shorter timeframe. Progress made so far in molecular plant breeding, genetics, genomic selection and genome editing has contributed to a deeper understanding on the role of molecular markers and greatly complemented breeding strategies. However, phenotyping remains the single most costly process in plant breeding, thus limiting options to increase the size of breeding programs.

Tomatoes offer affordable source of Parkinson's disease drug

(Science Daily)

Scientists have produced a tomato enriched in the Parkinson's disease drug L-DOPA in what could become a new, affordable source of one of the world's essential medicines. The development of the genetically modified (GM) tomato has implications for developing nations where access to

pharmaceutical drugs is restricted. This novel use of tomato plants as a natural source of L-DOPA also offers benefits for people who suffer adverse effects -- including nausea and behavioral complications -- of chemically synthesised L-DOPA. Tomato -- was chosen as a widely cultivated crop that can be used for scaled up production and potentially offering a standardised and controlled natural source of L-DOPA .

GM Birch Tree Study Shows Promising Results Against Insect Herbivores
(ISAAA)
A researcher from the University of Eastern Finland conducted a study that investigated the roles of flavonoids and condensed tannins in the silver branch tree's defense system against autumnal moth and ultraviolet B radiation (UVB). The results showed that foliar flavonoids have toxic and deterring effects against insect herbivores. Two experiments were conducted using control and genetically modified (GM) silver birch trees. The GM plants have specific enzymes of the flavonoid-tannin pathway partially silenced using RNAi. These are the dihydroflavonol reductase (DFR), and anthocyanin synthase (ANS), or anthocyanin reductase (ANR). Silencing them led to the block in production of one or both types of condensed tannin monomers thereby reducing the accumulation or altering the structure of condensed tannins. Data from the experiment showed that DFRi resulted in strongly reduced photosynthesis in plant growth, while ANRi decreased growth compared to the unmodified control plants.

Narrowing uncertainties in the effects of elevated CO2 on crops
(Nature)
Plant responses to rising atmospheric carbon dioxide (CO2) concentrations, together with projected variations in temperature and precipitation will determine future agricultural production. Estimates of the impacts of climate change on agriculture provide essential information to design effective adaptation strategies and develop sustainable food systems. Here, we review the current experimental evidence and crop models on the effects of elevated CO2 concentrations. Recent concerted efforts have narrowed the uncertainties in CO2-induced crop responses so that climate change impact simulations omitting CO2 can now be eliminated. To address remaining knowledge gaps and uncertainties in estimating the effects of elevated CO2 and climate change on crops, future research should expand experiments on more crop species under a wider range of growing conditions, improve the representation of responses to climate extremes in crop models, and simulate additional crop physiological processes related to nutritional quality.

A phased Vanilla planifolia genome enables genetic improvement of flavour and production
(Nature)
The global supply of vanilla extract is primarily sourced from the cured beans of the tropical orchid species Vanilla planifolia. Vanilla plants were collected from Mesoamerica, clonally propagated and globally distributed as part of the early spice trade. Today, the global food and beverage industry depends on descendants of these original plants that have not generally benefited from genetic improvement. As a result, vanilla growers and processors struggle to meet global demand for vanilla extract and are challenged by inefficient and unsustainable production practices. Here, we report a chromosome-scale, phased V. planifolia genome, which reveals sequence variants for genes that may impact the vanillin pathway and therefore influence bean quality. Resequencing of related vanilla species, including the minor commercial species Vanilla × tahitensis, identified genes that could impact productivity and post-harvest losses through pod dehiscence, flower anatomy and disease resistance. The vanilla genome reported in this study may enable accelerated breeding of vanilla to improve high-value traits.

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